Lucent Technologies
Bell Labs Innovations

Metropolis® DMX Access Multiplexer

Release 3.0

User Operations Guide

365-372-301 R3.0
Issue 6
July 2002

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This equipment is designed 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 instructions manual, may cause 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 his own expense.

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Technical Support Telephone Numbers

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This number is monitored 24 hours a day.

Information Product Support Telephone Number

You can also call these telephone numbers to provide comments on the Metropolis® DMX Access Multiplexer or to suggest enhancements.

This document was developed by the Lucent Learning Organization (LLO).

Lucent Technologies values your comments!

Lucent Technologies
Bell Labs Innovations

Metropolis® DMX Access Multiplexer, Release 3.0
User Operations Guide

365-372-301 R3.0 Issue 6 Date: July 2002

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In the language of your choice?	☐	☐	☐
In the desired media (paper, CD-ROM, etc.)?	☐	☐	☐
Available when you needed it?	☐	☐	☐

Please provide any additional comments:

_____

_____

2. Please rate the effectiveness of this information product:

	Excellent	*More than satisfactory*	*Satisfactory*	*Less than satisfactory*	*Unsatisfactory*	*Not applicable*
Ease of use	☐	☐	☐	☐	☐	☐
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Readability and clarity	☐	☐	☐	☐	☐	☐
Organization	☐	☐	☐	☐	☐	☐
Completeness	☐	☐	☐	☐	☐	☐
Technical accuracy	☐	☐	☐	☐	☐	☐
Quality of translation	☐	☐	☐	☐	☐	☐
Appearance	☐	☐	☐	☐	☐	☐

If your response to any of the above questions is "*Less than satisfactory*" or "*Unsatisfactory,*" please explain your rating.

_____

_____

3. If you could change one thing about this information product, what would it be?

_____

_____

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_____

_____

Please complete the following if we may contact you for clarification or to address your concerns:

Name: _____ Date: _____

Company/organization: _____ Telephone number: _____

Address: _____

Email address: _____ Job function: _____

If you choose to complete this form online, go to http://www.lucent-info.com/comments
Otherwise fax to 407 767 2760 (U.S.) or +1 407 767 2760 (outside the U.S.) or email comments to ctiphotline@lucent.com

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About this Information Product

Purpose

This User Operations Guide (UOG) provides the following information about the Metropolis® DMX Access Multiplexer (Metropolis® DMX), Release 3.0:

- Detailed descriptive information to the circuit pack level
- Acceptance, operation, and provisioning tasks.

Reason for reissue

This document, *Metropolis® DMX Access Multiplexer User Operations Guide, 365-372-301*, Issue 6, is reissued to update existing information and add new information about product Release 3.0.

Significant changes in this issue are noted by bars (|) in the left margin.

Safety labels

This document may contain safety labels in the form of **DANGER**, **WARNING**, and **CAUTION**. 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. Caution is also used for property-damage-only accidents, including equipment damage, loss of software, or service interruption.

Intended audience

This User Operations Guide is intended primarily for telecommunications technicians and communications network providers.

Descriptive information in this document is intended for anyone desiring specific information or knowledge about the operational functions and features of the Metropolis® DMX.

Procedural information (tasks) in this document is intended primarily for maintenance, operation, and provisioning personnel responsible for operating and maintaining the Metropolis® DMX.

How to use this information product

This User Operations Guide includes both descriptive, reference chapters and procedural, task chapters.

Assumptions

This document assumes that users have an understanding of the following:

- Basic principles of telecommunication transmission
- Common telecommunication and system terminology (a glossary is provided in this manual to assist you)
- Test sets and tools used in the telecommunication industry
- Local operations and functional procedures of your company
- Personal computer (PC) operation, common PC terminology, and navigational procedures in a windows-style user interface

Chapter contents

The following table provides a brief description of each chapter in this document.

Table 1 Chapter Contents

Chapter	Contents
Chapter 1, "System Overview"	This chapter: • briefly describes Metropolis® DMX and the Metropolis® DMX Product Family • lists key features • describes the transmission interfaces • describes system growth
Chapter 2, "Platform Description"	This chapter provides an equipment overview including: • shelves, • circuit packs • power equipment

Chapter	Contents
Chapter 3, "Operations Interfaces"	This chapter describes the various operations interfaces available to the Metropolis® DMX including: • craft interface terminal (CIT) • OS interfaces • circuit pack faceplates • fan unit LEDs and controls • office alarms interfaces
Chapter 4, "Synchronization Interfaces"	This chapter describes the Metropolis® DMX synchronization interfaces.
Chapter 5, "Provisioning, Security, & Administration"	This chapter describes Metropolis® DMX provisioning and issues concerning: • network element (NE) login administration and security • AIDs overview and parameter tables • cross-connection management • fault management
Chapter 6, "Performance Monitoring"	This chapter describes performance monitoring at various levels.
Chapter 7, "Ethernet"	This chapter describes the ethernet implementation for Metropolis® DMX.
Chapter 8, "Acceptance Tasks"	This chapter provides procedures to accept hardware after installation by someone else.
Chapter 9, "Operations Tasks"	This chapter provides procedures that can be used in day-to-day operations including: • logins • passwords • fan filters • loopbacks

Chapter	Contents
Chapter 10, "Circuit Order/Provisioning Tasks"	This chapter provides procedures that are used when adding or deleting work order items including: • timing • cross-connections • circuit packs • optical protection groups • TCA profiles • PM registers
Chapter 11, "Supporting Tasks"	This chapter provides procedures for performing supporting tasks including: • cleaning fibers and connectors • removing and inserting circuit packs • replacing fan units / power filters / shelf covers / etc. • selecting LBOs
Appendix A, WaveStar® CIT Tutorial	This appendix contains a brief tutorial on the WaveStar® CIT.
Appendix B, Technical Specifications	This appendix contains the technical specifications for Metropolis® DMX, including: • Electrical interfaces • Optical interfaces • System performance • Operations interfaces • Physical specifications
Appendix C, IS-IS Level 2 Routing Guidelines	This appendix details the guidelines for IS-IS Level 2 Routing in networks larger than 50 OSI nodes.
Appendix D, An Introduction to SONET	This appendix provides an introduction to Synchronous Optical NETwork (SONET) as defined by the American National Standards Institute (ANSI).
Appendix E, Allowable Cross-Connections	This appendix provides the allowable cross-connections.

Chapter	Contents
Glossary	Defines terms used throughout the Metropolis® DMX documentation.
Index	Provides detailed access to the contents of this document.

Conventions used

The following conventions are used in this document.

- **Commands** and *Parameters*
- *Document References*, 123-456-789
- Cross-Reference/page number:
  Introduction to Metropolis® DMX Access Multiplexer
- A **MONOSPACE** font identifies the lettering designations on panels, shelves, and circuit packs.

Related documentation

The following table lists the documents included in the Metropolis® DMX documentation set.

Table 2 Metropolis® DMX Documentation Set

Comcode	Document Number	Title
NA	365-372-304 R3.0	*Metropolis® DMX Access Multiplexer Installation Manual*
109 251 496	365-372-300 R3.0	*Metropolis® DMX Access Multiplexer Applications and Planning Guide*
NA	365-372-306 R3.0	*Metropolis® DMX Access Multiplexer TL1 Command Manual*
109 251 470	365-372-301 R3.0	*Metropolis® DMX Access Multiplexer User Operations Guide*
109 251 488	365-372-302 R3.0	*Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide*
109 246 686	NA	*Metropolis® DMX Access Multiplexer Release 3.0 Documents*

Laser safety information

Optical fiber telecommunication systems, their associated test sets, and similar operating systems use semiconductor laser transmitters that emit infrared (IR) light at wavelengths between approximately 800 nanometers (nm) and 1600 nm. 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-IR 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 monochromatic light 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

The optical energy emitted by laser and high-radiance LEDs in the 400-1400 nm range may cause eye damage if absorbed by the retina. When a beam of light enters the eye, the eye magnifies and focuses the energy on the retina magnifying the irradiance. The irradiance of the energy that reaches the retina is approximately 105 or 100,000 times more that at the cornea and, if sufficiently intense, may cause a retinal burn.

The damage mechanism at the wavelengths used in an optical fiber telecommunications is thermal in origin, for example, damage caused by heating. Therefore, a specific amount of energy is required for a definite time to heat an area of retinal tissue. Damage to the retina 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. Optical energies above 1400 nm cause corneal and skin burns, but do not affect the retina. The thresholds for injury at wavelengths greater than 1400 nm are significantly higher that for wavelengths in the retinal hazard region.

Classification of lasers

Manufacturers of lasers and laser products in the United States are regulated by the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) under 21 CFR 1040. These regulations require manufacturers to certify each laser or laser product as belonging to one of four major Classes: I, II, IIa, IIIa, IIIb, or IV. The International Electro-technical Commission (IEC) is an international standards body that writes laser safety standards. Classification schemes are similar with Classes divided into Classes 1, 2, 3A, 3B, and 4. Lasers are classified according to the accessible emission limits and their potential for causing injury. Optical fiber telecommunication systems are generally classified as Class I/1, because, under normal operating conditions, all energized laser transmitting circuit packs are terminated on optical fibers which enclose the laser energy with the fiber sheath forming a protective housing. Also, a protective housing/access panel is typically installed in front of the laser circuit pack shelves. The circuit packs themselves, however, may be FDA/CDRH Class I or IIIb or IEC Class 1, 3A, or 3B.

Laser safety precautions for optical fiber tekecommunications systems

In its normal operating mode, an optical fiber telecommunication system is totally enclosed and presents no risk of eye injury. It is a Class I/1 system under the FDA/CDRH and IEC classifications.

The fiber optic cables that interconnect various components of an optical fiber telecommunication 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 density) 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 milliwatts at the near IR wavelengths and a few tens of milliwatts at the far IR 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, adjustments and procedures other than those specified herein may result in hazardous laser radiation exposure.

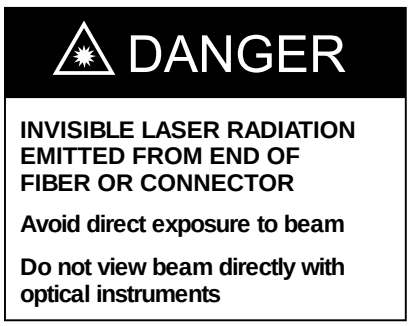
Laser safety precautions for enclosed systems

Under normal operating conditions, optical fiber telecommunication systems are completely enclosed; nonetheless, the following precautions shall be observed:

- Because of the potential for eye damage, technicians should not stare into optical connectors or broken fibers.
- Under no circumstance shall laser/fiber optic operations be performed by a technician before satisfactorily completing an approved training course.
- Since viewing lightwave emission directly in excess of Class I/1 limits with an optical instrument such as an eye loupe greatly increases the risk of eye damage, appropriate labels must appear in plain view, in close proximity to the optical port on the protective housing/access panel of the terminal equipment.

Figure 1 illustrates the FDA Class IIIb non-interlocked protective housing label.

Figure 1 Protective Housing Label



NC-USM-111

Laser safety precautions for unenclosed systems

During service, maintenance, or restoration, an optical fiber telecommunication system is considered unenclosed. Under these conditions, follow these practices:

- 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. Laser modules associated with the optical ports of laser circuit packs are typically recessed, which limits the exposure distance. Optical port shutters and automatic power reduction (APR), and automatic power shut down (APSD) are engineering controls that are also used to limit the emissions. However, technicians removing or replacing laser circuit packs should not stare or look directly into the optical port with optical instruments or magnifying lenses. (Normal eye wear or indirect viewing instruments, such as a Find-R-Scopes, are not considered magnifying lenses or optical instruments.)
- Only authorized, trained personnel shall use the optical test equipment during installation or servicing since this equipment contains semiconductor lasers. (Some examples of optical test equipment are Optical Time Domain Reflectometers [OTDRs], Hand-Held Loss Test Sets, and Feature Finders.)
- Under no circumstances shall any personnel scan a fiber with an optical test set without verifying that all laser sources on the fiber are turned off.
- All unauthorized personnel shall be excluded from the immediate area of the optical fiber telecommunication systems during installation and service.

Consult *ANSI* Z136.1, American National Standard for Safe Use of Lasers in the United States or outside the United States, IEC-60825, Part 2 for guidance on the safe use of optical fiber optic communication systems in the workplace.

Electrostatic Discharge (ESD) Considerations

This section describes the precautions required because of ESD.

Circuit pack handling precautions

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

Observe the following precautions when handling circuit packs/units to prevent damage by electrostatic discharge:

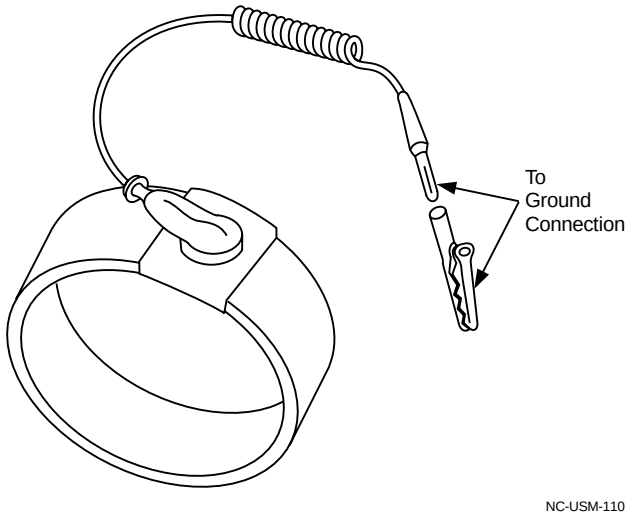
- Assume all circuit packs contain solid-state electronic components that can be damaged by ESD.
- When handling circuit packs (storing, installing, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, static-dissipating floor mat.
- 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 all warning labels on bags and cartons. Whenever possible, do not remove circuit packs from antistatic packaging until ready to insert them into slots.
- If possible, open all circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats.
- Always store and transport circuit packs in static-safe packaging. Shielding is not required unless specified.
- Keep all static-generating materials such as food wrappers, plastics, and *Styrofoam*® containers away from all circuit packs. When removing circuit packs from a shelf, immediately place the circuit packs in static-safe packages.
- Whenever possible, maintain relative humidity above 20 percent.

Important! Any connectors on the shelf interconnection panel that are not cabled should be fitted with a plastic dust cap to provide ESD protection.

Static control wrist straps

To reduce the possibility of ESD damage, the Metropolis® DMX shelf is equipped with an ESD grounding jack to enable personnel to ground themselves using wrist straps (Figure 2), while handling circuit packs or working on the shelf. The wrist straps should be checked periodically with a wrist strap tester to ensure that they are working properly.

Figure 2 Static Control Wrist Strap



Important! The grounding jack is located on the front of the shelf, on the lower right-hand corner. Another grounding jack is also located on the rear panel.

Important safety instructions

READ AND UNDERSTAND ALL INSTRUCTIONS.

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying this product.

When installing, operating, or maintaining this equipment basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons, including the following:

1. Follow all warnings and instructions marked on this product.
2. This equipment is to be installed only in Restricted Access Areas.
3. To be powered only by Safety Extra Low Voltage (SELV) -48 V DC sources.
4. Disconnect up to Two (2) power supply connections when removing power from the system.
5. This product should be only operated from the type of power sources indicated on the marking label.
6. Connect this product only to the type of power sources recommended by Lucent Technologies. For information on the powering instructions, consult the Installation Instructions section of the installation manual.
7. This equipment must be provided with a readily accessible disconnect device as part of the building installation.
8. Installation must include an independent frame ground drop to the building ground.
9. This equipment is suitable for mounting on a concrete or other noncombustible surface only.
10. For information on proper mounting instructions, consult the Instructions section of the installation manual.
11. Install only equipment identified in the installation manual. Use of other equipment may result in improper connection of circuitry leading to fire or injury to persons.
12. The telecommunication interfaces should not leave the building premises unless connected to telecommunication devices providing primary and secondary protection, as possible.
13. Do not use this product near water, for example, in a wet basement.
14. Do not place this product on an unstable cart, stand, or table. The product may fall, causing serious damage to the product.
15. Use caution when installing or modifying telecommunications lines.

16. Never install telecommunications wiring during a lightning storm.
17. Never install telecommunications connections in wet locations.
18. Never touch uninsulated telecommunication wires or terminals unless the telecommunication line has been disconnected at the network interface.
19. Never touch uninsulated wiring or terminals carrying direct current or ringing current, or leave this wiring exposed. Protect and tape uninsulated wiring and terminals to avoid risk of fire, electric shock, and injury to service personnel.
20. Never push objects of any kind into this product through 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 liquids of any kind on the product.
21. Slots and openings in the unit are provided for ventilations, to protect it from overheating, and these openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided.
22. To reduce the risk of an 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.
23. Some of the Metropolis® DMX Access Multiplexer system circuit packs contain FDA/CDRH Class I/IEC Class 1 single-mode laser products that are enclosed lightwave transmission systems. Under normal operating conditions, lightwave transmission systems are completely enclosed; nonetheless, the following precaution must be observed because of the potential for eye damage:
    - Do not disconnect any lightwave cable or splice and stare into the optical connectors terminating the cables.
    - Lightwave/lightguide operations should not be performed by a technician who has not satisfactorily completed an approved training course.
    - Do not use optical instruments such as an eye loupe to view a fiber or unterminated connector.
    - More information about laser safety can be found in the installation manual.

SAVE THESE INSTRUCTIONS.

User interface to system

Users interact with the Metropolis® DMX Access Multiplexer using a PC and a windows-based graphical user interface (GUI). The GUI is called the WaveStar® Craft Interface Terminal (WaveStar® CIT), which permits users to perform system operations such as administration, provisioning, fault management, and more.

Using the WaveStar® CIT

Procedures or tasks presented in this document expect users to be familiar with the WaveStar® CIT and navigating through the screens of information relating to a particular operation. The screens are designed to be straightforward and to contain all information relating to a particular operation. The tasks presented in this document rely on the information provided in the screen displays. Therefore, it is imperative that users read all the information provided in a screen before continuing an operational function.

Appendix A, WaveStar® CIT Tutorial provides introductory information about using the WaveStar® CIT.

> **Important!** Use the tutorial only with a network element that is out of service.

Using tasks

To find instructions for performing a specific job, first determine the task category (for example acceptance, operations, or circuit order/provisioning). After determining the task category, go to the corresponding chapter and find the task in the chapter table of contents.

Using task elements

Task elements contain step-by-step instructions to accomplish a distinct user task. Task elements are provided in the following task chapters:

- Chapter 8, “Acceptance Tasks”
- Chapter 9, “Operations Tasks”
- Chapter 10, “Circuit Order/Provisioning Tasks”

All task elements in each task category are numbered and listed in numerical order. However, do not perform any of the tasks in numerical order unless directed to by a task element.

Important! Perform all **steps** in a task element sequentially, unless that step sends you to another step, task element, supporting element (SE), or a supporting task.

Unless otherwise instructed, if one task element sends you to another task element or supporting task, you must return to the first task element after you complete the second. After you have completed the first task element, you have finished the task.

Using supporting tasks

The tasks in Chapter 11, "Supporting Tasks" are referenced from multiple task elements to support a job function you are performing.

Go to a supporting task only when it is referred to by a task element. Supporting tasks are not to be accessed directly except by very experienced personnel.

Important! Perform all steps in a supporting task in numeric order unless a step sends you to another task element, or supporting task.

Unless otherwise instructed, if one task element sends you to another task element or supporting task, you must return to the first task element after you complete the second. After you have completed the first task element, you have finished the task.

If/Then statements in a task

If …/Then … columns in a task contain only one condition that is true in a table cell under the If … column. You perform the action in the related table cell under the Then … column. You then continue to the next sequential step or as directed by the action under the Then … column.

Verifying actions

Sometimes you will be asked to verify that actions 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 chapter entitled "Trouble-Clearing Tasks" in the *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302* to start trouble clearing.

Documentation ordering information

This section describes how to order

- Additional copies of this document
- Electronic documentation (CD-ROMs)

ILEC/CLEC Customers

ILEC/CLEC customers should process orders through your Company Documentation Coordinator.

Commercial Customers

The following table provides the information necessary for commercial customers to order standard documentation or request placement on the standing order list (for reissues of any document) by mail, telephone, or fax.

Table 3 Placing an Order (Mail, Email, Phone, or Fax)

Addresses	Telephone Numbers	Fax Numbers
Mailing Address: Lucent Learning Organization Attention: Order Entry 2855 N. Franklin Road P.O. Box 19901 Indianapolis, IN 46219 Email: intlnaorders@lucent.com	From USA: 1-888-LUCENT-8 (1-888-582-3688)	1-800-566-9568
	From Canada, North American Region: +1-317-322-6615	+1-317-322-6699
	From Europe, the Middle East, and Africa (EMEA), Asia, Pacific Region, and China; Caribbean, Latin America (CALA): +1-317-322-6416	+1-317-322-6699

The following table provides the information necessary for customers to order standard documentation or request placement on the standing order list (for reissues of any document) via the internet.

Table 4 Placing an Order via the Internet

Customer	Web-SIte
Commercial Customers	http://www.lucentdocs.com
	http://www.lucent8.com
Lucent Associates	http://www.cic.lucent.com

Methods of payment

Lucent Associates are billed using an FML organization number/cost center and location code.

Commercial customers may use one of the following methods of payment:

- Check (payable to Lucent Technologies)
- Money order (payable to Lucent Technologies)
- Invoice upon receipt of a purchase order.

  (Purchase orders may be faxed or mailed using the information provided above.)
- Credit card:
  - Visa
  - MasterCard
  - American Express

Important! For orders totaling $1000 or less, either a credit card or prepayment by check/money order is required.

Worldwide Services

Lucent Worldwide Services provides a full life-cycle of services and solutions to help you plan, design, implement, and operate your network in today's rapidly changing and complex environment.

Engineering Services

Engineering Services provide information and technical support to customers during the planning, implementation, and placement of equipment into new or existing networks. We determine the best, most economical equipment solution for a customer and help ensure equipment is configured correctly for the customer’s network needs, works as specified, and is ready for installation on delivery. These services consist of the following:

- Equipment engineering
- Software engineering
- Site records
- Engineering consulting
- Additional engineering services (for example, Network Realignment, System Capacity Planning, System Health Assessment

Installation Services

Lucent Technologies offers Installation Services focused on providing the technical support and resources customers need to efficiently and cost-effectively install their network equipment. We offer a variety of options that provide extensive support and deliver superior execution to help ensure the system hardware is installed, tested, and functioning as engineered and specified. Installation Services provides a complete flexible solution tailored to meet customers' specific needs. These services consist of the following:

- Equipment installation
- Specialized equipment installation
- Network connectivity services
- Installation support services

Technical Support

Lucent Technologies provides the following Technical Support Services:

- Remote Technical Support (RTS) - remote technical support to troubleshoot and resolve system problems.
- On-site Technical Support (OTS) - on-site assistance with operational issues and remedial maintenance.
- Repair and Replacement (R&R) - technical support services for device repair/return or parts replacement.
- Lucent OnLine Customer Support - online access to information and services that can help resolve technical support requests.

Important! Technical Support Services are available 24 hours a day, 7 days a week.

Customers inside the United States and Canada

Technical Support Services can be reached at **1-866-LUCENT8** (866-582-3688): *Prompt 1*.

Customers outside the United States

Technical Support Services can be reached at **+1-630-224-4672**: *Prompt 2*.

Web-Site

For additional information regarding Worldwide Services, refer to the Lucent Technologies' web-site at **http://www.lucent.com/products**

1. Click on **Browse the catalog**
2. Click on **Worldwide Services Solutions**
3. Select the desired service to display:
   - Engineering and Installation
   - Technical Support Services

Training

This document expects a user to be familiar with the basic functions of the system before performing tasks that could damage the system, affect system operations, or impede communication traffic within the system. Understanding the descriptive material provided in this manual and attending the recommended training courses should allow you to perform the tasks necessary to operate and maintain Metropolis® DMX.

Refer to **https://www.lucent-product-training.com** for descriptions of the training courses available for Metropolis® DMX.

Registering for a course

To review the available courses or to enroll in a training course at one of Lucent's corporate training centers,

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1 System Overview

Overview

Purpose

This chapter introduces the Metropolis® DMX Access Multiplexer and briefly describes the products features.

Contents

The following topics are included in this chapter:

Introduction to Metropolis® DMX Access Multiplexer

Overview

The Metropolis® DMX Access Multiplexer (Metropolis® DMX) is a single shelf network multiplexer designed primarily for access transport, business access, and regional interoffice applications transporting voice and data at the OC-48 level via a unidirectional path switched ring. In Release 2.1, Metropolis® DMX supports OC-192 unidirectional path switched rings and high speed OC-48 2-fiber bidirectional line switched rings. In Release 3.0, Metropolis® DMX supports high speed OC-192 2-fiber bidirectional line switched rings, high speed OC-48 linear (1+1) applications, and a single low speed OC-48 2-fiber bidirectional line switched ring.

Lucent's rich history of SONET multiplexers provides the foundation for Metropolis® DMX. Metropolis® DMX builds on that tradition by providing the tools necessary for the new generation of access networks: greater capacity, increased network flexibility, diverse functionality, and reliable service.

Metropolis® DMX supports a wide array of wideband and broadband transport, including traditional SONET transport of DS1, DS3, EC-1, OC-3, OC-12, OC-48, and OC-192 (Release 2.1 and later) signals, as well as 10/100/1000 Mb/s LAN transport. 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.

Functionality

There are 13 circuit pack slots in each shelf, consisting of the following:

- 1 Control slot (CTL) for the SYSCTL circuit pack
- 2 Main slots (M1, M2) for high speed optical line interface units (OC-48 or OC-192 OLIUs)
- 8 multipurpose Function Unit slots (A1, A2 through D1, D2) for DS1, DS3, EC-1, OC-3, OC-12, OC-48, 100BASE-TX, 1000BASE-SX, and 1000BASE-LX service
- 2 Growth slots (G1, G2) for OC-3, OC-12, OC-48, 1000BASE-SX, and 1000BASE-LX service

Release 3.0 supports the following circuit packs:

- System Controller (LNW1)
- 28DS1 (LNW6)
- 28DS1PM (LNW7)
- 12DS3/EC1 (LNW16)
- TMUX (LNW18)
- Quad OC-3 OLIU (LNW36)
- Dual OC-12 OLIU (LNW46)
- OC-48 OLIU (LNW26 and LNW26B)
- OC-48 OLIU (LNW27)
- OC-48 OLIU (LNW28)
- OC-48 OLIU (LNW29)
- OC-48 OLIU (LNW76)
- OC-48 OLIU (LNW77)
- OC-48 OLIU (LNW31)
- OC-48 PWDM OLIUs (LNW121B-159B) providing 32 wavelengths (hardware-tunable)
- OC-48 PWDM OLIUs (LNW221-259) providing 32 wavelengths (hardware-tunable)
- OC-48 Low Speed PWDM OLIUs (LNW421-459) providing 32 wavelengths (hardware-tunable)
- OC-192 OLIU (LNW56)
- OC-192 OLIU (LNW58)
- 10/100T (100BASE-TX) (LNW66)
- 1GSX (1000BASE-SX) (LNW67)
- 1GLX (1000BASE-LX) (LNW68)

Important! Growth slots (G1 and G2) may be equipped with service and protection OC-3, OC-12, and OC-48 (LNW31) OLIUs, as well as service 1GSX and 1GLX circuit packs. DS1, DS3, EC-1, and 10/100T functionality is not supported in the Growth slots.

Capacity

Metropolis® DMX provides a VT1.5 and STS-1 cross-connect fabric for a variety of signals. Listed below is the number of signals that Metropolis® DMX can transport if all function unit and/or growth slots are equipped with a particular circuit pack (for example, 112 DS1s if all four Function Unit groups are equipped with the 28DS1 circuit pack):

- 112 DS1
- 48 DS3
- 48 EC-1
- 40 OC-3(c) (including Growth slots)
- 20 OC-12(c) (including Growth slots)
- 10 OC-48(c) (including Growth slots)
- 96 100BASE-TX
- 10 1000BASE-SX/LX (including Growth slots).

Metropolis® DMX also provides STS-1 virtual concatenation. This provides increased flexibility when managing Ethernet services. Each 100BASE-TX and 1000BASE-SX/LX Ethernet service can be provisioned in up to 21 STS-1 signals.

Operations

Metropolis® DMX is representative of ten years of Lucent's innovation and experience in network operations, control, and maintenance. Utilizing Level 1 and Level 2 Target Identifier (TID) Address Resolution Protocol (TARP), a consistent and standard form of address resolution is in place, enabling the Metropolis® DMX network to be easily monitored and maintained.

Metropolis® DMX also supports standard interworking using the Open Systems Interconnection (OSI) seven-layer protocol stack over the DCC. The OSI seven-layer protocol stack refers to the OSI reference model, a logical framework for network operations standardized by the ISO. This provides for large networks up to 1000 NEs via level 1 area provisioning and level 2 routing.

Metropolis® DMX is designed for easy installation and operation. Centralized operation is supported by a full set of single-ended operations, control, and maintenance features. Integrated test capabilities and default provisioning simplifies installation.

Basic maintenance tasks can be performed using faceplate LED displays and controls, while the WaveStar® CIT or a remote operations system gives access to sophisticated maintenance, provisioning, and reporting features.

Built-in maintenance capabilities support both installation and system operation. Metropolis® DMX can be tested and installed without external test equipment.

Feature Descriptions (Release 1.0)

Overview

This section briefly describes the major features included in Release 1.0 of Metropolis® DMX.

OC-48 UPSR for STS-1/VT1.5

The Metropolis® DMX system supports an OC-48 unidirectional path switched ring (UPSR). When both Main slots are equipped with OC-48 OLIU (LNW26) circuit packs, an STS-1 and VT1.5 switching fabric supports the low-speed interfaces. Each circuit pack establishes an east *or* west rotation on the ring (each pack's rotation is opposite to the other pack's rotation). A UPSR ring provides a very valuable and reliable foundation for services protecting against fiber cuts and intermediate node failures.

In the receive direction, each Main OLIU terminates one ring rotation from which a tail end path switch selects an STS-1 or VT1.5 from one rotation or the other depending on signal quality. In the transmit direction, an STS-1 or VT1.5 signal is copied or bridged onto both rotations of the ring.

VT1.5 granularity

In Release 1.0, VT1.5 granularity is provided across any 6 to 12 STS-1 signals within the high speed OC-48 interface, providing a fully-flexible assignment of VT1.5 timeslots across any 6 to 12 STS-1 signals.

28DS1 circuit pack

The Metropolis® DMX offers a very high density 1x1 protected DS1 circuit pack containing 28 ports per pack. When four Function Unit groups are equipped with 28DS1 (LNW6) or 28DS1PM (LNW7) circuit packs, up to 112 DS1s can be added/dropped. In addition to maintenance and provisioning functions, the 28DS1PM circuit pack provides performance monitoring capabilities.

12DS3/EC1 circuit pack for DS3 service

Metropolis® DMX also provides a very high density 1x1 protected DS3/EC1 circuit pack containing 12 ports per pack. When four Function Unit groups are equipped with 12DS3/EC1 circuit packs, 48 DS3s are add/dropped per shelf.

The 12DS3/EC1 circuit pack is switch-selectable for either DS3 or EC-1 service on a per-pack basis. DS3 service is available in R1.0. EC-1 service will be available in R1.1.

Maintenance, provisioning, and performance monitoring functions are available with the 12DS3/EC1 circuit pack.

User interface

The WaveStar® CIT command builder (and TL1 cut-through) local and remote access is supported. TL1 autonomous messages are also supported (for example, to monitor small networks).

The CIT manages the Metropolis® DMX system, providing TL1 messaging, software download, and full operations and provisioning capability when used in conjunction with the TL1 command builder. The TL1 command builder, is a flexible TL1 interface that supports full TL1 management.

TL1 OS access

TL1 OS access is supported via an IAO LAN and/or X.25 interface for both local and remote Metropolis® DMXs.

Embedded Stratum 3 timing generator

The LNW26 OC-48 high-speed OLIU circuit pack features an embedded Stratum 3 timing generator (TG3). This timing generator is used when the Metropolis® DMX is configured in a free running or holdover mode.

Line timing and external timing are also supported by Metropolis® DMX. Line timing is derived from an incoming Main OC-48 line, while external timing is derived from an external DS1 timing input.

S1 byte synchronization messaging

Metropolis® DMX uses the S1 byte of the SONET overhead to send/receive timing status information to other nodes in an access transport network. Metropolis® DMX supports “sync auto reconfiguration”.

Remote operations

Metropolis® DMX operations features such as remote OS access and CIT remote login are supported over the OC-48 Section DCC and IAO LAN. Any Metropolis® DMX operation supported over the DCC is also supported over the IAO LAN. Metropolis® DMX remote operations features allow Metropolis® DMX networks to be managed from a CO and/or a centralized maintenance center.

Performance monitoring

Performance monitoring (PM) data is reported on the VT1.5, STS-1, DS1, DS3, and OC-48 levels.

Remote NE status

A Metropolis® DMX can be provisioned to be an alarm gateway NE (AGNE) to support remote office alarms, a remote SYSCTL LED display, and summary alarm information of remote Metropolis® DMXs in the local alarm report. More than one AGNE can be provisioned per alarm group, but this is not recommended as it can degrade the network performance.

Software download via DCC

This feature enables initial software upgrade to be downloaded (locally or remotely) via the data communications channel (DCC). Metropolis® DMX-to-Metropolis® DMX copies are also supported.

Security

Security features include provisionable password aging (from 7 to 999 days), customized login proprietary messages, and support for 150 users. Security password aging does not apply to privileged users.

OSI seven-layer protocol stack

This feature provides interworking using the open systems interconnection (OSI) seven-layer protocol stack over the data communications channel (DCC) or an IAO LAN.

TARP

Metropolis® DMX supports Target ID Address Resolution Protocol (TARP), OSI, IAO LAN, and TL1/X.25 as specified in Telcordia Technologies GR-253.

SONET

Many of the traditional SONET maintenance, provisioning, operations, control, and synchronization features are included in Metropolis® DMX. The flexible SONET standard provides a formidable foundation for Metropolis® DMX to build upon.

TIRKS/NMA/TEMS compatibility

Metropolis® DMX is supported by Telcordia OSs *TIRKS* (R19.4), *NMA* (R10.1/11.0), and *TEMS* (R2.0).

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Feature Descriptions (Release 1.1)

Overview

This section briefly describes the major features added in Release 1.1 of the Metropolis® DMX.

Graphical user interface (GUI)

This CIT interface eliminates the need to enter TL1 commands and provides a graphical representation of the Metropolis® DMX and the surrounding network.

100BASE-TX (10/100-FE) Ethernet interface

This 24 port Ethernet interface provides data transport at a rate of up to 10/100 Mb/s. The 10/100-FE (LNW66) circuit pack performs layer 2 IP switching in point-to-point and multipoint dedicated configurations. Bandwidth can be dedicated to one customer or shared among several customers. Standard IEEE 802.1Q virtual LANs (VLANs) are used to guarantee privacy. This feature provides cost savings by incorporating voice and data transport into one system. Metropolis® DMX's STS-1 virtual concatenation capability provides increased Ethernet management flexibility by provisioning the service in increments of single STS-1s. Up to 96 100BASE-TX signals are supported when four Function Unit groups are equipped with the 10/100-FE circuit pack.

1000BASE-SX/LX optical Ethernet interfaces

These 2 port Ethernet interfaces provide data transport at a rate of up to 1 Gb/s per port. The 1G SX (LNW67) and 1G LX (LNW68) circuit packs perform layer 2 IP switching in point-to-point and multipoint configurations. Bandwidth can be dedicated to one customer or shared among several customers. Standard IEEE 802.1Q virtual LANs (VLANs) are used to guarantee privacy. This feature also provides cost savings by incorporating voice and data transport into one system. Metropolis® DMX's STS-1 virtual concatenation capability provides increased Ethernet management flexibility by provisioning the service in increments of single of STS-1s. Up to ten 1000BASE-SX/LX signals are supported when all Function Unit groups (including Growth slots) are equipped with 1GSX and 1GLX circuit packs.

These circuit packs are functionally equivalent except for optical span length. The 1GLX circuit pack provides long-reach optics, while the 1GSX provides short-reach optics.

Quad OC-3 low-speed optics

Metropolis® DMX provides a quad OC-3 low-speed optical interface that provides VT1.5/STS-1/STS-3(c) path switching. Up to 40 STS-3(c)s are supported when all Function Unit groups (including Growth slots) are equipped with the OC-3 OLIU (LNW36) circuit pack. The OC-3 OLIU can interface with other OC-3 rings in the network and can also be used as an interface for OC-3 linear optical extensions, as well as single- and dual- homed ring extensions. The LNW36 is user-provisionable on a per-port basis.

Dual OC-12 low-speed optics

Metropolis® DMX provides a dual OC-12 low-speed optical interface that provides VT1.5/STS-1/STS-3(c)/STS-12(c) path switching. Up to 20 STS-12(c)s are supported when all Function Unit groups (including Growth slots) are equipped with the OC-12 OLIU (LNW46) circuit pack. The OC-12 OLIU can interface with other OC-12 rings in the network and can also be used as an interface for OC-12 linear optical extensions, as well as single- and dual- homed ring extensions. The LNW46 is user-provisionable on a per-port basis.

12DS3/EC1 circuit pack for EC-1 service

The 12DS3/EC1 (LNW16) circuit pack can provide bidirectional transport of up to 12 EC-1 signals. When four Function Unit groups are equipped with 12DS3/EC1 circuit packs, up to 48 EC-1 signals can be added/dropped per shelf.

Maintenance, provisioning, and performance monitoring functions are available with the 12DS3/EC1 circuit pack.

The 12DS3/EC1 circuit pack is switch-selectable for either DS3 or EC-1 service on a per-pack basis.

OC-48 UPSR for STS-3(c)/STS-12(c)

Metropolis® DMX supports UPSR on the STS-3(c) and STS-12(c) levels, in addition to STS-1 and VT1.5 available in R1.0. When both Main slots are equipped with OC-48 OLIU (LNW26) circuit packs, an STS-3 and STS-12 switching fabric supports the low-speed interfaces. Each circuit pack establishes an east-to-west rotation on the ring. A UPSR ring provides a very valuable and reliable foundation for services protecting against fiber cuts and node failures.

Brownout protection

Every active circuit pack has a shut-down circuit that monitors the incoming -48V level. If it drops below -39V ±1V pack will de-power. When voltage returns above -43V ±0.5V pack will re-power.

VT cross-connects

In Release 1.1, Metropolis® DMX supports VT1.5 cross-connections between the main OC-48 interfaces and DS1, EC1, OC-3, and OC-12 interfaces. Any 12 STS-1s on the LNW26 OC-48 main OLIU interface can be selected for VT cross-connections (add-drop or pass-through) to either the quad OC-3, dual OC-12 or EC-1 low-speed interfaces. Up to 112 VT1.5 channels can be add-drop cross-connected as 112 DS1s from the OC-48 ring to Function Unit groups equipped with 28DS1 packs.

Certain restrictions do apply. Refer to Chapter 5, "Provisioning, Security, & Administration" for details.

VT ring closure

The Metropolis® DMX can host multiple rings on the low-speed interfaces of the Metropolis® DMX shelf. This is accomplished by intra-function group, pass-through cross-connections. The Metropolis® DMX can close a low-speed ring by supporting a cross-connection between a receive port on one circuit pack and a transmit port on another circuit pack in the same function or growth group. All protection switching advantages/capabilities of UPSR configurations still apply in VT Ring Closure applications.

Hairpinning cross-connections

In a "hairpinning" topology, low-speed tributary traffic is routed into the system and back out of the system without ever being placed on the high-speed (OC-48) UPSR interfaces. Hairpin cross-connections utilize the switch fabric on the high speed OC-48 OLIUs, but, do not affect the UPSR traffic. The cross-connection capability of connecting any input on a circuit pack in a function or growth slot to any output on a circuit pack in a different function or growth slot the same shelf, allows you to use a combination of add/drop and hairpinning of compatible payloads through a variety of interfaces. You can bring traffic in from one remote site and cross-connect it at the STS-1, STS-3c, or STS-12c level back out to other remote sites without consuming any capacity on the high-speed UPSRs. For detailed information about hairpin cross-connections, refer to Chapter 5, "Provisioning, Security, & Administration".

Linear optical extensions

In Release 1.1, Metropolis® DMX supports 1+1 protected linear optical extensions for data transport originating at a data device. The linear optical extension may also be an OC-3 or OC-12 node, as well as an OC-48 node (future releases). If the active line fails, the system performs nonrevertive line switching.

Single- and dual-homed ring extensions

In Release 1.1, Metropolis® DMX supports low-speed OC-3 and OC-12 0x1 protected broadband tributaries, including single- and dual-homed ring extensions. A DDM-2000 OC-3, OC-12, or FiberReach Multiplexer may be the add/drop multiplexer on the lower-speed ring.

TL1 management via TCP/IP

TL1 message exchange is supported over TCP/IP via IAO LAN, X.25, OSI LAN, and CIT interfaces. IAO LAN supports TCP/IP protocol and OSI protocol. These provide a communication link from a Metropolis® DMX to a local node that may serve as a gateway to the network.

DS1 timing output

The embedded TG3 can generate a DS1 timing output to time other externally-timed systems.

Performance monitoring

In addition to the PM capabilities available in R1.0, R1.1 provides PM data on all EC-1, STS-3c, STS-12c, OC-3, OC-12, 100BASE-TX, and 1000BASE-SX/LX incoming signals.

Product Family 2000/WaveStar Product Family Interworking

Metropolis® DMX supports TARP interoperability with Product Family 2000 nodes such as the FT-2000 OC-48 Lightwave System, the DDM-2000 OC-3/OC-12 Multiplexer, and the DDM-2000 FiberReach Multiplexer.

The Metropolis® DMX also provides interoperability with all WaveStar Product Family nodes supporting TARP.

SNMS compatibility

The Metropolis® DMX is supported by WaveStar® SNMS (R5.1).

Network size

Metropolis® DMX supports a network size of 256 nodes. Future releases will be tested in larger networks.

Integrated TCP/IP

The integrated transmission control protocol/internet protocol feature provides a communication link from a Metropolis® DMX to a local node that may serve as a gateway to the network.

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Feature Descriptions (Release 2.0)

Overview

This section briefly describes the major new features of Metropolis® DMX, Release 2.0.

OC-48 OLIU (LNW26B)

The LNW26B has the same capabilities as the LNW26 circuit pack, except the LNW26B OLIU can cross-connect VTs in any 12 of 48 selected STS-1s.

OC-48 OLIU (LNW28)

The OC-48 OLIU (LNW28) circuit pack is an environmentally hardened version of the LNW26B. The LNW28 is designed specifically for outside cabinet deployment and is certified to withstand extreme temperatures.

OC-48 OLIU (LNW31)

The OC-48 OLIU (LNW31) circuit pack is a single port, low speed, 1310 nm optical line interface unit. The LNW31 supports OC-48 add/drop, UPSR configurations, 1+1 linear, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The LNW31 OLIU can cross-connect VTs in any 12 of 48 selected STS-1s. The central TDM switch fabrics are embedded in the OC-48 OLIU.

OC-48 OLIU (LNW77)

The OC-48 OLIU (LNW77) circuit pack is a intermediate reach (20km), high-speed 1310 nm optical line interface unit. The LNW77 supports OC-48 add/drop, UPSR configurations, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The Stratum 3 timing generator and central TDM switch fabrics are embedded in the OC-48 OLIU. The LNW77 OLIU can cross-connect VTs in any 12 of 48 selected STS-1s.

OC-48 PWDM OLIUs (LNW121B-159B)

The sixteen OC-48 PWDM OLIUs (LNW121B-159B) circuit packs are designed for use with passive MUX/DMUX and optical add/drop shelves. Each circuit pack supports two wavelengths via a hardware selection configuration. This provides a total of 32 different wavelengths that are available for service applications.

The optical circuit packs are designed to be used with the Lucent Passive Optical Shelves. Using the OC-48 PWDM OLIUs and the Passive Optical Shelves can increase fiber capacity by a factor of 16 or 32.

OC-48 PWDM OLIUs support add/drop, UPSR/BLSR configurations, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The Stratum 3 timing generator and central TDM switch fabrics are embedded in the OC-48 OLIU. The OC-48 PWDM OLIUs can cross-connect VT1.5 signals in any 12 of 48 selected STS-1 signals; however, in Release 2.0 the software supports VT1.5 signals in any 6 of 48 selected STS-1 signals.

OC-48 UPSR for STS-48(c)

Metropolis® DMX supports UPSR on the STS-48(c) level, in addition to STS-1, STS-3(c) and STS-12(c), and VT1.5 available in earlier releases. When both Main slots are equipped with OC-48 OLIU circuit packs, a VT1.5 and STS-1 switching fabric supports the low-speed interfaces. Each circuit pack establishes an east-to-west rotation on the ring. A UPSR ring provides a very valuable and reliable foundation for services protecting against fiber cuts and node failures.

IP tunneling

Metropolis® DMX supports IP tunneling to extend FTP/IP file transfers over the OSI protocol stack on the DCC and IAO LAN to remote Metropolis® DMX shelves which do not have a direct IP connection.

Hairpinning enhancements

In a “hairpinning” topology, in Release 2.0, you can bring traffic in from one remote site and cross-connect it at the VT and Ethernet level, in addition to STS-1, STS-3c, or STS-12c levels available in earlier releases, back out to other remote sites without consuming any capacity on the high-speed UPSRs. Hairpin cross-connections utilize the switch fabric on the high speed OC-48 OLIUs; but, do not affect the UPSR traffic. For detailed information about hairpin cross-connections, refer to Chapter 5, “Provisioning, Security, & Administration”.

VT ring closure

VT Ring closure for OC-3, OC-12 or OC-48 interfaces. This capability includes Intra-Fn Pass-Through (signal passed from one group's slot to the other slot), and add/drop with the ability to perform path selection on the low speed optics, and therefore closing the subtending (hosted) ring.

VLAN tagging

Support of 4093 Virtual Local Area Networks (VLANs) and stacked VLANs for customer identification and isolation.

Network size

Metropolis® DMX supports a network size of 1000 nodes.

Navis™ Optical EMS compatibility

The Metropolis® DMX is supported by Navis™ Optical Element Management Systems (Navis™ Optical EMS), R7.0 (formerly referred to as SNMS).

Port-provisionable 12DS3/EC1 circuit pack

In prior releases, the 12DS3/EC1 circuit pack was switch selectable for DS3 or EC-1 service on a per-pack basis. In Release 2.0, DS3 or EC-1 service can be provisioned via the WaveStar® CIT on a per-port basis.

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Feature Descriptions (Release 2.1)

Overview

This section briefly describes the major new features of Metropolis® DMX, Release 2.1.

OC-48 OLIU (LNW27)

The OC-48 OLIU (LNW27) circuit pack is a long reach, 1310-nm optical line interface unit. The LNW27 OC-48 OLIU can cross-connect VT1.5 signals in up to 48 STS-1 signals.

OC-48 OLIU (LNW29)

The OC-48 OLIU (LNW29) circuit pack is an extended long reach, 1550-nm optical line interface unit. The LNW29 OC-48 OLIU can cross-connect VT1.5 signals in up to 48 STS-1 signals.

OC-48 OLIU (LNW76)

The OC-48 OLIU (LNW76) circuit pack is a short reach, 1310-nm optical line interface unit. The LNW76 OC-48 OLIU can cross-connect VT1.5 signals in up to 48 STS-1 signals.

Improved VT1.5 Granularity

The Release 2.1 software supports cross-connections between VT1.5 signals and up to 12 STS-1 signals in the LNW26B, LNW28, LNW77, and LNW121B-series OC-48 OLIU circuit packs.

Passive WDM-Compatible OC-48 OLIUs (LNW221 - LNW259)

The passive WDM-compatible OC-48 OLIU (LNW221-LNW259) circuit packs provide 32 wavelengths for passive WDM applications. The OC-48 OLIU (LNW221-LNW259) circuit packs can cross-connect VT1.5 signals in up to 48 STS-1 signals.

In service OC-48 OLIU upgrades

Metropolis® DMX supports upgrading OC-48 OLIUs in service. OC-48 OLIUs with a 6 STS-1 VT fabric may be upgraded to OC-48 OLIUs with a 12 or 48 STS-1 VT fabric. OC-48 OLIUs with a 12 STS-1 VT fabric may be upgraded to OC-48 OLIUs with a 48 STS-1 VT fabric.

OC-48 BLSR

Metropolis® DMX supports high speed OC-48 2-fiber bidirectional Line switched rings (BLSRs) in Release 2.1. The 2-fiber BLSRs supports STS-1, STS-3c, and STS-12c cross-connections to DS1, DS3, OC-3, OC-12, low speed OC-48, Fast Ethernet, and Gigabit Ethernet interfaces. A 2-fiber BLSR is a self-healing ring configuration in which the traffic flow is bidirectional between nodes. The traffic flow is protected by redundant bandwidth on the bidirectional lines that interconnect the ring nodes.

Because traffic flow is bidirectional between nodes, traffic can be added at one node and dropped at the next without traveling around the entire ring. This leaves the spans between other nodes available for additional traffic. Therefore, with distributed traffic patterns, a BLSR can carry more traffic than the same facilities could carry if configured for a unidirectional path switched ring.

OC-192 OLIU (LNW56)

The OC-192 OLIU (LNW56) circuit pack is an intermediate reach, 1550-nm optical line interface unit. The LNW56 OC-192 OLIU can cross-connect VT1.5 signals in up to 48 STS-1 signals.

OC-192 OLIU (LNW58)

The OC-192 OLIU (LNW58) circuit pack is a short reach, 1310-nm optical line interface unit. The LNW58 OC-192 OLIU can cross-connect VT1.5 signals in up to 48 STS-1 signals.

OC-192 UPSR

The Metropolis® DMX supports an OC-192 unidirectional path switched ring (UPSR) in Release 2.1. When both Main slots are equipped with OC-192 OLIU circuit packs, an STS-1 and VT1.5 switching fabric supports the low-speed interfaces. Each circuit pack establishes an east-to-west rotation on the ring. A UPSR ring provides a very valuable and reliable foundation for services protecting against fiber cuts and node failures.

High Capacity Shelf

The Metropolis® DMX high capacity shelf supports additional DS1/DS3 interfaces that enable Metropolis® DMX to support 224 DS1s or 192 DS3s in a future release. The new, higher density DS1 and DS3 circuit packs will be available in a future release.

Passive Optical Add/Drop Units

Passive optical dual add drop modules are available to add and drop 1, 2, or 4 wavelengths. The modules are unidirectional.

Hairpinning enhancements

In a “hairpinning” topology, in Release 2.1, users can cross-connect traffic from a remote site at the VT and Ethernet level, in addition to STS-1, STS-3c, STS-12c, and STS-48c levels available in earlier releases, to other remote sites without consuming any capacity on the high-speed UPSRs or BLSRs. Hairpin cross-connections utilize the switch fabric on the high speed OC-48 OLIUs; but, do not affect the UPSR or BLSR traffic. For detailed information about hairpin cross-connections, refer to Chapter 5, “Provisioning, Security, & Administration”.

Interworking with LambdaUnite™ MultiService Switch

Two Metropolis® DMX shelves and one LambdaUnite MultiService Switch can be collocated in the same bay. As the needs of an access site grow to the point where equipment is required to hub more than 6 OC-48 rings, it becomes advantageous to upgrade a Metropolis® DMX shelf to a LambdaUnite MultiService Switch. The Very Short Reach (VSR) OC-48 and OC-192 optics supported by the Metropolis® DMX are designed for such an application. Once the LambdaUnite MultiService Switch is installed as the hub-node, the site can hub 64 OC-48 rings or 16 OC-192 rings while simultaneously using the original Metropolis® DMX as a low-speed drop node or mini-digital cross-connect.

In service OC-48 UPSR to OC-192 UPSR Upgrade

Metropolis® DMX supports an in-service upgrade to increase UPSR network capacity from OC-48 to OC-192 without affecting service.

□

Feature Descriptions (Release 3.0)

Overview

This section briefly describes the major new features of Metropolis® DMX, Release 3.0.

Transmultiplexer (TMUX) (LMW18) circuit pack

The TMUX (LMW18) circuit pack collects DS1 signals from various nodes in a ring network and multiplexes them into a single DS3 signal for transport. Up to 12 channelized DS3 signals are supported.

Low Speed Passive WDM-Compatible OC-48 OLIUs (LNW421 - LNW459)

The low speed passive WDM-compatible OC-48 OLIU (LNW421-LNW459) circuit packs provide 32 wavelengths for passive WDM applications. The low speed OC-48 OLIU (LNW421-LNW459) circuit packs can cross-connect VT1.5 signals in up to 48 STS-1 signals.

Optical amplfiers for passive WDM-compatible OC-48 and OC-192 OLIUs

External optical amplifiers are available for use with the passive WDM-compatible OC-48 and OC-192 OLIUs. Optical amplifiers can be used to increase OC-48 and OC-192 optical spans up to 140 km.

Single low speed OC-48 BLSR

Metropolis® DMX supports a single low speed BLSR using the low speed passive WDM-compatible OC-48 OLIUs (LNW421-LNW459) or the low speed OC-48 OLIU (LNW31) circuit pack. Metropolis® DMX also supports BLSR to BLSR cross-connections.

Automatic ring discovery in BLSRs

In Release 3.0, Metropolis® DMX automatically discovers the other nodes that exist in a BLSR and creates a ring map. The ring map consists of nodes IDs, NSAPs, target identifiers (TIDs), and network element types of each network element in the ring. (In Release 2.1, Metropolis® DMX supports only manual ring map provisioning.) Automatic ring discovery supports BLSR interworking with the FT-2000 OC-48 Lightwave System, WaveStar TDM 2.5G/10G Multiplexer, and the LambdaUnite™ Multiservice Switch.

High speed OC-192 BLSRs

Metropolis® DMX supports high speed OC-192 BLSRs using the OC-192 OLIUs (LNW56 and LNW58) circuit packs. The OC-192 OLIU (LNW56) circuit pack is an intermediate reach, 1550-nm optical line interface unit. The OC-192 OLIU (LNW58) circuit pack is a short reach, 1310-nm optical line interface unit.

Nonpreemptible unprotected traffic

Nonpreemptible unprotected traffic allows users to disable protection on selected working channels of a bidirectional line switched ring. Therefore, traffic carried on these channels is unprotected. This allows users to rely on path layer protection switching or to offer unprotected capacity in a flexible way. Nonpreemptible unprotected traffic makes support possible for multipoint Ethernet connections, and dual 0x1 low speed connections over a BLSR.

High speed OC-48 linear application

Metropolis® DMX provides a high speed OC-48 1+1 protected linear extension in the Main slots.

Per STS-1 protection provisioning

The per STS-1 protection provisioning feature provides the ability to support switched and unswitched cross-connections on the same UPSR port. Switched cross-connections are protected at both the path level and an internal equipment level. Unswitched cross-connections (the equivalent of 0x1 cross-connections in prior releases) are not protected at the path level or at the internal equipment level.

Hashed FTP

The hashed FTP capability prevents someone from tampering with a downloadable software image. When FTP over TCP/IP is used for software download, a digital signature is transmitted with the image file, and verified by the generic software.

FTAM/FTP gateway

Metropolis® DMX acts as an FTAM/FTP gateway or file transfer translation device (FTTD). The FTTD allows Metropolis® DMX to function as a gateway network element that facilitates file downloads between FTP servers and remote network elements connected to Metropolis® DMX.

1 Mb/s Ethernet rate shaping

Metropolis® DMX supports a basic peak information rate policer that meters packets leaving the Ethernet packet switch going toward the SONET network. Metropolis® DMX drops any packets that exceed the provisioned peak information rate for the VLAN or customer ID associated with the packet. This guarantees that no more than the specified network capacity is provided.

Simple network management protocol (SNMP) support

Metropolis® DMX supports SNMP for monitoring alarms and traps associated with Ethernet circuit packs. The SNMP is an application layer protocol used to manage data network performance, and find and resolve data network problems.

Network time protocol (NTP) support

Metropolis® DMX supports NTP client functionality. NTP is an internet protocol used to synchronize computers and devices to a standard time reference. The NTP allows Metropolis® DMX to set and synchronize the Date and Time of Day clock. The NTP client queries the NTP server for the date and time of day.

In service OC-48 BLSR to OC-192 BLSR Upgrade

Metropolis® DMX supports an in-service upgrade to increase BLSR network capacity from OC-48 to OC-192 without affecting service.

□

2 Platform Description

Overview

Purpose This section describes the possible physical arrangements of the Metropolis® DMX Access Multiplexer.

Contents The following physical arrangement considerations are covered in this section:

Shelf Descriptions

Overview

The Metropolis® DMX is a single-shelf multiservice multiplexer that may house 28DS1, 12DS3/EC1, TMUX (Release 3.0 and later) OC-3, OC-12, and OC-48, OC-192 (Release 2.1 and later), 10/100T, 1GSX and 1GLX circuit packs.

In Release 2.1 and later releases, the Metropolis® DMX high capacity shelf is available in addition to the Metropolis® DMX shelf.

Capacity

Metropolis® DMX provides a VT1.5 and STS-1 cross-connect fabric for a variety of signals. Listed below is the number of signals that Metropolis® DMX can transport if all function unit and/or growth slots are equipped with a particular circuit pack (for example, 112 DS1 signals if all four function units are equipped with the 28DS1 circuit pack):

- 112 DS1
- 48 DS3
- 48 EC-1
- 40 OC-3(c) (including growth slots)
- 20 OC-12(c) (including growth slots)
- 10 OC-48(c) (including growth slots)
- 96 100BASE-TX
- 10 1000BASE-SX/LX (including growth slots).

In a future release when the higher density DS1 and DS3 circuit packs are available, the Metropolis® DMX high capacity shelf supports up to 224 DS1 or 192 DS3 signals.

Metropolis® DMX also provides STS-1 virtual concatenation. This provides increased flexibility when managing Ethernet services. Each 100BASE-TX and 1000BASE-SX/LX Ethernet service can be provisioned to any number of STS-1 signals (up to 21 STS-1 signals).

Metropolis® DMX shelf dimensions

The Metropolis® DMX shelf is:

- 16 inches high *without* the Metropolis® DMX fan unit
- 19.5 inches high *with* the Metropolis® DMX fan unit
- 17.6 inches wide
- 15 inches deep.

Up to four Metropolis® DMX shelves can fit in a bay (including fan unit), and all shelves are individually mounted.

Metropolis® DMX high capacity shelf dimensions

The Metropolis® DMX high capacity shelf is:

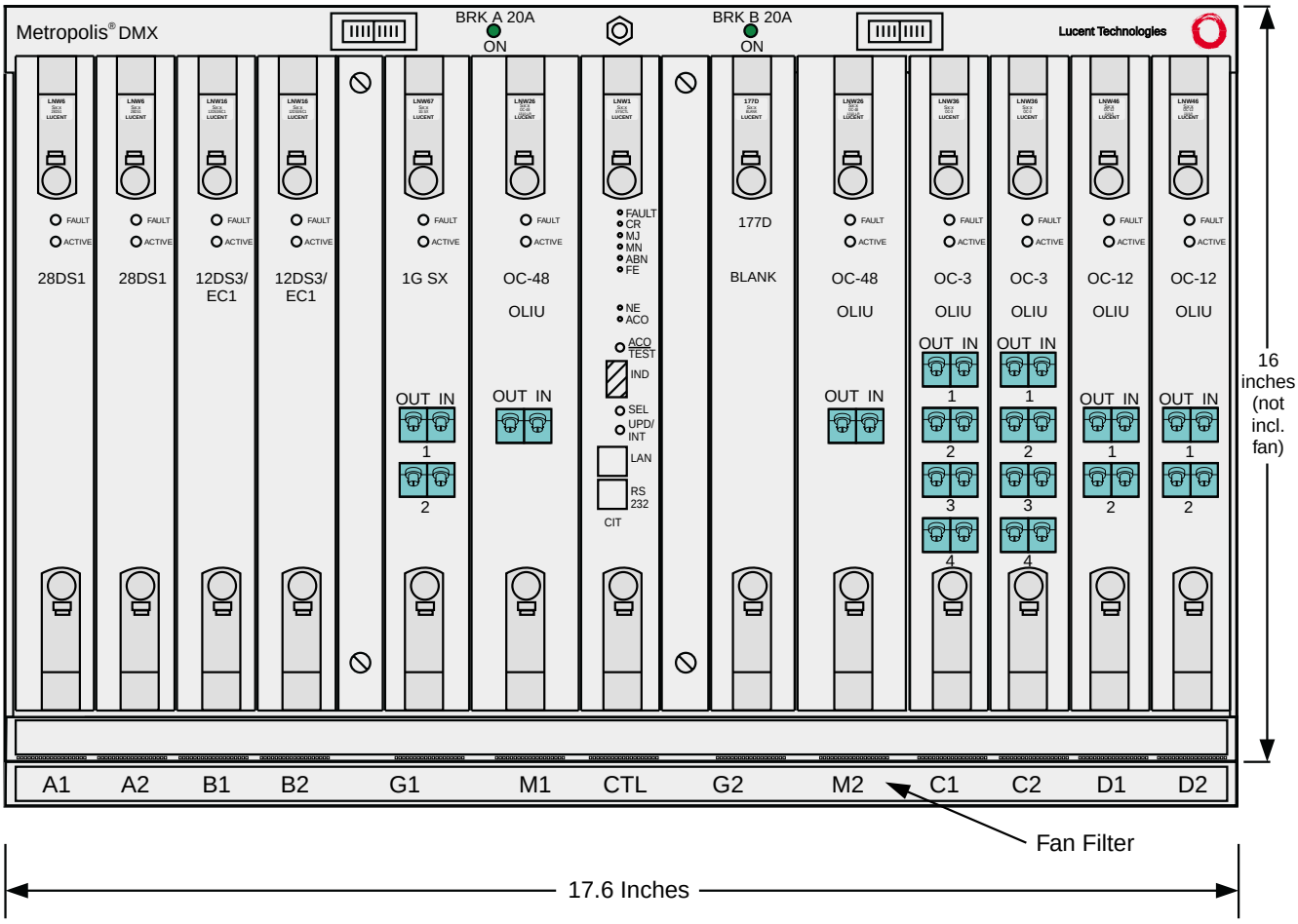
- 19 inches high (includes integral fan unit)
- 17.6 inches wide
- 16 inches deep.

Up to four Metropolis® DMX high capacity shelves can fit in a bay (including fan unit), and all shelves are individually mounted.

Shelf Front View

Figure 2-1 shows the front view of the Metropolis® DMX shelf and Metropolis® DMX high capacity shelf. (Both shelves have the same circuit pack slots.) The shelf is equipped with 28DS1 and 12DS3/EC1 circuit packs, a 1GSX Ethernet circuit pack, OC-3, OC-12, and OC-48 OLIU circuit packs, and a SYSCTL circuit pack.

Figure 2-1 Shelf Front View



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Circuit pack slots and compatible circuit packs

The Metropolis® DMX shelf and Metropolis® DMX high capacity shelf have 8 function unit slots, 2 main slots, 2 growth slots, and one control slot.

Function units slots

The function unit slots are divided into five groups designated A, B, C, D, and G (Growth slots). Function unit slots A1, A2, B1, B2, C1, C2, D1, and D2 can be equipped, depending on the application, with the following circuit packs

- 28DS1
- 12DS3/EC1
- TMUX
- OC-3
- OC-12
- OC-48 (LNW31 and LNW421 - LNW459 only)
- 10/100T
- 1GSX
- 1GLX

The 10/100T, 1GSX , and 1GLX circuit packs cannot be protected and are restricted to slot 1 of a function unit (for example, slot A1). If slot 1 of a function unit is equipped with a 10/100T,
1GSX , and 1GLX circuit pack, then slot 2 must be equipped with a 177D apparatus blank.

Growth slots

Growth slots G1 and G2 can be equipped, depending on the application, with the following circuit packs:

- OC-3
- OC-12
- OC-48 (LNW31 and LNW421 - LNW459 only)
- 1GSX
- 1GLX

The 1GSX and 1GLX circuit packs cannot be protected and are restricted to slot G1. If slot G1 of a function unit is equipped with a 1GSX or 1GLX circuit pack, then slot G2 must be equipped with a 177D apparatus blank.

Main slots

The main slots M1 and M2 can be equipped, depending on the application, with the following circuit packs:

- OC-48 OLIU circuit packs LNW26/26B, LNW27 (Release 2.1 and later), LNW28, LNW29 (Release 2.1 and later), LNW76 (Release 2.1 and later), LNW77, LNW121B-159B, or LNW221-LNW259 (Release 2.1 and later)
- OC-192 OLIU circuit packs LNW56, LNW58 (Release 2.1)

The Stratum 3 timing generator and central TDM switch fabrics are embedded in the OC-48 and OC-192 circuit packs. If main slot M1 or M2 is not equipped with a circuit pack, the slot must be equipped with a 177E apparatus blank.

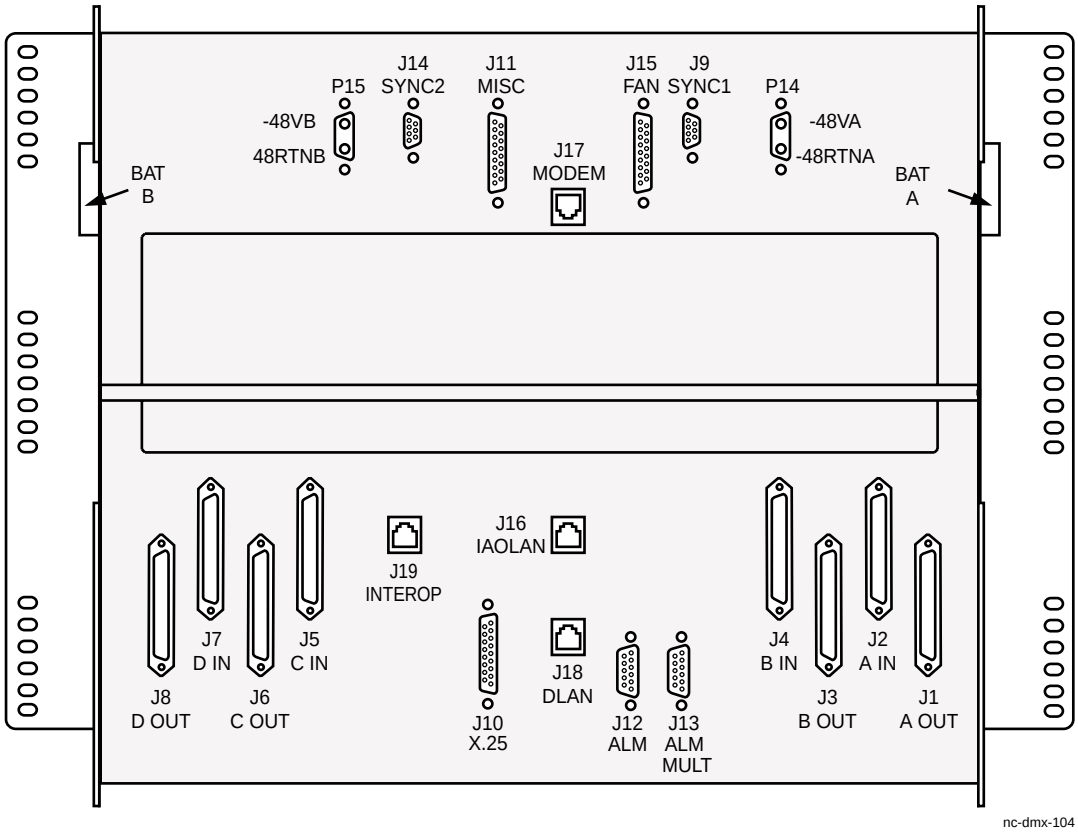
Control slot

The control slot CTL is reserved for the non-redundant System Controller (SYSCTL) circuit pack.

Metropolis® DMX shelf rear view

Figure 2-2 shows the rear backplane connectors on the Metropolis® DMX shelf.

Figure 2-2 Metropolis® DMX Shelf Backplane Connectors



The shelf backplane provides the following connectors:

- Communications modem (J17 MODEM)
- Intraoffice LAN (J16 IAOLAN)
- External DS1 synchronization input and output (J9 SYNC1 and J14 SYNC2)
- Fan shelf power/alarm (J15 FAN)
- -48 V DC power feeder A and B (P14 -48VA, -48RTNA and P15 -48VB, -48RTNB)
- Miscellaneous (environmental) discrete telemetry (J11 MISC)
- TL1/X.25 interface (J10 X.25)
- Office alarm interface (J12 ALM)
- Office alarm multiplier (J13 ALM MULT)
- J18 DLAN (Reserved for use in a future release)

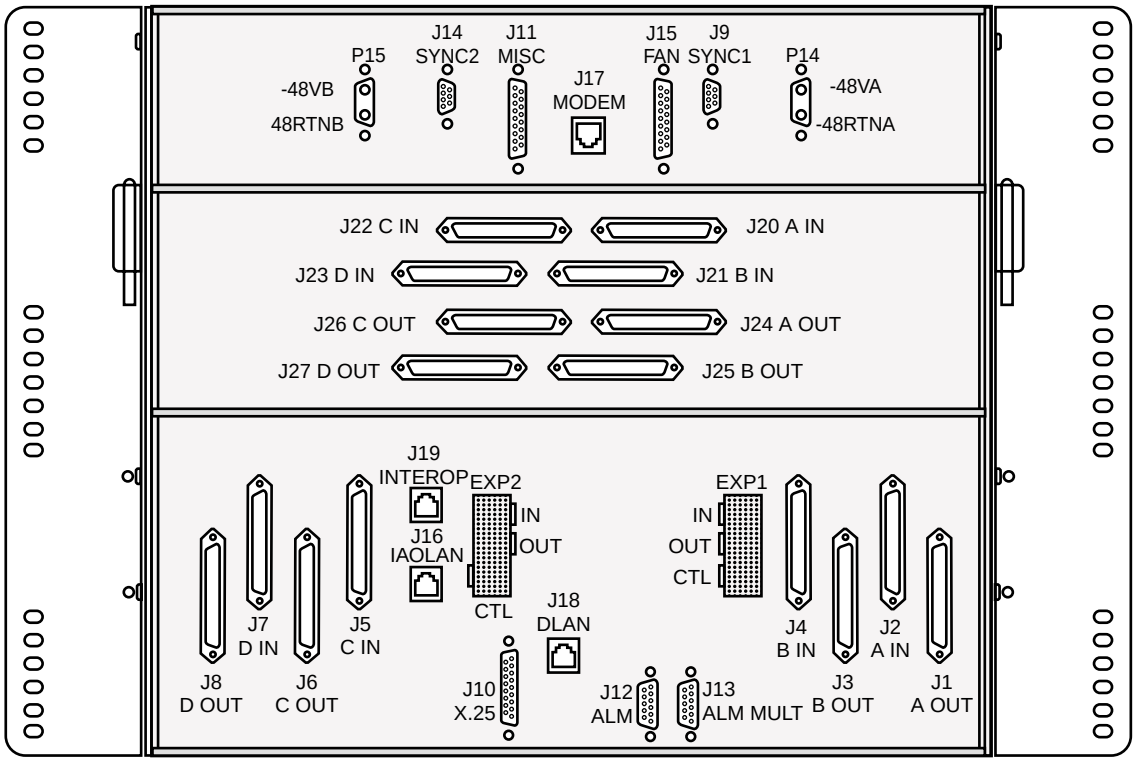
- J19 INTEROP (Reserved for use in a future release)
- Four DS1/DS3 and 10/100Base-T inputs (J2 A IN, J4 B IN, J5 C IN, J7 D IN)
- Four DS1/DS3 and 10/100Base-T outputs (J1 A OUT, J3 B OUT, J6 C OUT, J8 D OUT)

The -48 V DC power feeder interfaces (BAT A and BAT B) are located on the sides of the shelf.

Metropolis® DMX high capacity shelf rear view

Figure 2-3 shows the rear backplane connectors on the Metropolis® DMX high capacity shelf.

Figure 2-3 Metropolis® DMX High Capacity Shelf Backplane Connectors



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The shelf backplane provides the following connectors:

- Communications modem (J17 MODEM)
- Intraoffice LAN (J16 IAOLAN)
- External DS1 synchronization input and output (J9 SYNC1 and J14 SYNC2)
- Fan shelf power/alarm (J15 FAN)
- -48 V DC power feeder A and B (P14 -48VA, -48RTNA and P15 -48VB, -48RTNB)
- Miscellaneous (environmental) discrete telemetry (J11 MISC)
- TL1/X.25 interface (J10 X.25)
- Office alarm interface (J12 ALM)
- Office alarm multiplier (J13 ALM MULT)
- J18 DLAN (Reserved for use in a future release)
- J19 INTEROP (Reserved for use in a future release)
- EXP1 IN, OUT, CTL (Reserved for use in a future release)
- EXP2 IN, OUT, CTL (Reserved for use in a future release)
- Eight DS1/DS3 and 10/100Base-T inputs (J2 A IN, J4 B IN, J5 C IN, J7 D IN, J20 A IN, J21 B IN, J22 C IN, J23 D IN)
- Eight DS1/DS3 and 10/100Base-T outputs (J1 A OUT, J3 B OUT, J6 C OUT, J8 D OUT, J24 A OUT, J25 B OUT, J26 C OUT, J27 D OUT)

The -48 V DC power feeder interfaces (BAT A and BAT B) are located on the sides of the shelf.

Shelf Configurations

Overview

Metropolis® DMX is designed to provide a wide array of wideband and broadband services. Therefore, there is great flexibility in the configuration of the shelf. Any combination of circuit packs may be used for whatever service is desired. The following paragraphs outline the specific packs that may be used in the function units for certain applications.

Requirements

Metropolis® DMX has the following shelf configuration requirements:

- OC-48 OLIUs LNW26/26B, LNW27, LNW28, LNW29, LNW76, LNW77, LNW121B-LNW159B, and LNW221-259 must be located in the main M1 and M2 slots
- OC-192 OLIUs LNW56 and LNW58 must be located in the main M1 and M2 slots
- The service and protection slots of a function unit (for example, A1 and A2) must contain the same circuit pack type. However, Gigabit Ethernet circuit packs (1GSX, 1GLX) can only be located in slot 1 of a function unit (including growth slots). The other slot must contain a 177D apparatus blank.
- The 10/100T (LNW66) circuit pack must be located in slot 1 of a function unit. The other slot must contain a 177D apparatus blank. Growth slots G1 and G2 do not support the 10/100T circuit pack.
- Growth slots G1 and G2 support the OC-3 (LNW36), OC-12 (LNW46), OC-48 (LNW31 and LNW421 - LNW459), 1GSX (LNW67), or 1GLX (LNW68) circuit packs.
- The SYSCTL LNW1 circuit pack must be located in the control CTL slot.

STS-1/VT1.5 UPSR shelf

An STS-1/VT1.5 UPSR shelf configuration has OC-48 or OC-192 OLIUs in the main M1 and M2 slots and can house the following circuit packs in any combination:

- 28DS1 (LNW6)
- 28DS1PM (LNW7)
- 12DS3/EC1 (LNW16)
- TMUX (LNW18)

STS-1/STS-3c/STS-12c/ STS-48c/VT1.5 UPSR shelf

The STS-1/STS-3c/STS-12c/STS-48c/VT1.5 UPSR shelf configuration has OC-48 or OC-192 OLIUs in the main M1 and M2 slots and can house the following circuit packs in any combination:

- 28DS1 (LNW6)
- 28DS1PM (LNW7)
- 12DS3/EC1 (LNW16)
- TMUX (LNW18)
- Quad OC-3 OLIU (LNW36)
- Dual OC-12 OLIU (LNW46)
- OC-48 OLIU (LNW31 and LNW421 - LNW459)

Note that the OC-3/OC-12/OC-48 OLIUs are required for STS-3c/STS-12c/STS-48c UPSR configurations, while the 28DS1 and 12DS3/EC1 packs are required for lower-level path switching. If lower level path switching (STS-1/VT1.5) is not desired, two function units could house OC-3/OC-12/OC-48 circuit packs, while the remaining function units could house 10/100T, 1GSX , and 1GLX Ethernet circuit packs.

BLSR shelf

The BLSR shelf configuration has OC48 or OC-192 OLIUs in the main M1 and M2 slots and the following circuit packs in any combination:

- 28DS1 (LNW6)
- 28DS1PM (LNW7)
- 12DS3/EC1 (LNW16)
- TMUX (LNW18)
- Quad OC-3 OLIU (LNW36)
- Dual OC-12 OLIU (LNW46)
- OC-48 OLIU (LNW31 and LNW421 - LNW45)

OC-48 linear shelf

The OC-48 linear shelf configuration has OC48 OLIUs in the main M1 and M2 slots and the following circuit packs in any combination:

- 28DS1 (LNW6)
- 28DS1PM (LNW7)
- 12DS3/EC1 (LNW16)
- TMUX (LNW18)
- Quad OC-3 OLIU (LNW36)
- Dual OC-12 OLIU (LNW46)
- OC-48 OLIU (LNW31 and LNW421 - LNW45)

Ethernet (data) transport shelf

The Ethernet (data) transport shelf configuration requires at least one of the following circuit packs:

- 10/100T (LNW66)
- 1GSX (LNW67)
- 1GLX (LNW68)

The LNW66, LNW67, and LNW68 circuit packs must be located in slot 1 of a function unit. Growth slot G1 also supports the LNW67 and LNW68 circuit packs. (Growth slots do not support the LNW66 10/100T circuit pack.) Slot 2 must contain a 177D apparatus blank. The other function units may house any other Metropolis® DMX circuit packs for traditional voice services.

Single and dual homing shelf

The single homing and dual homing shelf configurations require at least one of the following circuit packs:

- Quad OC-3 OLIU (LNW36)
- Dual OC-12 OLIU (LNW46)
- OC-48 OLIU (LNW31)
- OC-48 OLIU (LNW421 - LNW459)

If the shelf is homing to an OC-3 ring, the LNW36 circuit pack must occupy at least one function unit or growth group. If the shelf is homing to an OC-12 ring, the LNW46 must occupy at least one function unit or growth group. If the shelf is homing to an OC-48 ring, the LNW31 or LNW421 - LNW459 circuit pack must occupy at least one function unit or growth group. It is possible to home to OC-3, OC-12, and/or OC-48 rings on the same shelf. Any other circuit pack may occupy other function units depending on the desired service.

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Typical Bay Arrangement

Overview

Up to four Metropolis® DMX shelves and/or Metropolis® DMX high capacity shelves, including fan units, can fit in one 7-foot network bay frame (19 or 23 inches wide). However, if a fuse panel is mounted at the top the network bay frame, up to three Metropolis® DMX shelves and/or four Metropolis® DMX high capacity shelves can fit.

These arrangements meet network equipment-building system (NEBS) central office requirements for bay heat dissipation. If typical arrangements are not used, normal heat flow could be interrupted and adversely affect shelf operation. Fan units must be used to guarantee proper air circulation.

Fan unit

Fan units are required (in all environments) to guarantee proper air circulation. The fan unit is designed to mount directly above a shelf and provide draw through cooling for the shelf below. The fan unit also acts as a heat baffle for the shelf above (if equipped).

Adding shelves

Shelves can be added incrementally by local technicians (since all cabling is connectorized) if interbay cabling is initially provided for the bay layout. If shelves are incrementally installed, it is recommended that they be installed from bottom to top to simplify bay mult cabling. However, shelves may be added in any position if proper bay mult cabling is selected.

For detailed information about network bay frame arrangements and installation instructions, refer to the *Metropolis® DMX Access Multiplexer, Installation Manual, 365-372-304*.

Circuit Packs

Overview

This part lists the circuit packs supported by Metropolis® DMX and briefly describes each circuit pack.

Supported circuit packs

The following table lists the circuit packs supported by Metropolis® DMX. The table also shows the circuit pack slot compatibility and the initial product release.

Table 2-1 Supported Circuit Packs

Circuit Pack	Apparatus Code	Slot(s)	Release	Comments
1GLX	LNW68	A1, B1, C1, D1, G1	1.1	1000 BASE-LX Ethernet interface, may only occupy slot 1 of a function unit or a growth slot
1GSX	LNW67	A1, B1, C1, D1, G1	1.1	1000 BASE-SX Ethernet interface, may only occupy slot 1 of a function unit or a growth slot
10/100T	LNW66	A1, B1, C1, D1	1.1	100 BASE-TX Ethernet interface, may only occupy slot 1 of a function units (NOT Growth slots)
12DS3/EC1	LNW16	A-D	1.0	Only DS3 support
			1.1	DS3 and EC-1 support, DS3/EC-1 per pack provisioning (via a hardware jumper)
			2.0	DS3/EC-1 per port provisioning, via the WaveStar® CIT
28DS1	LNW6	A-D	1.0	
28DS1PM	LNW7	A-D	1.0	Supports performance monitoring features
Apparatus Blank	177D	A-D, G1, G2	1.0	Filler plates used in unequipped function unit and growth slots
	177E	M2	2.1	Filler plates used in unequipped main slot
OC-3 OLIU	LNW36	A-D, G1, G2	1.1	Low-speed, long reach, four ports, 1310 nm

Circuit Pack	Apparatus Code	Slot(s)	Release	Comments
OC-12 OLIU	LNW46	A-D, G1, G2	1.1	Low-speed, long reach, two ports, 1310 nm
OC-48 OLIU	LNW26	M1, M2	1.0	High-speed, long reach, 1310 nm, partial (6 to 12 STS-1s) VT mapping
	LNW26B	M1, M2	2.0	High-speed, long reach, 1310 nm, partial (up to 12 STS-1s) VT mapping
	LNW27	M1, M2	2.1	High-speed, long reach, 1310 nm, full (up to 48 STS-1s) VT mapping
	LNW28	M1, M2	2.0	High-speed, long reach, 1310 nm, partial (up to 12 STS-1s) VT mapping, extended temp. certification for outside cabinet deployment
	LNW29	M1, M2	2.1	High-speed, extended long reach, 1550 nm, full (up to 48 STS-1s) VT mapping
	LNW31	A-D, G1, G2	2.0	Low-speed, intermediate reach, 1310 nm, partial (up to 12 STS-1s) VT mapping
	LNW76	M1, M2	2.1	High-speed, short reach, 1310 nm, full (up to 48 STS-1s) VT mapping
	LNW77	M1, M2	2.0	High-speed, intermediate reach, 1310 nm, partial (up to 12 STS-1s) VT mapping
	LNW121B-LNW159B	M1, M2	2.0	High-speed,16 different passive DWDM circuit packs, 32 different wavelengths (hardware-tunable), partial (up to 12 STS-1s) VT mapping
	LNW221-LNW259	M1, M2	2.1	High-speed, 16 different passive DWDM circuit packs, 32 different wavelengths (hardware-tunable), full (up to 48 STS-1s) VT mapping

Circuit Pack	Apparatus Code	Slot(s)	Release	Comments
OC-48 OLIU	LNW421-LNW459	A-D, G1, G2	3.0	Low-speed, 16 different passive DWDM circuit packs, 32 different wavelengths (hardware-tunable), partial (up to 12 STS-1s) VT mapping
OC-192 OLIU	LNW56	M1, M2	2.1	High-speed, intermediate reach, 1550 nm, partial (up to 48 STS-1s) VT mapping
	LNW58	M1, M2	2.1	High-speed, short reach, 1310 nm, partial (up to 48 STS-1s) VT mapping
System Controller (SYSCTL)	LNW1	CTL	1.0	Always required
TMUX	LNW18	A-D	3.0	12 ports per circuit pack

1GLX (LNW68) 1000BASE-LX optical Ethernet interface

The 1GLX (LNW68) circuit pack has two 1 Gb/s ports and provides long-reach high-speed optical data transport. The 1GLX circuit pack uses standard Ethernet switching IEEE 802.1, standard encapsulation according to *ANSI* T1X1.5/2000-024R4 (ITU-T G.gfp), and standard virtual concatenation according to ITU G.707. The 1GLX circuit pack is not equipment protected; but, service can be protected at the network level via UPSR/BLSR switching and the spanning tree algorithm. Fiber access is provided by two LC-type connector pairs on the circuit pack faceplate. The 1GLX circuit pack transmits signals at a wavelength of 850 nm.

The 1GLX circuit pack may occupy slot 1 of any function unit (including growth slots), and up to 10 1GLX ports are addressable when five function unit/growth slots are equipped with 1GLX circuit packs.

Important! When a 1GLX circuit pack occupies slot 1 of a function unit, slot 2 of that function unit must be equipped with an apparatus blank (177D).

1GSX (LNW67) 1000BASE-SX optical Ethernet interface

The 1GSX (LNW67) circuit pack has two 1 Gb/s ports and provides short-reach high-speed optical data transport. The 1GSX (LNW67) circuit pack uses standard Ethernet switching IEEE 802.1, standard encapsulation according to *ANSI* T1X1.5/2000-024R4 (ITU-T G.gfp), and standard virtual concatenation according to ITU G.707. The 1GSX circuit pack is not equipment protected; but, service can be protected at the network level via UPSR/BLSR switching and the spanning tree algorithm. Fiber access is provided by two LC-type connector pairs on the circuit pack faceplate. The 1GSX circuit pack transmits signals at a wavelength of 850 nm.

The 1GSX circuit pack may occupy slot 1 of any function unit (including growth slots), and up to 10 1GSX ports are addressable when five function unit/growth slots are equipped with 1GSX circuit packs.

> **Important!** When a 1GSX circuit pack occupies slot 1 of a function unit, slot 2 of that function init must be equipped with an apparatus blank (177D).

10/100T (LNW66) 100BASE-TX Ethernet interface

The 10/100T circuit pack (LNW66) has 24 physical ports and provides data transport at the rate of 10/100 Mb/s. The 10/100T circuit pack uses standard Ethernet switching IEEE 802.1, standard encapsulation according to *ANSI* T1X1.5/2000-024R4 (ITU-T G.gfp), and standard STS-1 virtual concatenation according to ITU G.707. The 10/100T circuit pack is not equipment protected; but, service can be protected at the network level via UPSR/BLSR switching and the spanning tree algorithm.

The 10/100T circuit pack may occupy slot 1 of function units A, B, C, and D, and 96 ports are addressable when four function units are equipped with LNW66 circuit packs.

> **Important!** When a 10/100T circuit pack occupies slot 1 of a function unit, slot 2 of that function unit must be equipped with an apparatus blank (177D).

12DS3/EC1 (LNW16)

The 12DS3/EC1 (LNW16) circuit pack contains 12 ports, is 1x1 equipment protected, and supports non-revertive protection switching. The 12DS3/EC1 circuit pack provides bidirectional transport of 12 DS3 or EC-1 signals and maps the signals into corresponding STS-1 signals, and supports transport of DS3 signals coded in bipolar 3-zero substitution (B3ZS).

The 12DS3/EC1 circuit pack may occupy function units A, B, C, and D. All electric interface circuit packs are 1x1 hardware protected. So, although both slots in each function unit can house a 12DS3/EC1 circuit pack, one slot in each function unit equipped with a 12DS3/EC1 circuit pack is always used for hardware protection. The shelf supports up to 48 working ports when four function units are equipped with 12DS3/EC1 circuit packs.

In Release 1.1, DS3 or EC-1 service is provisioned by jumpers on a per-pack basis. In Release 2.0, DS3 or EC-1 service is provision via the WaveStar® CIT on a per-port basis. For detailed information about installing the 12DS3/EC1 circuit pack, refer to “Task 313: Install 12DS3/EC1 (LNW16) Circuit Pack” (10-123).

28DS1 (LNW6) and 28DS1PM (LNW7)

The 28DS1 (LNW6) and 28DS1PM (LNW7) circuit packs contain 28 DS1 ports that can be cross-connected to any available VT1.5 timeslot. Both circuit packs are 1x1 protected, and non-revertive protection switching is supported. Line build-outs and DS1 signal encoding are software provisionable. Both circuit packs terminate up to 28 bidirectional DS1 electrical signals and support the transport of DS1 signals coded in either alternate mark inversion (AMI) or bipolar 8-zero substitution (B8ZS) modes. The signals received from the DSX-1 are mapped into SONET VT1.5 signals and then routed to the high-speed OLIU circuit pack.

Both circuit packs can occupy function units A, B, C, and D. All electric interface circuit packs are 1x1 hardware protected. So, although both slots in each function unit can be equipped with an LNW6 or LNW7 circuit pack, one slot in each function unit is always used for hardware protection. The shelf supports up to 112 working ports when four function units are equipped with the LNW6 or LNW7 circuit pack.

In addition to maintenance and provisioning functions, the 28DS1PM circuit pack provides performance monitoring capabilities.

OC-3 OLIU (LNW36)

The quad OC-3 OLIU (LNW36) circuit pack is a four-port, long-reach, 1310 nm optical line interface unit supporting VT1.5, STS-1 and STS-3(c) path switching. The OC-3 OLIU can interface with other OC-3 rings in the network and can also be used as an interface for OC-3 linear optical extensions, as well as single- and dual- homed ring extensions. Fiber access is provided via four pairs of LC-type connectors on the circuit pack faceplate.

The OC-3 OLIU can occupy any function unit slot (including growth slots), and up to 40 ports are addressable when all function units are equipped with the OC-3 OLIU.

OC-12 OLIU (LNW46)

The dual OC-12 OLIU (LNW46) circuit pack is a two-port, long-reach, 1310 nm optical line interface unit supporting VT1.5, STS-1, STS-3(c), and STS-12(c) path switching. The OC-12 OLIU provides a low-speed OC-12 interface to other OC-12 rings, linear optical extensions, and single- and dual-homed ring extensions. Fiber access is provided via two pairs of LC-type connectors on the circuit pack faceplate.

The OC-12 OLIU can occupy any function unit slot (including growth slots), and up to 20 ports are addressable when all function units are equipped with the OC-12 OLIU.

OC-48 OLIU (LNW26)

The OC-48 OLIU (LNW26) circuit pack is a long reach 1310 nm optical line interface unit. The LNW26 OC-48 OLIU supports OC-48 add/drop, UPSR/BLSR configurations, 1+1 linear, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The LNW26 OC-48 OLIU can cross-connect VT1.5 signal in 6 to 12 of 48 selected STS-1 signals. (For more information about cross-connections and cross-connection restrictions, refer to Chapter 5, “Provisioning, Security, & Administration”.) The Stratum 3 timing generator and central TDM switch fabrics are embedded in the LNW26 OC-48 OLIU.

The LNW26 OC-48 OLIU may occupy main slots M1 and M2. Fiber access is provided via LC-type connectors on the circuit pack faceplate.

OC-48 OLIU (LNW26B)

The LNW26B OC-48 OLIU has the same capabilities as the LNW26 OC-48 OLIU circuit pack. In Release 2.0, the LNW26B OC-48 OLIU can cross-connect VT1.5 signals in any 6 to 12 of 48 selected STS-1 signals. In Release 2.1, the LNW26B OC-48 OLIU is provisioned using a jumper to cross-connect VT1.5 signals in any 12 of 48 STS-1 signals. (For more information about cross-connections and cross-connection restrictions, refer to Chapter 5, “Provisioning, Security, & Administration”.)

The LNW26B OC-48 OLIU may occupy main slots M1 and M2. Fiber access is provided via a pair of LC-type connectors on the circuit pack faceplate.

OC-48 OLIU (LNW27)

The OC-48 OLIU (LNW27) circuit pack is a long reach 1310 nm optical line interface unit. The LNW27 OC-48 OLIU supports OC-48 add/drop, UPSR/BLSR configurations, 1+1 linear, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The LNW27 OC-48 OLIU can cross-connect VT1.5 signals in up to 48 STS-1 signals. The Stratum 3 timing generator and central TDM switch fabrics are embedded in the LNW27 OC-48 OLIU.

The LNW27 OC-48 OLIU may occupy main slots M1 andM2. Fiber access is provided via LC-type connectors on the circuit pack faceplate.

OC-48 OLIU (LNW28)

The OC-48 OLIU (LNW28) circuit pack is an environmentally hardened version of the LNW26B OC-48 OLIU. The LNW28 OC-48 OLIU is designed specifically for outside cabinet deployment and is certified to withstand extreme temperatures. Refer to the description of the LNW26B OC-48 OLIU above for details.

OC-48 OLIU (LNW29)

The OC-48 OLIU (LNW29) circuit pack is an extended long reach 1550 nm optical line interface unit. The LNW29 OC-48 OLIU supports OC-48 add/drop, UPSR/BLSR configurations, 1+1 linear, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The LNW29 OC-48 OLIU can cross-connect VT1.5 signals in up to 48 STS-1 signals. The Stratum 3 timing generator and central TDM switch fabrics are embedded in the LNW29 OC-48 OLIU.

The LNW29 OC-48 OLIU may occupy main slots M1 andM2. Fiber access is provided via LC-type connectors on the circuit pack faceplate.

OC-48 OLIU (LNW31)

The OC-48 OLIU (LNW31) circuit pack is a single port, low speed, intermediate reach 1310 nm optical line interface unit. The LNW31 OC-48 OLIU supports OC-48 add/drop, UPSR/BLSR configurations, 1+1 linear, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The OC-48 OLIU can cross-connect VT1.5 signals in up to 12 STS-1 signals. The central TDM switch fabrics are embedded in the OC-48 OLIU.

The LNW31 OC-48 OLIU may occupy any function unit slots (including growth slots), and up to 10 ports are addressable when all function units are equipped with the OC-48 OLIU. Fiber access is provided via a pair of LC-type connectors on the circuit pack faceplate.

OC-48 OLIU (LNW76)

The OC-48 OLIU (LNW76) circuit pack is a short reach (20km), high-speed 1310 nm optical line interface unit. The LNW76 OC-48 OLIU supports OC-48 add/drop, UPSR/BLSR configurations, 1+1 linear, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The Stratum 3 timing generator and central TDM switch fabrics are embedded in the LNW76 OC-48 OLIU. The LNW76 OC-48 OLIU can cross-connect VT1.5 signals in any 48 selected STS-1 signals.

The LNW76 OC-48 OLIU may occupy main slots M1 and M2. Fiber access is provided via a pair of LC-type connectors on the circuit pack faceplate.

OC-48 OLIU (LNW77)

The OC-48 OLIU (LNW77) circuit pack is an intermediate reach (20km), high-speed 1310 nm optical line interface unit. The LNW77 OC-48 OLIU supports OC-48 add/drop, UPSR/BLSR configurations, 1+1 linear, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The Stratum 3 timing generator and central TDM switch fabrics are embedded in the OC-48 OLIU. In Release 2.0, the LNW77 OC-48 OLIU can cross-connect VT1.5 signals in 6 to 12 of 48 selected STS-1 signals. In Release 2.1, the LNW77 OC-48 OLIU is provisioned using a jumper to cross-connect VT1.5 signals in up to 12 of 48 STS-1 signals. (For more information about cross-connections and cross-connection restrictions, refer to Chapter 5, “Provisioning, Security, & Administration”.)

The LNW77 OC-48 OLIU may occupy main slots M1 and M2. Fiber access is provided via a pair of LC-type connectors on the circuit pack faceplate.

OC-48 PWDM OLIUs (LNW121B-159B)

The sixteen OC-48 PWDM OLIUs (LNW121B-159B) are optical OLIUs designed for use with passive MUX/DMUX and optical add/drop shelves. Each OC-48 PWDM OLIU supports two wavelengths via a hardware selection configuration. This provides 32 different wavelengths for service applications. For detailed information about installing the OC-48 PWDM OLIUs (LNW121B-159B) circuit pack, refer to "Task 312: Install Main OLIU Circuit Packs" (10-113).

The optical port units are designed to be used with the Lucent Passive Optical Shelves. Using the OC-48 PWDM OLIUs and the Passive Optical Shelves can increase fiber capacity by a factor of 16 or 32.

The OC-48 PWDM OLIU circuit packs support add/drop, UPSR/BLSR configurations, 1+1 linear, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The Stratum 3 timing generator and central TDM switch fabrics are embedded in the OC-48 OLIU. In Release 2.0, the OC-48 PWDM OLIUs can cross-connect VT1.5 signals in 6 to 12 of 48 selected STS-1 signals. In Release 2.1, the OC-48 PWDM OLIUs are provisioned using a jumper to cross-connect VT1.5 signals in up to 12 of 48 STS-1 signals.

The OC-48 WDM OLIUs may occupy main slots M1 and M2. Fiber access is provided via a pair of LC-type connectors on the OC-48 PWDM OLIU faceplate.

OC-48 PWDM OLIUs (LNW221-259)

The sixteen OC-48 PWDM OLIUs (LNW221-259) are optical OLIUs designed for use with passive MUX/DMUX and optical add/drop shelves. Each OC-48 PWDM OLIU supports two wavelengths via a hardware selection configuration. This provides 32 different wavelengths for service applications. For detailed information about installing the OC-48 PWDM OLIUs (LNW221-259) circuit pack, refer to "Task 312: Install Main OLIU Circuit Packs" (10-113).

The OC-48 PWDM OLIUs are designed to be used with the Lucent Passive Optical Shelves. Using the OC-48 PWDM OLIUs and the Passive Optical Shelves can increase fiber capacity by a factor of 16 or 32.

The OC-48 PWDM OLIUs support add/drop, UPSR/BLSR configurations, 1+1 linear, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and

STS-48(c) signal transport. The Stratum 3 timing generator and central TDM switch fabrics are embedded in the OC-48 OLIU. The OC-48 PWDM OLIUs can cross-connect VT1.5 signals in any of the 48 STS-1 signals.

The OC-48 WDM OLIUs may occupy main slots M1 and M2. Fiber access is provided via a pair of LC-type connectors on the OC-48 PWDM OLIU faceplate.

OC-48 PWDM OLIUs (LNW421-459)

The sixteen OC-48 PWDM OLIUs (LNW221-259) are low speed optical OLIUs designed for use with passive MUX/DMUX and optical add/drop shelves. Each OC-48 PWDM OLIU supports two wavelengths via a hardware selection configuration. This provides 32 different wavelengths for service applications. For detailed information about installing the OC-48 PWDM OLIUs (LNW121B-159B) circuit pack, refer to "Task 321: Install OLIU Circuit Packs in Function/Growth Slots" (-1).

The OC-48 PWDM OLIUs are designed to be used with the Lucent Passive Optical Shelves and Optical Amplifiers. Using the OC-48 PWDM OLIUs and the Passive Optical Shelves can increase fiber capacity by a factor of 16 or 32.

The OC-48 PWDM OLIUs support add/drop, UPSR/BLSR configurations, 1+1 linear, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The OC-48 PWDM OLIUs can cross-connect VT1.5 signals in any 12 of 48 STS-1 signals.

The OC-48 PWDM OLIUs may occupy any function unit or growth slot. Fiber access is provided via a pair of LC-type connectors on the OC-48 PWDM OLIU faceplate.

OC-192 OLIU (LNW56)

The OC-192 OLIU (LNW56) circuit pack is a intermediate reach, high-speed 1550 nm optical line interface unit. The LNW56 OC-192 OLIU supports OC-48 add/drop, UPSR/BLSR configurations, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The Stratum 3 timing generator and central TDM switch fabrics are embedded in the OC-192 OLIU. The LNW56 OC-192 OLIU can cross-connect VT1.5 signals in up to 48 STS-1 signals.

The LNW56 OC-192 OLIU can occupy main slots M1 and M2. Fiber access is provided via a pair of LC-type connectors on the circuit pack faceplate.

OC-192 OLIU (LNW58)

The OC-192 OLIU (LNW58) circuit pack is a short reach, high-speed 1310 nm optical line interface unit. The LNW58 OC-192 OLIU supports OC-48 add/drop, UPSR/BLSR configurations, single- and dual-homing, non-revertive protection switching, and VT1.5, STS-1, STS-3(c), STS-12(c), and STS-48(c) signal transport. The Stratum 3 timing generator and central TDM switch fabrics are embedded in the OC-192 OLIU. The LNW58 OC-192 OLIU can cross-connect VT1.5 signals in up to 48 STS-1 signals.

The LNW58 OC-192 OLIU can occupy main slots M1 and M2. Fiber access is provided via a pair of LC-type connectors on the circuit pack faceplate.

System controller (LNW1)

The SYSCTL circuit pack provides communication with other circuit packs in the shelf. The SYSCTL circuit pack supports all operations interfaces, including IAO LAN (OSI or TCP/IP), TL1/X.25, CIT, office alarms, and miscellaneous discretes. The SYSCTL circuit pack also supports DCC terminations for each optical line interface, and a cross-connect fabric that supports path/line switching and timing functions.

The SYSCTL circuit pack faceplate has push-button switches, alarm/status LEDs, and a 7-segment numeric display to facilitate local operations. The SYSCTL circuit pack provides redundancy by duplicating all cross-connect information on the OLIU circuit packs. Transmission is not affected if the SYSCTL circuit pack fails.

The SYSCTL circuit pack provides a microprocessor, nonvolatile memory to store the generic program software, a provisioning database, and additional memory for system operation. The SYSCTL circuit pack also has interfaces across the backplane to monitor and control every circuit pack in the shelf.

The SYSCTL circuit pack supports WaveStar® CIT front access to the shelf via the IAO LAN (beginning with Release 1.1) and a serial RS-232 port located on the shelf backplane.

TMUX (LNW18)

The TMUX (LNW18) circuit pack terminates 12 DS3 signals and demultiplexes the DS3 signals down to DS1 signals. The TMUX circuit pack monitors the performance of the up to 336 DS1 signals and maps the signals into VT-structured STS-1 signals for transport on an OC-n facility.

The LNW18 TMUX circuit pack can occupy Function units A, B, C, or D. The TMUX circuit pack is 1x1 equipment protected. The shelf supports up to 48 working DS3 ports when the Function units are equipped with TMUX circuit packs.

□

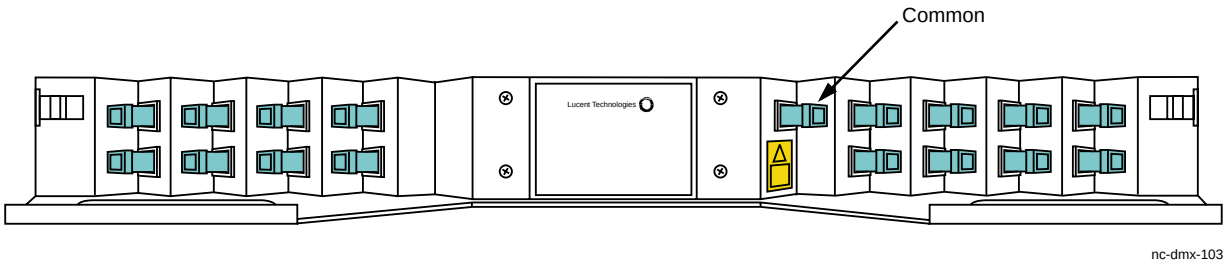
Passive Optics Shelf

Overview

The Passive Optics shelf is a lower-cost solution in using DWDM for transmitting large amounts of traffic on one fiber. The shelf fits in a bay frame with Metropolis® DMX. If the Passive Optics shelf is used in the same bay frame with Metropolis® DMX, then the number of Metropolis® DMX shelves in that bay frame is limited to two. The Passive Optics shelf does not require any power supply or management system.

The following figure shows an example of a Passive Optics shelf.

Figure 2-4 Passive Optics Shelf



Dimensions

The Passive Optics shelf is:

- 74.00 mm (2.913 in.) high, Max.
- 498.00 mm (19.606 in.) wide, Max. (without mounting flange)
- 378.64 mm (14.907 in.) deep, Max.

Configurations

The Passive Optics shelf is available in the following configurations:

- 16 Channel MUX: This configuration supports unidirectional and bidirectional transmission systems.
- 16 Channel DMUX: This configuration supports unidirectional and bidirectional transmission systems. The filters are cascaded in reverse order of the 16 Channel MUX module.
- 16 Channel MUX with Interleaver: This configuration supports unidirectional and bidirectional transmission systems, and includes an interleaver to support 16 additional channels.
- 16 Channel DMUX with Interleaver: This configuration supports unidirectional and bidirectional transmission systems, and includes an interleaver to support 16 additional channels.
- 1 Channel Dual Optical Add Drop Module (OADM): This configuration supports unidirectional transmission systems only and can add/drop one channel. (Two OADMs are provided with each shelf.)
- 2 Channel Dual Optical Add Drop Module (OADM): This configuration supports unidirectional transmission systems only and can add/drop one channel.
- 4 Channel Dual Optical Add Drop Module (OADM): This configuration supports unidirectional transmission systems only and can add/drop one channel.

Applications

The Passive Optics shelf supports the following applications:

- 1, 2, or 4 unidirectional wavelengths (optical add drop only)
- 16 unidirectional/bidirectional wavelengths
- 32 unidirectional/bidirectional wavelengths.

□

External Optical Amplifiers

Overview

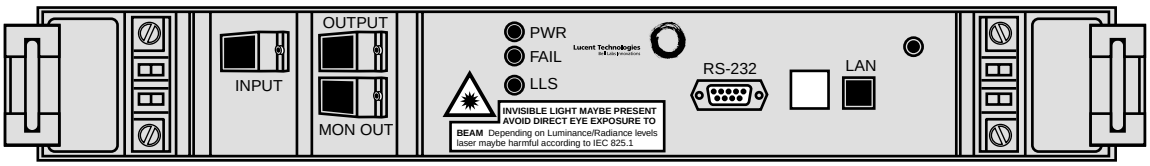
The Lucent external optical amplifier provides service providers, system integrators, and network equipment manufacturers with one of the key technologies needed to build next generation DWDM and OADM networks. With the optical amplifier, operators enhance system performance while minimizing capital expenditures.

The optical amplifier can be configured to provide variable gain between 13 dB and 22 dB. This enables users to optimize optical transmission performance as needs grow. After gain setting is provisioned, the amplifier dynamically controls and maintains signal levels even as the number of amplified wavelengths change.

The amplifier features dynamic transient suppression and gain flattening across C-band to reduce the likelihood of data errors, channel outage, and signal degradation. In dynamic metro access networks or long-haul optical networks, these features allow service providers to provision and deliver reliable wavelength services to their end customers on demand.

The following figure shows the external optical amplifier.

Figure 2-5 Optical Amplifier



nc-dmx2-015

Dimensions

The external optical amplifier is:

- 1.75 in. high
- 17.19 in. wide
- 11.10 in. deep

The external optical amplifier weighs 10 pounds.

Interfaces

The optical amplifier provides a 10/100 Mbps and an RS-232 port for operations and maintenance communications (similar to DMX). These ports are located on the front of the optical amplifier. The optical amplifier continuously monitors its own electrical and optical performance. If operating parameters exceed user-specified thresholds, autonomous alarms are reported.

The optical amplifier may be managed by any of the following means:

- Simple Network Management Protocol (SNMP Version 1 and 2c)
- TL1 messages (GR-833 CORE)
- File Transfer Protocol (FTP) (RFC 956)
- Alarm relay contact closures.

For detailed optical and power specifications, refer to Appendix B, Technical Specifications.

Control

Overview

Metropolis® DMX provides extensive control features, accessible through technician and operations system (OS) interfaces. In addition to accessing local Metropolis® DMX network elements through direct interfaces, technicians and OSs can use the operations features supported via the data communications channel (DCC) in the optical signals to access remote NEs. Control functions are supported by the SYSCTL circuit pack.

Three-tiered operations interface

Maintenance procedures are built on three levels of system information and control.

The first tier includes the following:

- Circuit pack faceplate LEDs and controls
- Fan shelf LEDs and controls
- Circuit breakers

The second tier uses the WaveStar® CIT to provision and retrieve detailed reports that show performance monitoring, alarm and status, and system configuration for local and remote NEs.

The third tier uses the OS interfaces such as TL1/X.25 and TL1 over IAO LAN (TCP/IP or OSI), or WaveStar® CIT to monitor performance, gather alarm information, and provision the system. The IAO LAN interfaces (provisioned for TCP/IP) also support software download and database backup/restore via FTP.

For detailed information about these operations interfaces, refer to Chapter 3, “Operations Interfaces”.

Embedded operations channel

Access and control extends beyond the local Metropolis® DMX to remote network elements via the SONET section data communications channel (DCC). Craft interface dialogs and operations messages are exchanged in the DCC overhead bytes on each OC-3, OC-12, OC-48, and OC-192 interface.

For more information about the DCC, refer to Chapter 3, “Operations Interfaces”.

Power

Overview

Two independent -48V office power feeders (A and B) enter the shelf through connectors and are filtered and distributed to the circuit packs through circuit breakers. Power conversion is performed through modular power converters located on the circuit packs eliminating the need for slots for bulk power converters. In each circuit pack, the feeders are diode OR'ed, fused, filtered, and regulated by the board-mounted power modules. This provides the required redundancy if one feeder or circuit breaker fails. The green Power LEDs located next to each circuit breaker (A and B) indicate power is being fed to the breaker.

For detailed information about power specifications, refer to Appendix B, Technical Specifications.

3 Operations Interfaces

Overview

Purpose This chapter briefly describes the operations interfaces that support technician and operations access to the Metropolis® DMX Access Multiplexer.

Contents The following topics are covered in this chapter:

Introduction to Operations Interfaces

Overview

Purpose This section provides information needed to understand the operations interfaces of the Metropolis® DMX.

Contents The information provided in this section includes:

What are Operations Interfaces?

Overview

Operations interfaces are interfaces that allow access to a network element (NE) and provide communication of alarm and status information on service and equipment. Metropolis® DMX operations interfaces are supported locally (directly) and remotely.

Metropolis® DMX operations interfaces

Metropolis® DMX operations interfaces include:

- WaveStar® CIT access via serial ports and/or an Ethernet 10/100BaseT LAN (IAO LAN) port
- OS access via an X.25 port and/or an Ethernet 10/100BaseT LAN (IAO LAN) port
- System alarm/status LEDs and controls on the SYSCTL circuit pack faceplate
- Circuit pack status LEDs on the circuit pack faceplates
- Office alarms
- User-definable miscellaneous discrete environmental alarms and controls.

Operations interworking (OI)

OI enables the interconnection and remote access of network elements (NEs) using the Synchronous Optical Network (SONET) data communications channel (DCC), the Intra-Office Local Area Network (IAO LAN), the TCP/IP Wide Area Network (WAN), and/or the X.25 data communications network (DCN) for operations communications.

The OI features provide operations support from a single location through a gateway to remote NEs that are in the same SONET subnetwork (a subnetwork consists of a group of SONET NEs with DCC (or OSI LAN) connectivity among the NEs). With this capability, you can perform operations, administration, maintenance, and provisioning (OAM&P) on a centralized basis, helping to save you travel time and money. Both the WaveStar® CIT and the operations systems (OS) interfaces can access local and remote Metropolis® DMX shelves.

Subnetwork

The term “subnetwork” is sometimes used to refer to such a group of NEs with OSI connectivity, but the term “subnetwork” may also have other meanings depending on the context. Therefore the term “subnetwork” is gradually being phased out of this document.

WaveStar® CIT and OS access summary

The following table summarizes the WaveStar® CIT and OS access interfaces supported by Metropolis® DMX. These and the other Metropolis® DMX operations interfaces are described in detail in this chapter.

Table 3-1 WaveStar® CIT and OS Access

Metropolis® DMX Operations Interfaces Guidelines			WaveStar® CIT Access	PC Software Generic Installation Program	OS Access
IAO LAN Ports	Front	OSI	Recommended for temporary local access	—	—
		TCP/IP	Supported for temporary local access	—	—
	Rear	OSI	Supported for local access	—	Recommended for local access to TL1-GNE
		TCP/IP	Recommended for remote and local access	—	Recommended for remote access to TL1-GNE
Serial Ports	Front		Supported for temporary local access	Required	—
	Rear		—*	—	—
X.25 Port	Rear		—	—	Supported
DCC			Recommended for access to RNEs	Supported (Copy Program recommended)	Recommended for TL1-GNE access to RNEs
* Supports dialup modem access from PCs with a terminal emulation software package, such as HyperTerminal, using raw TL1 messages.					

Provisionable operations parameters

For a complete list of Metropolis® DMX provisionable operations parameters (including commands, defaults, and ranges), refer to Chapter 5, "Provisioning, Security, & Administration".

Release Compatibility

Release compatibility

The following table documents the products and releases with which Metropolis® DMX supports OI compatibility.

Table 3-2 Metropolis® DMX Release Compatibility Matrix

Product	Release	Metropolis® DMX Release				
		1.0	1.1	2.0	2.1	3.0
Metropolis® DMX	Release 1.0	X	X	X	X	X
	Release 1.1		X	X	X	X
	Release 2.0			X	X	X
	Release 2.1				X	X
	Release 3.0					X
Metropolis® DMX*press*	Release 1.0			X	X	X
	Release 1.1			X	X	X
DDM-2000 OC-3	Release 15.0		X	X	X	X
DDM-2000 OC-12	Release 7.0		X	X	X	X
FiberReach	Release 4.0		X	X	X	X
FT-2000 ADR	Release 9.1		X	X	X	X
WaveStar® TDM 2.5G/10G (2-Fiber)	Release 4.0		X	X	X	X
	Release 5.0		X	X	X	X
WaveStar® BandWidth Manager	Release 4.0		X	X	X	X
Lambda Unite	Release 2.0			X	X	X
WaveStar® SNMS	Release 5.1	X	X			
Navis™ Optical Element Management System (formerly SNMS)	Release 7.0	X	X	X		
	Release 8.0	X	X	X	X	
	Release 9.0	X	X	X	X	X
Navis™ Ethernet Manager Support	Release 1.0					X

Product	Release	Metropolis® DMX Release				
		1.0	1.1	2.0	2.1	3.0
WaveStar® CIT	Release 5.0.0	X				
	Release 5.1	X	X			
	Release 7.0	X	X	X		
	Release 7.3	X	X	X	X	
	Release 8.2	X	X	X	X	X
TIRKS	Release 19.4	X	X			
	Release 19.5	X	X	X		
	Release 19.6	X	X	X	X	X
ETEK				X	X	X
Avanex				X	X	X
NMA	Release 10.1	X				
	Release 11.0	X	X	X		
	Release 11.1		X	X	X	
	Release 12.0		X	X	X	X
Transport (TEMS)	Release 2.0	X	X			
	Release 2.2	X	X	X		
	Release 2.4	X	X	X	X	
	Release 2.5	X	X	X	X	X

OI Compatibility

OI compatibility summary

The following table summarizes Metropolis® DMX OI compatibility with the products and releases specified in the previous table.

Table 3-3 Metropolis® DMX OI Compatibility Summary

Product	DCC	IAO LAN	WaveStar® CIT Access	OS Access		Remote Software Download	Auto. Time/ Date Sync.	Remote NE Status
			from Metropolis® DMX	Metropolis® DMX tl1-gne	Metropolis® DMX tl1-rne			
Metropolis® DMX	yes	yes	yes	yes	yes	yes	yes	yes
Metropolis® DMX*press*	yes	yes	yes	yes	-	yes	yes	yes
DDM-2000 OC-3	yes	yes	yes	yes	-	yes	yes	yes
DDM-2000 OC-12	yes	yes	yes	yes	-	yes	yes	-
FiberReach	yes	-	yes	yes	-	yes	yes	yes
FT-2000 ADR	yes	-	yes	-	-	-	yes	-
WaveStar® TDM 2.5G/10G (2-Fiber)	yes	yes	yes	yes	yes	-	-	-
WaveStar® BandWidth Manager	yes	yes	yes	-	yes	-	-	-
Lambda Unite	yes	yes	yes	-	yes	-	-	-
Navis™ Optical Element Management System (formerly SNMS)	-	yes	-	yes	yes	-	yes	-
Navis™ Ethernet Management System	-	yes	-	yes	yes	-	yes	-
NMA	-	yes	-	yes	yes	-	-	-
Transport (TEMS)	-	yes	-	yes	yes	-	-	-

Data Communications Channel (DCC)

Provisioning the DCC

To support remote operations over the DCC embedded in the SONET section overhead of the optical signal, the DCC itself must be provisioned as indicated in the following paragraphs.

DCC enable/disable

By default, the DCC is enabled on all optical ports. DCC communications can be enabled or disabled on each port independently.

DCC protection mode

The DCC protection mode is determined by the transmission protection mode assigned to each low-speed optical port (per the *application* parameter). The protection mode can be linear (1+1) identical, or distinct (UPSR). Linear (1+1) identical is the default for the low-speed optical ports. Release 3.0 software also supports a single low-speed OC-48 BLSR.

In systems equipped with Release 2.0 or earlier software, the high-speed optical ports are always distinct (UPSR) and are not provisionable.

In systems equipped with Release 2.1 software, the OC-48 high-speed optical ports may be provisioned for UPSR or BLSR applications. The OC-192 high-speed ports are autoprovisioned for UPSR applications only.

In systems equipped with Release 3.0 and later software, the OC-48 high-speed optical ports may be provisioned for UPSR, BLSR, or 1+1 applications. The OC-192 high-speed ports may be provisioned for UPSR or BLSR applications.

The following table summarizes the DCC protection modes.

Table 3-4 DCC Protection Modes

Optical Port Protection Mode	Shelf Slots	Max. Number Simultaneous Optical Ports (see note)	Max. Number Simultaneous Section DCCs per Shelf
OC-48/OC-192 UPSR	High-speed Main slots	1 pair	1 pair
OC-48/OC-192 BLSR		1 pair	1 pair
OC-48 Linear (1+1)		1 pair	1 pair
OC-48 UPSR	Low-speed Function and Growth slots	5 pairs	5 pairs
OC-48 BLSR		1 pair	1 pair
OC-48 Linear (1+1)		5 pairs	5
OC-48 0x1 (UNSWITCHED in Release 3 and later releases)		10	10
OC-12 UPSR		10 pairs	10 pairs
OC-12 Linear (1+1)		10 pairs	10
OC-12 0x1 (UNSWITCHED in Release 3 and later releases)		20	20
OC-3 UPSR	Low-speed Function and Growth slots	20 pairs	20 pairs
OC-3 Linear (1+1)		20 pairs	20
OC-3 0x1 (UNSWITCHED in Release 3 and later releases)		40	40
Note: In this table, each optical port counted includes both a transmit and receive fiber.			

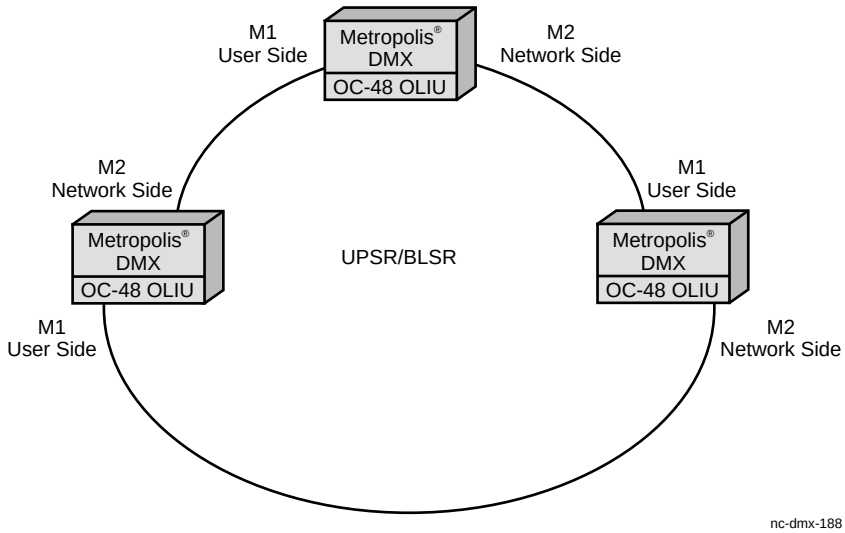
User side and network side

The operation of each DCC span also depends on one end of the span being designated the “User” side and the other end being designated the “Network” side. The DCC User/Network side assignments are provisionable.

By default, the high-speed port dcc-m1-1 is designated the “User” side and dcc-m2-1 is designated the “Network” Side. If each Metropolis® DMX on a high-speed ring application is connected to its neighbor with a fiber-pair between ports main-1 and main-2, the default DCC User side/Network side assignments are sufficient.

Figure 3-1 shows the User and Network side designations for Metropolis® DMXs on a high-speed UPSR or BLSR.

Figure 3-1 Default User/Network Side Designation on a UPSR/BLSR



By default, low-speed linear (1+1) DCC is designated “Network” side but low-speed 0x1 (UNSWITCHED in Release 3 .0 and later) and UPSR/BLSR DCC designations alternate between each Function Slot and Growth Slot, for example, dcc-a1-1 is designated “Network” side and dcc-a2-1 is designated “User” Side. If each Metropolis® DMX on a low-speed UPSR is connected to its neighbor with a fiber-pair between ports fn-a-1-1 and fn-a-2-1 (for example), the default DCC User side/Network side assignments are sufficient.

Figure 3-2 shows the User and Network side designations for Metropolis® DMXs on a low-speed UPSR with DDM-2000.

Figure 3-2 Default User/Network Side Designation on an OC-3/12 UPSR with DDM-2000

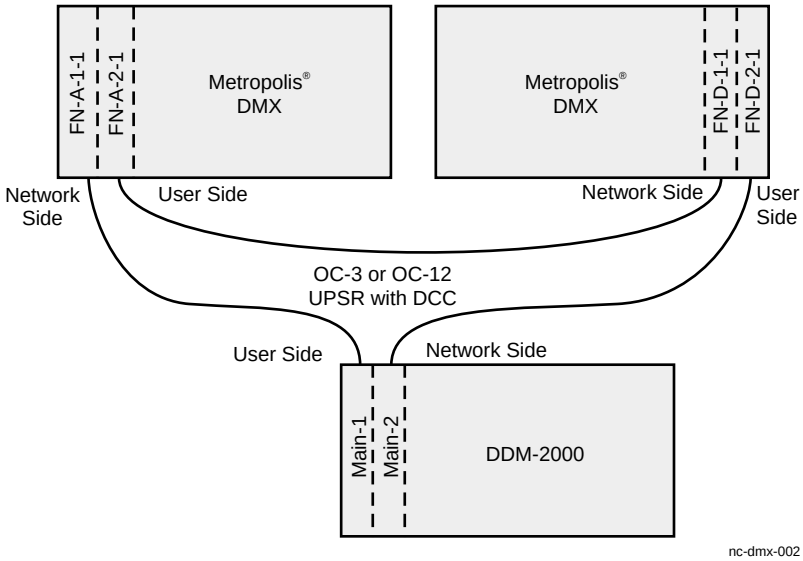
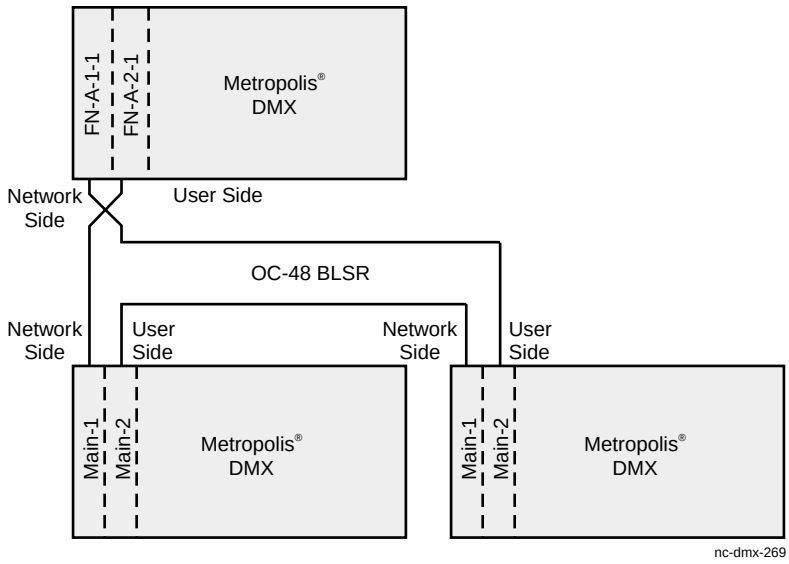


Figure 3-3 shows the User and Network side designations for Metropolis® DMXs on a low-speed OC-48 BLSR.

Figure 3-3 Default User/Network Side Designation on a Low Speed OC-48 BLSR



DCC compatibility

Metropolis® DMX supports the optical interfaces with DCC communications compatibility as shown in the following table. Metropolis® DMX supports Section DCC running the OSI protocol stack. The "1+1" entries represent linear (1+1) identical protected DCC compatibility. The "0x1" (UNSWITCHED in Release 3 and later releases) entries represent unprotected 0x1 DCC compatibility.

Table 3-5 DCC Compatibility

Product	Optical Interfaces Supported		Metropolis® DMX				
			High-Speed Main Slots		Low-Speed Function and Growth Slots		
			OC-192	OC-48	OC-48	OC-12	OC-3
Metropolis® DMX	High-Speed	OC-192	UPSR/ BLSR				
		OC-48		UPSR/ BLSR 1+1	UPSR BLSR 1+1 0x1*		
	Low-Speed	OC-48		UPSR BLSR 1+1	UPSR BLSR 1+1 0x1*		
		OC-12				UPSR 1+1 0x1*	
		OC-3					UPSR 1+1 0x1*
Metropolis® DMX*press*	High-Speed	OC-48		UPSR	UPSR		
		OC-12				UPSR 1+1 0x1*	
DDM-2000 OC-3	High-Speed	OC-12				UPSR 0x1*	
		OC-3					UPSR 0x1*
	Low-Speed	OC-3			UPSR 0x1*		1+1 0x1 (Note)
DDM-2000 OC-12	High-Speed	OC-12				UPSR 0x1*	
	Low-Speed	OC-3			UPSR 0x1*		1+1 0x1*

Product	Optical Interfaces Supported		Metropolis® DMX				
			High-Speed Main Slots		Low-Speed Function and Growth Slots		
			OC-192	OC-48	OC-48	OC-12	OC-3
FiberReach	High-Speed	OC-12				UPSR 0x1*	
		OC-3					UPSR 0x1*
FT-2000 ADR	High-Speed	OC-48		BLSR	BLSR		
	Low-Speed	OC-12				1+1 0x1*	
		OC-3					1+1 0x1*
WaveStar® TDM 2.5G/10G (2-Fiber)	High-Speed	OC-48		UPSR/ BLSR	UPSR/ BLSR 1+1 0x1*		
	Low-Speed	OC-12				UPSR 1+1 0x1*	
		OC-3					1+1 0x1*
WaveStar® BandWidth Manager, Release 4.0	High-Speed	OC-48		UPSR/ BLSR	UPSR BLSR 1+1 0x1*		
	Low-Speed	OC-12				UPSR 1+1 0x1*	
		OC-3			1+1 0x1[1]		1+1 0x1*
Lambda Unite	High-Speed	OC-192	UPSR BLSR				
		OC-48		UPSR/ BLSR	UPSR/ BLSR		

* UNSWITCHED in Release 3 and later releases.

IAO LAN Ports

Overview

Metropolis® DMX supports a front and rear IAO LAN port. Each IAO LAN port operates independently (Metropolis® DMX does not support an *internal* IAO LAN hub). The front IAO LAN port is recommended for convenient, temporary local WaveStar® CIT access. When, for example, the WaveStar® CIT is directly connected to either IAO LAN port, a LAN crossover cable is required (to connect the transmit wire-pair at one end to the receive wire-pair at the other end, and vice versa).

The rear IAO LAN port is recommended for permanent local WaveStar® CIT access and all remote WaveStar® CIT access via TCP/IP as well as for OS access. Metropolis® DMX's rear IAO LAN port is typically expected to be connected to an Ethernet LAN hub in CO applications, but unused at remote sites.

The Metropolis® DMX IAO LAN ports support 10/100BaseT Ethernet (per Telcordia Technologies GR-253, ANSI/IEEE 802.2 and 802.3, and ISO 8802.2 and 8802.3) over four-wire twisted pair using an RJ-45 connector. Each IAO LAN port automatically adapts its rate to 10 Mb/s or 100 Mb/s to match the capability of the other nodes on the same IAO LAN, with 10 Mb/s as the default rate.

OSI on the IAO LAN

When the OSI protocol stack is used on an IAO LAN port, the term "OSI LAN" is sometimes used. The OSI LAN is effectively an extension of the DCC. All remote operations supported over the DCC are also supported over the OSI LAN. The term "DCC connectivity" is used throughout this document to mean DCC and/or OSI LAN connectivity.

OSI communications on the IAO LAN ports can be enabled or disabled. By default, OSI is enabled on the IAO LAN ports.

TCP/IP on the IAO LAN

The IAO LAN ports also support the TCP/IP protocol stack. TCP/IP communications on the IAO LAN ports can be enabled or disabled. By default, TCP/IP is disabled on the IAO LAN ports.

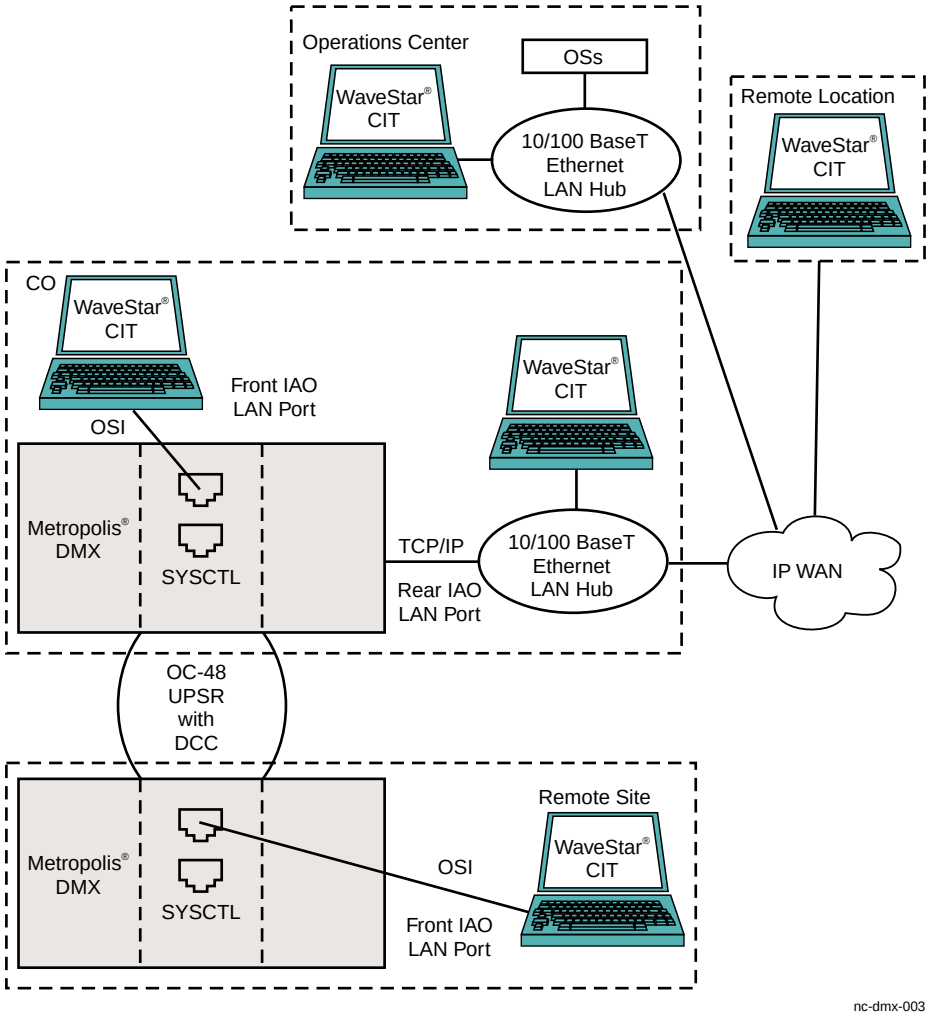
When the TCP/IP protocol stack is used on an IAO LAN port, the term "TCP/IP LAN" is sometimes used.

OSI or TCP/IP on the same IAO LAN

It is generally recommended that each IAO LAN port be used for OSI or TCP/IP, but not both protocols simultaneously on the same IAO LAN port.

Figure 3-4 provides examples of common applications using the IAO LAN ports.

Figure 3-4 IAO LAN Port Applications



IAO LAN compatibility

The following table documents Metropolis® DMX IAO LAN communications compatibility with other products and the applicable OSI and/or TCP/IP protocol stacks. (WaveStar® CIT and OS access applications compatibility via the IAO LAN is covered separately later.)

Table 3-6 IAO LAN Compatibility

Product	Metropolis® DMX	
	OSI	TCP/IP
Metropolis® DMX	yes	yes
Metropolis® DMX*press*	yes	yes
DDM-2000 OC-3	yes	-
DDM-2000 OC-12	yes	-
FiberReach	-	-
FT-2000 ADR	-	-
WaveStar® TDM 2.5G/10G (2-Fiber)	yes	yes
WaveStar® BandWidth Manager	yes	yes
Lambda Unite	yes	yes
WaveStar® CIT	yes	yes
Navis™ Optical Element Management System (formerly SNMS)	yes	yes
Navis™ Ethernet Management System	yes	yes

Network Size

Overview

There isn't any inherent limit to the total number of NEs in a SONET transmission network, but there is a limit to the number of nodes that can be part of the same OSI domain, that is, with OSI LAN and/or DCC connectivity for operations communications among the NEs.

Maximum number of OSI nodes

The maximum number of OSI nodes supported is 50, unless IS-IS Level 2 Routing is used, in which case, up to 256 OSI nodes are supported. In Release 2.0, up to 1000 nodes are supported. Each Metropolis® DMX counts as one OSI node.

To simplify administration and minimize provisioning, the number of nodes included in the same OSI domain should be limited to no more than 50, whenever practical, by disabling all OSI LAN and DCC between some logical groupings of NEs.

IS-IS level 2 routing

IS-IS Level 2 Routing involves the assignment of NEs to multiple areas of less than 50 nodes each. Level 2 routers support OSI communications between the NEs in different areas. Both the assignment of NEs to areas and the enabling of NEs as Level 2 routers is accomplished by provisioning.

For more information, refer to Appendix C, IS-IS Level 2 Routing Guidelines.

Directory Services

What is directory services?

OS and WaveStar® CIT users access remote Metropolis® DMXs using the remote Metropolis® DMX's TID (name) but remote Metropolis® DMXs are addressed on the DCC using NSAPs (addresses). Therefore, a method to provide TID-to-NSAP (name-to-address) and NSAP-to-TID (address-to-name) translations is necessary. Target Identifier Address Resolution Protocol (TARP) provides this capability.

For SONET NEs that support TCP/IP and TL1/X.25 OS interfaces, TARP is the de facto directory services standard to support multi-vendor OI compatibility. TARP is specified in Telcordia GR-253-CORE, SONET Transport Systems: Common Criteria.

TID provisioning

Each NE in a network must be provisioned with a unique TID. The Metropolis® DMX's default TID is "LT-DMX". The terms TID and source identifier (SID) are generally used interchangeably.

> **Important!** Some other-vendor NEs may require that all TIDs adhere to specific rules, for example, that each TID start with an alphabetic character and/or that each TID consist of at least 6-to-7 characters.
>
> To be compatible with WaveStar products, Metropolis® DMX TIDs should *not* include special characters "%" and "#". Even though Metropolis® DMX TID provisioning allows those special characters, T1.245 SONET Directory Services (SDS) does not support those special characters.

NSAP provisioning

By default, each Metropolis® DMX has a unique Network Service Access Point (NSAP) address, thus no NSAP provisioning is necessary in small networks. If the network size exceeds 50 OSI nodes, NSAP provisioning is required.

For more information, refer to Appendix C, IS-IS Level 2 Routing Guidelines.

TARP provisioning

Although TARP functions automatically without any user provisioning, using standard default values, Metropolis® DMX allows provisioning of the following TARP parameters. All TARP parameters are provisionable:

- Lifetime
- Manual Adjacency
- Timers
- Loop Detection Buffer (LDB) Flush Timer
- TARP Data Cache (TDC) Enable/Disable
- TDC TID-NSAP Entries.

It is recommended that the TARP default values always be used.

TARP TID-to-NSAP translations

The three operations that depend on TARP TID-to-NSAP translations are:

1. TL1 OS access
2. WaveStar® CIT access
3. Remote (Software) Install Program/Copy Program.

When a TL1 TCP/IP or TL1/X.25 GNE receives a TL1 login request for a TL1-RNE, the TL1 login request includes the TL1-RNE's TID. The TL1-GNE relies on TARP to determine the TL1-RNE's NSAP. The TL1-GNE needs the NSAP to establish an OSI association with the TL1-RNE. The TL1 login request is forwarded to the TL1-RNE over that OSI association.

The local Metropolis® DMX serves as a TL1-GNE and uses TARP as described above for WaveStar® CIT access via Metropolis® DMX's serial ports or TCP/IP. When accessing Metropolis® DMX via OSI LAN, the WaveStar® CIT (or OS) performs the TL1-GNE function and uses TARP in a similar manner, too. The local Metropolis® DMX uses TARP as described above to support remote Install Program/Copy Program, too.

TARP propagation

The first time a TL1-GNE (or local Metropolis® DMX) requires a TARP TID-to-NSAP translation for each remote NE, the TL1-GNE originates a TARP query. The TARP query is propagated to all NEs in the same OSI routing area, and if no response is received from within the area, up to two additional TARP queries are propagated throughout the OSI domain. Each NE forwards the TARP queries to each of its neighboring OSI nodes (that is, adjacencies), except the neighbor from which the TARP query was received.

When the TARP query reaches the remote NE with the requested TID, that remote NE responds to the originating NE with the remote NE's NSAP address. If there is no response to any of the TARP queries for a TID, after the third query times out, an error response (for example, TL1- GNE unknown TID or TID not found) is returned to the originating NE.

TARP NSAP-to-TID translations

When a Metropolis® DMX is commanded to perform this translation, it knows the NSAPs of the remote NEs to be included in the responses but relies on TARP to determine the corresponding TIDs.

To ensure that the responses to these commands always include the most up-to-date network information, real-time TARP queries are originated instead of relying on the TDC (although the TDC is updated, as appropriate, based on the responses to these NSAP-to-TID queries).

Because the NSAPs are known, these TARP queries are addressed directly to each remote NE (TARP propagation is not necessary). Each remote NE responds to the originating NE with the remote NE's TID.

TARP data cache

In order to reduce the frequency of TARP propagation, and to improve the performance of the affected operations, Metropolis® DMX supports a TDC option. By default, the TDC is enabled.

Each Metropolis® DMX maintains its own TDC, independently. The TDC consists of TID-NSAP translations. Each Metropolis® DMX automatically updates its own TDC based on the responses to previous TARP queries. The TDC may also be updated upon receipt of an unsolicited, automatic notification from another NE in the same OSI domain of a TID or NSAP change.

Metropolis® DMX checks its TDC to see if it already has a required TID-to-NSAP translation before originating a TARP query. If a translation is not found in the TDC, the response to that TARP query is used to update the originating Metropolis® DMX's TDC. Metropolis® DMX assures that its TDC maintains only one TID-NSAP translation for each unique TID. Metropolis® DMX supports TDC sizes of up to 110 TID-NSAP translations. If the TDC is disabled or Metropolis® DMX's system controller is reset, the contents of the TDC are deleted.

TDC accuracy

In the unlikely event that a TDC includes an inaccurate TID-to-NSAP translation, Metropolis® DMX confirms that both the NSAP and TID of the remote Metropolis® DMX are correct before a remote operation proceeds. If there is a mismatch, an error response (for example, TL1-RNE unknown TID, Inconsistent TID, or Association Setup Failure) is returned to the originating NE.

To correct such a situation, delete the subject TID (L4tdctid) from the TDC, then re-request the remote operation for the subject TID. The subsequent TARP query results in an accurate TID-to-NSAP translation, and the TDC is updated accordingly. A broader solution is to disable and re-enable the TDC in which case *all* TDC entries are deleted.

□

WaveStar® CIT

Overview

Purpose This section describes the WaveStar® CIT.

Contents The information provided in this section includes:

Introduction to the WaveStar® CIT

What is the WaveStar® CIT?

The WaveStar® CIT is the primary tool used to interface with Metropolis® DMX. It is a personal computer (PC) with the WaveStar® CIT user-interface software installed.

The WaveStar® CIT supports the following user interface options:

- Graphical user interface (GUI)
- TL1 command builder
- TL1 cut-through access to other NEs

The WaveStar® CIT is referred to as the "WaveStar® CIT" because the Metropolis® DMX user-interface software is integrated with the WaveStar® CIT software for the WaveStar® products.

For information about installing the WaveStar® CIT user-interface software on a PC, refer to "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133) and the *Metropolis*® DMX Access Multiplexer *Installation Manual*, 365-372-304.

For information about establishing a WaveStar® CIT session to an NE, refer to "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3).

WaveStar® CIT functionality

The WaveStar® CIT provides an easy-to-use interface and security features to prevent unauthorized access. The WaveStar® CIT supports the following:

- Local access control based on login and password
- OSI neighbor discovery for easy access to the local NE(s)
- User provisioning of cross-connections, equipment, ethernet services, software management, protection provisioning, and fault management
- Reports on NE equipage, cross-connections, alarms, and states

TL1 interface

The interface between the WaveStar® CIT and the Metropolis® DMX supports TL1 messages. This interface allows the WaveStar® CIT to issue TL1 commands and receive responses, as well as receive TL1 alarm reports from autonomous events that are detected by the Metropolis® DMX.

WaveStar® CIT Access

WaveStar® CIT access methods

The WaveStar® CIT can access a network element using the following:

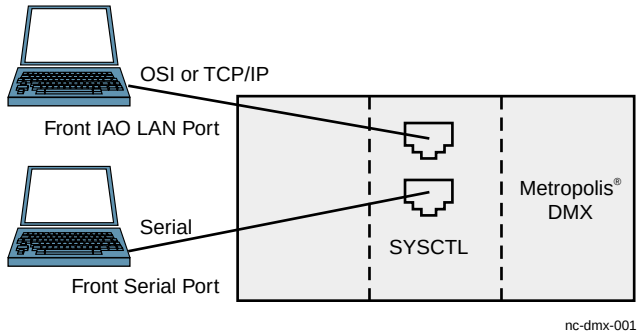
- Front and rear IAO LAN ports supporting OSI communications
- Front and rear IAO LAN ports supporting TCP/IP communications
- Front serial port
- Rear serial port

WaveStar® CIT direct local access

The recommended method for temporary local access is to connect the WaveStar® CIT to Metropolis® DMX via the CIT LAN port on the system controller (SYSCTL) circuit pack faceplate.

The WaveStar® CIT can also be connected to the serial CIT RS232 port on the SYSCTL circuit pack faceplate.

Figure 3-5 CIT Direct Local Access

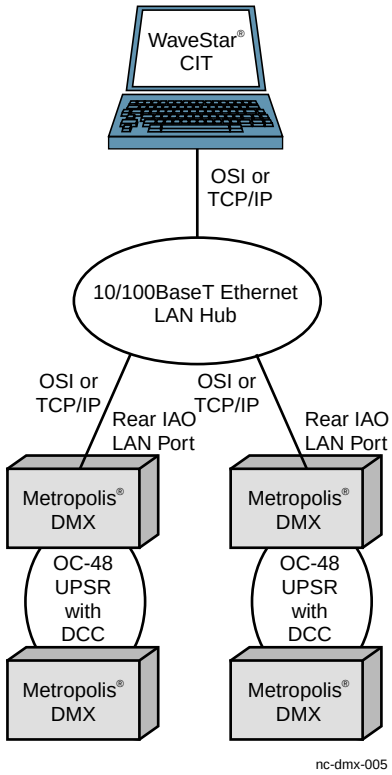


Important! When the WaveStar® CIT is directly connected to the CIT LAN port (not to an Ethernet LAN hub), a LAN crossover cable is required.

WaveStar® CIT access via rear IAO LAN Port

The rear IAO LAN port supports local and/or remote WaveStar® CIT access. The figure below shows how the rear IAO LAN port can be used to provide local WaveStar® CIT access by connecting to a local Ethernet LAN hub. The WaveStar® CIT is depicted as being local but could also be remote. The OSI protocol stack may be sufficient if local access only is required, but TCP/IP would typically be used to support remote access.

Figure 3-6 WaveStar® CIT Access via rear IAO LAN Port



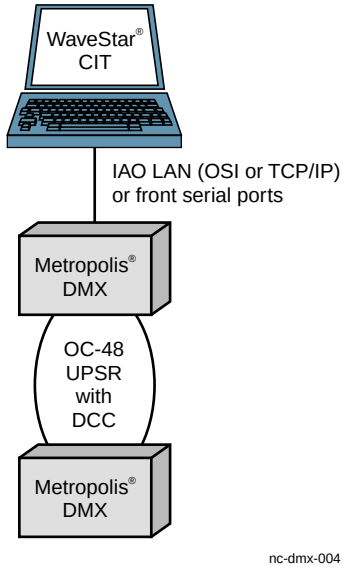
WaveStar® CIT access via TCP/IP LAN

For security reasons (and per SIF standards), neither local nor remote TCP/IP access via the Metropolis® DMX IAO LAN ports is allowed by default.

WaveStar® CIT remote access using DCC

A WaveStar® CIT with direct physical access to a local Metropolis® DMX can also be used to access remote NEs with DCC connectivity to the local Metropolis® DMX. WaveStar® CIT remote access over DCC is functionally equivalent to WaveStar® CIT direct access.

Figure 3-7 WaveStar® CIT Access via DCC

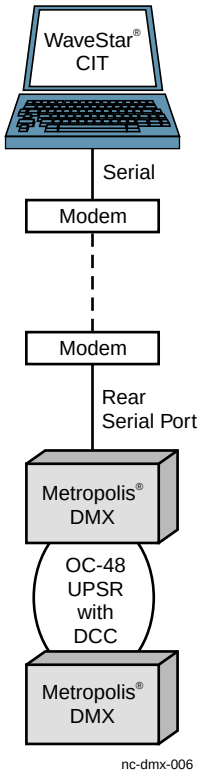


Remote access to the rear serial port

Metropolis® DMX can also be accessed remotely via dialup modems, but not by the WaveStar® CIT software. The rear serial port when equipped with the recommended cable is configured as DTE to allow a permanent modem connection.

A PC with a terminal emulation software package, such as HyperTerminal, can be used for access to Metropolis® DMX's rear serial port via dialup modems. The PC can use its internal modem or an external modem (shown). This form of access supports TL1 messages only, and can be used to access remote NEs with DCC connectivity to the Metropolis® DMX with the modem connection, too.

Figure 3-8 Remote WaveStar® CIT Access via modem



Operations Features

Overview

Purpose This section describes additional operations features supported by Metropolis® DMX.

Contents The information provided in this section includes:

Software Download (Generic)

Overview

Metropolis® DMX supports local and remote software download features.

For complete coverage of Metropolis® DMX's software download features, refer to Chapter 9, "Operations Tasks" and the *Metropolis®* DMX Access Multiplexer *Installation Manual*, 365-372-304.

Local software download

Metropolis® DMX supports the following local software download features.

- Local software download from a WaveStar® CIT connected to the **CIT RS-232** (RS-232 serial) port on the SYSCTL circuit pack faceplate
- Local software installation via File Transfer Protocol (FTP) from a WaveStar® CIT connected to the **CIT LAN** (IAO LAN) port on the SYSCTL circuit pack faceplate or the **J16 IAOLAN** (IAO LAN) port on the shelf backplane. Software installation via FTP requires the following:
  - FTP Client software is enabled on the NE
  - IP parameters are provisioned on the NE.

Remote software download

Remote software download reduces the need to travel to remote sites when the software version of multiple Metropolis® DMX systems is being upgraded throughout a network.

- Remote software download from a local PC connected to the **CIT RS-232** (RS-232 serial) port on the SYSCTL circuit pack faceplate to a remote:
  - Metropolis® DMX
  - Metropolis® DMX*press*
  - DDM-2000 OC-3
  - DDM-2000 OC-12
  - FiberReach

  Important! Both the local and remote NEs must have an active software generic.

- Software copy from the local Metropolis® DMX to a remote:
  - Metropolis® DMX
  - Metropolis® DMX*press*
  - DDM-2000 OC-3
  - DDM-2000 OC-12
  - FiberReach.

  Important! The software must be in the dormant area of Metropolis® DMX. Both the local and remote NEs must have an active software generic.
- Remote software download via FTP to Metropolis® DMX. Both the FTP gateway network element (GNE) and remote NE must have an active software generic.

  Important! Release 2 and later software supports IP tunneling.
- Remote software download via an FTAM-FTP gateway to Metropolis® DMX (Release 3.0 and later). The FTAM-FTP gateway is also referred to as the file transfer translation device (FTTD).

Impact of software download and activation

Initial local software installation is equivalent to a *forced* local software download; both are initiated via the push-buttons on the faceplate of the system controller (SYSCTL) circuit pack, and both temporarily disrupt operations communications because the system controller is reset to activate the software immediately.

Other local software downloads temporarily disrupt operations communications, too, because a system controller reset is involved, but the dormant software is not activated immediately.

Remote software download or copy of compressed dormant software is accomplished without any disruption of operations communications (that is, no system controller resets), because the dormant software is not activated immediately.

The dormant software may be applied at any time the user specifies, for example, the same time for all NEs to be upgraded. Activation of the dormant NE software generic requires the Metropolis® DMX system controller to reset, thus temporarily disrupting operations communications.

Remote software download compatibility

The following table lists Metropolis® DMX remote software download compatibility with other products.

Table 3-7 Remote Software Download Compatibility

Product	From PC Connected to:
	Metropolis® DMX
	Front Serial Port
Metropolis® DMX	yes
Metropolis® DMX*press*	yes
DDM-2000 OC-3	yes
DDM-2000 OC-12	yes
FiberReach	yes

Digital signature capability

In Release 3.0 and later releases, Metropolis® DMX verifies software downloads using a digital signature. When FTP over TCP/IP is used for a software download, a digital signature is transmitted with the software download and verified by the network element. If the verification fails, Metropolis® DMX reports an autonomous message and the software download fails. The digital signature is discarded after verification.

Checking the digital signature of software download can be enabled or disabled using the **Configuration > Software > Software Download** command.

For more information about downloading software to an in-service system, refer to "Task 206: Release 3.0.0 Software Generic Download and Upgrade via FTP (In-Service System)" (9-31). For more information about the **Configuration > Software > Software Download** command, refer to the WaveStar® CIT on-line help.

Database Backup and Restore

Overview

This section describes the database backup and restore feature in Metropolis® DMX. IP tunneling is required to support remote database backup/restore for remote Metropolis® DMX systems.

The Metropolis® DMX uses the following connections to perform database backup and restore:

- A direct IP connection
- OSI connectivity to an FTP GNE.

Database backup

Metropolis® DMX can backup all provisionable data via a local or remote FTP file transfer. In Release 3.0 and later releases, data can be backed up to a remote operations system via an FTAM-FTP gateway. The FTAM-FTP gateway is also referred to as the file transfer translation device (FTTD).

The backup database is stored on a WaveStar® CIT, and Navis™ Optical Element Management System (Navis™ Optical EMS), or another FTP server. For information about the **Configuration>Software>Remote Backup** command, refer to the WaveStar® CIT help. For more information about backing up the network element database, refer to "Task 211: Backup and Restore" (9-85).

Database restore

In the event of a catastrophic failure, Metropolis® DMX can restore all provisionable data (from the backup file) via local or remote FTP. In Release 3.0 and later releases, data can be restored from a remote operations system via an FTAM-FTP gateway. The FTAM-FTP gateway is also referred to as the file transfer translation device (FTTD).

The backup database maybe stored on a WaveStar® CIT, and Navis™ Optical Element Management System (Navis™ Optical EMS), or another FTP server. For information about the **Configuration>Software>Remote Restore** command, refer to the WaveStar® CIT help. For more information about restoring the network element database, refer to "Task 211: Backup and Restore" (9-85).

Automatic database backup

Metropolis® DMX supports automatic database backups. This allows users to establish a backup interval, date, and time. The database backups may be saved on the WaveStar® CIT or another FTP server.

The user can also specify the number of backups to destination files before overwriting those same files with subsequent backups. To eliminate the scenario of multiple Metropolis® DMX systems initiating automatic backups simultaneously, Metropolis® DMX does not support a default scheduled backup date/time; the user must provision their own date/time. For information about the **Configuration>Software>Configure Auto Backup Interval** command, refer to the Wavestar CIT help.

□

IP Access for Network Management

Overview

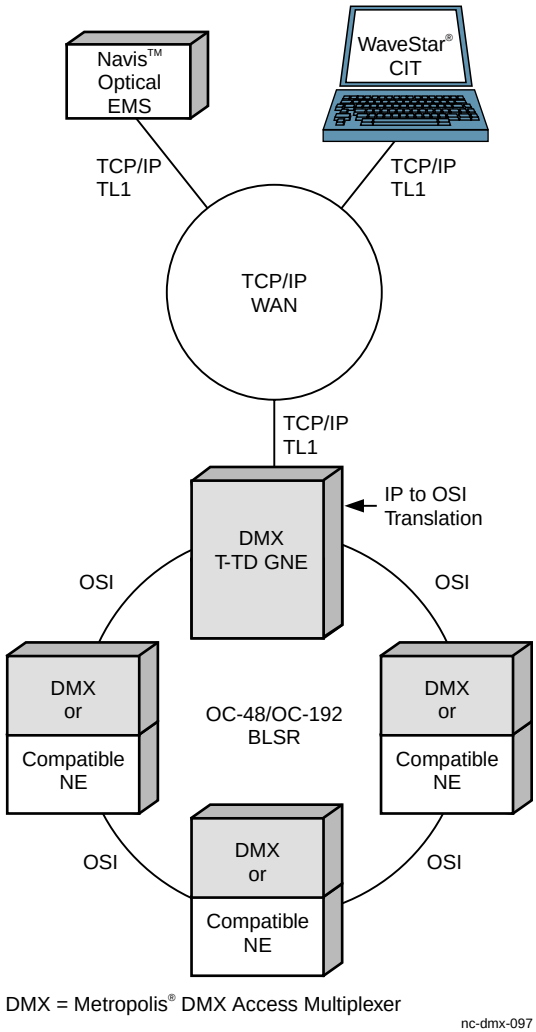
For network management purposes, the Metropolis® DMX supports the following types of IP Access:

- Metropolis® DMX can serve as a TL1 Translation Device (T-TD) by acting as a gateway network element that allows Navis™ Optical EMS and/or WaveStar® CIT to communicate to other network elements (NEs) through an IP access network. This capability allows you to send TL1 commands from Navis™ Optical EMS or WaveStar® CIT located on a TCP/IP based network to various NEs connected on an OSI network.
- Metropolis® DMX can functionally encapsulate IP packets within OSI packets to be transmitted through the OSI network to the proper NE. Thus Metropolis® DMX supports IP based protocols such as FTP by providing end-to-end IP connectivity between OS and NE. This capability is called IP tunneling. IP tunneling is required to support remote database backup/restore in between Metropolis® DMX systems.
- In Release 3.0 and later releases, Metropolis® DMX can also serve as a File Transfer Translation Device (FTTD) by acting as an FTAM-FTP gateway network element. The FTAM-FTP gateway network element translates FTAM over OSI presentation to FTP over TCP/IP. The FTAM-FTP gateway supports software downloads, database backups, and database restores.
- In Release 3.0 and later releases, Metropolis® DMX also supports Simple Network Management Protocol (SNMP) for data network applications. Metropolis® DMX provides limited support for certain reports and traps (alarms and events autonomous messages).
- In Release 3.0 and later releases, Metropolis® DMX also supports Network Time Protocol (NTP) using IP tunneling to synchronize the time and date to a standard time reference.

TL1 Translation

Metropolis® DMX can copy the application information within an IP packet into an OSI packet. This translation is performed at the application layer. When acting as a TL1 translation device, Metropolis® DMX system must be provisioned with a list of possible OSs. If an OS is not on the list residing within the system, a connection from that OS will not be accepted. When Metropolis® DMX is used as a TL1 translation device it is referred to as the T-TD GNE (Gateway Network Element).

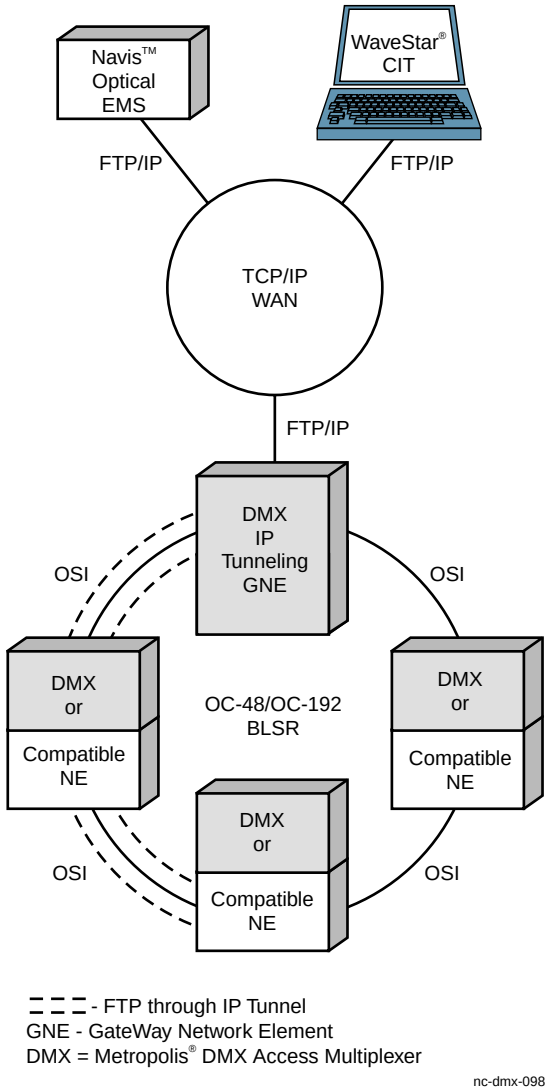
Figure 3-9 TL1 Translation Device



IP Tunneling

IP tunneling is used to perform end-to-end FTP through the IP and OSI portion of the network. In this instance the Metropolis® DMX serves as a gateway network element that encapsulates an IP packet within an OSI packet. When the final destination of the packet is reached, the IP packet is taken from within the OSI packet and processed by the TCP/IP stack. Thus, IP tunneling allows an Navis™ Optical EMS and/or WaveStar® CIT to reach NEs in an OSI based DCN network with FTP over IP. In this case, the end point of the IP tunnel is the actual end for the IP traffic.

Figure 3-10 IP Tunneling



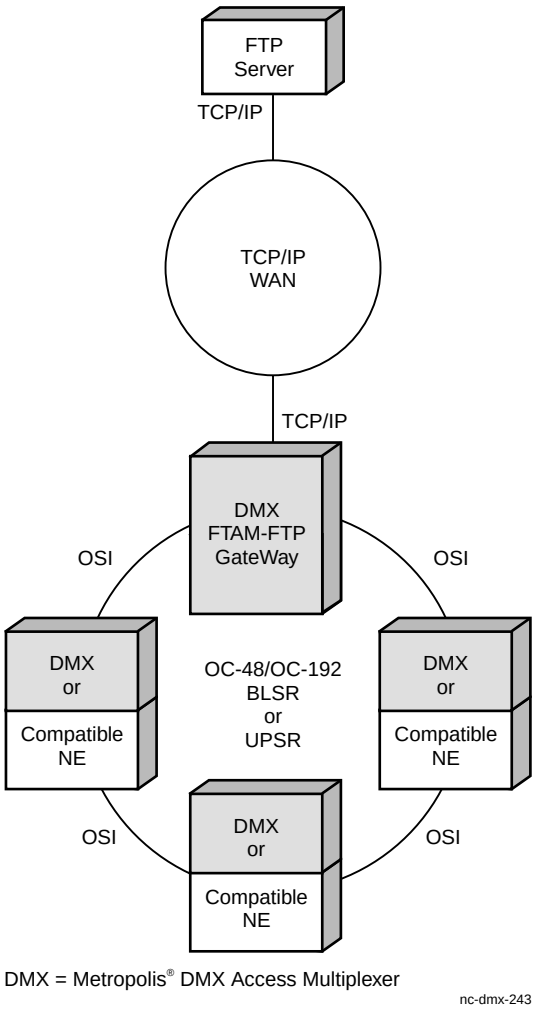
An NE with a direct IP connection to an FTP server can be provisioned as an FTP GNE. All NEs can be provisioned to enable the Tunnel Auto Provisioning (TAP) protocol to establish an IP tunnel with the FTP GNE automatically or manually. For IP tunneling to work, all NEs must be provisioned with an IP address, subnet mask and default router. For more information about provisioning IP tunneling, refer to "Task 323: Add IP Tunnel(s) Through Network" (10-179).

FTAM-FTP gateway network element

In Release 3.0 and later releases, Metropolis® DMX can serve as a File Transfer Translation Device (FTTD) by acting as an FTAM-FTP gateway network element. The FTAM-FTP gateway network element translates FTAM over OSI presentation to FTP over TCP/IP. The FTAM-FTP gateway supports software downloads, database backups, and database restores.

Figure 3-11 shows an Metropolis® DMX provisioned as an FTAM-FTP gateway network element. The FTAM-FTP gateway network element allows remote Metropolis® DMX network elements to request software downloads and database restores from an FTP server. The FTAM-FTP gateway network element also allows remote Metropolis® DMX network elements to backup databases to an FTP server.

Figure 3-11 FTAM-FTP Gateway



The FTAM-FTP gateway network element function can be enabled or disabled at a network element using the **Administration > Data Communications > TCP/IP** command. For more information about the **Administration > Data Communications > TCP/IP** command, refer to the WaveStar® CIT on-line help.

Simple network management protocol (SNMP) support

In Release 3.0 and later releases, Metropolis® DMX supports simple network management protocol (SNMP) for data network management applications. SNMP is an application layer protocol that facilitates the exchange of management information between network devices. SNMP allows network administrators to manage network performance, find and solve network problems, and plan for network growth.

Metropolis® DMX supports the SNMP interface for performance monitoring information and traps. Traps are equivalent to TL1 alarm and event autonomous messages. For more information about the SNMP parameters and traps, refer to Chapter 6, "Performance Monitoring".

SNMP users are provisioned using the **Administration > Security > SNMP User Management** command. For more information about SNMP user provisioning and the **Administration > Security > SNMP User Management** command, refer to the WaveStar® CIT on-line help.

Network time protocol (NTP) support

In Release 3.0 and later releases, Metropolis® DMX supports network time protocol (NTP) client functionality. Network time protocol is an internet protocol used to synchronize computer clocks and devices to a standard time reference. Metropolis® DMX can poll up to three network time protocol servers.

Network time protocol allows Metropolis® DMX to provide synchronized time across all NTP-enabled network elements in a network. Synchronized time is necessary to provide consistent and precise timestamps for messages, logs, and reports. Consistent timestamps are important for troubleshooting and supporting service level agreements.

Network time protocol support is enabled/disabled and provisioned using the **Administration > Network Time Protocol** command. When network time protocol is enabled, the existing time synchronization methods are overridden. When network time protocol is disabled, the existing time synchronization methods operate normally. For more information about existing time and date synchronization methods, refer to "Time and Date Synchronization" (3-41) in this chapter.

For more information about the **Administration > Network Time Protocol** command and provisioning network time protocol, refer to the WaveStar® CIT on-line help.

Time and Date Synchronization

Overview

Synchronizing the time and date among all NEs in a network is useful to correlate events reported by different NEs.

The time and date is synchronized:

- Manually using the WaveStar® CIT **Administration > Set Date and Time** command.
- Automatically from another NE via the DCC.
- Automatically by the OS
- Automatically by Network Time Protocol (Release 3 and later).

Provisioning

In a new installation, it is recommended that the time and date be manually provisioned in at least the first Metropolis® DMX in each ring. Each subsequent Metropolis® DMX that is added to the network tries to learn the current time and date from one of the existing NEs automatically.

After start-up (or any subsequent controller resets), the Metropolis® DMX's time and date revert back to the original time 00:00:00 and date 70-01-01. Metropolis® DMX waits 5 minutes, in case other NEs are also resetting (for example, as part of a software upgrade of the network), before starting to check with other NEs for the current time and date. If necessary, the Metropolis® DMX checks with all remote NEs for the current time and date.

The Metropolis® DMXs allow up to 2 minutes for each remote NE to respond before checking with the next remote NE for the current time and date, and keep checking until a valid current time and date is found.

The Metropolis® DMX accepts a provisioned time and date value or any remote NE date later than 00-01-01 as a valid current time and date.

For detailed information about provisioning the time and date, refer to "Task 354: Set Date and Time" (-1)

Considerations

The automatic time and date synchronization is intended to achieve time and date synchronization among compatible NEs with DCC connectivity in a network, but such synchronization can not be guaranteed at start-up for all network configurations or over the course of time.

TL1 command responses and autonomous messages include Metropolis® DMX's current time and date. As an alternative to manually provisioning and confirming the current time and date in each Metropolis® DMX in a network, Navis™ Optical Element Management System, (formerly SNMS), automatically checks the current date and time, periodically or on-demand.

Time and date synchronization compatibility

The following table lists Metropolis® DMX Time and Date Synchronization compatibility with other products.

Table 3-8 Metropolis® DMX Time and Date Synchronization Compatibility

Products	Metropolis® DMX
Metropolis® DMX	yes
Metropolis® DMXpress	yes
DDM-2000 OC-3	yes
DDM-2000 OC-12	yes
FiberReach	yes
FT-2000 ADR	yes

Office Alarms Interface

Description

The office alarms interface is a set of discrete relays controlling audible and visible office alarms. Relays are provided for the following types of alarm conditions:

- CR (critical)
- MJ (major)
- MN (minor)

If desired, critical and major alarm outputs can be wired so that either, neither, or both of the outputs control the major office alarm.

For information pertaining to power and steady state current, refer to Appendix B, Technical Specifications.

Steady state current

The steady state current for office alarm connections must not exceed 1.0 Amp at 60 Volts or 1.8 Amps at 30 Volts. The maximum transient currents (20 msec duration) during initial contact closure must not exceed 9 Amps at 60 Volts or 18 Amps at 30 Volts.

Provisionable alarm delay and alarm clear delay

Metropolis® DMX provides provisionable incoming signal alarm delay and alarm clear delay. The office alarms are not activated unless an incoming signal condition of greater duration than the alarm delay occurs. When a failure clears, a provisionable alarm clear delay prevents premature clearing of the alarm. The incoming signal alarm delay and alarm clear delay values can be provisioned. For more information about the **Configuration>Alarms>Alarm Configuration** command, refer to the WaveStar® CIT help.

Multiple alarms

When multiple alarm conditions occur, the highest-level office alarm (audible and visible) is activated. When the highest-level alarm condition clears, the office alarm “bumps down” to the next highest level alarm condition.

If enabled, the Remote NE Status feature includes alarms at other NEs in the same alarm group as the local NE to determine when to activate the local office alarm and the appropriate alarm level.

Alarm cut-off

The audible office alarms are silenced through activation of the alarm cut-off (ACO) function. Visible alarms are not extinguished by the ACO function.

If the ACO function has been activated to silence the active audible alarm and a “bump down” occurs, the audible alarm remains silent (that is, the lower level visible alarm is activated, but the corresponding audible alarm is not reactivated). If another alarming condition occurs while the ACO is active, the highest level audible alarm is activated even if the new condition is a lower level. For example, if a major (MJ) alarm was active and silenced using the ACO function and a minor (MN) alarming condition occurs, the MJ audible alarm will sound.

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SYSCTL and Equipment Indicator Interfaces

Description

System controller (SYSCTL) circuit pack and equipment indicator interfaces provide visible communication of alarm and status information through the use of light-emitting diodes (LEDs), and allow direct access to the Metropolis® DMX through the use of a WaveStar® CIT.

Equipment indicator interfaces include:

- circuit pack faceplate LEDs
- fan shelf LEDs and controls
- circuit breakers

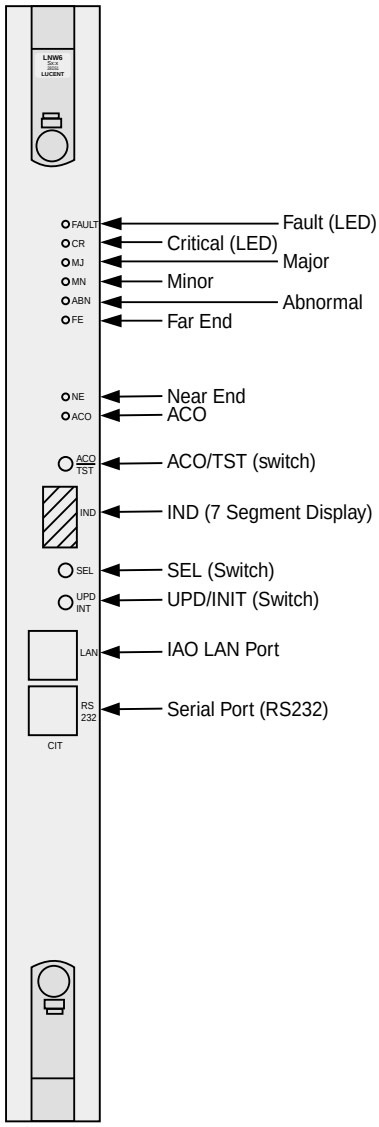
SYSCTL faceplate

The SYSCTL circuit pack faceplate provides system-level information and control functions, in addition to the red FAULT LED which indicates the status of the SYSCTL circuit pack itself (including DCC alarm status).

The SYSCTL circuit pack contains the following push-button switches and LEDs:

- FAULT LED
- Critical (CR) LED
- Major (MJ) LED
- Minor (MN) LED
- Abnormal (ABN) LED
- Far End (FE) Activity LED
- Near End (NE) Activity LED
- Alarm Cut-Off (ACO) LED
- ACO/TST (test) button
- Select (SEL) button
- Update/Initialize (UPD/INIT) button
- 7-segment numeric display

Figure 3-12 Equipment Indicators on the SYSCTL Circuit Pack



The SYSCTL circuit pack faceplate LEDs show the system level alarms and status conditions in the local shelf as follows:

- The highest level alarm LED (red **CR**, red **MJ**, or yellow **MN**) of all active alarm/status conditions at the local NE is lit. At most, one alarm LED is lit at any time.
- The yellow **ABN** LED is lit if an abnormal status condition is active at the local NE.
- The green **ACO** LED is lit if the alarm cutoff function is active at the local NE.
- The yellow Far-End (**FE**) LED is only lit if the Remote NE Status feature is enabled and another NE in the same alarm group as the local NE has an active alarm, abnormal status, or "activity" status condition. If enabled, the Remote NE Status feature also affects the operation of the alarm (CR, MJ and MN) and ABN LEDs.
- The yellow Near-End (**NE**) LED is lit if the local NE has an active alarm, abnormal status, or "activity" status condition.

Abnormal status conditions are significant manually-initiated conditions, for example, loopbacks. "Activity" status condtions are significant automatically detected status conditions, for example, an incoming signal failure with a notification code of NA (Not Alarmed). Other less-significant status conditions don't affect the Near-End (or FE) LED.

The **SEL**, **ACO/TEST**, and **UPD/INT** push-buttons are provided to control system operation. (For example, pressing and holding the ACO button displays the Metropolis® DMX software release on the seven segment display, refer to the *Metropolis*® DMX Access Multiplexer *Installation Manual*, 365-372-304 for more information.)

Transmission circuit pack faceplate LEDs

A red **FAULT** LED indicator is provided on all circuit packs. A green **ACTIVE** LED indicator is provided on all 1x1 protected circuit packs to show which circuit packs are actively carrying traffic.

Fan shelf LEDs and controls

A green **PWR ON** LED indicates that power is on. The red **FAULT** LED indicates a failure with the fan shelf.

Circuit breakers

The green LED located next to each circuit breaker (**BRK A** and **BRK B**) show -48V power is being fed to the breaker.

Low voltage (brownout) protection

Low voltage (brownout) protection is provided by each circuit pack. Circuit packs monitor the input voltage and when the input voltage drops to -39V (-38.5 ± 0.5 V) for more than 100 ms, the NE shuts down. A low voltage (brownout) condition is indicated by the letter “L” in the display (**IND**) on the SYSCTL circuit pack faceplate. The power unit restarts automatically when the voltage at the input terminal reaches -43 ± 0.5 V.

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Remote NE Status

Overview

If enabled, the Remote NE Status feature reflects the summary alarm/status level for both the local and remote NEs in the same alarm group as the local NE with the following local indications.

Office alarms

The local office visual alarm always shows the highest alarm level and the local office audible alarm is activated in response to each new alarm occurrence, among the local and remote NEs, thus alerting on-site craft of problems in the network with an indication of the severity.

SYSCTL faceplate LEDs

The CR, MJ, or MN LED on the local SYSCTL circuit pack faceplate shows the highest alarm level among the local and remote NEs. The FE LED on the local SYSCTL circuit pack faceplate is lit if any remote NE has an active alarm, abnormal status (indicated by the ABN LED), or "activity" status condition, thus identifying the local NE to query further. (Although not dependent on the Remote NE Status feature, the Near-End LED on the local SYSCTL circuit pack faceplate is only lit if the local NE itself has an active alarm, abnormal status, or "activity" status condition.)

Remote NE status and alarm/status retrieval

The local NE can retrieve the highest alarm/status level of each NE in a network with an active alarm, abnormal status, or "activity" status condition, thus identifying the remote NE to further query.

Determination of the highest alarm/status level of each NE includes the alarm/status level of active miscellaneous discrete alarm/status inputs, too.

The Remote NE Status feature can be used to expedite maintenance activities for NEs that report TL1 autonomous alarm/status messages to a maintenance OS at an operations center, too.

The Remote NE Status feature may be enabled or disabled. By default, the Remote NE Status feature is disabled.

Alarm group

By default, all Metropolis® DMX systems are assigned to alarm group 255. This is typically sufficient for small networks of up to 50 nodes. All NEs with DCC connectivity that have the same alarm group number are members of the same alarm group. All alarm group members share summary alarm/status information with each other but not with NEs in different alarm groups. To take advantage of the remote activation of local office alarms, in particular, at least one member of the alarm group should be located in a central office.

In large networks, with IS-IS Level 2 Routing and multiple Level 1 areas, each alarm group *must* be confined to within a single Level 1 area only. For example, a network with three different Level 1 areas would require a minimum of three alarm groups, that is, one alarm group for each Level 1 area. If desired, multiple alarm groups can be defined within an Level 1 area, also. The maximum number of NEs in an alarm group is limited by the maximum number of nodes in an Level 1 area.

Alarm gateway NE (AGNE)

By default, no NE is enabled as an AGNE. Even if the default alarm group number for all NEs is used, at least one NE in each alarm group must be enabled as an AGNE. Any NE in an alarm group can be enabled as an AGNE, for example, an AGNE does not need to be located in a central, in fact, it is recommended that an AGNE should not also be a TL1 TCP/IP GNE, TL1/X.25 GNE, or IS-IS Level 2 Router.

A second NE in each alarm group may be enabled as a backup AGNE, if required. It is recommended that the maximum number of AGNEs per alarm group be limited to at most two to assure good performance.

Instead of having every NE exchange alarm/status information with every other NE in the same alarm group directly, only the AGNE receives alarm/status information from every NE directly, and the AGNE distributes the accumulated alarm/status information for all the NEs to every NE in the alarm group.

Provisioning sequence

If there is no AGNE, each NE in an alarm group reports an AGNE Communications Failure alarm; therefore, the following provisioning sequence is recommended:

1. Provision one or two (at most) NEs as the AGNE
   - Enable the Remote NE Status parameter
   - Enable the network element as an Alarm Gateway
   - Provision the alarm group number, if different than the default.
2. Provision the other NEs in the same alarm group
   - Enable the Remote NE Status parameter
   - Provision the alarm group number, if different than the default.

For more information about the **Administration>Set NE** command, refer to the WaveStar® CIT help.

Remote NE status compatibility

The following table lists Metropolis® DMX remote NE status compatibility with other products.

Table 3-9 Remote NE Status Compatibility

Product	Metropolis® DMX
Metropolis® DMX	yes
Metropolis® DMX*press*	yes
DDM-2000 OC-3	yes
DDM-2000 OC-12	yes
FiberReach	yes

User-Settable Miscellaneous Discrete Interface

Overview

This section describes the miscellaneous discrete environmental alarm/status input points and (external) control output points.

Description

The user-settable miscellaneous discrete interface allows users to monitor and control equipment collocated with Metropolis® DMX through a set of discrete input and output points. There are 19 miscellaneous discrete inputs (miscellaneous discrete number 15 is dedicated to monitor Metropolis® DMX fan shelf failure) to monitor environmental conditions such as open doors or high temperature, and 4 miscellaneous discrete outputs to control equipment such as fans and generators.

Local miscellaneous discrete input points are included in the determination of the summary alarm/status level for each NE, but even if the Remote NE Status feature is enabled, the alarm/status of *individual* miscellaneous discrete inputs/outputs is not exchanged among NEs.

Miscellaneous discrete input alarm level

The alarm level to be associated with each miscellaneous discrete input point (except miscellaneous discrete number 15) is provisionable. By default, each miscellaneous discrete input is a minor alarm.

If a miscellaneous discrete input point is provisioned as an alarm (minor, major, or critical), TL1 autonomous message **REPT ALM ENV** is used to report the alarm occurrence, thus identifying the remote NE to further query.

If a miscellaneous discrete input point is provisioned as not alarmed (that is, status), TL1 autonomous message **REPT EVT COM** is used to report the condition, thus identifying the need to retrieve any active miscellaneous discrete status conditions.

Miscellaneous discrete input description

The description to be associated with each miscellaneous discrete input alarm or status point may be provisioned. The provisioned description appears as the *almmsg* or *conddescr* parameter value in applicable TL1 messages. The default description for each miscellaneous discrete input point is *environment1*, *environment2*, and so forth. In the case of input point number 15, the default description *fan failure* is not provisionable.

Miscellaneous discrete output description

The description to be associated with each miscellaneous discrete output control point may be provisioned. The default description for each miscellaneous discrete output point is *control1*, *control2*, and so forth. Control points for miscellaneous discrete outputs may be operated and then released.

Reference

For information about the **Configuration>Misc. Discretes** command, refer to the WaveStar® CIT help. For detailed wiring information, refer to the *Metropolis*® DMX Access Multiplexer *Installation Manual*, 365-372-304 and *Metropolis*® DMX Access Multiplexer *Application Schematic*, SD8C500-01. For information pertaining to external customer equipment and power, refer to Appendix B, Technical Specifications.

4 Synchronization Interfaces

Overview

Purpose This chapter describes synchronization features and functions for the Metropolis® DMX Access Multiplexer.

Contents The following synchronization topics are discussed in this section:

Network Synchronization Environment

Overview

Careful consideration should be given to proper design of the SONET network's synchronization environment. Proper synchronization engineering minimizes timing instabilities, maintains quality transmission network performance, and limits network degradation due to unwanted propagation of synchronization network faults. The synchronization features of the Metropolis® DMX are designed to complement the existing and future synchronization network and allow it not only to make use of network timing but also to take on an active role in facilitating network synchronization.

Published sources

A number of published sources give generic recommendations on setting up a synchronization network. The Metropolis® DMX is designed to operate in a network that complies with recommendations stated in GR-253-CORE, GR-436-CORE, and the following documents:

- TR-NPL-000436, *Digital Synchronization Network Plan*
- TA-TSY-000378, *Timing Signal Generator (TSG) Requirements and Objectives*
- *ANSI* T1.101, *Synchronization Interface Standards for Digital Networks*
- GR-1244-CORE, *Clocks for the Synchronized Network: Common Generic Criteria*.

Recommendations

The following are some key recommendations from the documents listed above. For further detailed explanation, the sources should be consulted directly.

1. A node can only receive the synchronization reference signal from another node that contains a clock of equivalent or superior quality (Stratum level).
2. The facilities with the greatest availability (absence of outages) should be selected for synchronization facilities.
3. Where possible, all primary and secondary synchronization facilities should be diverse, and synchronization facilities with the same cable should be minimized.
4. The total number of nodes in series from the Stratum 1 source should be minimized. For example, the primary synchronization network would ideally look like a star configuration with the Stratum 1 source at the center. The nodes connected to the star would branch out in decreasing Stratum level from the center.
5. No timing loops may be formed in any combination of primary and secondary facilities.

Stratum 3 Timing Generator

Metropolis® DMX supports a Stratum 3 Timing Generator (TG3) embedded in each high speed (MAIN) OC-48 and OC-192 (Release 2.1 and later) optical interface circuit pack. The TG3 operates with an internal oscillator of ± 4.6 ppm long-term accuracy in the free running mode, while in holdover the accuracy is ± .37 ppm over the full -40 to +65^{o} C temperature range. The TG3 should be used according to the recommendations in the documents referenced previously.

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Synchronization Features

Overview

Synchronization is an important part of all SONET products. Metropolis® DMX is designed for high performance and reliable synchronization and can be used in a number of synchronization environments. Each Metropolis® DMX can be provisioned to free run from an internal oscillator, line time from an incoming optical interface, or get external timing from the digital synchronization network via DS1 references.

Synchronization modes

Metropolis® DMX supports three synchronization reference configurations:

- **External Timing** from a Stratum 3 or better office clock (typical CO installations should be synchronized with DS1 timing references from a Stratum 3).
- **Free Running** from the shelf's internal Stratum 3 Timing Generator (no synchronization inputs).
- **Line Timing** from incoming OC-48 or OC-192 signal (for small COs or remote sites).

These timing modes are supported by the embedded Stratum 3 Timing Generator in the OC-48 and OC-192 circuit packs. The three basic timing modes can be combined into various network configurations.

Internal timing distribution

In support of evolution toward SONET-based timing distribution, Metropolis® DMX can derive an optional DS1 timing output from the incoming OC-48 and OC-192 high-speed interfaces. With this capability, the Metropolis® DMX network can distribute high quality synchronization among its sites. For example, the building integrated timing supply (BITS) clock in each office can be synchronized using SONET facilities by using the DS1 timing output from Metropolis® DMX in each office.

Internal timing functions are provided by the Stratum 3 Timing Generator (TG3). The TG3 distributes clock and frame signals, derived from the selected reference source, to the transmission packs.

External timing mode

In external timing mode, the TG3 accepts two DS1 references from an external Stratum 3 or better clock. This Stratum 3 (or better) clock would typically be traceable to a primary reference source (PRS). The DS1 references from the clock synchronize the local Metropolis® DMX with other network equipment operating under the same primary clock source. A high-stability digital phase-locked loop (DPLL) removes any transient impairments on the DS1 references for improved jitter performance.

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, and whose timing signal is used as the basis of reference for the control of other clocks in the network. Universal coordinated time is a time and frequency standard maintained by the US National Institute of Standards and Technology.

The DS1 reference inputs are monitored for error-free operation. If the selected reference becomes corrupted or unavailable, the TG3 will switch to the protection reference without causing service degradations. A switch to the protection reference is nonrevertive. If both DS1 inputs are corrupted, the DPLL circuit holds the on-board oscillator frequency at the last good reference sample (holdover). The TG3 will switch back to the external timing mode when a reference is no longer corrupted, but it can be provisioned to require a manual switch from holdover. Switching between the two DS1 reference inputs can also be done using a manual command.

Line timing mode

In line timing mode, the TG3 derives local shelf timing from the incoming service OC-48 or OC-192 high-speed signal in the Main slot. The DPLL serves to remove any timing transients for improved network jitter performance. If one of the OC-n references is corrupted or unavailable, the TG3 will make a nonrevertive protection switch to the other reference without causing timing degradations. If all OC-n timing signals are lost (for example, due to a cable cut), the TG3 will switch to holdover mode. The TG3 will normally switch back to the line timing mode when a reference is no longer corrupted, but it can be provisioned to require a manual switch. Switching between the two Main OC-n reference inputs can also be done using a manual command.

Free running mode

In free running mode, no mode switching is performed. The TG3 derives timing from a high stability temperature-compensated, voltage-controlled crystal oscillator that has an end of life performance of ± 4.6 ppm. This oscillator is capable of Stratum 3 accuracy. Only one Metropolis® DMX in a subnetwork can be provisioned in the free running mode. All other Metropolis® DMX NEs in the subnetwork must be line timed to this free running system to avoid performance degradation.

DS1 timing output

Metropolis® DMX also supports a DS1 timing output feature that facilitates network timing distribution. The DS1 timing output is derived from the OC-n line rate, so it is not subjected to multiplexing or pointer processing effects. The result is a DS1 traceable to the far-end source with extremely low jitter and wander. The timing output can be locked to an OC-n line or be automatically controlled using synchronization messaging.

The frame format on the DS1 output is provisionable. Provisioning options are superframe format (SF) or extended SF (ESF). The DS1 is a framed all-ones signal under normal conditions or an AIS signal under failure conditions.

Holdover mode

In case of unprotected synchronization reference failure, the TG3 will switch to “holdover mode” and continue to provide system timing, using the internal oscillator to maintain the last known good reference frequency. If the DS1 timing output is enabled for network synchronization, DS1 AIS is inserted on detection of unprotected optical reference failure.

□

Timing Distribution

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. Metropolis® DMX 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 Metropolis® DMX subnetwork and has extremely low jitter and wander. This is true regardless of the number of Metropolis® DMX systems connected in the network. This DS1 can be fed to the local BITS clock which subsequently times the local Metropolis® DMX 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 Metropolis® DMX) directly. Metropolis® DMX can provide DS1 timing outputs in all supported topologies (for example, linear 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.

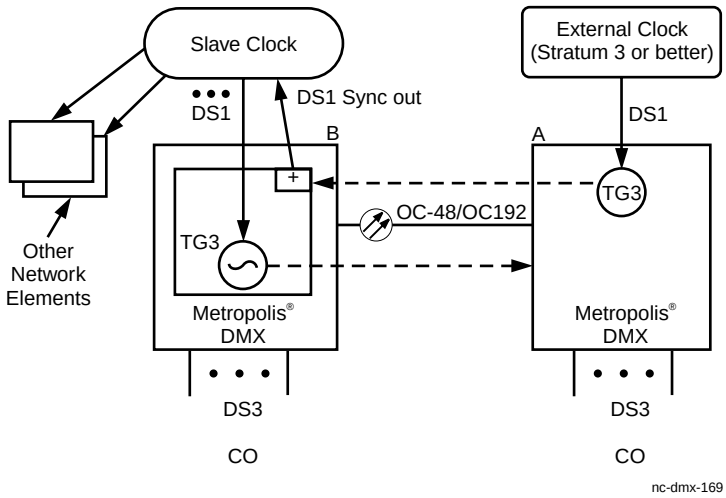
Metropolis® DMX can provide timing to sub-tending Network Element (NEs).

External timing with DS1 sync out

In this configuration, a DS1 reference from the CO BITS clock (Node A) times the OC-n transmitted to the remote site (Node B).

At Node B, a DS1 output reference is created directly from the received OC-n signal. (See Figure 4-1.)

Figure 4-1 External Timing with DS1



Potential advantages

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 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 the network timing failures could not be communicated to downstream clocks via DS1 AIS, since the DS1 signal does not pass over the OC-n interface. A standard SONET synchronization messaging scheme to convey synchronization failures is now in place. Metropolis® DMX supports this synchronization messaging scheme. With this option, 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 Metropolis® DMX sends AIS over the DS1 interface. If the local OC-n lines fail, Metropolis® DMX outputs AIS on the DS1 output or an upstream Metropolis® DMX 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 times the OC-n transmitted to the remote site. The line timing capability of Metropolis® DMX 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 may be used to time switch remotes, Metropolis® DMX 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 Metropolis® DMX 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.

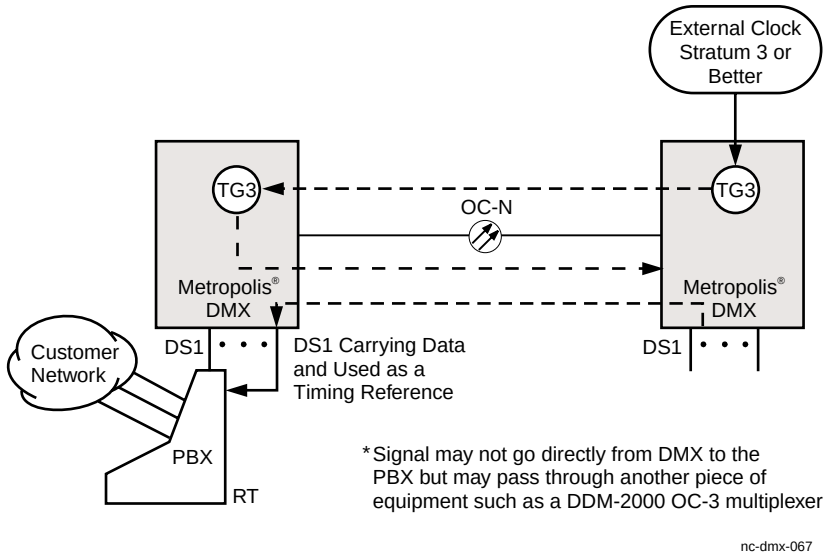
Alternate timing sources

Although an ideal source of timing, OC-n timing distribution, via a DS1 timing output, cannot be used to provide timing in all applications. In cases where the local equipment is not provided with an external timing reference input, or in some private networks where the timing is to be distributed from another private network location, timing may be distributed via traffic-carrying DS1s. In these applications, a stable DS1 timing source can be achieved by ensuring that all elements in the SONET network are directly traceable to a single master clock via line timing. In this environment, the high-performance desynchronizer design of Metropolis® DMX 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 Metropolis® DMX 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 (as shown in the following figure) and synchronizing an end-office remote switch to a larger office's host switch.

Figure 4-2 Alternate Timing Sources



Important! 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 Metropolis® DMX 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.

Synchronization Messaging

Overview

Metropolis® DMX provides 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 Metropolis® DMX to the next. This capability allows line-timed Metropolis® DMX shelves to automatically change their timing reference in order to always maintain the highest quality timing available. The capability also allows Metropolis® DMX to inform a local BITS clock when the DS1 timing output has been degraded and should no longer be used as a reference. This synchronization messaging feature is based on the scheme developed in the *ANSI* T1X1 standards committee.

Applications

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

- DS1 timing output integrity
- Automatic synchronization reconfiguration
- Synchronization provisioning integrity.

DS1 timing output integrity

The derived DS1 timing outputs are typically used as a synchronization reference to a BITS clock which provides the timing reference to an externally-timed Metropolis® DMX shelf. The synchronization reference is derived from the SONET transmission facility which is synchronized from an upstream timing reference. In this way, the timing from the BITS clock in one office (master) is distributed to the next office (slave) using the SONET transmission facilities between them as the synchronization vehicle.

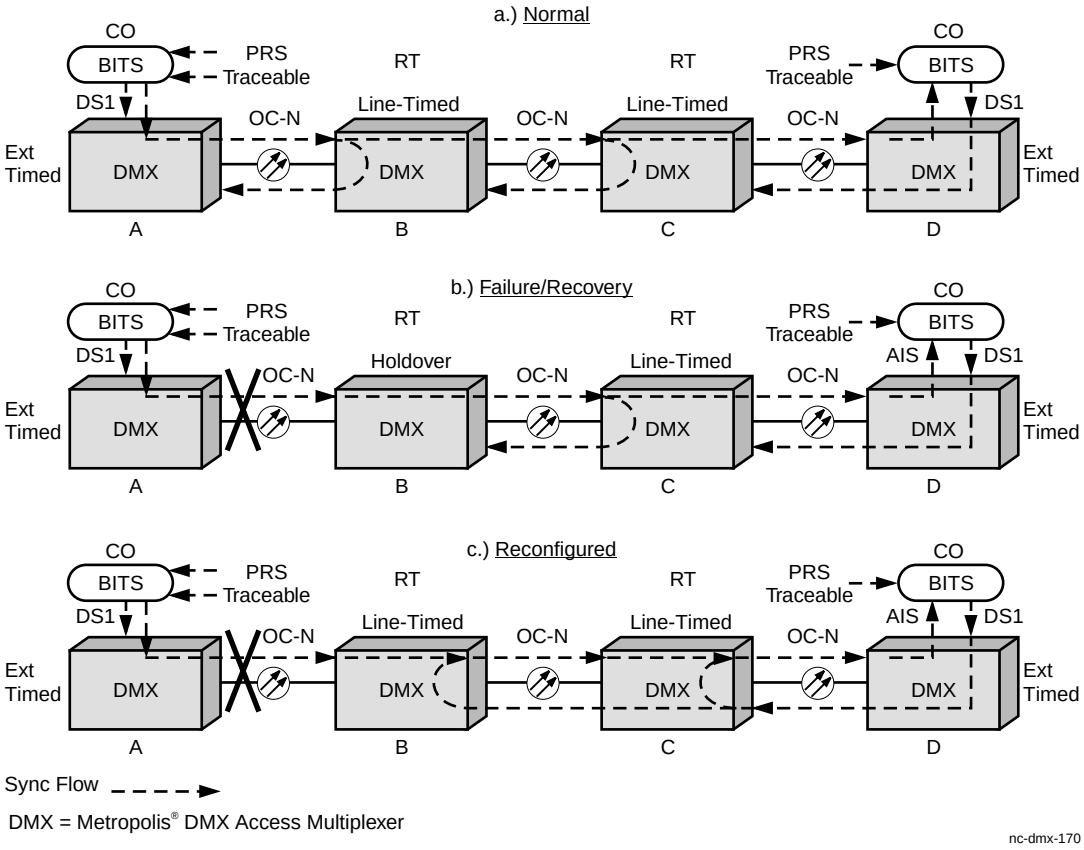
The BITS are typically capable of synchronizing to a Stratum 3 or better accuracy. Metropolis® DMX equipped with the embedded TG3 is capable of synchronizing to a 4.6 ppm clock (Stratum 3) or better. The Stratum timing hierarchy requires that clocks of equal or better Stratum level be used to synchronize other clocks. In this way, the Stratum timing hierarchy is preserved under all failure conditions. Under non-failure conditions, Metropolis® DMX does not introduce its own internal timing source onto the SONET facility, but merely transfers the quality of its timing reference. A failure of all derived DS1 timing references to the BITS at the master office will cause the BITS to enter holdover mode, whose minimum accuracy is dependent on its internal clock. Since the BITS internal clock is of equal or better Stratum level than Metropolis® DMX, the externally-timed Metropolis® DMX shelf will use this reference to synchronize all outgoing SONET transmission facilities. This preserves the required hierarchical structure of the timing network which must be maintained at all times.

If the externally-timed Metropolis® DMX shelf at the master office enters holdover due to a disconnected reference cable or a local BITS failure, the quality of the derived DS1 timing output at the slave office will now be traceable directly to Metropolis® DMX. The Stratum timing hierarchy is violated if the slave office BITS requires timing accuracy of better Stratum level than that provided by the master shelf's internal clock. Because Metropolis® DMX contains the embedded TG3, Stratum 3 accuracy is maintained indefinitely. This provides acceptable timing for Stratum 3 NEs at slave offices.

Another scenario that will cause the Stratum timing rules to be violated is when at least one line-timed Metropolis® DMX 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 will cause the line-timed Metropolis® DMX to enter holdover (with accuracy dependent upon its internal clock). If the BITS at the slave office requires a higher accuracy clock than that generated by Metropolis® DMX in holdover, the Stratum timing hierarchy is violated.

Figure 4-3 shows a linear application (available in Release 3 and later releases) and is used to explain the concept of sync messaging. Metropolis® DMX does not support a linear configuration in releases prior to Release 3, but this particular sync messaging concept is better conveyed in this manner. The use of SONET synchronization messaging notifies Metropolis® DMX at the slave site (Node D) to place AIS on the DS1 timing output. This BITS (at Node D) can then enter holdover or switch to an alternate reference.

Figure 4-3 Synch Messaging



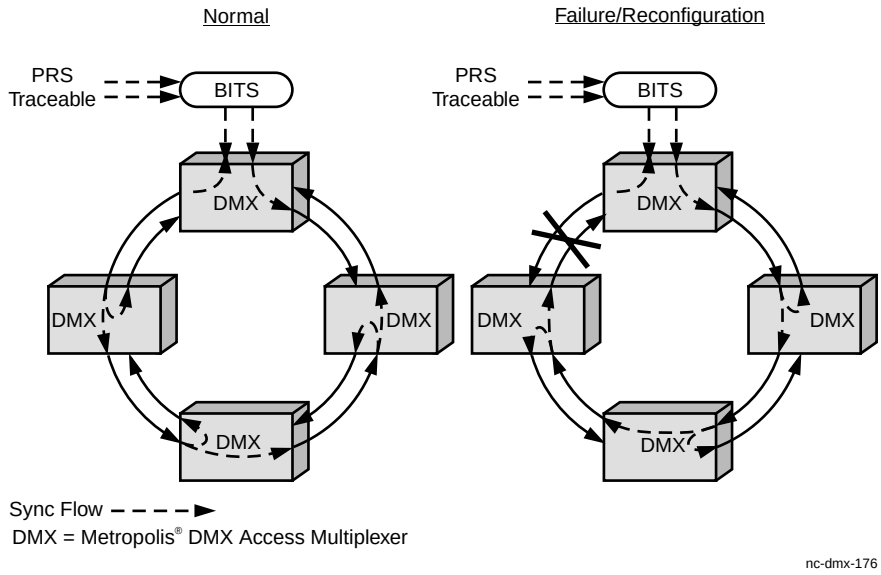
Automatic synchronization reconfiguration

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 Metropolis® DMX NE. The Metropolis® DMX shelf can be optioned to determine the best timing reference available and switch to that reference. 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.

Access ring network example

Under normal operation, the access ring network shown in Figure 4-4 has one Metropolis® DMX shelf externally timed and the others line timed. If a fiber failure occurs between the first two Metropolis® DMX shelves, the synchronization autoreconfiguration feature causes Metropolis® DMX shelves to change their line timing directions to the opposite direction. The result is that the ring is again operating synchronously. The ring already provides self-healing of the traffic, so it is especially important to maintain synchronous operation during this type of failure to prevent service degradation due to increased jitter and wander.

Figure 4-4 Synchronization Autoreconfiguration



Synchronization provisioning integrity

A welcome side feature of synchronization messaging is that it helps prevent provisioning errors. Provisioned timing loops on Metropolis® DMX shelves are quickly detected through the synchronization messaging algorithm and prevented by forcing a shelf into holdover. The system can then be reprovisioned correctly.

Sync Messaging Feature Details and Options

Overview

As mentioned previously, SONET sync messaging is used to communicate the quality of the subnetwork timing throughout the subnetwork. This is done using bits 5-8 of the S1 byte in the SONET overhead. If a Metropolis® DMX shelf is deriving timing from a given OC-n interface, and sync messaging is enabled on that interface, the system interprets the received message to determine the system's timing status. The system also determines the state of the DS1 output, if the DS1 output is enabled, by forcing a DS1 AIS on the DS1 sync outputs if the timing status received on the OC-n interface is below a provisioned quality. Metropolis® DMX also transmits over the particular OC-n interface, and all other OC-n interfaces that are enabled for sync messaging, the appropriate message indicating the quality of its timing and its active timing mode.

Sync messages using S1 byte

The following table lists the associated internal timing status and DS1 output states that are associated with sync messages (using the S1 byte) received from the OC-n interface when sync messaging is enabled. Messages are listed from low to high quality.

Table 4-1 Sync Messages with the S1 Byte

Received Message	Active Timing Mode (Note 1)	Default DS1 Output State (Note 2)	Quality Level
Don't Use (DUS)	Holdover	AIS	9
Traceable Stratum 4 (ST4)	Holdover	AIS	8
Traceable SONET Clock w/S3-TG (SMC)	Holdover	AIS	7
Traceable Stratum 3 (ST3) (Note 3)	OK to use	AIS	6
Traceable Stratum 3E (ST3E) (Note 4)	OK to use	AIS	5
Traceable Transit Node Clock (TNC) (Note 4)	Ok to use	AIS	4
Traceable Stratum 2 (Note 4)	OK to use	Good	3
Sync Trace Unknown	OK to use	Good	2
PRS Traceable (Note 3)	OK to use	Good	1

Notes:

1. This column applies only when provisioned for line timing mode.
2. This table represents DS1 output AIS threshold equal to level 4.
3. The embedded TG3 can generate a Stratum 3 signal.
4. Presently, the shelves do not generate these messages, but they could be retransmitted and supported for autoreconfiguration if any of these are received by a shelf..

Disabling sync messaging

Sync messaging using the SONET S1 byte can be disabled on a per OC-n interface basis. A DON'T USE message is transmitted on bits 5-8 of the S1 byte if this is done. The timing and synchronization status of each shelf can be determined.

"Don't use"

The DON'T USE message is sent when the system determines that its timing is not suitable for synchronization (for example, due to failure).

External timing with SYNC OUT

When Metropolis® DMX is configured for external timing and its DS1 output port is provisioned for the SYNC OUT mode, the DON'T USE is sent on the OC-n interface towards the NE from which the DS1 timing output is being derived. The Synchronized - Traceability Unknown (STU) message is sent on all other OC-n interfaces where sync messaging is provisioned. If the DS1 output is generating AIS while the system is configured in this way, the message STU is transmitted on all OC-n interfaces.

TG3 with free running or holdover

When using the embedded TG3, if Metropolis® DMX is configured for free running or is in holdover mode, the Traceable Stratum 3 message is sent on all OC-n interfaces when sync messaging is provisioned.

Line timing

When Metropolis® DMX is configured for line timing, the DON'T USE message is sent on the OC-n interfaces towards the NE from which the timing is being derived. The message received on the OC-n interface is sent on all other OC-n interfaces where sync messaging is provisioned.

Automatic synchronization reconfiguration

With automatic synchronization reconfiguration, the Metropolis® DMX shelves use and compare the incoming sync 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 non-revertive operation of reconfiguration. The line timing reference is provisionable.

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

□

Sync Messaging Examples

Overview

In this section, some detailed examples are given to show specifically how the sync messages propagate through 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. Although Metropolis® DMX does not support linear configurations in releases prior to Release 3, some examples are depicted in a linear configuration because the particular sync messaging concept is more easily conveyed in linear terms. Those concepts can be applied to Metropolis® DMX ring networks.

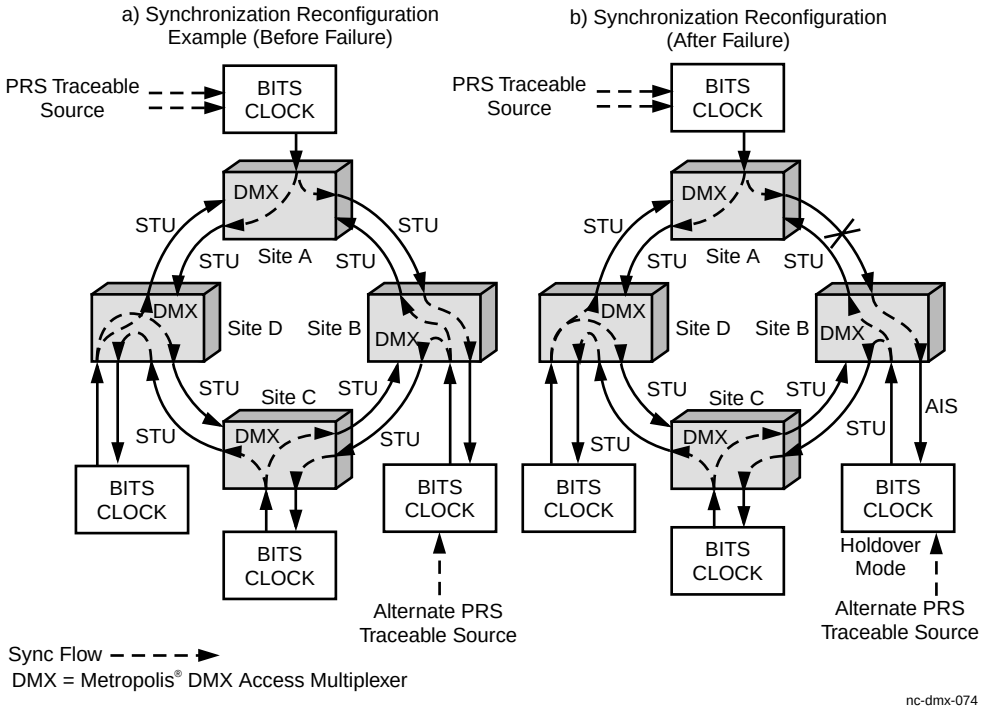
> **Important!** All nodes in a ring using automatic synchronization reconfiguration must have the sync messaging and automatic synchronization reconfiguration features enabled to prevent alarms.

Synchronization reconfiguration using an externally timed access ring

Figure 4-5a illustrates an externally timed access ring operating in its normal configuration. The Metropolis® DMX shelf at Site A is externally timed from a BITS clock referenced to a Primary Reference Source (PRS). The remaining Metropolis® DMX shelves (Sites B, C, and D) are externally timed from a BITS referenced to a derived DS1 timing reference output. The STU 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 Metropolis® DMX shelves. Therefore, a change in the sync message will not cause an automatic synchronization reconfiguration.

In Figure 4-5b, a fiber has been cut between Sites A and B. Immediately, Metropolis® DMX at site B changes the format of its derived DS1 to AIS. This forces the BITS clock at Site B to enter holdover or switch input source (if a valid one is available). Because automatic synchronization reconfiguration is not available, the synchronization status messages are not used. All other non-host nodes will track the holdover clock at Site B. Although no timing loops have been formed, the timing of all non-host nodes will differ from the host node by the accuracy of the holdover clock at Site B.

Figure 4-5 External Timing with Automatic Synchronization Reconfiguration, Part A and B

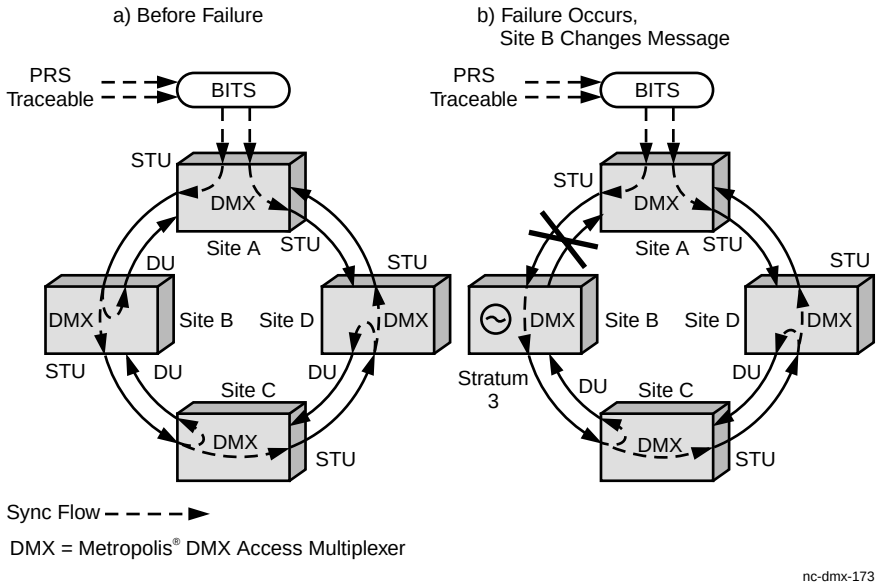


Synchronization reconfiguration in an access ring

Figure 4-6a illustrates an access ring operating in its normal configuration. The Metropolis® DMX shelf at the CO is externally timed, and each of the other Metropolis® DMX shelves are line timed in a counterclockwise direction. The STU message is sent to indicate where timing is traceable to an external BITS and where it is valid to be used. The DON'T USE message is sent on the interface that is being used as the line timing reference and, thus, where using that timing would create a timing loop. Sync messaging and automatic synchronization have both been enabled for this network.

In Figure 4-6b, a fiber has been cut between sites A and B. Immediately, the Metropolis® DMX shelf at site B enters holdover and sends out the Stratum 3 message to site C. The Metropolis® DMX shelf at site B cannot switch to line time from site C because it is receiving the DON'T USE message on that interface.

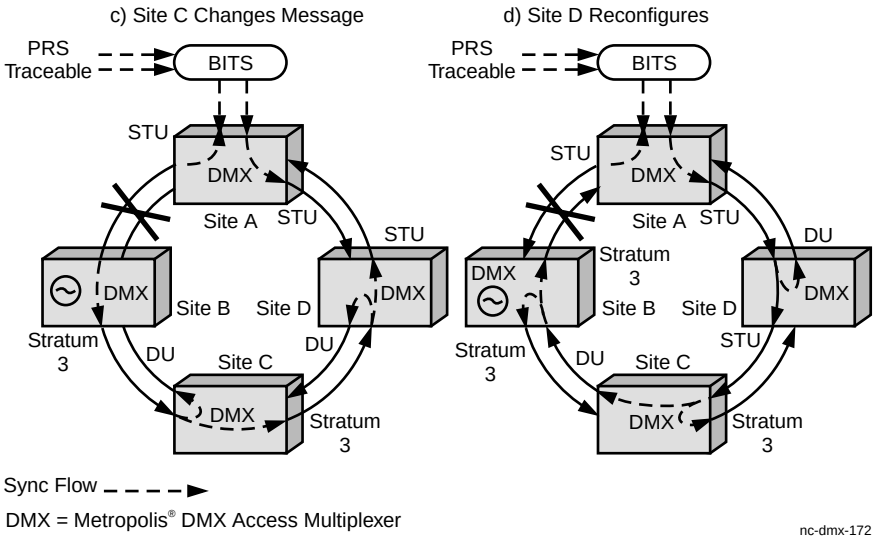
Figure 4-6 Automatic Synchronization Reconfiguration, Part A and B



In Figure 4-7c, the Metropolis® DMX shelf at site C detects the incoming Traceable Stratum 3 message and sends the message to site D. The Metropolis® DMX shelf at site C cannot switch to line timing from the other rotation because it is receiving the DON'T USE message on that interface.

In Figure 4-7d, the Metropolis® DMX shelf at site D detects the incoming Traceable Stratum 3 message. The STU message is a better quality message than the Traceable Stratum 3 message, so the Metropolis® DMX shelf at site D switches to line timing from site A. After the switch occurs, the DON'T USE message is sent back to site A, and the STU message is retransmitted to site C.

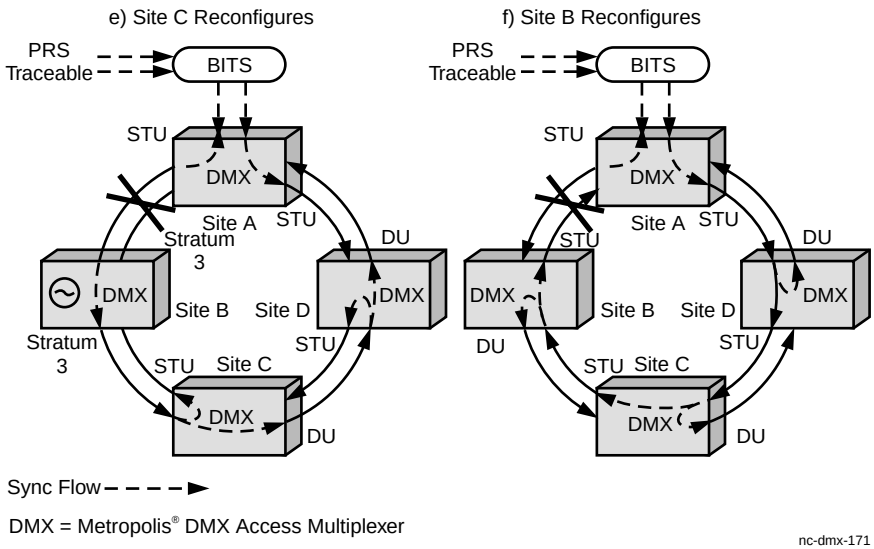
Figure 4-7 Automatic Synchronization Reconfiguration, Part C and D



In Figure 4-8e, the Metropolis® DMX shelf at site C detects the incoming STU message from site D. The STU message is a better quality message than the Traceable Stratum 3 message being received from site B, so the Metropolis® DMX shelf at site C switches to line time from site D. After the switch occurs, the DON'T USE message is sent back to site D, and the STU message is retransmitted to site B.

In Figure 4-8f, the Metropolis® DMX shelf at site B detects the incoming STU message from site C. The STU message is a better quality message than the internal holdover capability, so the Metropolis® DMX shelf at site B switches to line time from site C. After the switch occurs, the DON'T USE message is sent back to site C, and the STU message is forwarded to site A. When the failure clears, the synchronization remains in the new configuration unless it is manually switched back.

Figure 4-8 Automatic Synchronization Reconfiguration Part E and F



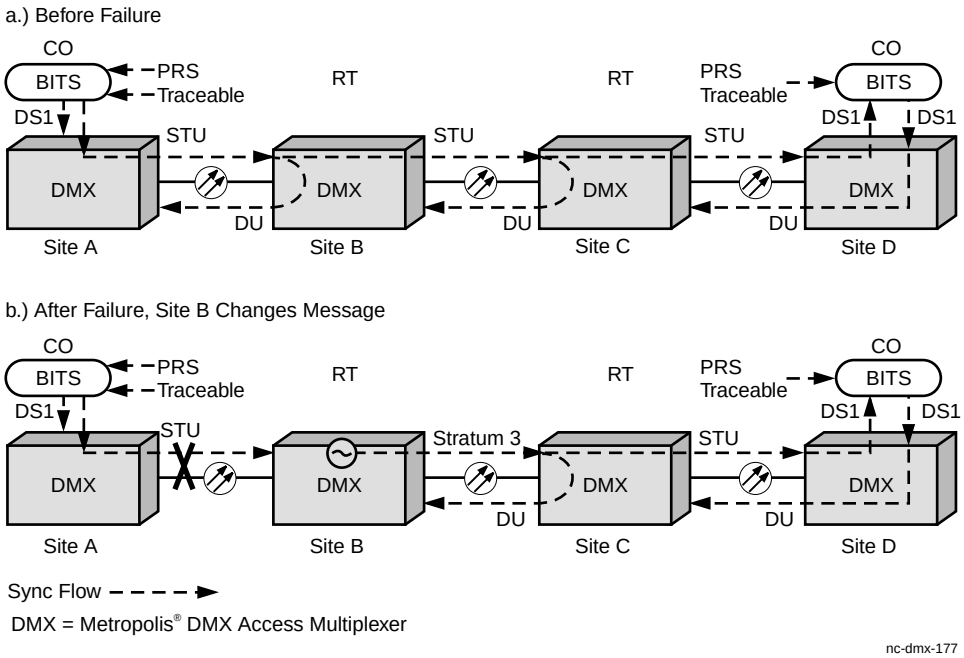
Sync messaging to support DS1 timing outputs

Important! The following two figures depict linear applications (available in Release 3 and later releases) and are used ONLY to explain the concepts of sync messaging. Metropolis® DMX does not support a linear configuration in releases prior to Release 3, but this particular sync messaging concept is better conveyed in this manner. The concept may be applied to Metropolis® DMX ring networks.

Figure 4-9a illustrates a dual homing linear network operating in its normal configuration. The Metropolis® DMX shelf at site A is externally timed, and the Metropolis® DMX shelves at sites B and C are line timed from site A. The Metropolis® DMX shelf at site D is also externally timed from another BITS. Both BITS should be PRS traceable. The STU message is sent to indicate where timing is traceable to an external BITS and where it is valid to be used. The DON'T USE message is sent to indicate where line timing has been used and, thus, where using that timing would create a timing loop. Synchronization messaging has been enabled for this network but automatic synchronization reconfiguration has not been enabled.

In Figure 4-9b, a fiber has been cut between sites A and B. Immediately, the Metropolis® DMX shelf at site B enters holdover and sends out the Traceable Stratum 3 message to site C.

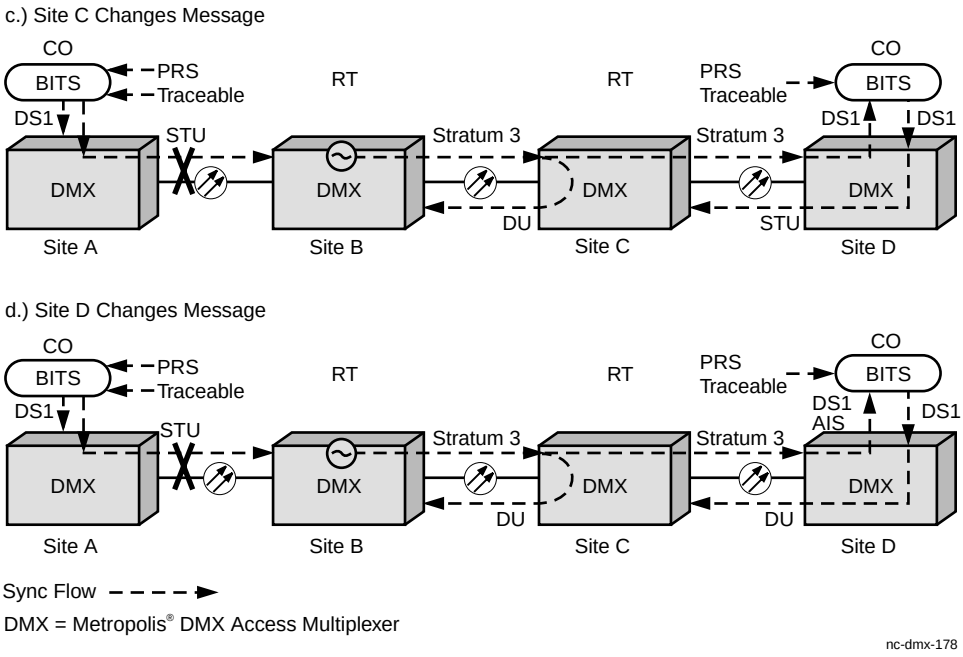
Figure 4-9 Synch Messaging, Part A and B



In Figure 4-10c, the Metropolis® DMX shelf at site C detects the incoming Traceable Stratum 3 message from site B and forwards it on to site D.

In Figure 4-10d, the Metropolis® DMX shelf at site D detects the incoming Traceable Stratum 3 message from site C and sends out AIS to the BITS. The BITS will either switch to an alternate reference, if available, or enter holdover.

Figure 4-10 Synch Messaging, Part C and D



Important! If the automatic synchronization reconfiguration feature had been enabled in this example, sites C and B would attempt to switch line timing directions to re-time from site D.

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Frequently Asked Network Timing Distribution Questions

Overview The following are some frequently asked questions about network timing distribution.

1 *How do I time Metropolis® DMX shelves in a central office environment?*

Each Metropolis® DMX shelf should be externally referenced to the BITS clock in the office. If a BITS clock is not available in the office, a traffic-carrying DS1 from the local switch may be bridged (for example, using a bridging repeater) as the reference to the Metropolis® DMX shelf. Line timing may also be used, but at least one Metropolis® DMX shelf in the network must be externally timed.

2 *Where do I use the DS1 timing output feature?*

The primary application is for supplying a timing reference to the office BITS clock. This allows the BITS clock to be slaved to a BITS clock in another office that is, in turn, traceable to the primary reference source (PRS). Typically, the Metropolis® DMX shelf supplying the DS1 timing output will, in turn, be externally timed by the BITS clock. If there is no BITS clock, the DS1 timing output can be used to time a switch or switch remote (if the switch remote is equipped for that option) directly or even another Metropolis® DMX.

3 *How do I prevent my BITS clock from using a DS1 timing output when a failure in the network results in this DS1 being timed from a SONET NE in holdover?*

SONET sync messaging informs the local Metropolis® DMX of this condition, and AIS is inserted on the DS1 timing output.

4 *What is the advantage of using the DS1 timing output instead of a multiplexed DS1 as the timing reference?*

The DS1 timing output is derived from the optical line rate and is superior because:

- The DS1 is virtually jitter-free
- Sync messages guarantee the traceability of the timing
- Administration of traffic DS1s for timing is eliminated.

5 *Can I ever use Metropolis® DMX in the free running timing mode?*

If a PRS traceable external reference is available, it is the recommended timing mode for any/all CO applications. The free running timing mode can be used but a slight increase in jitter will result. If one Metropolis® DMX is provisioned for free running, all other Metropolis® DMX NEs in the network must be line timed and SONET interfaces to other equipment are not allowed. The DS1 timing output is not allowed with a free running network.

6 *How do I provide timing to a central office host switch that does not have the option for an external reference?*

A DS1 carried over SONET may contain significant jitter/wander and be unacceptable to the switch as a timing reference. If the central office has a BITS clock, the recommendation is to use the output from the BITS clock into an unused DS1 traffic port on the switch. If the central office does not have a BITS clock, the recommendation is to use the DS1 timing output from Metropolis® DMX as the line timing reference into an unused DS1 traffic port on the switch.

7 *Can a DS1 carried over SONET ever be used as a timing reference?*

YES! In many applications there is no other choice. Most switch remotes, for instance, obtain their timing from a specific DS1 signal generated by their host switch, so these remotes must line time from the DS1 signal. In addition, DLC equipment, channel banks, and PBXs will not likely have external references and may be allowed to line time from a DS1 carried over SONET.

8 *Are there any specific concerns when using a DS1 carried over SONET to time equipment such as a switch remote or DLC?*

Yes. The major concern is to make sure all the equipment is synchronous. The Metropolis® DMX NEs should be synchronous to each other to prevent pointer adjustments. This can be accomplished by having one source Metropolis® DMX that is externally timed. The other Metropolis® DMX NEs in the network should be line timed, or they should be externally timed to a clock to which they provide a DS1 timing output. The Metropolis® DMX NEs should also be synchronous to the switch to prevent excessive mapping jitter. This can be done by synchronizing the host switch to the BITS clock used to reference the Metropolis® DMX shelf.

9 *Will I have any problems providing timing to a customer that has a high quality PBX or switch?*

If the network is completely synchronous, as described in the previous answer, there should be no problems. If the PBX is sensitive to the jitter produced, even under the synchronous conditions, the DS1 timing output of Metropolis® DMX may be required to be used as a timing reference to this equipment.

10 *Why does TELCORDIA say that DS1s carried over SONET should not be used for timing?*

TELCORDIA has provided this recommendation because there are several limitations. TELCORDIA says that DS1s carried over SONET must be used in applications such as switch remotes and is acceptable, provided pointer adjustments are not created.

11 *Can pointer adjustments be prevented?*

Neither random nor periodic pointer adjustments will occur if the Metropolis® DMX shelf is provisioned for line timing.

12 *How do I time Metropolis®* DMX *at a remote site?*

Line time.

13 *How many Metropolis®* DMX *NEs can I chain together in an add/drop configuration before the timing becomes degraded?*

The Stratum level traceability of the nth node in an add/drop chain is the same as that in the first node. Also, while timing jitter will theoretically increase as the number of nodes is increased, the high quality timing recovery and filtering on Metropolis® DMX allows add/drop chains to be extended to any practical network limit without detectable increases in jitter levels. In practice, the only effects on timing at the nth node will occur whenever high-speed protection switches occur in any of the previous n-1 nodes. These effects should be rare.

14 *How do I time a Metropolis®* DMX *ring network?*

An interoffice ring should have each node externally timed if BITS clocks are available. All other rings should have one node externally timed (two in some dual homing architectures) and the rest of the nodes line timed. Synchronization reconfiguration defaults to disabled.

15 *Why are there more issues related to timing with SONET equipment than there are with asynchronous equipment?*

SONET equipment was designed to work ideally in a synchronous network. When the network is not synchronous, mechanisms such as pointer processing and bit-stuffing must be used and jitter/wander increases.

16 *What are the limitations on automatic synchronization reconfiguration?*

Automatic synchronization reconfiguration is only available when Metropolis® DMX is provisioned for line timing mode. This allows the timing direction of an OC-n ring network to change automatically in response to a failure. When Metropolis® DMX is provisioned for external timing, automatic synchronization reconfiguration is not available. When an OC-n fault is detected in the timing direction, AIS is inserted on the derived DS1s which forces the BITS into holdover preventing timing loops.

17 *How do I synchronize a BITS clock and maintain automatic synchronization reconfiguration on a Metropolis® DMX ring?*

Provision all but the host node (node with co-located PRS) for line timing. Provide each non-host BITS clock with a pair of derived DS1s. Metropolis® DMX will detect faults and provide the BITS clocks with good inputs if available. Timing loops are prevented. The host node should be set for external timing and get its timing from an externally timed BITS clock. To prevent a timing loop, the host BITS clock should get its timing from a PRS traceable source. The non-host nodes should not be timed from the co-located BITS clock since this would disable the automatic synchronization reconfiguration feature.

□

5 Provisioning, Security, & Administration

Overview

Purpose

This section describes the provisioning, security, and administration features and functions for the Metropolis® DMX Access Multiplexer.

Contents

The following topics are discussed in this section:

Provisioning

Provisioning

Provisioning is the modification of certain programmable parameters that define how the node functions with various installed entities. Provisioning requests may alter auto provisioned values of an entity that already exists. Parameter modifications may be initiated locally or remotely with a WaveStar® CIT or an OS. Parameter modifications may be applied to the node via the intraoffice local area network (IAO LAN), serial port, or any data communications channel (DCC). The provisioned data is maintained in NVM and/or hardware registers. The provisionable parameters and values (current and original) are maintained in the nonvolatile memory.

Types of provisioning

There are three types of provisioning:

- Auto provisioning allows the NE to discover the NE hardware configuration and to create the associated entities automatically using original or preprovisioned parameters
- Provisioning affects changes to entities known by the NE, therefore impact the configuration of an NE.
- Deprovisioning is the removal of provisioned parameters.

Auto provisioning

Auto provisioning is the ability of an NE to detect the presence of equipment, validate it, and then assign default original values or preprovisioned parameter values to new equipment. Nonvolatile memory (NVM) and/or hardware registers maintain the parameter values. If you have predefined or preprovisioned some or all of the parameters, the auto provisioning function validates the request and assigns the preprovisioned values or default values as required. Auto-provisioning allows an NE to be set up initially with minimal user intervention. Auto-provisioning also supports a self inventory function which allows operations center personnel to learn about and track activities at a remotely located NE.

Automatic provisioning on circuit pack replacement

Replacement of a failed circuit pack is simplified by automatic provisioning of the original circuit pack values. The SYSCTL circuit pack maintains a provisioning map of the entire shelf, so when a transmission circuit pack is replaced, the SYSCTL circuit pack automatically downloads the correct values to the new circuit pack. Likewise, if the SYSCTL circuit pack is ever replaced, the correct provisioning data from every other circuit pack in the shelf is automatically uploaded to the new SYSCTL circuit pack's nonvolatile memory. However, if a SYSCTL circuit pack is replaced, some user-provisioned data is lost, unless the data is backed up before replacement.

Items auto provisioned

Some items that are auto-provisioned include the following:

- System target identifier (TID) (which can be changed at initial start-up)
- Default threshold-crossing alert (TCA) profiles
- Circuit packs
- Synchronization default mode

Original value provisioning

Installation provisioning is minimized with original default values. Each provisionable parameter is assigned an original value at the factory. A parameter is a characteristic of the system that affects its operation. The parameter value may be a number, text string, or other menu selection. The provisionable parameters and original values are set during installation. The original values assigned at the factory cannot be changed. However, the current values can be overridden through local or remote provisioning.

Equipment removal

The NE detects and reports the removal of equipment. The removal of equipment does not cause the NE to delete any entities. Removal of a piece of equipment may result in equipment alarms and insertion of maintenance signals when the state related data is updated. However, removal of equipment does not necessarily mean that the provisioning of the shelf slot has changed. The user must execute specific commands to remove an entity from the system database.

Automatic channel state provisioning

Automatic channel state provisioning is a capability provided on Metropolis® DMX NEs that suppresses reporting of transient alarms and events during provisioning by supporting multiple states (automatic, in-service, and not-monitored) for VT1.5, STS-1, STS-3c, STS-12c, and STS-48c channels.

While an end-to-end circuit is being set up, particularly during VT1.5, STS-1, STS-3c, STS-12c, and STS-48c cross-connect provisioning several transient maintenance signals result. Without automatic channel state provisioning, these are reported as alarms and 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, Metropolis® DMX provides automatic channel state provisioning.

Channel states

A VT1.5, STS-1, STS-3c, STS-12c, or STS-48c channel is kept in the default *OOS-MA-AS* (automatic [AUTO]) state until the reception of a valid signal (a framed non-AIS or non-LOP) in that channel. While in AUTO state, no alarms or events are reported on the channel. On receiving a valid signal, which occurs when the end-to-end circuit is completely provisioned, the channel automatically changes to the in-service (IS) state, where it resumes normal alarm and event reporting. An additional state, *OOS* (not-monitored [NMON]), is also supported in which alarm and event reporting is suppressed regardless of the validity of the signal being received on the channel. The user can submit 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.

Port/line states

Port state provisioning is a feature provided on Metropolis® DMX NEs that can help suppress alarm reporting and performance monitoring by supporting multiple states (automatic, in-service, and not-monitored) for DS1, and DS3, EC-1, and LAN ports.

Line state OC-3 and OC-12 interfaces can be set manually to “NMON” or “AUTO”.

Ports without signals (undriven) are in the automatic state until changed to the in-service state when a signal is present. Commands allow a user to retrieve and change the state of a port to the not-monitored state or from the not-monitored state to the automatic state.

□

Cross-Connection Provisioning

Overview

Metropolis® DMX provides cross-connections that offer users flexibility in directing traffic flow through systems to support a wide variety of customer applications using two-way and multipoint (data specific) cross-connections.

Making cross-connections

Cross-connections are made by specifying the SONET rate (VT1.5 or STS-N), the end point addresses (AIDs), and the cross-connection type (for example, 2-Way Point-to-Point, Through). Each single cross-connection command establishes a two-way cross-connection.

Cross-connection rates

Metropolis® DMX supports the following cross-connection rates:

- VT1.5
- STS1
- STS3
- STS12
- STS48

The cross-connection rate is a measure of the cross-connected bandwidth. It is not an indication of the constituent rate structure of the cross-connection. For example, an STS12 rate cross-connection can carry one STS-12c signal, four STS-3c signals, twelve STS-1 signals, or a combination of STS-3c and STS-1 signals.

Cross-connection types

Metropolis® DMX supports the following cross-connections types:

- 2-Way Point-to-Point, Through
- 2-Way Point-to-Point, Add, Drop to 0x1 (Release 2.1 and earlier)
- 1+1 Add/Drop (Release 3.0 and later)
- UPSR Ring Add/Drop (switched and unswitched)
- 2F BLSR Add/Drop
- 2-Way Hairpin
- Multipoint

Typical cross-connections

STS-n and VT1.5 signals may be cross-connected in several ways. For bidirectional add/drop services, the default two-way cross-connection (**2WAYPR**) is used to connect a like signal in the high-speed Main slot to any available time slot in any low-speed port.

Two-way hairpin cross-connections (Function/Growth to Function/Growth) are supported between different combinations of port types and function units.

Two-way point-to-point through cross-connections (Main to Main) are supported at pass-through nodes in UPSR/BLSR networks.

Multipoint cross-connections can be made between the Ethernet ports and OC-N OLIU ports (OC-3, OC-12, OC-48, and OC-192).

Considerations

Any STS-1, STS-3c, STS-12c, STS-48c, or VT1.5 signal may be cross-connected to a like signal with an available time slot. For more information about supported cross-connections, refer to Appendix E, “Allowable Cross-Connections” (E-1).

Any 12 STS-1 signals in the OC-48 Main interfaces can be selected for VT1.5 cross-connections to any compatible interface. (When the Main interfaces are provisioned for BLSRs, VT1.5 cross-connections are not supported to the Main interfaces. However, VT1.5 cross-connections are supported between Function/Growth slots.)

In Release 2.1 and later releases, any 48 STS-1 signals in the LNW27, LNW29, LNW76, and LNW221-259 OC-48 circuit packs can be selected for VT1.5 cross-connections to any compatible interface.

2-way point-to-point, through cross-connections

2-way point-to-point, through cross-connections are bidirectional connections between a specified channel on the main 1 and main 2 OC-48 or OC-192 OLIU circuit packs.

2-way point-to-point add/drop to 0x1 cross-connections (Release 2.1 and earlier releases only)

In Release 2.1 and earlier releases, 2-way point-to-point add/drop to 0x1 cross-connections are bidirectional connections between a channel on the main OC-48 or OC-192 OLIU circuit packs and a channel on an unprotected circuit pack in a function unit or growth group.

1+1 add/drop cross-connections

In Release 3.0 and later releases, the 1+1 add/drop cross-connection is a bidirectional cross-connection between a channel on the 1+1 protected main OC-48 OLIU circuit packs and a protected channel on circuit packs in a function unit or growth group.

UPSR ring add/drop cross-connections

A two-way UPSR ring add/drop cross-connection is a bidirectional cross-connection between a channel on the main OC-48 or OC-192 OLIU circuit packs and a channel on circuit packs in a function unit or growth group.

In Release 3 and later releases, switched and unswitched UPSR ring add/drop cross-connections can be provisioned on low speed and high speed UPSRs. The switching behavior is provisioned on a per cross-connection basis. Therefore, a single UPSR port can support a mix of switched and unswitched cross-connections. However, on ports supporting such a mix, short transmission hits may be observed on one rotation of the switched traffic as a result of provisioning unswitched cross-connections on these ports and in response to the failure of or removal/insertion of the circuit packs containing these ports.

Switched cross-connections

Switched cross-connections are protected at both the path level and an internal equipment level. Path selection is performed on drops from the UPSR ring and internal equipment protection is used to provide an alternative signal path in the event of a circuit pack failure. Switched cross-connections provide the connectivity associated with cross-connections to UPSR ports in releases prior to Release 3.0.

Unswitched cross-connections

Unswitched cross-connections are not protected at the path level or at the internal equipment level. No path selection is performed on drops from the UPSR ring and no internal equipment protection is performed. These cross-connections provide the connectivity associated with cross-connections to an 0x1 port in releases prior to Release 3.0. Traffic is routed only between the ports in slot 1 of the specified port pairs (for example, main-1 to fn-a-1) and between the ports in slot 2 of the specified port pairs (for example, main-2 to fn-a-2). Traffic cannot be routed between slot 1 of one specified port pair and slot 2 of the other specified port pair (for example, main-1 to fn-a-2).

2F BLSR add/drop cross-connections

In Release 2.1 and later releases, the two-way 2F BLSR add/drop cross-connection is a bidirectional cross-connection between a channel on the main OC-48 or OC-192 (Release 3.0 and later) OLIU circuit packs and a protected channel on circuit packs in a function unit or growth group.

Release 3.0 supports the following cross-connections to BLSR channels provisioned for nonpreemptible unprotected traffic (NUT):

- Multipoint (mltpt) cross-connections from data circuit packs (100Base-TX, 1000Base-SX/LX)
- 2-way (2waypr) unswitched cross-connections between UPSR channels and NUT provisioned BLSR channels

2-way hairpin cross-connections

2-way hairpin cross-connections support inter-function unit, intra-function unit, and pass-through hairpins.

Inter-function group hairpin

In an inter-function group hairpin cross-connection, traffic entering the system on a channel of a port in one low-speed (function or growth) group is cross-connected (through the switch fabric on the main ports) to a channel of a port in a different low-speed (function or growth) group. This capability enables the user to bring in traffic from one remote site and cross-connect it at the VT1, STS-1, STS-3c, STS-12c, or STS-48c rate back out to other remote sites without consuming any capacity on the high speed interfaces.

Intra-function group hairpin

In an intra-function group hairpin cross-connection, traffic entering the system on a channel of a port in one low-speed (function or growth) group is cross-connected (through the switch fabric on the main ports) to a channel of a different port in the same low-speed (function or growth) group. This capability enables the user to bring in traffic from one remote site and cross-connect it at the STS-1, STS-3c, STS-12c, or STS-48c rate back out to other remote sites without consuming any capacity on the high speed interfaces.

Pass-through hairpin

In a pass-through hairpin cross-connection, traffic entering the system on a channel of a port in one slot of a slot pair (Main, Function, or Growth) is cross-connected to the same numbered channel on the same numbered port in the other slot of the same slot pair. Pass-through cross-connections are supported at the VT1.5, STS-1, STS-3c, STS-12c, and STS-48c rates on UPSR and BLSR interfaces.

Multipoint (data specific) cross-connections

The data specific multi-point cross-connect is a bidirectional cross-connection between two STS-1 Virtual Concatenation Groups (VCGs) on 100BASE-TX or 1000BASE-SX/LX ports to two different ring interfaces on the same ring. All multi-point cross-connections are done at the STS-1 level. For more information about ethernet applications, refer to Chapter 7, "Ethernet".

In TL1, the **MLTPT** cross-connect type is used to establish multi-point cross-connections between Ethernet ports and OC-N OLIUs.

Assignment of VT bandwidth on the OC-48 high speed interface

When using the OC-48 OLIU in M1 and M2 (LNW26/26B, LNW28, LNW77, LNW121B-LNW159B), for VT add/drop cross-connections, VT hairpin cross-connections, and VT pass through cross-connection, the following restrictions apply.

> **Important!** The following restrictions do not apply to the LNW27, LNW29, LNW76, and LNW221-LNW259 OC-48 OLIU circuit packs.

VT fabric capacity

The VT fabric on the main OC-48 OLIU circuit packs (M1 and M2) supports is used to support several types of VT cross-connections.

- VT add/drop from/to OC-N OLIUs in the Function Unit and Growth slots
- VT add/drop from/to DS1 ports
- VT hairpins
- VT pass throughs on the main OC-4 OLIUs (M1 and M2)

The total provisionable bidirectional VT cross-connect capacity of 336 VT1.5s is shared among the four types of VT cross-connections.

The maximum number of VT add/drop cross-connects to DS1 ports is limited to 4 STS-1s, or 112 VT1.5s.

Source and destination restriction

The user can not provision a VT1.5 connection whose source STS is the same as the destination STS of another VT1.5 connection. Source and destination are not a function of the src_aid and dest_aid in the ENT-CRS-rr command. Rather source and destination are determined based on the relative STS number. The lower STS number is designated as the source and the higher STS number is designated as the destination based on the following ordering of the slots, main < fna < fnb < fnc < fnd < growth.

The one exception to this rule is for cross-connections to DS1 ports. For these connections the OC-N port is always the source and the DS1 port is always the destination. The following example illustrates the restriction. Note, the commands are not syntactically correct. They are intended only to show the aids.

Example: The ENT-CRS-VT1 command uses the following aid format for the src_aid and dest_aid parameters.
{group}-{line}-{STS}-{VTG}-{VT1.5}.

Step 1:

Ent-crs-vt1:b-1-1-1-1,a-1-1-1-1 cross-connects a VT1.5 in FN Group A to a VT1.5 in Function Group B. According to the rule defined above, the lower STS channel (a-1-1) is designated the source and the higher STS channel (b-1-1) is designated the destination.

Step 2:

Ent-crs-vt1:b-1-1-1-2,c-1-1-1-2 cross-connects a VT1.5 in FN Group B to a VT1.5 in Function Group C.

In the above example, the cross-connection in step 2 (b-1-1-1-1 to c-1-1-1-2) would be denied because the source STS (b-1-1) is the same as the destination STS channel (b-1-1) in the cross-connect established in step 1 (b-1-1-1-1 to a-1-1-1-1).

Pass-through restriction

If the Main slots are equipped with LNW26 OC-48 OLIU circuit packs or LNW26B, LNW28, LNW77, or LNW121B-159B OC-48 OLIU circuit packs provisioned to support VT1.5 signals in up to 6 STS-1 signals, VT pass-through cross-connections on the Main circuit packs can in some cases conflict with VT add/drop cross-connections and VT hairpin cross-connections. This restriction, however, cannot be characterized by a set of rules. Requests to establish a VT cross-connection that would result in a conflict between a VT pass through cross-connection on the main and a VT add/drop or VT hairpin cross-connection will be denied.

Provisionable Parameters

Default parameters

Installation provisioning is minimized with thoughtfully chosen default values set in the factory. Every parameter has a factory default value. These factory defaults for software parameters are maintained in the SYSCTL circuit pack, and a single command is provided to restore all default values. All provisioning data is stored in nonvolatile memory to prevent data loss during power failures and maintenance operations.

User settable options

The following sections identify the Metropolis® DMX user settable options for the various parameters. The tables in this section include the TL1 commands associated with each activity. The TL1 commands can be used to identify additional command details from the *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*.

Port parameters

The following table shows the provisionable port parameters:

Table 5-1 Port Parameters

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
BPV to All Zeroes Translation on Incoming DS1 (BPV)*	**ENT-T1**	N,Y	N	1.0	**Configuration> Provision**
DS1 Incoming Signal Format (FMT)		SF, ESF, ESFN	ESF	1.1	
DS1 Line Code (LINECDE)*		AMI, B8ZS	AMI	1.0	
DS1 Line Buildout (LBO)*		1161A cable: 20 (0-133 ft.), 40 (133-267 ft.), 60 (267-420 ft.), 80 (420-533 ft.), 100 (533-655 ft.)	20	1.0	
DS3 AIS	**ENT-T3**	Y, N	N	1.0	
DS3/EC1 Mode (EIF)	**ENT-T3** **ENT-EC1**	DS3, EC1	DS3	2.0	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
DS3 Line Buildout (LBO)	**ENT-T3**	IN (0-65), OUT (greater than 65)	IN	1.0	**Configuration> Provision**
DS3 Line Coding (LINECDE)		B3ZS, CCHAN*	B3ZS	1.0	
DS3 Frame Format (FRAME)		M13, CBIT	M13	1.1	
P-bit Violation Removal (PBIT)		ON, OFF	ON	1.0	
DS3 Incoming Signal Format (FMT)		PBIT, FMBIT, CPBIT	PBIT	1.1	
Performance Monitoring Mode (PMMD)	**ENT-T1** **ENT-T3**	ON, OFF ON, OFF	ON ON	1.0 1.0	
Incoming Signal Failure Alarm Level (NTFNCDE)	**ENT-T1** **ENT-T3** **ENT-EC1**	MJ, MN, NA CR, MJ, MN, NA CR, MJ, MN, NA	NA CR CR	1.0 1.0 1.1	
Signal Degrade Threshold (SFTHR)	**ENT-T1*** **ENT-T3** **ENT-EC1**	-3, -6, -7, -8 -4, -6 -3, -5, -6, -7, -8, -9	-6 -6 -6	1.0 1.0 1.1	
Primary State (PST)	**ENT-T1** **ENT-T3** **ENT-EC1**	OOS-MA-AS (AUTO), OOS (NMON)	OOS-MA-AS	1.0 1.0 1.1	
Alarm Indication Signal (AIS) Notification for Non-Service Affecting Alarms (AISNC)	**ENT-OC3** **ENT-OC12** **ENT-OC48** **ENT-OC192**	CR, MJ, MN, NA	NA	1.1 1.1 1.1 2.1	
Line Remote Defect Indicator (RDI-L)	**ENT-EC1** **ENT-OC3** **ENT-OC12** **ENT-OC48** **ENT-OC192**	MJ, MN, NA	NA	2.1	
Signal Degrade Threshold (SFTHR)	**ENT-OC3** **ENT-OC12** **ENT-OC48** **ENT-OC192**	-5, -6, -7, -8, -9	-6	1.1 1.1 1.0 2.1	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Primary State (PST) (low-speed slots)	**ENT-OC3** **ENT-OC12** **ENT-OC48**	IS (AUTO), OSS (NMON)	IS	1.1 1.1 2.0	**Configuration> Provision**
Transmission Protection (application) (low-speed slots)	**ENT-OC3** **ENT-OC12** **ENT-OC48**	0X1, 1+1, UPSR 0X1, 1+1, UPSR 0x1, 1+1, UPSR, 2FBLSR	1 + 1	1.1 1.1 2.0	
Transmission Protection (application) (high-speed slots)	**ENT-OC48** **ENT-OC192**	UPSR, 2F BLSR, 1+1 UPSR, 2F BLSR	UPSR	2.1 2.1	
*Does not apply to the TMUX circuit pack.					

Channel parameters The following table identifies the Metropolis® DMX provisionable parameters for channels.

Table 5-2 Channel Parameters

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Alarm Indication Signal (AIS) Notification for Non-Service Affecting Alarms (AISNC)	**ENT-STS1** **ENT-STS3c** **ENT-STS12c** **ENT-STS48c** **ENT-VT1**	MN, NR	MN	1.0 1.1 1.1 2.0 1.0	**Configuration> Provision**
Primary State (PST)	**ENT-STS1** **ENT-STS3c** **ENT-STS12c** **ENT-STS48c** **ENT-VT1**	OOS-MA-AS (AUTO), OOS (NMON)	OOS-MA-AS	1.0 1.1 1.1 2.0 1.0	
Signal Degrade Threshold (SFTHR)	**ENT-STS1** **ENT-STS3c** **ENT-STS12c** **ENT-STS48c**	-5, -6, -7, -8, -9	-6	1.0 1.1 1.1 2.0	
Alarm Indication Signal Notification for Service Affecting Alarms (AISNCSA)	**ENT-STS1** **ENT-STS3c** **ENT-STS12c** **ENT-STS48c**	CR, NA	CR	1.0 1.1 1.1 2.0	
Signal Fail Threshold (SFAIL)	**ENT-STS1** **ENT-STS3c** **ENT-STS12c** **ENT-STS48c**	-3, -6	-3	1.0 1.1 1.1 2.0	
Alarm Indication Signal Notification for Service Affecting Alarms (AISNCSA)	**ENT-VT1**	MJ, NA	MJ	1.0	
Idle Channel Signal (Idle) (Insert AIS or Unequipped Signal)	**ENT-SYS**	AIS or unequipped	AIS	1.0	
Signal Degrade Threshold (SFTHR)	**ENT-VT1**	-5, -6, -7, -8	-6	1.0	

Ethernet/VLAN parameters

The following table identifies the Metropolis® DMX provisionable parameters for Ethernet/VLAN commands.

Table 5-3 Ethernet/VLAN Parameters

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Default Priority (dftpri)	**ED-EPORT**	NA, high, low	NA	1.1	**Configuration> Provision**
Duplex Mode (dplxmd)		half, full, auto	auto	1.1	
Ethernet Port Monitoring Mode (epmode)		auto, is, nmon	auto	1.1	
Ethernet Port PM Enabled (eppm)		enable, disable	disable	1.1	
Flow Control Mode (fcmd)		disable, auto	auto	1.1	
Line Rate (lnrate)		10m, 100m, auto	auto	1.1	
Default Port Tag (dftporttag)		1 - 4093 or 0	0	2.0	
Alarm Level (almlvl)		MJ,MN,NA	NA	2.0	
Spanning Tree Root Priority (strp)	**ENT-STGRP**	0 - 65535	32768	1.1	**Configuration> Data> Create a Spanning Tree Group**
Spanning Tree Group Members (vcglist)		An ampersand (&) separated list	empty	1.1	
Spanning Tree Max Age Timer (stmaxage)		6.0 - 40.0	20.0	2.0	
Spanning Tree Group ID (stgrpid)		1-4095	(none)	1.1	
Spanning Tree forward delay timer (stfdtm)		4-255	15	2.0	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Spanning tree port priority (stpp)	**ED-VCG**	0-255	128	1.1	**Configuration> Provision**
VCG Monitoring Mode (vmode)		auto, nmon	auto	1.1	
VCG PM Enable (vpm)		enable, disable	disable	1.1	
Spanning Tree Path Cost (stpcost)		1 - 65535	10	2.0	
Default Port Tag (dftporttag)		1-4093 or 0	0	2.0	
Valid Port Tag Add List (addporttag)		Ampersand separated list (1-4093)	empty	2.0	
Valid Port Tag Delete list (delporttag)		Ampersand separated list (1-4093)	empty	2.0	
Alarm Level (almlvl)		MJ,MN,NA	NA	2.0	
Pause control (psctl)		Transparent, Local, None	Local	2.0	
Tagging Mode (vlantagmd)	**ED-EQPT**	802.1TAG, TRANS, NOTAG	802.1TAG: 10/100-TX circuit packs, NOTAG: 1000-SX/LX circuit packs	2.0	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Virtual Switch ID (vrtswid)	**ED-VRTSW**	1 - 4095		2.0	**Configuration> Data > Create a Virtual Switch**
LAN port list (eplst)		Ampersand separated list of port AIDs	empty	2.0	
VCG port list (vcglst)		Ampersand separated list of port AIDs	empty	2.0	
Composite list of LAN ports to be added to virtual switch (addep)		Ampersand separated list of port AIDs	empty	2.0	
Composite list of VCG ports to be added to virtual switch (addvcg)		Ampersand separated list of port AIDs	empty	2.0	
Composite list of LAN ports to be deleted from virtual switch (delep)		Ampersand separated list of port AIDs	empty	2.0	
Composite list of LAN ports to be deleted from virtual switch (delvcg)		Ampersand separated list of port AIDs	empty	2.0	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
VLAN ID (vlanid)	**ENT-VLAN**	1- 4093		2.0	**Configuration> Data > Create a VLAN**
LAN port list (eplst)		Ampersand separated list of port AIDs	empty	2.0	
VCG port list (vcglst)		Ampersand separated list of port AIDs	empty	2.0	
Default LAN port list (dfeplst)		Ampersand separated list of port AIDs	empty	2.0	
Default VCG port list (dfvcglst)		Ampersand separated list of port AIDs	empty	2.0	
Composite list of LAN ports to be added to as VLAN members (addep)		Ampersand separated list of port AIDs	empty	2.0	
Composite list of VCG ports to be added as VLAN members (addvcg)	**ED-VLAN**	Ampersand separated list of port AIDs	empty	2.0	**Configuration> Data > Provision a VLAN**
Composite list of LAN ports to be added to as VLAN default ports (adddfep)		Ampersand separated list of port AIDs	empty	2.0	
Composite list of VCG ports to be added as VLAN default ports (adddfvcg)		Ampersand separated list of port AIDs	empty	2.0	
Composite list of LAN ports to be deleted as VLAN members (delep)		Ampersand separated list of port AIDs	empty	2.0	
Composite list of VCG ports to be deleted as VLAN members (delvcg)		Ampersand separated list of port AIDs	empty	2.0	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Composite list of LAN ports to be deleted as VLAN default ports (deldfep)	**ED-VLAN**	Ampersand separated list of port AIDs	empty	2.0	**Configuration> Data > Provision a VLAN**
Composite list of VCG ports to be deleted as VLAN default ports (deldfvcg)		Ampersand separated list of port AIDs	empty	2.0	

Cross-connection parameters

The following table identifies the Metropolis® DMX provisionable parameters for cross-connections.

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
VT1.5 Cross-Connect Type	**ENT-CRS-VT1**	2waypr	2waypr	1.0	**Configuration> Cross-Connection**
STS-1 Cross-Connect Type	**ENT-CRS-STS1**	2waypr mltpt (Ethernet)	2waypr	1.0 1.1	
STS-3c Cross-Connect Type	**ENT-CRS-STS3c**	2waypr	2waypr	1.1	
STS-12c Cross-Connect Type	**ENT-CRS-STS12c**	2waypr	2waypr	1.1	
STS-48c Cross-Connect Type	**ENT-CRS-STS48c**	2waypr	2waypr	2.0	
Location A (loca)	**ENT-CRS-rr**	Source Node Target Identifier (TID)		2.1	
Location Z (locz)		Destination Node Target Identifier (TID)		2.1	
Channel Application (chappl)		UNSWITCHED		3.0	

Synchronization parameters

The following table identifies the Metropolis® DMX provisionable parameters for synchronization.

Table 5-4 Synchronization Parameters

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
AIS Threshold Level (aisthres)	**SET-SYNCN**	LEVEL7, LEVEL6, LEVEL5, LEVEL4, LEVEL3, LEVEL2	LEVEL6	1.1	**Configuration> Timing/Sync**
DS1 Signal Frame Format for MAIN-1 Timing (ds1_liof) and MAIN-2 Timing (ds1_2iof)		SF, ESF	SF	1.0	
DS1 Timing Reference Input Line Code for REF-1 (ds1_1ilc) and REF-2 (ds2_lilc)		AMI, B8ZS	AMI	1.0	
DS1 Sync Output Equalizer Value for MAIN-1 Pack (ds1_1equ) and for MAIN-2 Pack (ds1_2equ)		1249C cable: 20 (90 ft.), 40 (180 ft.), 60 (270 ft.), 80 (360 ft.), 100 (450 ft.) 613C Cable: 20 (133 ft.), 40 (267 ft.), 60 (400 ft.), 80 (533 ft.), 100 (655 ft.)	20	1.1	
Mode Switch (mdsw)		REVERTIVE NONREVERTIVE	REVERTIVE	1.0	
Synchronization Mode (syncnmod)		FRNG, EXT, EXT_SYNCOUT, LINE, LINE_SYNCOUT	FRNG EXT (3.0 and later)	1.0	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Synchronization Source (src)	**SET-SYNCN**	MAIN-1-1 MAIN -2-1	MAIN-1-1	1.0	**Configuration> Timing/Sync**
SynchAutorecon-figuration (auto)		Enabled, Disabled	Disabled	1.0	
Sync Messaging (syncmsg)	**ENT-OC3** **ENT-OC12** **ENT-OC48** **ENT-OC192**	Sbyte, disabled	Sbyte	1.1 1.1 1.0 2.1	**Configuration> Provision**

Performance monitoring parameters

The following table identifies the Metropolis® DMX provisionable parameters for performance monitoring.

Table 5-5 Performance Monitoring Parameters

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Monitored Type (montype)	**SET-TH-T1** **SET-TH-T3** **SET-TH-VT1** **SET-TH-STS1** **SET-TH-STS3c** **SET-TH-STS12c** **SET-TH-STS48c** **SET-TH-EC1** **SET-TH-OC3** **SET-TH-OC12** **SET-TH-OC48** **SET-TH-OC192**			1.0/1.1/ 2.0/2.1	**Performance> Prov PM Thresholds**
Threshold Level (thlev)				1.0/1.1	
Location (locn)		FEND (for T1 and T3 only) NEND	FEND (T1) NEND (T3) NEND for others	1.0/1.1	
Direction (dirn)		NULL, NA	NA	1.0/1.1	
Time period (tmper)		15-MIN, 1-DAY, NONE	NA	1.0	
Format (fmt)	**SET-TH-T1**	SF, ESF	ESF	1.0	
Format (fmt)	**SET-TH-T3**	PBIT, FMBIT, CPBIT	PBIT	1.0	

Operations parameters

The following table identifies the Metropolis® DMX provisionable parameters for operations commands.

Table 5-6 Operations Parameters

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Date	**ED-DAT**	YY-MM-DD (00-01-01 — 99-12-31)	70-01-01	1.0	**Administration> Set Date and Time**
Time		HH-MM-SS (00-00-00 — 23-59-59)	00:00:00	1.0	
NE's DCC Side	**ENT-FECOM**	NS (network side), US (user side)	(function of slot, dcc AID and protection mode)	1.0	**Configuration> DCC Terminations**
OSI Communication (com)		Enabled, disabled	enabled	1.0	
LAN Reset		lan-1, lan-2	lan-1	1.0	**Administration> LAN Reset**
IP Address of the System (ipaddr)	**ENT-ULS**	32-bit IP address; 4 dot-separated decimal numbers from 0-255	(none)	1.1	**Administration> Data Communications**
IP Default Router Address (ipdrad)		32-bit IP address; 4 dot-separated decimal numbers from 0-255	(none)	1.1	
IP Subnet Mask for IAO LAN Ports (ipsnmk)		32-bit IP address; 4 dot-separated decimal numbers from 0-255	(none)	1.1	
TCP/IP communication on the specified IAO LAN port(s), or on the DCC (TCPIP)		Enabled, disabled	disabled	1.1	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Alarm Gateway NE (agne)	**ENT-SYS**	Yes, No	No	1.0	**Administration> Set NE**
Alarm Group Number (almgrp)		1-255	255	1.0	
Remote NE Status (rnestat)		Enabled, disabled	disabled	1.0	
TL1 TCP/IP Gateway NE (tcpipgw)		Enabled, disabled	disabled	1.1	**Administration> Data Communications**
FTAM-FTP Gateway (ftamftpgw)		Enabled, disabled	disabled	3.0	
X.25 Packet Size (x25ps)		128, 256	256	1.0	
FTP		Enabled, disabled	enabled	2.0	**Administration> Set NE**
Target Identifier (TID)		20 alphanumeric or special characters: “#” (pound), “%”(percent), “+”(plus),“-” (hyphen), “.” (period)	LT-DMX	1.0	**Administration> Set TID**
Network Time Protocol (ntp)		Enabled, disabled, reset	enabled	3.0	**Administration> Set NE**
Coordinated Universal Time Offset (utco)		-24:00 to +24:00 exclusive	0	3.0	**Administration> Network Time Protocol**
NE Mode for Ring Upgrade (nemode)		normal, ring-upgrade	normal	2.1	**Configuration> Upgrade>Ring Upgrade**
Idle channel signal		ais, unequipped	ais	2.0	**Configuration> Provision**

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Automatic Ring Discovery	**ENT-PROTN-GRP**	enable, disable	enable	3.0	**Configuration> Provision**
Ring ID (BLSR only)		text string		2.1	
Wait-to-restore (BLSR only)		0-12, 99	5	2.1	
Target/Source Identifier (sid)	**SET-SID**	20 characters		1.0	**Administration> Set TID**
Serial Port Baud Rate (BAUDRATE)	**ENT-CID-SECU**	1200, 2400, 4800, 9600, 19200	9600	1.0	**Administration> Data Communications**
Serial Port Echo (ECHO)		Enable, disable	enable	1.0	
Serial Port Inactivity Timer (TMOUT)		0 (disabled), 1-120 minutes	15 minutes	1.0	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
OSI Level 2 Router (L3LV2IS)	**ENT-ULSDCC-L3**	Enable, disable	disable	1.0	**Administration> Data Communications**
NSAP Address (L3ORG, L3RES, L3RD, L3AREA)		L3ORG, L3RES, L3RD, L3AREA	L3ORG: 000000 L3RES: 0000 L3RD: 0000 L3AREA: 0000	1.0	
TARP Data Cache (L4ETDC)	**ENT-ULSDCC-L4**	Enable, disable	enable	1.0	
TARP Data Cache Manual Entries	**ENT-ULSDCC-L4** **DLT-ULSDCC-L4**		(none)	1.0	
TARP Lifetime (L4TLIF)	**ENT-ULSDCC-L4**	1 - 65535	100	1.0	
TARP Loop Detection Buffer Flush Timer (L4LFTM)		1 - 1440 minutes	5 minutes	1.0	
TARP Manual Adjacency	**ENT-ULSDCC-L4** **DLT-ULSDCC-L4**		(none)	1.0	
TARP T1 Timer (L4T1TM)	**ENT-ULSDCC-L4**	1 - 3600 seconds	15 seconds	1.0	
TARP T2 Timer (L4T2TM)		1 - 3600 seconds	25 seconds	1.0	
TARP T3 Timer (L4T3TM)		1 - 3600 seconds	40 seconds	1.0	
TARP T4 Timer (L4T4TM)		1 - 3600 seconds	20 seconds	1.0	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
TCP/IP Calling Address (TCPIPADDR)	**ENT-IPMAP**	32-bit IP address of the OS; 4 dot-separated decimal numbers from 0-255	0	1.1	**Administration> Data Communications**
ACID (Application Context ID) to be assigned to a TCP/IP address or IP Host		1-23 alphanumeric characters	TL1 PEERCOMM	1.1	
Host name assigned to a TCP/IP address (TCPIPHOST)		1-24 alphanumeric characters	NULL	1.1	
Application Context Identifier (ACID)	**ENT-TL1MSG MAP**	TL1PEERCOMM TL1MAINTENANCE TL1MEMORYADMINISTRATION TL1TEST TL1OTHER1 TL1OTHER2		1.0	**Administration> Set TL1 Message Map**
TL1 Autonomous Message Type (msgtype)		ALM (REPT ALM) ENV (REPT ALM ENV) CON (REPT COND) DB (REPT DBCHG) EVT (REPT EVT) PM (REPT PM) SW (REPT SW)		1.0	
Action		enabled, disabled		1.0	
LINEn (n=1 -11)	**ENT-BANNER**	Max 11 lines (maximum of 60 characters per line) Total banner size cannot exceed 420 characters.		1.0	**Administration> Change NE Login Banner**

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
X.25 Virtual Circuit (VC) type	**ENT-OSACMAP** **DLT-OSACMAP**	PVC LCN 1-9 SVC DTE Calling Address (1-15 digits)		1.0	**Administration> Data Communications**
X.25 subnetwork point of attachment (SNPA)	**ENT-OSACMAP** **DLT-OSACMAP**	Logical channel number (LCN) for PVC: 1, 2, 3, 4, 5, 6, 7, 8, or 9. DTE calling address for SVC: 1 to 15 digits.		1.0	
Application Context Identifier (ACID)	**ENT-OSACMAP** **DLT-OSACMAP**	TL1PEERCOMM TL1MAINTENANCE TL1MEMORYADMINISTRATION TL1TEST TL1OTHER1 TL1OTHER2 TL1CR	(function of VC and SPA)	1.0	
TAP Learn Status (TLEARNSTAT)	**ED-IP-TUNNEL**	Enable, disable	enable	2.0	
TAP Advertise Status (TADVERSTAT)		Enable, disable	enable	2.0	
TAP Group Number (TAPGROUP)		0-65535	0	2.0	
Maximum Slew Seconds (maxslew)	**ED-NTP**	0 - 60 seconds with one decimal place	0.5 seconds	3.0	**Administration> Network Time Protocol**
Minimum Poll Interval to NTP Server (minpinvl)		2-4096 seconds and values are powers of two	64 seconds	3.0	
Maximum Poll Interval to NTP Server (maxpinvl)		2-4096 seconds and values are powers of two	1024 seconds	3.0	
IP Address of NTP server(s)	**ENT-NTP-SERVER**	32 bit IP address		3.0	

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Destination IP address (DEST_IP)	**ENT-IP-ROUTE**	32-bit IP address; 4 dot-separated decimal numbers from 0-255		2.0	**Administration> Data Communications**
Destination IP subnet mask (DEST_MASK)		32-bit IP subnet mask; 4 dot-separated decimal numbers from 0-255		2.0	
Next-Hop Port Type (NXTHOPPORT)		lan,clnp_tunnel	clnp_tunnel	2.0	
Next-Hop Address (NXTHOPADR)	**ENT-IP-ROUTE**	IP address (for LAN) or NSAP address (for clnp_tunnel)		2.0	
Tunnel Auto Provisioning (TAP) Advertise (TAPADVER)		Yes, No	Yes	2.0	
Tunnel Auto Provisioning (TAP) Cost (TAPCOST)		0-65535	20	2.0	

Security parameters

The following table identifies the Metropolis® DMX provisionable parameters for security.

Table 5-7 Security Parameters

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
New Password (new_pid)	**ENT-USER-SECU**	6-10 alphanumeric or symbolic characters		1.0	**Administration> Security>User Provisioning**
New User ID (new_uid)		alphanumeric string of 5-10 characters	(none)	1.0	
Password Aging Interval (PAGE)		0 (disabled), 7-999 days	0	1.0	
Password (pid)		6-10 alphanumeric or symbolic characters		1.0	
User Access Privilege (uap)		GENERAL MAINTENANCE REPORTS-ONLY		1.0	
Old Private Identifier/ password (old_pid)	**ED-PID**	6-10 alphanumeric or symbolic characters	(none)	1.0	**Administration> Change Password**
New Private Identifier/ password (new_pid)		6-10 alphanumeric or symbolic characters	(none)	1.0	
Security State (state)	**ENT-CID-SECU**	IS (no lockout), LO (Lockout)	IS	1.0	**Administration> Security>Lockout Logins** **Administration> Security>Enable Logins**
Community Identifier for SNMP user (ucomid)	**ENT-SNMP-USER**	alphanumeric string of 6 to 20 characters		3.0	**Administration> Security>SNMP User Management**
User IP address (uipadr)		32-bit IP address		3.0	

Other provisionable parameters

The following table identifies the Metropolis® DMX other provisionable parameters.

Table 5-8 Miscellaneous Parameters

Parameter	TL1 Commands	Range	Default	Release	Related WaveStar® CIT Commands
Alarm Clear Delay (clrdel)	**SET-ATTR-ALM**	0-30 sec.	15	1.0	**Configuration> Alarms>Alarm Configuration**
Incoming Signal Alarm Delay (almdel)		0-30 sec.	2	1.0	
Miscellaneous Discrete Alarm Notification Code (ntfcncde)	**SET-ATTR-ENV**	CR, MJ, MN, NA	MN	1.0	**Configuration> Misc. Discretes**
Miscellaneous Discrete Alarm Type (almtype)		1-10 alphanumeric characters	MISC	1.0	
Miscellaneous Discrete Alarm Message (almmsg)		Up to 26 alphanumeric characters	1-14: environment 15: not provisionable 16-19: environment	1.0	
Miscellaneous Discrete Control Type (conttype)	**SET-ATTR-CONT**	Up to 26 alphanumeric characters	control (1-4)	1.0	

Security

Capabilities

Metropolis® DMX provides security capabilities to protect against unauthorized access to the system.

User types

Four types of users (with tiered restriction levels) are allowed access to the system with a valid login and password:

- Privileged users can execute all commands

  A privileged login has access to all the system functional capabilities. Only the privileged logins have access to the security and access functions. These functions include assigning/changing login/passwords for other users, setting target identifier (TID) names, resetting the system, and system initialization functions.
- General users have access to all the system functional capabilities except security, access, system initialization and software installation functions.
- Maintenance users can only execute commands that access the system, extract reports and execute maintenance functions through a specific set of commands. No privileged commands may be executed by maintenance users.
- Reports-only users can only execute commands that retrieve reports from the system.

Security can be set to a “lockout” state, which blocks non-privileged users from logging in to the system. Timeouts can be provisioned independently for front and rear serial ports.

System initialization

When the system is first initialized, three privileged default logins and passwords are provided. Up to 147 logins and passwords can be added, deleted, and/or changed by any of the privileged users. Timeouts can be provisioned independently for front and rear serial interfaces only. For more information on provisioning, refer to Chapter 10, “Circuit Order/Provisioning Tasks”.

Privileged users

Authorized privileged users can establish general, maintenance, and reports-only user logins. Authorized privileged users can also “lockout” access by general, maintenance, and reports-only users without deleting the login and password file. When in “lockout” state, only privileged users can access the system.

The following commands are restricted to privileged users:

TL1 Command	Related WaveStar® CIT Command(s)
ALW-MSG (Allow Message)	**Administration > Security > Allow/Inhibit Autonomous Messages**
APPLY (Apply)	**Configuration > Software > Apply Software**
CPY-MEM (Copy Memory)	**Configuration > Software > Download Software** **Configuration > Software > Remote Backup** **Configuration > Software > Remote Restore**
CPY-PRGM (Copy Program)	**Configuration > Software > Copy Software**
DLT-IP-ROUTE (Delete IP Route)	**Administration > Data Communications > IP Tunnel**
DLT-IPMAP (Delete IP Address to Application Context ID Map)	**Administration > Data Communications > TCP/IP Gateway**
DLT-NTP-SERVER (Delete Network Time Protocol Server)	**Administration > Network Time Protocol**
DLT-OSACMAP (Delete OS Address to Application Context ID Map)	**Administration > Data Communications > X.25 Gateway**
DLT-SNMP-USER (Delete SNMP User)	**Administration > Security > SNMP Management**
DLT-ULSDCC-L4 (Delete Upper Layer Section DCC Layer 4)	**Administration > Data Communications > TARP Data Cache**
DLT-USER-SECU (Delete User Security)	**Administration > Security > User Provisioning**
ED-DAT (Edit Date and Time)	**Administration > Set Date and Time**
ED-IP-Tunnel (Edit IP Tunnel)	**Administration > Data Communications > IP Tunnel**
ED-NTP (Edit Network Time Protocol)	**Administration >Network Time Protocol**
ED-SNMP-USER (Edit SNMP User)	**Administration > Security > SNMP User Management**
ED-USER-SECU (Edit User Security)	**Administration > Security > User Provisioning**
ENT-BANNER (Enter Banner)	**Administration > Change NE Login Banner**
ENT-FECOM (Enter Far End OSI Communication)	**Configuration > DCC Terminations**

TL1 Command	Related WaveStar® CIT Command(s)
ENT-IP-ROUTE (Enter IP Route)	**Administration > Data Communications > IP Tunnel**
ENT-IPMAP (Enter IP Address to Application Context ID Map)	**Administration > Data Communications > TCP/IP Gateway**
ENT-NTP (Enter Network Time Protocol)	**Administration >Network Time Protocol**
ENT-SNMP-USER (Enter SNMP User)	**Administration > Security > SNMP User Management**
ENT-SYS (Enter System)	**Administration > Set NE** **Administration > Set TID**
ENT-TL1MSGMAP (Enter TL1 Autonomous Message Map)	**Administration > Set TL1 Message Map**
ENT-ULS (Enter Upper Layer Stack)	**Administration > Data Communications > TCP/IP**
ENT-ULSDCC-L3 (Enter Upper Layer Stack DCC Layer 3)	**Administration > Data Communications > Network Layer**
ENT-ULSDCC-L4 (Enter Upper Layer Section DCC Layer 4)	**Administration > Data Communications > TARP Data Cache**
ENT-USER-SECU (Enter User Security)	**Administration > Security > User Provisioning**
INH-MSG (Inhibit Message)	**Administration > Security > Allow/Inhibit Autonomous Messages**
INIT-SYS (Initialize System)	**Configuration > Update System**
INS-PRGM (Install Program)	**NA**
RTRV-SNMP-USER (Retrieve SNMP User)	**Administration > Security > SNMP User Management**
RTRV-USER-SECU (Retrieve User Security)	**Administration > Security > User Provisioning**
SCHED-BACKUP (Schedule Backup)	**Configuration > Software > Configure Auto Backup Interval**
SET-SID (Set Source Identifier)	**Administration > Set TID**
SET-SYNCN (Set Synchronization)	**Configuration > Timing/Sync**

For more information about WaveStar® CIT commands, refer to the online help available with the WaveStar® CIT. Refer to the *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306,* for more information about TL1 commands and TL1/X.25 command access privileges.

User logins and passwords

The WaveStar® CIT always tries to connect to a selected NE using the same login and password you have for the WaveStar® CIT. If your login and password are the same for both the selected NE and WaveStar® CIT, then you are automatically connected to the selected NE. If your login and password are different for the selected NE and WaveStar® CIT, then you must enter the correct login and password to connect to the selected NE. Login and password parameters must be administered on a per-NE basis. You may have a different login and/or password on one NE than you have on other NEs.

Inactivity timeout period

The inactivity timeout applies only to the RS-232 serial port.

The inactivity timeout period is the number of minutes after which a user with an inactive session is logged out. The range of values for the inactivity timeout period is zero (0) to 120 minutes. A value of zero (0) disables inactivity timeout. The default value is 15 minutes.

Password aging

The password aging interval is the number of days allowed before a user's password expires. When a user's password expires, the user is prompted to select a new password prior to login. The values for the password aging interval are zero (0) or a range from 7 to 999 days. A value of zero (0) disables password aging. The default value is 0. Password aging does not apply to privileged users' passwords.

WaveStar® CIT default logins and passwords

Two default Privileged logins and passwords are initially installed in the WaveStar® CIT are LUC01 and LUC02 (LUC-zero-one, and LUC-zero-two). Their associated passwords are LUC+01, LUC+02, (LUC-plus sign-zero-one, LUC-plus sign-zero-two), respectively.

NE default logins and passwords

Three default Privileged logins and passwords are initially installed in the NE is LUC01, LUC02, or LUC03 (LUC-zero-one, LUC-zero-two, and LUC-zero-three). Their default password is DMX2.5G10G.

Administration

Overview

System administration includes performing the following:

- Changing passwords
- Changing notifications
- Performing security administration
- Viewing NE administration
- Setting TIDs
- Setting NE defaults
- Performing a LAN reset
- Provisioning data communications
- Viewing OSI routing map

WaveStar® CIT login/password administration

The **Administration > Security > User Provisioning** command on the WaveStar® CIT View menu allows a privileged user to create, change, or delete another login or password.

> **Important!** Any changes made to a user's provisioning takes place the next time the user logs in. If the user is currently logged in, no changes take place until that user logs off and logs back in.

Valid logins

A valid user login must be a minimum of one character to a maximum of ten characters (no character restrictions).

Valid passwords

A valid password must comply with the following conditions:

- Length must be a minimum of six characters to a maximum of ten characters
- Must begin with a letter
- Must contain at least three non-alphabetic characters (symbol or number)
- At least one of the non-alphabetic characters must be a symbol
- When changing a password, the new password must be different than the previous password by at least one character.

> **Important!** User passwords are case-sensitive.

Characters NOT allowed in a password

The following table lists the ten characters that are not allowed in a password.

Table 5-9 Characters NOT Allowed in a Password

Character	Description	Character	Description
	Space	“	Quotation mark
@	Commercial at	&	Ampersand
,	Comma	;	Semicolon
:	Colon	_	horizontal bar (underscore)
=	Equals sign	?	Question mark

Characters allowed in a password

The following table lists the characters that are allowed in a password.

Table 5-10 Characters Allowed in a Password

Character	Description	Character	Description
A... Z	Uppercase letters	*	Asterisk
a... z	Lowercase letters	[	Left square bracket
0... 9	Digits	]	Right square bracket
'	Apostrophe	^	Caret
-	Hyphen	`	Grave accent
(	Left parenthesis	{	Left curly brace
)	Right parenthesis	}	Right curly brace
.	Period (full stop)	|	Vertical bar
/	Slash (Solidus)	<	Less than
+	Plus sign	>	Greater than
!	Exclamation mark	~	Tilde
%	Percent sign	#	Number sign

Changing your own password

The **Administration > Change Password** command allows any user to change his or her own password. Only a user with the proper security authorization level can change another user's login or password.

The user can change his or her own password at any time. The user must enter their original (old) password, their new password, and then their new password again. The two new password entries must match for the new password to be accepted. The Change Password screen is also automatically invoked immediately after the login screen if a user's password has expired. The user is prevented from performing any other function until the password is successfully changed. This screen is also invoked the first time a login is attempted for a new user ID.

Metropolis® DMX login/password administration

The **Administration > Security > User Provisioning** command on the network element System View menu allows a privileged user to create, change, or delete another network element login or password.

> **Important!** Any changes made to a user's provisioning takes place the next time the user logs in. If the user is currently logged in, no changes take place until that user logs off and logs back in.

Valid logins

A valid user login must be a minimum of one allowed character to a maximum of ten allowed characters.

Valid passwords

A valid password must comply with the following conditions:

- Length must be a minimum of six characters to a maximum of ten characters
- Must contain at least one alphabetic character and at least three non-alphabetic characters (symbol or number)
- At least one of the non-alphabetic characters must be number and at least one must be a symbol
- When changing a password, the new password must be different than the previous password by at least one character.

> **Important!** User passwords are case-sensitive.

Characters NOT allowed in a password and login

The following table lists the ten characters that are not allowed in a password and login.

Table 5-11 Characters NOT Allowed in a Password and Login

Character	Description	Character	Description
	Space	“	Quotation mark
@	Commercial at	;	Semicolon
,	Comma	*	Asterisk
:	Colon	!	Exclamation Mark
=	Equals sign	?	Question mark
\	Back slash		

Characters allowed in a password and login

The following table lists the characters that are allowed in a password login.

Table 5-12 Characters Allowed in a Password and Login

Character	Description	Character	Description
A... Z	Uppercase letters	^	Caret
a... z	Lowercase letters	`	Grave accent
0... 9	Digits	{	Left curly brace
'	Apostrophe	}	Right curly brace
-	Hyphen	|	Vertical bar
(	Left parenthesis	<	Less than
)	Right parenthesis	>	Greater than
.	Period (full stop)	~	Tilde
/	Slash (Solidus)	%	Percent sign
+	Plus sign	#	Number sign
[	Left square bracket	&	Ampersand
]	Right square bracket	_	Horizontal bar (underscore)

Changing your own password

From the network element System View, the **Administration > Change Password** command allows any user to change his or her own password. Only a user with the proper security authorization level can change another user's login or password.

6 Performance Monitoring

Overview

Purpose This section lists and describes performance monitoring parameters, data storage, thresholds, and TCA transmission.

Contents The following performance monitoring information is included in this section:

Introduction to Performance Monitoring

Definition

Performance monitoring (PM) is the in-service, non-intrusive monitoring and reporting of transmission quality.

PM helps proactive maintenance detect and correct degrading signal conditions that are not yet severe enough to initiate protection switching or alarming.

Proactive maintenance

Proactive maintenance is the process of detecting degrading conditions that are indicative of an impending hard or soft failure, but not severe enough to initiate alarming.

Reactive maintenance

Hard and soft failures result in reactive maintenance.

Data registers

The following table lists the data registers that are provided for all performance monitoring parameters.

Table 6-1 Data Registers

15-Minute Registers	1-Day (24-Hour) Registers
One current	One current
One previous	One previous
31 recent	NA

Metropolis® DMX retrieves and reports the contents of any parameter storage register. The WaveStar® CIT may be used to initialize (set to zero) the current 15-minute and/or current 1-day registers locally or remotely. This capability enables the user to verify that a repair to a failed facility was successful.

How registers are updated

The two registers are updated in the following manners:

15-minute registers

The registers are updated with a push-down methodology. At 0, 15, 30, and 45 minutes on the system clock, the contents of the 30th recent register is moved to the 31st recent register. The contents of each of the other recent registers are moved to the next higher register. The contents of the previous register are moved to the first recent register. The contents of the current register are moved to the previous register. The new measured value is placed in the current register.

Day registers

At day boundaries (midnight as defined by the local time/date function), the current day register is written to the previous day storage register and the current day register is set to zero. The day boundary is midnight by default, but may be provisioned to a different time.

PM scheduling

Performance monitoring can be scheduled to provide quarter hour and daily reports beginning at different time intervals. In order to schedule PM reports, PM messaging must be enabled and you must use the WaveStar® CIT TL1 cut-through mode or the TL1 Command Builder. PM cannot be scheduled via the WaveStar® CIT Graphical interface.

Enabling/disabling performance monitoring

Performance monitoring can be enabled/disabled for DS1 ports, DS3 ports, EC-1 ports, STS-n paths, VT1.5 paths, and OC-N lines.

DS1 ports

Performance monitoring is enabled on a DS1 port by provisioning the Performance Monitoring Mode (PMMD) and the Primary State (PST) parameters using the WaveStar® CIT **Configuration > Provision** command. Performance monitoring is enabled when the PMMD parameter is provisioned ON, there is a cross-connection, and the PST parameter is provisioned IS (in service) or NMON (not monitored).

Performance monitoring is disabled when the PMMD parameter is provisioned OFF or the PST parameter provisioned AUTO (no valid input signal).

DS3 ports

Performance monitoring is enabled on a DS3 port by provisioning the Performance Monitoring Mode (PMMD) and the Primary State (PST) parameters using the WaveStar® CIT **Configuration > Provision** command. Performance monitoring is enabled when the PMMD parameter is provisioned ON, there is a cross-connection, and the PST parameter is provisioned IS (in service) or NMON (not monitored).

Performance monitoring is disabled when the PMMD parameter is provisioned OFF or the PST parameter provisioned AUTO (no valid input signal).

EC-1 ports

Performance monitoring is enabled on an EC-1 port by provisioning the Primary State (PST) parameter using the WaveStar® CIT **Configuration > Provision** command. Performance monitoring is enabled when the PST parameter is provisioned IS (in service), there is a cross-connection, and a valid input signal is detected.

Performance monitoring is disabled when the PST parameter is provisioned AUTO (no valid input signal) or NMON.

STS-n paths

Performance monitoring is enabled on a terminated STS-n path by provisioning the Primary State (PST) parameter using the WaveStar® CIT **Configuration > Provision** command. Performance monitoring is enabled when the PST parameter is provisioned IS (in service).

Performance monitoring is disabled when the PST parameter is provisioned AUTO (no valid input signal) or NMON.

On pass through cross-connections, intermediate path performance monitoring is always enabled.

VT1.5 paths

VT 1.5 performance monitoring is only available on terminated cross-connections to DS1 and TMUX circuit packs. Performance monitoring is enabled on a terminated VT1.5 path by provisioning the Primary State (PST) parameter using the WaveStar® CIT **Configuration > Provision** command. Performance monitoring is enabled when the PST parameter is provisioned IS (in service).

Performance monitoring is disabled when the PST parameter is provisioned AUTO (no valid input signal) or NMON.

OC-n lines

Performance monitoring is enabled on an OC-n line by provisioning the Primary State (PST) parameter using the WaveStar® CIT **Configuration > Provision** command. Performance monitoring is enabled when the PST parameter is provisioned IS (in service).

Performance monitoring is disabled when the PST parameter is provisioned AUTO (no valid input signal) or NMON.

For more information about the **Configuration > Provision** command, refer to the WaveStar® CIT on-line help.

PM during failed conditions

When a trouble condition is detected, Metropolis® DMX stops accumulating PM parameters affected by that failure. PM parameters are inhibited during unavailable time per GR-253-CORE. All unaffected performance parameters continue to accumulate during a trouble condition.

Threshold crossing alerts (TCAs)

Whenever the current quarter-hour or the current day threshold for a given parameter is exceeded, Metropolis® DMX generates a threshold-crossing alert (TCA) that is entered into the performance monitoring exception report and reported to the OS through the TL1 interface.

In order to view autonomous TCAs, Event Messaging must be enabled.

TL1 access

The TL1 interfaces should be used to derive full benefit from Metropolis® DMX's performance monitoring capabilities. The full set of PM data stored by Metropolis® DMX (TCAs and the contents of PM registers) is provided through the TL1 interface.

Enabling/disabling TCA reporting

TCA reporting can be enabled or disabled on individual parameters.

Individual parameters

Threshold Crossing Alert (TCA) reporting may be enabled or disabled on a parameter basis. When the threshold value of a parameter is set to zero, no quality of service (QOS) alarm message is generated. Enabling/disabling the TCA reporting of an individual parameter is independent of any other parameter.

Parameter groups

Metropolis® DMX supports enabling/disabling TCA reporting at a group level for a parameter grouping such as line. Reporting on such a parameter group can be disabled by setting all parameters for the parameter group to zeros. For example, setting the threshold values of all line PM parameters to zero will disable the TCA reporting on the line level.

Provisioning TCA parameter thresholds

The current quarter-hour and current day thresholds for each parameter type are provisionable, on a per-shelf basis. If values other than the defaults are used, only one value for each parameter type needs to be set for each signal.

The following commands are used to provision performance monitoring parameter thresholds.

- **Performance > Prov PM Threshold > DS1 (Near End)**
- **Performance > Prov PM Threshold > DS1 (Far End)**
- **Performance > Prov PM Threshold > DS3 (Near End)**
- **Performance > Prov PM Threshold > DS3 (Far End)**
- **Performance > Prov PM Threshold > OC3**
- **Performance > Prov PM Threshold > OC12**
- **Performance > Prov PM Threshold > OC48**
- **Performance > Prov PM Threshold > OC192**
- **Performance > Prov PM Threshold > EC1**
- **Performance > Prov PM Threshold > STS1**
- **Performance > Prov PM Threshold > STS3c**
- **Performance > Prov PM Threshold > STS12c**
- **Performance > Prov PM Threshold > STS48c**
- **Performance > Prov PM Threshold > VT1**

For more information about provision performance monitoring thresholds refer to the WaveStar® CIT on-line help.

Retrieving TCAs

All TCAs are retrievable either locally or remotely via the WaveStar® CIT. If provisioned for autonomous TCA reporting, the message-based operations system interface can communicate TCA reports to the operations centers.

OC-N Performance Parameters

Overview

This section describes the performance monitoring parameters that are applicable to OC-N (OC-3, OC-12, OC-48, OC-192) signals.

Monitored parameters

The following table lists the OC-N section and line performance parameters that Metropolis® DMX monitors, including the default and ranges for the 15-minute and 1-day (24-hour) registers.

Table 6-2 OC-N Performance Parameters

Facility	Measured Provisionable Parameter	15-Min		1-Day	
		Default	Range	Default	Range
OC-N Section	SE Frame Seconds (SEFS/OOF)	10	1-63	30	1-4095
OC-192 Line	Coding Violations (CV-L)	8960	1-16383	86016	1-1048575
OC-48 Line	Coding Violations (CV-L)	2240	1-16383	21504	1-1048575
OC-12 Line	Coding Violations (CV-L)	560	1-16383	5376	1-1048575
OC-3 Line	Coding Violations (CV-L)	140	1-16383	1344	1-1048575
OC-N Line	Errored Seconds (ES-L)	40	1-900	900	1-65535
	Errored Seconds Type A (ESA-L)	30	1-900	90	1-65535
	Errored Seconds Type B (ESB-L)	30	1-900	90	1-65535
	Severely Errored Seconds (SES-L)	30	1-900	90	1-65535
	Unavailable Seconds (UAS-L)	30	1-900	90	1-65535
	Pointer Justification Counts (PJC)	60	1-900	5760	1-65535
OC-3 Line (1+1) OC-12 Line (1+1) OC-48 Line (1+1)	Line Protection Switch Counts (PSC-L)	2	1-63	4	1-255
OC-N Line (BLSR)	Line Protection Switch Counts - Working (PSC-W)	2	1-63	4	1-255
	Line Protection Switch Counts - Protection (PSC-P)	2	1-63	4	1-255
	Line Protection Switch Duration (PSD-L)	2	1-900	4	1-86400

OC-N section parameter

Metropolis® DMX monitors a single OC-N section parameter.

Severely errored frame seconds (SEFS/OOF)

The SEFS/OOF parameter increments once for each second during which Metropolis® DMX detects one or more severely errored frames.

For more information about the OC-N section parameter and the **Performance > Reports > OCn Section** command, refer to the WaveStar® CIT on-line help.

OC-N line parameters

Metropolis® DMX monitors several OC-N line parameters.

Coding violations (CV-L)

Line layer bit interleaved parity (BIP) errors are reflected in the B2 byte of the line overhead. Metropolis® DMX calculates the errors in the received frame and compares that value to the errors received in the following frames. Metropolis® DMX can detect up to 8 times N (8xN) BIP errors per STS-N frame. Each error is then reflected in the CV-L count.

Errored seconds (ES-L)

The ES-L parameter increments once for every second during which Metropolis® DMX detects either one or more B2 parity violations or an OC-N line AIS.

Errored seconds Type A (ESA-L)

The ESA-L parameter increments once for every second during which Metropolis® DMX detects exactly one B2 parity violation.

Errored seconds Type B (ESB-L)

The ESA-L parameter increments once for every second during which Metropolis® DMX detects more than one, but less than 32, B2 parity violations.

Severely errored seconds (SES-L)

The SES-S parameter increments once for each second during which Metropolis® DMX detects either one or more SEF defects or LOS defects, or K section layer BIP errors where K equals:

- 154 BIP errors for OC-3 signals
- 615 BIP errors for OC-12 signals
- 2459 BIP errors for OC-48 signals
- 2459 BIP errors for OC-192 signals

Unavailable seconds (UAS-L)

The UAS-L parameter increments once each second during which a line is unavailable. A line is considered unavailable from the beginning of 10 consecutive severely errored seconds until the beginning of 10 consecutive seconds, none of which are severely errored.

Pointer justifications counts (PJC)

Metropolis® DMX monitors line Pointer Justifications that are detected and generated on at least one SONET non-terminated path.

Protection switch count (PSC-L)

The PSC parameter records the number of times that service traffic switched to or from another line either automatically, by a WaveStar® CIT command, or operations system command.

> **Important!** This parameter is only monitored for OC-3/OC-12/OC-48 1+1 linear extensions.

Protection switch count (PSC-W and PSC-P)

The PSC-W and PSC-P parameters record the number of times that service traffic switched to or from another line either automatically, by a WaveStar® CIT command, or operations system command.

> **Important!** These parameters are only monitored for OC-48/OC-192 BLSR applications.

Protection switch duration (PSD-L)

The PSD parameter records the time in seconds from when a 2-fiber BLSR switch occurs until the switch is released.

> **Important!** This parameter is only monitored for OC-48/OC-192 2-fiber BLSR applications.

For more information about the OC-N line parameters and the **Performance > Reports > OCn Line** command, refer to the WaveStar® CIT on-line help.

EC-1 Performance Parameters

Overview

This section describes the performance monitoring parameters that are applicable to EC-1 signals.

Monitored parameters

The following table lists the EC-1 line performance parameters that Metropolis® DMX monitors, including the default and ranges for the 15-minute and 1-day (24-hour) registers.

Table 6-3 EC-1 Performance Parameters

Facility	Measured Provisionable Parameter	15-Min		1-Day	
		Default	Range	Default	Range
EC-1 Line	Coding Violations (CV-L)	47	1-16383	448	1-1048575
	Errored Seconds (ES-L)	40	1-900	900	1-65535
	Errored Seconds Type A (ESA-L)	30	1-900	90	1-65535
	Errored Seconds Type B (ESB-L)	30	1-900	90	1-65535
	Severely Errored Seconds (SES-L)	30	1-900	90	1-65535
	Unavailable Seconds (UAS-L)	30	1-900	90	1-65535
	Pointer Justification Counts (PJC)	60	1-900	5760	1-65535

EC-1 line parameters

Metropolis® DMX monitors several EC-1 line parameters.

Coding violations (CV-L)

Line layer bit interleaved parity (BIP) errors are reflected in the B2 byte of the line overhead. Metropolis® DMX calculates the errors in the received frame and compares that value to the errors received in the following frames. Metropolis® DMX can detect up to 8 times N (8xN) BIP errors per STS-N frame. Each error is then reflected in the CV-L count.

Errored seconds (ES-L)

The ES-L parameter increments once for every second during which Metropolis® DMX detects either one or more B2 parity violations or a line AIS.

Errored seconds Type A (ESA-L)

The ESA-L parameter increments once for every second during which Metropolis® DMX detects exactly one B2 parity violation.

Errored seconds Type B (ESB-L)

The ESA-L parameter increments once for every second during which Metropolis® DMX detects more than one, but less than 32, B2 parity violations.

Severely errored seconds (SES-L)

The SES-S parameter increments once for each second during which Metropolis® DMX detects either one or more SEF defects or LOS defects, or K section layer BIP errors where K equals 2459 for EC-1 signals.

Unavailable seconds (UAS-L)

The UAS-L parameter increments once each second during which a line is unavailable. A line is considered unavailable from the beginning of 10 consecutive severely errored seconds until the beginning of 10 consecutive seconds, none of which are severely errored.

Pointer justifications counts (PJC)

Metropolis® DMX monitors line Pointer Justifications that are detected and generated on at least one SONET non-terminated path.

For more information about the EC-1 line parameters and the **Performance > Reports > EC1 Line** command, refer to the WaveStar® CIT on-line help.

STS-N Performance Parameters

Overview

This section describes the performance monitoring parameters on terminated (STS-1) and intermediate STS-N (STS-1, STS-3c, STS-12c, STS-48c) paths that are cross-connected through the system. For example, DS3 interfaces terminate STS-1 paths.

Monitored parameters

The following table lists the STS-N path performance parameters that Metropolis® DMX monitors, including the default and ranges for the 15-minute and 1-day (24-hour) registers.

Table 6-4 STS-N Performance Parameters

Facility	Measured Provisionable Parameter	15-Min		1-Day	
		Default	Range	Default	Range
STS-48c Path	Coding Violations (CV-P)	300	1-16383	3000	1-1048575
STS-12c Path	Coding Violations (CV-P)	75	1-16383	750	1-1048575
STS-3c Path	Coding Violations (CV-P)	25	1-16383	250	1-1048575
STS-1 Path	Coding Violations (CV-P)	15	1-16383	125	1-1048575
STS-N Path	Errored Seconds (ES-P)	40	1-900	900	1-65535
	Errored Seconds Type A (ESA-P)	30	1-900	90	1-65535
	Errored Seconds Type B (ESB-P)	30	1-900	90	1-65535
	Severely Errored Seconds (SES-P)	30	1-900	90	1-65535
	Unavailable Seconds (UAS-P)	30	1-900	90	1-65535

STS-N path parameters

Metropolis® DMX monitors several STS path parameters.

Coding violations (CV-P)

Path layer bit interleaved parity (BIP) errors are reflected in the B3 byte of the incoming STS-N path overhead. Metropolis® DMX calculates the errors in the received frame and compares that value to the errors received in the following frames. Metropolis® DMX can detect up to 8 BIP errors per frame. Each error is then reflected in the CV-P count.

Errored seconds (ES-P)

The ES-P parameter increments once for each second during which Metropolis® DMX detects either one or more B3 parity violations, an AIS-P defect, or an LOP-P defect.

Errored seconds Type A (ESA-P)

The ESA-P parameter increments once for every second during which Metropolis® DMX detects exactly one B3 parity violation.

Errored seconds Type B (ESB-P)

The ESB-P parameter increments once for every second during which Metropolis® DMX detects more than one, but less than 9, B3 parity violations.

Severely errored seconds (SES-P)

The SES-P parameter increments once for each second during which Metropolis® DMX detects either an AIS-P defect, or an LOP-P defect, or 2400 or more B3 parity violations.

Unavailable seconds (UAS-P)

A UAS-P is a second during which the path is unavailable. A path is considered unavailable from the beginning of 10 consecutive severely errored seconds until the beginning of 10 consecutive seconds, none of which are severely errored.

For more information about the STS-N path parameters and the **Performance > Reports > STSn Path** command, refer to the WaveStar® CIT on-line help.

VT1.5 Performance Parameters

Overview

This section describes the performance monitoring parameters relevant to VT1.5 paths that are cross-connected through the system.

Monitored parameters

The following table lists the VT1.5 path performance parameters that Metropolis® DMX monitors, including the default and ranges for the 15-minute and 1-day (24-hour) registers.

Table 6-5 VT1.5 Performance Parameters

Facility	Measured Provisionable Parameter	15-Min		1-Day	
		Default	Range	Default	Range
VT1.5 Path	V5 Errored Seconds (ES-P)	40	1-900	900	1-65535
	Severely Errored Seconds (SES-P)	40	1-900	900	1-65535
	Unavailable Seconds (UAS-P)	40	1-900	900	1-65535

VT1.5 path parameters

Metropolis® DMX monitors several VT1.5 path parameters.

Errored seconds (ES-P)

The ES-P parameter increments once for each second during which Metropolis® DMX detects either one or more V5 parity violations, an AIS-P defect, or an LOP-P defect.

Severely errored seconds (SES-P)

The SES-P parameter increments once for each second during which Metropolis® DMX detects either an AIS-P defect, or an LOP-P defect, or 15 or more V5 parity violations.

Unavailable seconds (UAS-P)

A UAS-P is a second during which the path is unavailable. A path is considered unavailable from the beginning of 10 consecutive severely errored seconds, until the beginning of 10 consecutive seconds, none of which are severely errored.

For more information about the VT1.5 path parameters and the **Performance > Reports > VT1.5 Path** command, refer to the WaveStar® CIT on-line help.

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DS3 Performance Monitoring Parameters

Overview

This section describes the performance monitoring parameters relevant to DS3 signals incoming from the fiber and from the internal cross-connect.

> **Important!** In order to generate valid DS3 PM reports, the port primary state must be either IS (in service) or NMON (not monitored), the PM mode must be ON, and the P-bit must be OFF. (The P-bit must be OFF because P-bits can be corrected at nodes provisioned for VMR along a DS3 path, and the DS3 P-bit PM data may not provide a complete report of the end-to-end DS3 path errors.)

Monitored parameters

The following table lists the DS3 line and path performance parameters that Metropolis® DMX monitors, including the default and ranges for the 15-minute and 1-day (24-hour) registers.

Table 6-6 DS3 Performance Parameters

Facility	Measured Provisionable Parameter	15-Min		1-Day	
		Default	Range	Default	Range
DS3 Line	Coding Violations (CV-L)	40	1-16383	3865	1-1048575
	Errored Seconds (ES-L)	25	1-900	250	1-65535
	Severely Errored Seconds (SES-L)	25	1-900	250	1-65535
DS3 Path	P-Bit Coding Violations (CV-P)	403	1-4026	38650	1-386500
	Coding Violations (CV-P) Coding Violations Far End (CV-PFE)	40	1-16383	3820	1-1048575
	Errored Seconds (ES-P) Errored Seconds Far End (ES-PFE)	25	1-900	250	1-65535
	Severely Errored Seconds (SES-P) Severely Errored Seconds Far End (SES-PFE)	25	1-900	250	1-65535
	Unavailable Seconds (UAS-P) Unavailable Seconds Far End (UAS-PFE)	25	1-900	250	1-65535
	SE Frame Seconds (SEFS/OOF)	2	1-63	8	1-4095

DS3 line parameters

Metropolis® DMX monitors several DS3 line parameters.

Coding violations (CV-L)

The CV-L parameter increments once for each bipolar violation (BPV) detected at the DS3 line layer.

Errored seconds (ES-L)

The ES-L parameter increments once for each second during which Metropolis® DMX detects either one or more bipolar violations (BPVs), or one or more LOS defects.

Severely errored seconds (SES-L)

The SES-L parameter increments once for each second during which Metropolis® DMX detects either one or more LOS defects, 2444 or more BPVs at a minimum BER of 7.5 X 10^{-5}, or 44 or more BPVs at a minimum BER of 1 X 10^{-6}.

For more information about the DS3 line parameters and the **Performance > Reports > DS3 Line** command, refer to the WaveStar® CIT on-line help.

DS3 performance monitoring modes

Metropolis® DMX monitors several modes of DS3 path parameters.

Metropolis® DMX provides P-bit, Adjusted F&M Bit, and CP-bit monitoring modes for DS3 signals and DSX-3.

The different modes supports P-bit correction (violation monitoring and removal [VMR]) on the outgoing DS3 signal toward the DS3 facility.

Important! C-Bit errors are never corrected.

P-Bit

When provisioned for P-bit, Metropolis® DMX calculates and provides counts of the following DS3 path parameters incoming from the fiber or DSX-3:

- Coding violations (CV-P)
- Errored seconds (ES-P)
- Severely errored seconds (SES-P)
- Severely errored frames seconds (SEFS-P)
- Unavailable seconds (UAS-P)

Important! Because P-bits can be corrected at nodes provisioned for VMR along a DS3 path, the DS3 P-bit PM data may not provide a complete report of the end-to-end DS3 path errors.

Adjusted F&M Bit

Adjusted F&M bit performance monitoring provides an alternative method for determining and accumulating DS3 path performance data based on an error estimation technique using errors on the F&M framing bits to approximate the actual error counts in the DS3 path payload.

Adjusted F&M bit performance monitoring estimates the following DS3 path parameters on incoming from the fiber or DSX-3:

- Coding violations (CV-P)
- Errored seconds (ES-P)
- Severely errored seconds (SES-P)
- Unavailable seconds (UAS-P)
- Severely errored frames seconds (SEFS/OOF)

Important! F&M bits are not corrected at nodes that are provisioned for VMR.

CP-Bit (Near End)

When provisioned for CP-bit, Metropolis® DMX calculates and provides counts of the following DS3 near end path parameters incoming from the fiber or DSX-3:

- Coding violations (CV-P)
- Errored seconds (ES-P)
- Severely errored seconds (SES-P)
- Unavailable seconds (UAS-P)
- Severely errored frames seconds (SEFS/OOF)

For C-bit PM, the DS3 service can be provisioned in either violation monitor (VM) or violation monitor and removal (VMR) mode.

Important! Although the P-Bit errors may be corrected when provisioned in VMR mode, C-Bit errors are never corrected.

CP-Bit (Near and Far End)

When the frame is provisioned for C-Bit and the format is provisioned for CP-Bit, Metropolis® DMX calculates and provides counts of the following DS3 near end and far end path parameters incoming from the fiber or DSX-3:

- Coding violations (CV-P)
- Coding violations Far End (CV-PFE)
- Errored seconds (ES-P)
- Errored seconds Far End (ES-PFE)
- Severely errored seconds (SES-P)
- Severely errored seconds Far End (SES-PFE)
- Unavailable seconds (UAS-P)
- Unavailable seconds Far End (UAS-PFE)
- Severely errored frames seconds (SEFS/OOF)

DS3 path parameters

Metropolis® DMX monitors several DS3 path parameters.

Important! The frame must be provisioned for C-Bit and the format must be provisioned for CP-Bit to monitor the far-end parameters.

Coding violations (CV-P)
Coding violations Far End (CV-PFE)

The CV-P parameter increments once for each parity error detected at the path level. Unidentical P-bits corresponding to the same DS3 M-frame also increment the CV-P parameter in P-bit mode. For C-bit mode, the three C-bits in subframe 3 of a C-bit formatted DS3 frame carry the DS3 path-parity information. At the DS3 transmitter, the CP bits in the DS3 C-bit frame are set equal to the two P-bits in frame “n”. These CP bits are then inserted into frame “n+1”. Since the CP bits are not modified in any way while passing through the network, the DS3 high-speed receiver can determine if errors occurred in the DS3 path. The DS3 receiver computes the parity of frame “n” and compares that parity with the value received in the CP bits in frame “n+1”. If the values do not match, DS3 path parity violations are counted

Errored seconds (ES-P)
Errored seconds Far End (ES-PFE)

The ES-P parameter increments once for each second during which Metropolis® DMX detects either one or more parity errors, one or more SEF defects, or one or more AIS defects.

Severely errored seconds (SES-P)
Severely errored seconds Far End (SES-PFE)

The SES-P parameter increments once for each second during which Metropolis® DMX detects either one or more AIS or SEF defects, 2444 or more BPVs at a minimum BER of 7.5×10^{-5}, or 44 or more BPVs at a minimum BER of 1×10^{-6}.

Unavailable seconds (UAS-P)
Unavailable seconds Far End (UAS-PFE)

A UAS-P is a second during which the path is unavailable. A path is considered unavailable from the beginning of 10 consecutive severely errored seconds until the beginning of 10 consecutive seconds, none of which are severely errored.

> **Important!** The UAS-P parameter is not monitored when the facility is provisioned for the C-Bit mode.

Severely errored frame seconds (SEFS/OOF)

The SEFS/OOF parameter increments once for each second during which Metropolis® DMX detects either one or more severely errored frames, or one more AIS defects.

For more information about the DS3 path parameters and the **Performance > Reports > DS3 Path** command, refer to the WaveStar® CIT on-line help.

DS1 Performance Monitoring Parameters

Overview

This section describes the performance monitoring parameters relevant to DS1 incoming from the fiber or DSX-1.

DS1 ESF format

Tariffed service verification consists of monitoring performance parameters that can be associated with the customer's end-to-end service. The Metropolis® DMX system provides this capability for DS1 services when equipped with 28DS1 circuit packs with the DS1 performance monitoring feature (28DS1PM [LNW7]). Based on *ANSI* T1.403 extended superframe format (ESF), this capability retrieves performance messages written into the ESF data link by the customer's terminal equipment. From these messages, Metropolis® DMX can determine and report the end-to-end error performance of the entire DS1 link *as seen by the customer*. The counts are retrieved by the message-based operations system to determine if the service is operating within tariffed limits.

DS1 SF format

Each 28DS1PM circuit pack measures the near-end performance of the incoming DS1, allowing the service provider to determine if a good DS1 signal was received from the customer before transporting it through the network. This information can then aid in sectionalizing any reported performance problems. The 28DS1PM circuit pack can also provide this same near-end information for super frame (SF) formatted (sometimes known as "D4 framing") DS1 services, but complete end-to-end performance verification is limited due to the lack of the PRM in the SF format.

Monitored parameters

The following table lists the DS1 line and path performance parameters that Metropolis® DMX monitors, including the default and ranges for the 15-minute and 1-day (24-hour) registers.

Table 6-7 DS1 Performance Parameters

Facility	Measured Provisionable Parameter	15-Min		1-Day	
		Default	Range	Default	Range
DS1 Line	Errored Seconds (ES-L)	65	1-900	648	1-65535
DS1 Path	Coding Violations (fmt=SF) (CV-P)	72	1-16383	691	1-1048575
	Coding Violations (fmt=ESF) (CV-P) Coding Violations Far End (CV-PFE)	13296	1-16383	132960	1-1048575
	Errored Seconds (ES-P) Errored Seconds Far End (ES-PFE)	65	1-900	648	1-65535
	Severely Errored Seconds (SES-P) Severely Errored Seconds Far End (SES-PFE)	65	1-900	648	1-65535
	Unavailable Seconds (UAS-P) Unavailable Seconds Far End (UAS-PFE)	65	1-900	648	1-65535

DS1 line parameters

Metropolis® DMX monitors one DS1 line parameters.

Errored seconds (ES-L)

The ES-L parameter increments once for each second during which Metropolis® DMX detects either one or more bipolar violations (BPVs), or one or more LOS defects.

For more information about the DS1 line parameter and the **Performance > Reports > DS1 line** command, refer to the WaveStar® CIT on-line help.

DS1 path parameters

Metropolis® DMX monitors several DS1 path parameters.

> **Important!** The format must be set to ESF to monitor the far end parameters (CV-PFE, ES-PFE, SES-PFE, and UAS-PFE).

Coding violations (CV-P)
Coding violations Far End (CV-PFE)

The CV-P parameter increments once for each parity error detected at the path level. Metropolis® DMX calculates the errors in the received frame and compares that value to the errors received in the following frames. Metropolis® DMX can detect up to 8 BIP errors per frame. Each error is then reflected in the CV-P count.

Errored seconds (ES-P)
Errored seconds Far End (ES-PFE)

The ES-P parameter increments once for each second during which Metropolis® DMX detects either one or more parity errors, one or more SEF defects, or one or more AIS defects.

Severely errored seconds (SES-P)
Severely errored seconds Far End (SES-PFE)

The SES-P parameter increments once for each second during which Metropolis® DMX detects either one or more AIS or SEF defects, 2444 or more BPVs at a minimum BER of 7.5×10^{-5}, or 44 or more BPVs at a minimum BER of 1×10^{-6}.

Unavailable seconds (UAS-P)
Unavailable seconds Far End (UAS-PFE)

A UAS-P is a second during which the path is unavailable. A path is considered unavailable from the beginning of 10 consecutive severely errored seconds until the beginning of 10 consecutive seconds, none of which are severely errored.

For more information about the DS1 path parameters and the **Performance > Reports > DS1 path** command, refer to the WaveStar® CIT on-line help.

□

Ethernet Performance Monitoring Parameters

Overview

Metropolis® DMX provides PM capabilities for the Fast Ethernet and Gigabit Ethernet interfaces. PM data is collected at each LAN and WAN interface in the network for both incoming and outgoing directions and is stored in quarter-hour and day bins. The WAN interface provides a connection to a SONET Virtual Concatenation Group (VCG).

TCAs

Provisionable threshold crossing alerts (TCAs) are not supported on the Ethernet interfaces.

Monitored parameters

The following table lists the Ethernet performance parameters that Metropolis® DMX monitors, including the ranges for the 15-minute and 1-day (24-hour) registers.

Table 6-8 Ethernet Performance Parameters

Facility	Monitored Parameter	15-Min	1-Day
		Range	Range
Ethernet	Ethernet dropped frames (congestion) (EDFC) (See Note 1)	0-72862694	0-6994818653
	Ethernet dropped frames (errors) (EDFE) (See Note 1)	0-72862694	0-6994818653
	Ethernet incoming number of bytes (EINB)	0-112500000000	0-10800000000000
	Ethernet incoming number of frames (EINF) (See Note 1)	0-72862694	0-6994818653
	Ethernet outgoing number of bytes (EONB)	0-112500000000	0-10800000000000
	Ethernet outgoing number of frames (EONF) (See Note 1)	0-72862694	0-6994818653

Notes:

1. Counter can overflow.

Enabling/disabling

Performance monitoring is enabled/disabled via the WaveStar® CIT. From the System View menu, select **Provision > Prov PM Ports**, then navigate to the port.

Ethernet parameters

Metropolis® DMX monitors several Ethernet parameters.

Ethernet dropped frames (congestion) (EDFC)

The EDFC parameter counts the number of incoming Ethernet frames dropped at a specific LAN/WAN port due to buffer overflow. Buffer overflow occurs when the network is congested.

Ethernet dropped frames (errors) (EDFE)

The EDFE parameter counts the number of incoming Ethernet frames dropped at a LAN/WAN port due to a frame check sequence (FCS) error or another defect in the frame.

Ethernet incoming number of bytes (EINB)

The EINB parameter counts the total number of non errored (good) bytes incoming to a LAN/WAN port.

Ethernet incoming number of frames (EINF)

The EINF parameter counts the total number of non errored (good) Ethernet frames incoming to a LAN/WAN port.

Ethernet outgoing number of bytes (EONB)

The EONB parameter counts the total number of outgoing bytes transmitted by a specified LAN/WAN port.

Ethernet outgoing number of frames (EONF)

The EONF parameter counts the total number of outgoing frames transmitted by a specified LAN/WAN port.

For more information about the Ethernet parameters and the **Performance > Reports > Ethernet** command, refer to the WaveStar® CIT on-line help.

□

SNMP Parameters and Traps

Parameters Supported

The Metropolis® DMX supports the following SNMP parameters.

Table 6-9 SNMP Parameters supported

SNMP Parameters
Interface Description (RFC2863)
Type of Interface (RFC2863)
Maximum Packet Size (RFC2863)
Interface Maximum Rate (RFC2863)
MAC Address (RFC2863)
Administration (RFC2863)
Operational (RFC2863)
Time Ticks Since Last Re-initialization (RFC2863)
Total Bytes Received (RFC2863)
Frames Received (RFC2863)
Multicast Frames Received (RFC2863)
Broadcast Frames Received (RFC2863)
Dropped Frames (RFC2863)
Received Error Frames (RFC2863)
Bytes Sent (RFC2863)
Frames Sent - Out Multicast Frames - Out Broadcast Frames (RFC2863)
Out Multicast Frames (RFC2863)
Out Broadcast Frames (RFC2863)
Interface Name (RFC2863)
Total Bytes Received (RFC2863)
Frames Received: Broadcast Frames Received- Multicast Frames Received (RFC2863)
Multicast Frames Received (RFC2863)
Broadcast Frames Received (RFC2863)

SNMP Parameters
Bytes Sent (RFC2863)
Frames Sent - Out Multicast Frames - Out Broadcast Frames (RFC2863)
Out Multicast Frames (RFC2863)
Out Broadcast Frames (RFC2863)
Traps Enabled or Disabled (RFC2863)
Interface Speed (RFC2863)
Promiscuous Mode (RFC2863)
Physical Connector Present (RFC2863)
Interface Alias Name (RFC2863)
Time of Last Counter Discontinuity (RFC2863)
Alignment Errors (RFC2358/RFC2665)
FCS Errors (RFC2358/RFC2665)
Single Collision Frames (RFC2358/RFC2665)
Late Collisions (RFC2358/RFC2665)
Frame Too Longs (RFC2358/RFC2665)
Internal Mac Receive Errors (RFC2358/RFC2665)
Duplex Status (RFC2358/RFC2665)
Control Functions Supported (RFC2358/RFC2665)
Pause Admin Mode (RFC2358/RFC2665)
Pause Oper Mode (RFC2358/RFC2665)
In Pause Frames (RFC2358/RFC2665)
Out Pause Frames (RFC2358/RFC2665)
System Description (FRC1907 Systems Group)
System Object ID (FRC1907 Systems Group)
System Up Time (FRC1907 Systems Group)
System Contact (FRC1907 Systems Group)
System Name (FRC1907 Systems Group)
System Location (FRC1907 Systems Group)

SNMP Parameters
System Services (FRC1907 Systems Group)
Port Type (Private Ethernet Current PM MIB)
Incoming Number of Bytes (Private Ethernet Current PM MIB)
Incoming Number of Frames (Private Ethernet Current PM MIB)
Dropped frames: Congestion (Private Ethernet Current PM MIB)
Dropped Frames: Errors (Private Ethernet Current PM MIB)
Outgoing Number of Bytes (Private Ethernet Current PM MIB)
Outgoing Number of Frames (Private Ethernet Current PM MIB)
Day Index (Private Ethernet 24 Hour PM MIB)
Port Type (Private Ethernet 24 Hour PM MIB)
Incoming Number of Bytes (Private Ethernet 24 Hour PM MIB)
Incoming Number of Frames (Private Ethernet 24 Hour PM MIB)
Dropped frames: Congestion (Private Ethernet 24 Hour PM MIB)
Dropped Frames: Errors (Private Ethernet 24 Hour PM MIB)
Outgoing Number of Bytes (Private Ethernet 24 Hour PM MIB)
Outgoing Number of Frames (Private Ethernet 24 Hour PM MIB)
15 Minute Bucket Index (Private Ethernet 15 Min PM MIB)
Incoming Number of Bytes (Private Ethernet 15 Min PM MIB)
Incoming Number of Frames (Private Ethernet 15 Min PM MIB)
Dropped frames: Congestion (Private Ethernet 15 Min PM MIB)
Dropped Frames: Errors (Private Ethernet 15 Min PM MIB)
Outgoing Number of Bytes (Private Ethernet 15 Min PM MIB)
Outgoing Number of Frames (Private Ethernet 15 Min PM MIB)
Circuit Pack Type (Private Equipment MIB)
Circuit Pack Apparatus Code (Private Equipment MIB)
Circuit Pack Series Number (Private Equipment MIB)
Common Language Equipment Code (Private Equipment MIB)

SNMP Parameters
Equipment Catalog Item Code (Private Equipment MIB)
Circuit Pack Serial Number (Private Equipment MIB)
Version of the Software Currently Stored in Circuit Pack (Private Equipment MIB)
Circuit Pack Mode (Private Equipment MIB)
Ethernet Cross-Connect Mode (Private Equipment MIB)
Virtual LAN Tagging Mode (Private Equipment MIB)

Traps Supported

The Metropolis® DMX supports the following SNMP traps.

Table 6-10 SNMP Traps supported

SNMP Traps
Link Up (RFC2863)
Link Down (RFC2863)
Incoming VCG Fail (Private VCG MIB)
Incoming VCG Loss of Alignment (Private VCG MIB)
Incoming VCG Loss of Frame Delineation (Private VCG MIB)
Incoming VCG Data Type Mismatch (Private VCG MIB)
Incoming STS-1 Loss of MultiFrame (Private VCG MIB)
Incoming STS-1 Sequence Number Mismatch (Private VCG MIB)
Incoming VCG Fail Clear (Private VCG MIB)
Incoming VCG Loss of Alignment Clear (Private VCG MIB)
Incoming VCG Loss of Frame Delineation Clear (Private VCG MIB)
Incoming VCG Data Type Mismatch Clear (Private VCG MIB)
Incoming STS-1 Loss of MultiFrame Clear (Private VCG MIB)
Incoming STS-1 Sequence Number Mismatch Clear (Private VCG MIB)
Loss of Signal (LOS on FE LAN Port (Private Ethernet MIB)
LOS Clear on FE LAN Port (Private Ethernet MIB)
Auto-negotiation Mismatch (ANM) on FE LAN Port (Private Ethernet MIB)
ANM CLear on FE LAN Port (Private Ethernet MIB)
Loss of Signal (LOS) on GbE LAN Port (Private Ethernet MIB)
LOS Clear on GbE LAN Port (Private Ethernet MIB)
Auto-negotiation Mismatch (ANM) on GbE LAN Port (Private Ethernet MIB)
ANM Clear on GbE LAN Port (Private Ethernet MIB)
Circuit Pack Not Allowed (Private Equipment MIB)
Circuit Pack Not Allowed Clear (Private Equipment MIB)

SNMP Traps
Illegal Circuit Pack Type (Private Equipment MIB)
Illegal Circuit Pack Type Clear (Private Equipment MIB)
FE LAN Circuit Pack Failed (Private Equipment MIB)
FE LAN Circuit Pack Failed Clear (Private Equipment MIB)
GbE LAN Circuit Pack Failed (Private Equipment MIB)
GbE LAN Circuit Pack Failed Clear (Private Equipment MIB)
Circuit Pack Removed (Private Equipment MIB)
Circuit Pack Removed Clear (Private Equipment MIB)
Circuit Pack Inserted (Equipment Private MIB)

7 Ethernet

Overview

Purpose

This section describes the Ethernet implementation for the Metropolis® DMX Access Multiplexer (Metropolis® DMX).

Contents

The following topics are covered:

Applications

Overview

Ethernet in a SONET network has two main applications:

- Virtual Private Networks (VPNs)
- Ethernet Service Aggregation

Virtual private networks

Virtual private networks allow communications services providers to extend their customers' private networks across the public telecommunications network while maintaining the integrity and security of a private network.

The VPN is established by allocating Ethernet ports to an individual customer and then controlling access through the SONET network by the use of virtual LANs (VLANs). In Release 2.0 and later releases, Metropolis® DMX supports up to 4093 VLANs for customer identification and isolation. Any number of VLANs in the range 1-4093 can be assigned to any number of ports with complete flexibility.

Ethernet service aggregation

Ethernet service aggregation allows the communications services provider to bundle Ethernet traffic from multiple customers, transport it across the SONET/SDH network, and unbundle it at appropriate destination nodes. This is usually a multipoint service that allows the traffic from an aggregated pipe to be routed to different destinations within the public telecommunications network.

Ethernet service aggregation is used for applications such as internet access.

Dedicated bandwidth

Specific Ethernet ports and specific Virtual Concatenation Group ports (VCG ports) may be dedicated to a single customer, thereby providing an Ethernet "private line" within the network.

Shared bandwidth

With shared bandwidth, traffic from multiple customers (and from multiple Ethernet ports) is multiplexed together at the packet layer into the same VCG ports. This provides the opportunity of statistical multiplexing: customers can have the opportunity for burst traffic at a rate greater than can be guaranteed to each customer.

Multicast Ethernet packets

Metropolis® DMX supports multicast Ethernet packets in all releases. A multicast packet is identified by the first bit in the MAC destination address. This type of MAC address does not appear as a source address; therefore, multicast destination addresses are not learned. Since unknown source addresses are treated as broadcast, multicast packets/ frames are sent to all ports in the VLAN (IEEE 802.1Q) or transparent LAN (customer/port tag) for that packet.

Multicast packets can be used to facilitate video distribution, webcasting, and other applications that use multipoint cross-connections.

Non service affecting software upgrades

The Ethernet circuit packs support non service affecting software upgrades. After a software upgrade, the 1GSX/1GLX and 10/100T circuit packs perform a warm boot to restart with the new software. The warm boot completes the software upgrade without affecting the service (no transmission hits).

During a warm boot, the Ethernet circuit packs ignore any commands received from the SYSCTL circuit pack. The SYSCTL circuit pack rejects all the new provisioning commands destined for Ethernet circuit packs while a boot is in progress. The network element outputs a denial message for all the Ethernet provisioning commands during the restart.

However, the following conditions may occur during an Ethernet circuit pack software upgrade that initiate a cold boot. A cold boot requires a circuit pack reset, which could be service affecting.

- Point release upgrade affecting circuit pack database
- Data over SONET (DOS) Field Programmable Gate Array (FPGA) needs to reloaded

Important! Since Release 1.1 does not support warm boot, upgrades from Release 1.1 to Release 2.0 are not hitless.

End-to-end flow control

Metropolis® DMX supports end-to-end flow control inter-operability. In full rate private line mode, Metropolis® DMX supports optional propagation of flow control (PAUSE) frames across the SONET network when congestion occurs at the customer's equipment. In Release 3.0 and later releases, Metropolis® DMX supports end-to-end flow control with enhanced latency buffering.

Metropolis® DMX also supports local flow control for sub-rate applications.

Local flow control

Metropolis® DMX also supports local flow control at the near end port or VCG level. When the near end device transmits too much data to the local Metropolis® DMX and congestion occurs, Metropolis® DMX transmits flow control (PAUSE) frames at the VCG or port level to the local device to temporarily stop transmission. This prevents the local buffers from overfilling and losing data frames. After Metropolis® DMX recovers from the congestion state, normal transmission resumes.

Auto-negotiation disable

In Release 2.1 and later releases, Metropolis® DMX supports provisionable auto-negotiation disable on Ethernet ports.

Auto-negotiation is disabled for a 10/100T Ethernet port when the duplex mode, flow control mode, and line rate are all provisioned non-auto values. If the duplex mode, flow control mode, or line rate are provisioned auto, then auto-negotiation is enabled. In this state, Metropolis® DMX advertises the statically provisioned capabilities to the link partner.

Auto-negotiation is disabled for a 1GSX/1GLX Ethernet port when the flow control mode is provisioned a non-auto value. Auto-negotiation is enabled when the flow control mode is provisioned auto.

On connected 1GSX/1GLX Ethernet ports with auto-negotiation enabled, if transmission is interrupted in one direction of transmission on a 1GSX/1GLX Ethernet port, then transmission is disabled in the other direction. For example, if one fiber in the transmit/receive pair is cut, then one-way transmission on the other fiber is maintained only if auto-negotiate is disabled and the link state is forced good at the transmit source equipment.

Cross-connections

Metropolis® DMX supports STS-1 cross-connections between

- Ethernet circuit packs (hairpin)
- Ethernet and low speed OC-N circuit packs (hairpin)
- Ethernet and high speed OC-N circuit packs.

Hairpin cross-connections

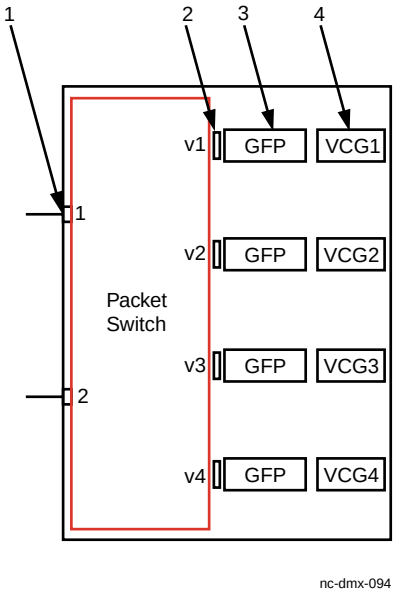
The hairpin cross-connections involving Ethernet circuit packs are summarized in the tables in Appendix E: “Allowable Cross-Connections” (E-1). In particular, connections between Gigabit Ethernet circuit packs, or between a Gigabit Ethernet and a Fast Ethernet circuit pack can be made to allow local switching of packets among ports on multiple circuit packs, and to support aggregation of traffic from ports on multiple circuit packs onto a single packet ring.

Ethernet Circuit Packs

Gigabit Ethernet (LNW67 and LNW68)

A Gigabit Ethernet circuit pack provides two external 1-Gigabit Ethernet ports and four 1-Gigabit VCG ports.

Figure 7-1 Gigabit Ethernet Circuit Pack



Legend:

1 External Ethernet Port
2 Virtual Concatenation Group Port
3 Generic Framing Procedure
4 Virtual Concatenation Group

External Ethernet port

Each of the two external Ethernet ports provides a one-Gigabit Ethernet interface. Depending on which circuit pack is installed, 1GSX or 1GLX, the optical interface may be either

- SX: 1000Base-LX (long-reach laser). The SX ports require a 50 µm or 62.5µm multimode optical cable and transmit up to 550 meters.
  The 1GSX (LNW67) Gigabit Ethernet circuit pack provides two 1000Base-SX ports.
- LX: 1000Base-LX (long-reach laser). The LX ports can use multimode or single mode optical cable. The port can transmit up to 18000 meters on single-mode fiber.
  The 1GLX (LNW68) Gigabit Ethernet circuit pack provides two 1000Base-LX ports.

Ethernet packet switch

The Ethernet packet switch routes Ethernet packets based on the destination address and the VLAN assignment. In order for a packet to be routed to a port (external Ethernet port or VCG port), that EPORT or VCG must be enabled for the VLAN of the Ethernet frame. The system allows a default VLAN to be assigned for each external Ethernet port. The default VLAN tag can be added to any frame which does not have a VLAN tag.

Virtual concatenation group port

The virtual concatenation group port (VCG port) is a one Gigabit internal Ethernet port that passes packets to the generic framing procedure and VCG operations.

In Release 3.0, Metropolis® DMX supports a basic peak information rate policer that meters packets leaving the Ethernet packet switch going toward the SONET network. Metropolis® DMX drops any packets that exceed the provisioned peak information rate for the VLAN or customer ID associated with the packet. This guarantees that no more than the specified network capacity is provided.

Generic framing procedure

The generic framing procedure (GFP) is a draft standard (ANSI T1X1.5/2001-024R4 and ITU-T G.GFP). The procedure encapsulates the Ethernet packet in a standard frame for transmission over the SONET/SDH network.

Virtual concatenation group

The virtual concatenation group (VCG) processing assembles packets into SONET STS-1 tributary groups that can then be sent through the SONET/SDH network. Virtual concatenation allows STS-1 tributary to be routed individually and reassembled at the receiving end of the transmission. Up to 21 STS-1 tributaries can be concatenated in a group. A group of 21 STS-1 tributaries provides full wire-speed transport for a 1-Gigabit Ethernet signal through the SONET network.

Metropolis® DMX also provides an adaptation function that compensates for delay variations as STS-N signals traverse the long haul SONET networks. In Release 2.1 and earlier releases, Metropolis® DMX compensates for delays up to 16 milliseconds.

Configuration restriction for Gigabit Ethernet

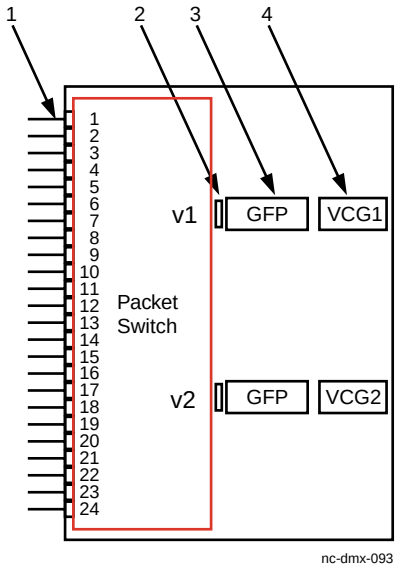
When the main slots (M1 and M2) of Metropolis® DMX are equipped with OC-48/OC-192 OLIUs only VCG 1 and VCG 2 can be used when a 1GSX or 1GLX Gigabit Ethernet circuit pack (LNW67 or LNW68) is installed in function unit slot A1, B1, or C1.

If a *dedicated bandwidth* configuration for both ports is needed, then the 1GSX or 1GLX Gigabit Ethernet circuit pack should be installed in function unit slot D1 and/or G1.

Fast Ethernet (LNW66)

The 10/100T Fast Ethernet circuit pack (LNW66) provides 24 external 100Base-TX Ethernet ports and two 1-Gigabit VCG ports.

Figure 7-2 LNW66 Fast Ethernet Circuit Pack



Legend:

1 External Ethernet Port
2 Virtual Concatenation Group Port
3 Generic Framing Procedure
4 Virtual Concatenation Group

Important! The elements on the LNW66 Fast Ethernet circuit packs function in the same manner as the elements on the Gigabit Ethernet circuit packs. See the discussion on the previous pages.

Tagging Modes

Overview

The Metropolis® DMX supports three tagging modes.

Private line mode (no tag)

The private line mode (no tag) is the default mode for the 1GSX/1GLX Gigabit Ethernet ports. The private line mode is used for point-to-point protected UPSR and BLSRs. In private line mode, no additional Ethernet provisioning is required after the cross-connection is established.

In private line mode, Metropolis® DMX supports optional propagation of end-to-end flow control (PAUSE) frames across the SONET network when congestion occurs.

In the private line mode (no tag), the ports support a maximum packet size of 1532 bytes.

> **Important!** The 10/100T Fast Ethernet circuit packs do not support the private line mode.

802.1q VLAN mode

In 802.1q Virtual LAN (VLAN) mode, the Ethernet ports (EPORT) are assigned one or more VLAN IDs and/or a default VLAN tag. VCG ports are assigned a VLAN ID and/or a default VLAN tag to support add/drop traffic to/from the EPORTs of the corresponding virtual switch. VLANs allow large bandwidth networks to carry multiple LANs and maintain the identity of each. Therefore, VLANs can extend a LAN across the wide-area network while maintaining the identity and operational integrity of the LAN.

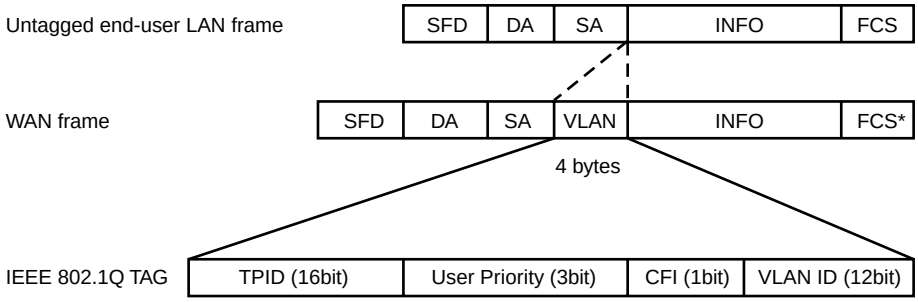
The 802.1q VLAN mode is the default mode for the 10/100T Fast Ethernet ports. The 1GSX/1GLX Gigabit Ethernet ports may also be tagged with the 802.1q VLAN mode.

If VLAN tags are used, the ports support a maximum packet size of 1536 bytes. If VLAN tags are not used, the ports support a maximum packet size of 1532 bytes.

VLAN tagging

Figure 7-3 illustrates how the VLAN tag appears in the Ethernet frame.

Figure 7-3 VLAN Tag



Legend:

SFD	start of frame delimiter
DA	destination address
SA	source address
VLAN	virtual LAN
INFO	data package
TPID	tag protocol ID
User Priority	user priority information contained in the frame
CFI	canonical format indicator
FCS	frame check sequence

nc-dmx-187

VLAN ID

In Metropolis® DMX, the VLAN ID may be a numerical value in the range 1-4093. A default VLAN ID may be provisioned for each Ethernet port (EPORT). When provisioned the default VLAN ID is assigned to any frame, which does not have a VLAN tag.

The VLAN ID is assigned to the Ethernet port (EPORT) and to the VCG port (VCG). The VLAN ID must be active for the port in order for the packet to be routed to that port. The ports are assigned/unassigned using the **Configuration > Data > Create a VLAN** and **Configuration > Data > Delete a VLAN** WaveStar® CIT commands. Also refer to the **ent-vlan** or **ed-vlan** TL1 commands.

The VLAN ID is examined within the Ethernet packet switch. The switch will route a packet to the port appropriate for the destination address only if the VLAN ID of the packet is enabled for that port. If the VLAN ID is not enabled for the port, the Ethernet packet is discarded.

WaveStar® CIT commands

The following WaveStar® CIT commands support VLAN tag provisioning:

- **Configuration > Data > Create a VLAN**
- **Configuration > Data > Delete a VLAN**
- **Configuration > Data > Provision a VLAN**

For more information about provisioning VLANs and the WaveStar® CIT commands, refer to the WaveStar® CIT on-line help.

Transparent mode

Transparent mode may be provisioned for 10/100T Fast Ethernet and/or Gigabit Ethernet ports provisioned for point-to-point or multi-point. In the transparent mode, Metropolis® DMX processes Ethernet traffic independent of the 802.1q VLAN tag that may be present on the packets received on LAN ports. This method eliminates the need for coordinating VLAN assignments between the service provider and customer and simplifies network administration.

In the transparent mode, the ports support a maximum packet size of 1532 bytes.

WaveStar® CIT commands

The **Configuration > Provision** WaveStar® CIT command is used to provision Ethernet port tags. For more information about the **Configuration > Provision** command and port tag provisioning, refer to the WaveStar® CIT on-line help.

Virtual switch

A virtual switch (VRTSW) is a logical grouping of Ethernet ports (EPORTs) and VCG ports that share interconnect and share a common set of properties. A virtual switch may support one or more spanning trees; a spanning tree can only belong to one virtual switch.

Restrictions

A port (EPORT or VCG) can only be assigned to one virtual switch at a time. VLANS (802.1q VLAN mode) and port tags (transparent mode) that are assigned to a virtual switch cannot be assigned to another virtual switch on the same circuit pack.

The 10/100T and 1GSX/1GLX circuit packs can support a maximum of two virtual switches on each circuit pack.

WaveStar® CIT commands

The following WaveStar® CIT commands support virtual switch provisioning:

- **Configuration > Data > Create a Virtual Switch**
- **Configuration > Data > Delete a Virtual Switch**
- **Configuration > Data > Provision a Virtual Switch**

For more information about provisioning virtual switches and the WaveStar® CIT commands, refer to the WaveStar® CIT on-line help.

□

Ethernet Topologies

Overview

Ethernet can be configured in the following major configurations:

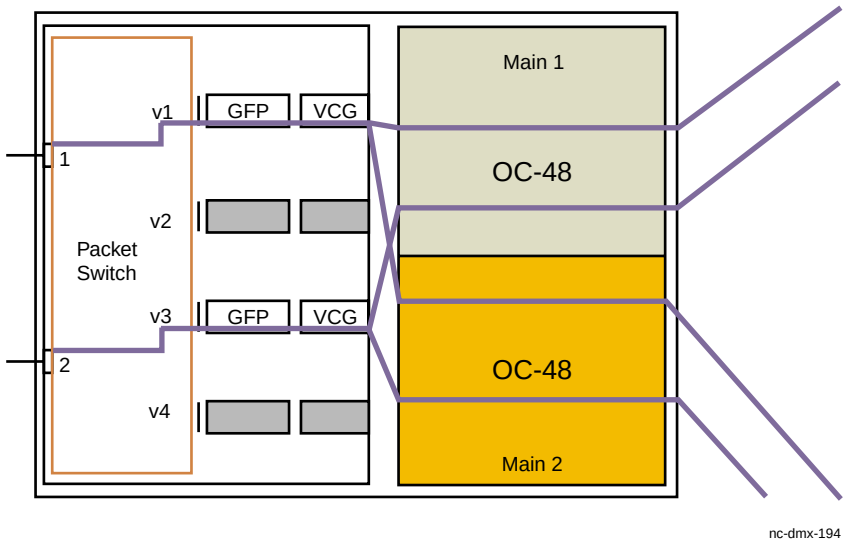
- Point-to-point (private line mode)
- Point-to-point
- Multipoint

Point-to-point (private line mode)

In a point-to-point (private line mode) configuration, SONET UPSRs can be used for network protection. In Release 2.1 and later releases, SONET bidirectional line switched rings (BLSRs) can also be used for network protection.

The following figure shows an example of a Gigabit Ethernet circuit pack configured in the point-to-point private line mode.The Gigabit Ethernet port 1 connects to VCG V1 and Gigabit Ethernet port 2 connects to VCG V3.

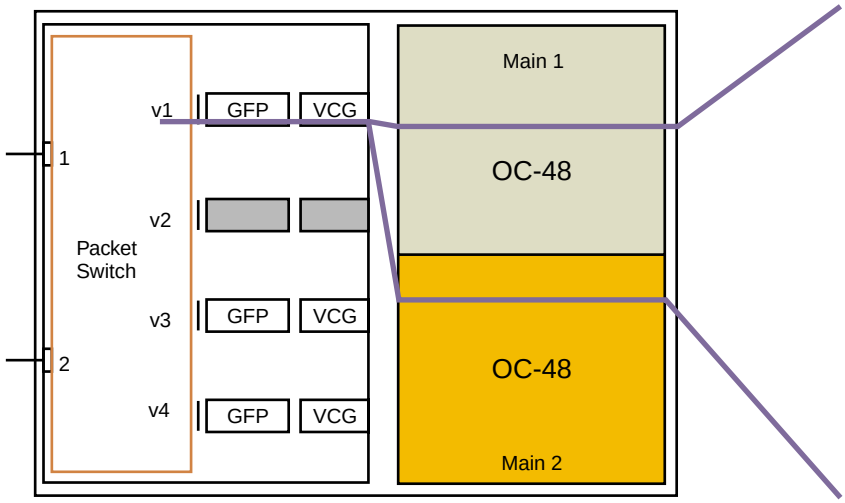
Figure 7-4 Point-to-Point (Private Line Mode) Example with Gigabit Ethernet (LNW67 and LNW68)



Point-to-point

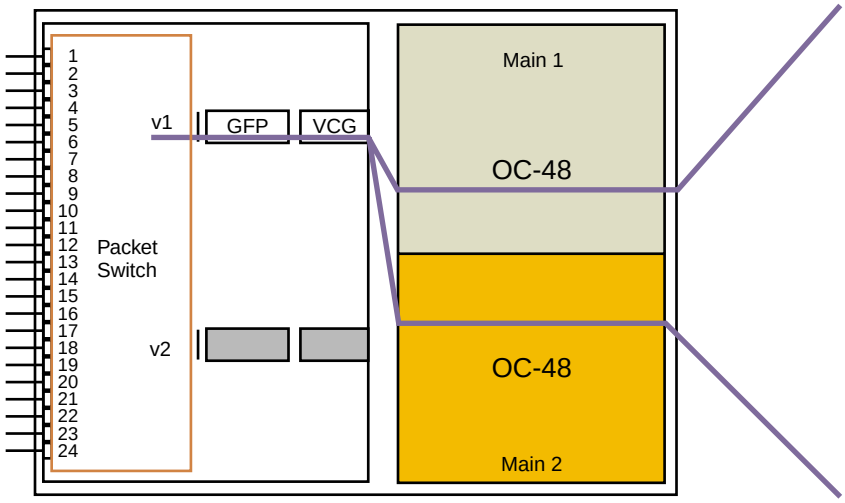
In a point-to-point configuration, a SONET UPSR can be used for network protection. In Release 2.1 and later releases, SONET bidirectional line switched rings (BLSRs) can also be used for network protection. When a circuit pack is configured for a point-to-point configuration the even-numbered VCG port of the pair is unavailable.

Figure 7-5 Point-to-Point Example with Gigabit Ethernet



nc-dmx-099

Figure 7-6 Point-to-Point Example with Fast Ethernet



nc-dmx-091

Point-to-point in a network

The point-to-point configuration allow two Ethernet interfaces to be configured as though they were adjacent points on a LAN.

The system works as follows:

1. The Ethernet packets are received by the circuit pack.
2. The packet switch routes the packet to the appropriate VCG port.
3. The packet is framed and included in a VCG STS-1 packet
4. The packet is routed through the SONET network to the other Ethernet circuit pack.
5. The VCG group is disassembled; the framing is removed; and the packet is delivered to the packet switch.
6. The packet switch routes the packet to the appropriate Ethernet port.

Figure 7-7 illustrates the path for a point-to-point configuration which routes the traffic over a UPSR.

Figure 7-7 Point-to-Point Example over a UPSR

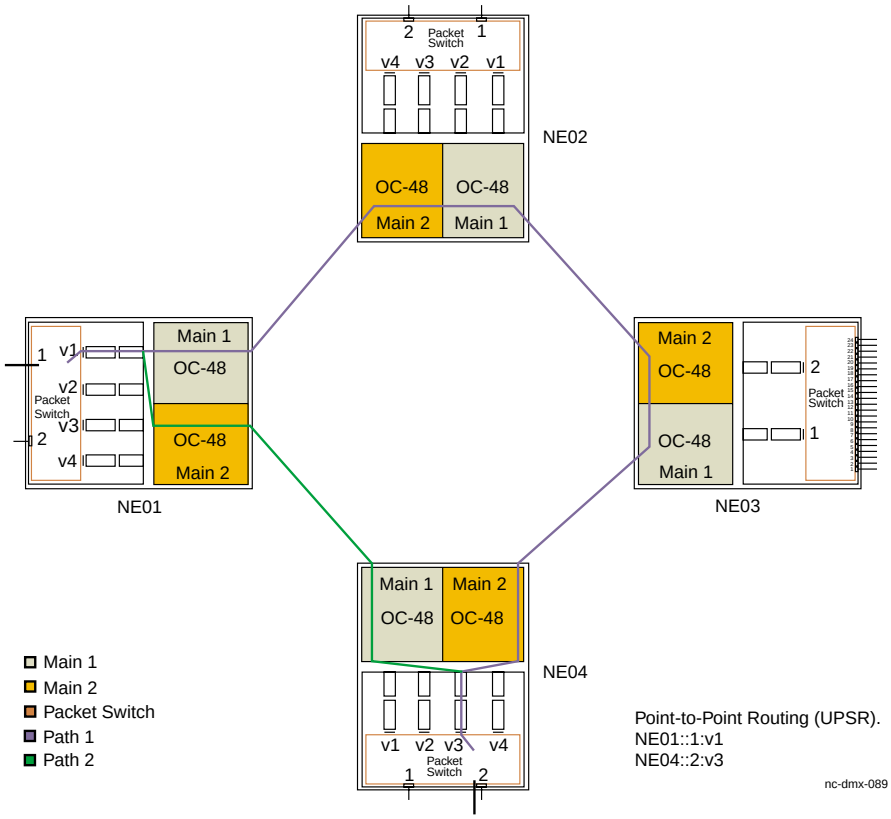
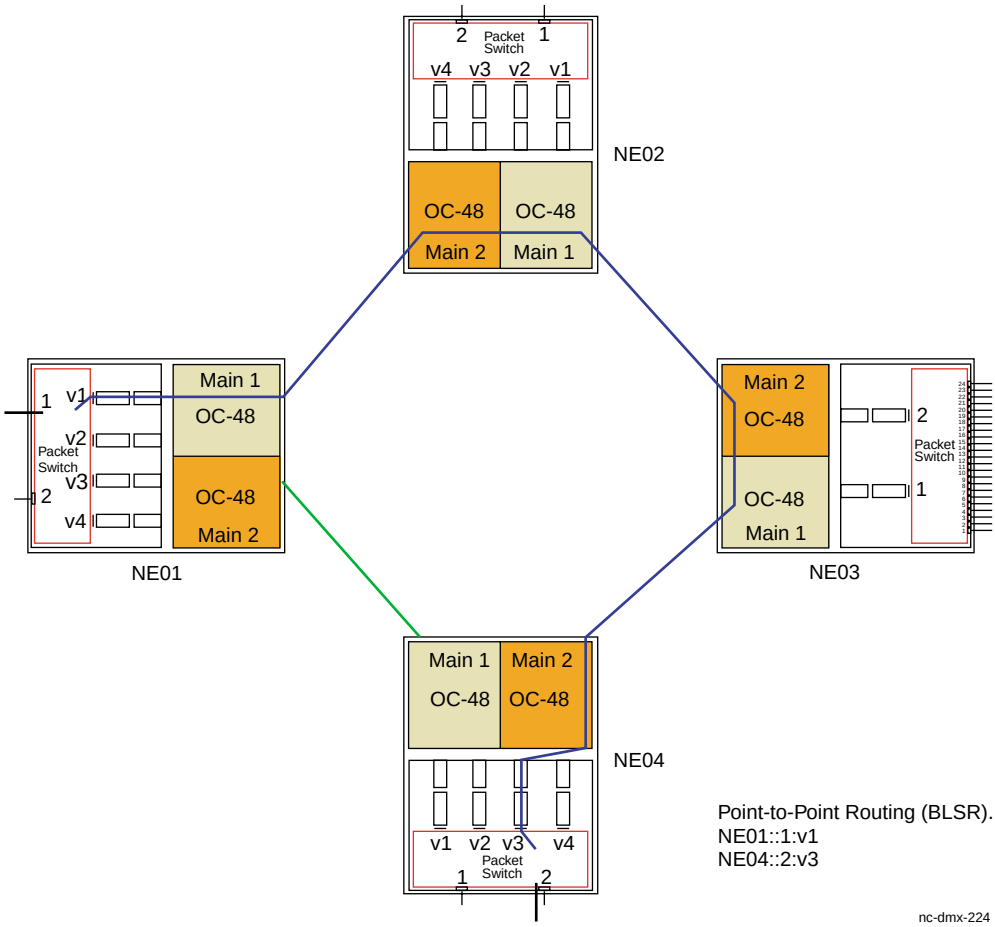


Figure 7-8 illustrates the path for a point-to-point configuration which routes the traffic over a 2-fiber BLSR.

Figure 7-8 Point-to-Point Example over a 2-Fiber BLSR



Multipoint

Multipoint configurations are used for LANs that have multiple drops from a SONET/SDH network. The configuration affects the way the card functions and the available network topologies. When a circuit pack is configured for a multipoint configuration, only the odd-numbered VCG ports are provisioned for cross-connections. The even-numbered port of the pair (VCG=n+1) mirrors the provisioned cross-connect settings of the odd-numbered port (VCG=n). One port is routed to Main 1, the other to Main 2.

Figure 7-9 illustrates a Gigabit Ethernet circuit pack configured for multipoint communications.

Figure 7-9 Multipoint Example with Gigabit Ethernet

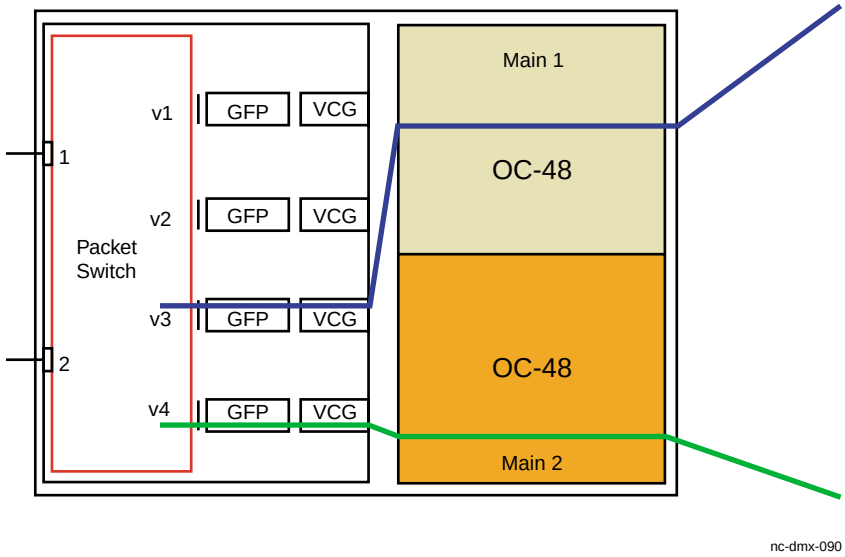
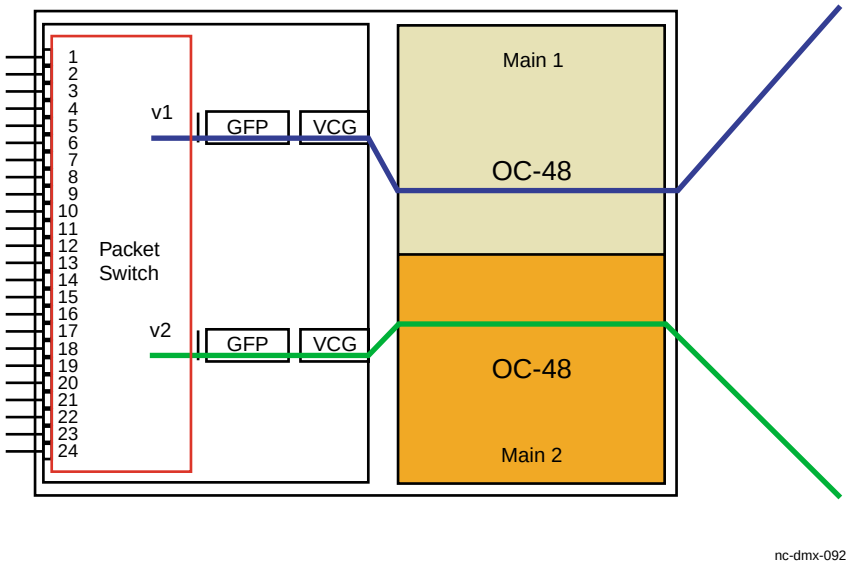


Figure 7-10 illustrates a Gigabit Ethernet circuit pack configured for multipoint communications.

Figure 7-10 Multipoint Example with Fast Ethernet



Multipoint in a network

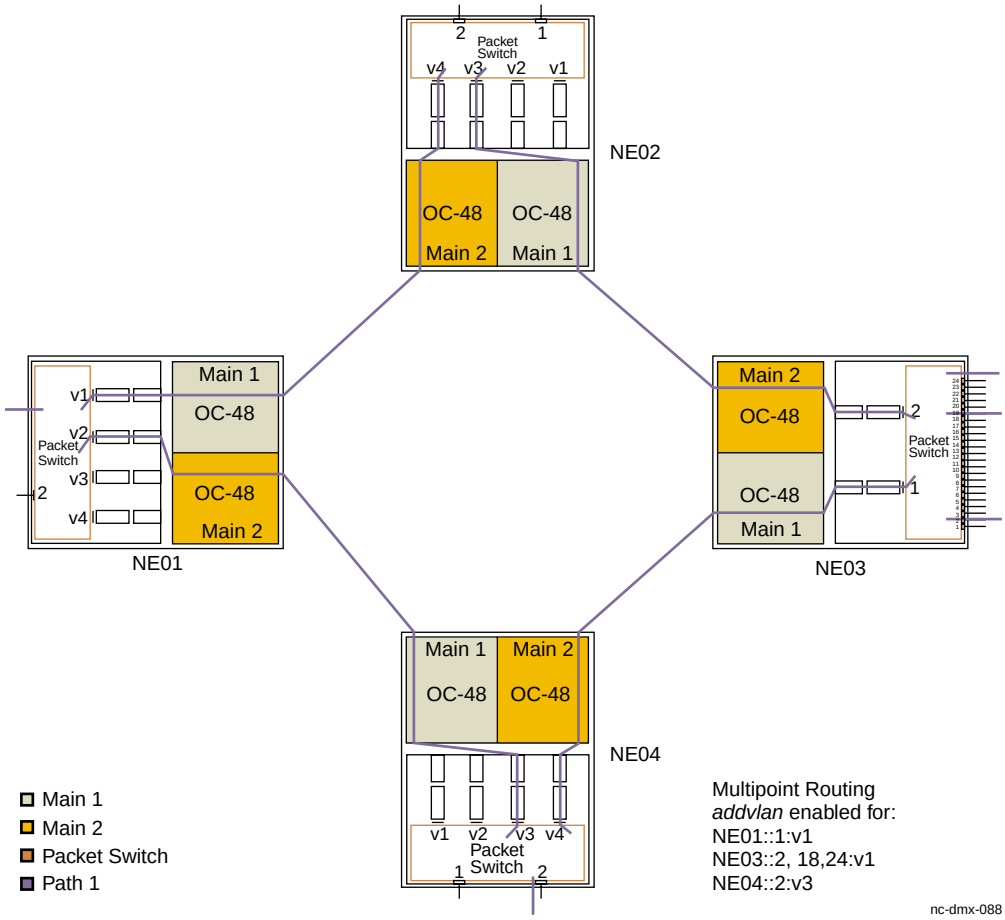
Multipoint configurations allow a LAN to have multiple drops from the SONET/SDH network. Also, multiple LANs can be configured through the network.

The system works as follows:

1. The Ethernet packets are received by the card.
2. The packet switch routes the packet to the appropriate VCG port or ports.
3. The packet is framed and included in a VCG STS-1 packet
4. The packet is routed through the SONET/SDH network to the other Ethernet circuit packs.
5. The VCG group is disassembled; the framing is removed; and the packet is delivered to the packet switch.
6. The packet switch routes the packet to the appropriate Ethernet ports, based on VLAN tagging.
7. If no port is enabled for the VLAN tag on the packet, the packet is discarded.

Figure 7-11 illustrates the path for a multipoint configuration which routes LANs to multiple drops over the network. In Release 3.0 and later releases, services may be transported over 2-fiber BLSRs with nonpreemptible unprotected traffic (NUT).

Figure 7-11 Multipoint Example over the Network



Rapid Spanning Tree Protocol

Overview

This section provides information on the configuration of rapid spanning tree protocol (RSTP).

Function of spanning tree

Spanning tree is a protection scheme for Ethernet transmission at the Ethernet packet level, as opposed to protection at the SONET level (UPSR/BLSR). Using rapid spanning tree protocol

- Eliminates loops in the network
- Restores transmission in the event of a broken link

Ethernet bridges and routers build tables that define the routes to specific devices. A MAC bridge, for example, has a filtering database that defines where to route any packets addressed to a specific MAC within the network. The tables are built based on input from devices within the network.

If there is a loop in the network, that is, if there is more than one way to get to a destination device, two problems can result:

- Frames may be duplicated in the network. That is, the same frame may be sent to a node via two different paths.
- The routing information will be changed as configuration bridge protocol data units (BPDUs) from that device are received across different paths. In a meshed network, the reconfiguration of the filtering database tables can begin to use up all the network resources, so that little bandwidth is left for data traffic.

Release 2.0 enhancements

In Release 2.0 and later releases, Metropolis® DMX supports several significant improvements to its packet-layer restoration capabilities:

With these enhancements, packet-layer restoration times are reduced from tens of seconds to a few hundred milliseconds. (Restoration time is a function of network size and configuration, location of the failure.)

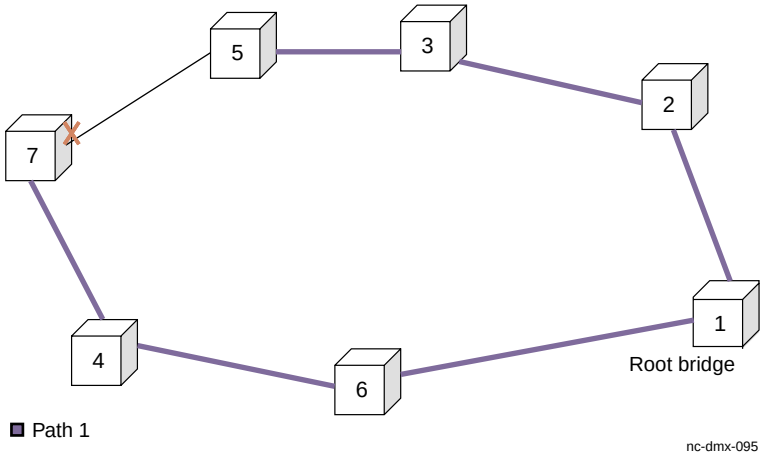
- Faster Failure Detection - The system uses SONET-layer failure detection to trigger packet-layer (spanning tree) reconfiguration, so packet-layer reconfiguration starts within a few milliseconds after a failure rather than several seconds later.
- IEEE 802.1W Rapid Reconfiguration - The system supports this new standard packet-layer restoration protocol, which uses new messages to significantly reduce convergence time.
- Enhanced STP configuration reports and controls which, together with 802.1W, enable support for much larger networks than are supported with IEEE 802.1D Spanning Tree Protocol.

How it works

Spanning tree works as follows:

1. Initially, every node in the group thinks it is the root node.
2. Configuration BPDUs are sent from each node to determine the most economical route from each node to the root node.
3. As information about the network becomes clear, one node is designated the root node; from this node, the distance to any point in the network may be measured.
4. Once the network has become clear, some ports are blocked so that there are no loops in the network and so that the network provides the most efficient paths from the root to the nodes. This effectively creates a tree structure for the network.
5. If an active link fails, the network is reconfigured so that previously blocked links can be used for traffic.

Figure 7-12 Spanning Tree



Legend:

Active Links 1 to 2; 2 to 3; 3 to 5; 1 to 6; 6 to 4; 4 to 7

Inactive Links 5 to 7

X Indicates a blocked port (frame relay is disabled)

Important! The configuration provides the shortest (most efficient) path from each node to the root. The configuration also provides only one path from among any two nodes.

Reconfiguration

If one of the active links is broken, the network reconfigures to activate the inactive link. For example, if the link between 2 and 3 is broken, the link between 5 and 7 would be enabled.

Spanning tree limitations

When running 802.1D Spanning Tree Protocol, there is a nine node network limitation. In order for spanning tree to reconfigure properly, the network cannot have more than nine nodes with spanning tree enabled. For example in a network with 30 nodes, only nine nodes can have spanning tree enabled. This limits the packet ring (multi-point) network size to nine nodes.

The maximum age timer also impacts performance and is recommended not to be increased for spanning tree.

Enhanced rapid spanning tree limitations

When running 802.1W Enhanced Rapid Spanning Tree Protocol with the *default* value settings, there is a nine node limitation in order for spanning tree to reconfigure properly. To increase the number of nodes running Enhanced Rapid Spanning Tree, the maximum age timer must be increased to support the desired spanning tree size. The default maximum age timer for both Spanning Tree and Enhanced Rapid Spanning Tree is 20. However, as the spanning tree size increases, the performance decreases. Use the following formula to determine the spanning tree size and the recommended setting of the maximum age timer:

*2 * (nodes + 1) <= maximum age timer*

For example, in a network with 20 nodes, the Maximum age timer should be provisioned as 42.

Administering spanning tree configurations

For information about creating a spanning tree configuration, refer to "Task 332: Determine Preferred Spanning Tree Configuration" (10-399). For information about changing an existing spanning tree configuration, refer to "Task 333: Change an Existing Spanning Tree Configuration" (10-407).

The **Configuration > Data > Create a Spanning Tree Group**, **Configuration > Data > Provision a Spanning Tree**, and **Configuration > Data > Delete a Spanning Tree Group** WaveStar® CIT commands are used to administer spanning trees. For more information about these commands and provisioning spanning trees, refer to the WaveStar® CIT on-line help.

□

Port Default Priority

Overview

Ethernet port default priority is used to determine the priority by which packets from a port are processed.

Priority levels

The following three levels or provisioning are available:

- High
- Low
- NA (Not Applicable): no priority assigned to this port

High or low priority

If an EPORT is provisioned for either high or low priority, frame processing depends on the tagging mode and whether or not the frame arrives with a VLAN tag and user priority.

Frame with a VLAN tag

In the 802.1q VLAN tagging mode, if a frame arrives at an EPORT with a VLAN tag, the frame is sent to the high or low priority queue based on the provisioned default priority of the port.

Frame without a VLAN tag

In the 802.1q VLAN tagging mode, if a frame arrives at an EPORT without a VLAN tag, a default VLAN tag is added with the user priority bits set according to the provisioned default priority of the port.

In the transparent tagging mode, all frames arriving at an EPORT are transparently tagged with a port tag with the user priority bits set according to the provisioned default priority of the port.

In both modes, if the port default priority is HIGH, then the priority tag is set to 0x7. If the port default priority is LOW, then the priority tag is set to 0x0. The frame is then sent to the high or low priority queue of the destination port according to the assigned priority value.

NA priority

If an EPORT is provisioned with a default priority of NA, no port default priority is assigned, and the frame processing depends upon the tagging mode and whether or not the the frame arrives with a VLAN tag and user priority.

Frame with a VLAN tag

In the 802.1q VLAN tagging mode, if a frame arrives at a EPORT with a VLAN tag, the frame is sent to the high or low priority queue based on the priority bits in the VLAN tag. If the tag value is 0x4 to 0x7, the frame is sent to the high priority queue. If the tag value is are 0x0 to 0x3, the frame is sent to the low priority queue.

Frame without a VLAN tag

In the 802.1q VLAN tagging mode, if a frame arrives at a EPORT without a VLAN tag, a default VLAN tag is added with the user priority bits set to 0x0. The frame is then sent to the low priority queue of the destination port.

In the transparent tagging mode, all frames arriving at an EPORT are transparently tagged with a port tag with the user priority bits set to 0x0. The frame is then sent to the low priority queue of the destination port.

Priority at a VCG port

If a frame arrives at a VCG port, the frame is sent to the high or low priority queue based on the priority tag. If the tag value is 0x4 to 0x7, the frame is sent to the high priority queue. If the tag value is 0x0 to 0x3, the frame is sent to the low priority queue.

Queue processing

The high and low priority queues are served using a weighted round robin with an 8:1 ratio. The system processes eight high priority frame, then one low priority frame, then eight high priority frame, then one low priority frame, and so on.

Priority provisioning

The EPORT default priority can be preprovisioned from the System View menu, by selecting **Configuration > Provision**, and then selecting the EPORT. Under the Admitted Frame Types tab, the Untagged VLAN Frames sections has a box for Default Priority selection.

Priority reporting

The priority can be reported from the System View menu, by selecting **View > View Equipment Details**, and then selecting the EPORT.

□

8 Acceptance Tasks

Overview

Purpose

The following procedures are for use in testing the Metropolis® DMX Access Multiplexer after another organization has equipped it. The procedures test the Metropolis® DMX system after all circuit packs have been installed and the shelf is looped back or after a system has been established end-to-end. They are not intended to be used for initial system turnup or in establishing an end-to-end system. System turnup procedures are found in this manual in Chapter 10, "Circuit Order/ Provisioning Tasks".

Contents

This chapter includes the following Acceptance Tasks:

Task 100: Accept Metropolis® DMX Shelf (Looped Back)

Purpose

Use this task to test and accept the Metropolis® DMX Access Multiplexer shelf.

> **Important!** It is assumed that the Metropolis® DMX is installed, powered, equipped, and free of alarms. If it is not left in that condition or fails to respond in the indicated manner, notify the installation organization that installed the Metropolis® DMX or refer to *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- 2 15 dB Line Buildouts (LBOs)
- 2 Fiber Jumpers (LC-Type Connectors)
- 1 or more DSX-1 or DSX-3 patch cords

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, verify that a CIT is connected and logged in to the Metropolis® DMX.

Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Task

Complete the following steps to accept a Metropolis® DMX.

. . . . . .

1 Verify correct circuit packs have been installed and option settings have been set correctly, if not already performed.

. . . . . .

2 Install optical loops and attenuators between the MAIN optical interface IN and OUT connectors on M1 and M2.

Important! An *inconsistent DCC switches* alarm will occur when the OLIUs are looped back. The alarms will be cleared in Step 7.

Reference: "Task 400: Connect OLIU Optical Loopbacks" (11-3)

3 Perform the LED test detailed in "Task 203: Perform LED Test" (9-21).
OR
Depress and hold the ACO pushbutton on the SYSCTL circuit pack. Verify that all SYSCTL and circuit pack LEDs light.
Release the ACO pushbutton. Verify that after several seconds, the LEDs on the Metropolis® DMX revert to their previous state.

Important! If the ACO pushbutton is depressed longer than two seconds, the SYSCTL display will scroll through the software version code and all LEDS will remain lighted until the code is displayed. 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 IND display. If the software in the SYSCTL is incompatible with the shelf configuration, the letter "C" will be displayed in the IND display. If these problems exist, refer the problem to the organization that installed the shelf.

4 Verify proper version of software is installed.

Reference: "Task 207: Retrieve Generic Software Version ID" (9-47)

5 Perform standalone transmission and cross-connect tests for each Function Units group, as required. Refer any failures to the organization that installed the Metropolis® DMX.

Important! These tasks assume that the Metropolis® DMX has been connected to the DSX-( ) cross-connect points, as required. DS1 and/or DS3 circuit packs must be inserted, as required before performing these tests.

Reference: Perform the appropriate task:

- "Task 401: Perform DS1 Transmission Test" (11-9)
- "Task 402: Perform DS3 Transmission Test" (11-17)

6 If required, from the **System View** menu, select **Fault > Reset > System Controller >Restore the system-level parameters to their default values** to reset provisionable parameters to default values.

Important! This step should not be performed on an in-service system.

Result: An inconsistent DCC switches alarm will occur when the command is executed.

7 To clear the inconsistent DCC switches alarm, disable the DCC:
From the **System View** menu, select **Configuration > DCC Terminations**.
Under **DCC Channel Parameter > Termination State**, select **Disabled** for dcc-m1-1 and dcc-m2-1.

8 Remove the optical loopbacks and attenuators installed in Step 2.

9 After each shelf in the network has been tested, the Metropolis® DMX will be ready for end-to-end testing.

Reference: "Task 101: Test (Accept) End-to-End Metropolis® DMX System (Network)" (8-7)

END OF STEPS

Task 101: Test (Accept) End-to-End Metropolis® DMX System (Network)

Purpose

Use this task to test and accept the Metropolis® DMX Access Multiplexer in an OC-48 or OC-192 end-to-end configuration. This configuration could be a single 2 node point-to-point ring or a multi-NE configuration.

> **Important!** It is assumed that the Metropolis® DMX is installed in an end-to-end network configuration and each shelf has previously been tested in a looped-back configuration.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- Optical Power Meter

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following chapters in this document:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, verify that a WaveStar® CIT is connected and logged in to the Metropolis® DMX.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Important! If the Metropolis® DMX fails to respond in the indicated manner, refer to *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

Task

Complete the following steps to accept a Metropolis® DMX in an OC-48/OC-192 end-to-end configuration.

. . . . . .

1 If required, from the **System View** menu, select
Fault>Reset>System Controller>
Restore the system-level parameters to their default values
to reset provisionable parameters to default values.

Important! This step should not be performed on an in-service system.

Result: An *inconsistent DCC switches* alarm will occur when the command is executed.

2 To clear the inconsistent DCC switches alarm, disable the DCC:
From the **System View** menu, select **Configuration > DCC Terminations**.
Under **DCC Channel Parameter >Termination State**,
select **Disabled** for dcc-m1-1 and dcc-m2-1.

3 Perform this step at each node to verify proper timing options:
From the **System View** menu, select **Configuration >Timing/Sync** and select the timing mode for the NE. Then complete the additional options for the node according to your work orders and the following table:

Free Running	No additional options are required
External Timing	From the **System Timing** Tab, provision **Mode Switching** and **Output Timing**. From the **Timing Input Ports** Tab, provision **DS1 Input and Output Format** and **DS1 Input Line Code**
Line Timing	From the **System Timing** Tab, provision **Mode Switching**, **Output Timing**, **Synchronization Source**, and **Synchronization Autoreconfiguration**. From the Timing Input Ports Tab, provision **DS1 Input and Output Format** and **DS1 Input Line Code**

Important! From the **System Timing** tab, set at least one node in the network for DS1 External or Free Running.

Important! When sync autoreconfiguration is enabled, Sbyte is also enabled.

4 Determine the optical loss of the optical facility from office records or by making the required measurements.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

5 Ensure all Metropolis® DMX OC-48 shelves (NEs) in the network have been properly connected to the optical facility. Verify the integrity of each optical span.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

6 From the **System View** menu, select **Configuration >DCC Terminations**. Under **DCC Channel Parameter >Termination State**, select **Enabled** to verify/enable the DCC channel between all nodes, as required.

7 Perform end-to-end line test on all optical spans. Report any failures to the organization that installed the Metropolis® DMX shelf.

Reference: "Task 404: Perform End-to-End Optical Line Test on Main OLIUs" (11-37)

8 Perform end-to-end DS1 transmission test in the MUX direction for each Function Units group, if required.

Reference: "Task 401: Perform DS1 Transmission Test" (11-9)

9 Perform end-to-end DS3 transmission test in the MUX direction for each Function Units group, if required.

Reference: "Task 402: Perform DS3 Transmission Test" (11-17)

10 Test protection switching function, if required.

Reference: "Task 406: Test Function Unit Equipment Protection Switching" (11-43)

11 Remove any unnecessary cross-connect patches for the end-to-end test.

12 The system is ready for service to be established.

13 Activate remaining optional features as required.

Reference: "Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login" (9-15)

"Task 358: Set NE Defaults — Enabling/Disabling Alarm Gateway, Alarm Group, Remote NE Status, and FTP" (10-595)

END OF STEPS

9 Operations Tasks

Overview

Purpose The following procedures are for operating the system such as connecting and using the WaveStar® CIT, activating optional system features, setting circuit pack options, installing a new generic software program.

Contents This chapter includes the following Operations Tasks:

Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session

Purpose

Use this task to connect PC and establish session.

Required equipment

The following equipment is required:

- Personal computer (PC) with WaveStar® CIT software installed
- Wrist strap
- At least one of the following cables:
  - RS-232 cable with an RJ-45 connector on one end and a PC serial connector on the other (typically DB9) for the **RS-232 CIT** port
  - CAT5 Ethernet cable with either a 10/100 hub or a cross-over cable for the **LAN CIT** or **IAO LAN** ports

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see Chapter 3, "Operations Interfaces" in this document.

Before you begin

Ensure that the descriptions and syntax of the various features and parameters of the Metropolis® DMX that may be set using the PC are understood prior to starting this task.

Task Complete the following steps to connect PC and establish a session.

1 Connect your PC (using the appropriate cable[s]) to one or two of the following ports:

- **CIT RS-232** serial port on the faceplate of the SYSCTL circuit pack to COM1 port of the PC
- **LAN** port on the faceplate of the SYSCTL circuit pack to the NIC card of PC
- **J16 IAO LAN** port on the rear of the Metropolis® DMX shelf to the NIC card of PC

Important! You can be connected to the **CIT RS-232** and the front **LAN** or the rear **J16 IAO LAN**.

Important! If you are uncertain that the LAN ports have already been provisioned, connecting via the serial port is recommended.

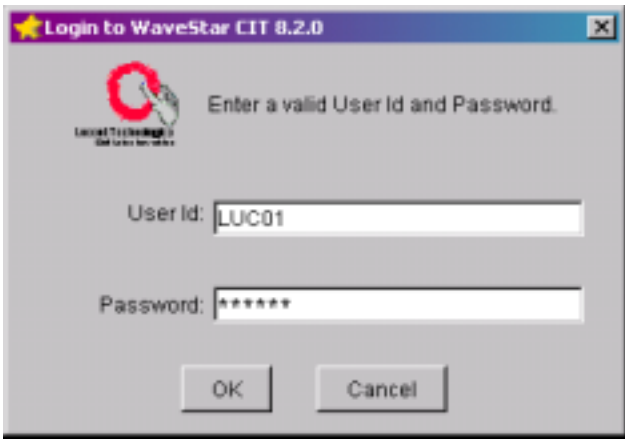
2 Start the WaveStar® CIT software on the PC by double-clicking on the WaveStar® CIT icon on your desktop (created by the installation procedure).

Figure 9-1 WaveStar® CIT Welcome Screen

3 Enter the following in the Login window (login information is case sensitive) to login to the WaveStar® CIT:

User ID: **LUC01**
Password: **LUC+01**

Figure 9-2 WaveStar® CIT Login Screen



Important! LUC01/LUC+01 and LUC02/LUC+02 are the default logins/passwords for the WaveStar® CIT. It is highly recommended that you change these logins and passwords during your first session to preserve the security of your equipment.

Important! Logins must adhere to the following guidelines:

- Logins must be five to ten alphanumeric characters in length.
- Logins are case sensitive.

Important! Passwords must adhere to the following guidelines:

- Passwords must be six to ten characters in length.
- Passwords must begin with a letter.
- Passwords must contain at least three non-alphabetic characters (numbers or symbols).
  At least one of the non-alphabetic characters must be a symbol

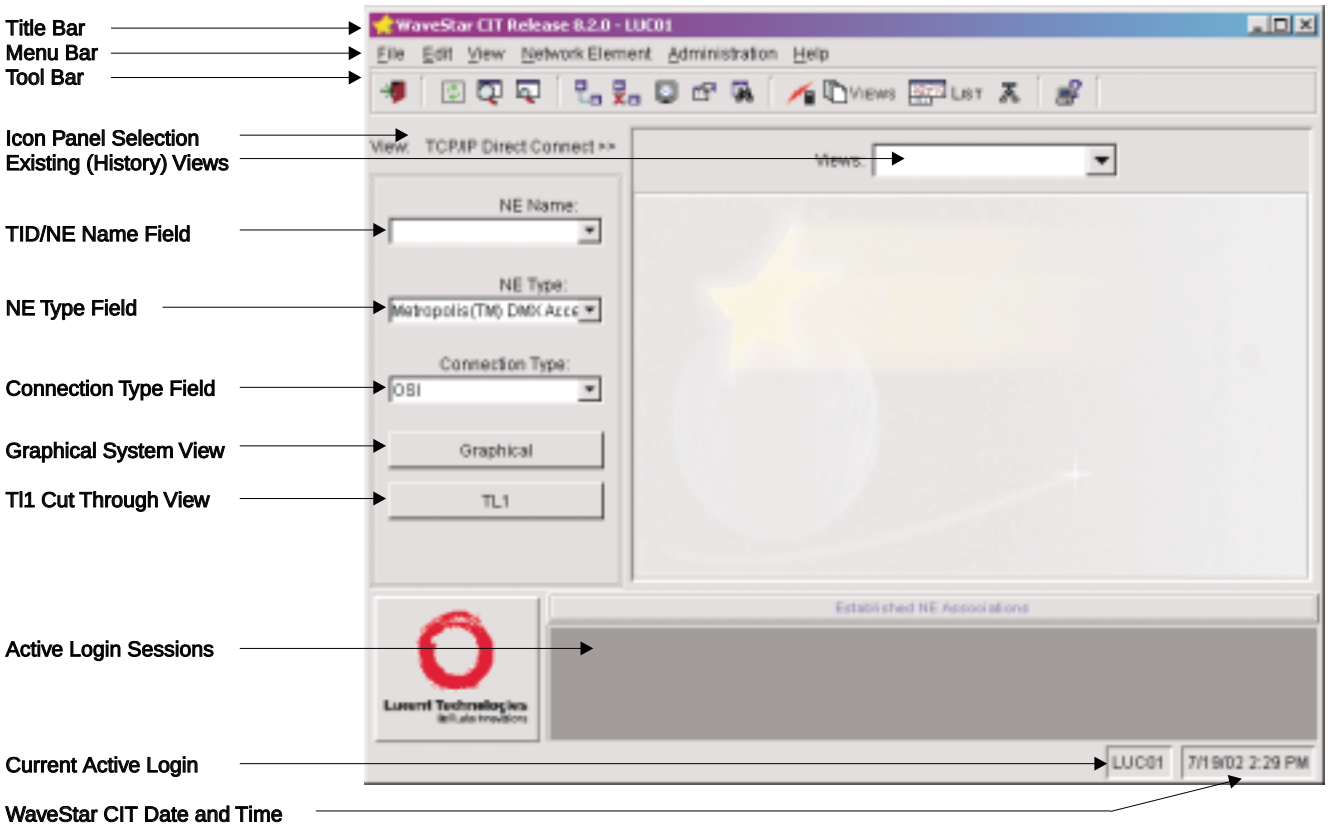
  Symbols may *not* include space ( ),, ampersand (**&**), “at” (**@**), comma (**,**), colon (**:**), semicolon (**;**), horizontal bar [underscore] (**_**), equals (**=**), question (**?**), or quotation (**“**).
- Passwords are case sensitive.

4 Click **OK** to bring up the Legal Notice.

Figure 9-3 Legal Notice

5 Read the Legal Notice and click **OK** to bring up the **Network View**.

Figure 9-4 Network View



6 Enter the NE name/TID of the Metropolis® DMX shelf that you wish to communicate with in the **NE Name:** field.

Important! The default TID is LT-DMX.

7 In the **NE Type:** field, click on the drop-down arrow and select Metropolis® DMX Access Multiplexer.

8 In the **Connection Type**: field, click on the drop-down arrow and select the appropriate connection type.

- OSI - if connected to the rear **J16 IAO LAN** or front **LAN** port
- Serial - if connected to the serial **CIT RS-232** port
- TCP/IP - if connected to the rear **J16 IAO LAN** or front **LAN** port

Important! When selecting TCP/IP...

- The TCP/IP option requires the NE to be provisioned to accept TCP/IP connections.
- A one-hour timeout interval exists with TCP/IP connections.

Reference: "Task 324: Provision/Enable/Disable TCP/IP on an IAO LAN Port" (10-205)

9 After completing the three fields, click on the **Graphical** button.

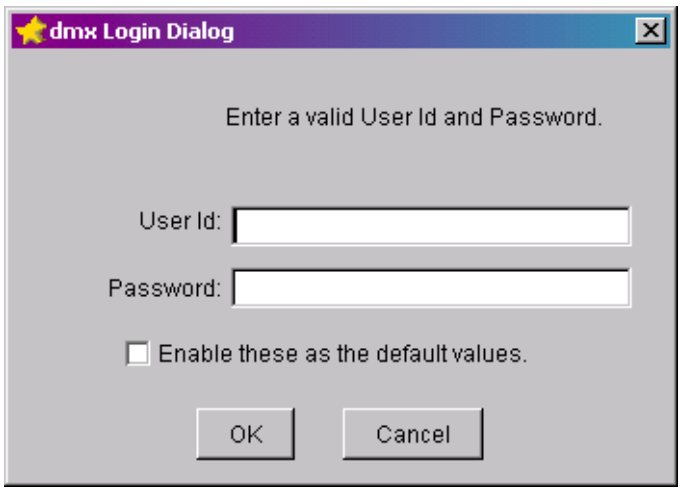
If you select the TCP/IP option, you must also enter the IP address of your NE and then click **OK**.

Important! All tasks in this manual assume that the **Graphical** button is used. However, the other option is the **TL1** button to perform maintenance using a **TL1** command line interface or the TL1 Command Builder interface.

Result: The shelf name can now be selected from the pull-down menu under the **NE Name** window.

10 An NE Login screen (Figure 9-5) appears:

Figure 9-5 NE Login



Enter the following in the Login window (login information is case sensitive) to login to the NE:

User ID: **LUC01**
Password: **DMX2.5G10G**

By selecting the **Enable these as the default values** checkbox, you will be able to reconnect to this NE without entering the User ID and Password. User ID and Password is stored for the duration of the CIT session and must be re-entered when the CIT is restarted.

> **Important!** LUC01, LUC02, LUC03 and DMX2.5G10G are the default privileged logins/password for Metropolis® DMX. It is highly recommended that you change all three logins and passwords during your first session to preserve the security of your equipment.

11 After a successful login, the NE Legal Notice screen appears.

Important! Your NE software Release number and User Privilege Level may be different. Your screen should be similar to Figure 9-6.

Figure 9-6 NE Level Legal Notice

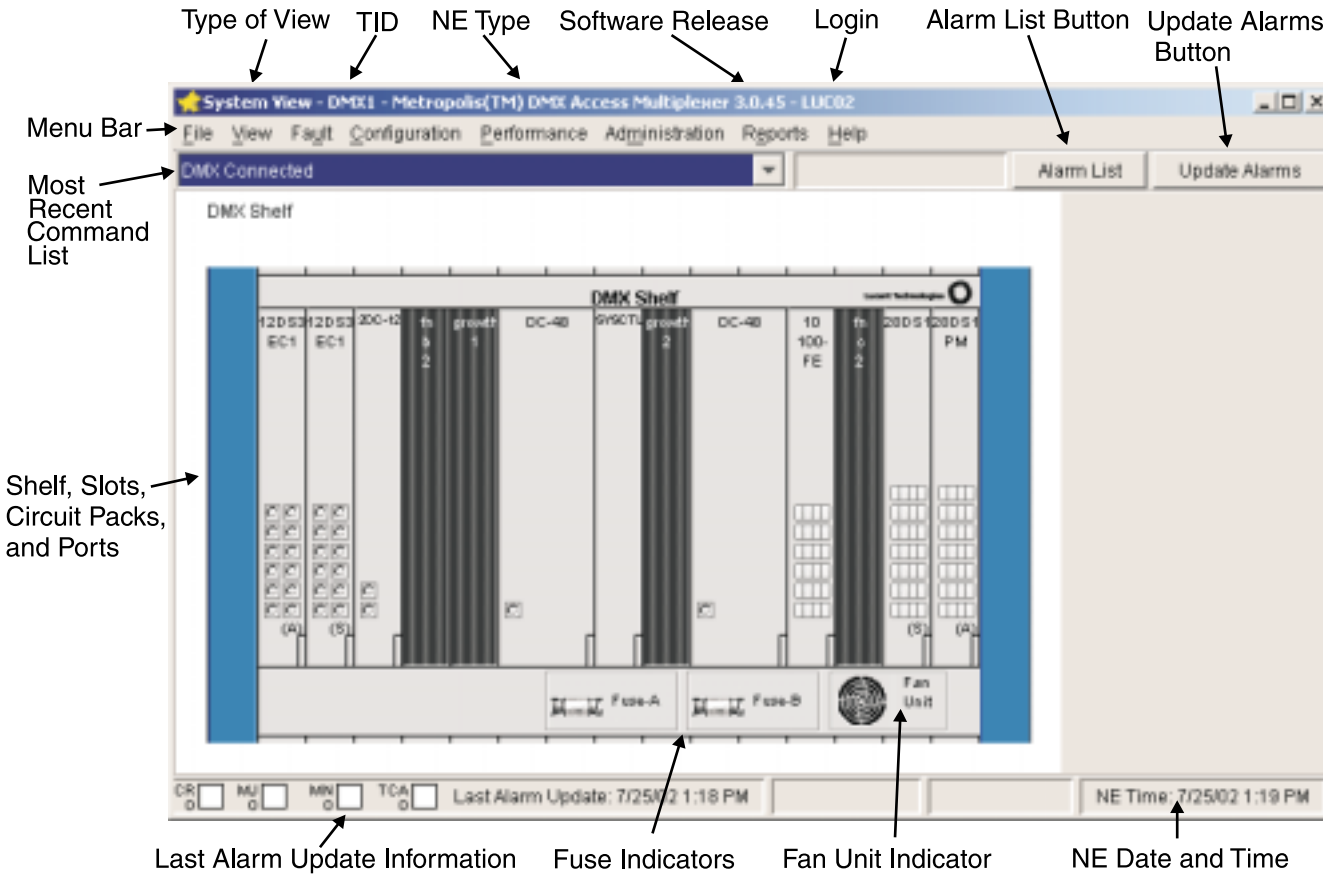
12 Read and observe the software Release (for example, **3.0.0**), and the User Privilege Level (for example, **Privileged**). Click on **OK** to continue.

13 Familiarize yourself with the different aspects of the graphical presentation of the shelf, including the toolbars, and status indicators.

The WaveStar® CIT has a menu bar across the top of the screen, a toolbar immediately below the menu bar, and status indicators across the bottom of the screen. Each item on the menu bar has a pull-down menu. Some menu items have additional submenu items.

The WaveStar® CIT is designed to Microsoft Windows® standards.

Figure 9-7 System View (Graphical)



Note: Release numbers and time/date stamps on your WaveStar® CIT may not match those displayed in Figure 9-7.

END OF STEPS

Task 201: Reserved for Future Use

Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login

Purpose

Use this task to change security or a user's login.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

You must login as a privileged user to complete this task.

The default privileged user login is **LUC01**, **LUC02**, or **LUC03**.

The default privileged user password is **DMX2.5G10G** .

Important! It is highly recommended that you change these logins and passwords during your first session to preserve the security of your equipment.

Important! Logins must adhere to the following guidelines:

- Logins must be one to ten characters in length.
- Logins may *not* include space ( ), asterisk (*****), ampersand (**&**), "at" (**@**), back slash (\), comma (**,**), colon (**:**), semicolon (**;**), horizontal bar [underscore] (**_**), equals (**=**), exclamation (**!**), question (**?**), or quotation (**"**).
- Logins are case sensitive.

Important! Passwords must adhere to the following guidelines:

- Passwords must be six to ten characters in length.
- Passwords must begin with a letter.
- Passwords must contain at least three non-alphabetic characters (numbers or symbols).
  At least one of the non-alphabetic characters must be a symbol.

  Symbols may *not* include space ( ), asterisk (*****), ampersand (**&**), "at" (**@**), back slash (\), comma (**,**), colon (**:**), semicolon (**;**), horizontal bar [underscore] (**_**), equals (**=**), exclamation (**!**), question (**?**), or quotation (**"**).
- Passwords are case sensitive.

Task

- Complete the following steps to change system security or a user's login. For additional information regarding provisionable entries required in this procedure, refer to Chapter 5, "Provisioning, Security, & Administration".

. . . . . .

1 Connect PC and establish a WaveStar® CIT session.

Important! You must login as a privileged user.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

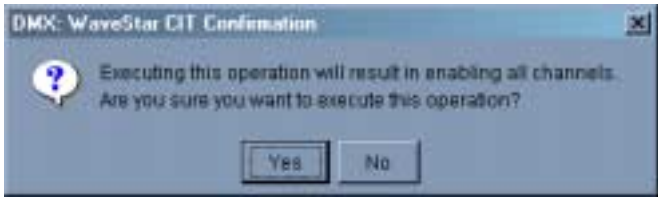
. . . . . .

2 Are you going to enable or disable system security or are you going to edit, delete, or enter (create) a user's login?

If you wish to...	Then...
Enable or Disable System Security (Lockout logins or enable logins)	Continue with Step 3.
Create a New User's Login	Proceed to Step 5.
Edit a User's Login	Proceed to Step 6.
Delete a User's Login	Proceed to Step 7.

3 From the **System View** menu, verify/select
Administration > Security > Enable Logins
or
Administration > Security > Lockout Logins
to enable or lockout security on an NE basis.

If your selection will change the current security status, one of the following screens will appear.



or

If this is acceptable, click **Yes**.

> **Important!** Performing a lockout will block all but privileged users from the system.

4 From the **System View** menu, select **Administration > Data Communications...**

- From the **Serial Port** tab, verify the **Access State** information for the **CIT Port** (**In Service** or **Lockout**).
- From the **LAN Management** tab, verify the **Access State** information for the **LAN Port** (**In Service** or **Lockout**).

Proceed to Step 8.

5 To create a new user login (refer to "Before you begin" (9-16) for login and password requirements):

From the **System View** menu select **Administration > Security > User Provisioning...**

1. From the **User ID Panel**, select **New User** and enter a new user ID in the adjacent field.
2. From the **User Password** panel, enter a password for the new user in the **Enter Password:** and **Confirm Password:** fields.
3. From the **User Privilege** panel, select a **Security Level** for the new user from the pulldown menu.
4. From the **Password Aging Period** panel, select **Disable** or enter a number of days (from **7-999**) for the new user.
5. From the buttons at the bottom of the **User Provisioning** menu, click **Add**.
6. Proceed to Step 8.

6 To edit a user login (refer to "Before you begin" (9-16) for login and password requirements):

From the **System View**, menu select **Administration > Security > User Provisioning...**

1. From the **User ID Panel**, select **Existing User** and an existing user ID from the pulldown menu.

   The remaining items in this step may be completed as required. Items not changed will maintain existing settings.
2. From the **New User ID** panel, enter the new ID for the existing user in the **Enter New User ID** field.
3. From the **User Password** panel, enter a password for the new user in the **Enter Password:** and **Confirm Password:** fields.
4. From the **User Privilege** panel, select a **Security Level** for the new user from the pulldown menu.
5. From the **Password Aging Period** panel, select **Disable** or enter a number of days (from **7-999**) for the new user.
6. From the buttons at the bottom of the **User Provisioning** menu, click **Modify**.
7. Proceed to Step 8.

7 To delete a user login:

From the **System View**, menu select **Administration > Security > User Provisioning...**

1. From the **User ID Panel**, select **Existing User** and an existing user ID from the pulldown menu.
2. From the buttons at the bottom of the **User Provisioning** menu, click **Delete**.
3. Proceed to Step 8.

Important! Privileged users cannot be removed.

8 Do you want to continue provisioning?

If...	Then...
Yes	Return to Step 2.
No	STOP! END OF TASK.

END OF STEPS

Task 203: Perform LED Test

Purpose

Use this task to test circuit pack LEDs.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Ensure that Metropolis® DMX is equipped with required circuit packs at the node being tested.

Task

Complete the following steps to perform the LED test.

1 Connect PC and establish a WaveStar® CIT session.

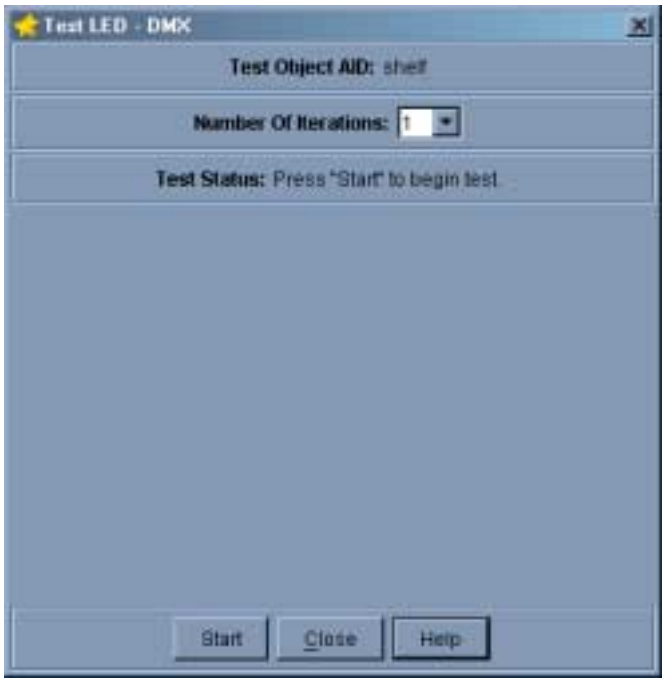
Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 From the **System View** menu, select **Fault> Test> LED...**
Select **Shelf** to perform the test on all LEDs.
Select **CP xxx** to perform the test on individual packs.

. . . . . .

3 The following screen appears
(in this example, **Shelf** was selected in Step 2):



In the **Number of Iterations** field, enter a number from 1 to 10 from the pull-down menu to indicate the number of cycles during which the LED test should be repeated.

Result: For each iteration:

1. All LEDs for the specified address light.
2. After 10 seconds, all LEDs go off.
3. After another 10 seconds, all LEDs are updated to show the current status of the system.

4 Did the LED test pass?

If...	Then...
Yes	STOP! END OF TASK.
No	Continue with Step 5.

5 Were you sent here by another task to perform an LED test?

If...	Then...
Yes	Continue with Step 6.
No	STOP! END OF TASK.

6 Record the circuit pack(s) (LEDs) that failed the LED test and return to the task that sent you here.

END OF STEPS

Task 204: Network Synchronization Provisioning

Purpose

To configure a network for the flow of valid timing signals between network elements under normal and failure conditions requires a well thought out synchronization plan. This task assumes such a synchronization plan exists and describes how to configure a Metropolis® DMX shelf accordingly.

Use this task to provision a timing mode and enable sync messaging and sync autoreconfiguration when needed.

The options for timing in the Metropolis® DMX are the following:

- Timing Source: either Free Running, External, or Line timing. External or Line timing allow for DS1 sync output mode to be enabled (external-syncout or line-syncout).
- Synchronization Autoreconfiguration: Enable/Disable. This option will enable/disable sync messaging using the S1 byte (Line only).
- Mode Switching: Revertive/Nonrevertive (Line or External).
- Synchronization Source. For Line-timed, external-syncout, or line-syncout, the source may be Main-1-1 or Main-2-1.

Because the default timing source is “External”, the NE will alarm and enter holdover if no DS1 inputs are available at turnup.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Related information

For related information, see the following:

- Chapter 4, “Synchronization Interfaces”
- Appendix B, Technical Specifications
- If you are unfamiliar with the parameters in this task, refer to **SET-SYNCN** in *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*.

Before you begin

Before you begin this task, verify that a PC is available. Ensure that the synchronization plan for the system is available.

Task Complete the following steps to provision network synchronization.

1 Connect PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the **System View** menu, select **Configuration** > **Timing/Sync**.

From the **System Timing** tab, select one of the following options from the **Timing Source** pull-down menu:

- Free Running
- External (default)
- Line

3 Click **Apply**.

Result: Whenever the timing mode is changed from free running to external or line timed, the FAULT LED on the OLIU in MAIN1 lights for approximately 3 seconds and extinguishes. Then the FAULT LED on the OLIU in MAIN2 lights for approximately 3 seconds and extinguishes. This indicates a reset and *not* an actual failure.

4 Did you select Free Running in Step 2?

If...	Then...
Yes	Proceed to Step 9.
No	Continue with Step 5.

5 Is syncout required/desired?

If...	Then...
Yes	Proceed to Step 9.
No	Continue with Step 6.

6 From the **System View** menu, select **Configuration** > **Timing/Sync**.

From the **System Timing** tab,

- from the **Output Timing** panel, select **Enabled** or **Disabled**.
- from the **Synchronization Source** panel, select **main-1-1** or **main-2-1** if output timing is enabled.
- from the **Synchronization Autoreconfiguration** panel, select **Enabled** or **Disabled**.
  Synchronization Autoreconfiguration applies to Line Timing mode only.

From the **Timing Output Ports** tab,

- from the **AIS Threshold** pull-down menu, select one of the following:
  - **SMC**
  - **ST3**
  - **ST3E**
  - **TNC**
  - **ST2**
  - **STU**

Click **Apply**.

7 To enter the DS1 Input Line Format and Code for the timing input ports (External only), from the **System View** menu, select **Configuration**>**Timing/Sync**.

From the **Timing Input Ports** tab,

- from the **DS1 Input and Output Format** panel for **REF-1** and **REF-2**, select **SF** (default) or **ESF**.
- from the **DS1 Input Line Code** panel for **REF-1** and **REF-2**, select either **AMI** (default) or **B8ZS**.

Click **Apply**.

8 To enter the DS1 Sync Output Equalization for the timing input ports (Line timing with output timing enable), from the **System View** menu, select **Configuration > Timing/Sync**.

From the **Timing Output Ports** tab,

- from the **DS1 Input and Output Format** panel for **REF-1** and **REF-2**, select **SF** (default) or **ESF**.
- from the **Timing Output Equalization** panel for **REF-1** and **REF-2**, select **20%** (initial value), **40%**, **60%**, **80%**, or **100%**.

Click **Apply**.

9 Do you wish to activate/deactivate Sync Status Messaging (SSM) on the MAIN OLIU ports?

If...	Then...
Yes	Continue with Step 10.
No	STOP! END OF TASK.

10 From the **System View** menu, select **Configuration > Provision**.

Select (expand) the **Shelf**.
Select (expand) the **CP main-1** or **CP main-2**.
Select **Port**.
Click **Provision**.

From **Sync Messaging:** in the **Fault Management** panel, select **Enable** or **Disable** if required.

Click **Apply** if any changes were made.

Click **Close**.

Important! Both ports may be provisioned differently.

END OF STEPS

Task 205: Replace Fan Filter

Purpose

Use this task to replace a fan filter.

Required equipment

The following equipment is required:

- Wrist Strap
- A replacement filter
  - For Metropolis® DMX
    comcode: 408 456 770
  - For Metropolis® DMX high capacity shelf
    comcode: 408 682 615

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see Chapter 3, "Operations Interfaces" in this document.

Before you begin

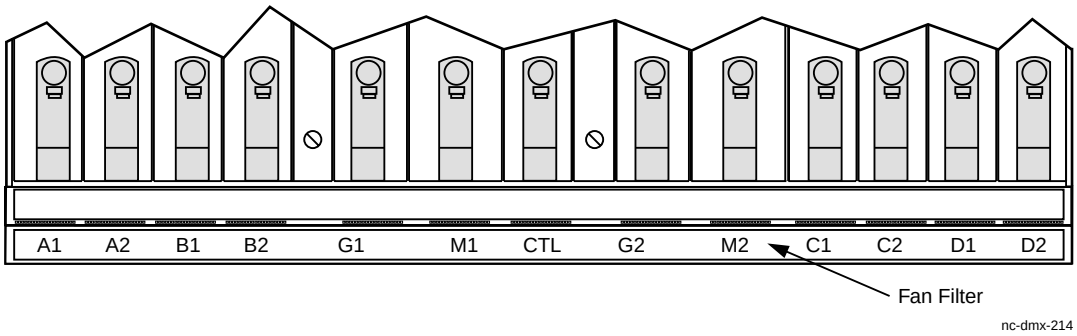
Ensure that the replacement fan filter is the same type as the original fan filter.

Task Complete the following steps to replace the fan filter.

1 Remove the fan filter by pulling it towards you.

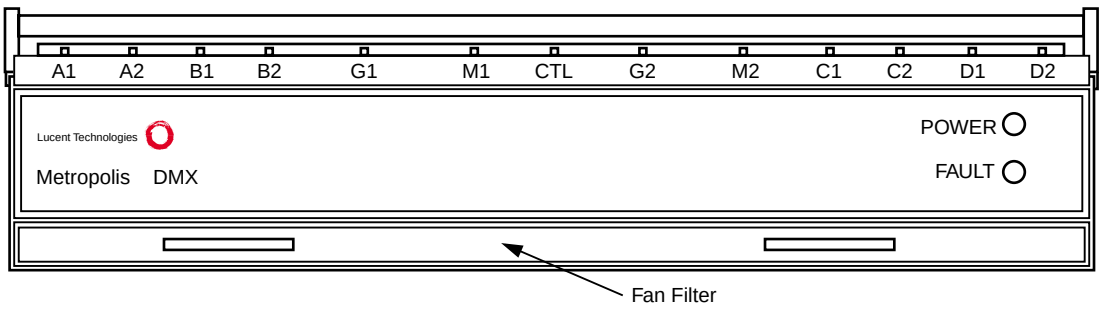
The Metropolis® DMX fan shelf is installed above the Metropolis® DMX shelf. The fan filter is located just below the Metropolis® DMX fiber tray (see Figure 9-8).

Figure 9-8 Metropolis® DMX Fan Filter



The Metropolis® DMX high capacity fan shelf is installed below the Metropolis® DMX high capacity shelf. The fan filter is located just below the Metropolis® DMX high capacity fan shelf (see Figure 9-9).

Figure 9-9 Metropolis® DMX Fiber Tray



2 Install new filter into the fan filter slot.

END OF STEPS

Task 206: Release 3.0.0 Software Generic Download and Upgrade via FTP (In-Service System)

Purpose

Use this task to download the R3.0.0 software generic via FTP over TCP/IP to the dormant area of any Metropolis® DMX shelf (local or remote) that is currently running an R2.0.x or later software generic.

This task uses the *cpy-mem* command to download software via FTP over TCP/IP in an in-service Metropolis® DMX shelf.

Important!

- A privileged login is required to perform this task.
- FTP cannot be used to download software unless the destination NE is running Release 2.0 or later.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Cable to connect the PC to Metropolis® DMX
- Working copy of the new system generic software program on CD-ROM
- Current *Metropolis® DMX Access Multiplexer Software Release Description* for the software generic being installed.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, refer to Chapter 3, "Operations Interfaces" in this document.

Before you begin

Before beginning the software download, refer to the *Metropolis® DMX Access Multiplexer Software Release Description* for the software being downloaded for a description of any special considerations involving this version of software.

Important! If the FTP server fails to start, it could mean that another program using an FTP server is already running. Depending on what operating system you are using, you must go to the device file and disable the FTP server.

- For Windows 2000 operating systems, select **Start** > **Settings** > **Control Panel**. Select **Administrative Tools**, then **Computer Management**, then **Services and Applications**, and then **Services**.
- For Windows NT operating systems, select **Start** > **Settings** > **Control Panel**. Select **Devices**.

Task

Complete the following steps to download system software via FTP.

1 If not previously completed, install generic and WaveStar® CIT software on the PC.

Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

2 Establish a WaveStar® CIT session (specifying either OSI or Serial in the **Connection Type:** field) and log in to the destination shelf (the shelf to which you want to download the software) in your network.

Important! FTP cannot be used to download software unless the destination NE is running Release 2.0 or later.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

3 Provision the destination shelf for TCP/IP communications. From the System View menu, select **Administration > Data Communications...** .

Result: The Data Communications for *TID* (your TID) window appears.

Figure 9-10 Example of the Data Communications Window

4 Which port are you provisioning for TCP/IP?

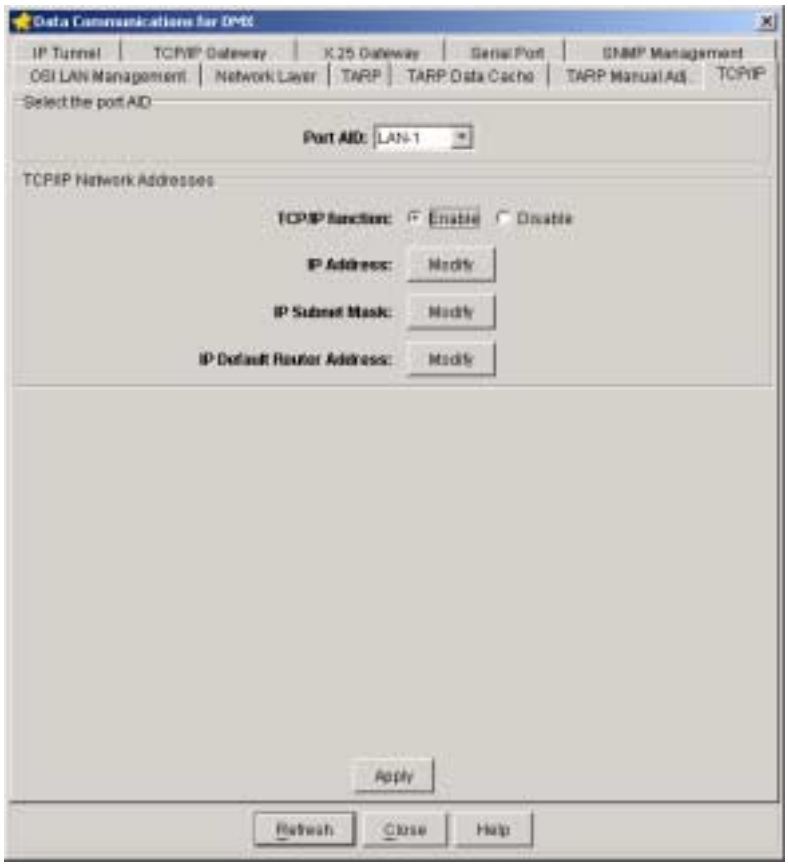
If...	Then...
lan-1 for the front **LAN** port on the SYSCTL	Continue with Step 5 and then proceed to Step 7.
lan-2 for the rear **J16 IAO LAN** port on the backplane	Proceed to Step 6 and then continue with Step 7.

Important! lan-1 is intended to be used for local (direct) software downloads.

5 From the Data Communications for *TID* window (Figure 9-11), click on the **TCP/IP** tab and provision the following fields accordingly for lan-1:

- **Port AID:** select the port that you are using for FTP: lan-1
- **TCP/IP function:** select enable
- Click **Modify** to either enter or change the following:
  - IP Address
  - IP Subnet Mask
  - IP Default Router Address (if necessary)

Figure 9-11 lan-1 Data Communications Window

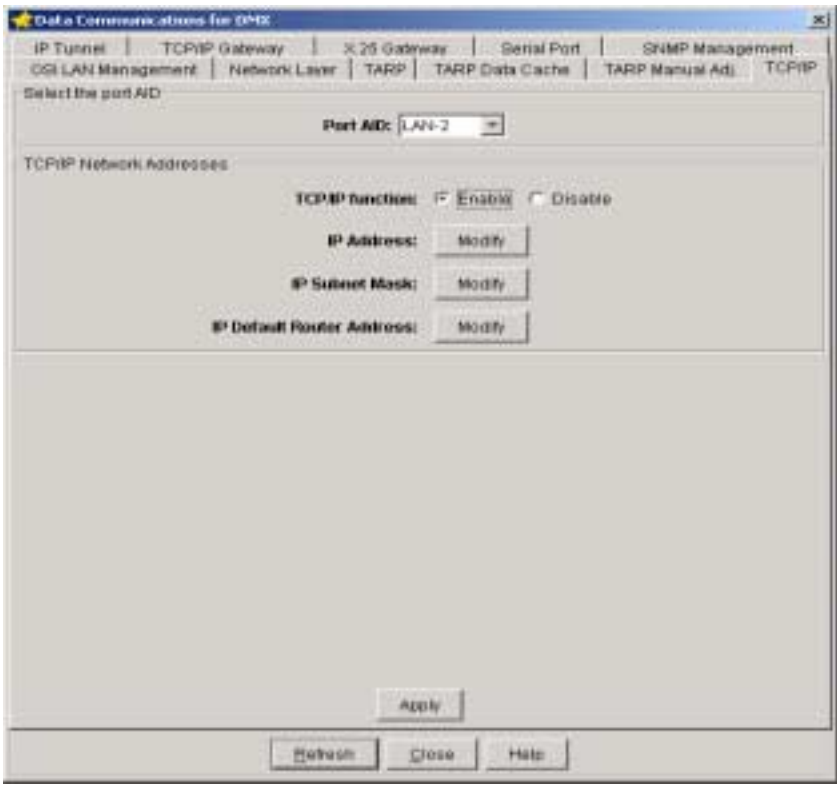


Important! Because lan-1 is intended to be used for local (direct) software downloads, the IP Default Router Address is not required when using lan-1.

6 From the Data Communications for *TID* window (Figure 9-12), click on the **TCP/IP** tab and provision the following fields accordingly for lan-2:

- **Port AID:** select the port that you are using for FTP: lan-2
- **TCP/IP function:** select Enable
- Click **Modify** to either enter or change the following:
  - IP Address
  - IP Subnet Mask
  - IP Default Router Address

Figure 9-12 lan-2 Data Communications Window



7 Click **Apply**.

Result: The following warning message appears:
This operation will cause the System View to close and may cause the system to reset. Do you want to execute this command?

8 Click **Yes**.

Important! Following a Metropolis® DMX system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). After 5 minutes (to allow for additional NE resets, as in the case of a network software upgrade), the shelf attempts an automatic synchronization of the time and date with another NE in the network. If the remote NE has not responded to the synchroniztion request within 2 minutes, the request is forwarded to another NE in the network. Each remote NE is allowed 2 minutes to respond. If a valid time and date is not found within the network, it must be entered manually.

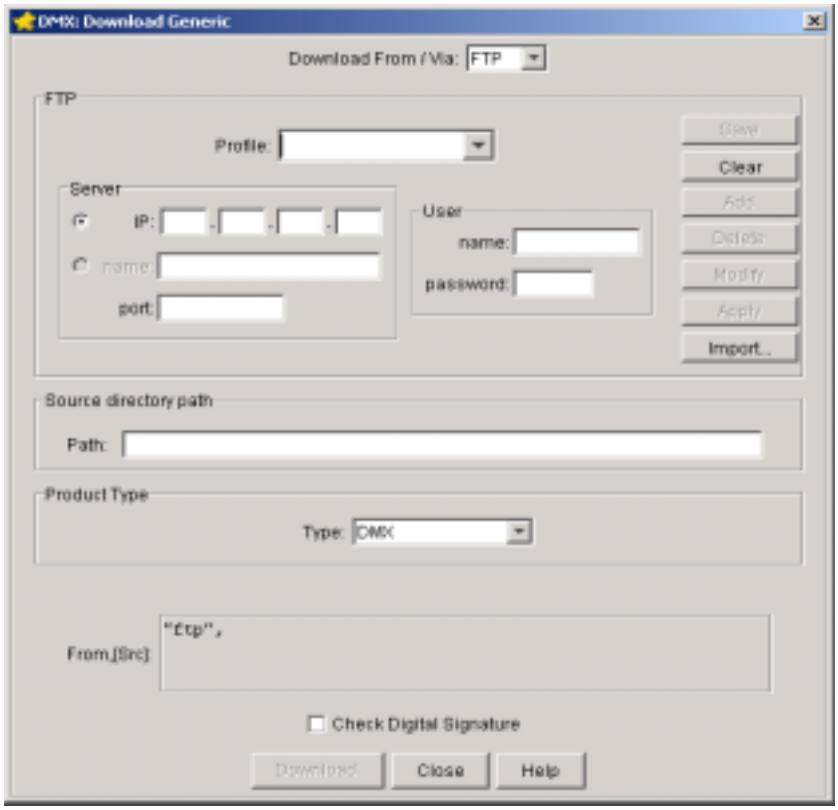
Reference: "Task 354: Set Date and Time" (10-571).

9 Specifying either OSI or Serial in the **Connection Type:** field, log in to the destination shelf again.

10 From the **System View** menu, select **Configuration** > **Software** > **Download Software....**

Result: The Download Generic window appears.

Figure 9-13 Download Generic Window



11 You must enter a valid download profile (If the profile already exists, you may select it from a pull-down menu. If you are creating a new profile, you may assign it a name and save it for future use).

Enter the following information in the Download Generic window (Figure 9-13):

1. In the pull-down menu entitled **Download From/Via:** select **FTP**. *NOTE: No other options are available at this time.*
2. In the **Profile:** field enter the desired name of this profile.

   (If the profile already exists, you may select it from the pulldown menu. NOTE: If you are selecting an existing profile, you may verify/change the name of the profile.)
3. In the **Server** panel, select **IP** and enter the address of the FTP server (often the WaveStar® CIT).
   Enter the **port:** (usually 21).
4. In the **User** panel, enter your user name and password for the FTP server (often the WaveStar® CIT).
5. If you are creating a new profile, click **Add**. The profile is now accessible from the **Profile:** pull-down menu.

   If you are modifying an existing profile, click **Save**.
6. In the **Source Directory Path** panel, enter the current location of the generic to be downloaded.

   Important! If the WaveStar® CIT is the FTP server, this entry must be in the following form:

```
generics/dmx/3.0.0/p/
```

   Important! If you are using the WaveStar® CIT as your FTP server, you must separate your directory structure using either "/" (as illustrated in the example above) or "\\" because TL1 interprets "\" as a character. The WaveStar® CIT fills in the beginning of the default path (C:/Program Files/Lucent Technologies/WaveStar CIT/).

   If the FTP server is not the WaveStar® CIT, then enter the path starting at the FTP home directory on the server.
7. In the **Product Type** panel, select **DMX**.

12 Click **Download**.

Result: A warning message appears indicating the transfer you are about to execute. *Do you wish to continue?*
Verify the information and click **Yes**.

While the transfer is in progress, the following in-progress indicator window appears. (The FTP download takes approximately 10 minutes.)

When the transfer is complete, the in-progress indicator window closes and the software download complete window appears.
Click **OK**.

13 Do you wish to watch the FTP download progress?

If...	Then...
Yes	Continue with Step 14.
No	Proceed to Step 15.

14 From the **Network View**, either

- select **Administration > FTP Administration...**.

  or

- click on the rotating FTP icon in the lower left-hand corner of the the Network View Window (not illustrated in Figure 9-14)

Result: The FTP Server window appears. Click **Close** when finished.

Important! Figure 9-14 illustrates the Network View; most WaveStar® CIT activities are executed from the System View menu.

Figure 9-14 Network View

15 Do you wish to apply (activate) the software generic that you recently downloaded to the dormant area of the Metropolis® DMX shelf?

If...	Then...
Yes	Continue with Step 16.
No	Proceed to Step 22.

16 Log in to the remote Metropolis® DMX to which you copied the software.

Specify the following when establishing the WaveStar® CIT session:

- **NE Name:** field: TID of the remote NE
- **NE Type:** field: Metropolis DMX Access Multiplexer
- **Connection Type:** field: OSI or Serial

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

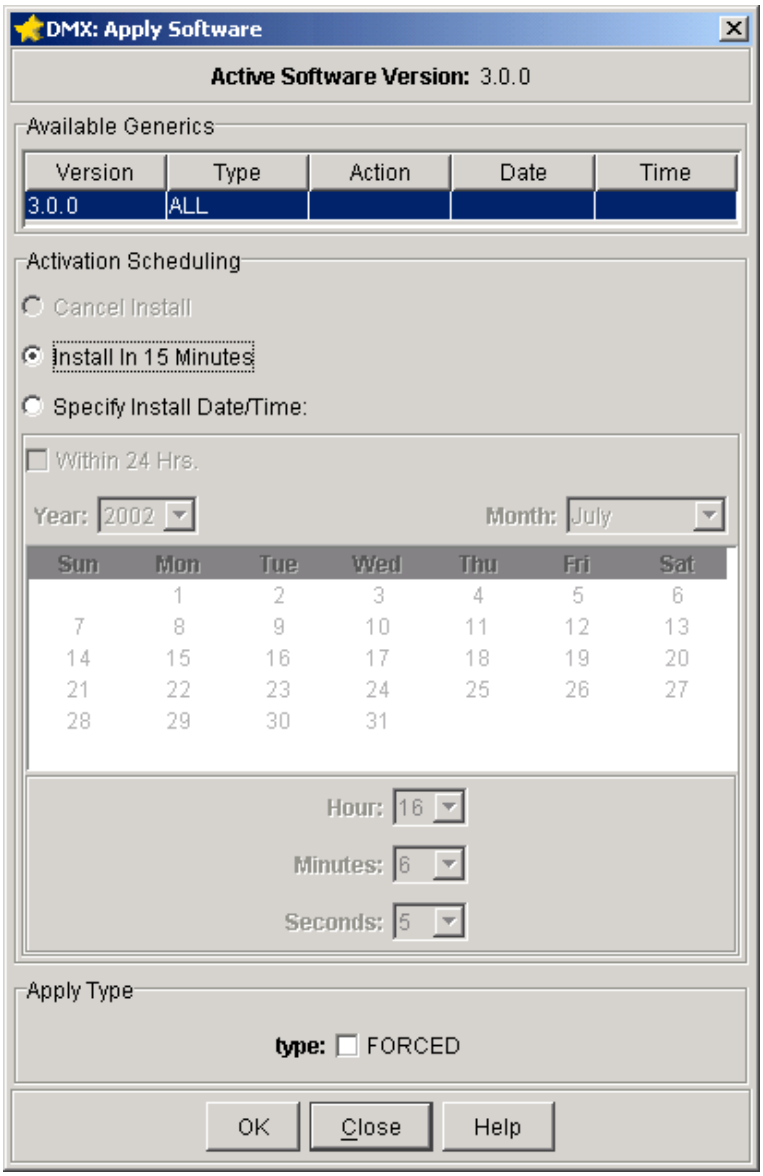
Result: After a few moments, the NE with the TID you previously specified appears in the System View.

17 From the **System View** menu, select **Configuration > Software > Apply Software**....

Important! The TID of the remote shelf will not be the same as your local shelf. Figure 9-15 is only an example of the window.

Result: The Apply Software window appears.

Figure 9-15 Apply Software Window



18 Select and/or enter the following information in the **Apply Software** window (Figure 9-15):

1. From the **Available Generics** panel, select the software generic to be activated.
2. From the **Activation Scheduling** panel, you may schedule the activation time and date in *one* of the following ways:
   - Select **Install In 15 Minutes**
     The software will install 15 minutes after you click **Okay**.
   - Select **Specify Install Date/Time** and select the **Year**, **Month**, **Date** and **Time**.
     In this case, the **Hour**, **Minute**, and **Second** fields are used to enter a 24-hour clock time (13 hours and 15 minutes means that the software will apply at 1:15 PM on the date specified).
   - Select **Specify Install Date/Time** *and* **Within 24 Hours**.
     In this case, the **Hour**, **Minute**, and **Second** fields are used to enter the time within 24 hours of the current date and time after you click **OK**.

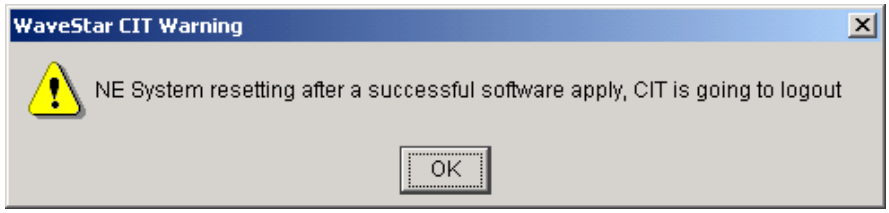
   Important! You may cancel the scheduled apply by returning to the **Apply Software** menu at any time before the software applies and selecting the generic and **Cancel Install** and then clicking **OK**.
3. Click **OK**.

Result: The following warning message appears:
Execution of Provision may affect the NE service. Do you want to execute this command?
Click **Yes**.

19 After approximately 15 minutes the apply is complete.

Result: The following warning screen appears, click **OK**. The System View closes.

Important! If the WaveStar® CIT Network View is unresponsive, perform a shut-down using Windows Task Manager to End the WaveStar® CIT.



Important! Following a Metropolis® DMX system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). After 5 minutes (to allow for additional NE resets, as in the case of a network software upgrade), the shelf attempts an automatic synchronization of the time and date with another NE in the network. If the remote NE has not responded to the synchroniztion request within 2 minutes, the request is forwarded to another NE in the network. Each remote NE is allowed 2 minutes to respond. If a valid time and date is not found within the network, it must be entered manually.

20 Establish a WaveStar® CIT session (specifying either OSI or Serial in the **Connection Type:** field) and re-log in to your Metropolis® DMX shelf.

Result: The title bars of the System View and the legal notice should both reflect the current NE software generic, R3.0.0.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (8-3)

21 Is the Generic Software Version correct?

If...	Then...
Yes	Continue with Step 22.
No	Contact your support center.

22 Repeat this task from Step 2 for each shelf that you wish to upgrade via FTP.

END OF STEPS

Task 207: Retrieve Generic Software Version ID

Purpose

Use this task to retrieve the generic software version that is loaded into the system.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see Chapter 3, "Operations Interfaces" in this document.

Before you begin

Ensure that the descriptions and syntax of the commands and parameters of the Metropolis® DMX that may be set using the PC are understood prior to starting this task.

Task

Complete the following steps to retrieve the generic software version ID.

1 Are you physically in front of the Metropolis® DMX for which you want to determine the generic software version?

If...	Then...
Yes	Continue with Step 2.
No	Proceed to Step 5.

2 Depress and hold the **ACO TEST** push-button on the SYSCTL for about 4 seconds.

Result: All LEDs on the shelf light. **8.** appears in the **IND** display on the SYSCTL.

3 Release the **ACO TEST** push-button on the SYSCTL when the **8.** disappears in the **IND** display.

Result: The current software generic appears in the **IND** display on the SYSCTL and the shelf LEDs return to their previous status.

4 STOP! END OF TASK.

5 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

6 The active generic can be accessed from the title bar in the WaveStar® CIT **System View** window.

OR

From the **System View**,
right click on the SYSCTL circuit pack,
then click on **View Circuit Pack sysctl Details**.
In the **Equipment Details** section, **Program Version** indicates the current generic software of the system.
Click **Close**.

END OF STEPS

Task 208: Install SYSCTL (LNW1) in New Metropolis® DMX Shelf

Purpose

Use this task to install a SYSCTL (LNW1) in a new Metropolis® DMX shelf for the first time.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see Chapter 2, "Platform Description" in this document.

Task

Complete the following steps to install the SYSCTL in a new shelf.

1 Insert the LNW1 (SYSCTL) circuit pack into the slot labeled CTL in the center of the shelf using a steady pressure on both faceplate latches.

2 Observe one of the following indications on the IND display. Note the indication and follow the suggested task.

Indications in the SYSCTL IND display:

- Nothing displayed indicates compatible software installed in the SYSCTL. Proceed to Step 4.
- Letter "**P**" indicates no software installed in the SYSCTL and 1.x boot code. Proceed to "Task 213: Install Software Generic Program in New Metropolis® DMX Shelf Installation" (9-101) for instructions on installing the new software generic.
- Alternating letter "**P**" and number "**2**" indicates no software installed in the SYSCTL and 2.0 boot code. Proceed to "Task 213: Install Software Generic Program in New Metropolis® DMX Shelf Installation" (9-101) for instructions on installing the new software generic.
- Alternating letter "**P**" and number "**2.**" and number "**1**" indicates no software installed in the SYSCTL and 2.1 boot code. Proceed to "Task 213: Install Software Generic Program in New Metropolis® DMX Shelf Installation" (9-101) for instructions on installing the new software generic.
- Alternating letter "**P**" and number "**3**" indicates no software installed in the SYSCTL and 3.0 boot code. Proceed to "Task 213: Install Software Generic Program in New Metropolis® DMX Shelf Installation" (9-101) for instructions on installing the new software generic.
- Letter "E" indicates SYSCTL must be replaced. Get replacement SYSCTL and repeat this task.
- Letter "F" indicates that SYSCTL faceplate latch is not fully seated. Unplug SYSCTL and repeat this task, properly seating the faceplate latch.
- Letter "L" indicates a low voltage condition (brownout) on the shelf. Refer to *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*.

3 STOP! END OF TASK.

4 To retrieve generic software version ID, depress and hold the **ACO TEST** push-button on the SYSCTL for about 4 seconds.

Result: All LEDs on the shelf light. **8.** appears in the **IND** display on the SYSCTL.

5 Release the **ACO TEST** push-button on the SYSCTL when the **8.** disappears in the **IND** display.

Result: The current software generic appears in the **IND** display on the SYSCTL and the shelf LEDs return to their previous status.

6 Is proper software version installed?

If...	Then...
Yes	STOP! END OF TASK.
No	Continue with Step 7.

7 Find another circuit pack with compatible software and repeat this task, or install new software.

Reference: "Task 213: Install Software Generic Program in New Metropolis® DMX Shelf Installation" (9-101)

END OF STEPS

Task 209: Release 3.0.0 Software Generic Upgrade for Local Shelf (In-Service System)

Purpose

Use this task to upgrade a local Metropolis® DMX shelf that is in-service to the new R3.0.0 software generic.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist strap
- Cable to connect the PC to Metropolis® DMX
- Working copy of the new system generic software program on CD-ROM
- Current *Metropolis® DMX Access Multiplexer Software Release Description* for the software generic being installed.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see Chapter 3, "Operations Interfaces" in this document.

Before you begin

Before beginning the software installation, refer to the *Metropolis® DMX Access Multiplexer Software Release Description* for the software being installed for a description of any special considerations required when installing this version of the software.

Important! A privileged login is required to perform this task.

Task Complete the following steps to install and upgrade your system software.

. . . . . .

1 If not previously completed, install generic and WaveStar® CIT software on the PC.

Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

. . . . . .

2 Observe the SYSCTL **IND** display. Note that there is nothing displayed indicating that compatible software is installed and running in the SYSCTL.

. . . . . .

3 Depress and hold the **ACO TEST** push-button on the SYSCTL for about 4 seconds.

Result: All LEDs on the shelf light. **8.** appears in the **IND** display on the SYSCTL.

. . . . . .

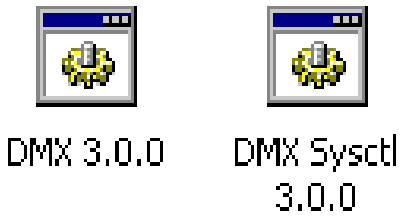
4 Release the **ACO TEST** push-button on the SYSCTL when the **8.** disappears in the **IND** display.

Result: The current software generic appears in the **IND** display on the SYSCTL and the shelf LEDs return to their previous status.

5 Double-click on **DMX 3.0.0 Downloads** folder on you PC desktop.

Result: The *DMX 3.0.0 Downloads* folder contains the following two icons.

Figure 9-16 Contents of DMX 3.0.0 Downloads Folder



6 What is the current software generic (as determined in Step 4) on the local shelf?

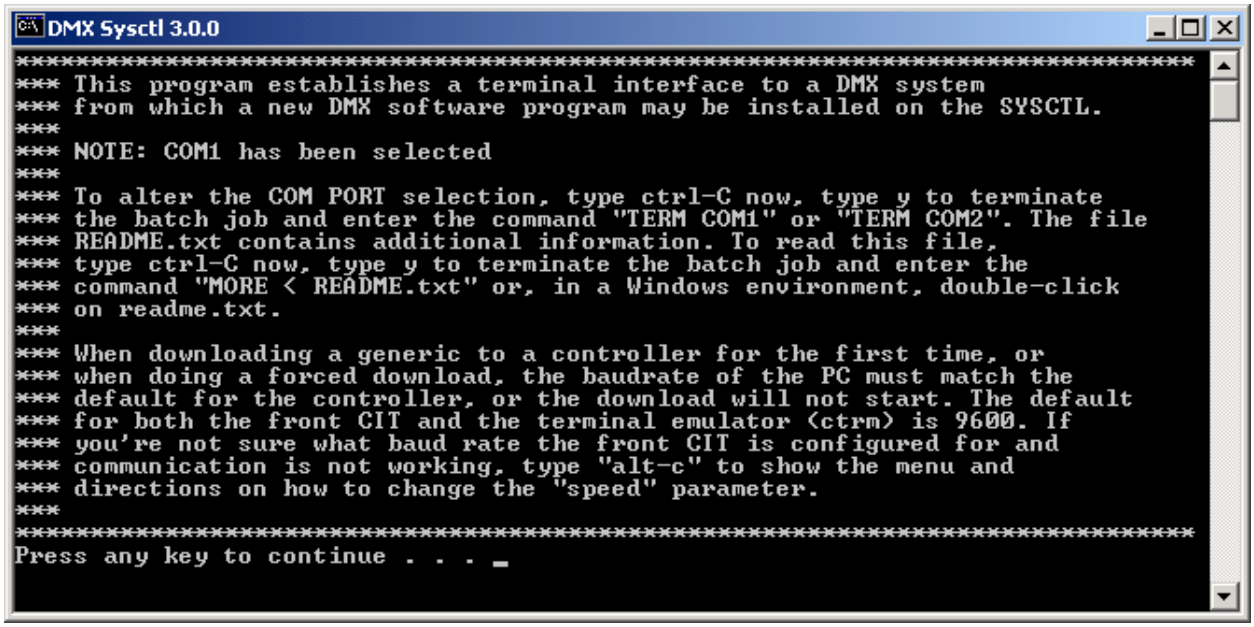
If...	Then...
R1.0.x	Double-click on the *DMX Sysctl 3.0.0* icon. Continue with Step 7.
R1.1.x	Double-click on the *DMX 3.0.0* icon. Proceed to Step 14.
R2.0.x or later and you have serial connectivity	Double-click on the *DMX 3.0.0* icon. Proceed to Step 14.
R2.0.x or later and you have TCP/IP connectivity	Proceed to "Task 206: Release 3.0.0 Software Generic Download and Upgrade via FTP (In-Service System)" (9-31).

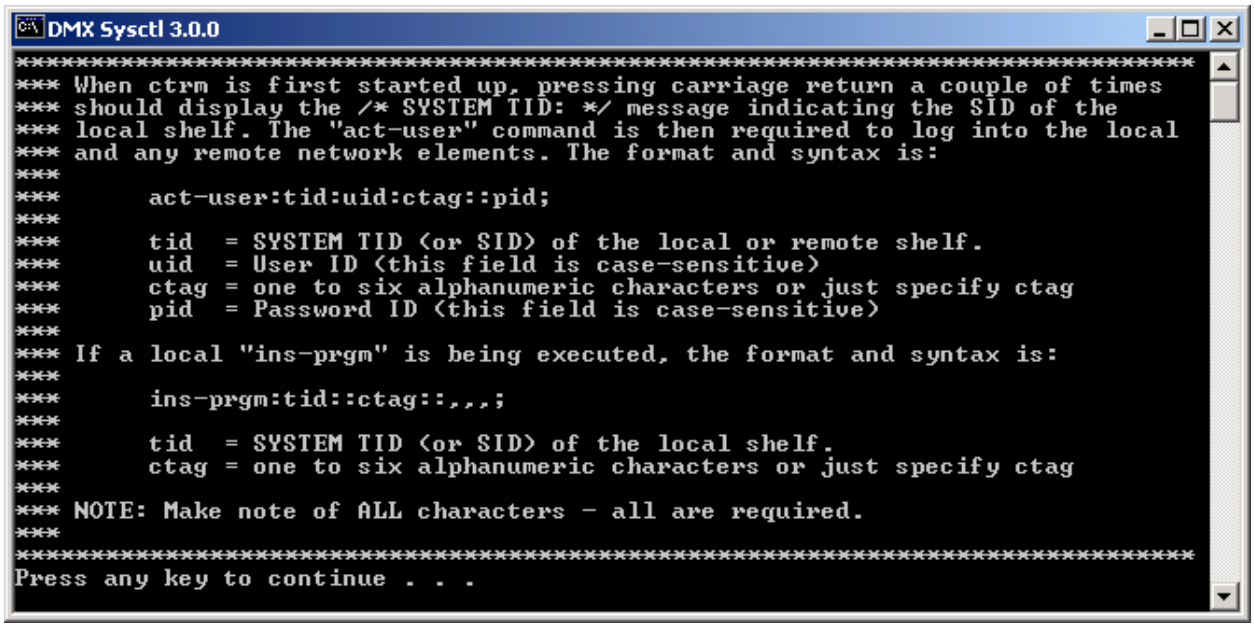
Important! A download using FTP takes approximately 12 minutes; a download using INS-PRGM (Step 7 and Step 14) takes approximately 45 minutes.

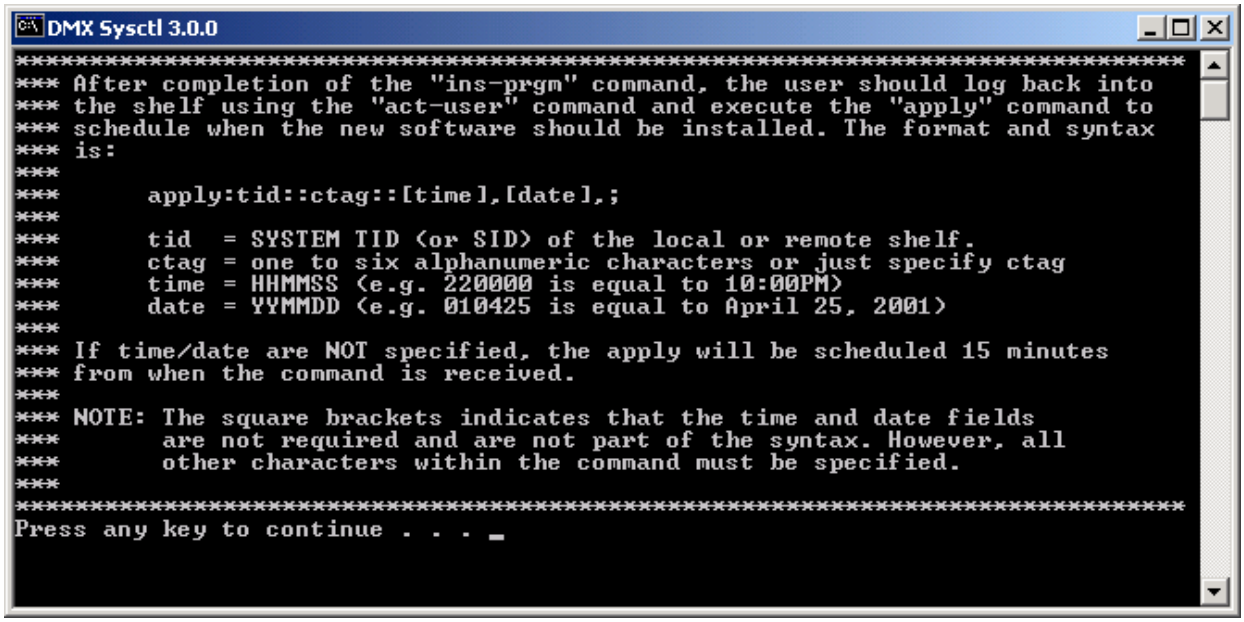
7 Using the appropriate cable, connect the **COM1** port of your PC to the **CIT RS-232** serial port on the faceplate of the SYSCTL circuit pack.

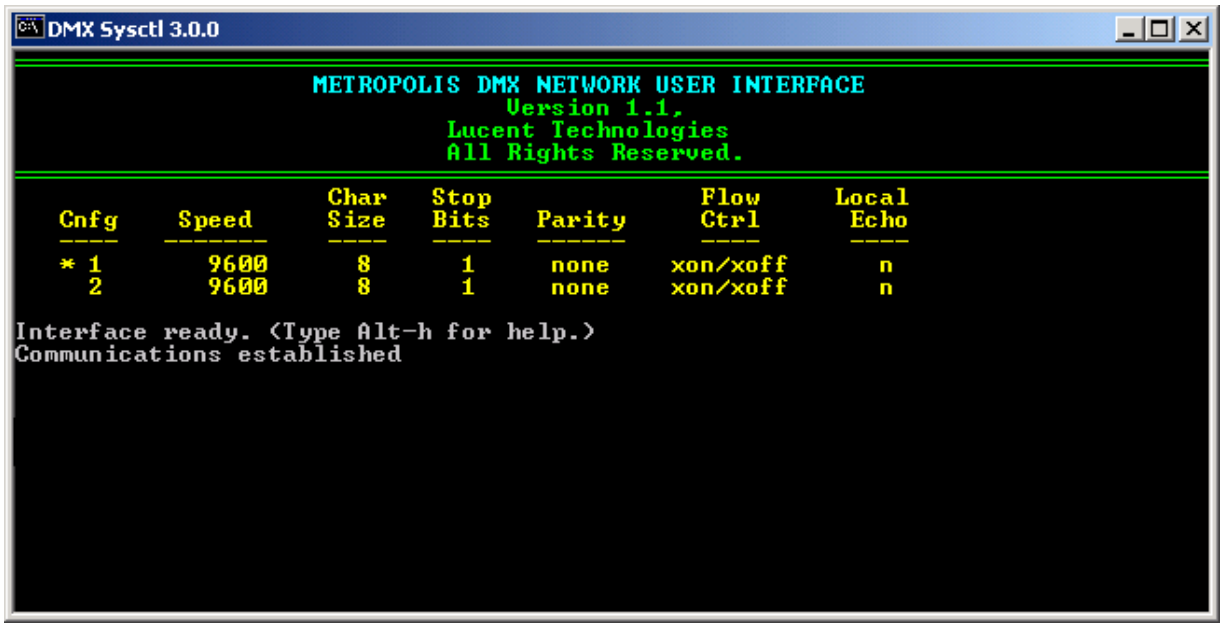
Important! DO NOT establish a WaveStar® CIT session.

8 Follow the instructions on the subsequent screens.






DMX Sysctl 3.0.0
*** After completion of the "ins-prgm" command, the user should log back into
*** the shelf using the "act-user" command and execute the "apply" command to
*** schedule when the new software should be installed. The format and syntax
*** is:
***
***   apply:tid::ctag::[time],[date],;
***
***   tid = SYSTEM TID (or SID) of the local or remote shelf.
***   ctag = one to six alphanumeric characters or just specify ctag
***   time = HHMMSS (e.g. 220000 is equal to 10:00PM)
***   date = YYMMDD (e.g. 010425 is equal to April 25, 2001)
***
*** If time/date are NOT specified, the apply will be scheduled 15 minutes
*** from when the command is received.
***
*** NOTE: The square brackets indicates that the time and date fields
***   are not required and are not part of the syntax. However, all
***   other characters within the command must be specified.
***
Press any key to continue . . .

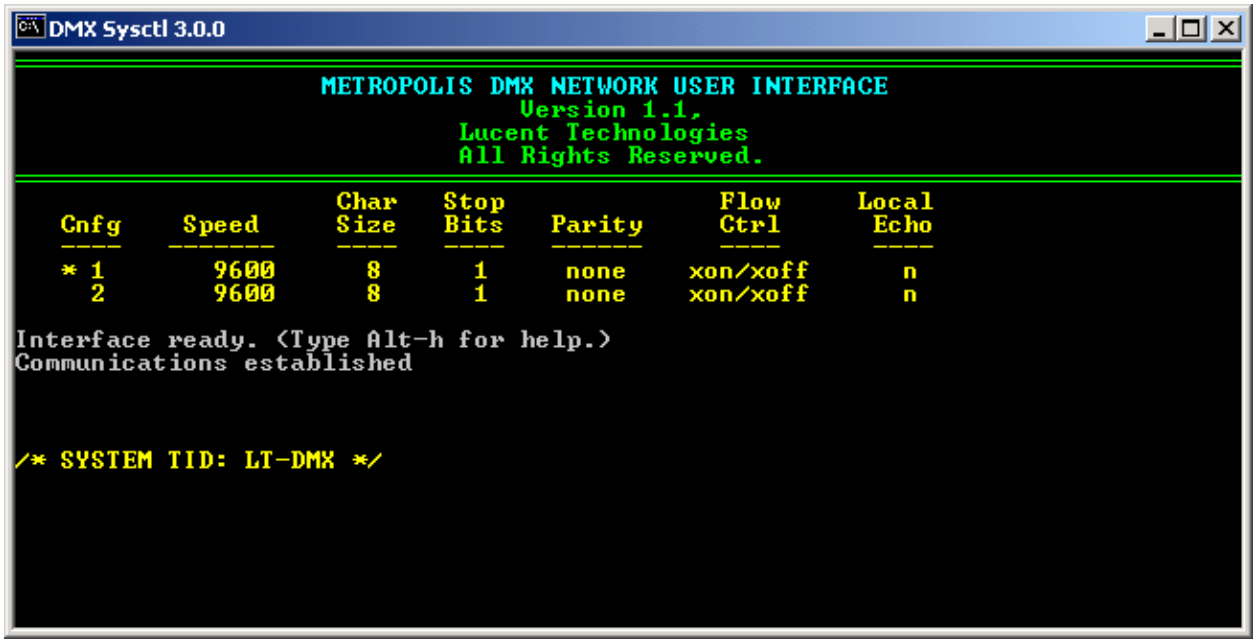

DMX Sysctl 3.0.0
METROPOLIS DMX NETWORK USER INTERFACE
Version 1.1,
Lucent Technologies
All Rights Reserved.
Cnfg Speed Char Size Stop Bits Parity Flow Ctrl Local Echo
* 1 9600 8 1 none xon/xoff n
2 9600 8 1 none xon/xoff n
Interface ready. (Type Alt-h for help.)
Communications established

. . . . . .

9 Press Enter.

Result: The following screen appears with the response /* SYSTEM TID: LT-DMX */.

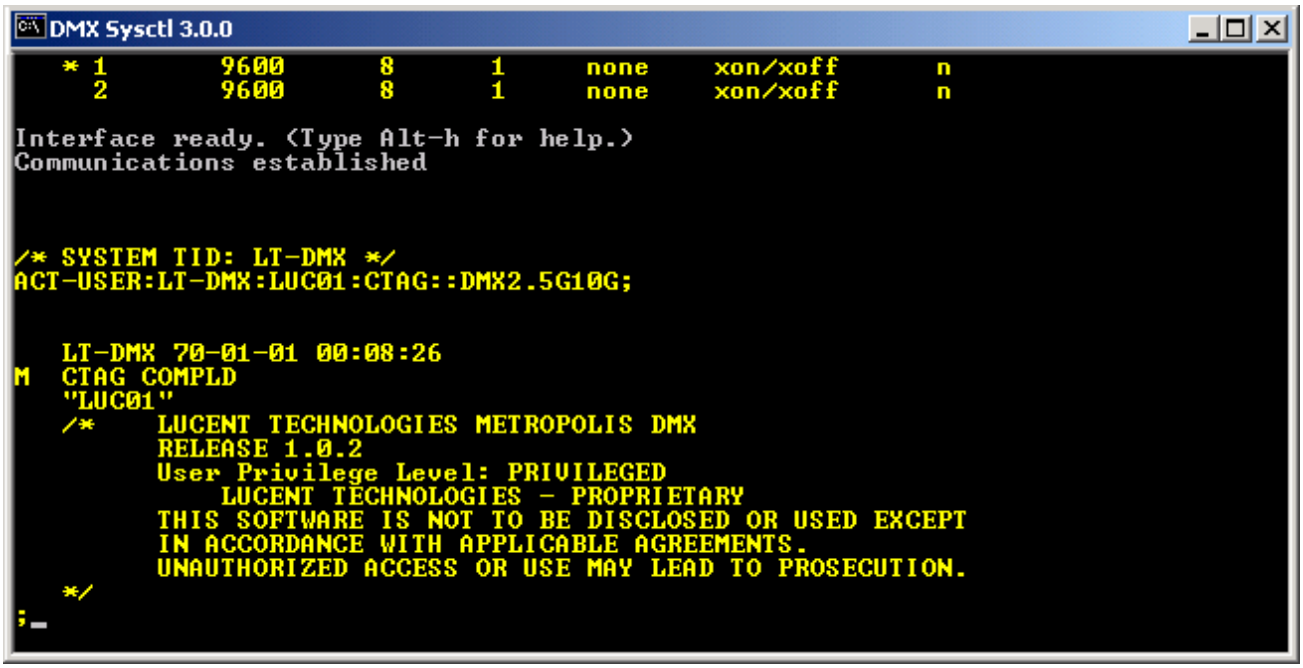
Important! LT-DMX is the default TID of a new system. If your system is currently in service, your TID could be different.



10 Press Enter and type **ACT-USER:LT-DMX:LUC01:CTAG::DMX2.5G10G;**

Important! Replace LT-DMX with your TID.

Result: The following screen appears.



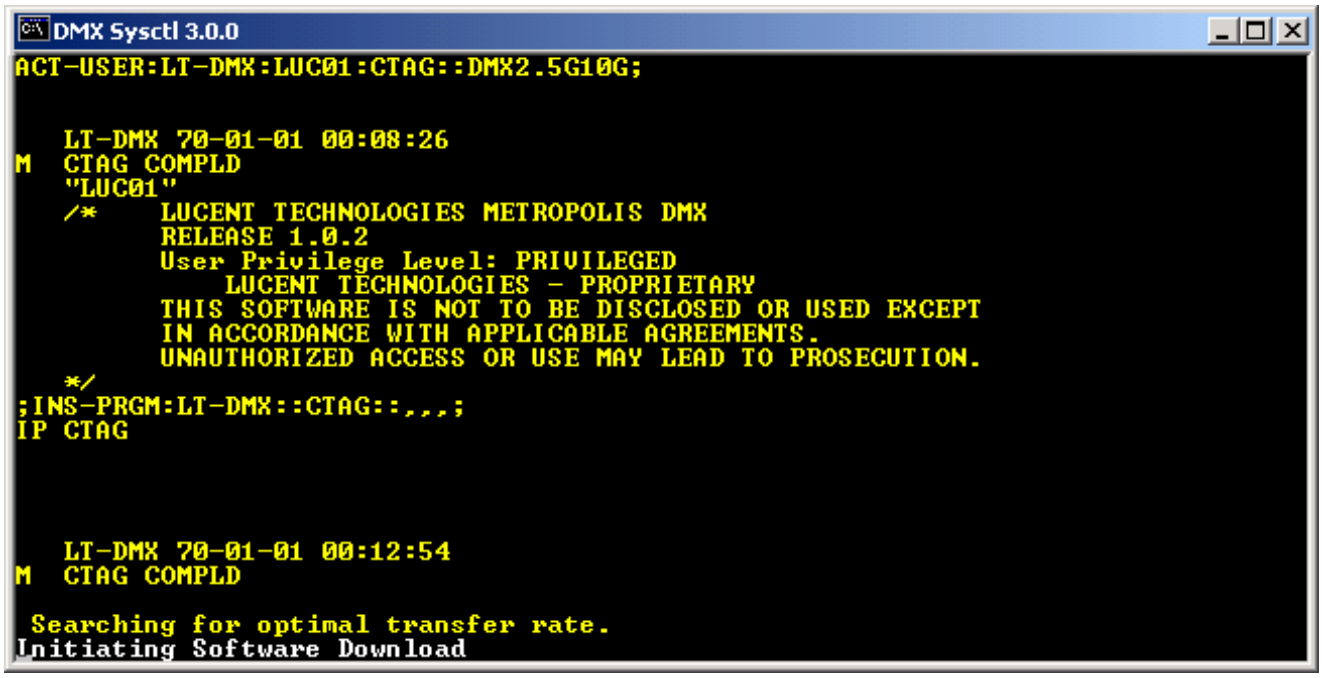
. . . . . .

11 Enter **INS-PRGM:LT-DMX::CTAG::,,,;**

Result: System returns CTAG COMPLD and initiates the software download.

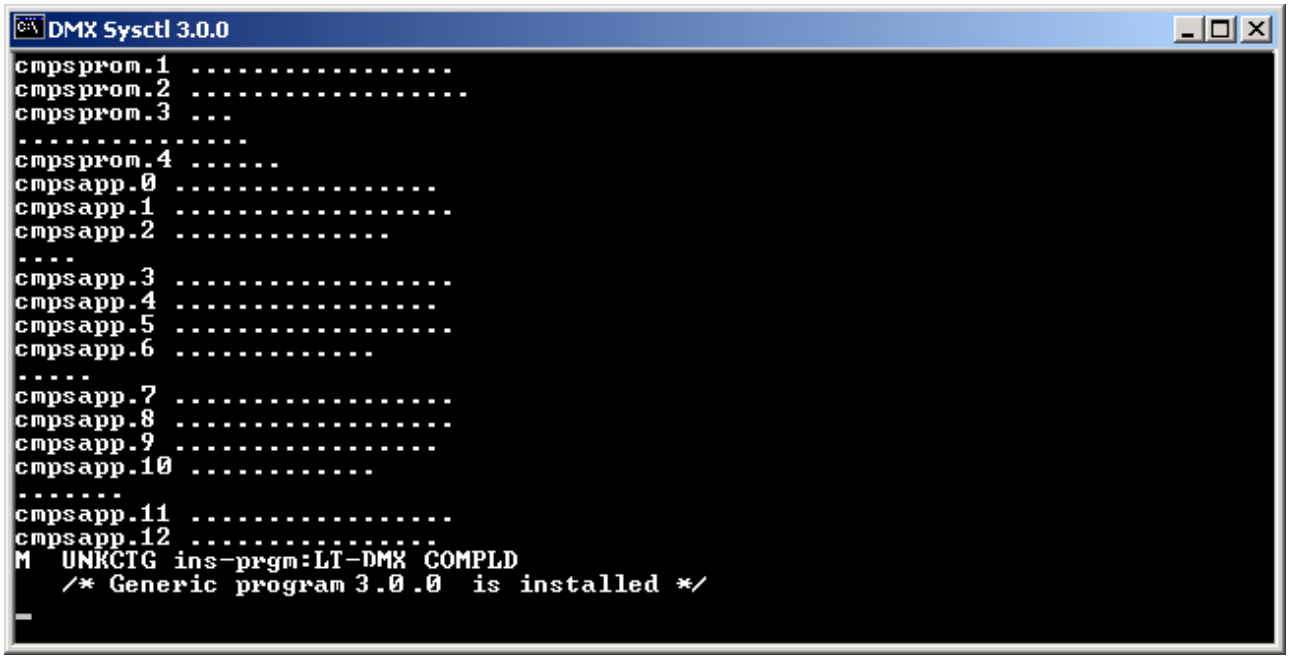
Important! Replace LT-DMX with your TID.

The software download takes approximately 45 minutes.



12 When the software download is complete, the following screen appears.

Important! The downloaded software has been installed in the dormant area.

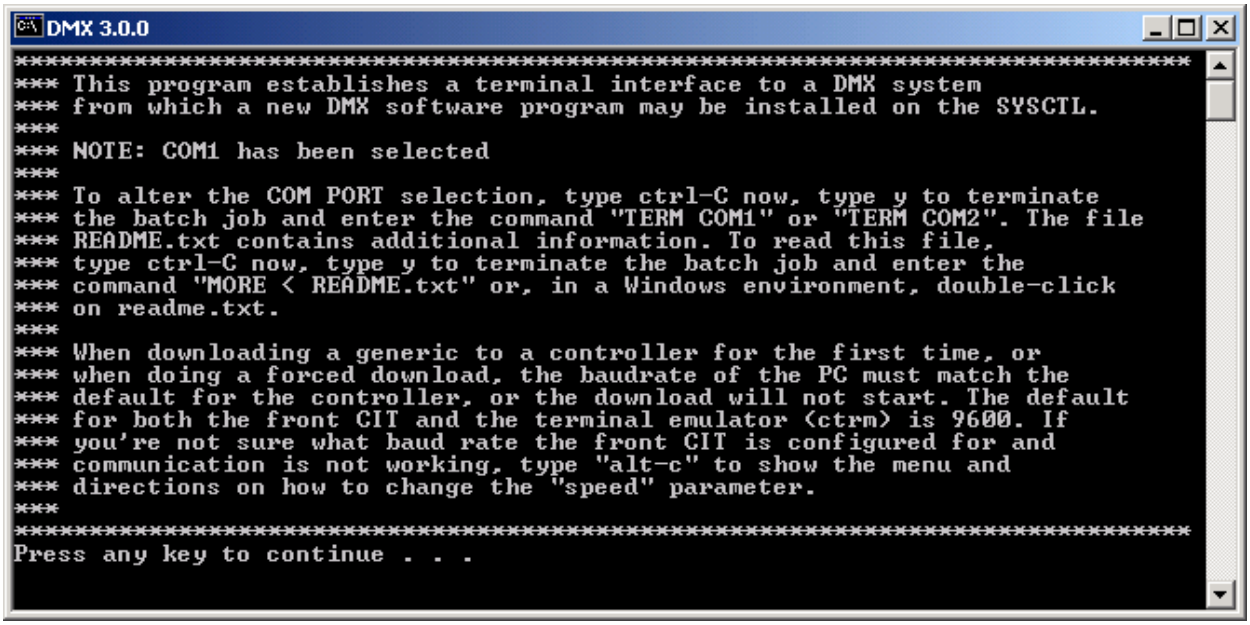


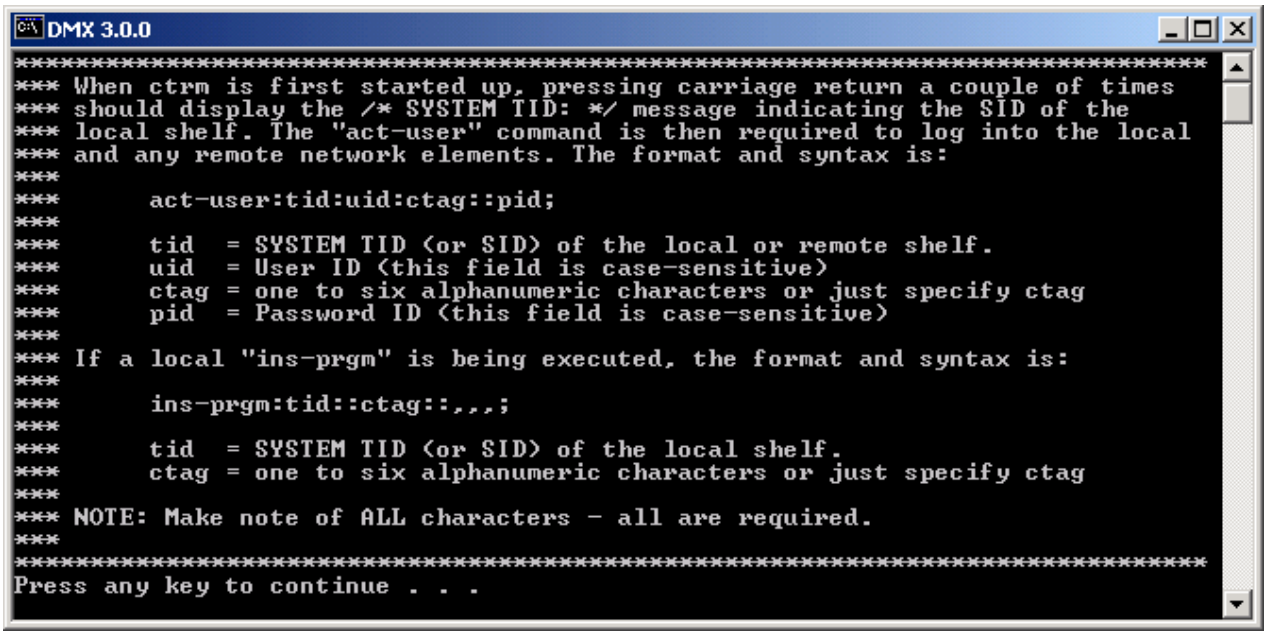
13 Exit the Term program using **ALT**+**F2**. Proceed to Step 21.

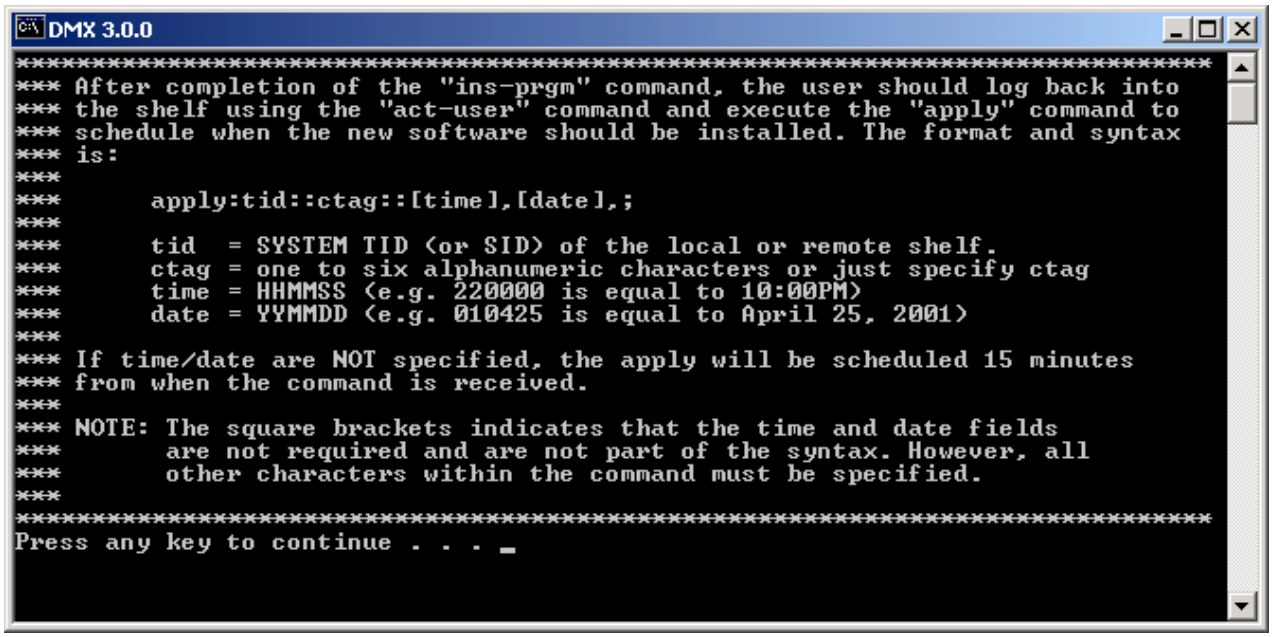
14 Using the appropriate cable, connect the **COM1** port of your PC to the **CIT RS-232** serial port on the faceplate of the SYSCTL circuit pack.

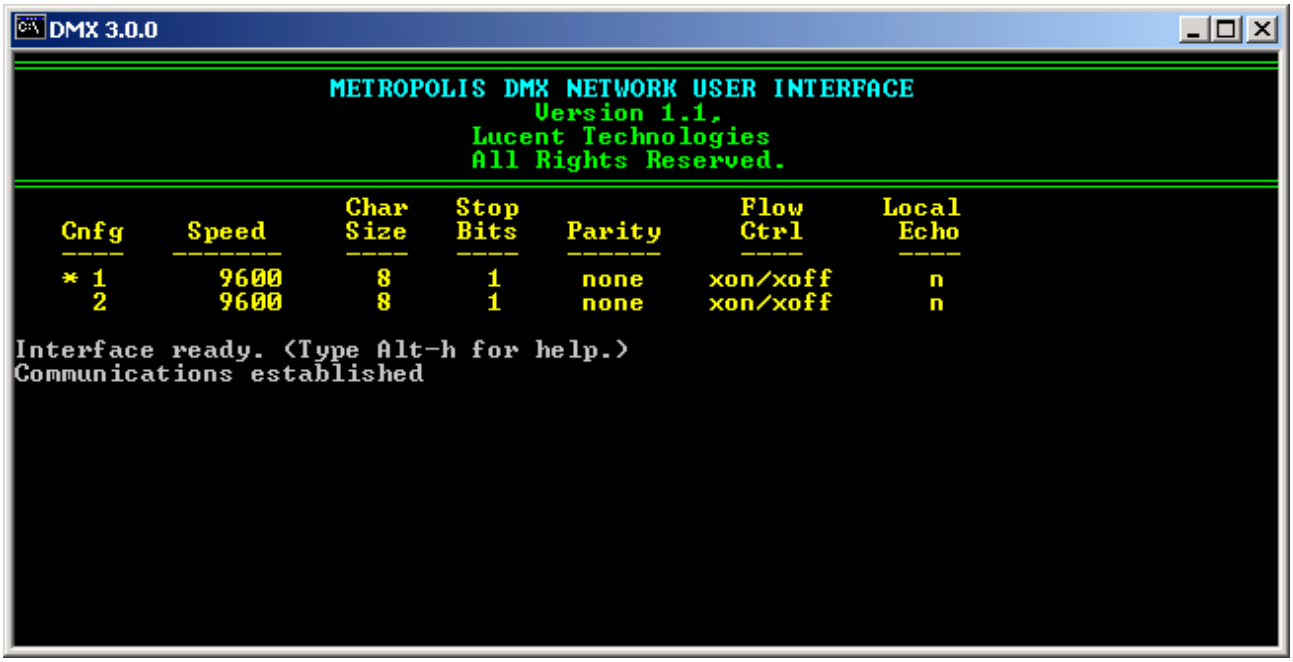
Important! DO NOT establish a WaveStar® CIT session.

15 Follow the instructions on the subsequent screens.





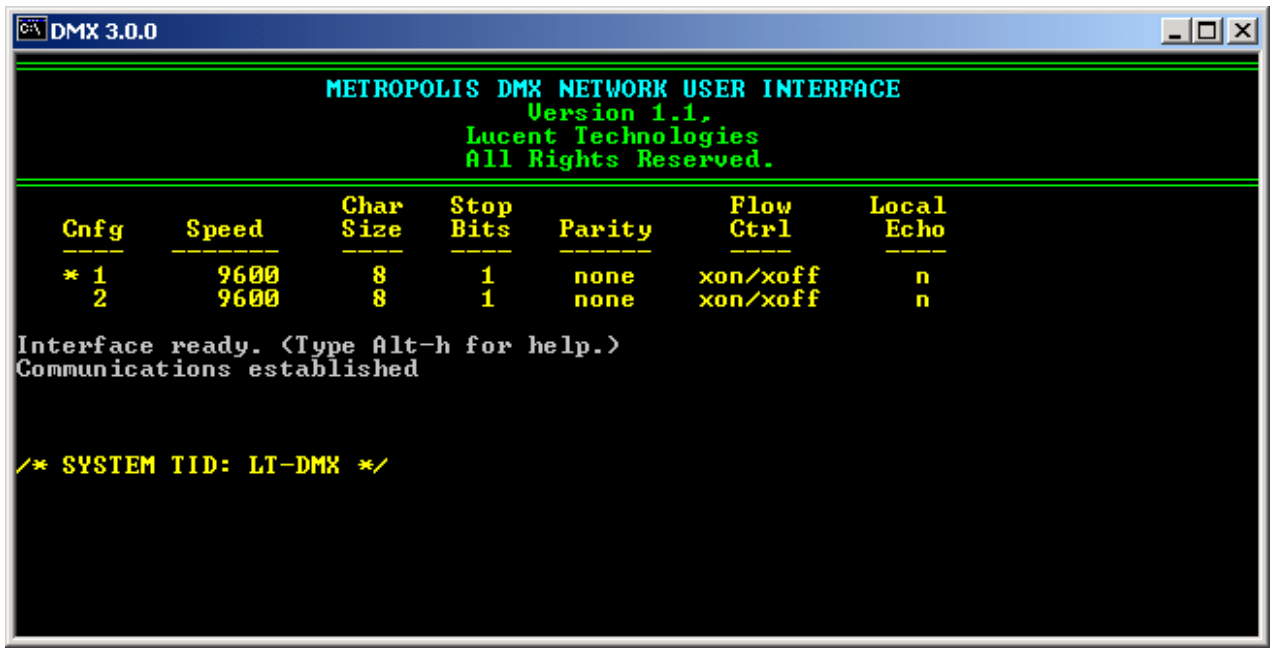

DMX 3.0.0
*** After completion of the "ins-prgm" command, the user should log back into
*** the shelf using the "act-user" command and execute the "apply" command to
*** schedule when the new software should be installed. The format and syntax
*** is:
***
***   apply:tid::ctag::[time],[date],;
***
***   tid = SYSTEM TID (or SID) of the local or remote shelf.
***   ctag = one to six alphanumeric characters or just specify ctag
***   time = HHMMSS (e.g. 220000 is equal to 10:00PM)
***   date = YYMMDD (e.g. 010425 is equal to April 25, 2001)
***
*** If time/date are NOT specified, the apply will be scheduled 15 minutes
*** from when the command is received.
***
*** NOTE: The square brackets indicates that the time and date fields
***   are not required and are not part of the syntax. However, all
***   other characters within the command must be specified.
***
Press any key to continue . . .


DMX 3.0.0
METROPOLIS DMX NETWORK USER INTERFACE
Version 1.1,
Lucent Technologies
All Rights Reserved.
Cnfg Speed Char Size Stop Bits Parity Flow Ctrl Local Echo
* 1 9600 8 1 none xon/xoff n
2 9600 8 1 none xon/xoff n
Interface ready. (Type Alt-h for help.)
Communications established

16 Press Enter.

Result: The following screen appears with the following response
/* SYSTEM TID: LT-DMX */

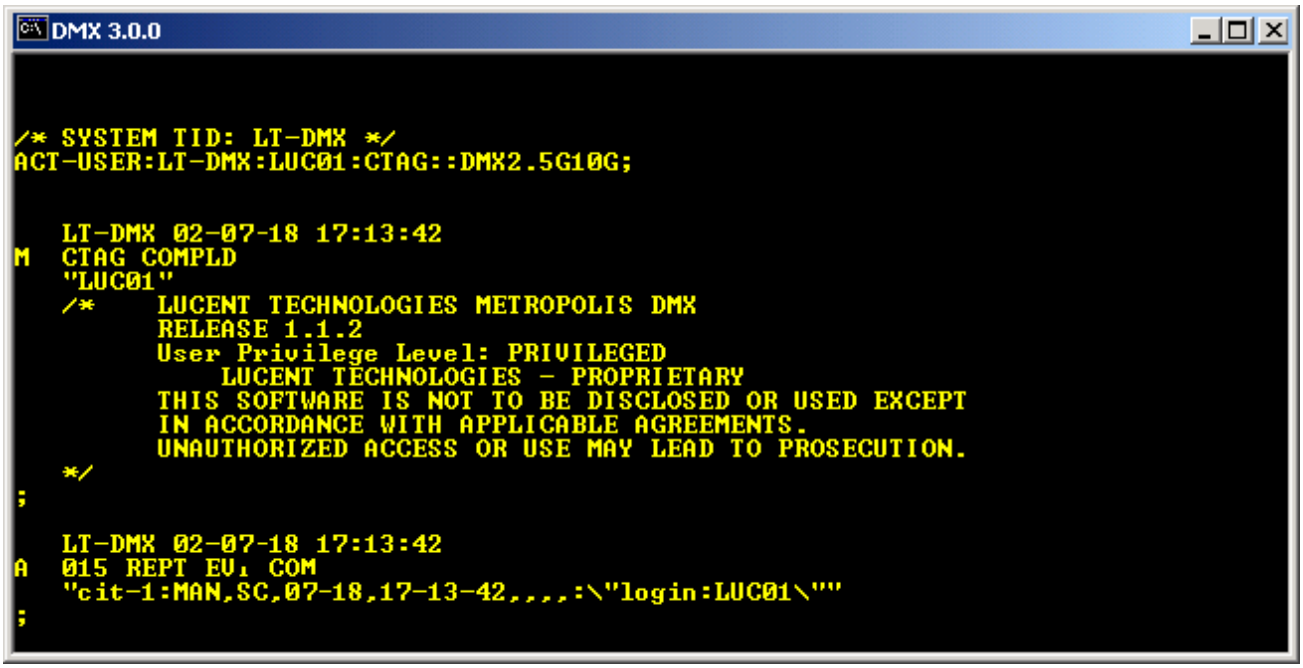
Important! LT-DMX is the default TID. Your TID may be different.



17 Press Enter and type **ACT-USER:LT-DMX:LUC01:CTAG::DMX2.5G10G;**

Important! Replace LT-DMX with your TID.
Your current running release could be 1.1.x or 2.0.x.

Result: The following screen appears.



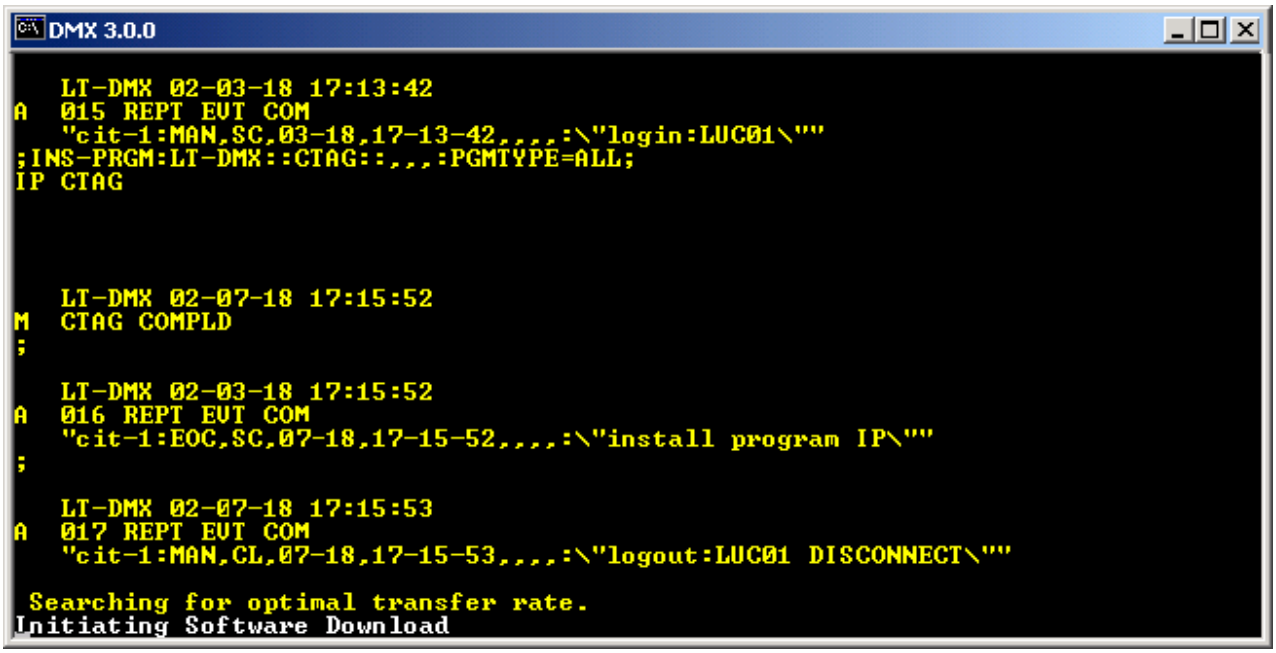
. . . . . .

18 Enter **INS-PRGM:LT-DMX::CTAG::„„:PGMTYPE=ALL;**

Result: System returns CTAG COMPLD and initiates the software download.

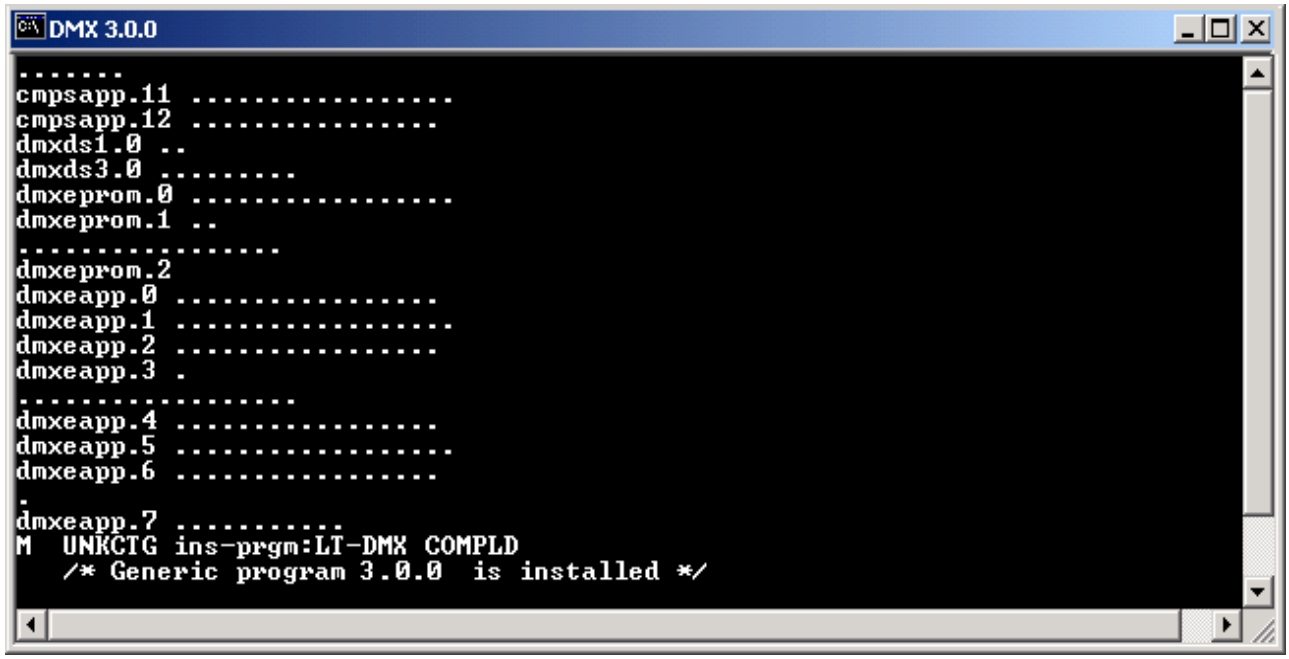
Important! Replace LT-DMX with your TID.

The software download takes approximately 45 minutes.



19 When the software download is complete, the following screen appears.

Important! The downloaded software has been installed as a dormant file.



20 Exit the Term program using **ALT**+**F2**. Continue with Step 21.

21 Do you wish to apply (activate) the software generic that you recently downloaded to the dormant area of the Metropolis® DMX shelf?

If...	Then...
Yes	Continue with Step 22.
No	Proceed to Step 28.

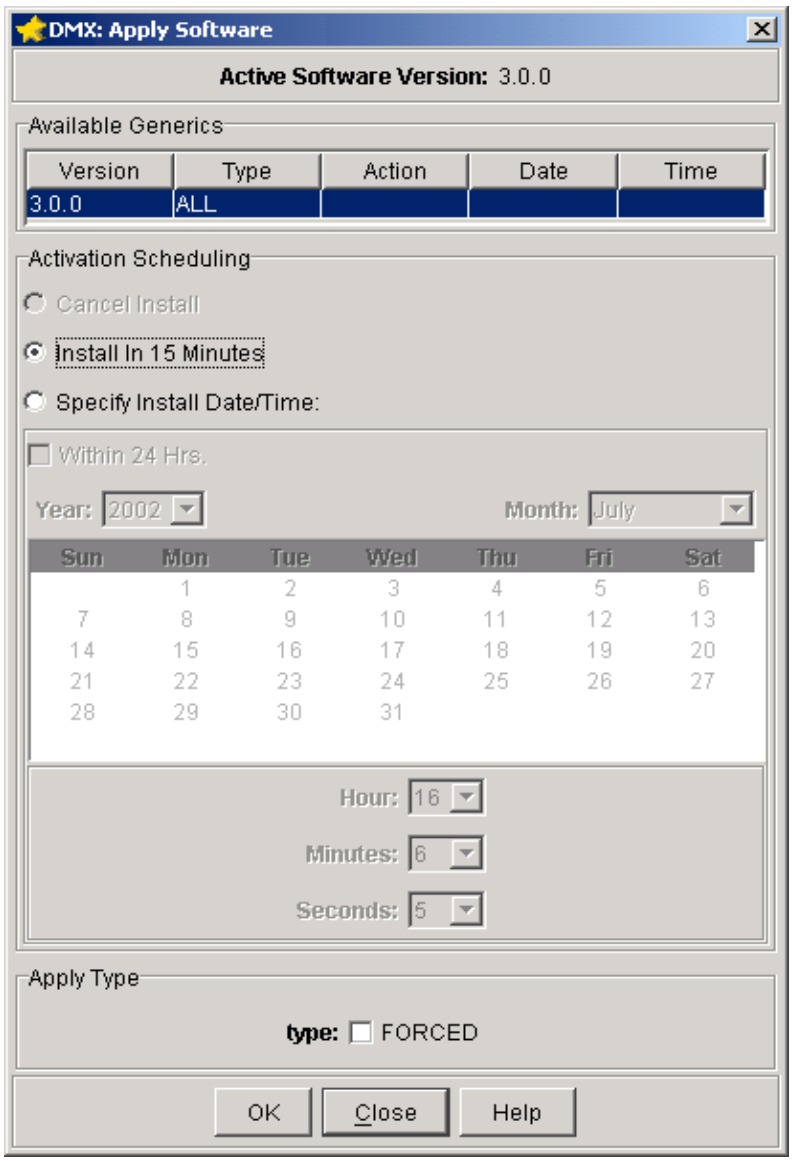
22 Establish a WaveStar® CIT session (specifying either OSI or Serial in the **Connection Type:** field) and log in to your Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

23 From the System View menu, select **Configuration > Software > Apply Software....**

Result: The Apply Software window appears.

Figure 9-17 Apply Software Window



24 Select and/or enter the following information in the Apply Software window (Figure 9-17):

1. From the **Available Generics** panel, select the software generic to be activated.
2. From the **Activation Scheduling** panel, you may schedule the activation time and date in *one* of the following ways:
   - Select **Install In 15 Minutes**
     The software will install 15 minutes after you click **Okay**.
   - Select **Specify Install Date/Time** and select the **Year**, **Month**, **Date** and **Time**.
     In this case, the **Hour**, **Minute**, and **Second** fields are used to enter a 24-hour clock time (13 hours and 15 minutes means that the software will apply at 1:15 PM on the date specified).
   - Select **Specify Install Date/Time** *and* **Within 24 Hours**.
     In this case, the **Hour**, **Minute**, and **Second** fields are used to enter the time within 24 hours of the current date and time after you click **OK**.

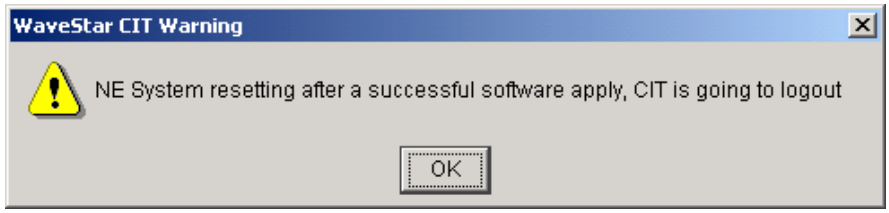
   Important! You may cancel the scheduled apply by returning to the **Apply Software** menu at any time before the software applies and selecting the generic and **Cancel Install** and then clicking **OK**.
3. Click **OK**.

Result: The following warning message appears:
Execution of Provision may affect the NE service. Do you want to execute this command?
Click **Yes**.

25 After approximately 15 minutes the apply is complete.

Result: The following warning screen appears, click **OK**. The System View closes.

Important! If the WaveStar® CIT Network View is unresponsive, perform a shut-down using Windows Task Manager to End the WaveStar® CIT.



Important! Following a Metropolis® DMX system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). After 5 minutes (to allow for additional NE resets, as in the case of a network software upgrade), the shelf attempts an automatic synchronization of the time and date with another NE in the network. If the remote NE has not responded to the synchroniztion request within 2 minutes, the request is forwarded to another NE in the network. Each remote NE is allowed 2 minutes to respond. If a valid time and date is not found within the network, it must be entered manually.

26 Establish a WaveStar® CIT session (specifying either OSI or Serial in the **Connection Type:** field) and re-log in to your Metropolis® DMX shelf.

Result: The title bars of the System View and the legal notice should both reflect the current NE software generic, R3.0.0.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (8-3)

27 Is the Generic Software Version correct?

If...	Then...
Yes	Continue with Step 28.
No	Contact your support center.

28 Is this software generic to be installed on other nodes in this network?

If...	Then...
Yes	Proceed to "Task 210: Release 3.0.0 Software Generic Copy to Remote Shelf (In-Service System)" (9-73).
No	STOP! END OF TASK.

END OF STEPS

Task 210: Release 3.0.0 Software Generic Copy to Remote Shelf (In-Service System)

Purpose

Use this task to copy and apply the new R3.0.0 software generic to a remote NE from a local Metropolis® DMX shelf.

> **Important!** This task requires that the software generic to be copied is installed in the dormant area of the local Metropolis® DMX shelf.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist strap
- Cable to connect the PC to Metropolis® DMX
- Working copy of the new system generic software program on CD-ROM
- Current *Metropolis® DMX Access Multiplexer Software Release Description* for the software generic being installed.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- "Task 209: Release 3.0.0 Software Generic Upgrade for Local Shelf (In-Service System)" (9-53)

Before you begin

Before beginning the software installation, refer to the *Metropolis® DMX Access Multiplexer Software Release Description* for the software being installed for a description of any special considerations required when installing this version of the software.

Important! A privileged login is required to perform this task.

This task uses the *cpy-prgm* command to copy a software generic from a local in-service Metropolis® DMX shelf to the following types of remote NEs:

- Metropolis® DMX
- Metropolis® DMX*press*
- DDM-2000 OC-3
- DDM-2000 OC-12
- DDM-2000 FiberReach

Important! For remote copy, it is assumed that the local shelf has already been upgraded and the software has been installed as a dormant copy.

Task

Complete the following steps to copy system software from a local Metropolis® DMX shelf to another NE.

. . . . . .

1 If not previously completed, install generic and WaveStar® CIT software on the PC.

Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

. . . . . .

2 Do you want to use remote copy (**cpy-prgm**) or FTP (**cpy-mem**)?

Important! Remote copy requires that the desired generic be present on the local shelf to which you are logged in.
FTP requires that the remote shelf be running release 2.0.x or later.

If...	Then...
Remote copy (**cpy-prgm**)	Continue with Step 3.
FTP (**cpy-mem**)	Proceed to "Task 206: Release 3.0.0 Software Generic Download and Upgrade via FTP (In-Service System)" (9-31).

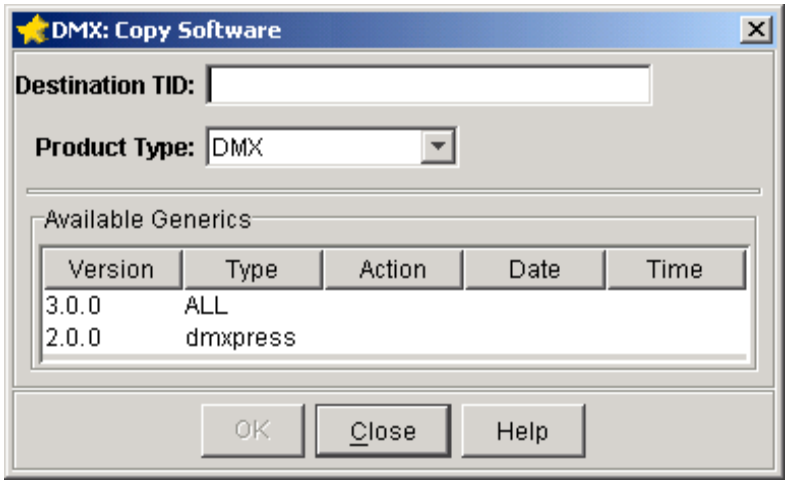
3 Connect the PC to the front LAN or serial port, establish a WaveStar® CIT session (specifying either OSI or Serial in the **Connection Type:** field) and log in to the local shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

4 From the System View menu, select **Configuration > Software > Copy Software...**.

Result: The Copy Software window appears.

Figure 9-18 Example of Copy Software Window



5 From the Copy Software Window (Figure 9-18), provision the following fields accordingly:

1. In the **Destination TID:** field, type the TID of the remote NE to which you wish to copy the NE Generic Software.

   Important! Currently, Metropolis® DMX is the only product that can store a software generic for Metropolis® DMX*press*, DDM-2000 OC-3, DDM-2000 OC-12, or FiberReach.
   For example, if your remote NE is a Metropolis® DMX*press* shelf, then your software generic type must also be Metropolis® DMX*press*.

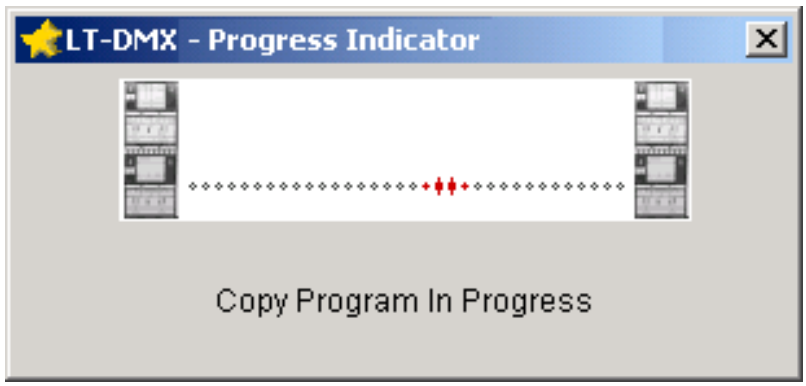
2. In the pull-down menu entitled **Program Type:** select the type of software that you are copying. Your choices are
   - DMX
   - DMXpress
   - DDM-2000 OC-3
   - DDM-2000 OC-12
   - FIBER REACH

3. In the **Available Generics** panel, select one of the generics (currently installed on the local Metropolis® DMX) that you wish to copy to the remote NE. The type of software can be identified by the following entry in the TYPE column
   - ALL = Metropolis® DMX
   - dmxpress = Metropolis® DMX*press*
   - ddmoc3 = DDM OC-3
   - ddmoc12 = DDM-2000 OC-12
   - fbrrch = FIBER REACH

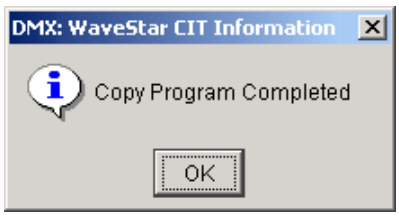
4. Click **OK**.

   Result: The following confirmation message appears: *Execution of Provision may affect the NE service. Do you wish to execute this command?*
   Click **Yes**.

Important! While the copy is in progress, the following window is present.



6 When the copy is complete, the following window appears. Click **OK**.



Result: The software is now in the dormant area of the remote NE and you are ready to continue.

7 Do you wish to apply (activate) the software generic that you recently downloaded to the dormant area of the remote NE?

If...	Then...
Yes	Disconnect from your local NE. Continue with Step 8.
No	Proceed to Step 15.

8 Is the remote NE either a Metropolis® DMX or Metropolis® DMXpress shelf?

If...	Then...
Yes	Continue with Step 9.
No	Refer to the appropriate DDM-2000 product documentation.

9 Log in to the remote Metropolis® DMX or Metropolis® DMX*press* to which you copied the software.
Specify the following when establishing the WaveStar® CIT session:

- **NE Name:** field: TID of the remote NE
- **NE Type:** field: Metropolis DMX Access Multiplexer or Metropolis DMXpress Access Multiplexer
- **Connection Type:** field: OSI or Serial

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

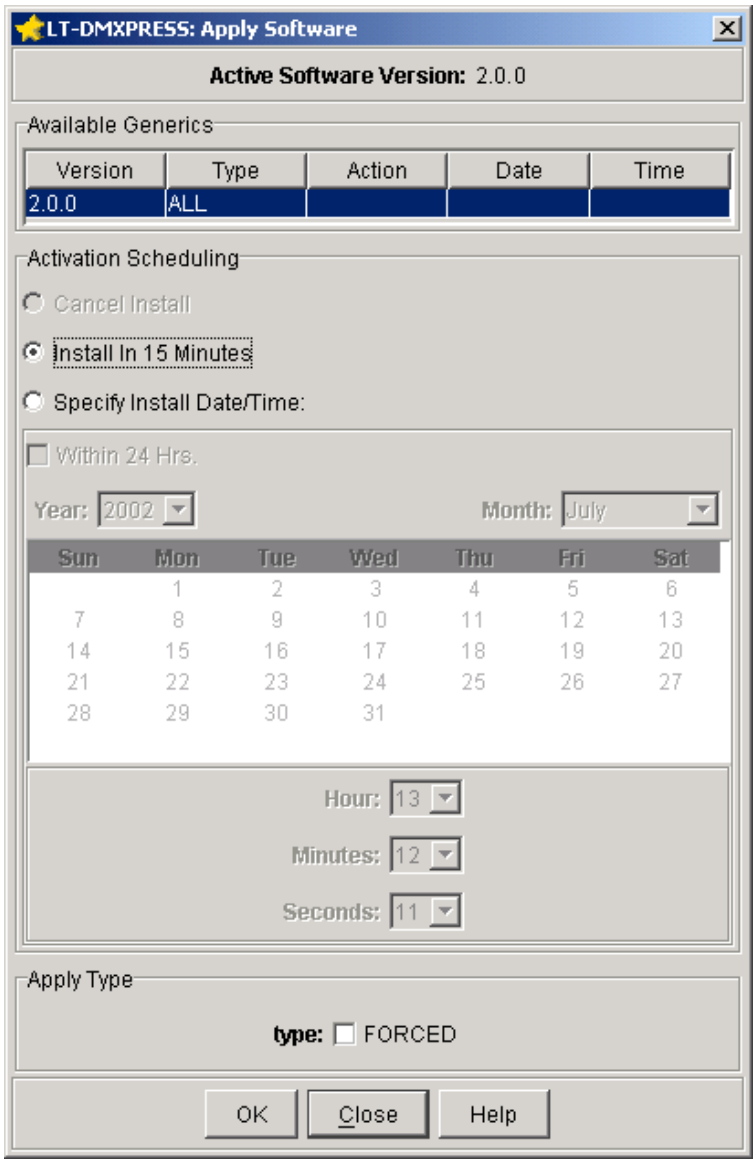
Result: After a few moments, the NE with the TID you specified appears in the System View.

10 From the **System View** menu, select **Configuration** > **Software** > **Apply Software**....

Important! The TID of the remote shelf will not be the same as your local shelf. Figure 9-19 is only an example of the window. In this example, your remote NE is a Metropolis® DMX*press* shelf.

Result: The Apply Software window appears.

Figure 9-19 Example of Apply Software Window



11 Select and/or enter the following information in the Apply Software window (Figure 9-19):

1. From the **Available Generics** panel, select the software generic to be activated.
2. From the **Activation Scheduling** panel, you may schedule the activation time and date in *one* of the following ways:
   - Select **Install In 15 Minutes**
     The software will install 15 minutes after you click **Okay**.
   - Select **Specify Install Date/Time** and select the **Year**, **Month**, **Date** and **Time**.
     In this case, the **Hour**, **Minute**, and **Second** fields are used to enter a 24-hour clock time (13 hours and 15 minutes means that the software will apply at 1:15 PM on the date specified).
   - Select **Specify Install Date/Time** *and* **Within 24 Hours**.
     In this case, the **Hour**, **Minute**, and **Second** fields are used to enter the time within 24 hours of the current date and time after you click **OK**.

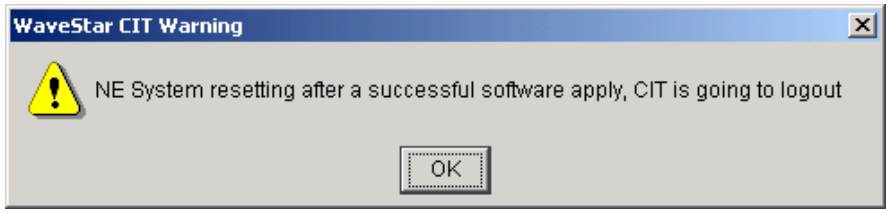
   Important! You may cancel the scheduled apply by returning to the **Apply Software** menu at any time before the software applies and selecting the generic and **Cancel Install** and then clicking **OK**.
3. Click **OK**.

Result: The following confirmation message appears: *Execution of Provision may affect the NE service. Do you wish to execute this command?*
Click **Yes**.

12 After approximately 15 minutes the apply is complete.

Result: The following warning screen appears, click **OK**. The System View closes.

Important! If the WaveStar® CIT Network View is unresponsive, perform a shut-down using Windows Task Manager to End the WaveStar® CIT.



Important! Following a system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). After 5 minutes (to allow for additional NE resets, as in the case of a network software upgrade), the shelf attempts an automatic synchronization of the time and date with another NE in the network. If the remote NE has not responded to the synchroniztion request within 2 minutes, the request is forwarded to another NE in the network. Each remote NE is allowed 2 minutes to respond. If a valid time and date is not found within the network, it must be entered manually.

13 Establish a WaveStar® CIT session (specifying either OSI or Serial in the **Connection Type:** field) and re-log in to your Metropolis® DMX or Metropolis® DMX*press* shelf.

Result: The title bars of the System View and the legal notice should both reflect the current NE software generic.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (8-3)

14 Is the Generic Software Version correct?

If...	Then...
Yes	Continue with Step 15.
No	Contact your support center.

15 Repeat this task from Step 2 for each remote shelf in the network that you wish to upgrade.

END OF STEPS

Task 211: Backup and Restore

Purpose

Use this task to backup and restore the NE database or to setup an automatic backup schedule.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- "Task 323: Add IP Tunnel(s) Through Network" (10-179)
- "Task 324: Provision/Enable/Disable TCP/IP on an IAO LAN Port" (10-205)

Before you begin

This task uses FTP to backup and restore all Metropolis® DMX provisionable data on a shelf.

The WaveStar® CIT is not a fully implemented FTP server, but it can handle backup and restore capabilities. For automatic backups, a Navis™ Optical Element Management System (Navis™ Optical EMS) or another large capacity FTP server should be used when the WaveStar® CIT is not guaranteed to always be connected and available at the scheduled backup times.

The backup feature can be forced or scheduled to complete automatically at specified intervals. The restore feature utilizes the TL1 **CPY-MEM** command with the restore option.

It is assumed that IP tunneling has already been established (refer to "Task 323: Add IP Tunnel(s) Through Network" (10-179)) or each NE has a direct IP connection.

Important! If the FTP server fails to start, it could mean that another program using an FTP server is already running. Depending on what operating system you are using, you must go to the device file and disable the FTP server.

- For Windows 2000 operating systems, select **Start > Settings > Control Panel**. Select **Administrative Tools**, then **Computer Management**, then **Services and Applications**, and then **Services**.
- For Windows NT operating systems, select **Start > Settings > Control Panel**. Select **Devices**.

Task

Complete the following steps to backup and restore the system.

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Do you wish to...

If	Then
perform an immediate system backup?	Continue with Step 3.
schedule or discontinue an automatic system backup?	Proceed to Step 10.
perform a system restore?	Proceed to Step 23.

3 From the **System View** menu, select **Configuration>Software>Remote Backup...** .

4 In the pulldown **Backup To/Via:** menu, select **FTP**.
NOTE: No other options are available at this time.

5 Select the connection from the **Profile** pulldown menu
OR

1. In the **Server** panel, select **IP** and enter the address of the FTP server.
2. Enter the **port** (default is **21**).
3. In the **User** panel, enter the user name and password for the FTP server (default for the WaveStar® CIT is **LUC01**/**LUC+01**).

6 If you entered connection information in Step 5 and wish to keep the information for future backups:

1. Type a new name in the **Profile** menu.
2. Click **Add** to add the profile to the list.
3. Click **Save** to save the list.

Entries to the **FTP Profile** pulldown menu may be changed using the **Modify** and **Apply** buttons
or
removed using the **Delete** button.

7 In the **Destination Directory Path** field, enter the location where the database information is to be stored (a maximum of 80 characters is suggested for this field).

A relative path is assigned to the WaveStar® CIT directory, therefore the user need only enter **FILENAME**. However, it is recommended that the information be stored in the backups directory. To do this, enter **backups/FILENAME**. Subdirectories may be assigned by entering **backups/DIRECTORY/FILENAME** if the DIRECTORY exists before the command is sent. Directories will not be created by this command, and therefore the command will be denied if any directory in the path does not already exist.

> **Important!** If the file system uses the "\" symbol to separate directories and files (DIRECTORY\FILENAME), then the user must use "\\" in this field.
> (For example: backups\\DIRECTORY\FILENAME will be translated to backups\DIRECTORYFILENAME by the NE.)

8 Click **Backup**.

You will be asked to verify that you wish to backup to the directory that you entered above. Click **Yes** if you typed the path correctly.

> **Result:** The **DMX Progress Indicator** screen appears to indicate that the backup is in progress. When the backup completes, a WaveStar® CIT information screen labeled **Remote Backup Screen** appears. Click the **Okay** button.

9 STOP! END OF TASK.

10 From the **System View** menu, select **Configuration>Software>Configure Auto Backup Interval...** .

> **Important!** The WaveStar® CIT is not intended to serve as an FTP server, although it may be used for this application if the WaveStar® CIT is guaranteed to be available (connected and running) at all scheduled backup times. Otherwise a Navis™ Optical Element Management System (Navis™ Optical EMS) or another large capacity FTP server should be used.

11 From the **Configure Auto Backup** screen, select the **Files** tab at the top of the screen.

12 Select the connection from the **Profile** pulldown menu
OR

1. In the **Server** panel, select **IP** and enter the address of the FTP server.
2. Enter the **port** (default is **21**).
3. In the **User** panel, enter the user name and password for the FTP server (default for the WaveStar® CIT is **LUC01**/**LUC+01**).

13 If you entered connection information in Step 12 (rather than selected an established profile), you should assign a new profile name to this information to allow Automatic Backup to store the FTP login password. To do this:

1. Type a new name in the **Profile** menu.
2. Click **Add** to add the profile to the list.
3. Click **Save** to save the list.

Entries to the **FTP Profile** pulldown menu may be changed using the **Modify** and **Apply** buttons
or
removed using the **Delete** button.

14 In the **File Path** field, enter the location where the database information is to be stored (a maximum of 80 characters is suggested for this field).

A relative path is assigned to the WaveStar CIT directory, therefore the user need only enter **FILENAME**. However, it is recommended that the information be stored in the backups directory. To do this, enter **backups/FILENAME**. Subdirectories may be assigned by entering **backups/DIRECTORY/FILENAME** if the DIRECTORY exists before the command is sent. Directories will not be created by this command, and therefore the command will be denied if any directory in the path does not already exist.

Important! If the file system uses the "\" symbol to separate directories and files (DIRECTORY\FILENAME), then the user must use "\\" in this field.
(For example: backups\\DIRECTORY\FILENAME will be translated to backups\DIRECTORYFILENAME by the NE.)

. . . . . .

15 From the **Type:** menu in the **Backup Type** panel, select **FORCED** from the pulldown menu.
NOTE: No other options are available at this time.

. . . . . .

16 From the **Files:** menu in the **Number of Files** panel, select a number from 1 to 9 (default is 2) from the pulldown menu, which indicates the number of backup files to be stored automatically before the files begin to overwrite.

Once established, the filename that you supplied in Step 14 will initially be appended with "1" (FILENAME1). In subsequent backups, the "1" will increase by one until the number selected in this step is reached; then the files will begin overwriting beginning with FILENAME1.

. . . . . .

17 Select the **Schedule** tab at the top of the screen.

. . . . . .

18 From the **Days** menu in the **Update Interval** panel, select a number from 1 to 99 (default is 30), which indicates the number of days between automatic backups. The number may be selected by sliding the arrow over the scale until the desired number appears in the field, or by typing the number directly into the field.

Important! Setting this field to "0" cancels automatic backup.

. . . . . .

19 If you wish to specify a start date for the automatic backup:

1. Select **Specify Date** in the **Backup Start Date/Time** panel,
2. Select the **Year:** and **Month:** from the pulldown menus,
3. Select a day from the calendar.

If you do not wish to specify a start date, the first backup will begin immediately upon completion of this task and the next backup will begin

after the requested number of days.

20 To specify a start time for the automatic backup:

1. Select **Specify Time** in the **Backup Start Date/Time** panel,
2. Select the **Hour:** (0-23), **Minutes:** (0-59), and **Seconds:** (0-59) from the pulldown menus,
   (*NOTE: It is recommended that only one backup occur at a time for the PC-CIT. However, larger servers may be able to handle multiple backups at the same time. It is suggested that the backups for the networks be performed a few minutes apart.*)

21 Click **Okay**.

A warning screen will appear, indicating that execution of provision may temporarily affect service. If this is acceptable, select **Yes**.

22 STOP! END OF TASK.

Important! The restore feature only works if the software release and the equipment populating the NE slots has not changed. If the software release has changed or different pack types have been installed since the backup was performed, then the restore will not work.

23 From the **System View** menu, select **Configuration>Software>Remote Restore...** .

24 In the pulldown **Restore From/Via:** menu, select **FTP**.
NOTE: No other options are available at this time.

25 Select the connection from the **Profile** pulldown menu
OR

1. In the **Server** panel, select **IP** and enter the address of the FTP server.
2. Enter the **port** (default is **21**).

3. In the **User** panel, enter the user name and password for the FTP server (default for the WaveStar® CIT is **LUC01/LUC+01**).

26 If you entered connection information in Step 25 and wish to keep the information for future restores:

1. Type a new name in the **Profile** menu.
2. Click **Add** to add the profile to the list.
3. Click **Save** to save the list.

Entries to the **FTP Profile** pulldown menu may be changed using the **Modify** and **Apply** buttons
or
removed using the **Delete** button.

27 In the **Source Directory Path** panel, enter the location where the database information is stored.

A relative path is assigned to the WaveStar CIT directory, therefore the user must enter the path and filename exactly as it was entered in Step 7 or Step 14 (For example: **backups/DIRECTORY/FILENAME)**.

Important! If the file system uses the "\" symbol to separate directories and files (DIRECTORY\FILENAME), then the user must use "\\" in this field.
(For example: backups\\DIRECTORY\FILENAME will be translated to backups\DIRECTORYFILENAME by the NE.)

28 Click **Restore**.

You will be asked to verify that you wish to restore the data from the backup file that you entered above. Click **Yes** if you typed the path correctly.

A second warning screen will appear that states that Execution of RESTORE will cause a System Reset. If this is acceptable, click **Yes**.

Result: The **DMX Progress Indicator** screen appears to indicate that the restore is in progress. A WaveStar® CIT warning screen states **NE reset after successful restore, CIT is going to log out**.

29 Click **Okay**.

Important! Following a Metropolis® DMX system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). If automatic synchronization is unsuccessful, the date and time must be reset manually.

Reference: "Task 354: Set Date and Time" (10-571).

END OF STEPS

Task 212: Condition and Connect Modems to Establish Communication From Remote CIT Location

Purpose

Use this task to connect modems and a Personal Computer (PC) to the Metropolis® DMX for use in provisioning the system from a remote location.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Modem and modem cable
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Ensure that the descriptions and syntax of the various features and parameters of the Metropolis® DMX that may be set using the PC with the WaveStar® CIT program installed are understood prior to starting this task.

Ensure that the proper modem cable is available. Use the following table to determine the correct assembly:

Table 9-1 Modem Cable Assembly and Pin Connections

Description	Cable Assembly #	Cable Length	Metropolis® DMX Connections
Modem Cable	848756508	50 ft.	J17
	848756524	100 ft.	
	848756516	150 ft.	
	848756532	250 ft	

Connection	RJ-45 Connector Pin #	Color	DB25 Connector Pin #
Modem Cable J17	1	White-Orange	8
	2	Brown	20
	3	White-Black	3
	5	Orange (and Shielding)	7
	6	Green	2

Task Complete the following steps to connect modem and establish communication from a remote WaveStar® CIT location.

. . . . . .

1 Verify the generic parameters of the modem are set to the following:

Modem Parameters

- 1200, 2400, 4800, 9600, or 19,200 baud
  (9600 is the default and recommended rate)
- 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.)

Important! Modems supporting a large set of options and error detection capabilities may require other options be set before using the modems to download generic software. Refer to manufacture's manuals for instructions on setting modem parameters.

. . . . . .

2 Are you at the Metropolis® DMX location or remote WaveStar® CIT location?

If...	Then...
Metropolis® DMX Location	Continue with Step 3.
Remote WaveStar® CIT Location	Proceed to Step 8.

. . . . . .

3 Set the modem to answer incoming calls.

. . . . . .

4 Connect the modem to the rear WaveStar® CIT interface on the Metropolis® DMX shelf using the proper Metropolis® DMX modem cable.

. . . . . .

5 Plug the telephone line into the modem.

. . . . . .

6 From the System View menu, select **Adminstration > Data Communications**.
From the **Serial Port** tab, set the options of the serial port.

The Metropolis® DMX shelf has a default setting of 9600 baud for the serial port. If the modem is set for another baud rate (1200, 2400, 4800 or 19200), establish a WaveStar® CIT session with the Metropolis® DMX shelf and set the baud rate to match that of the modem.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

7 STOP! END OF TASK.

. . . . . .

8 At the remote WaveStar® CIT location, set the modem parameters to match those set at the Metropolis® DMX location. Refer to manufacture's manual for instructions on setting modem parameters.

. . . . . .

9 Connect the remote modem to the WaveStar® CIT terminal using the appropriate modem cable.

. . . . . .

10 Verify the telephone line is plugged into the modem.

. . . . . .

11 Refer to the PC and Modem documentation to establish a connection (place a call) to the modem at the Metropolis® DMX.

12 Once the Modem at the Metropolis® DMX has answered, establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

END OF STEPS

Task 213: Install Software Generic Program in New Metropolis® DMX Shelf Installation

Purpose

Use this task to install software generic in a new factory-fresh SYSCTL (LNW1).

> **Important!** This task uses the *cpy-mem* command via FTP to install a new software program in a new Metropolis® DMX shelf.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- Cables to connect the PC to Metropolis® DMX
- Working copy of the new system generic software program on CD-ROM
- Current *Metropolis® DMX Access Multiplexer Software Release Description* for the software generic being installed.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Before you begin this task:

1. Verify that new software generic program is available.
2. Refer to the *Metropolis® DMX Access Multiplexer Software Release Description* for a description of any special considerations required when installing this version of software
3. Unseat all circuit packs in the shelf, except the SYSCTL to which you are downloading the new software generic.
4. Determine the IP address assigned to LAN card (in the WaveStar® CIT) that will be used to connect to the shelf.

Important! A privileged login is required to perform this task.

Task

Complete the following steps to install software generic program in a new shelf installation with only a factory-fresh SYSCTL installed.

. . . . . .

1 If not previously completed, install generic and WaveStar® CIT software on the PC.

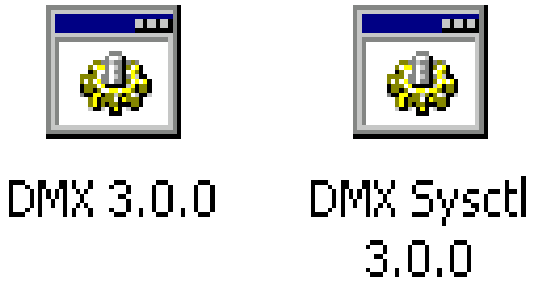
Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

. . . . . .

2 Double-click on **DMX 3.0.0 Downloads** folder on you PC desktop.

Result: The *DMX 3.0.0 Downloads* folder contains the following two icons.

Figure 9-20 Contents of DMX 3.0.0 Downloads Folder



3 Verify that only a factory-fresh SYSCTL is installed in your Metropolis® DMX shelf; no other circuit packs should be seated in the shelf.

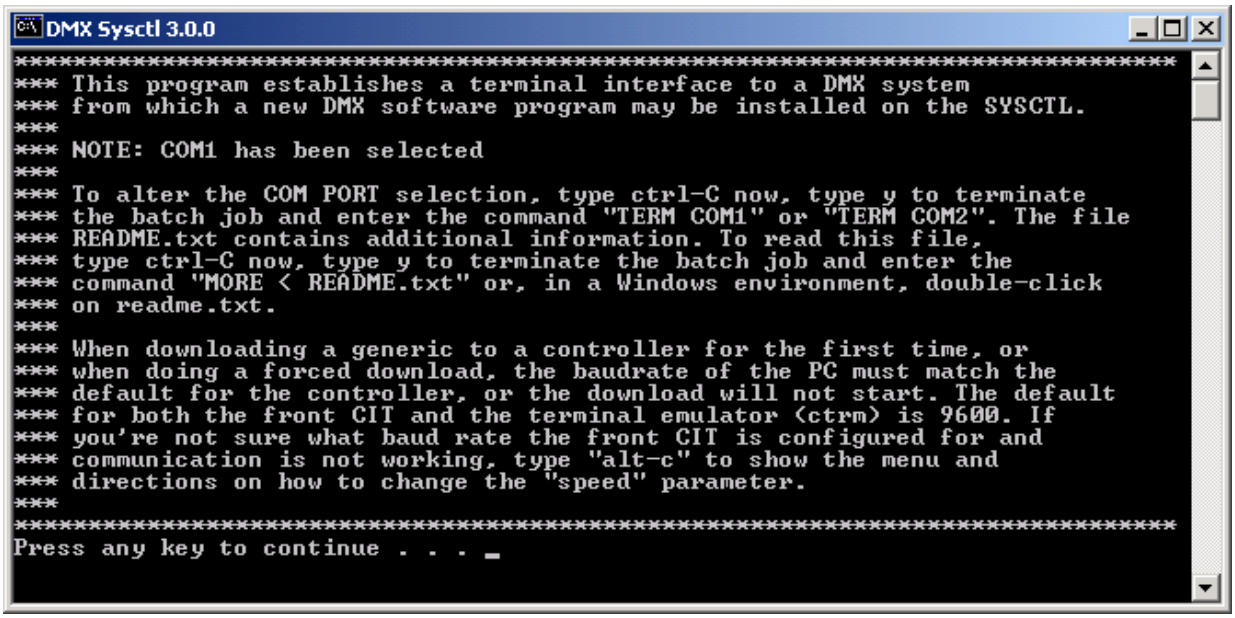
Important! A factory-fresh SYSCTL circuit pack does not contain a software generic; it only contains the information loaded at the factory (boot code).

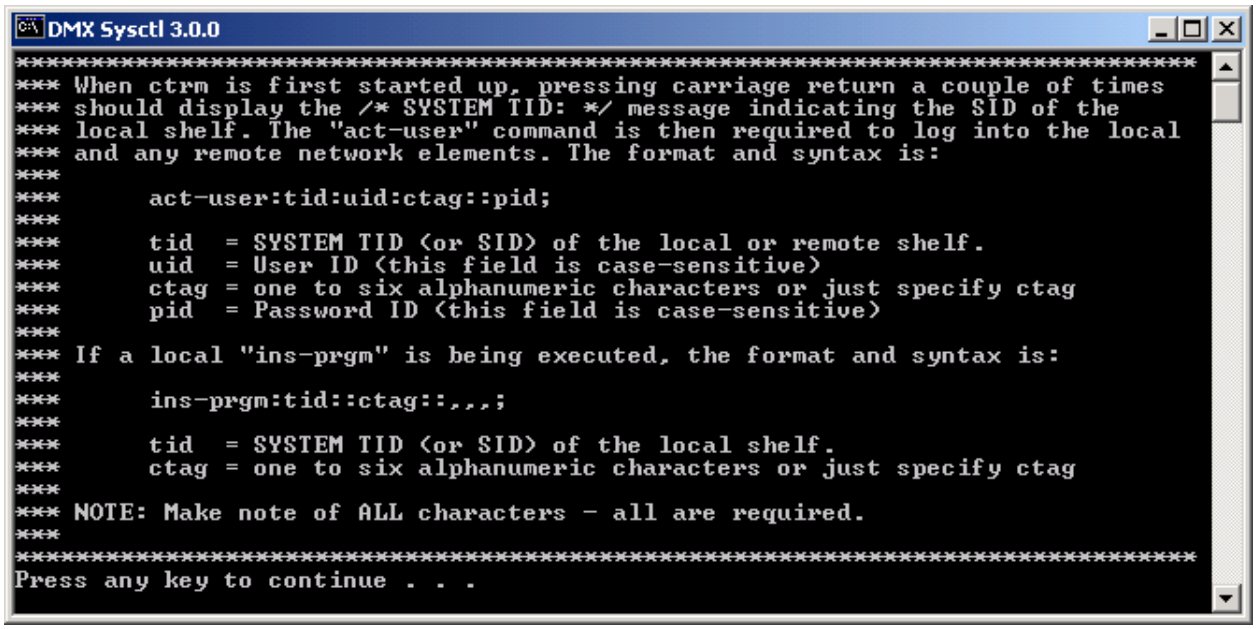
4 Observe the **IND** display on the SYSCTL; the display indicates which boot code is installed in the SYSCTL.

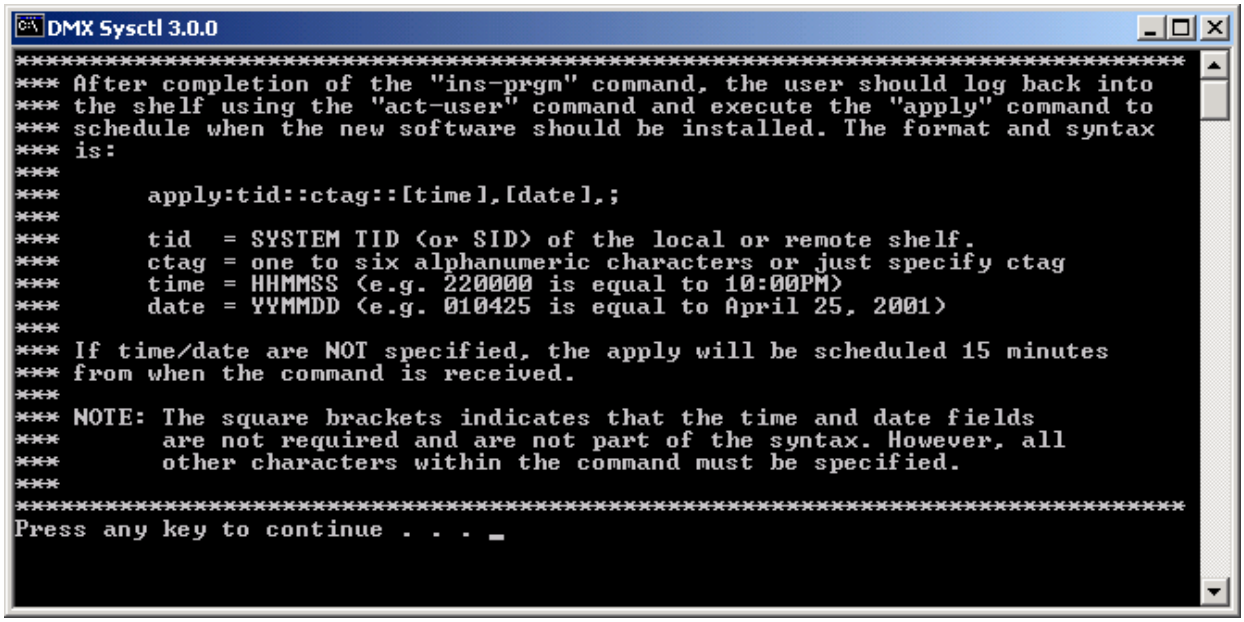
Important! Installing the R3.0.0 generic in a SYSCTL with a 1.x boot code requires two downloads. The first download (Step 5 through Step 9), installs the R3.0.0 unbundled generic, which installs the 3.x bootcode on the SYSCTL. The second download (beginning in Step 10) installs the R3.0.0 bundled generic which includes the DS1, DS3, and Ethernet circuit pack software.

If...	Then...
P (boot code is 1.1)	Double-click on the *DMX Sysctl 3.0.0* icon. Continue with Step 5.
alternating **P** and **2** (boot code is 2.0)	Proceed to Step 25.
alternating **P** and **2.** and **1** (boot code is 2.1)	
alternating **P** and **3** (boot code is 3.0)	

5 Follow the instructions on the subsequent screens.






DMX Sysctl 3.0.0
*** After completion of the "ins-prgm" command, the user should log back into
*** the shelf using the "act-user" command and execute the "apply" command to
*** schedule when the new software should be installed. The format and syntax
*** is:
***
***   apply:tid::ctag::[time],[date],;
***
***   tid = SYSTEM TID (or SID) of the local or remote shelf.
***   ctag = one to six alphanumeric characters or just specify ctag
***   time = HHMMSS (e.g. 220000 is equal to 10:00PM)
***   date = YYMMDD (e.g. 010425 is equal to April 25, 2001)
***
*** If time/date are NOT specified, the apply will be scheduled 15 minutes
*** from when the command is received.
***
*** NOTE: The square brackets indicates that the time and date fields
***   are not required and are not part of the syntax. However, all
***   other characters within the command must be specified.
***
Press any key to continue . . .


DMX Sysctl 3.0.0
METROPOLIS DMX NETWORK USER INTERFACE
Version 1.1,
Lucent Technologies
All Rights Reserved.
Cnfg Speed Char Size Stop Bits Parity Flow Ctrl Local Echo
* 1 9600 8 1 none xon/xoff n
2 9600 8 1 none xon/xoff n
Interface ready. (Type Alt-h for help.)
Communications established

6 Unseat the SYSCTL circuit pack and using the appropriate cable, connect the **COM1** port of the PC to the **CIT RS-232** serial port on the faceplate of the SYSCTL circuit pack.

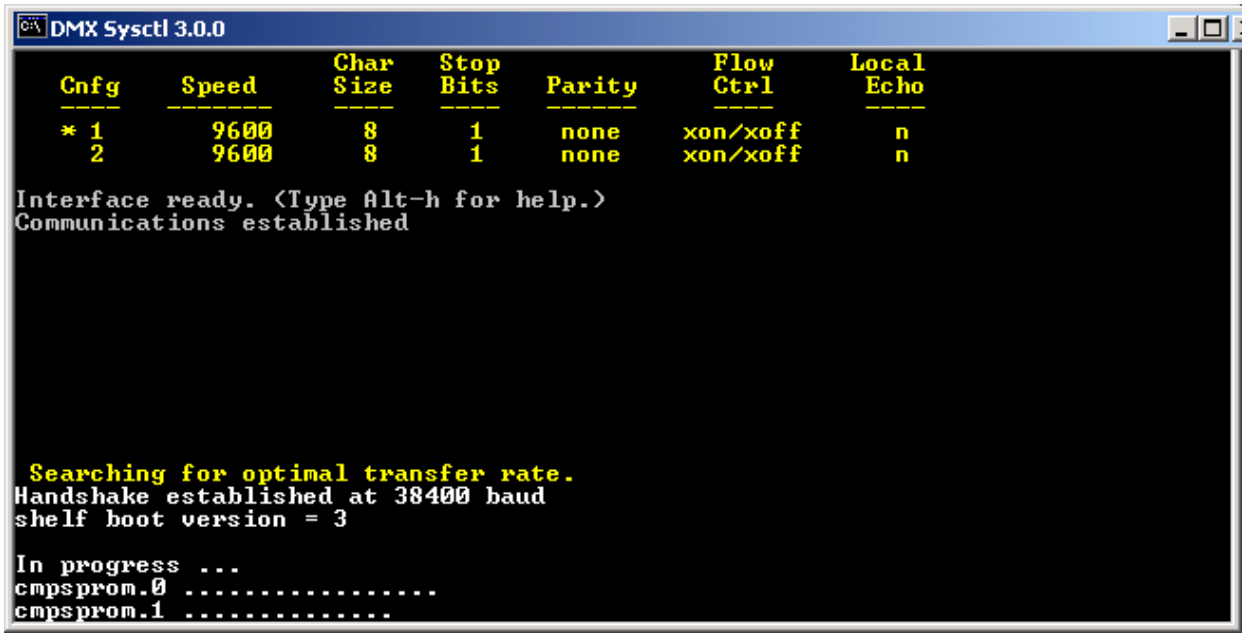
7 Reseat the SYSCTL circuit pack.

Result: All the LEDs on the SYSCTL light and the the **IND** display shows **8.** briefly and the **P** returns.

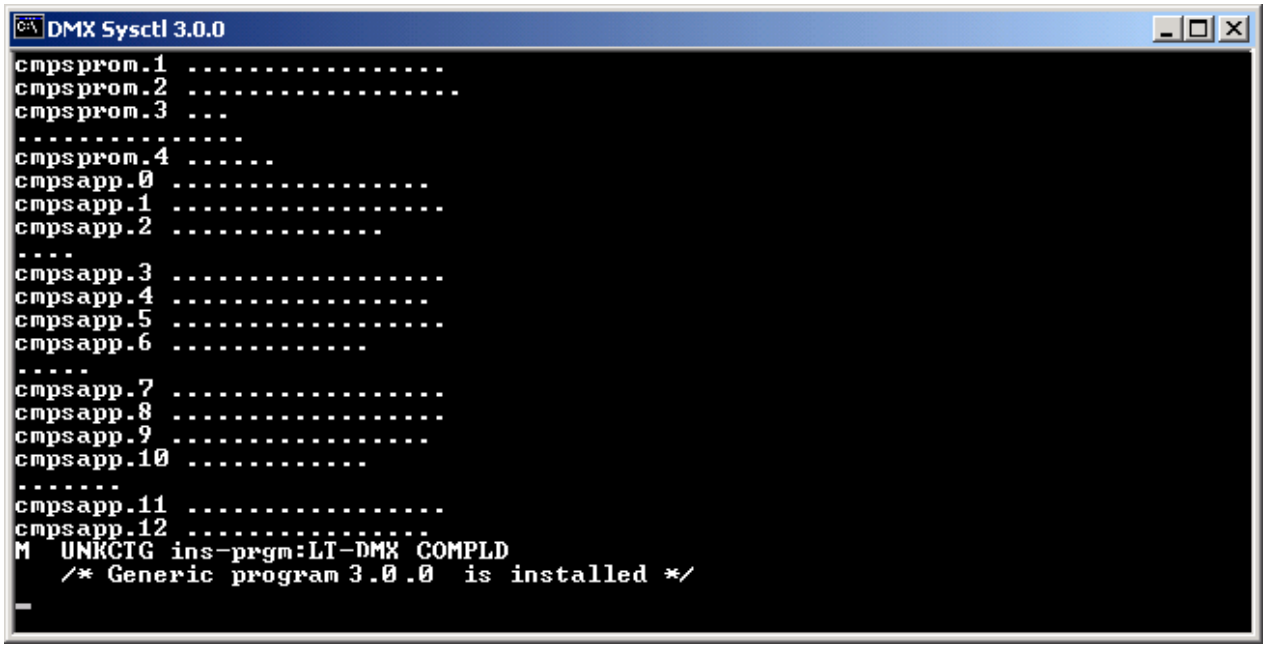
The software begins to download automatically from the WaveStar® CIT to the SYSCTL.

Important! The download takes approximately 45 minutes to complete. After the download completes, the software is automatically applied (installed).

You may view the progress of the download in following the term screen.



8 After the download and installation are complete, verify that your term screen returned the following confirmation.



9 To confirm that the downloaded software has been successfully applied, retrieve the generic software version ID:

1. Depress and hold the **ACO TEST** push-button on the SYSCTL for about 4 seconds.

   Result: All LEDs on the SYSCTL light. **8.** appears in the **IND** display on the SYSCTL.

2. Release the **ACO TEST** push-button on the SYSCTL when the **8.** disappears in the **IND** display.

   Result: The current software generic (3.0.0) appears in the **IND** display on the SYSCTL and the SYSCTL LEDs return to their previous status.

10 Do you have the capability for TCP/IP connectivity?

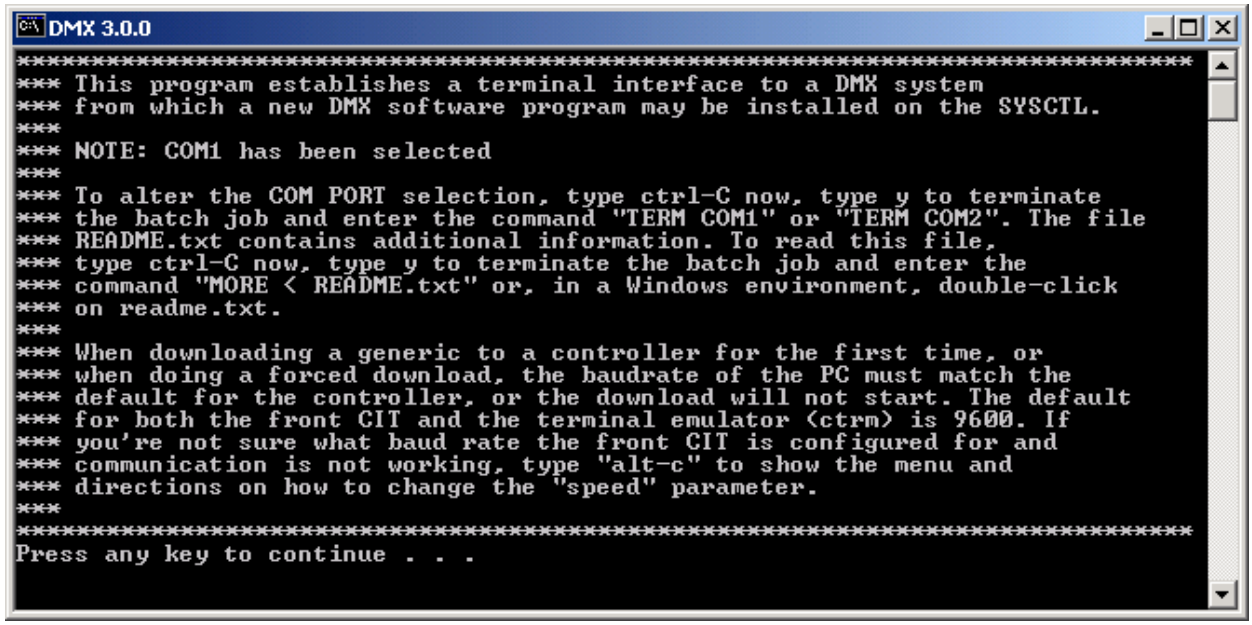
If...	Then...
Yes	Proceed to Step 25.
No	Continue with Step 11.

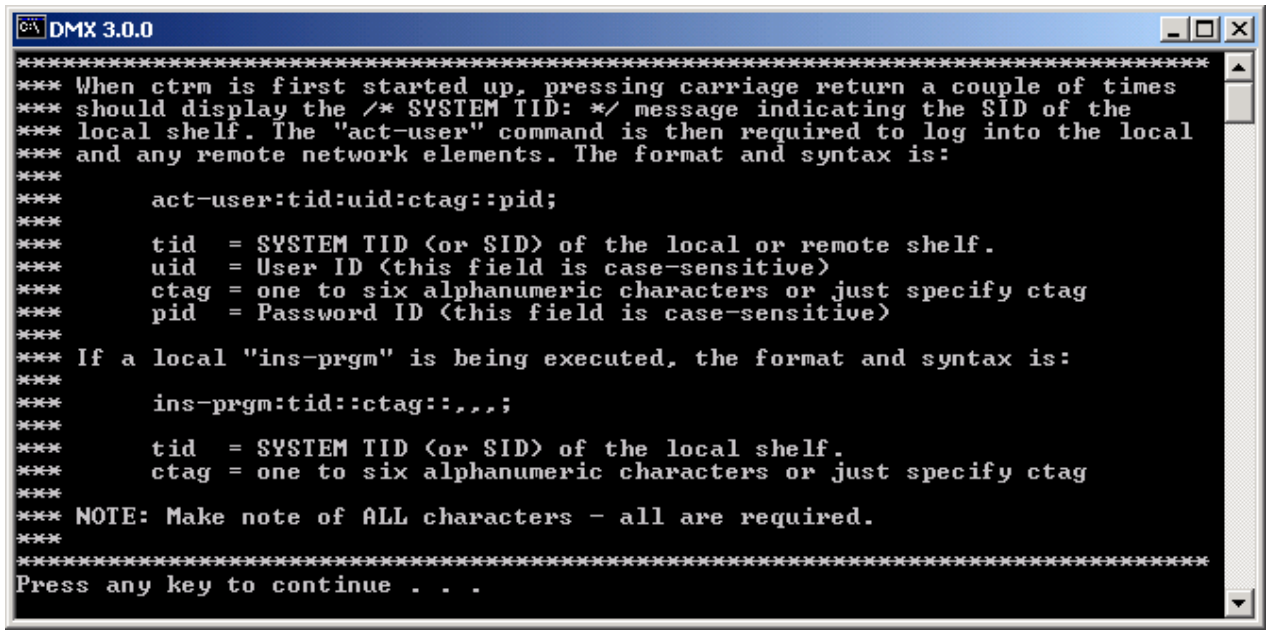
Important! TCP/IP connectivity is preferred. Downloading software via FTP download (which requires TCP/IP connectivity) takes approximately 10 minutes. Downloading software using INS-PRGM takes approximately 45 minutes.

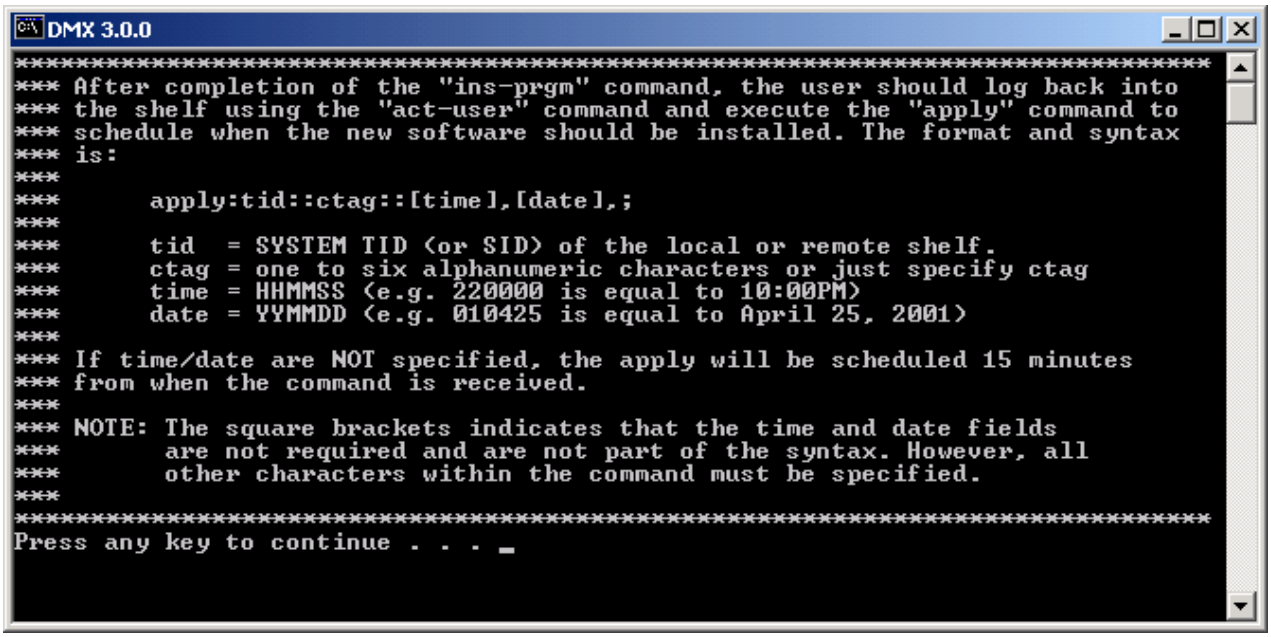
11 Verify that the **COM1** port of your PC is still connected to the **CIT RS-232** serial port on the faceplate of the SYSCTL circuit pack.

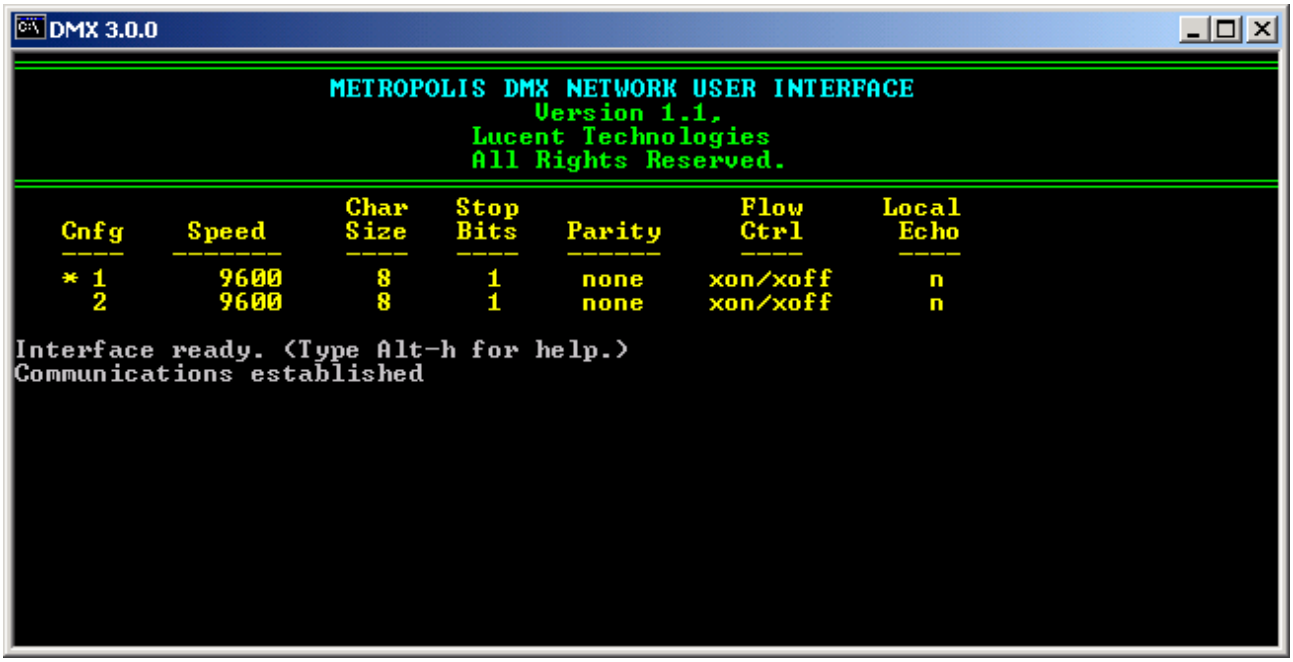
12 Double click on on the *DMX 3.0.0* icon within the **DMX 3.0.0 Downloads** folder on you PC desktop. (Refer to Step 2.)

Follow the instructions on the subsequent screens.





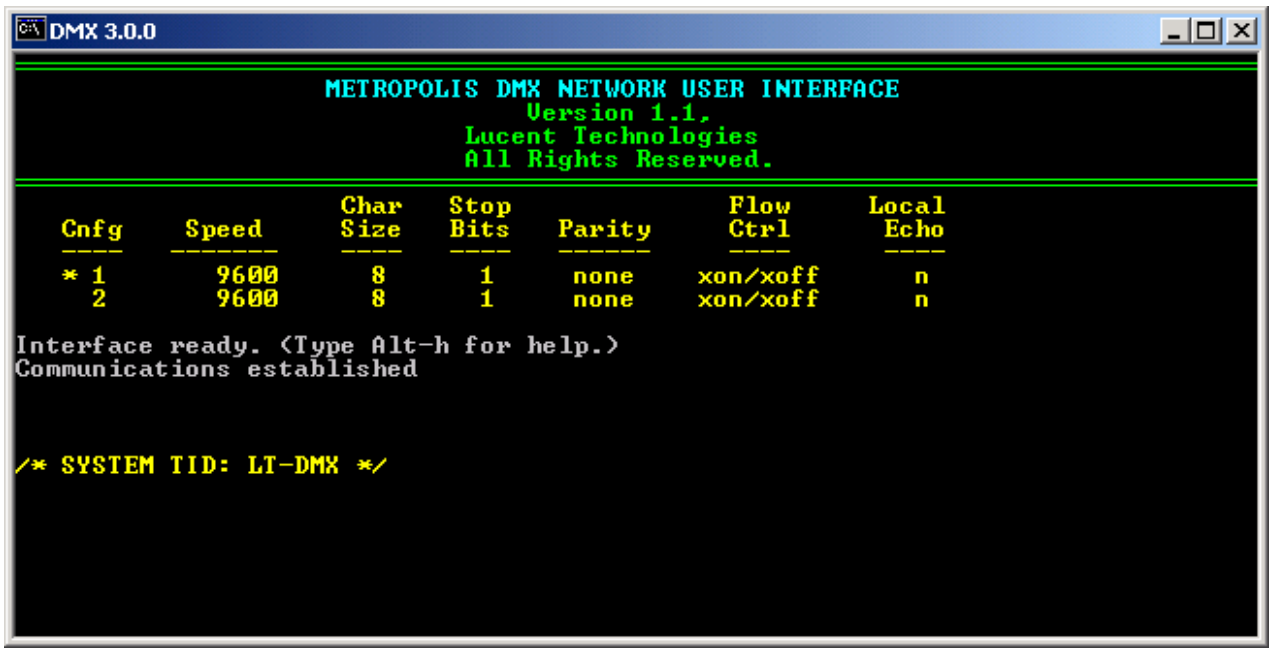

DMX 3.0.0
*** After completion of the "ins-prgm" command, the user should log back into
*** the shelf using the "act-user" command and execute the "apply" command to
*** schedule when the new software should be installed. The format and syntax
*** is:
***
***   apply:tid::ctag::[time],[date],;
***
***   tid = SYSTEM TID (or SID) of the local or remote shelf.
***   ctag = one to six alphanumeric characters or just specify ctag
***   time = HHMMSS (e.g. 220000 is equal to 10:00PM)
***   date = YYMMDD (e.g. 010425 is equal to April 25, 2001)
***
*** If time/date are NOT specified, the apply will be scheduled 15 minutes
*** from when the command is received.
***
*** NOTE: The square brackets indicates that the time and date fields
***   are not required and are not part of the syntax. However, all
***   other characters within the command must be specified.
***
Press any key to continue . . .


DMX 3.0.0
METROPOLIS DMX NETWORK USER INTERFACE
Version 1.1,
Lucent Technologies
All Rights Reserved.
Cnfg Speed Char Size Stop Bits Parity Flow Ctrl Local Echo
* 1 9600 8 1 none xon/xoff n
2 9600 8 1 none xon/xoff n
Interface ready. (Type Alt-h for help.)
Communications established

13 Press Enter.

Result: The following screen appears with the following response
/* SYSTEM TID: LT-DMX */

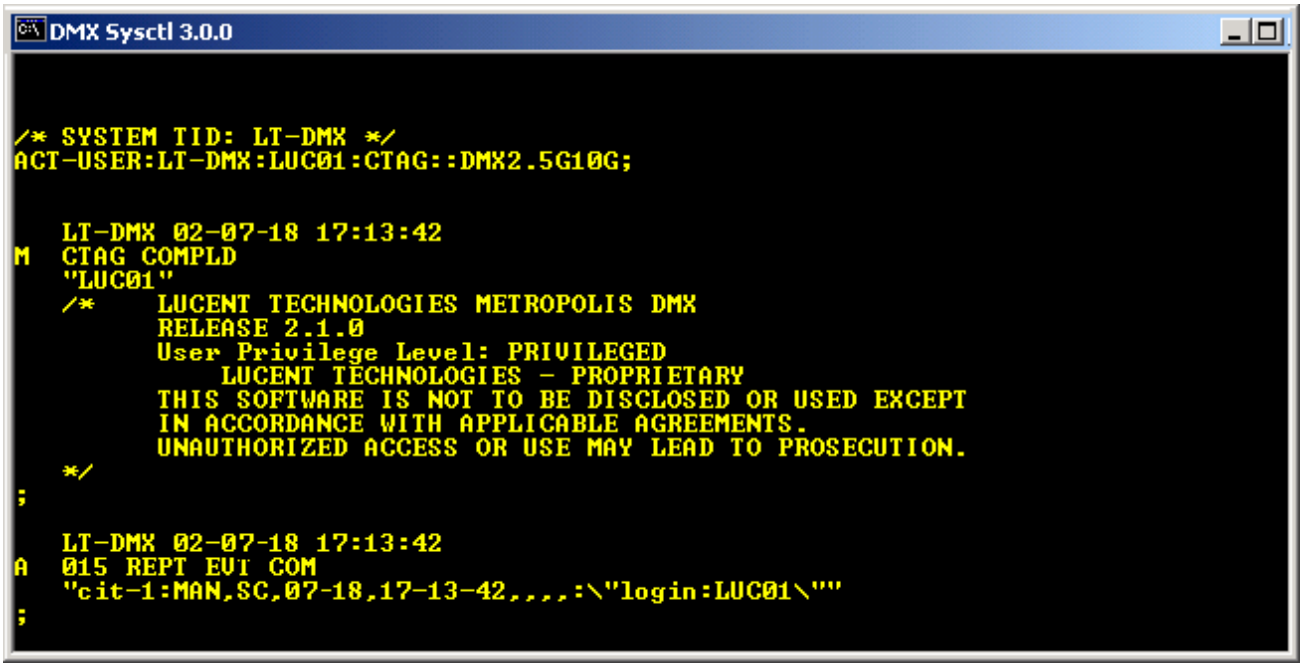
Important! LT-DMX is the default TID. Your TID may be different.



14 Press Enter and type **ACT-USER:LT-DMX:LUC01:CTAG::DMX2.5G10G;**

Important! Replace LT-DMX with your TID.

Result: The following screen appears. Note the release is 3.0.0 because the unbundled software generic was applied.



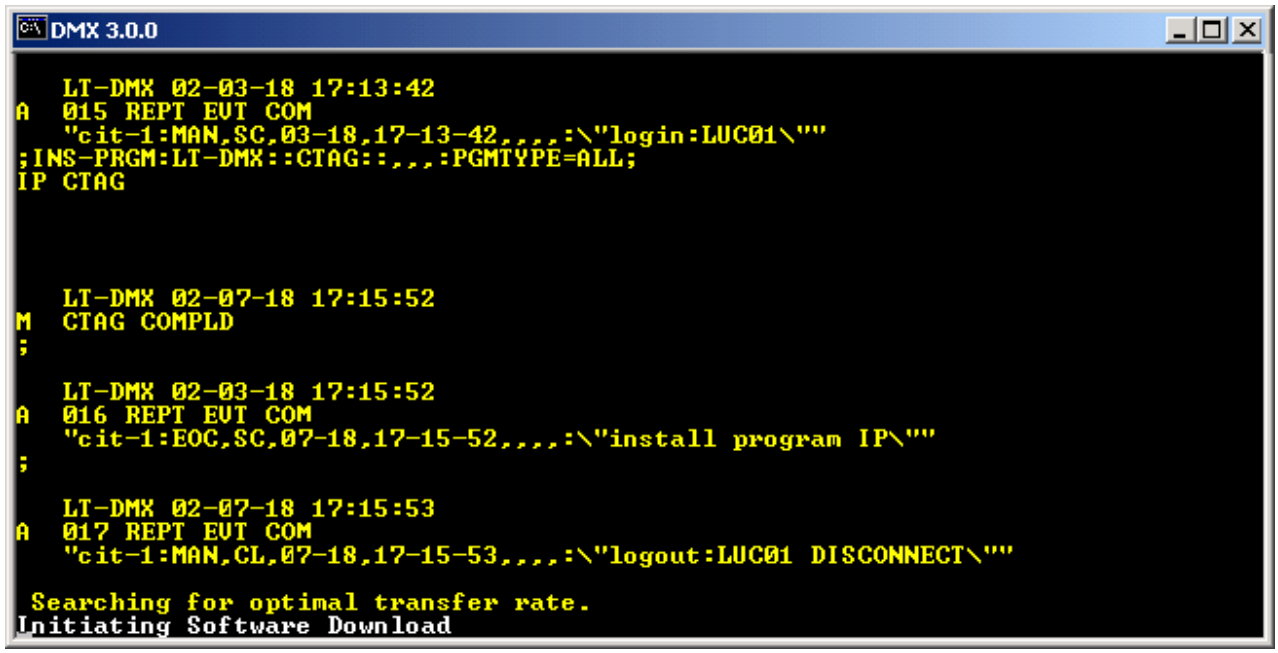
. . . . . .

15 Enter **INS-PRGM:LT-DMX::CTAG::„„:PGMTYPE=ALL;**

Result: System returns CTAG COMPLD and initiates the software download.

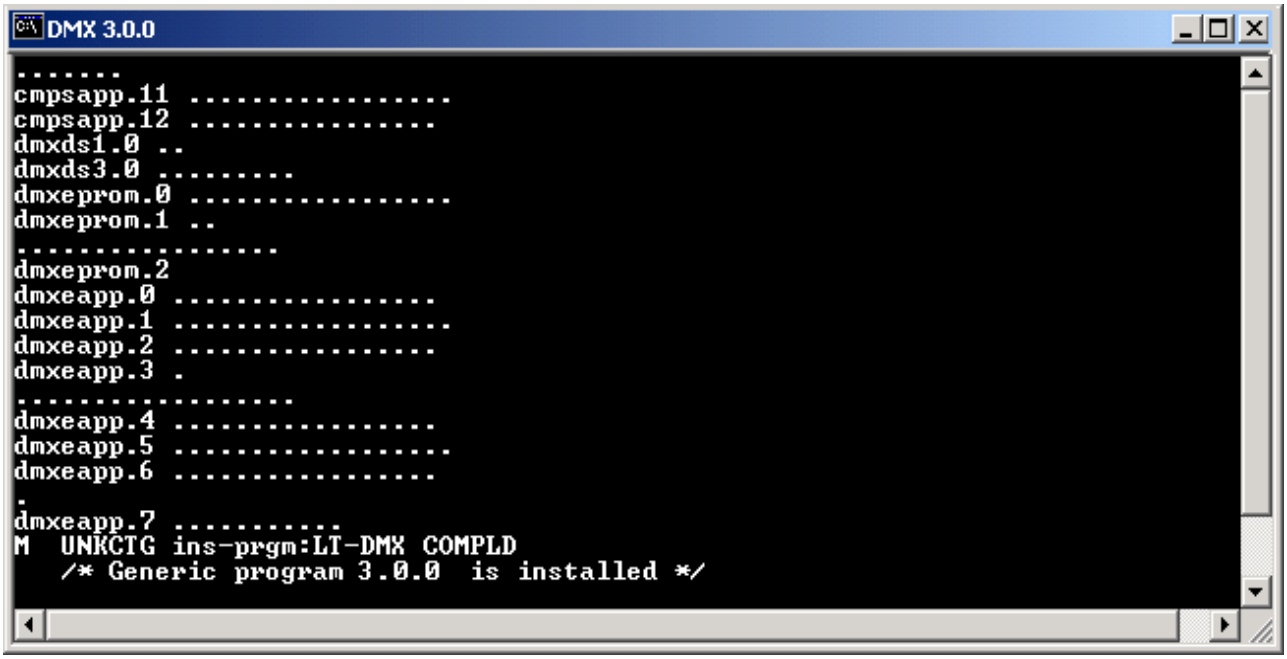
Important! Replace LT-DMX with your TID.

The software download takes approximately 45 minutes.



16 When the software download is complete, the following screen appears.

Important! The downloaded software has been installed as a dormant file.



17 Exit the Term program using **ALT**+**F2**. Continue with Step 18.

18 Do you wish to apply (activate) the software generic that you recently downloaded to the dormant area of the Metropolis® DMX shelf?

If...	Then...
Yes	Continue with Step 19.
No	STOP! END OF TASK.

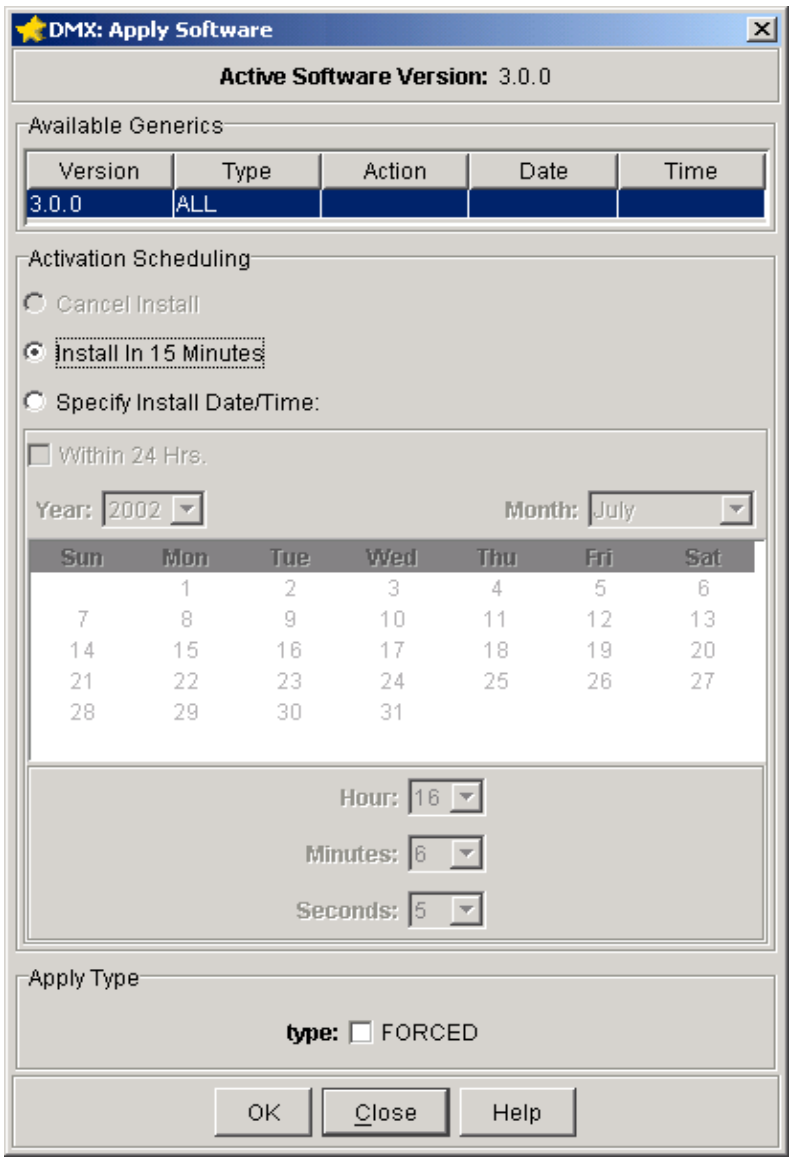
19 Establish a WaveStar® CIT session (specifying either OSI or Serial in the **Connection Type:** field) and log in to your Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

20 From the System View menu, select **Configuration > Software > Apply Software**....

Result: The Apply Software window appears.

Figure 9-21 Apply Software Window



21 Select and/or enter the following information in the Apply Software window (Figure 9-21):

1. From the **Available Generics** panel, select the software generic to be activated.
2. From the **Activation Scheduling** panel, you may schedule the activation time and date in *one* of the following ways:
   - Select **Install In 15 Minutes**
     The software will install 15 minutes after you click **Okay**.
   - Select **Specify Install Date/Time** and select the **Year**, **Month**, **Date** and **Time**.
     In this case, the **Hour**, **Minute**, and **Second** fields are used to enter a 24-hour clock time (13 hours and 15 minutes means that the software will apply at 1:15 PM on the date specified).
   - Select **Specify Install Date/Time** *and* **Within 24 Hours**.
     In this case, the **Hour**, **Minute**, and **Second** fields are used to enter the time within 24 hours of the current date and time after you click **OK**.

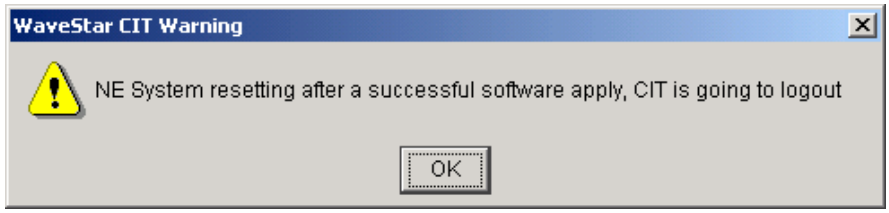
   Important! You may cancel the scheduled apply by returning to the **Apply Software** menu at any time before the software applies and selecting the generic and **Cancel Install** and then clicking **OK**.
3. Click **OK**.

Result: The following warning message appears:
Execution of Provision may affect the NE service. Do you want to execute this command?
Click **Yes**.

22 After approximately 15 minutes the apply is complete.

Result: The following warning screen appears, click **OK**. The System View closes.

Important! If the WaveStar® CIT Network View is unresponsive, perform a shut-down using Windows Task Manager to End the WaveStar® CIT.



Important! Following a Metropolis® DMX system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). After 5 minutes (to allow for additional NE resets, as in the case of a network software upgrade), the shelf attempts an automatic synchronization of the time and date with another NE in the network. If the remote NE has not responded to the synchroniztion request within 2 minutes, the request is forwarded to another NE in the network. Each remote NE is allowed 2 minutes to respond. If a valid time and date is not found within the network, it must be entered manually.

23 Establish a WaveStar® CIT session (specifying either OSI or Serial in the **Connection Type:** field) and re-log in to your Metropolis® DMX shelf.

Result: The title bars of the System View and the legal notice should both reflect the current NE software generic, R3.0.0.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (8-3)

. . . . . .

24 Is the Generic Software Version correct?

If...	Then...
Yes	STOP! END OF TASK
No	Contact your support center.

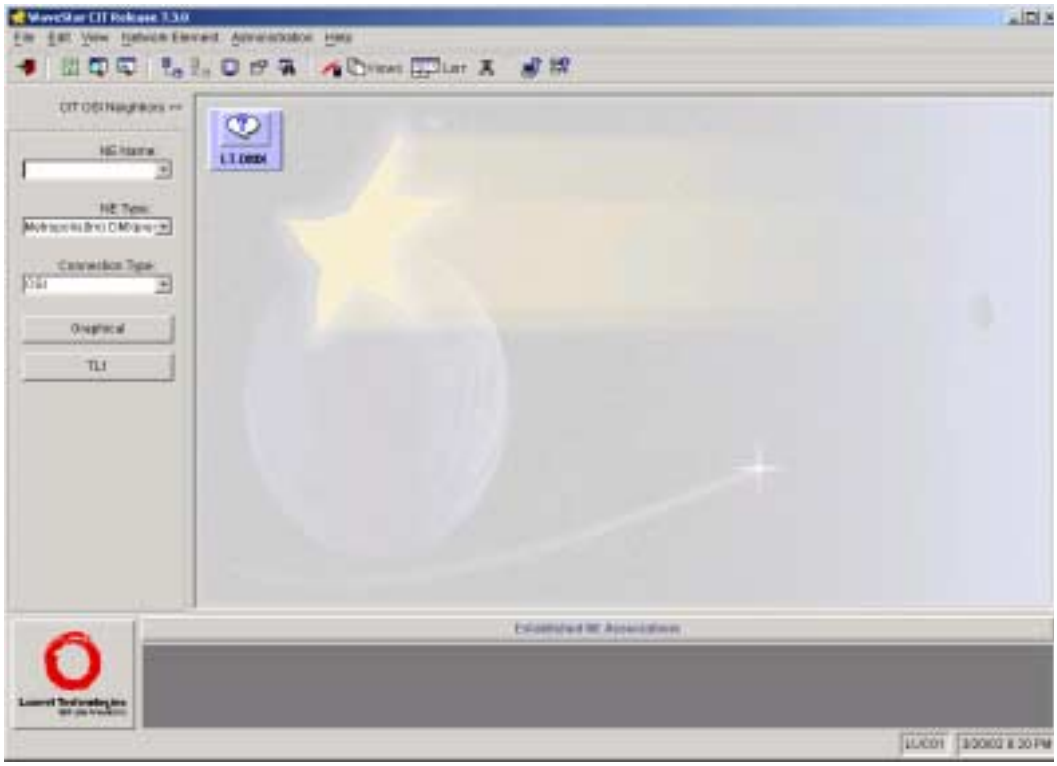
25 Connect the OSI cable from the PC's Network Interface Card (NIC) to the rear **J16 IAO LAN** port on the Metropolis® DMX shelf backplane and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Important! Do NOT log into the shelf; only log in to the WaveStar® CIT.

Result: The following Network View appears. Click on **OSI Network Neighbors** and the CIT OSI Neighbor(s) are automatically detected.

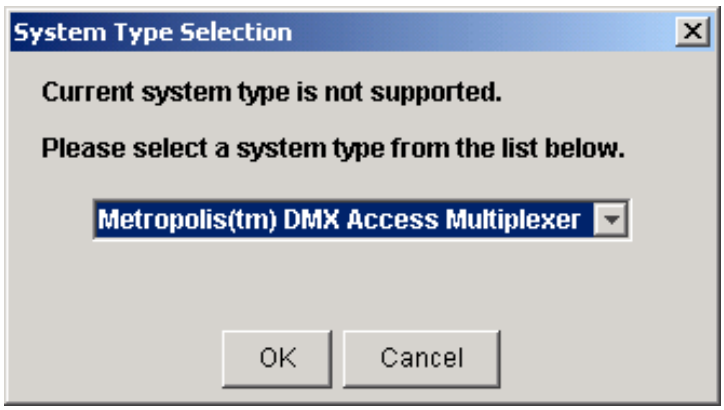
Figure 9-22 CIT OSI Neighbor



26 In the Network View (Figure 9-22), right-click on the LT-DMX NE icon and select **Graphical Using > OSI** from the resulting menu.

Result: The System Type Selection window appears.

27 In the System Type Selection window, select Metropolis DMX Access Multiplexer and click **OK**.



Result: The NE Login Dialog window appears.

28 Enter the following in the NE Login Dialog window (login information is case sensitive) to log in to the NE:

User ID: **LUC01**
Password: **DMX2.5G10G**

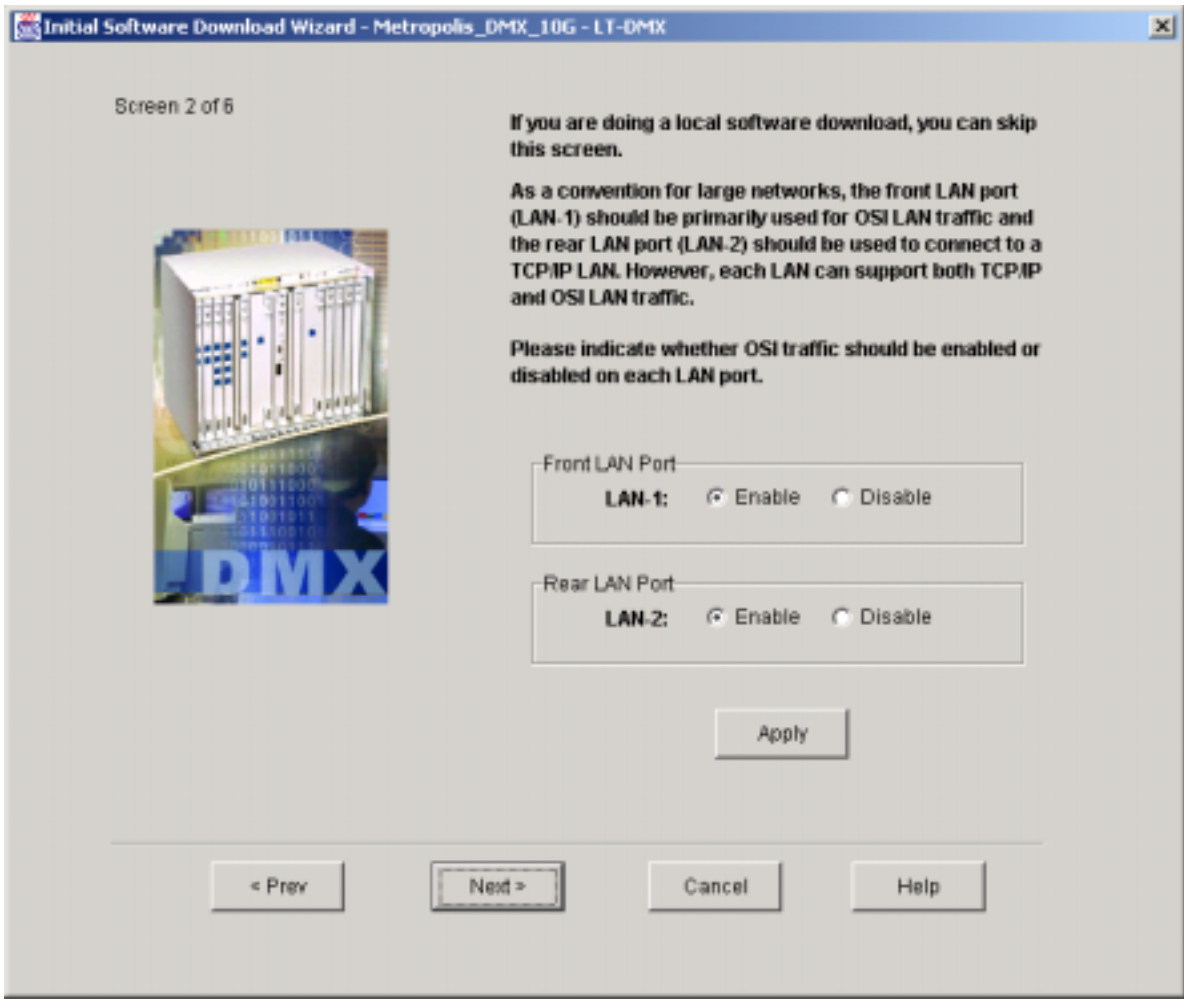
Important! LUC01, LUC02, LUC03 and DMX2.5G10G are the default privileged logins/password for Metropolis® DMX. It is highly recommended that you change all three logins and passwords during your first session to preserve the security of your equipment.

Result: After a successful login, the following welcome screen (Screen 1) appears.

. . . . . .

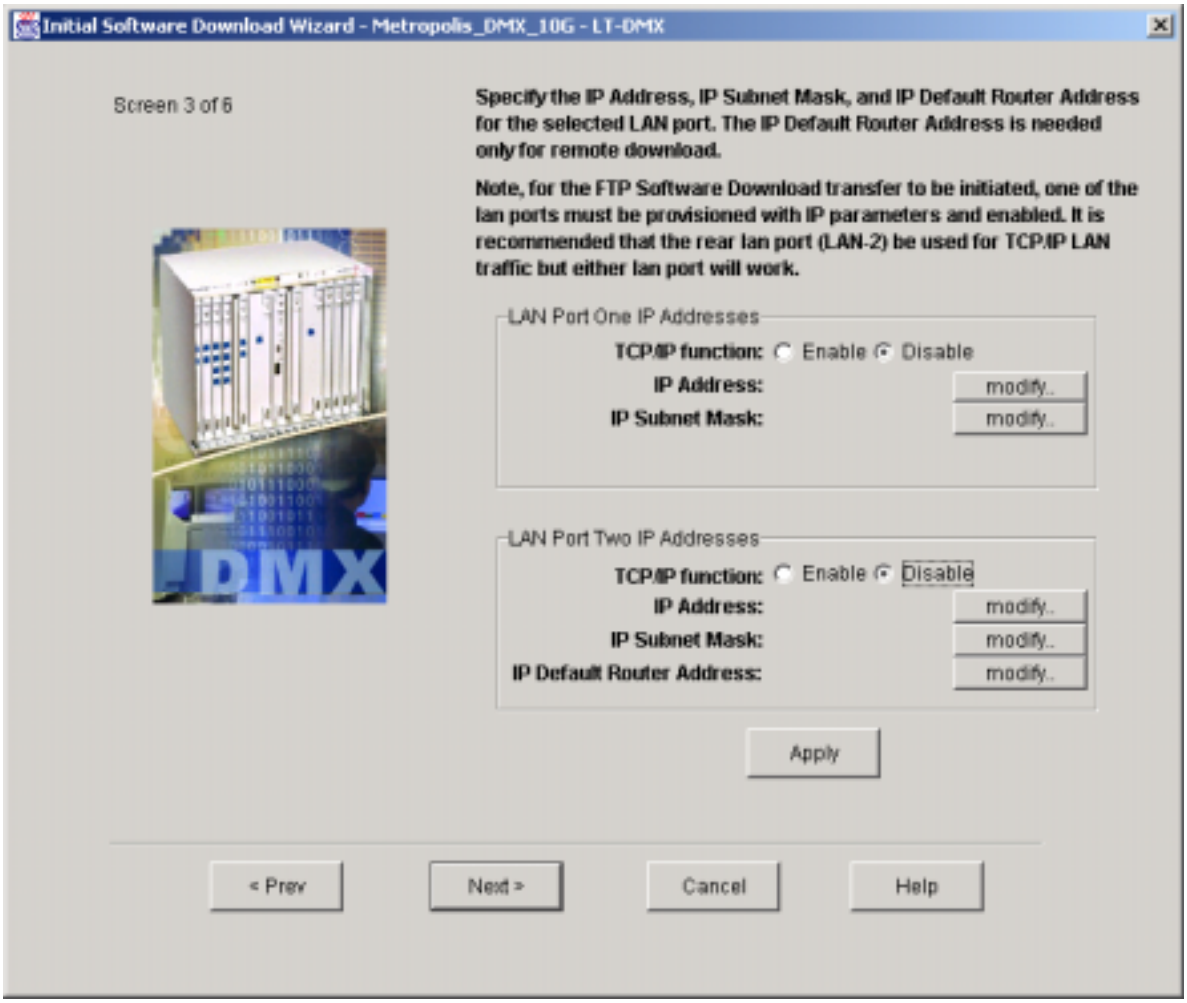
29 On Screen 1, read the material and click **Next**.

Result: Screen 2 appears.



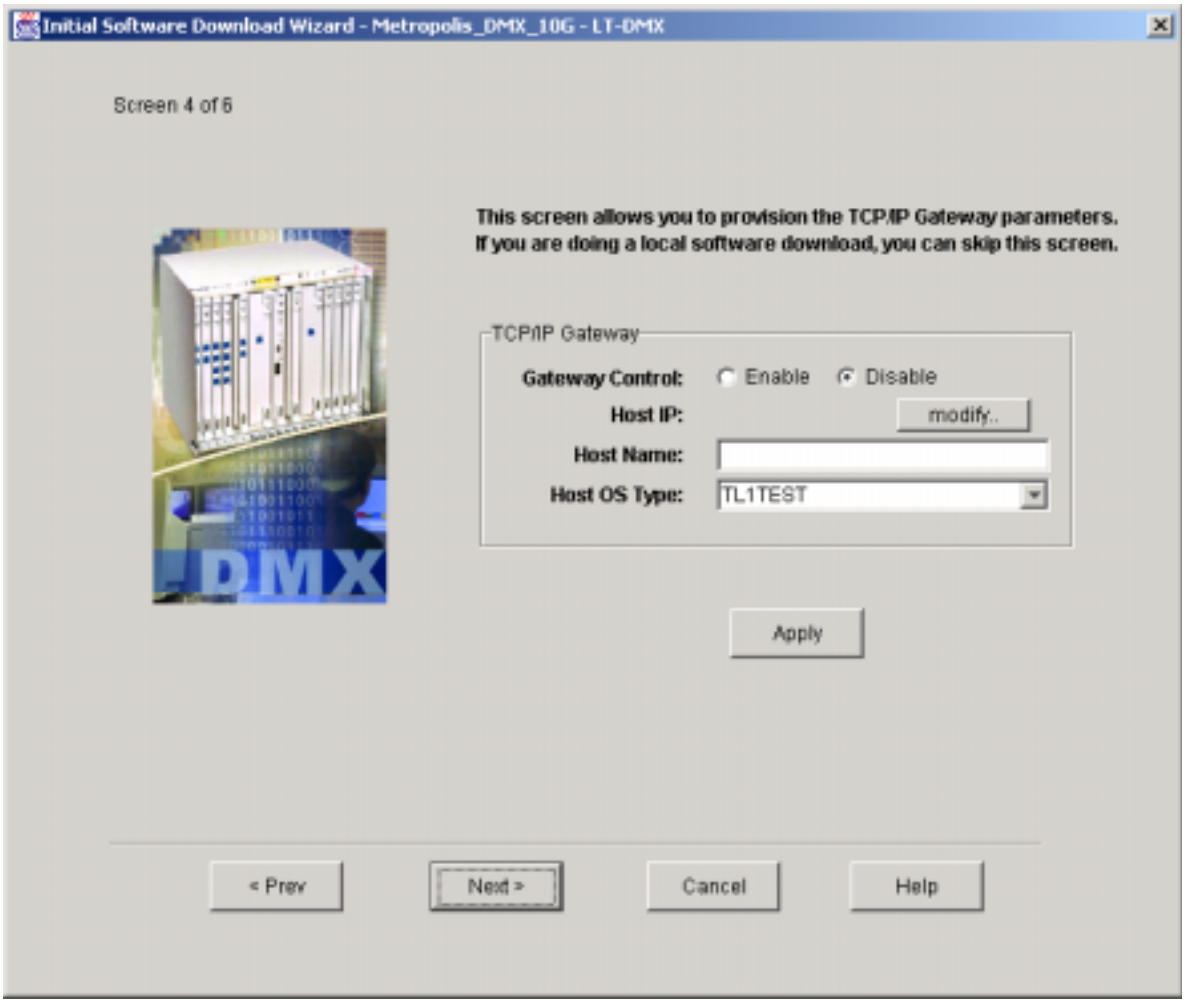
30 Because this is a local download, skip Screen 2. Click **Next**.

Result: Screen 3 appears.



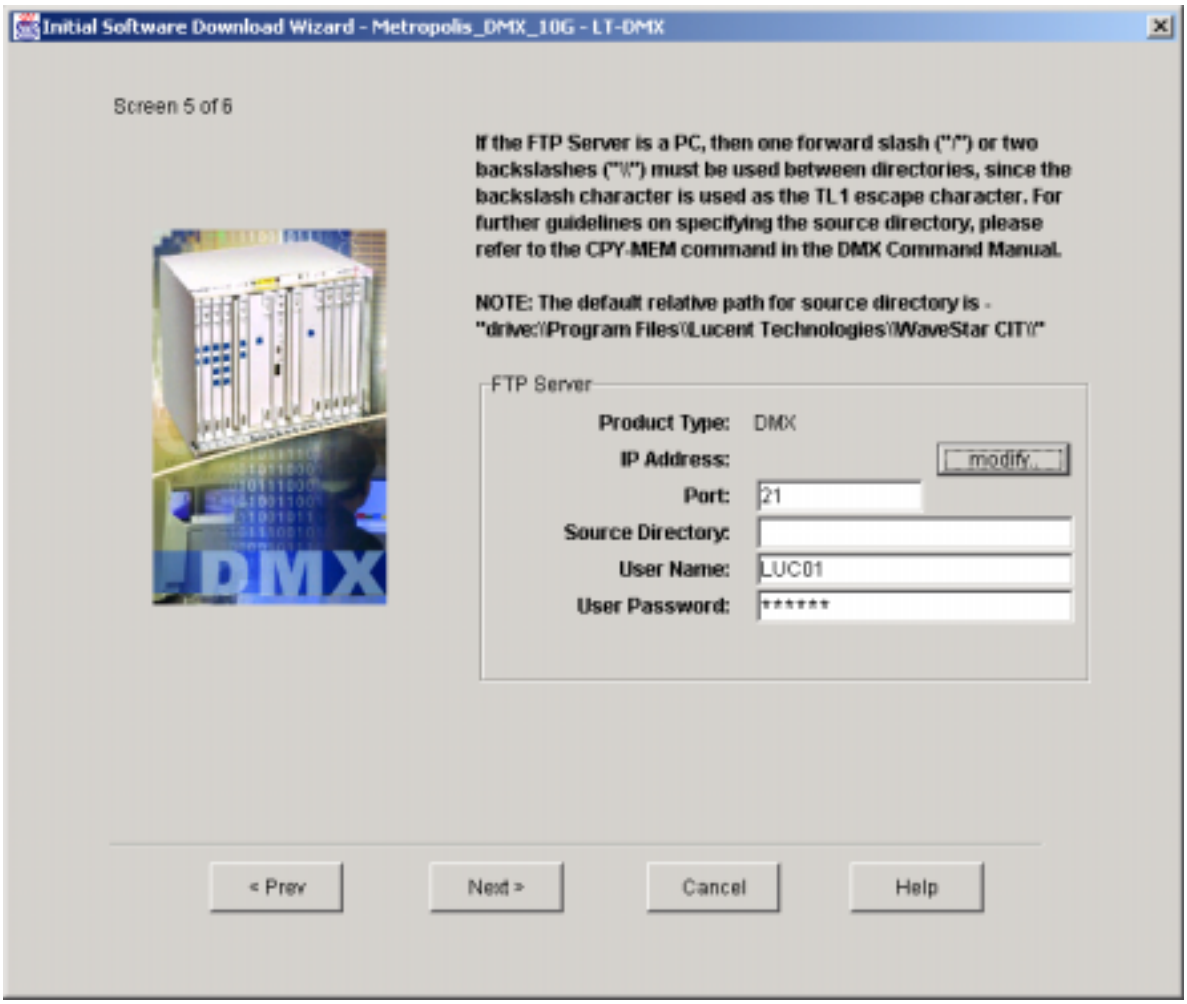
31 From Screen 3, follow the instructions to enable TCP/IP function on the LAN port(s). Click **Modify** to enter the IP Address, IP Subnet Mask, and/or IP Default Router Address. Click **Next**.

Result: Screen 4 appears.



32 This step is not required for the initial download. Click **Next**.

Result: Screen 5 appears.



33 Follow the directions on Screen 5 to provision the information for you FTP server. Click **Next**.

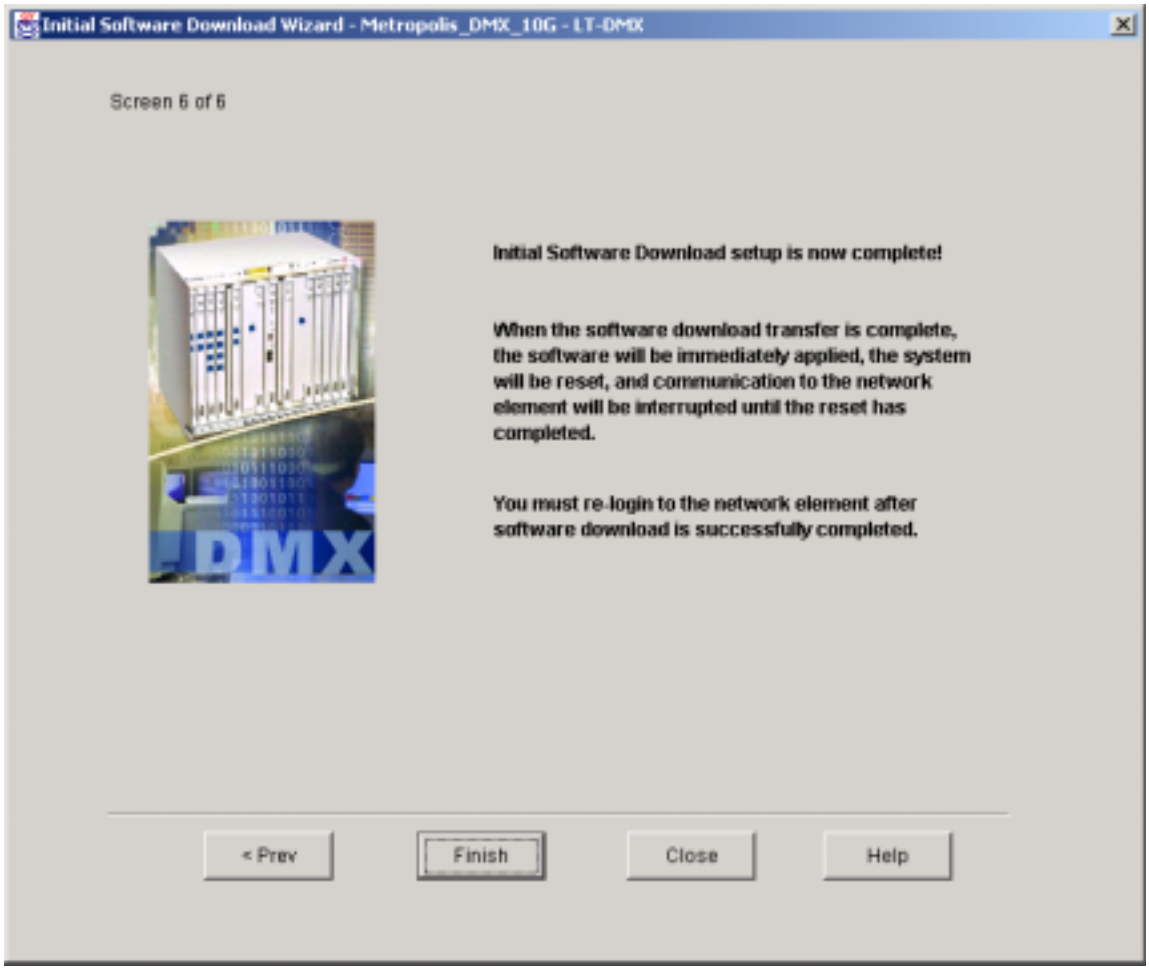
Important! If the WaveStar® CIT is the FTP server, the path of the software generic must be in the following form:

```
generics/dmx/3.0.0/p/
```

Important! If you are using the WaveStar® CIT as your FTP server, you must separate your directory structure using either "/" (as illustrated in the example above) or "\\" because TL1 interprets "\" as a character. The WaveStar® CIT fills in the beginning of the default path (C:/Program Files/Lucent Technologies/WaveStar CIT/).

If you are not using the WaveStar® CIT as your FTP server, enter the path starting from the home directory on your FTP server.

Result: Screen 6 appears.

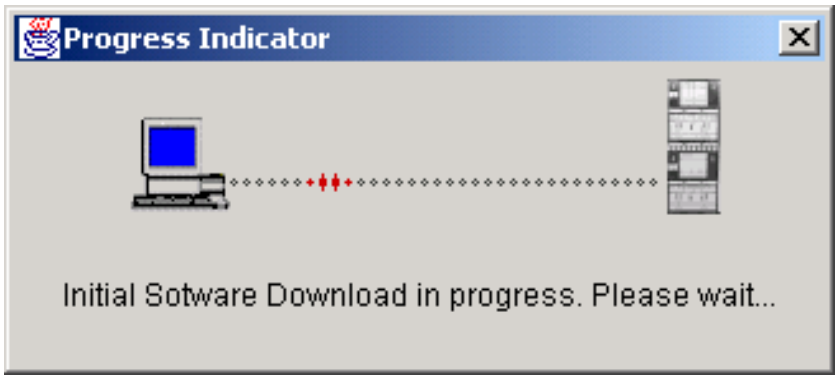


34 On Screen 6, click **Finish**.

Result: A warning message appears that lists the information you provisioned in the six screens. Verify that the information is correct and click **Yes**.
Note: The FTP download source directory is generics/dmx/3.0.0/P .

The FTP download of the software (**cpy-mem**), takes approximately 15 minutes.

While the transfer is in progress, the following Progress Indicator appears.

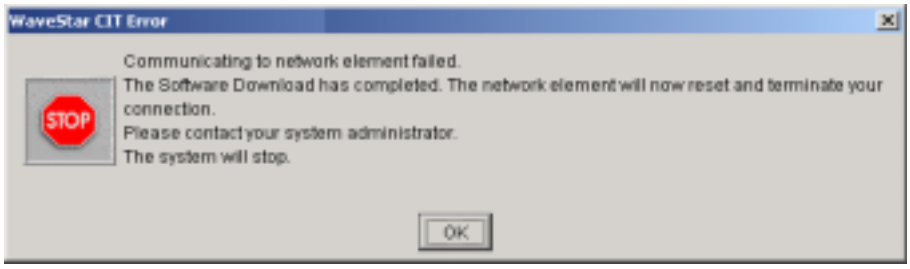


35 The initial software download is a two-part process, totalling approximately 25 minutes. The first part, FTP download of the software (**cpy-mem**), takes approximately 15 minutes. The second part, the reset of the shelf and the apply/activation of the downloaded software (**apply**), takes approximately 10 minutes.

After the FTP download is complete, the following completion message appears. Click **OK**.

Result: The second part of the initial software download begins, the reset of the shelf and the apply/activation of the downloaded software (**apply**). All LEDs on the SYSCTL light and **8.** appears in the **IND** display.

36 When following window appears, indicating that the system is resetting and you are being disconnected, click **OK**.



Result: During the reset and the apply, the SYSCTL circuit pack cycles through a series of changes in the LEDs' state and the **IND** display.

For example, all LEDs on the shelf light and **8.** appears in the **IND** display on the SYSCTL and then the LEDs go off and **P** appears in the **IND** display.

Important! When all LEDs are off and nothing appears in the **IND** display, the initial software download (FTP download, apply and shelf reset) is complete.

37 If the WaveStar® CIT Network View is unresponsive, perform a shut-down using Windows Task Manager to End the WaveStar® CIT.

38 To verify that the download and apply were successful, depress and hold the **ACO TEST** push-button on the SYSCTL for about 4 seconds.

Result: All LEDs on the shelf light. **8.** appears in the **IND** display on the SYSCTL.

39 Release the **ACO TEST** push-button on the SYSCTL when the **8.** disappears in the **IND** display.

Result: The current software generic appears in the **IND** display on the SYSCTL and the shelf LEDs return to their previous status.

40 Specifying OSI in the **Connection Type:** field, log in to the shelf again.

Result: The title bar of the **System View** reflects the current NE software generic, R3.0.0.

41 Is the Generic Software Version correct?

If...	Then...
Yes	STOP! END OF TASK.
No	Contact your next level of support.

END OF STEPS

Task 214: Install Generic and WaveStar® CIT Software on the PC

Purpose

Use this task to prepare for software download.

Required equipment

The following equipment is required:

- Personal Computer (PC) with at least one network interface card (NIC)
- Working copy of the new system generic software program on CD-ROM
- Current *Metropolis® DMX Access Multiplexer Software Release Description* for the software generic being installed.

Safety precautions

There are no safety precautions required for this task.

Related information

For related information, see Chapter 3, "Operations Interfaces" in this document.

Before you begin

Before beginning the software installation procedure, complete the following steps:

Preinstallation Steps

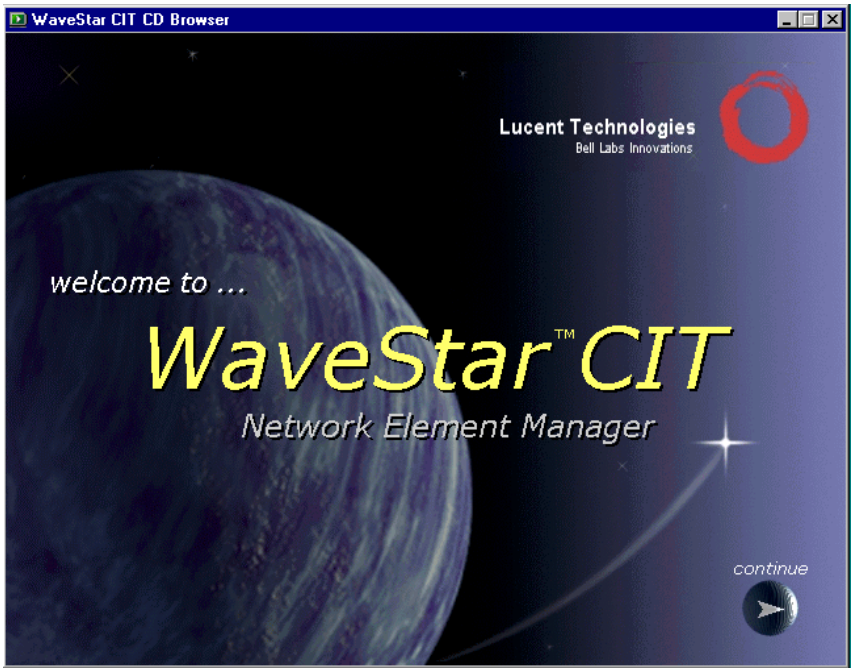
1. Become familiar with the characteristics and operating procedures of your PC and the operating system installed. If you are using multiple NICs, know the IP address of the NIC you will be using for this interface.
   If you are using DCHP with multiple NICs, you may need to temporarily remove all NICs except the one you plan to use for this interface.
2. Operate laptop PCs on AC power during download procedures.
3. Follow proper procedures in handling the CD-ROM.
4. Read the *Metropolis® DMX Access Multiplexer Software Release Description* for the software generic being installed.

Task Complete the following steps to install system software and the WaveStar® CIT software on your PC.

. . . . . .

1 With the PC *not* connected to the Metropolis® DMX shelf, insert the CD-ROM into the PC.

Result: The CD autoruns and the following screen appears:



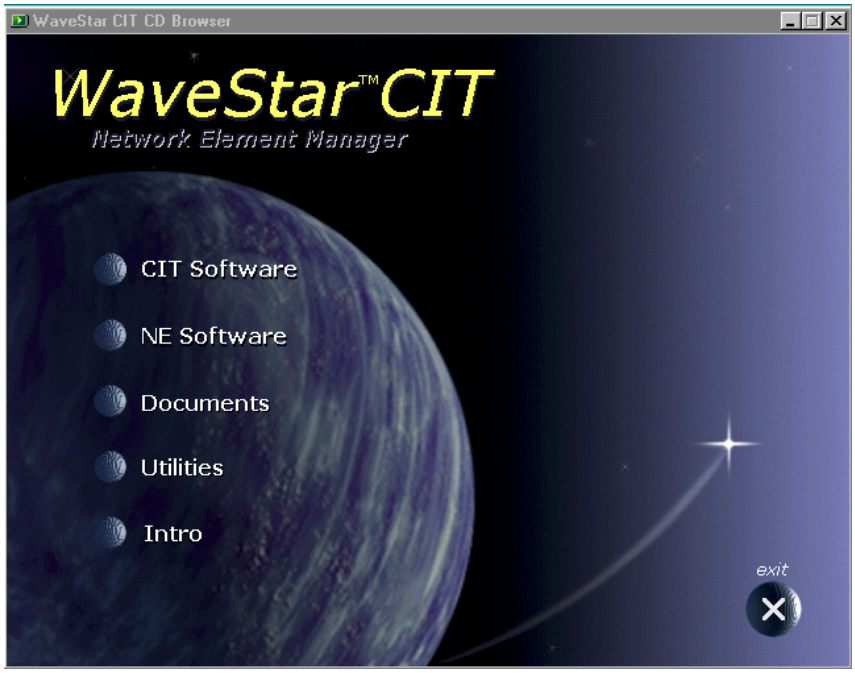
Important! If the CD-ROM does not autorun, verify that the CD is inserted properly in your CD-ROM drive.

1. Double-click on My Computer on your desktop.
2. Double-click on your Compact Disc icon (often identified as drive D:)
3. Double-click on setup.exe

. . . . . .

2 Click *continue*.

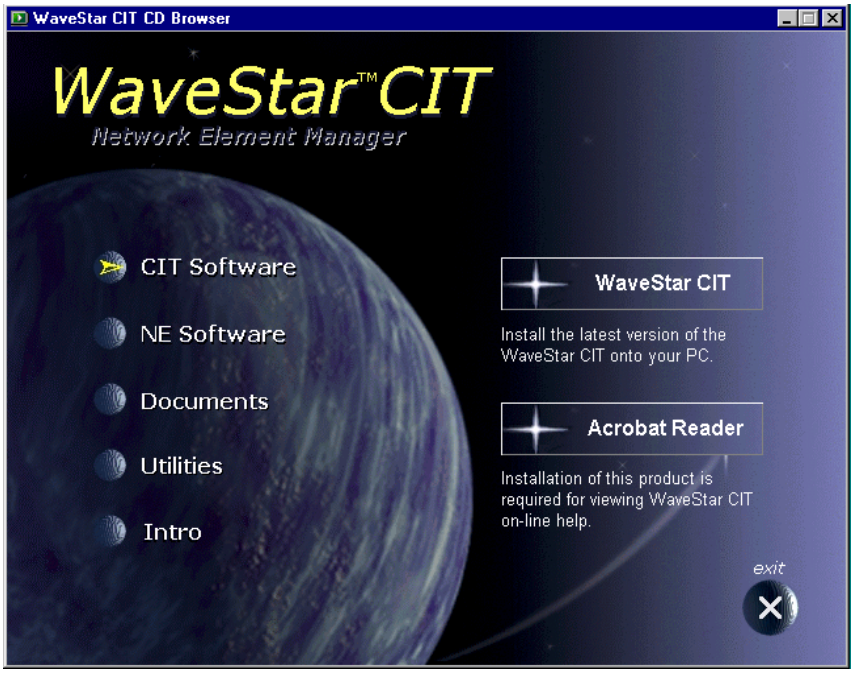
Result: The following screen appears:



. . . . . .

3 Click **CIT Software** to install the WaveStar® CIT software.

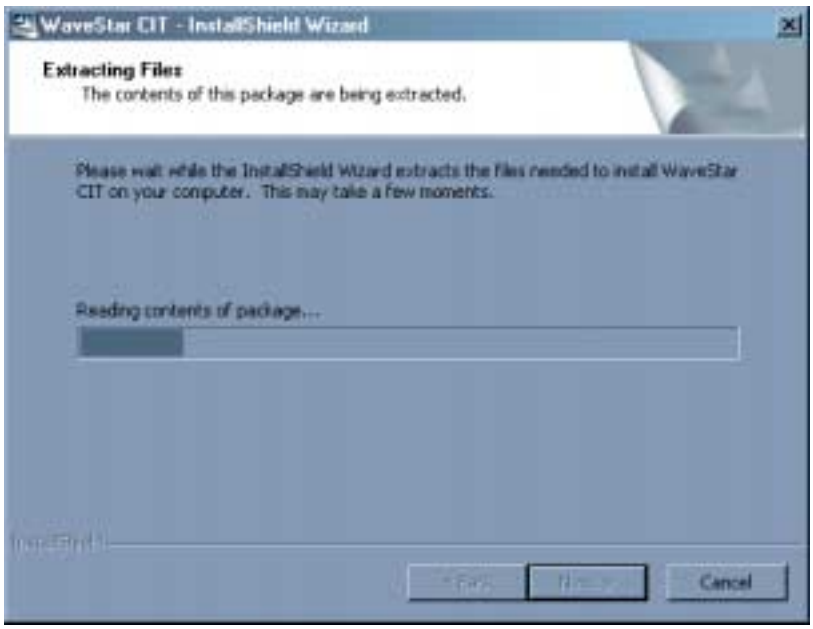
Result: The following screen appears:



4 Click **WaveStar CIT** on the right.

Result: The InstallShield® Wizard appears.

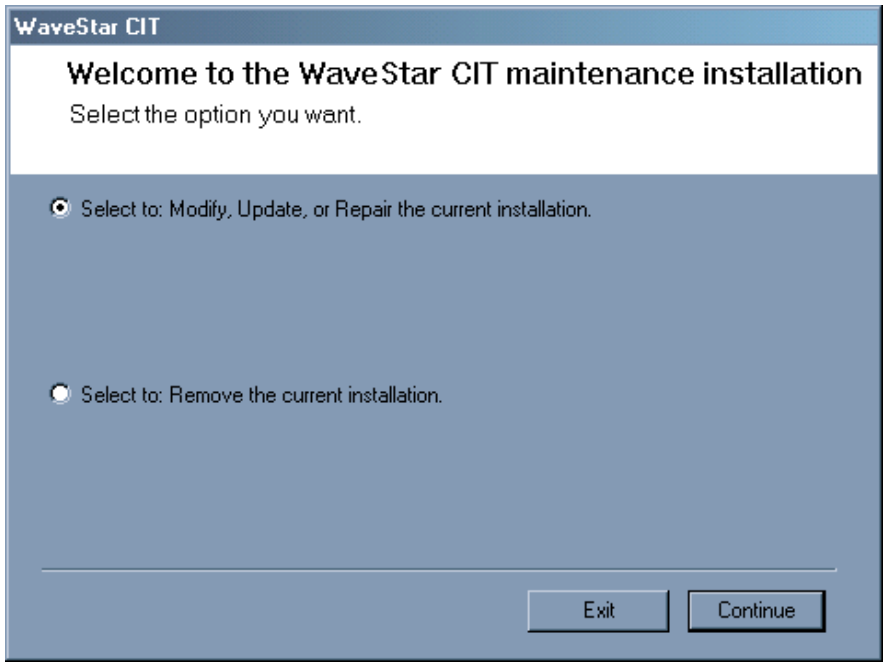
Click **Next** and the InstallShield Wizard begins extracting files.



5 Do you have a previous version of the WaveStar® CIT installed on your computer?

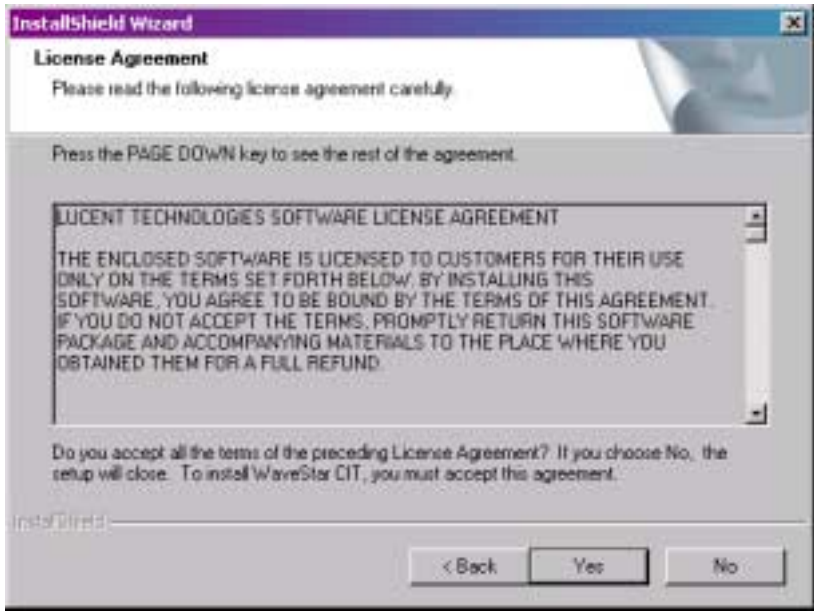
IF...	THEN...
Yes	Continue with Step 6.
No	Proceed to Step 7.

6 When the following screen appears, select *Select to: Modify, Update, or Repair the current installation* and click **Continue**.

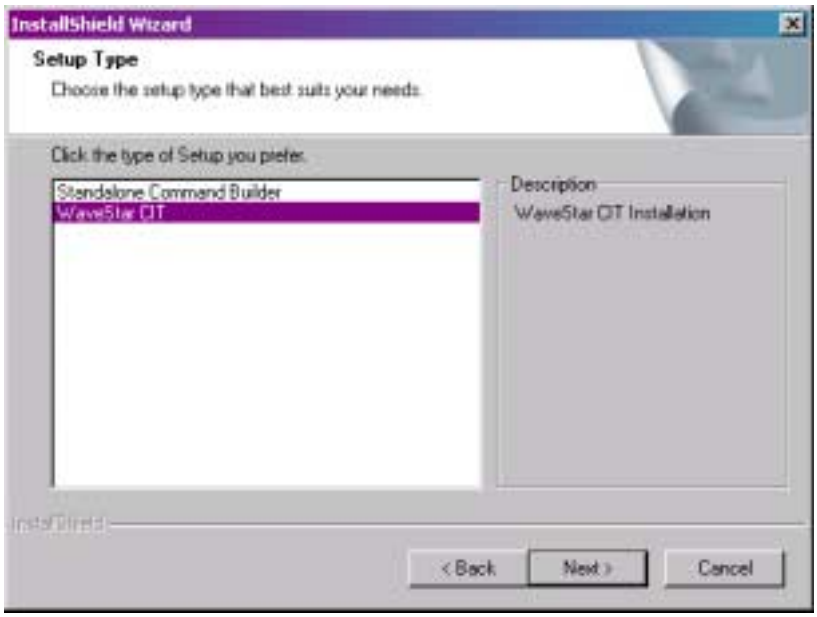


Proceed to Step 9.

7 Follow the instructions on the different InstallShield® Wizard screens, including reading and agreeing to the License Agreements.



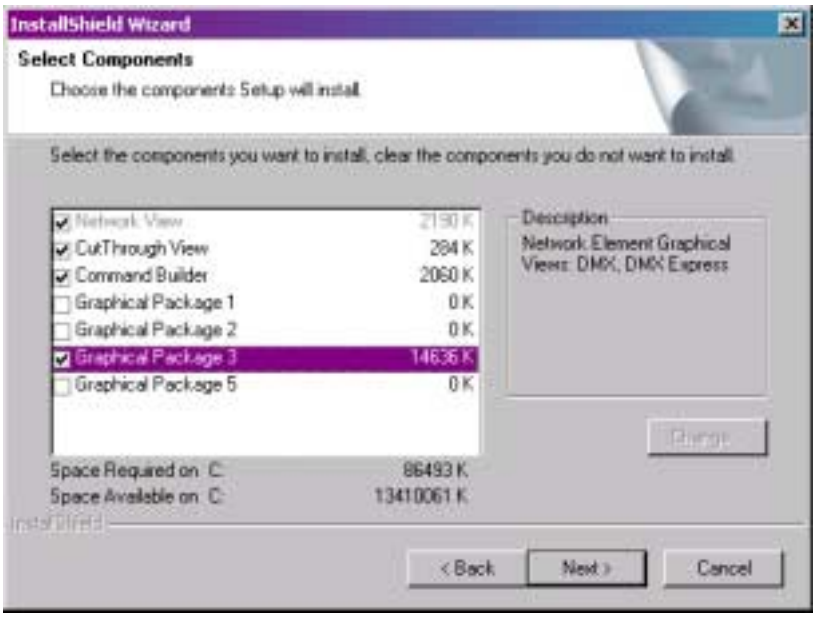
8 When the following screen appears, enter the type of installation you want. Select WaveStar CIT.



9 When this screen appears, select the following components to complete the WaveStar® CIT installation.

- Network View
- CutThrough View
- Command Builder
- Graphical Package 3

Important! In order to save valuable disc space, deselect **Graphical Package 1, Graphical Package 2,** and **Graphical Package 5** (unless you plan to use this WaveStar® CIT with the other products indicated under Description in the following screen).



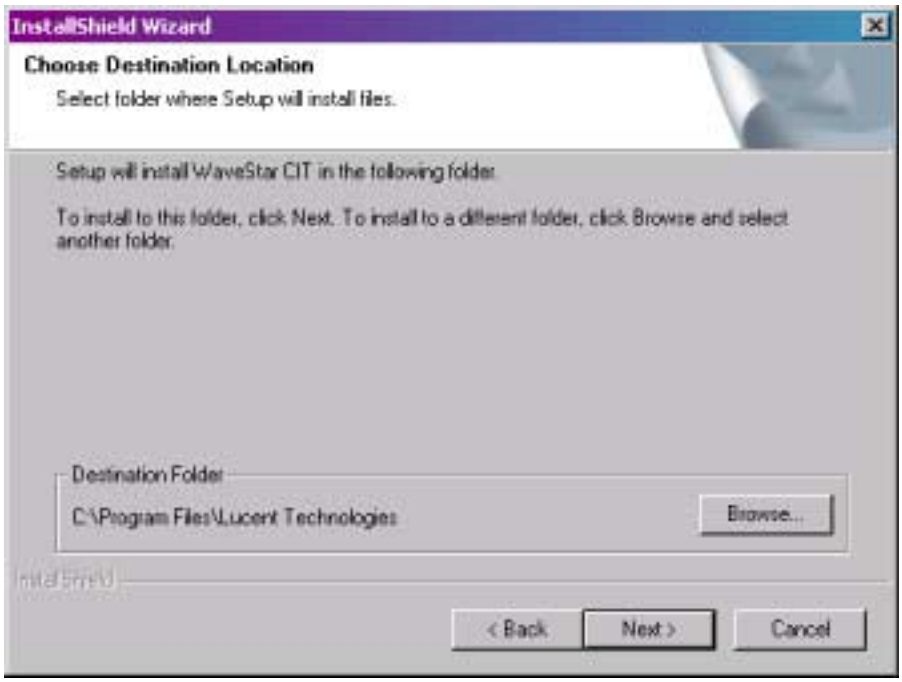
Important! If you have multiple NICs installed, you will be asked to select one in Step 11.

10 When the following screen appears, select where you want the WaveStar® CIT software installed on your PC.

- Select the default Destination Folder: C:\Program Files\Lucent Technologies\

  OR

- Click **Browse** and navigate to your desired directory.

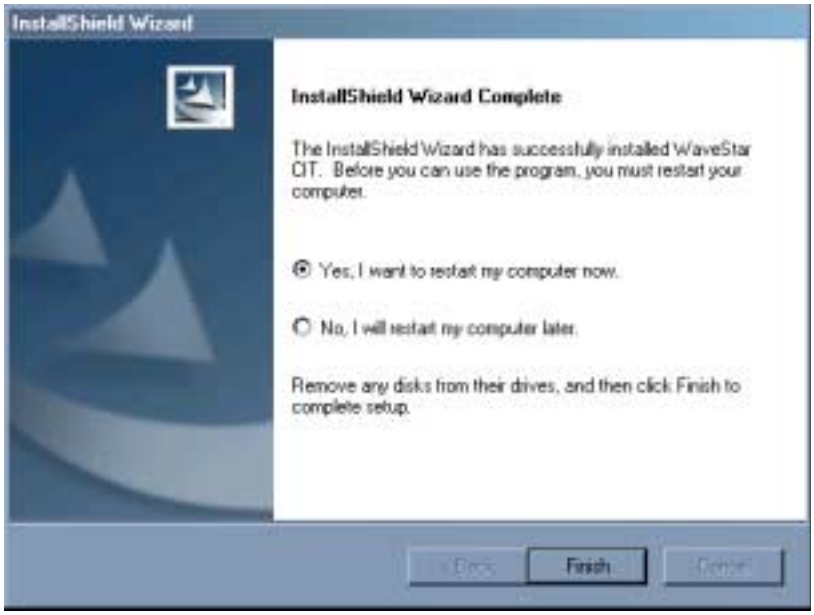


Click **Next**.

Result: The InstallShield® Wizard installs the required files.

11 If you have more than one Network Card on your PC, select the card you wish to use to connect to the NE.

Result: The InstallShield® Wizard continues to install the required files. The following screen appears when the installation is completed.



12 Select *No, I will restart my computer later.* and click **Finish**.

Important! Before using your new WaveStar® CIT, you *MUST* reboot your computer. This task allows you to continue with the copying the NE software to the PC before rebooting.

Result: You will see the following additional icons on your desktop.

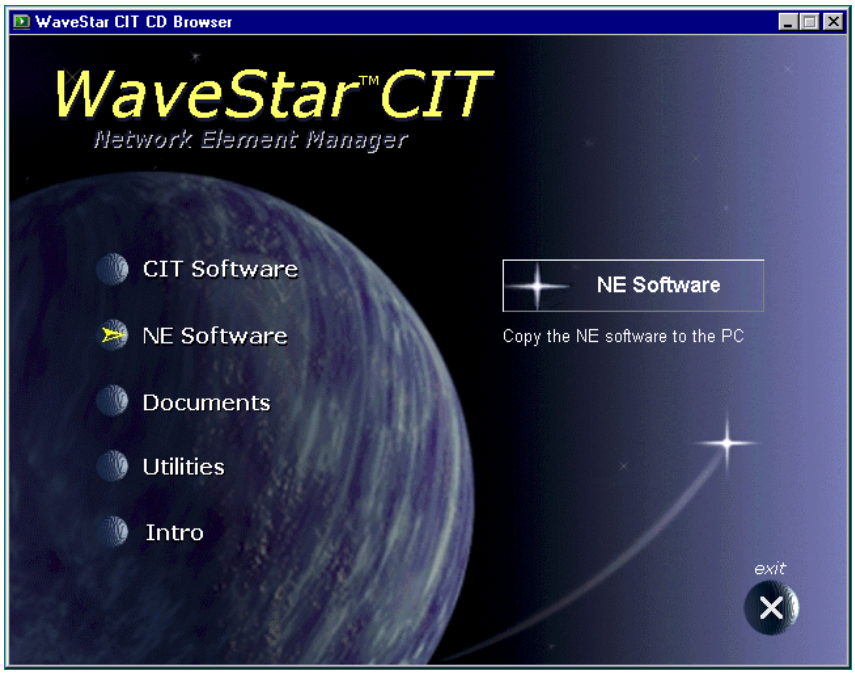
Important! If you had a previous version of Metropolis® DMX software on your PC, you may also have icons for those download releases.

13 Double click on the **DMX 3.0.0 Downloads** icon.

Result: The *DMX 3.0.0 Downloads* folder contains the following two icons.

14 Return to the WaveStar CIT CD Browser window and click on **NE Software**.

Result: The following screen appears:



15 Click **NE Software (Copy the NE Software to the PC)** on the right.

Result: A “Copying files, please wait...” window appears. When the window closes, the software files are successfully copied into the following directories on your PC:

C:\Program Files\Lucent Technologies\WaveStar CIT\generics\dmx\3.0.0\p

This directory contains bundled software and is accessible by double-clicking on the DMX 3.0.0 icon that is found within the DMX 3.0.0 Downloads folder. (Refer to Step 13 for an illustration of the icon.) This directory is used for initial R3.0.0 installations and upgrades from R1.1.x or later to R3.0.0.

C:\Program Files\Lucent Technologies\WaveStar CIT\generics\dmx\3.0.0\DMX

This directory contains R3.0.0 software and is accessible by double-clicking on the DMX Sysctl 3.0.0 icon that is found within the DMX 3.0.0 Downloads folder. (Refer to Step 13 for an illustration of the icon.) This directory is used for downloads to upgrade a Metropolis® DMX running R1.0.x or initial software download to a 1.x.x factory-fresh SYSCTL circuit pack.

16 On the WaveStar CIT CD Browser window, click **Exit**.

17 Restart your PC before using the new WaveStar® CIT.

END OF STEPS

Task 215: Change Your Own System Password

Purpose

Use this task to change your *own* password.

Only users with a privileged access code may change other user's passwords. See "Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login" (9-15).

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Passwords must adhere to the following guidelines:

- Passwords must be six to ten characters in length.
- Passwords must begin with a letter.
- Passwords must contain at least three non-alphabetic characters (numbers or symbols).
  At least one of the non-alphabetic characters must be a symbol

  Symbols may *not* include space ( ), ampersand (**&**), "at" (**@**), comma (**,**), colon (**:**), semicolon (**;**), horizontal bar [underscore] (**_**), equals (**=**), question (**?**), or quotation (**"**).
- Passwords are case sensitive.

Task

Complete the following steps to change your own password.

1 Connect PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the **System View** menu, select **Administration** > **Change Password** to change your own password on an NE basis.

Result: The Change User Password window opens.

3 Enter your old password. Then enter your new password, and then enter your new password again to confirm your new password. Click **OK**.

4 Read the warning message, then click **Yes** to execute the command.

END OF STEPS

Task 216: Replace Metropolis® DMX Shelf (Standard Shelf)

Purpose

Use this task to replace the standard Metropolis® DMX Access Multiplexer shelf (C848540464). The standard shelf has a separate fan shelf. The High Capacity shelf has an integrated fan shelf.

Important! It is assumed that the Metropolis® DMX is out of service. Power to the shelf will be removed.

Required equipment

The following equipment is required:

- Replacement Metropolis® DMX shelf

Important! A standard Metropolis® DMX shelf can be replaced with either a Standard or High Capacity Metropolis® DMX shelf

If a High Capacity shelf is replacing a Standard shelf the following cables are required in addition to the shelf.

- If sync cables with molded DB-9 connectors are installed, then two sync cables as follows:

Cable Assembly #	Cable Length (feet)
848839619	50
848839627	100
848839635	150
848839643	250
848839650	450

- Miscellaneous discrete cables as follows:

Cable Assembly #	Cable Length (feet)
848839569	50
848839577	100
848839585	150
848839593	250
848839601	350

Important! A Metropolis® DMX High Capacity shelf can only be replaced with a High Capacity shelf.

- Personal Computer (PC) with WaveStar® CIT software installed

- Wrist Strap
- Optical fiber connector dust covers
- Optical circuit pack connector dust covers
- ESD protective bags for temporary storage of circuit packs
- *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-304*

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-304*.

Before you begin

Before you begin this task, verify that the Metropolis® DMX is out of service.

Task Complete the following steps to replace a Metropolis® DMX shelf.

. . . . . .

1 Verify that both 20 ampere circuit breakers on the Metropolis® DMX Access Multiplexer are in the OFF position. These breakers are located on the front of the Metropolis® DMX Access Multiplexer shelf.

. . . . . .

2 Disengage all circuit packs in the shelf.

. . . . . .

3 Remove power to the Metropolis® DMX Access Multiplexer shelf by operating the circuit breakers to the OFF position at the Battery Distribution Feeder Bay (BDFB) or removing the fuses at the BDFB.

Important! Remove power for both A and B feeders to the shelf.

. . . . . .

4 Operate both breakers on the Metropolis® DMX Access Multiplexer shelf to the ON position.

. . . . . .

5 Disconnect the power cables from the backplane connectors (P14 and P15).

. . . . . .

6 Using a voltmeter, measure the voltage on the power cable connectors between BAT A (red) and BAT A RTN (black).

Result: Voltmeter indicates no voltage.

. . . . . .

7 Using a voltmeter, measure the voltage on the power cable connectors between BAT B (red) and BAT B RTN (black).

Result: Voltmeter indicates no voltage.

8 On the backplane, label all cables connecting to the Metropolis® DMX Access Multiplexer. These include:

- Fan Shelf Power/Alarm Cable (J15)
- DS1/DS3/EC1/FastE Transmission Cables as equipped (J1, J2, J3, J4, J5, J6, J7, J8)
- IAO LAN (J16)
- Modem cable (J17)
- TL1/X.25 Interface Cable (J10)
- Sync Cables (J9 and J14)
- Office Alarm Cable (J12)
- Alarm Mult (J13)
- Miscellaneous (Environmental) Discrete (J11)

9 Remove all cables from the Metropolis® DMX Access Multiplexer shelf backplane. It may be necessary to untie the cables from the cable tie bar.

10 Disconnect the A and B power connectors from the left and right sides of the Metropolis® DMX Access Multiplexer shelf.

11 On the front of the Metropolis® DMX Access Multiplexer, label all cables connecting to circuit packs. These include:

- Optical Fibers connected to the Main OLIUs (Transmit/Receive)
- Optical Fibers connected to OC3/OC12/OC48 Low Speed OLIUs in Function Slots A, B, C, D and Growth Slots (Transmit/Receive)
- Optical Fibers connected to Gigabit Ethernet Circuit Packs in Function Slots A, B, C, D and Growth Slots (Transmit/Receive)
- LAN cable
- CIT cable

12 Remove all cables from circuit packs in the Metropolis® DMX Access Multiplexer.

13 Place protective dust covers on fiber connections (fibers and circuit packs).

14 Carefully remove the fibers from the Metropolis® DMX Access Multiplexer shelf fiber tray.

15 Note the position of each circuit pack (function slot number or growth slot) for reference when installing the new shelf.

16 Remove each circuit pack and place them in ESD protective bags.

17 Unscrew the mounting screws that attach the Metropolis® DMX Access Multiplexer shelf to the bay frame and remove the shelf.

Important! Do not disturb cables associated with other Metropolis® DMX Access Multiplexer shelves in the bay or equipment in adjacent bays.

18 Inspect the replacement Metropolis® DMX shelf for visible damage including bent or touching backplane pins.

19 Determine the mounting configuration for the Metropolis® DMX shelf:

- type of bay frame (23-inch or 19-inch wide)
- mounting position (front or rear)
- position in bay (bottom to top).

Important! The Metropolis® DMX shelf is shipped with the mounting brackets positioned for mounting to the rear of a 23-inch wide network bay frame.

The Metropolis® DMX shelf mounting brackets may have to be repositioned and remounted, depending on the frame type and mounting position (front or rear).

20 If necessary, reposition the shelf mounting brackets accordingly.

Reference: For 23-inch frame, front or rear mounting, refer to Figure 9-23.

Reference: For 19-inch frame, front or rear mounting, refer to Figure 9-24.

Figure 9-23 Metropolis® DMX Mounting Bracket Positions - 23-inch Frame

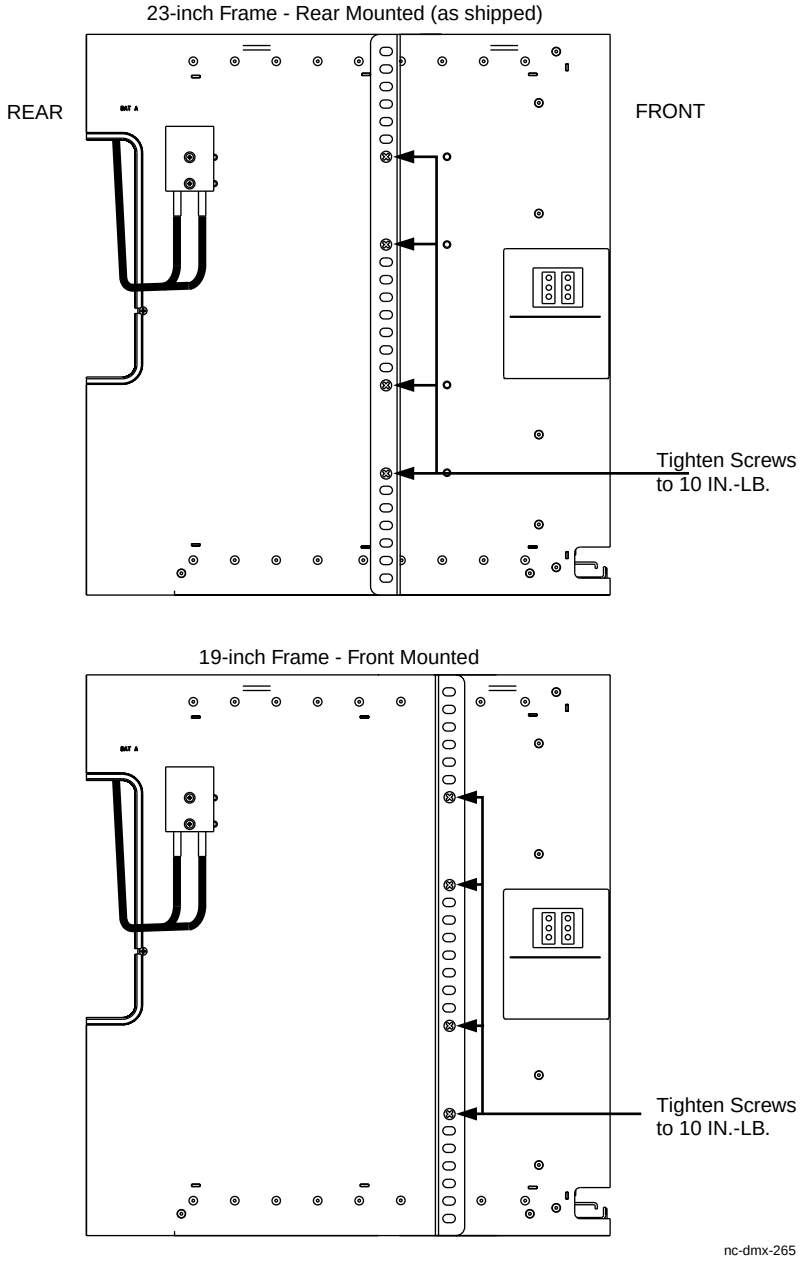
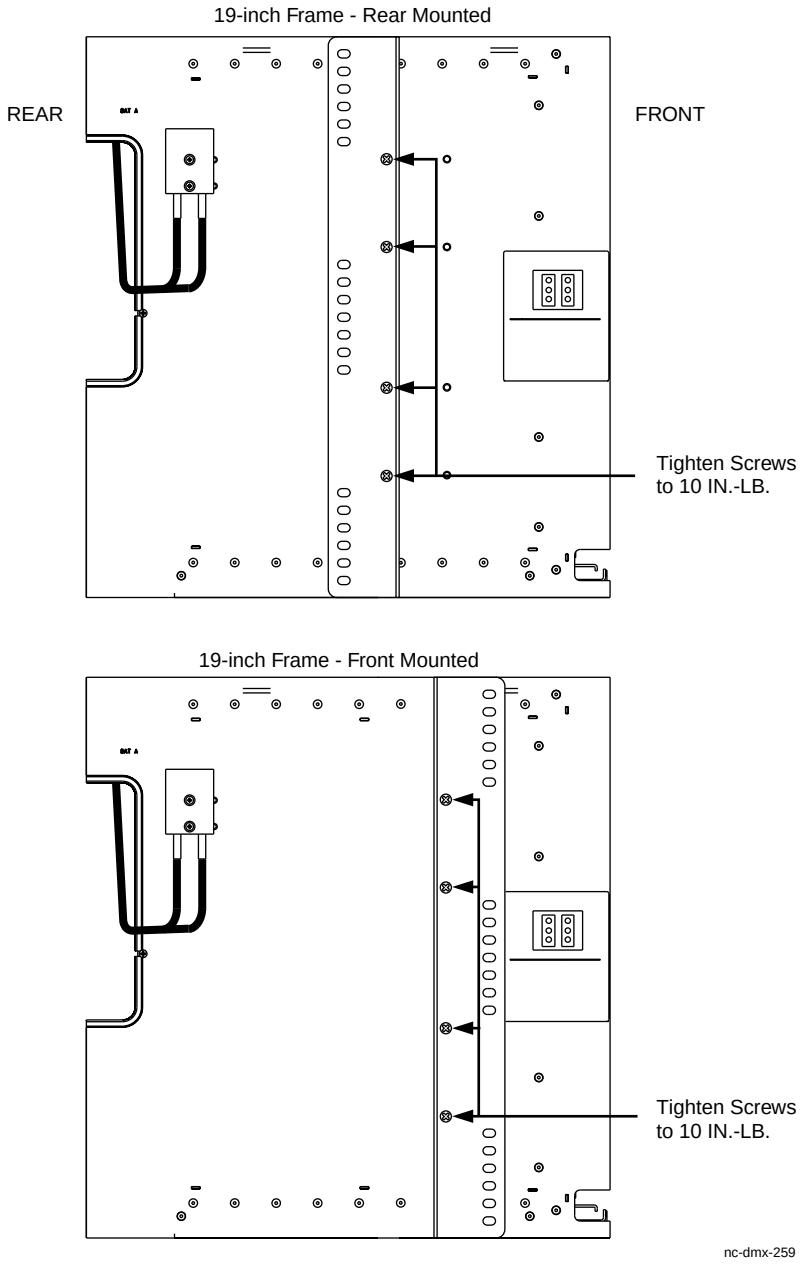


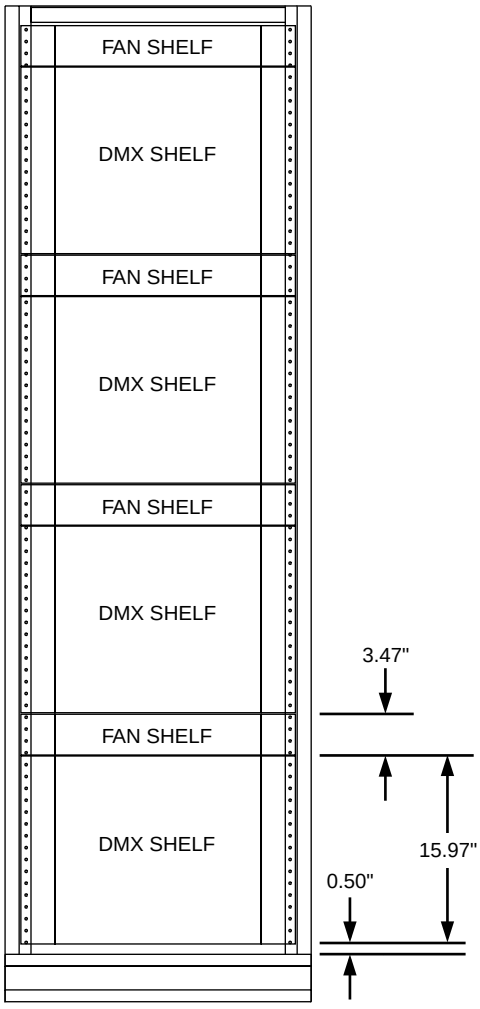
Figure 9-24 Metropolis® DMX Mounting Bracket Positions - 19-inch Frame



21 Determine the position that the Metropolis® DMX shelf will be mounted.

Reference: Figure 9-25 shows the recommended mounting positions.

Figure 9-25 Typical Metropolis® DMX Bay Mounting Arrangements



DMX = Metropolis® DMX Access Multiplexer

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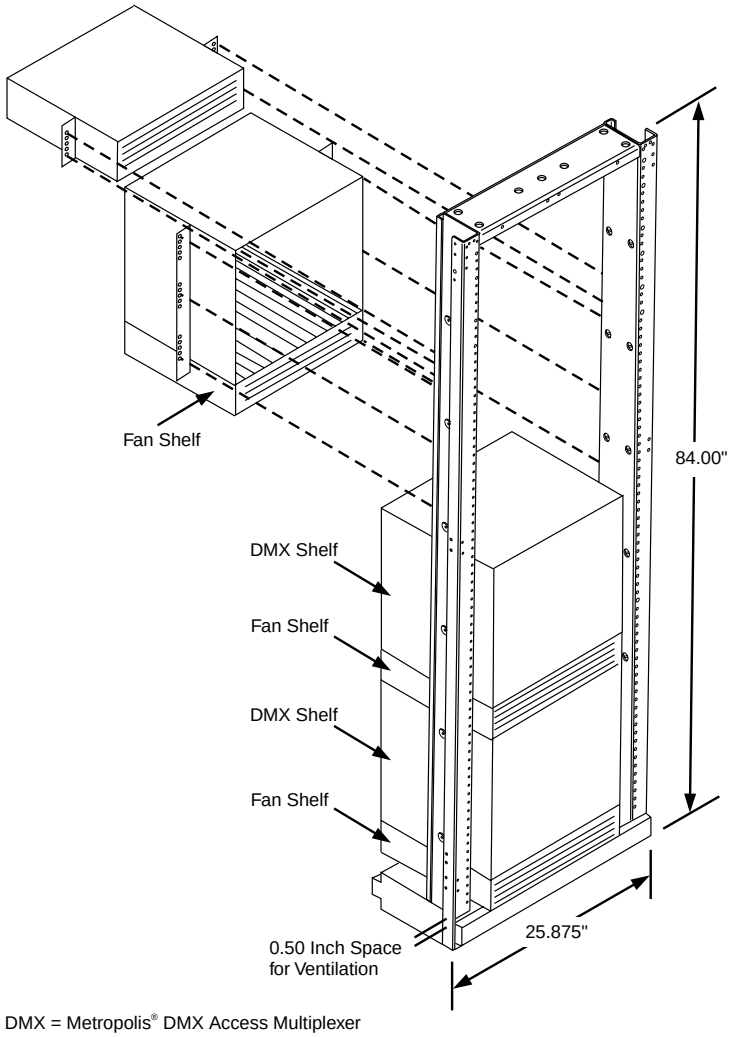
22 Position the Metropolis® DMX shelf in the frame and secure the shelf to the frame using the thread-forming screws included with the shelf (3 screws per side). Tighten the screws to 21 in.-lb. (minimum)/30 in.-lb. (maximum)

Important! Be sure to mount the shelf using the thread-forming screws provided with the shelf to ensure a solid ground connection from the bay to the shelf.

Reference: Figure 9-26 shows the Metropolis® DMX shelf being mounted to the rear of a 23-inch frame in a fully equipped Metropolis® DMX bay.

Figure 9-26 Metropolis® DMX Shelf Mounted to the Rear of a 23-inch Frame



23 Verify with an ohmmeter that the Metropolis® DMX shelf is grounded to the bay frame. Measure between the Metropolis® DMX shelf mounting bracket and the office ground lug on the bay frame.

Result: The ohmmeter reads less than 1 ohm.

24 Replace each circuit pack in the Metropolis® DMX shelf based on the prior position of each as recorded.

Important! Do not engage the circuit packs in the shelf now.

25 Reconnect all optical fibers to the front of the optical circuit packs based on the fiber labels attached earlier and the circuit pack positions noted.

26 Place loose fibers in the shelf fiber tray.

27 Reconnect the LAN and CIT cables (if equipped) to the front of the LNW1 SYSCTL circuit pack.

28 Reconnect the A and B power connectors to the left and right sides of the DMX shelf.

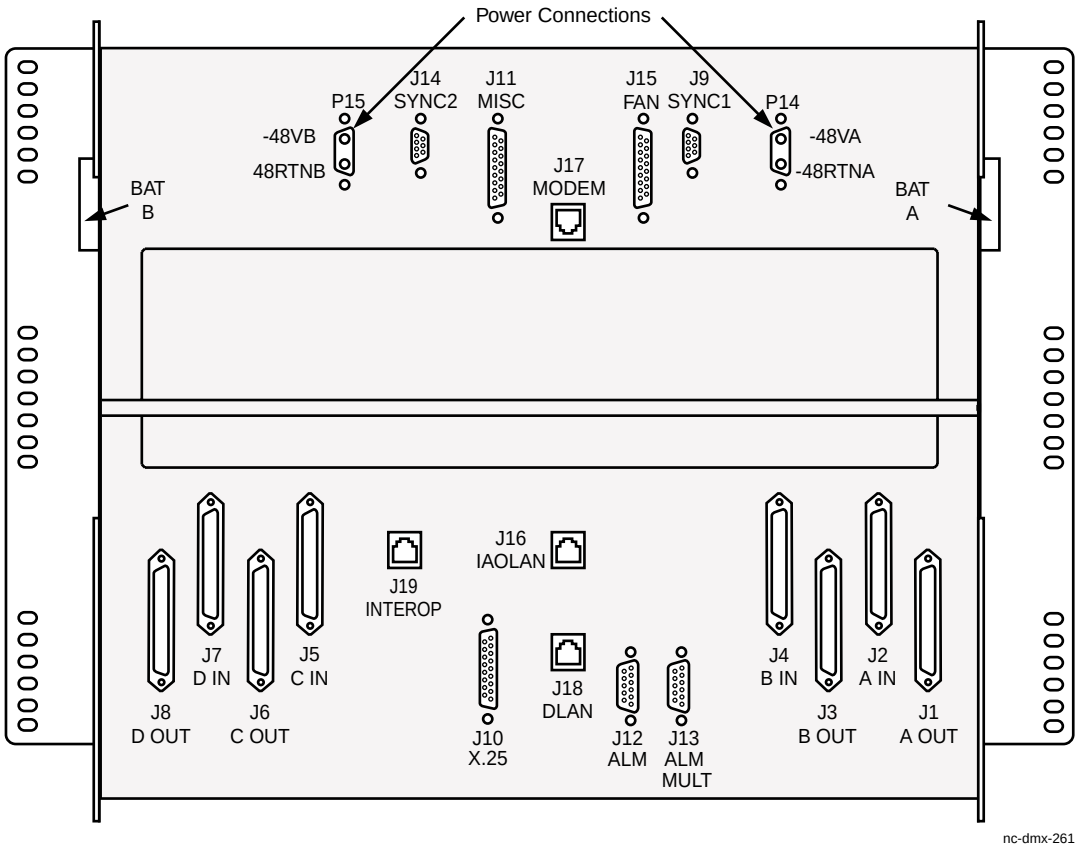
29 At the rear of the shelf, reconnect all cables based on the labels placed on them when they were removed.

30 Verify that both 20 ampere circuit breakers on the Metropolis® DMX are in the ON position. These breakers are located on the front of the Metropolis® DMX shelf.

31 Disconnect the power cables from the backplane connectors (P15 from J15 and P14 from J14).

Reference: Figure 9-27

Figure 9-27 Power Connections on Metropolis® DMX Backplane



32 If fuses are being used, install 25-ampere fuses in the Battery Distribution Feeder Bay (BDFB) that powers the Metropolis® DMX A and B feeders.

33 If breakers are being used, verify that 25-ampere breakers are installed and switch the breakers to the ON position for the Metropolis® DMX A and B feeders.

34 At the Metropolis® DMX backplane power connector, use a voltmeter and measure the voltage on the power cable between BAT A and BAT A RTN. Then measure the voltage between BAT B and BAT B RTN.

Designation	Color
BAT A	Red
BAT A RTN	Black
BAT B	Red
BAT BRTN	Black

Important! The voltage MUST be between - 41.75 and - 60.0 V DC.

35 Disconnect the power at the BDFB panel.

36 Put both 20-ampere circuit breakers on the Metropolis® DMX in the OFF position.

Important! A small flat-bladed screwdriver or other similar type tool is required to set the Metropolis® DMX circuit breakers to the OFF position.

37 Reconnect the “A” feed of the power cable to the backplane connector (P14 to J14), and reconnect the “B” feed of the power cable to the backplane connector (P15 to J15).

38 Connect the power at the BDFB panel.

39 Place both 20-ampere circuit breakers on the Metropolis® DMX shelf in the ON position.

40 Verify that the fans have started running.

41 At the BDFB either remove the fuse or put the circuit breaker, associated with the “B” feed of the Metropolis® DMX, in the OFF position.

42 Verify the PWR A LED on the Metropolis® DMX shelf is lighted with only the “A” feed powered.

43 At the BDFB either insert the fuse or put the circuit breaker, associated with the “B” feed of the Metropolis® DMX, in the ON position. Then either remove the fuse or put the circuit breaker, associated with the “A” feed of the Metropolis® DMX, in the OFF position.

44 Verify the PWR B LED on the Metropolis® DMX shelf is lighted with only the “B” feed powered.

45 At the BDFB either insert the fuse or put the circuit breaker, associated with the “A” feed of the Metropolis® DMX, in the ON position.

46 Verify that both the PWR A LED and PWR B LED on the Metropolis® DMX shelf are lighted with both the “A” and “B” feeds powered.

47 Verify that the fans are still running and are moving air.

48 Fully engage the LNW1 SYSCTL circuit pack in the shelf.

49 After about 5 minutes, verify that the SYSCTL has booted by logging into the shelf using the CIT.

50 Fully engage the M1 and M2 circuit packs in the shelf.

51 Starting at the left side of the shelf, fully engage each circuit pack in the shelf.

Result: All circuit packs have a lighted, green **ACTIVE** LED.

52 Connect the WaveStar® CIT and log into the shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

53 From the System View window, click on **Alarm List** button and verify that there are no alarms, lockouts, loopbacks, or switches present.

END OF STEPS

Task 217: Replace Metropolis® DMX High Capacity Shelf

Purpose

Use this task to replace the Metropolis® DMX Access Multiplexer High Capacity Shelf shelf (C848793287). The High Capacity shelf has an integrated fan shelf. The standard shelf has a separate fan shelf.

Important! It is assumed that the Metropolis® DMX High Capacity shelf is out of service. Power to the shelf will be removed.

Required equipment

The following equipment is required:

- Replacement Metropolis® DMX High Capacity shelf

  Important! A Metropolis® DMX High Capacity shelf can only be replaced with a Metropolis® DMX High Capacity shelf.
- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- Optical fiber connector dust covers
- Optical circuit pack connector dust covers
- ESD protective bags for temporary storage of circuit packs
- *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-304*

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-304*.

Before you begin

Before you begin this task, verify that the Metropolis® DMX High Capacity shelf is out of service.

Task

Complete the following steps to replace a Metropolis® DMX High Capacity shelf.

. . . . . .

1 Verify that both 30 ampere circuit breakers on the Metropolis® DMX High Capacity shelf are in the OFF position. These breakers are located on the front of the Metropolis® DMX High Capacity shelf.

. . . . . .

2 Disengage all circuit packs in the shelf.

. . . . . .

3 Remove power to the Metropolis® DMX High Capacity shelf by operating the circuit breakers to the OFF position at the Battery Distribution Feeder Bay (BDFB) or removing the fuses at the BDFB.

Important! Remove power for both A and B feeders to the shelf.

. . . . . .

4 Operate both breakers on the Metropolis® DMX High Capacity shelf to the ON position.

. . . . . .

5 Disconnect the power cables from the backplane connectors (P14 and P15).

6 Using a voltmeter, measure the voltage on the power cable connectors between BAT A (red) and BAT A RTN (black).

Result: Voltmeter indicates no voltage.

7 Using a voltmeter, measure the voltage on the power cable connectors between BAT B (red) and BAT B RTN (black).

Result: Voltmeter indicates no voltage.

8 On the backplane, label all cables connecting to the Metropolis® DMX High Capacity shelf. These include:

- DS1/DS3/EC1/FastE Transmission Cables as equipped (J1, J2, J3, J4, J5, J6, J7, J8, J20, J21, J22, J23, J24, J25, J26, J27)
- IAO LAN (J16)
- Modem cable (J17)
- TL1/X.25 Interface Cable (J10)
- Sync Cables (J9 and J14)
- Office Alarm Cable (J12)
- Alarm Mult (J13)
- Miscellaneous (Environmental) Discrete (J11)

9 Remove all cables from the Metropolis® DMX High Capacity shelf backplane. It may be necessary to untie the cables from the cable tie bar.

10 Disconnect the A and B power connectors from the left and right sides of the Metropolis® DMX High Capacity shelf.

11 On the front of the Metropolis® DMX High Capacity, label all cables connecting to circuit packs. These include:

- Optical Fibers connected to the Main OLIUs (Transmit/Receive)
- Optical Fibers connected to OC3/OC12/OC48 Low Speed OLIUs in Function Slots A, B, C, D and Growth Slots (Transmit/Receive)
- Optical Fibers connected to Gigabit Ethernet Circuit Packs in Function Slots A, B, C, D and Growth Slots (Transmit/Receive)
- LAN cable
- CIT cable

12 Remove all cables from circuit packs in the Metropolis® DMX High Capacity shelf.

13 Place protective dust covers on fiber connections (fibers and circuit packs).

14 Carefully remove the fibers from the Metropolis® DMX High Capacity shelf fiber tray.

15 Note the position of each circuit pack (function slot number or growth slot) for reference when installing the new shelf.

16 Remove each circuit pack and place them in ESD protective bags.

17 Unscrew the mounting screws that attach the Metropolis® DMX High Capacity shelf to the bay frame and remove the shelf.

Important! Do not disturb cables associated with other Metropolis® DMX High Capacity shelves in the bay or equipment in adjacent bays.

18 Inspect the replacement Metropolis® DMX High Capacity shelf for visible damage including bent or touching backplane pins.

19 Determine the mounting configuration for the Metropolis® DMX High Capacity shelf:

- type of bay frame (23-inch or 19-inch wide)
- mounting position (front or rear)
- position in bay (bottom to top).

Important! The Metropolis® DMX High Capacity shelf is shipped with the mounting brackets positioned for mounting to the rear of a 23-inch wide network bay frame.

The Metropolis® DMX High Capacity shelf mounting brackets may have to be repositioned and remounted, depending on the frame type and mounting position (front or rear).

20 If necessary, reposition the shelf mounting brackets accordingly.

Reference: For 23-inch frame, front or rear mounting, refer to Figure 9-28.

Reference: For 19-inch frame, front or rear mounting, refer to Figure 9-29.

Figure 9-28 Metropolis® DMX High Capacity Mounting Bracket Positions - 23-inch Frame

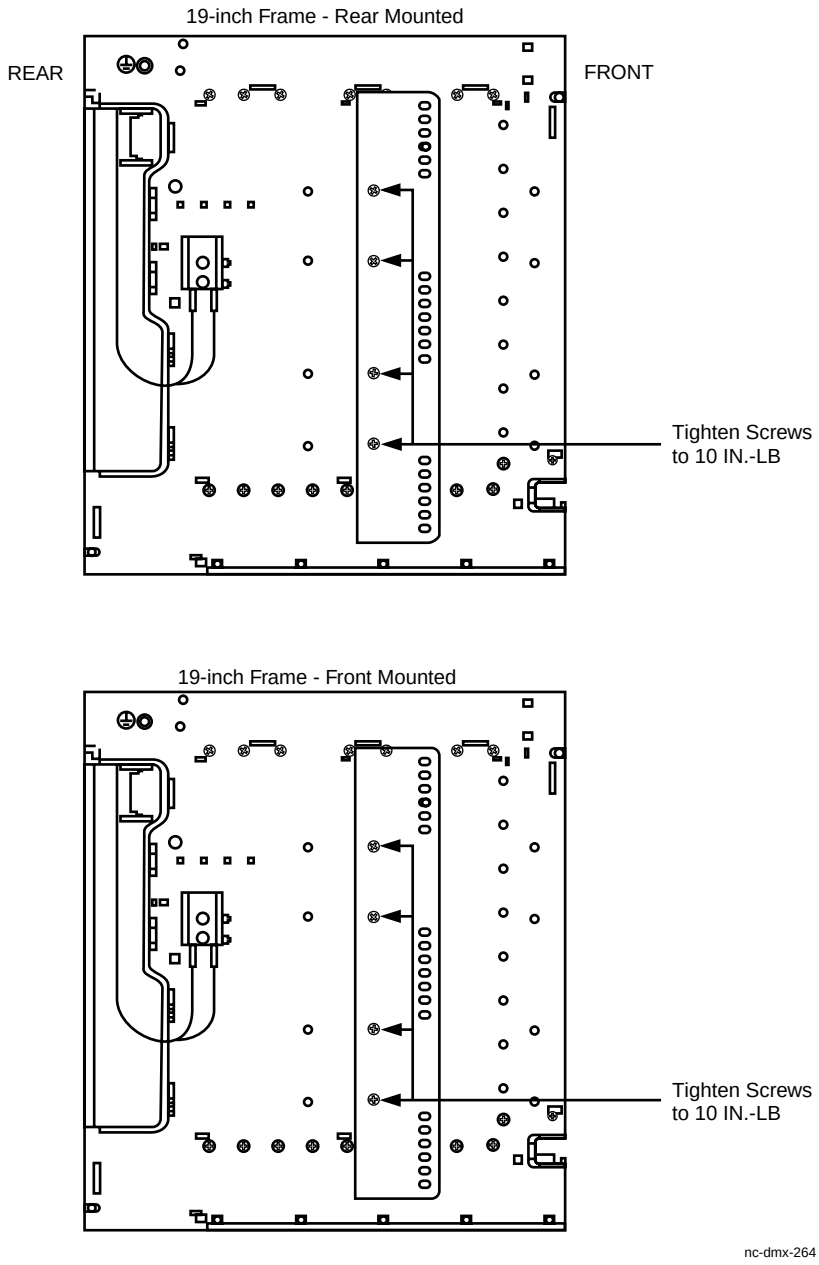
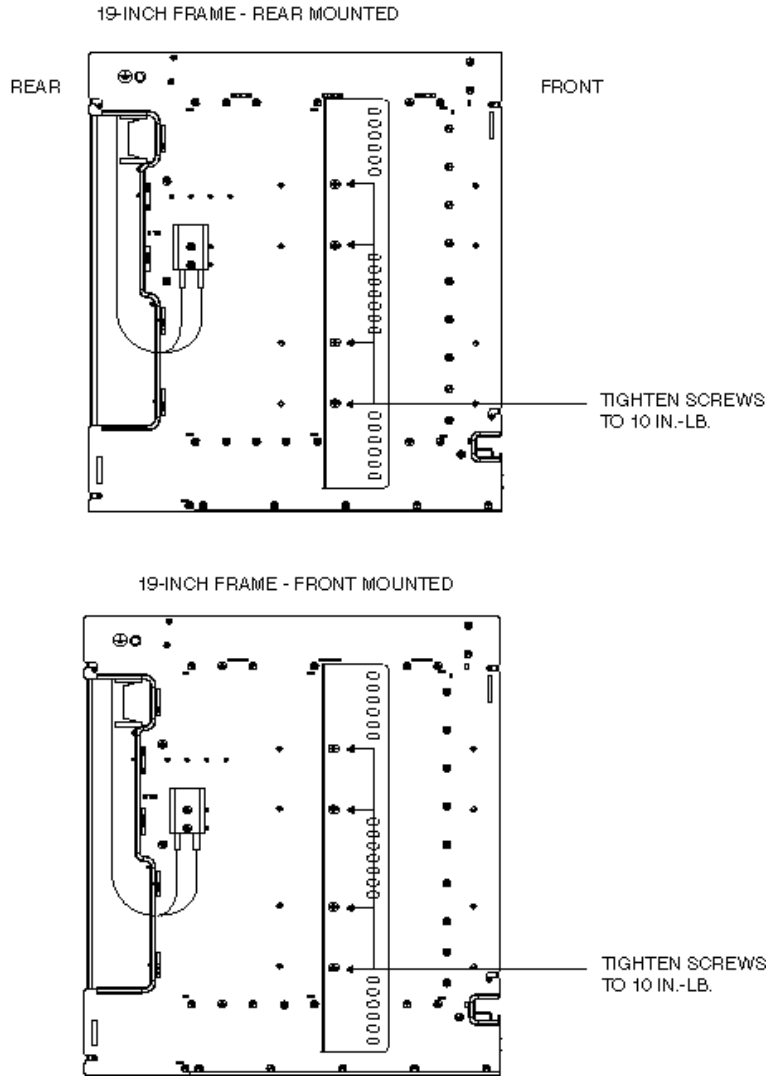


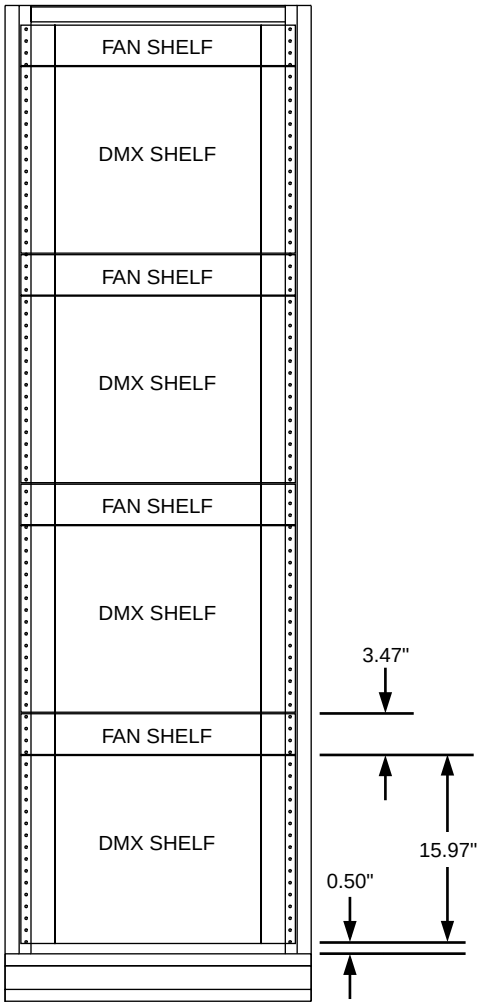
Figure 9-29 Metropolis® DMX High Capacity Mounting Bracket Positions - 19-inch Frame



21 Determine the position that the Metropolis® DMX High Capacity shelf will be mounted.

Reference: Figure 9-30 shows the recommended mounting positions.

Figure 9-30 Typical Metropolis® DMX Bay Mounting Arrangements



DMX = Metropolis® DMX Access Multiplexer

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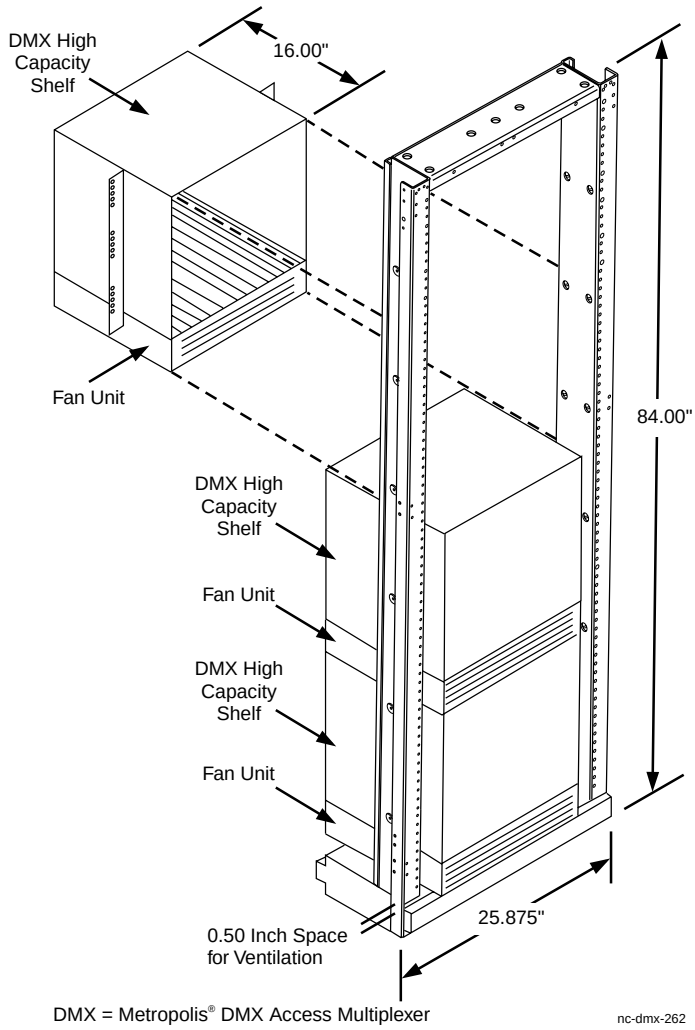
22 Position the Metropolis® DMX High Capacity shelf in the frame and secure the shelf to the frame using the thread-forming screws included with the shelf (3 screws per side). Tighten the screws to 21 in.-lb. (minimum)/30 in.-lb. (maximum)

Important! Be sure to mount the shelf using the thread-forming screws provided with the shelf to ensure a solid ground connection from the bay to the shelf.

Reference: Figure 9-31 shows the Metropolis® DMX High Capacity shelf being mounted to the rear of a 23-inch frame in a fully equipped Metropolis® DMX bay.

Figure 9-31 Metropolis® DMX High Capacity Shelf Mounted to the Rear of a 23-inch Frame



23 Verify with an ohmmeter that the Metropolis® DMX High Capacity shelf is grounded to the bay frame. Measure between the Metropolis® DMX High Capacity shelf mounting bracket and the office ground lug on the bay frame.

Result: The ohmmeter reads less than 1 ohm.

24 Replace each circuit pack in the Metropolis® DMX High Capacity shelf based on the prior position of each as recorded.

Important! Do not engage the circuit packs in the shelf now.

25 Reconnect all optical fibers to the front of the optical circuit packs based on the fiber labels attached earlier and the circuit pack positions noted.

26 Place loose fibers in the shelf fiber tray.

27 Reconnect the LAN and CIT cables (if equipped) to the front of the LNW1 SYSCTL circuit pack.

28 Reconnect the A and B power connectors to the left and right sides of the DMX shelf.

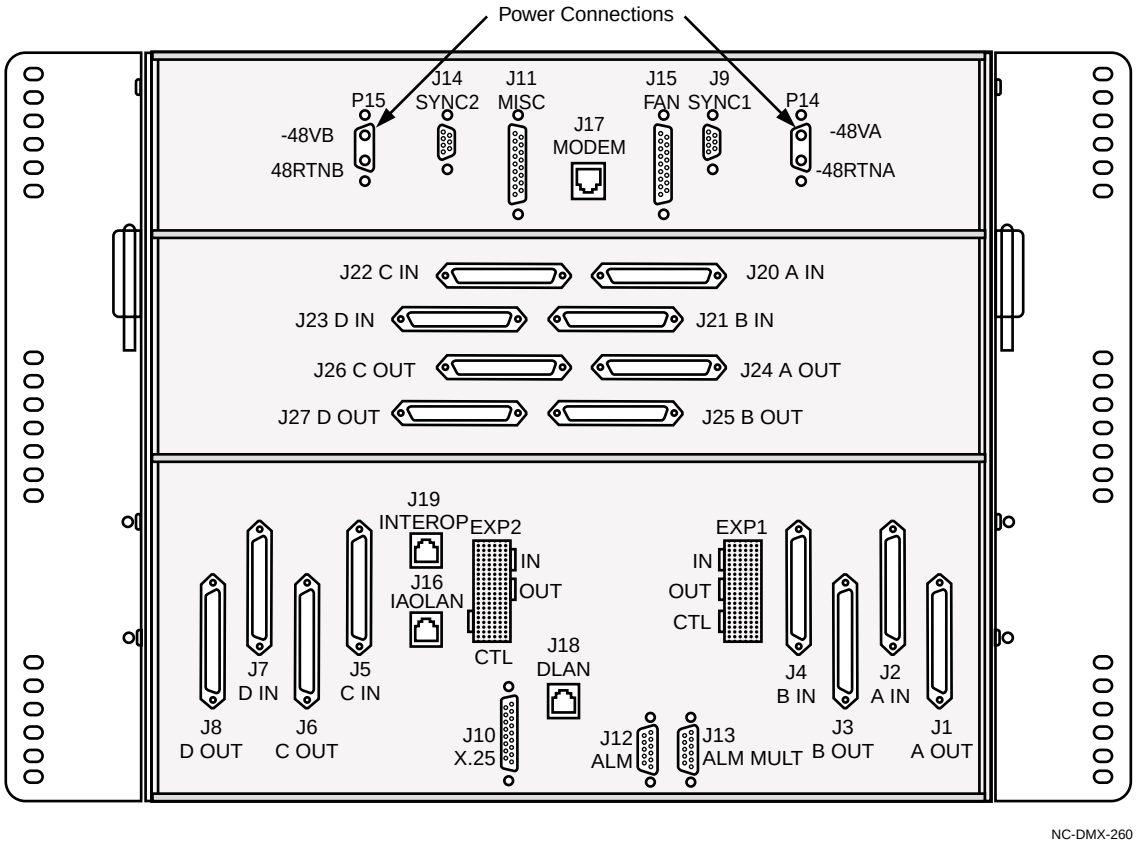
29 At the rear of the shelf, reconnect all cables based on the labels placed on them when they were removed.

30 Verify that both 30 ampere circuit breakers on the Metropolis® DMX High Capacity are in the ON position. These breakers are located on the front of the Metropolis® DMX High Capacity shelf.

31 Disconnect the power cables from the backplane connectors (P15 from J15 and P14 from J14).

Reference: Figure 9-32

Figure 9-32 Power Connections on Metropolis® DMX High Capacity Shelf Backplane



32 If fuses are being used, install 35-ampere fuses in the Battery Distribution Feeder Bay (BDFB) that powers the Metropolis® DMX High Capacity shelf A and B feeders.

33 If breakers are being used, verify that 25-ampere breakers are installed and switch the breakers to the ON position for the Metropolis® DMX High Capacity shelf A and B feeders.

34 At the Metropolis® DMX High Capacity shelf backplane power connector, use a voltmeter and measure the voltage on the power cable between BAT A and BAT A RTN. Then measure the voltage between BAT B and BAT B RTN.

Designation	Color
BAT A	Red
BAT A RTN	Black
BAT B	Red
BAT B RTN	Black

Important! The voltage MUST be between - 41.75 and - 60.0 V DC.

35 Disconnect the power at the BDFB panel.

36 Put both 30-ampere circuit breakers on the Metropolis® DMX High Capacity shelf in the OFF position.

Important! A small flat-bladed screwdriver or other similar type tool is required to set the Metropolis® DMX High Capacity shelf circuit breakers to the OFF position.

37 Reconnect the “A” feed of the power cable to the backplane connector (P14 to J14), and reconnect the “B” feed of the power cable to the backplane connector (P15 to J15).

38 Connect the power at the BDFB panel.

39 Place both 30-ampere circuit breakers on the Metropolis® DMX High Capacity shelf in the ON position.

40 Verify that the fans have started running.

41 At the BDFB either remove the fuse or put the circuit breaker, associated with the “B” feed of the Metropolis® DMX High Capacity shelf, in the OFF position.

42 Verify the PWR A LED on the Metropolis® DMX High Capacity shelf is lighted with only the “A” feed powered.

43 At the BDFB either insert the fuse or put the circuit breaker, associated with the “B” feed of the Metropolis® DMX High Capacity shelf, in the ON position. Then either remove the fuse or put the circuit breaker, associated with the “A” feed of the Metropolis® DMX High Capacity shelf, in the OFF position.

44 Verify the PWR B LED on the Metropolis® DMX High Capacity shelf is lighted with only the “B” feed powered.

45 At the BDFB either insert the fuse or put the circuit breaker, associated with the “A” feed of the Metropolis® DMX High Capacity shelf, in the ON position.

46 Verify that both the PWR A LED and PWR B LED on the Metropolis® DMX High Capacity shelf are lighted with both the “A” and “B” feeds powered.

47 Verify that the fans are still running and are moving air.

48 Fully engage the LNW1 SYSCTL circuit pack in the shelf.

49 After about 5 minutes, verify that the SYSCTL has booted by logging into the shelf using the CIT.

50 Fully engage the M1 and M2 circuit packs in the shelf.

51 Starting at the left side of the shelf, fully engage each circuit pack in the shelf.

Result: All circuit packs have a lighted, green **ACTIVE** LED.

52 Connect the WaveStar® CIT and log into the shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

53 From the System View window, click on **Alarm List** button and verify that there are no alarms, lockouts, loopbacks, or switches present.

END OF STEPS

10 Circuit Order/Provisioning Tasks

Overview

Purpose

The following tasks are for performing normal work items other than trouble clearing. They are intended to be used for initial system turn-up, establishing an end-to-end system, or establishing, adding, or discontinuing specific features.

Contents

This chapter includes the following Circuit Order/Provisioning Tasks:

Task 300: Equip Metropolis® DMX Shelf (Looped-Back)

Purpose

Use this task to initially equip and test a new Metropolis® DMX in a looped-back configuration.

This task assumes that all hardwired installation and testing of the unequipped Metropolis® DMX shelf is done. It also assumes that power is applied to the shelf.

The basic purpose of this task is to:

- Install and test system required circuit packs and software.
- Install and test optional circuit packs that you want to install at initial installation.
- Test the Metropolis® DMX for proper and alarm free operation before placing into the network.

Additional references are provided at the end of this task for provisioning optional system and circuit pack port parameters.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Obtain the work instructions for this task which state the quantity and type of circuit packs to be installed.
- Verify that you have the proper type and code of circuit packs being installed.
- If system and circuit pack port parameters are being set at this time, ensure you have a full set of work instructions detailing the values of the parameters being set.

It is suggested that you first install and test all the required circuit packs, perform the necessary system tests, reset all provisionable parameters to factory default values, then provision system and port parameters from values given in your work instructions.

Important! Some of the tasks referenced in this procedure ask if you want to provision port parameters. If you provision parameters after installing each circuit pack, then you may not want to perform Step 19 which resets all provisionable parameters to default values.

Task Complete the following steps to equip the Metropolis® DMX shelf in a looped-back configuration.

. . . . . .

1 Install SYSCTL circuit pack.

Reference: "Task 208: Install SYSCTL (LNW1) in New Metropolis® DMX Shelf" (9-49)

. . . . . .

2 Connect personal computer and establish WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

3 Install system software, if required.

Reference: "Task 213: Install Software Generic Program in New Metropolis® DMX Shelf Installation" (9-101)

. . . . . .

4 Install high speed OLIU circuit packs in M1 and M2 slots.

Reference: "Task 312: Install Main OLIU Circuit Packs" (10-113)

. . . . . .

5 If this system is going to be line timed or externally timed and the external timing reference is *not* yet available, select **View > Timing/Sync > System Timing** from the **System View** menu and verify that the system Timing Source is set to Free Running. If required, use the **Configuration > Timing/Sync** command from the System View menu to set the timing source to Free Running, or external timed if the external timing source is available.

Important! The system Timing Source should be set to Free Running or External to avoid Holdover alarms before the end-to-end system is established. The Timing Source may be re-provisioned during end-to-end system configuration.

Reference: "Task 204: Network Synchronization Provisioning" (9-25)

6 Install high speed OLIU optical loops.

Important! OLIUs may require line build outs (LBOs) during loopback.

Note that when the OLIUs are looped back, inconsistent DCC switches and section dcc channel failed alarms will occur if DCC terminations are enabled. To clear the alarm during a fiber loopback, use the **Configuration > DCC Terminations** command from the System View menu to set the **Termination State** to **disabled** for the dcc-m( ) ports with alarms. See "Task 330: Establishing Ethernet Services" (-243).

Reference: "Task 400: Connect OLIU Optical Loopbacks" (11-3)

7 Install any required OC-3/OC-12/OC-48 OLIU circuit packs in appropriate Function Unit or Growth slots.

Reference: "Task 321: Install OLIU Circuit Packs in Function/Growth Slots" (10-169)

8 Verify/Install OC-3/OC-12/OC-48 OLIU optical loops.

Important! OLIUs may require line build outs (LBOs) during loopback.

Note that when the OLIUs are looped back, inconsistent DCC switches and section dcc channel failed alarms will occur if DCC terminations are enabled. To clear the alarm during a fiber loopback, use the **Configuration > DCC Terminations** command from the System View menu to set the **Termination State** to **disabled** for the dcc-m( ) ports with alarms. See "Task 330: Establishing Ethernet Services" (-243).

On OLIUs with ports that may not be looped back, use **Configuration > Provision** from the System View menu, select the port being provisioned, then set the **OCn Line State** to **Not Monitored** to silence the alarms.

Reference: "Task 400: Connect OLIU Optical Loopbacks" (11-3)

9 Install any required 12DS3/EC1 circuit packs.

Reference: "Task 313: Install 12DS3/EC1 (LNW16) Circuit Pack" (10-123)

10 Install any required 28DS1/28DS1PM circuit packs.

Reference: "Task 314: Install 28DS1/28DS1PM (LNW6/LNW7) Circuit Pack" (10-127)

11 Install any required LNW18 TMUX circuit packs.

Reference: "Task 347: Install TMUX (LNW18) Circuit Pack" (10-505)

12 Install any required FE/GbE Ethernet circuit packs.

Reference: "Task 334: Install 10/100T (LNW66) Fast Ethernet Circuit Pack" (10-413) and "Task 335: Install 1GSX/1GLX (LNW67/LNW68) Gigabit Ethernet Circuit Packs" (10-417)

13 Install 177D Apparatus Blanks in any unused Function/Growth slots on the shelf.

14 Perform LED test.

Reference: "Task 203: Perform LED Test" (9-21)

15 Perform local (looped-back) terminal transmission tests, if required.

Important! This task assumes that the Metropolis® DMX high speed signals are looped back (manual optical OLIU loopback).

Reference:

"Task 401: Perform DS1 Transmission Test" (11-9)

"Task 402: Perform DS3 Transmission Test" (11-17)

"Task 415: Perform EC-1 Transmission Test" (11-77)

16 Perform local cross-connect wiring (facility) transmission test (looped back), if required.

Important! This task assumes that the Metropolis® DMX has been connected to the low-speed DSX cross connect as required.

Reference:

"Task 401: Perform DS1 Transmission Test" (11-9)

"Task 402: Perform DS3 Transmission Test" (11-17)

"Task 415: Perform EC-1 Transmission Test" (11-77)

17 Test protection switching function, if required.

Reference: "Task 406: Test Function Unit Equipment Protection Switching" (11-43)

18 Check office alarm interface, if required.

CAUTION

The following step resets all system provisionable parameters and cross-connections to factory default values. This command should never be used on an in-service system. It should be used only on a new shelf after the shelf has been equipped and tested. If you have already set provisionable parameters for the installed circuit pack ports, they will be reset to factory default values.

19 From the System View menu, use the **Fault > Reset > Initialize System** command to reset system parameters to default values, if required. Read all the warnings and follow the prompts to execute the command.

Result: You will be logged off the system during the controller reset and provisionable parameters will be set to factory default.

Inconsistent DCC switches alarms may occur again when this command is executed because the DCC channels become enabled again. To clear the alarms, use the **Configuration > DCC Terminations** command from the System View menu to set the DCC Channel Parameter **Termination State** to **disabled** for each of the ports reporting the alarm.

20 Provision optional system parameters as required from work order or office records.

See "Provisionable Parameters" (5-12) in Chapter 5, "Provisioning, Security, & Administration" for a list of provisionable parameters.

Reference: "Task 349: Setting Optional System Parameters" (10-513)

21 Establish the end-to-end Metropolis® DMX subnetwork, when required.

Reference: "Task 301: Establish End-to-End Metropolis® DMX System" (10-15)

END OF STEPS

Task 301: Establish End-to-End Metropolis® DMX System

Purpose

Use this task to establish an end-to-end Metropolis® DMX high speed:

- OC-48 UPSR
- OC-192 UPSR (Release 2.1 and later)
- OC-48 BLSR (Release 2.1 and later)
- OC-192 BLSR (Release 3.0 and later)
- OC-48 1+1 Linear (Main-to-Main) (Release 3.0 and later)
- OC-48 1+1 Linear (Main-to-Function/Growth) (Release 3.0 and later)

Important! This task assumes that all Metropolis® DMX shelves have been equipped and passed the looped transmission test(s). If not, refer to "Task 300: Equip Metropolis® DMX Shelf (Looped-Back)" (10-7).

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the WaveStar® CIT is available.

Task

Complete the following steps to establish an end-to-end Metropolis® DMX system.

. . . . . .

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Refer to one of the following procedures to establish an end-to-end Metropolis® DMX system.

- "SE 301-1: Establish High Speed OC-48/OC-192 UPSR" (10-19)
- "SE 301-2: Establish High Speed OC-48/OC-192 2-Fiber BLSR" (10-23)
- "SE 301-3: Establish High Speed OC-48 1+1 Linear (Main-to-Main)" (10-29)
- "SE 301-4: Establish High Speed OC-48 1+1 Linear (Main-to-Function/Growth)" (10-33)

END OF STEPS

SE 301-1: Establish High Speed OC-48/OC-192 UPSR

Procedure Complete the following steps to establish a high speed OC-48/OC-192 UPSR.

1 To verify the OC-48/OC-192 port parameters, from the System View menu select **View > View Equipment Details...**. Select the appropriate OC-48/OC-192 port.

2 To set the OC-48/OC-192 port parameters, from the System View menu select **Configuration > Provision...**. Select the appropriate OC-48/OC-192 port and provision the port parameters as needed. Perform this step at each end of the optical span being established.

> **Important!** The Application parameter must be provisioned *UPSR*.

3 To verify Network-Side/User-Side parameters, from the System View menu select **View > DCC Terminations...**.

4 To set Network-Side/User-Side parameters, from the System View menu select **Configuration > DCC Terminations...**. Select the appropriate OLIU port from the **Port AID:** pull-down menu. Provision the DCC connection as needed. Perform this step at each end of the optical span being established.

> **Important!** The Network-Side/User-Side parameters must be set opposite at each end of the optical span.

5 To verify the operational synchronization mode of the system, from the System View menu select **View > Timing/Sync** and click on the **System Timing** tab.

If the **Timing Source** is holdover, check that the incoming timing references are connected. Also check **Mode Switching** (NA, revertive, or nonrevertive) and the external DS1 Line Format by clicking on the **Timing Input Ports** tab.

6 To provision the operational synchronization mode of the system, from the System View menu select **Configuration > Timing/Sync** and click on the **System Timing** tab. Set the timing mode as specified in the work order or office records.

7 To verify if Sbyte (sync messaging) is enabled or disabled, from the System View menu select **View > Timing/Sync > System Timing** tab. Check the **Synchronization Autoreconfiguration:** field; it should read either NA, enabled, or disabled, depending on the timing source selected.

> **Important!** Synchronization autoreconfiguration is only provisionable if the system timing is provisioned as line timed.

8 If Metropolis® DMX is provisioned as line timed, from the System View menu, select **Configuration > Timing/Sync > System Timing** tab to enable or disable the sync autoreconfiguration parameter as required by your work order. Select **Enabled** or **Disabled** under Synchronization Autoreconfiguration and click **Apply**.

Important! When sync autoreconfiguration is enabled, Sbyte is also enabled. If Sbyte (sync messaging) is enabled at any node in the network, it must be enabled at all nodes in the network.

9 To designate the AGNE(s) and alarm group numbers, from the System View menu select **Administration > Set NE.** Provision the AGNE and alarm group numbers as required.

10 Determine the optical loss of each optical span from office records or by making the required measurements.

11 At the near-end, remove the optical connections and LBO from one OLIU (for example, M2) associated with the optical span being established. At the other end, remove the optical connections and LBO from the associated OLIU (for example, M1) in the optical span being established.

12 Perform optical fiber connections and verification of the integrity of the optical span being established.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

13 To designate the NSAPAREA field, from the System View menu select **Administration>Data Communications.** Click on the **Network Layer** tab and then click **Modify.** Enter the appropriate NSAP numbers.

14 Perform end-to-end optical line test.

Reference: "Task 404: Perform End-to-End Optical Line Test on Main OLIUs" (11-37)

15 Repeat this task from Step 1 for each optical span being established in the high speed OC-48/OC-192 UPSR.

END OF STEPS

□

SE 301-2: Establish High Speed OC-48/OC-192 2-Fiber BLSR

Procedure

Important! This procedure assumes that all Metropolis® DMX shelves have been equipped, circuit packs installed, and optical ports are looped. If not, refer to "Task 300: Equip Metropolis® DMX Shelf (Looped-Back)" (10-7).

Complete the following steps to establish a high speed OC-48/OC-192 BLSR. (Refer to the 2-fiber bidirectional line switched ring worksheet at the end of this procedure when performing this task.)

1 At the starting node (refer to the 2-fiber BLSR worksheet at the end of this task), select **Configuration > Provision...** from the System View screen.

Result: The *Provision Parameters for Equipment* screen appears.

Important! *OCn* represents OC-48 or OC-192 depending on the BLSR line rate.

2 Expand the *CP main-2 (OCn/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OCn)* and **Provision**.

Result: The port provisionable parameters appear.

Important! The Application parameter must be provisioned *2F BLSR*.

3 Provision the port parameters according to the work instructions. Click on **Apply**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**. The application parameter of main-1 is automatically provisioned *2F BLSR.*

4 Select **View > View Equipment Details...**

Result: The *View Equipment Details* screen appears.

Important! *OCn* represents OC-48 or OC-192 depending on the BLSR line rate.

5 Expand the *CP main-2 (OCn/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OCn)* and **Select**. Verify that the port parameters were provisioned correctly and click on **Close**.

6 At the opposite end of the optical span (refer to the 2-fiber BLSR worksheet at the end of the task), repeat Step 1 through Step 5 to provision the port on the *main-1* circuit pack.

7 At the starting node, select **Configuration > Provision...**.

Result: The *Provision Parameters for Equipment* screen appears.

8 Select the **Ptn Grp** tab and the appropriate 2-fiber BLSR protection group. Then click on **Provision**.

Result: The protection group parameters appear.

Important! In Release 3.0 and later releases, Metropolis® DMX supports provisionable automatic ring discovery.

9 Provision the *Group Member* parameters (Ring ID, Wait to Restore, and Automatic Ring Discovery) according to the work instructions and click on **Apply**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes** and **Close**.

10 Select **View > Protection**.

Result: The *View Protection* screen appears.

11 Click on *2F BLSR main-1* and **Select**. Verify that the protection group parameters were provisioned correctly and click on **Close**.

12 At the opposite end of the optical span, repeat Step 7 through Step 11 to provision the 2-fiber BLSR protection group.

13 At the starting node, select **Configuration > DCC Terminations...**

Result: The *Provision DCC Terminations* screen appears.

Important! The Termination State parameter must be provisioned *Enabled*.
The LAPD parameter for the *dcc-m1-1* port must be provisioned as *user-side*, and the LAPD parameter for the *dcc-m2-1* port must be provisioned as *network-side*.

14 Select the required DCC Port (*dcc-m1-1* or *dcc-m2-1*) and provision the DCC Termination parameters (Termination State and LAPD Role) according to the work instructions. Click on **OK**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes** and **Close**.

15 Select **View > DCC Terminations...**. Verify that the DCC Termination parameters were provisioned correctly and click on **Close**.

16 At the opposite end of the optical span, repeat Step 13 through Step 15 to provision the DCC terminations.

Important! If the system Timing Mode parameter is provisioned as *Line*, the Synchronization Autoreconfiguration parameter must be provisioned *Enabled*.

17 At the starting node, provision synchronization functions according to work instructions. Repeat this step at the opposite end of the optical span.

Reference: "Task 204: Network Synchronization Provisioning" (9-25)

Important! If the network element is designated as the Alarm Gateway Network Element (AGNE), the Alarm Gateway parameter must be provisioned *Enabled*.

18 At the starting node, select **Administration > Set NE**. Provision the Remote NE Status, Alarm Group, and Alarm Gateway parameters according to the work instructions and click on **OK**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**.

Repeat this step at the opposite end of the optical span.

19 Perform optical fiber connections and verification of the integrity of the optical span being established.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

20

IF ...	THEN...
automatic ring discovery (Release 3.0 and later releases),	after the automatic ring discovery is complete, continue with Step 21.
manual ring discovery (Release 2.1),	Establish a new manual ring map. Repeat this step at the opposite end of the optical span. **Reference:** "Task 305: Provision Manual Ring Map" (10-79)

21 Perform end-to-end optical line test.

Reference: "Task 404: Perform End-to-End Optical Line Test on Main OLIUs" (11-37)

22 Repeat this procedure from Step 1 for each optical span in the 2-fiber BLSR network (refer to the 2-fiber BLSR example and worksheet at the end of the task).

23 To verify 2-fiber BLSR protection switching, at the starting node:

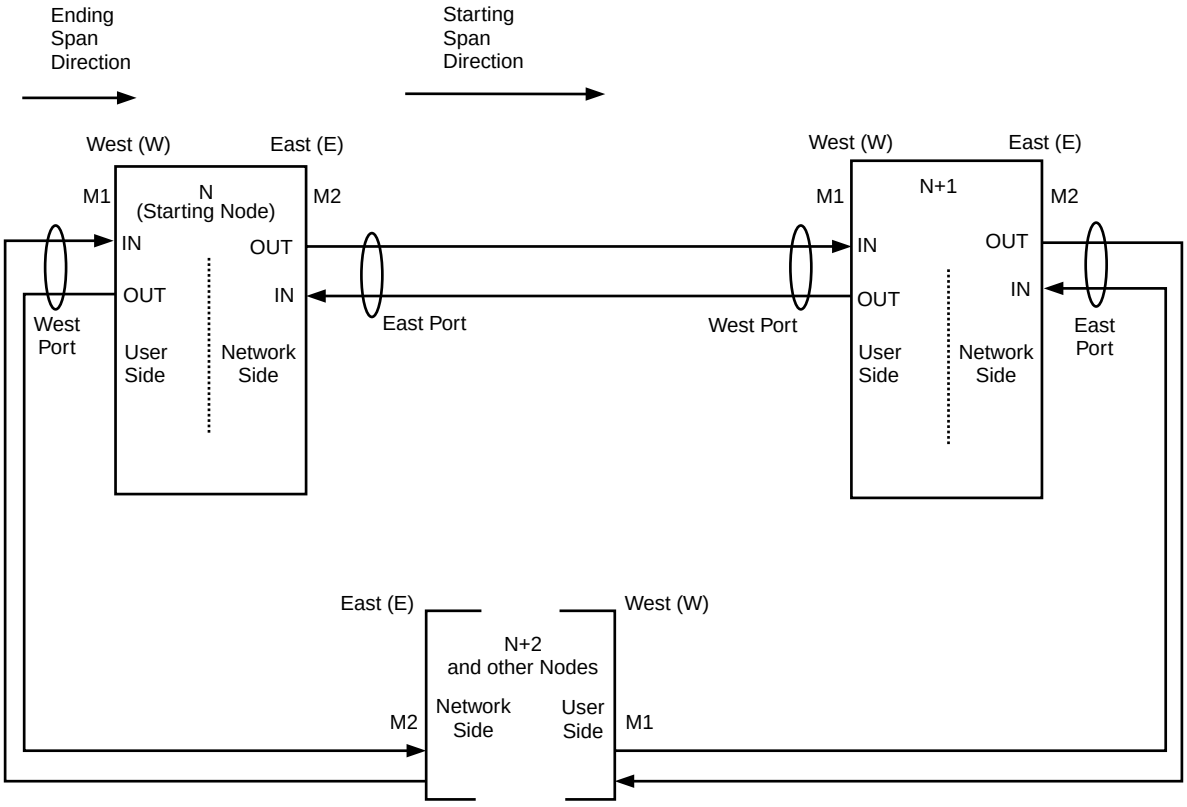
1. Select **Fault > Protection Switch....** Select the 2-fiber BLSR protection group and perform a protection switch in the **East** direction with switch type **Manual to Protection, Ring**.
2. Select **View > Protection....** Select the 2-fiber BLSR protection group and verify the 2-fiber BLSR protection switch was performed.
3. Select **Fault > Protection Switch....** Select the 2-fiber BLSR protection group and perform a protection switch in the **East** direction with switch type **Clear**.

Repeat this step for each optical span in the 2-fiber BLSR network to verify protection switching.

24

IF automatic ring discovery was provisioned...	THEN...
enabled at each node (in Step 9),	**Important!** As the ring is connected, nodes automatically communicate with each other using the data communications channel (DCC) and build a ring map. If successful, automatic ring discovery builds a ring map at each node. If unsuccessful, the ring map is not complete and alarms are reported. At the starting node, select **View > Ring Map > Ring Map**. Then click on the appropriate ring and **Select**. **Result:** The ring map information appears. If the ring is incomplete and alarms are present, refer to *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*.
disabled at each node (in Step 9),	*STOP! End of Task.*

2-Fiber Bidirectional Line Switched Ring Worksheet



nc-usm-368

2-FIBER RING WORKSHEET _____ SPAN NAME/ID _____

N

TID=

Ring ID: _____

Node ID: _____

Protection Group AID _____

OUT Fiber Color/ID _____

IN Color/ID _____

Received Power Level _____

Required LBO _____

N+1

TID=

Node ID: _____

Protection Group AID _____

IN Fiber Color/ID _____

Received Power Level _____

Required IN PAD _____

OUT Fiber Color _____

NC-USM-216

SE 301-3: Establish High Speed OC-48 1+1 Linear (Main-to-Main)

Procedure

Important! This procedure assumes that all Metropolis® DMX shelves have been equipped, circuit packs installed, and optical ports are looped. If not, refer to "Task 300: Equip Metropolis® DMX Shelf (Looped-Back)" (10-7) to equip new shelves.

Complete the following steps to establish a high speed OC-48 1+1 linear system between Main slots of two Metropolis® DMX shelves. (Refer to the 1+1 linear worksheet at the end of this procedure when performing this task.)

1 At the near end node (refer to the 1+1 linear worksheet at the end of this task), select **Configuration** > **Provision...** from the System View screen.

Result: The *Provision Parameter for Equipment* screen appears.

2 Expand the *CP main-1 (OC48/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OC48)* and **Provision**.

Result: The port provisionable parameters appear.

Important! The Application parameter must be provisioned *1+1*.

3 Provision the the port parameters according to the work instructions. Click on **Apply**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**. The application parameter of main-2 is automatically provisioned *1+1*.

4 On the left side of the screen, expand the *CP main-2 (OC48/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OC48)* and **Provision**.

Result: The port provisionable parameters appear.

5 Provision the the port parameters according to the work instructions and click on **Apply** .

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes** and **Close**.

6 Select **View > View Equipment Details...**

Result: The *View Equipment Details* screen appears.

7 Expand the *CP main-1 (OC48/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OC48)* and **Select**. Verify that the port parameters were provisioned correctly.

8 On the left side of the screen, expand the *CP main-2 (OC48/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OC48)* and **Select**. Verify that the port parameters were provisioned correctly and click on **Close**.

9 Select **Configuration > DCC Terminations...**

Result: The *Provision DCC Terminations* screen appears.

Important! The Termination State parameter must be provisioned *Enabled*.
The default value of the LAPD parameter for port *dcc-m1-1* is *network-side*. The LAPD parameter must be provisioned different values at each end of the system.

10 Select DCC Port *dcc-m1-1*, provision the DCC Channel parameters (Termination State and LAPD Role) according to the work instructions, and click on **OK**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes** and **Close**.

11 Select **View > DCC Terminations...**. Verify that the DCC termination parameters were provisioned correctly and click on **Close**.

Important! If the system Timing Mode parameter is provisioned as *Line*, the Synchronization Autoreconfiguration parameter must be provisioned *Enabled*.

12 Provision synchronization functions according to work instructions.

Reference: "Task 204: Network Synchronization Provisioning" (9-25)

Important! If the network element is designated as the Alarm Gateway Network Element (AGNE), the Alarm Gateway parameter must be provisioned *Enabled*.

13 Select **Administration > Set NE**. Provision the Remote NE Status, Alarm Group, and Alarm Gateway parameters according to the work instructions and click on **OK**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**.

14 At the far end node, repeat Step 1 through Step 13.

Important! The near end OC-48 OLIU circuit pack in the Main 1 slot must be connected to the far end OC-48 OLIU circuit pack in the Main 1 slot, and the near end OC-48 OLIU circuit pack in the Main 2 slot must be connected to the far end OC-48 OLIU circuit pack in the Main 2 slot. Refer to the 1+1 linear worksheet.

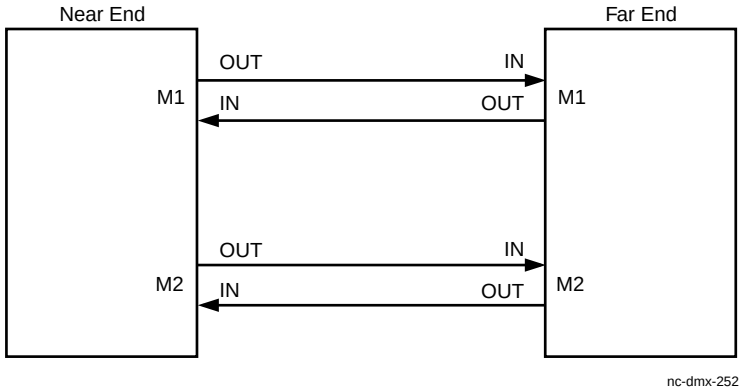
15 Perform optical fiber connections and verification of the integrity of the optical span being established.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

16 Perform end-to-end optical line test.

Reference: “Task 404: Perform End-to-End Optical Line Test on Main OLIUs” (11-37)

1+1 Linear Worksheet (Main-to-Main)



TID= Protection Group AID _____	TID= Protection Group AID _____
M1 OUT Fiber Color/ID _____ IN Fiber Color/ID _____ Received Power Level _____ Required LBO _____	Port _____ IN Fiber Color/ID _____ Received Power Level _____ Required LBO _____ OUT Fiber Color/ID _____
M2 OUT Fiber Color/ID _____ IN Fiber Color/ID _____ Received Power Level _____ Required LBO _____	Port _____ IN Fiber Color/ID _____ Received Power Level _____ Required LBO _____ OUT Fiber Color/ID _____

nc-dmx-251

SE 301-4: Establish High Speed OC-48 1+1 Linear (Main-to-Function/Growth)

Procedure

Important! This procedure assumes that all Metropolis® DMX shelves have been equipped, circuit packs installed, and optical ports are looped. If not, refer to "Task 300: Equip Metropolis® DMX Shelf (Looped-Back)" (10-7) to equip new shelves.

To install OC-48 OLIU circuit packs in the function/growth slots of an existing shelf, refer to "Task 321: Install OLIU Circuit Packs in Function/Growth Slots" (10-169).

Complete the following steps to establish a high speed OC-48 1+1 linear system between the Main slots and Function/Growth slots of two Metropolis® DMX shelves. (Refer to the 1+1 linear worksheet at the end of this procedure when performing this task.)

1 At the node where the Main slots are to be used, (refer to the 1+1 linear worksheet at the end of this task), select **Configuration** > **Provision...** from the System View screen.

Result: The *Provision Parameter for Equipment* screen appears.

2 Expand the *CP main-1 (OC48/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OC48)* and **Provision**.

Result: The port provisionable parameters appear.

Important! The Application parameter must be provisioned *1+1*.

3 Provision the the port parameters according to the work instructions. Click on **Apply**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**. The application parameter of main-2 is automatically provisioned *1+1*.

4 On the left side of the screen, expand the *CP main-2 (OC48/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OC48)* and **Provision**.

Result: The port provisionable parameters appear.

5 Provision the the port parameters according to the work instructions. Click on **Apply**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes** and **Close**.

6 Select **View > View Equipment Details...**

Result: The *View Equipment Details* screen appears.

7 Expand the *CP main-1 (OC48/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OC48)* and **Select**. Verify that the port parameters were provisioned correctly.

8 On the left side of the screen, expand the *CP main-2 (OC48/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OC48)* and **Select**. Verify that the port parameters were provisioned correctly and click on **Close**.

9 Select **Configuration > DCC Terminations...**

Result: The *Provision DCC Terminations* screen appears.

Important! The Termination State parameter must be provisioned *Enabled*.
The default value of the LAPD parameter for port *dcc-m1-1* is *network-side*. The LAPD parameter must be provisioned different values at each end of the system.

10 Select DCC Port *dcc-m1-1*, provision the DCC Channel parameters (Termination State and LAPD Role) according to the work instructions, and click on **OK**.

Result: A dialog box appears asking you to confirm executing this this command. Click on **Yes** and **Close**.

11 Select **View > DCC Terminations...**. Verify that the DCC termination parameters were provisioned correctly and click on **Close**.

Important! It is assumed that this network element is connecting to a network element that is in the line or external timing mode. Therefore, the system Timing Mode parameter should be provisioned as *Line*, and the Synchronization Autoreconfiguration parameter should be provisioned *Enabled*.

12 Provision synchronization functions according to work instructions.

Reference: "Task 204: Network Synchronization Provisioning" (9-25)

Important! If the network element is designated as an Alarm Gateway Network Element (AGNE), the Alarm Gateway parameter must be provisioned *Enabled*.

13 Select **Administration > Set NE.** Provision the Alarm Group and Alarm Gateway parameters according to the work instructions and click on **OK**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**.

Important! The Application parameter must be provisioned *1+1*.

14 At the far end node (node with Function/Growth slots used), provision the port parameters according to the work instructions.

Reference: "Task 322: Provision Function/Growth OLIU Circuit Packs/Ports for New Service" (10-175)

15 Select **Configuration > DCC Terminations...**

Result: The *Provision DCC Terminations* screen appears.

Important! The Termination State parameter must be provisioned *Enabled*.
The default value of the LAPD parameter for *dcc-{a,b,c,d,g,}-1* is *network-side*. The LAPD parameter must be provisioned different values at each end of the system.

16 Select DCC Port *dcc-{a,b,c,d,g,}-1*, provision the DCC Channel parameters (Termination State and LAPD Role) according to the work instructions, and click on **OK**.

Result: A dialog box appears asking if you want to execute this command. Click on **Yes** and **Close**.

17 Select **View > DCC Terminations....** Verify that the DCC termination parameters were provisioned correctly and click on **Close**.

Important! The near end OC-48 OLIU circuit pack in the Main 1 slot must be connected to the far end OC-48 OLIU circuit pack in the Function/Growth (A, B, C, D, G) 1 slot, and the near end OC-48 OLIU circuit pack in the Main 2 slot must be connected to the far end OC-48 OLIU circuit pack in the Function/Growth (A, B, C, D, G) 2 slot. Refer to the 1+1 linear worksheet when connecting fibers.

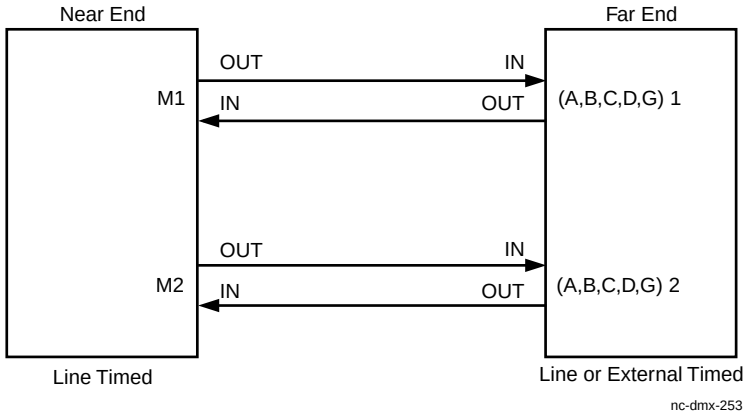
18 Perform optical fiber connections and verification of the integrity of the optical span being established.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

19 Perform end-to-end optical line test.

Reference: "Task 404: Perform End-to-End Optical Line Test on Main OLIUs" (11-37)

1+1 Linear Worksheet (Main-to-Function/Growth)



TID= Protection Group AID _____	TID= Protection Group AID _____
M1 OUT Fiber Color/ID _____ IN Fiber Color/ID _____ Received Power Level _____ Required LBO _____	Port _____ IN Fiber Color/ID _____ Received Power Level _____ Required LBO _____ OUT Fiber Color/ID _____
M2 OUT Fiber Color/ID _____ IN Fiber Color/ID _____ Received Power Level _____ Required LBO _____	Port _____ IN Fiber Color/ID _____ Received Power Level _____ Required LBO _____ OUT Fiber Color/ID _____

nc-dmx-251

Task 302: Add New Metropolis® DMX Node (Shelf) to Network

Purpose

Use this task to add a new Metropolis® DMX node (shelf) to the following network (rings):

- OC-48 UPSR
- OC-192 UPSR (Release 2.1 and later)
- OC-48 BLSR (Release 2.1 and later)
- OC-192 BLSR (Release 3.0 and later)

Important! This task assumes that the new Metropolis® DMX shelf has been equipped, circuit packs installed, passed the looped transmission test, and that the proper release of software has been loaded. If not, refer to "Task 300: Equip Metropolis® DMX Shelf (Looped-Back)" (10-7).

Required equipment

The following equipment is required at the new Metropolis® DMX node (shelf) and the two adjacent network elements:

- Personal computer (PC) with WaveStar® CIT software installed
- Wrist strap
- Optical power meter
- Note pad

The technicians at each network element must be able to communicate with each other.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the WaveStar® CIT is available.

Task

Complete the following steps to add a new Metropolis® DMX node to a network.

. . . . . .

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 To verify that no alarms are present, click on **Alarm List** in the top right corner of the System View.

To verify that no lockouts, loopbacks, or switches are present, from the System View menu, select **View > View Rolling Events**. Under the line reading
RTRV-COND-ALL:DMX::40 any lockouts, loopbacks, or switches are displayed.

> **Important!** If the Metropolis® DMX fails to respond in the indicated manner, refer to the *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*.

3 Notify maintenance center that alarms will be generated.

4 Determine from either the work order or Network Operations Center (NOC) the synchronization for the new node. If no external timing is present, view the synchronization of the adjacent nodes to determine the direction of the line timing. Configure the new node the same way. From the System View menu, select **Configuration > Timing/Sync** and click the **System Timing** tab. If externally timed, provision according to the work order. Refer to "Task 204: Network Synchronization Provisioning" (9-25).

> **Important!** Two or more shelves in the same network cannot have the same system name or TID.

5 Determine from either the Network Operations Center (NOC) or the work order, all the other nodes in the existing ring. Verify that no duplicate TID settings exist between the ring and the new node. If duplicate TID settings exist, determine new settings and at each of the sites with duplicate TID settings, select **Administration > Set TID** from the System View menu, and enter new TID settings.

6 To designate the alarm gateway function and alarm group numbers, select **Administration > Set NE** from the System View. Provision the *Alarm Gateway* and *Alarm Group* parameters according to the work instructions.

7 Refer to one of the following procedures to add a new Metropolis® DMX node (shelf) to a network:

- "SE 302-1: Add New Metropolis® DMX Node (Shelf) to OC-48/OC-192 UPSR" (10-43)
- "SE 302-2: Add New Metropolis® DMX Node (Shelf) to OC-48/OC-192 BLSR" (10-51)

END OF STEPS

SE 302-1: Add New Metropolis® DMX Node (Shelf) to OC-48/OC-192 UPSR

Procedure Complete the following steps to add a new Metropolis® DMX node (shelf) to an OC-48/OC-192 UPSR.

Important! The Application parameter must be provisioned *UPSR*.

1 At the new Metropolis® DMX node (shelf), select **Configuration > Provision...**. Expand the *CP main-1 (OCn/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OCn)* and **Provision**. Provision the port parameters according to the work instructions and click on **Apply**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**. The application parameter of main-2 is automatically provisioned *UPSR*.

Repeat this step for the port on the main-2 circuit pack.

2 Select **View > View Equipment Details....** Select the appropriate OC-48/OC-192 port and click on **Select**. Verify that the port parameters were provisioned correctly and click on **Close**.

Important! The Termination State parameter must be provisioned *Enabled*.
The default value of the LAPD parameter for port *dcc-m1-1* is *user-side*. The LAPD parameter must be provisioned different values at each end of the system.

3 Select **Configuration > DCC Terminations...** Select DCC Port *dcc-m1-1*, provision the DCC Channel parameters (Termination State and LAPD Role) according to the work instructions, and click on **OK**.

Result: A dialog box appears asking you to confirm executing this this command. Click on **Yes** and **Close**.

Repeat this step to provision DCC port *dcc-m2-1* as *network-side*.

4 Select **View > DCC Terminations...**. Verify that the DCC termination parameters were provisioned correctly and click on **Close**.

CAUTION

Service affecting

Pass through cross-connections must be provisioned to support existing traffic on the ring through the new node. If pass through cross-connections are not provisioned service interruptions can occur.

5 Determine from either the Network Operations Center (NOC) or the work order all the other nodes in the existing ring. Verify through the NOC, all existing cross-connections that exist on the adjacent nodes to where the new node will be located. Also, note the cross-connection rate (for example, STS1, STS3c). These will be pass-through cross-connections at the new node. Enter the pass-through cross-connections into the new node by selecting **Configuration > Cross-Connect ion> Create a New Cross Connection > 2-way point-to-point through**.

Important! It may be helpful to make a sketch of the network to visualize the cross-connections required.

6 Have the NOC perform **View > Protection > Path Protection** to determine which path is active. This will determine which direction of transmission is active. If the active path is going through the two adjacent NEs, have the NOC perform a path ring switch using **Fault > Protection > Path Protection > Switch Type Manual**. (For example, in Figure 10-1, switch all the active Main 1 paths on NE1 to standby, and the active Main 2 paths on NE2 to standby.)

Verify that all traffic is going away from the two adjacent NEs by having the NOC perform **View > Protection > Path Protection** again.

CAUTION

Service affecting

Removal of wrong fiber connections will result in a service interruption. Ensure that you remove only the fiber connections for the optical span being discontinued.

7 Remove one pair of optical fibers (M1 in one node to M2 in the adjacent node) from the MAIN in the West direction. Measure the optical power level in the receive direction and pad if necessary. Refer to "Task 403: Perform Connection and Verification of Optical Facility" (11-25). Connect both transmit and receive fibers from the West direction to the appropriate OLIU of the new node (refer to Figure 10-1 for example).

Remove the other pair of optical fibers (M1 in one node to M2 in the adjacent node) to the MAIN in the East direction. Measure the optical power level in the receive direction and pad if necessary. Refer to "Task 403: Perform Connection and Verification of Optical Facility" (11-25). Connect both transmit and receive fibers from the East direction to the appropriate OLIU of the new node (refer to Figure 10-1 for example).

Figure 10-1 Example of Adding a Node

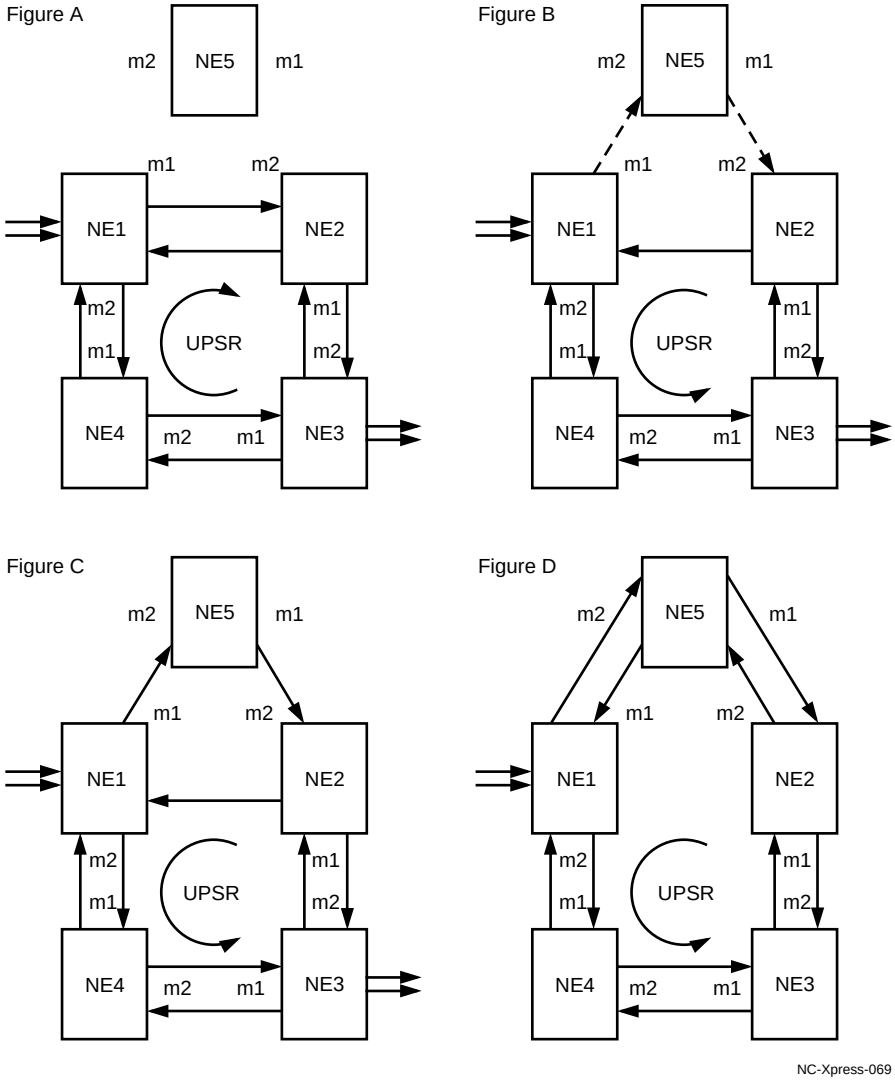


Figure A shows where NE5 is going to be added to the ring. The direction of traffic flow would be from NE1 to NE2. Figure B shows traffic now flowing in the opposite direction after a path ring switch. Figure C now adds NE5 between NE1 and NE2 after the through cross connects, power measurements, and timing, have been provisioned. Figure D now has traffic flowing through NE5.

. . . . . .

8 To verify if Sbyte (sync messaging) is enabled or disabled, from the System View menu select **View > Timing/Sync > System Timing** tab. Check the **Synchronization Autoreconfiguration:** field; it should read either NA, enabled, or disabled, depending on the timing source selected.

9 From the System View menu select **Configuration > Timing/Sync > Synch Messaging Timing** tab to enable or disable the sync autoreconfiguration parameter (if applicable to the selected timing source) as required by your work order. Select **Enabled** or **Disabled** under Synchronization Autoreconfiguration and click **Apply**.

> **Important!** When sync autoreconfiguration is enabled, Sbyte is also enabled. If Sbyte (sync messaging) is enabled at any node in the network, it must be enabled at all nodes in the network.

10 Verify that there are no alarms at this point in time on the new NE as well as the adjacent NEs.

11 From the System View menu, select **Administration > OSI Neighbor Map** to verify proper fiber connections have been made to the adjacent node.

> **Important!** If the report in this step indicates wrong fiber connections or no connection, verify that fecom is enabled. From the System View menu, select **View > DCC Terminations**. Check fiber integrity.

12 To verify the operational synchronization mode of the system, from the System View menu select **View > Timing/Sync** and click on the **System Timing** tab.

If the **Timing Source** is holdover, check that the incoming timing references are connected. Also check **Mode Switching** (NA, revertive, or nonrevertive) and the external DS1 Line Format by clicking on the **Timing Input Ports** tab.

13 To provision the operational synchronization mode of the system, from the System View menu select **Configuration > Timing/Sync** and click on the **System Timing** tab. Set the timing mode as specified in the work order or office records.

14 From the System View menu, select **Administration > OSI Neighbor Map** to verify proper fiber connections have been made to the adjacent node.

Important! If the report in this step indicates wrong fiber connections or no connection, verify that fecom is enabled. From the System View menu, select **View > DCC Terminations**. Check fiber integrity.

15 To verify that all alarm and status conditions clear, click on **Alarm List** in the top right corner of the System View window.

Important! If inc. VT AIS or inc. STS AIS alarm is present and no inc. OCn LOS alarm, check that all pass-through cross-connections have been properly made. From the System View menu, select **View>Cross Connections**.

16 To designate the NSAPAREA field, from the System View menu, select **Administration > Data Communications.** Set the level 2 IS-IS routing, as required. Click on the **Network Layer** tab and then click **Modify.** Enter the appropriate NSAP numbers.

17 Perform end-to-end OC-48/OC-192 line test.

Reference: “Task 404: Perform End-to-End Optical Line Test on Main OLIUs” (11-37)

18 Perform appropriate end-to-end transmission test for the circuits being added, as required.

Reference:

“Task 401: Perform DS1 Transmission Test” (11-9)

“Task 402: Perform DS3 Transmission Test” (11-17)

“Task 415: Perform EC-1 Transmission Test” (11-77)

19 Perform a path switch to the new NE. From the System View menu, select **Fault > Protection Switch > Path Protection > Switch Type Manual**. Verify that all traffic is going through the new NE by having the NOC perform **View > Protection > Path Protection** again.

20 The system is now ready for initial service to be established.

Reference:

"Task 304: Establish DS1 Service" (10-75)

"Task 308: Establish End-to-End DS3 or EC-1 Service" (10-93)

END OF STEPS

SE 302-2: Add New Metropolis® DMX Node (Shelf) to OC-48/OC-192 BLSR

Procedure

Important! This procedure assumes that the new Metropolis® DMX shelf have been equipped, circuit packs installed, and optical ports are looped. If not, refer to "Task 300: Equip Metropolis® DMX Shelf (Looped-Back)" (10-7).

Verify that the work instructions specify whether automatic ring discovery is enabled or disabled on the existing ring.

Complete the following steps to add a new Metropolis® DMX node (shelf) to an OC-48/OC-192 2-fiber bidirectional line switched ring (BLSR).

1 At the new node, select **Configuration** > **Provision...** from the System View screen.

Result: The *Provision Parameter for Equipment* screen appears.

2 Expand the *CP main-1 (OCn/OLIU)* circuit pack (OCn= 48 or 192) by clicking on the plus sign (+). Then click on *Port 1 (OCn)* and **Provision**.

Result: The port provisionable parameters appear.

Important! The Application parameter must be provisioned *2F BLSR*.

3 Provision the the port parameters according to the work instructions. Click on **Apply**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**. The Application parameter of the main-2 circuit pack is automatically provisioned *2F BLSR*.

4 On the left side of the screen, expand the *CP main-2 (OCn/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OCn)* and **Provision**.

Result: The port provisionable parameters appear.

5 Provision the the port parameters according to the work instructions. Click on **Apply**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**.

6 Select **View > View Equipment Details...**

Result: The *View Equipment Details* screen appears.

7 Expand the *CP main-1 (OCn/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OCn)* and **Select**. Verify that the port parameters were provisioned correctly.

8 On the left side of the screen, expand the *CP main-2 (OCn/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OCn)* and **Select**. Verify that the port parameter were provisioned correctly and click on **Close**.

9 At the new node, select **Configuration > Provision...**.

Result: The *Provision Parameter for Equipment* screen appears.

10 Select the **Ptn Grp** tab and the *2F BLSR main-1* protection group. Then click on **Provision**.

Result: The protection group parameters appear.

Important! In Release 3.0 and later releases, Metropolis® DMX supports provisionable automatic ring discovery.

11 Provision the *Group Member* parameters (Ring ID, Wait to Restore, and Automatic Ring Discovery) according to the work instructions and click on **Apply**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes** and **Close**.

12 Select **View > Protection**.

Result: The *View Protection* screen appears.

13 Click on *2F BLSR main-1* and **Select**. Verify that the protection group parameters were provisioned correctly and click on **Close**.

14 At the new node, select **Configuration > DCC Terminations...**

Result: The *Provision DCC Terminations* screen appears.

Important! The Termination State parameter must be provisioned enabled. The LAPD parameter for the *dcc-m1-1* port must be provisioned as *user-side*.

15 Select DCC Port *dcc-m1-1* and provision the DCC Channel parameters (Termination State and LAPD Role) according to the work instructions. Click on **OK**.

Result: A dialog box appears asking if you want to execute this command. Click on **Yes**.

Important! The Termination State parameter must be provisioned enabled. The LAPD parameter for the *dcc-m2-1* port must be provisioned as *network-side*.

16 Select DCC Port *dcc-m2-1* and provision the DCC Channel parameters (Termination State and LAPD Role) according to the work instructions. Click on **OK**.

Result: A dialog box appears asking if you want to execute this command. Click on **Yes** and **Close**.

17 Select **View > DCC Terminations...**. Verify that the DCC termination parameters were provisioned correctly and click on **Close**.

Important! It may be helpful to make a sketch of the network to visualize the required pass through cross-connections at the new node.

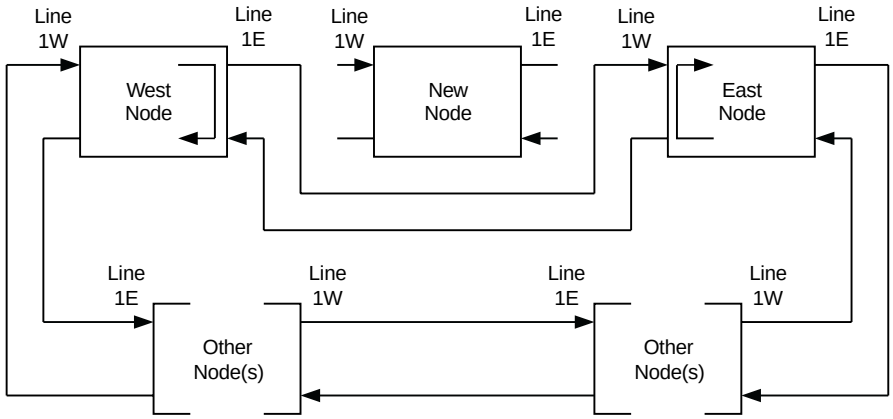
18 Determine from either the Network Operations Center (NOC) or the work order all the other nodes in the existing ring. Verify through the NOC, all existing cross-connections that exist on the adjacent nodes to where the new node will be located. Also, note the cross-connection rate (for example, STS1, STS3, STS12). These will be pass-through cross-connections at the new node.

To verify the cross-connections, at the adjacent West node select **View > Cross-Connections**. On the left side of the screen, select the *CP main-2 (OCn/OLIU)* circuit pack and click on **Select**. Record the *Src* (source tributary AID), *Src NE Name* (source network element name), *Rate*, and *Dest NE Name* (destination network element name) of the cross-connections. These will be pass-through cross-connections at the new node.

Important! The Force to Protection, Ring switch may cause transmission hits.

19 Have the NOC perform the following:

- At the West Node (refer to the following figure), from the System View menu select **Fault > Protection Switch...**. Select the *2F BLSR main-1* protection group and perform a protection switch in the **East** direction with switch type **Force to Protection, Ring**. Click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. After the protection switch completes, click on **Close**.
- At the East Node (refer to the following figure), from the System View menu select **Fault > Protection Switch...**. Select the *2F BLSR main-1* protection group and perform a protection switch in the **West** direction with switch type **Force to Protection, Ring**. Click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. After the protection switch completes, click on **Close**.



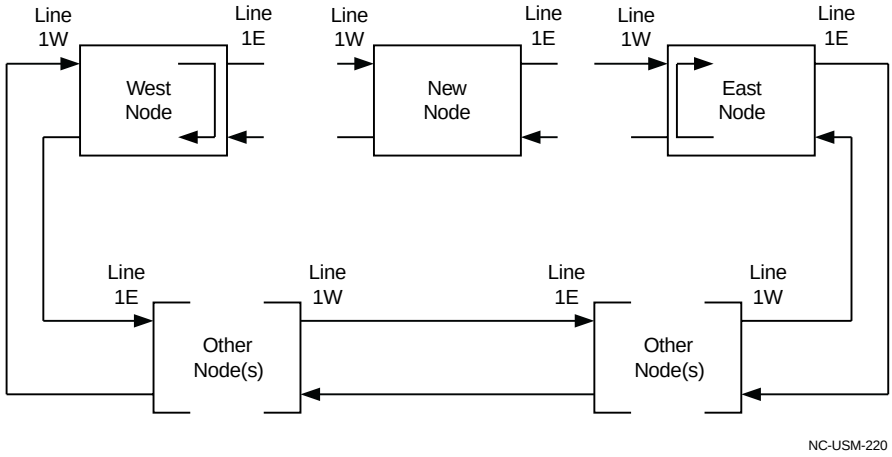
CAUTION

Service affecting

Removal of wrong fiber connections will result in a service interruption. Ensure that you remove only the fiber connections for the optical span being reconfigured.

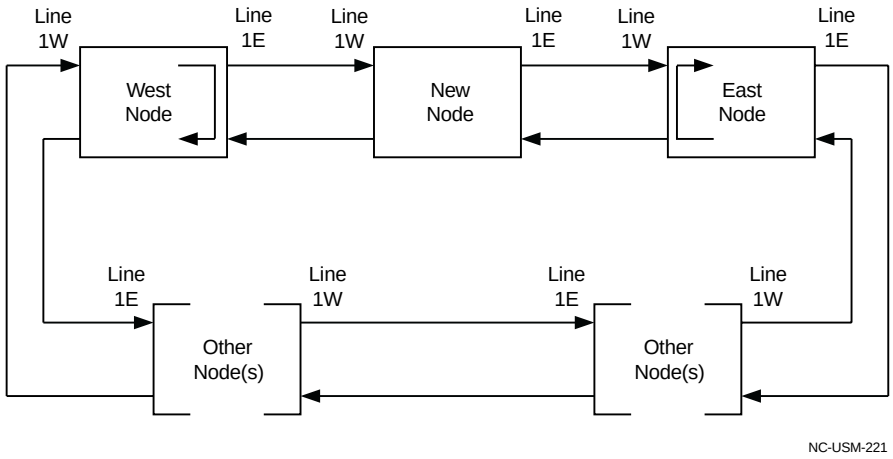
20 Perform the following:

- At the West Node, disconnect the optical fibers connected to the East Node. (Refer to the following figure.)
- At the East Node, disconnect the optical fibers connected to the West Node. (Refer to the following figure.)



21 Perform the following:

- At the West, New, and East nodes, connect all transmit fibers. (Refer to the following figure.)
- At the West, New, and East nodes, measure the optical power level in the receive direction and attenuation if necessary. Refer to "Task 403: Perform Connection and Verification of Optical Facility" (11-25). Connect the receive fiber. (Refer to the following figure.)
- At the West, New, and East nodes, connect all receive fiber. (Refer to the following figure.)



CAUTION

Service affecting

Pass through cross-connections must be provisioned to support existing traffic on the ring through the new node. If pass through cross-connections are not provisioned, service interruptions can occur.

22 At the new node, enter the required pass-through cross-connections by selecting **Configuration > Cross-Connect ion> Create New a Cross Connection > 2-way point-to-point through**.

23

IF...	THEN...
automatic ring discovery (Release 3.0 and later releases),	after the automatic ring discovery is complete, continue with Step 24.
manual ring discovery (Release 2.1),	establish a new manual ring map at the new node, and add the new node to the existing manual ring map at each node in the network. **Reference:** "Task 305: Provision Manual Ring Map" (10-79)

Important! The Clear switch may cause transmission hits.

24 Have the NOC perform the following:

- At the West Node, from the System View menu select **Fault** > **Protection Switch...**. Select the *2F BLSR main-1* protection group and clear the protection switch in the **East** direction with switch type **Clear**. Click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. After the protection switch clears, click on **Close**.
- At the East Node, from the System View menu select **Fault** > **Protection Switch...**. Select the *2F BLSR main-1* protection group and clear the protection switch in the **West** direction with switch type **Clear**. Click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. After the protection switch clears, click on **Close**.

25 Verify that there are no alarms at this point in time on the new node as well as the adjacent nodes.

26 At the new node, select **Administration > OSI Neighbor Map** to verify proper fiber connections have been made to the adjacent nodes.

Important! If the report in this step shows wrong fiber connections or no connection, verify that fecom is enabled. From the System View menu, select **View > DCC Terminations**. Check fiber integrity.

27 At the new node, select **View > Timing/Sync** and click on the **System Timing** tab to verify the operational synchronization mode of the system.

If the **Timing Source** is holdover, check that the incoming timing references are connected. Also check **Mode Switching** (NA, revertive, or nonrevertive) and the external DS1 Line Format by clicking on the **Timing Input Ports** tab. If required, refer to "Task 204: Network Synchronization Provisioning" (9-25) to provision the new node according to the work instructions.

28 At the new node, click on **Alarm List** in the top right corner of the System View window to verify that all alarm and status conditions clear.

Important! At the new node, if inc. VT AIS or inc. STS AIS alarm is present and no inc. OCn LOS alarm, check that all pass-through cross-connections have been properly made. From the System View menu, select **View > Cross Connections**.

29 The new node is now ready for initial service to be established, as required.

Reference:

"Task 304: Establish DS1 Service" (10-75)

"Task 308: Establish End-to-End DS3 or EC-1 Service" (10-93)

END OF STEPS

Task 303: Discontinue Metropolis® DMX Node (Shelf) from Network

Purpose

Use this task to discontinue a Metropolis® DMX node (shelf) from the following network (rings):

- OC-48 UPSR
- OC-192 UPSR (Release 2.1 and later)
- OC-48 BLSR (Release 2.1 and later)
- OC-192 BLSR (Release 3.0 and later)

.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see Chapter 3, "Operations Interfaces" in this document:

Before you begin

Before you begin this task, verify that the WaveStar® CIT is available.

Task

Complete the following steps to discontinue a Metropolis® DMX node from the Metropolis® DMX ring.

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Click the **Alarm List** button to verify that no alarms, locks, loops, or switches are present

Important! To retrieve a map of the SONET network use the menu **Administration > OSI Routing Map** and **Administration > OSI Neighbor Map**. The CIT may be used to retrieve the VT1.5 (DS1) and STS-1 (DS3) cross-connections within Metropolis® DMX. From the System View menu, select **View > Cross Connections**, then select the shelf.

3 Determine which Metropolis® DMX node (shelf) is being discontinued.

4 Verify that the optical loss budget will not be exceeded by removing this node.

5 For external timed rings, if necessary, reconfigure the timing of the network. From the **System View** menu select **Configuration > Timing/Sync**.

CAUTION

Service affecting

Discontinuing a node with active add/drop traffic will result in a service interruption. Ensure that all service is removed from the node before continuing.

6 At the shelf being discontinued and all associated terminating shelves and extensions, ensure service (signals) had been removed from the Function Units groups being discontinued. From the System View menu, use **View>Cross-connects** to verify that there are no add/drop connections on the node.

Reference:
"Task 307: Discontinue End-to-End DS1 Service" (10-87)

"Task 311: Discontinue End-to-End DS3 or EC-1 Service" (10-107)

7 If a shelf being discontinued is a AGNE, establish the AGNE on another shelf, if required. Disable the AGNE at the shelf being discontinued. From the System View menu select **Administration > Data Communications > TCP/IP Gateway > TCP/IP Gateway Control > Disabled**.

Important! The Remote NE Status must be enabled prior to designating the AGNE(s). From the System View menu select **Administration > Set NE > Remote NE Status > Enabled**.

8 Refer to one of the following procedures to discontinue a Metropolis® DMX shelf.

- "SE 303-1: Discontinue Metropolis® DMX Node (Shelf) from OC-48/OC-192 UPSR" (10-65)
- "SE 303-2: Discontinue Metropolis® DMX Node (Shelf) from OC-48/OC-192 BLSR" (10-69)

END OF STEPS

SE 303-1: Discontinue Metropolis® DMX Node (Shelf) from OC-48/OC-192 UPSR

Procedure Complete the following steps to discontinue a Metropolis® DMX node from an OC-48/OC-192 unidirectional path switched ring (UPSR).

1 At each node in the ring, have the Network Operations Center (NOC) determine which path is active for add/drop traffic. (Refer to Figure 10-2 for an example showing the removal of NE5 from the ring). If the active path is flowing clockwise (Figure A in Figure 10-2: NE1 M1 transmit to NE5 M2 receive and NE5 M1 transmit to NE2 M1 receive), have the NOC perform a path ring switch using **Fault > Protection > Path Protection > Switch Type Manual** to switch the active path to the counter-clockwise direction.

Verify that all traffic is counter-clockwise between the two adjacent NEs by having the NOC perform **View > Protection > Path Protection** again.

Figure 10-2 Example of Deleting a Node

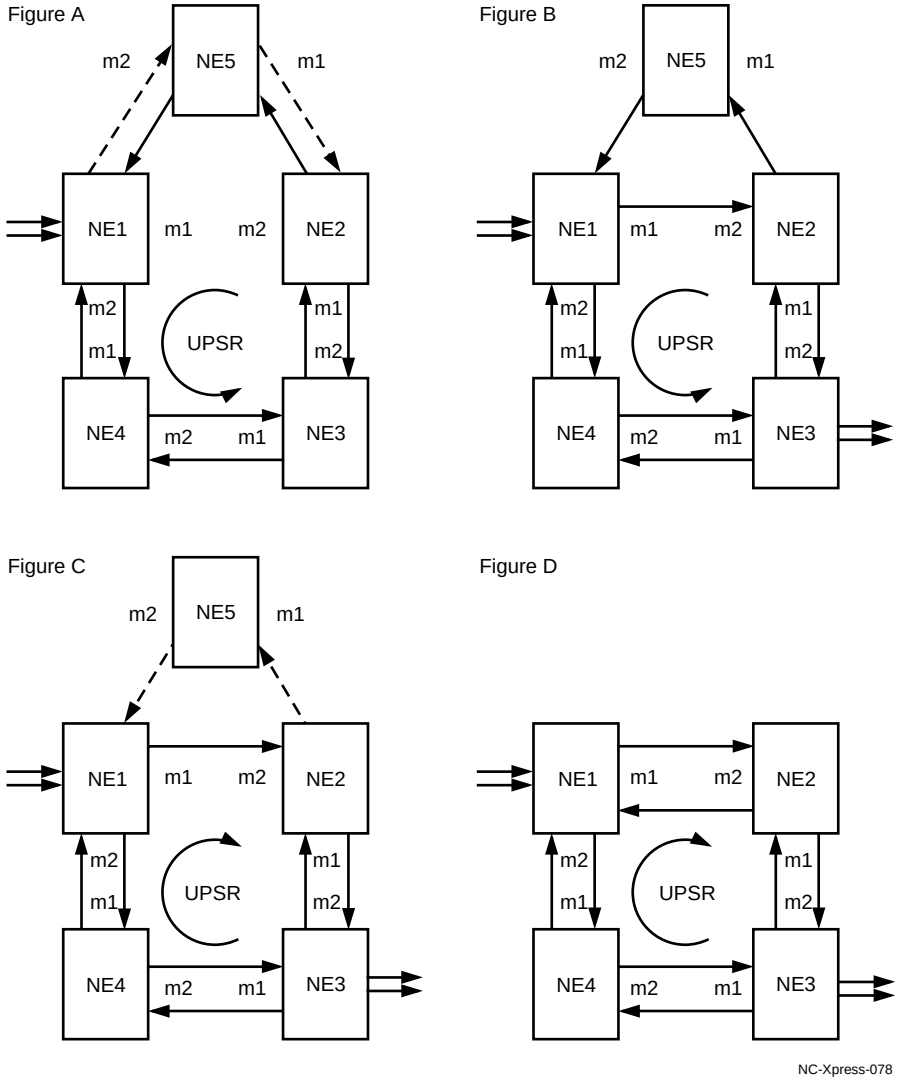


Figure A shows where NE5 is going to be deleted from the ring. The direction of traffic flow is counter clockwise from NE2 to NE1, passing through NE5. Figure B shows the removal of the optical fibers in the clockwise direction and the reconnection of that fiber from NE1 to NE2. Figure C shows traffic flowing in the clockwise direction after a path ring switch. Figure D now shows traffic flowing through the ring without NE5 and all fibers connected.

CAUTION

Service affecting

Removal of wrong fiber connections will result in a service interruption. Ensure that you remove only the fiber connections for the optical span being discontinued.

2 Refer to Figure 10-2 for this entire step.
Remove the optical fiber from NE1 M1 transmit to NE5 M2 receive and the optical fiber from NE5 M1 transmit to NE2 M2 receive (only). (The fibers removed represented the clockwise transmission path on the ring.) Connect these fibers from NE1 M1 transmit to NE2 M2 receive (Figure B in Figure 10-2). Measure the optical power level in the receive direction and pad if necessary. Refer to "Task 403: Perform Connection and Verification of Optical Facility" (11-25).

3 Refer to Figure 10-2 for this entire step.

To remove the other direction of transmission, (NE2 M2 transmit to NE5 M1 receive and NE5 M2 transmit to NE1 M1 receive), have the NOC perform a path ring switch using **Fault>Protection>Path Protection>Switch Type Manual** on all tributaries passing through the NE to be removed in the counter-clockwise direction (Figure C in Figure 10-2).

Verify that all traffic is now flowing clockwise between the two adjacent NEs by having the NOC perform **View>Protection>Path Protection** again. Verify that there are no alarms present in the clockwise direction before proceeding.

4 Refer to Figure 10-2 for this entire step.

Remove the optical fiber from NE2 M2 transmit to NE5 M1 receive and the optical fiber from NE5 M2 transmit to NE1 M1 receive. Connect these fibers from NE2 M2 transmit to NE1 M1 receive (Figure D in Figure 10-2). Measure the optical power level in the receive direction and pad if necessary. Refer to "Task 403: Perform Connection and Verification of Optical Facility" (11-25).

5 Is the removed shelf to be powered down?

If...	Then...
Yes	Power down the shelf per local procedures and remove circuit packs (if required), then proceed to Step 9.
No	Continue with Step 6.

6 Connect optical loops to any OLIU circuit packs.

Reference: "Task 400: Connect OLIU Optical Loopbacks" (11-3)

7 If any circuit packs were removed, update the internal equipment list. Either depress the UPD/INIT pushbutton on the SYSCTL circuit pack or From the System View menu select **Configuration > Update System**

8 Verify that all alarms clear.

9 The Metropolis® DMX node is now removed from the OC-48/OC-192 unidirectional path switched ring (UPSR).

END OF STEPS

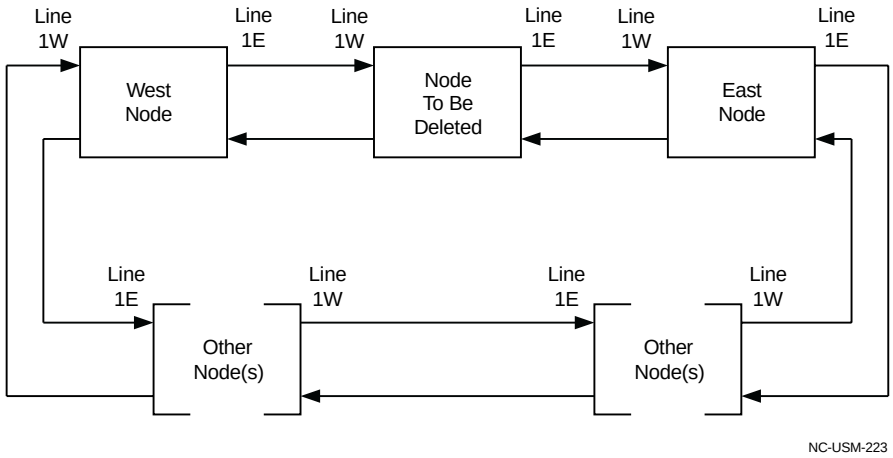
SE 303-2: Discontinue Metropolis® DMX Node (Shelf) from OC-48/OC-192 BLSR

Procedure

Important! Verify that the work instructions specify whether automatic ring discovery is enabled or disabled on the existing ring.

Complete the following steps to discontinue a Metropolis® DMX node (shelf) from an OC-48/OC-192 2-fiber bidirectional line switched ring (BLSR).

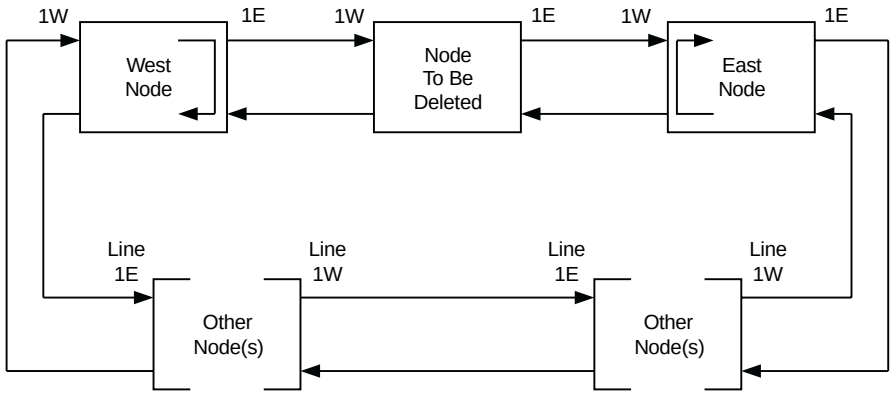
1 Identify the node to be discontinued, the adjacent West node, and the adjacent East node. (Refer to the following figure.)



Important! The Force to Protection, Ring switch may cause transmission hits.

2 Have the NOC perform the following:

- At the West Node (refer to the following figure), from the System View menu select **Fault > Protection Switch...**. Select the *2F BLSR main-1* protection group and perform a protection switch in the **East** direction with switch type **Force to Protection, Ring**. Click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. After the protection switch completes, click on **Close**.
- At the East Node (refer to the following figure), from the System View menu select **Fault > Protection Switch...**. Select the *2F BLSR main-1* protection group and perform a protection switch in the **West** direction with switch type **Force to Protection, Ring**. Click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. After the protection switch completes, click on **Close**.

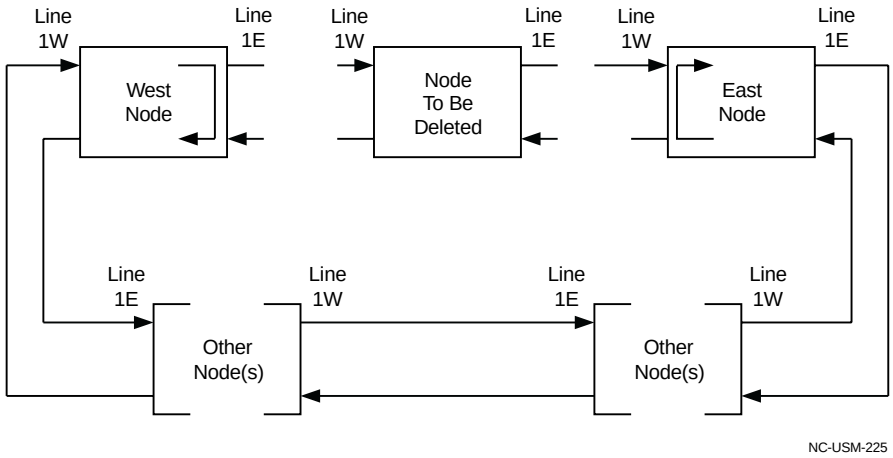


CAUTION

Service affecting

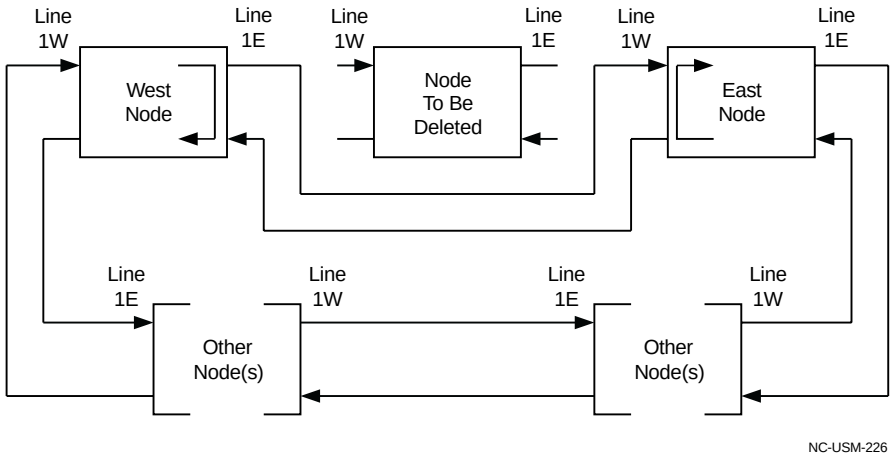
Removal of wrong fiber connections will result in a service interruption. Ensure that you remove only the fiber connections for the optical span being discontinued.

3 At the node to be deleted, disconnect the optical fibers connected to the adjacent East Node and West Node. (Refer to the following figure.)



4 Perform the following:

- At the West and East nodes, connect the transmit fiber. (Refer to the following figure.)
- At the West and East nodes, measure the optical power level in the receive direction and pad if necessary. Refer to "Task 403: Perform Connection and Verification of Optical Facility" (11-25).
- At the West and East nodes, connect the receive fiber. (Refer to the following figure.)



5

If...	Then...
automatic ring discovery (Release 3.0 and later releases),	after the automatic ring discovery is complete, continue with Step 6.
manual ring discovery (Release 2.1)	**Important!** The manual ring map must be updated manually at each node in the ring. at each node in the ring, remove the node to be deleted from the manual ring map. **Reference:** "Task 305: Provision Manual Ring Map" (10-79)

Important! The Clear switch may cause transmission hits.

6 Have the NOC perform the following:

- At the West Node, from the System View menu select **Fault>Protection Switch...**. Select the *2F BLSR main-1* protection group and clear the protection switch in the **East** direction with switch type **Clear**. Click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. After the protection switch completes, click on **Close**.
- At the East Node, from the System View menu select **Fault>Protection Switch...**. Select the *2F BLSR main-1* protection group and clear the protection switch in the **West** direction with switch type **Clear**. Click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. After the protection switch completes, click on **Close**.

Result: The node to be deleted is now removed from the ring.

7 Is the node to be removed to be powered down?

If...	Then...
Yes	Power down the shelf per local procedures then proceed to Step 10.
No	Continue with Step 8.

8 If OLIU circuit packs are not removed, connect optical loops to OLIUs.

Reference: "Task 400: Connect OLIU Optical Loopbacks" (11-3)

9 If any circuit packs were removed, update the internal equipment list. Either depress the UPD/INIT pushbutton on the SYSCTL circuit pack or From the System View menu select **Configuration > Update System**.

10 Verify that there are no alarms or conditions at each node in the ring.

END OF STEPS

Task 304: Establish DS1 Service

Purpose

Use this task to establish DS1 service.

Important! This task assumes that the system and network have been properly equipped and tested.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, verify that you have the work instructions for this task stating the circuit pack and port options to be set, the pass-through and terminating end nodes, and cross-connections being made.

Task Complete the following steps to establish end-to-end DS1 service.

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Verify that no alarms are present by clicking on the **Alarm List** button. If any alarms are present they must be cleared prior to beginning this task.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

3 From the System View menu at each Metropolis® DMX terminating end, select **View > View Equipment Details** to verify that the proper service and protection DS1 circuit packs have been installed in the Function Unit group(s) (A, B, C, or D) used for this service.

4 If circuit packs have not been installed, install circuit packs as required.

Reference: "Task 314: Install 28DS1/28DS1PM (LNW6/LNW7) Circuit Pack" (10-127)

5 At the DS1 terminating node(s) of the circuit being established, determine which DS1 port(s) is to be put into service and what port options are to be selected.

6 From the System View menu at each Metropolis® DMX terminating end, select **Configuration > Provision**. Expand the details for the circuit pack, then select the DS1 port to provision for the circuit being established. Provision parameters as required.

When BPV=N (default), then incoming BPVs at the DS1 port are corrected by the port unit circuitry before the DS1 is mapped into the VT1.5 payload. Some digital loop carrier (DLC) equipment (for example, SLC-96) requires either a DS1 LOS or a DS1 LOF in order to effect a protection switch. Therefore, the DS1 port units in Metropolis® DMX need to be provisioned accordingly for that application.

For the Metropolis® DMX DS1 port unit connected to the DLC remote terminal, set BPV=Y. For the DMX port unit connected to the DLC central office terminal (COT). Set LINECDE=AMI for DS1 LOS, or to B8ZS for DS1 LOF.

Reference: "Task 315: Provision 28DS1/28DS1PM Ports for New DS1 Service" (10-131)

7 Verify that the DS1 cable connections have been made from each DS1 terminating node to the DS1 cross-connect or equivalent connection points.

8 Determine the necessary pass through and add/drop cross-connections for each node from your work instructions.

9 From the System View menu at each Metropolis® DMX node in the network select **Configuration** > **Cross-Connection**. Use the Cross-Connection Wizard to make the necessary VT1.5/STS-1 cross-connections. Use the following references as examples.

Reference:

"Task 317: Make VT1.5 or STS-n Cross-Connections, Single OC-48/OC-192 UPSR Ring Configuration" (10-137)

"Task 326: Make Dual-Homed Cross-Connections to a Metropolis® DMX Access Multiplexer Backbone Ring" (10-213)

"Task 327: Make Single-Homed Cross-Connections to a Metropolis® DMX Access Multiplexer Backbone Ring" (10-221)

"Task 328: Make 1+1 (Linear Extension) Cross-Connections" (10-229)

"Task 329: Make Function Unit UPSR, Hairpin, and Main to Function Unit UPSR Cross-Connections" (10-237)

10 Perform DS1 end-to-end transmission test for each circuit being put into service, as required.

Reference: "Task 401: Perform DS1 Transmission Test" (11-9)

11 Set/verify the port state of the DS1 ports of the circuit being established. From the System View menu at each terminating node, select **Configuration** > **Provision**, then select the port. Under DS1 Primary State, set/verify the Port Mode to *Not Monitored* or *Automatic*.

Important! If the Port Mode is *Not Monitored*, the signal is not monitored or alarmed and the port will not automatically go to the *in service* state when a signal is detected. If the Port Mode is set to *Automatic*, the port will automatically go to the *in service* state when a signal is detected. The Port Mode must be set to *Automatic* to turn on monitoring of signal failures.

END OF STEPS

Task 305: Provision Manual Ring Map

Purpose

Use this procedure to perform the following at a node in a 2-fiber bidirectional line switched ring (BLSR):

- Establish a new manual ring map
- Add a node(s) to an existing manual ring map
- Delete a node(s) from an existing manual ring map.

Required equipment

A personal Computer (PC) with WaveStar® CIT software installed is required to perform this task.

Related information

For related information, see the following:

- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions specify the Ring ID and node ID(s).
- Verify that the WaveStar® CIT is available.

Task

Complete the following steps to provision the manual ring map at a node(s) in a 2-fiber bidirectional line switched ring (BLSR).

1 Select **Configuration > Configure Manual Ring Map...**

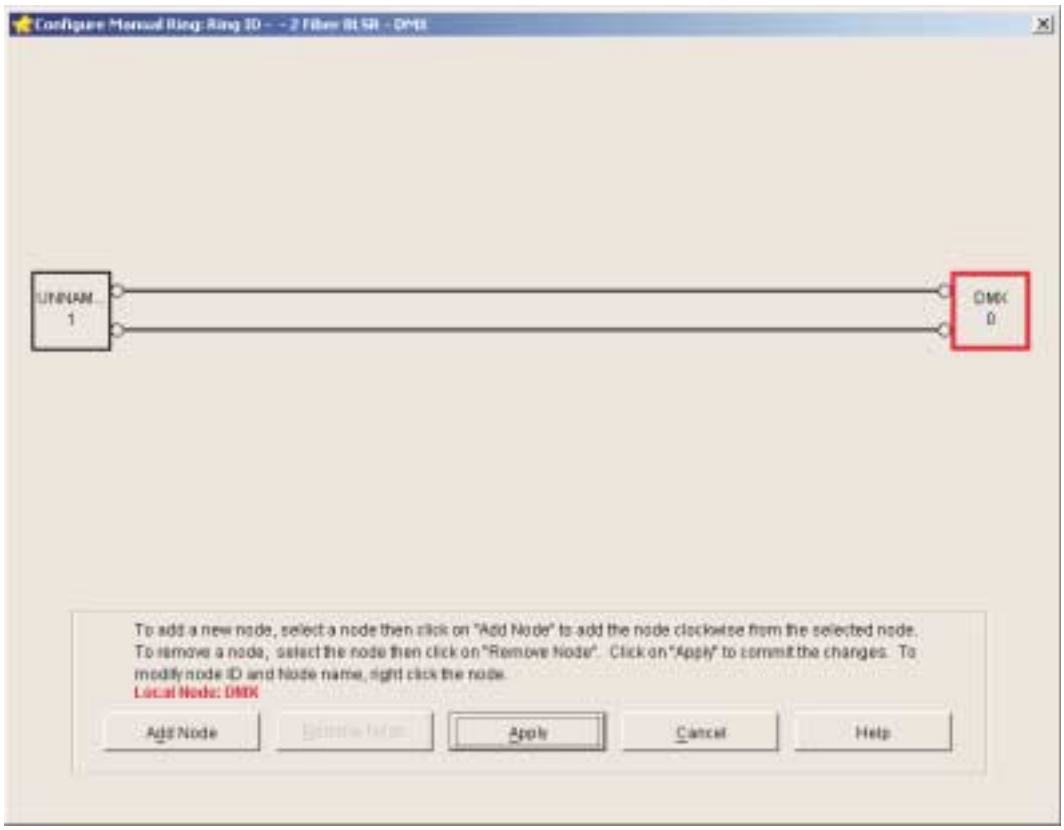
Result: The *Configure Manual Ring Map* screen appears.

2

If...	Then go to...
Establishing a new manual ring map,	Step 3.
Adding a node(s) to an existing manual ring map,	Step 8.
Deleting a node(s) from an existing manual ring map,	Step 11.

3 Click on the required Ring ID and **Select**.

Result: A dialog box appears stating that there is no existing manual ring map, you will be configuring a new manual ring map. Click on **OK.** The *Configure Manual Ring* screen appears showing the local node and an unnamed node. (Refer to following figure.)



Important! The local node appears on the right side of the *Configure Manual Ring* screen. This shows the NE Name (DMX) and Node ID (0). The Node ID of the local node may need to be changed to comply with the work instructions.

4 If required, right click on the local node and change the *Node ID* according to the work instructions. Click on **OK**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**, and the modified node information appears on the *Configure Manual Ring* screen.

Important! The *NE Name* and *Node ID* of the unnamed node must be modified to the NE Name and node ID of the node that is connected to the East port (Main-2) of the Local node per the work instructions.

5 Right click on the unnamed node (*UNNAMED 1*) and change the *NE Name* and *Node ID* according to the work instructions. Click on **OK**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**, and the modified node information appears on the *Configure Manual Ring* screen.

Important! In the manual ring map, nodes are added in the clockwise (East) direction only from the node that is selected.

6 Click on the node modified in Step 5 and click on **Add Node**. Enter the *NE Name* and *Node ID* of the next node in the East direction (clockwise) according to the work instructions. Click on **OK**.

Result: A dialog box appears asking you to confirm adding a new node to the manual ring map. Click on **Yes**, and the new node appears on the *Configure Manual Ring* screen.

Important! A maximum of 16 nodes can be added to the manual ring map.

7 As required per the work instructions, continue adding nodes in the East direction (clockwise) around the ring until complete. Then proceed to Step 14.

8 Click on the required Ring ID and **Select**.

Result: The *Configure Manual Ring* screen appears.

Important! The local node appears at the top of the *Configure Manual Ring* screen. In the manual ring map, nodes are added in the clockwise (East) direction only from the node that is selected.

9 Select the required node and then click on **Add Node**. Enter the *NE Name* and *Node ID* of the new node according to the work instructions. Click on **OK**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**, and the new node appears on the *Configure Manual Ring* screen.

Important! A maximum of 16 nodes can be added to the manual ring map.

10 If required, repeat Step 9 to add additional nodes to the manual ring map; otherwise, proceed to Step 14.

11 Click on the required Ring ID and **Select**.

Result: The *Configure Manual Ring* screen appears.

Important! The local node appears at the top of the *Configure Manual Ring* screen.

12 Click on the node to be deleted and then click on **Remove Node**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes** and the node is removed from the *Configure Manual Ring* screen.

13 If required, repeat Step 12 to delete additional nodes from the manual ring map; otherwise, proceed to Step 14.

14 Click on **Apply**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes** and the changes now reside in the inactive manual ring map.

15 Select **View > Ring Map > Ring Map...**. Select the required Ring ID and click on **Select**. Verify that the inactive manual ring map was provisioned correctly and click on **Close**.

16 Select **Configuration > Activate Manual Ring Map...**

Result: The *Apply Manual Ring Map* screen appears.

17 Select the required Ring ID and click on **Select**.

Result: A dialog box appears asking you to confirm activating the manual ring map. Click on **OK**. The inactive manual ring map is now activated.

END OF STEPS

Task 306: Reserved for Future Use

Task 307: Discontinue End-to-End DS1 Service

Purpose

Use this task to discontinue end-to-end DS1 service.

Important! This task assumes that the Metropolis® DMX is in service and that DS1 port(s) are being discontinued.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, verify that the WaveStar® CIT is available.

Task Complete the following steps to discontinue DS1 service.

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Determine which DS1 ports are to be discontinued. Click on the **Alarm List** button. If any LEDs or alarms are activated, they must be cleared prior to beginning this task.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

3 At the DSX-1 at the DS1 terminating nodes, remove the DS1 signals associated with the port(s) being discontinued.

Important! This step may activate the office major, minor, or no alarm. The audible alarm may be suppressed by depressing the ACO pushbutton.

Result: FAULT LEDs begin flashing on 28DS1/DS1PM circuit pack with signals removed.

4 Clear the DS1 LOS alarm. Momentarily depress the UPD/INIT pushbutton on the SYSCTL circuit pack or From the **System View** menu select **Configuration > Update System**.

Select **Yes**.

Result: Flashing FAULT LEDs go off.

5 Verify that the port has been changed correctly.

From the **System View** menu select **View > View Equipment Details**, then navigate down the tree to the port:

1. Expand **CP fn-#-# (ds1)**
2. Expand **VT Group #**
3. Select the **Port #-# (ds1)**

Under **Port Data/Fault**, the **Port Mode** should be **Automatic**.

Close view.

6 Determine the cross-connections for the circuit being discontinued.

Use the work order, or From the **System View** menu select **View > Cross Connections**, then navigate down the tree to the port.
Select **CP fn-#-# (ds1)**.

Take note of the **SRC** addresses to be deleted.

Close view.

7 Delete the terminating (drop) node cross-connections for all DS1 service being removed.

From the **System View** menu select **Configuration > Cross Connection**, then use the Cross Connection Wizard to remove the cross connections.

When deletions are complete, close the Cross-Connection Wizard and click **Yes** to confirm.

> **Important!** DS1 slots cannot be unequipped without an alarm until all port cross-connections are removed.

8 Delete the pass-through cross-connections at each nonterminating node for all DS1 service being removed.

From the **System View** menu select **Configuration > Cross Connection**, then use the Cross Connection Wizard to remove the cross connections.

When deletions are complete, close the Cross-Connection Wizard and click **Yes** to confirm.

9 If all twenty-eight (28) ports on the 28DS1/DS1PM circuit pack are being discontinued, you may remove the 28DS1/DS1PM circuit pack, if required.

10 Have circuit packs been removed?

If...	Then...
Yes	Continue with Step 11.
No	Continue with Step 13.

11 If circuit packs have been removed, update the internal equipment list. Momentarily depress the UPD/INIT pushbutton on the SYSCTL circuit pack, or From the **System View** menu select **Configuration > Update System**.

Select **Yes**.

12 Insert 177D application blank(s) into the empty slots, then go to Step 14.

13 If circuit packs have not been removed, set the port mode of the DS1 port(s) to **Automatic** or **Not Monitored**, as required.

From the **System View** menu select **Configuration > Provision**, then navigate down the tree to the port.

- Expand **CP fn-#-# (ds1)**
- Select **VT Group #**
- Select **Port #-# (ds1)**
- Click **Provision.**

Under **DS1 Primary State**, you can set the **Port Mode** to **Automatic** or **Not Monitored**,

> **Important!** If the Port Mode is *Not Monitored*, the signal is not monitored or alarmed. The port will not automatically go to the *in service* state when a signal is detected as it will if the Port Mode is set to *Automatic*. The Port Mode must be set to *Automatic* to turn on monitoring of signal failures.

14 Verify that no alarms are present. Click on the **Alarm List** button.

END OF STEPS

Task 308: Establish End-to-End DS3 or EC-1 Service

Purpose

Use this task to establish end-to-end DS3 or EC-1 service.

Important! This task assumes that the system and network have been properly equipped and tested.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, verify that you have the work instructions for this task stating the circuit pack and port options to be set, the pass-through and terminating end nodes, and cross-connections being made.

Task Complete the following steps to establish end-to-end DS3 service.

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Verify that no alarms are present by clicking on the **Alarm List** button. If any alarms are present they must be cleared prior to beginning this task.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

3 From the System View menu at each Metropolis® DMX terminating end, select **View > View Equipment Details** to verify that the proper service and protection DS3/EC-1 circuit packs have been installed in the Function Unit group (A, B, C, or D) used for this service.

4 If circuit packs have not been installed, install circuit packs as required.

Reference: "Task 313: Install 12DS3/EC1 (LNW16) Circuit Pack" (10-123)

5 At the DS3/EC-1 terminating node(s) of the circuit being established, determine which DS3/EC-1 port(s) is to be put into service and what options are to be selected.

6 From the System View menu at each Metropolis® DMX terminating end, select **Configuration > Provision**, then select the DS3/EC-1 port to provision for the circuit being established.

Reference: "Task 316: Provision 12DS3/EC1 Ports for New DS3 or EC-1 Service" (10-135)

7 Verify that the DS3/EC-1 cable connections have been made from each DS3/EC-1 terminating node to the DS3/EC-1 cross-connect or equivalent connection points.

8 Determine the necessary pass through and add/drop cross-connections for each node from your work instructions.

9 From the System View menu at each Metropolis® DMX node in the network select **Configuration > Cross-Connection**. Use the Cross-Connection Wizard to make the necessary cross-connections. Use the following references as examples.

Reference:

"Task 317: Make VT1.5 or STS-n Cross-Connections, Single OC-48/OC-192 UPSR Ring Configuration" (10-137)

"Task 326: Make Dual-Homed Cross-Connections to a Metropolis® DMX Access Multiplexer Backbone Ring" (10-213)

"Task 327: Make Single-Homed Cross-Connections to a Metropolis® DMX Access Multiplexer Backbone Ring" (10-221)

"Task 328: Make 1+1 (Linear Extension) Cross-Connections" (10-229)

"Task 329: Make Function Unit UPSR, Hairpin, and Main to Function Unit UPSR Cross-Connections" (10-237)

10 Perform DS3 or EC-1 end-to-end transmission test for each circuit being put into service, as required.

Reference:

"Task 402: Perform DS3 Transmission Test" (11-17)

"Task 415: Perform EC-1 Transmission Test" (11-77)

11 Set/verify the port state of the DS3/EC-1 ports of the circuit being established. From the System View menu at each terminating node, select **Configuration > Provision**, then select the port. Under T3 Primary State, set/verify the Port Mode to *Not Monitored* or *Automatic*.

> **Important!** If the Port Mode is *Not Monitored*, the signal is not monitored or alarmed and the port will not automatically go to the *in service* state when a signal is detected. If the Port Mode is set to *Automatic*, the port will automatically go to the *in service* state when a signal is detected. The Port Mode must be set to *Automatic* to turn on monitoring of signal failures.

END OF STEPS

Task 309: Establish OC-48 0x1 Unprotected Extensions to a Metropolis® DMX NE from Metropolis® DMX*press* Shelf

Purpose

Use this task to establish OC-48 0x1 unprotected extensions where the Metropolis® DMX shelf is the host and the Metropolis® DMX*press* shelf is the non-switching extension.

Required equipment

The following equipment is required at both sites:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- Optic Power Meter

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*
- *Metropolis® DMXpress Access Multiplexer User Operations Guide, 365-372-314*

Before you begin

Before you begin this task:

- Verify that you have the necessary work instructions detailing the slots, circuit packs, ports, and network element parameters to be used for this task.
- Verify that the network ring containing the host Metropolis® DMX shelf is established and operating properly using the procedures in this manual.
- Verify that the application option plug (p5) on the OC48/1.3I2 Main pack was set to 0x1 in the unswitched extension.

  Refer to the *Metropolis® DMXpress Access Multiplexer User Operations Guide, 365-372-314*

Task Complete the following steps to establish the configuration.

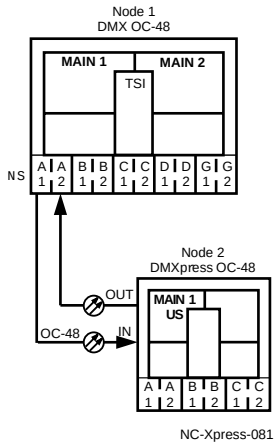
1 Connect a PC to the host Metropolis® DMX Metropolis® DMX*press* and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Determine the network configuration.

Figure 10-3 shows an example where Node 1 is the host Metropolis® DMX and Node 2 is the unprotected extension.

Figure 10-3 OC-48 0x1 Unprotected Extension



3 Determine the optical loss of each optical span from office records or by making the required measurements.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

4 At the host Metropolis® DMX node, verify/install OC-48 LS OLIU (LNW31) circuit packs in Function Group or Growth slots (A1, B1, C1, D1, or G1) being used for access.

At the extension, verify Main 1 is being used for access (Main 2 is unavailable in this application).

Important! If you plan to use STS-1 tribs 25-48 on slots A1, B1, or C1 of the Metropolis® DMX host node, then the OC-48 LNW27 OLIU must be used in the MAIN slots.

Important! If the work order or office records do not specify OLIU types, refer to Chapter 2, "Platform Description", 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.

Reference: "Task 321: Install OLIU Circuit Packs in Function/Growth Slots" (10-169)

5 At the host Metropolis® DMX node, an *inconsistent DCC switches* alarm may occur when the OLIUs are looped back and DCC is enabled. Ignore the alarm, for now.

6 From the **System View** menu at the Metropolis® DMX host node, select **Configuration > Provision**, select the required port, and provision port parameters as required from your work instruction.

Important! For this application, ensure the Application port parameter is set to UPSR at the host nodes.

Reference: "Task 322: Provision Function/Growth OLIU Circuit Packs/Ports for New Service" (10-175)

7 Verify/set Network Side/User Side parameters at each end of the optical spans being established.
From the **System View** menu select **Configuration > DCC Terminations**, under **LAPD Parameter**, select the appropriate parameter.

> **Important!** The Network Side (NS)/User Side (US) parameters must be set opposite at each end of an optical span. The default for Main 1 of the extension is "User Side" and the default for the Metropolis® DMX Function/Growth slot is "Network Side".

8 Set the timing at the DMXpress NE.
From the **System View** menu select **Configuration > Timing/Sync**.
In the **Provision Timing/Sync** window set the following:

- **Timing Source:** to Line
- **Mode Switching** to Revertive
- **Synchronization Source** to main-1-1
- **Synchronization Autoreconfiguration** to Enabled

9 Determine from either the Network Operations Center (NOC) or a work order, all the nodes in the existing network. At the DMX NE verify the NEs in the ring or network by selecting **Administration > OSI Routing Map**.

> **Important!** Note the NEs. Verify that no NE on the ring or network has the same TID name as the NE being added. If a duplicate TID exists request a new TID name from the NOC. At the DMXpress NE being added, select **Administration > Set TID** and enter the new TID Name.

10 Ensure far-end communication is enabled.
From the **System View** menu select **Configuration > DCC Terminations**, set **DCC Channel Parameter: Termination State** to Enabled.

11 At the Metropolis® DMX NE, remove the optical loop from the OLIU in the function or growth port in position 1. At the Metropolis® DMX*press* NE, remove the optical loop from Main-1.

Result: A loss of signal (LOS) alarm will occur if the port is being monitored.

12 At the Metropolis® DMX NE, connect the fiber drop to function 1 or growth 1 OLIU OUT.

13 At the Metropolis® DMX*press* NE, measure the power on the fiber drop to Main-1 IN. If required insert an LBO in Main-1 IN and connect the Fiber drop to the LBO. Verify that the flashing red LED on the main circuit pack stops flashing. Connect the fiber drop to Main-1 OUT.

14 At the Metropolis® DMX NE, measure the power on the fiber drop to function 1 or growth 1 OLIU IN. If required insert an LBO in function 1 or growth 1 IN and connect the Fiber drop to the LBO. Verify that the flashing red LED on the circuit pack stops flashing.

END OF STEPS

Task 310: Configure Miscellaneous Discrete Inputs and Outputs

Purpose

Use this procedure to configure the miscellaneous discrete inputs (MDI), miscellaneous discrete outputs (MDO), or operate an MDO.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Related information

For related information, see the following sections in this document:

- Chapter 3, "Operations Interfaces"
- Appendix A, WaveStar® CIT Tutorial

Before you begin

Before you begin this task, you must:

- Obtain the work instructions for this task.
- Identify the inputs or outputs you want to configure.
- Determine the names for the various inputs and outputs.
- Log in to the NE with the WaveStar® CIT and be familiar with the operation of the WaveStar® CIT.

Task

Complete the following steps to configure miscellaneous discrete inputs (MDI), outputs (MDO), or operate an MDO.

1

If you...	Then...
are configuring miscellaneous discretes INPUTs (MDI) or OUTPUTS (MDO),	Continue with Step 2.
want to operate a miscellaneous discrete OUTPUT (MDO),	Proceed with Step 13.

2 From the System View toolbar, select **Configuration > Misc Discretes**.

Result: The Configure Miscellaneous Discretes window opens.

3

If you...	Then...
are configuring miscellaneous discretes INPUTs (MDI),	Continue with Step 4.
are configuring miscellaneous discretes OUTPUTs (MDO),	Continue with Step 9.

4 Click on the **Input**, then select an available MDI Input you want to provision or an existing MDI you want to edit, then click **Select**.

The provisionable parameters display for the selected input.

5 Enter or edit the name for the MDI input in the **Name** box.

6 Enter, edit, or verify the **Alarm Type** and **Alarm Level**.

7 Click **Apply** to activate your changes.

Result: A warning appears which indicates that the NE service may be affected by the changes.

8 Click on **Yes** to execute the command.

If you want to provision MDO Outputs, continue with the Step 9, otherwise, Stop.

END OF STEPS TO CONFIGURE MDIs.

9 Click on the **Output**, then select an available MDO Output you want to provision or an existing MDO you want to edit, then click **Select**.

The provisionable parameters display for the selected output.

10 Enter or edit the name for the MDO output in the **Control Type** box.

11 Click **Apply** to activate your changes.

A warning appears which indicates that the NE service may be affected by the changes.

12 Click on **Yes** to execute the command.

Repeat this procedure to provision any other inputs or outputs.

END OF STEPS TO CONFIGURE MDOs.

13 To operate an MDO output, select **Fault > Operate Miscellaneous Discrete Output** from the System View menu.

14 Expand the Output list, select an output, then click **Select**.

15 Under Control State, select **Operate Control Point** to operate the output, or select **Release Control Point** to turn off the output.

16 Click **Apply** to make your changes. Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

END OF STEPS

Task 311: Discontinue End-to-End DS3 or EC-1 Service

Purpose

Use this task to discontinue end-to-end DS3 or EC-1 service.

Important! This task assumes that the Metropolis® DMX is in service and that DS3 port(s) are being discontinued.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, verify that the WaveStar® CIT is available.

Task Complete the following steps to discontinue DS3/EC-1 service.

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Determine which DS3/EC-1 ports are to be discontinued.

3 Determine if any alarms are activated. Click on the List Alarms button. If any LEDs or alarms are activated they must be cleared prior to beginning this task.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

4 At the DSX-3 at the DS3/EC-1 terminating nodes, remove the DS3/EC-1 signals associated with the port(s) being discontinued.

Important! This step may activate the office major, minor, critical or no alarm. The audible alarm may be suppressed by depressing the ACO push-button.

Result: FAULT LEDs begin flashing on the 12DS3/EC1 or TMUX circuit pack with signals removed.

5 Clear the DS3/EC-1 LOS alarms. At the terminating (drop) nodes, momentarily depress the UPD/INIT push-button on the SYSCTL circuit pack or From the **System View** menu select **Configuration > Update System**.

Click **Yes**.

Result: Flashing FAULT LEDs go off.

6 Verify that the correct port mode has been changed from *Monitored* to *Automatic* mode.

Use the work order, or From the **System View** menu select **View > View Equipment Details**, then navigate down the tree to the port.

- Expand **CP fn-a-1 (12DS3EC1)**
- Select **Port # (DS3)** or **Port # (EC1)**.

Or in the graphical display, right-click on the port and select **View Port Details**. The **Port Mode** is shown under **Port Data/Fault**.

Close view.

7 Determine the cross-connections for the circuit being discontinued.

Use the work order, or from the **System View** menu select **View > Cross Connections**, then navigate down the tree to the port.

- Expand **CP fn-#-# (12DS3EC1)**
- Select **Port # (DS3)** or **Port # (EC1)**.

Take note of the **SRC** addresses to be deleted.

Close view.

8 Delete the terminating (drop) node cross-connections for all DS3/EC-1 service being removed.

From the **System View** menu select **Configuration > Cross Connection**, then use the Cross Connection Wizard to remove the cross connections.

When deletions are complete, close the cross-connection wizard and click **Yes** to confirm.

> **Important!** DS3/EC-1 slots cannot be unequipped without an alarm until all port cross-connections are removed.

9 Delete the pass-through cross-connections at each nonterminating node for all DS3/EC-1 service being removed.

From the **System View** menu select **Configuration > Cross Connection**, then use the Cross Connection Wizard to remove the cross connections.

When deletions are complete, close the cross-connection wizard and click **Yes** to confirm.

10 If all twelve (12) ports on the 12DS3/EC1 circuit pack are being discontinued, you may remove the 12DS3/EC1 circuit pack, if required.

11 If circuit packs have been removed continue with Step 12, otherwise proceed to Step 13.

12 If circuit packs have been removed, update the Metropolis® DMX internal equipment list.

From the **System View** menu select **Configuration > Update System**.

Click **Yes**.

Insert 177D application blank(s) into empty slots, then proceed to Step 14.

13 If circuit packs have not been removed, set the port mode of the DS3/EC-1 port(s) to *Automatic* or *Not Monitored*, as required.

From the **System View** menu select **Configure > Provision**, then navigate down the tree to the port.

- Expand **CP fn-#-# (12DS3EC1)**
- Select **Port # (DS3)** or **Port # (EC1)**
- Click Provision in the **T3 Primary State,**
- Change the **Port Mode** to the desired setting.
- Click **Apply**
- Click **Yes** to confirm
- Close the window.

Or in the graphical display, right-click on the port and select **Provision Port**. Under **T3 Primary State**, you can set the **Port Mode**.

> **Important!** If the Port Mode is *Not Monitored*, the signal is not monitored or alarmed. The port will not automatically go to the *in service* state when a signal is detected as it will if the Port Mode is set to *Automatic*. The Port Mode must be set to *Automatic* to turn on monitoring of signal failures.

14 Verify all alarms are off. Click on the **Alarm List** button.

END OF STEPS

Task 312: Install Main OLIU Circuit Packs

Purpose

Use this task to install Main OC-48/OC-192 OLIU circuit packs. These packs are installed in M1 and M2.

Required equipment

The following equipment is required:

- Personal computer (PC) with WaveStar® CIT software installed
- Wrist strap
- Erasable marker or pencil
- Optical loopback cables, LBOs, and optical fiber cleaning tools (if loopbacks are performed)

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"

Before you begin

Prior to performing this task:

1. Ensure that correct OC-48/OC-192 OLIU circuit packs are available for installation.
2. If not previously completed, install generic and WaveStar® CIT software on the PC.

   Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

3. Connect PC and establish a WaveStar® CIT session.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

4. Obtain the work instructions for this task. It is especially important to know desired wavelengths and enhanced mode requirements when applicable.

   Important! If responses are not correct when installing OC-48/OC-192 OLIU circuit packs, check the connections. If the connections are correct, replace the circuit pack with the wrong response. (The red FAULT LED normally flashes when an OLIU circuit pack is monitored and there is no signal present.)

Task

Complete the following steps to install OC-48/OC-192 OLIU circuit packs in M1 and M2.

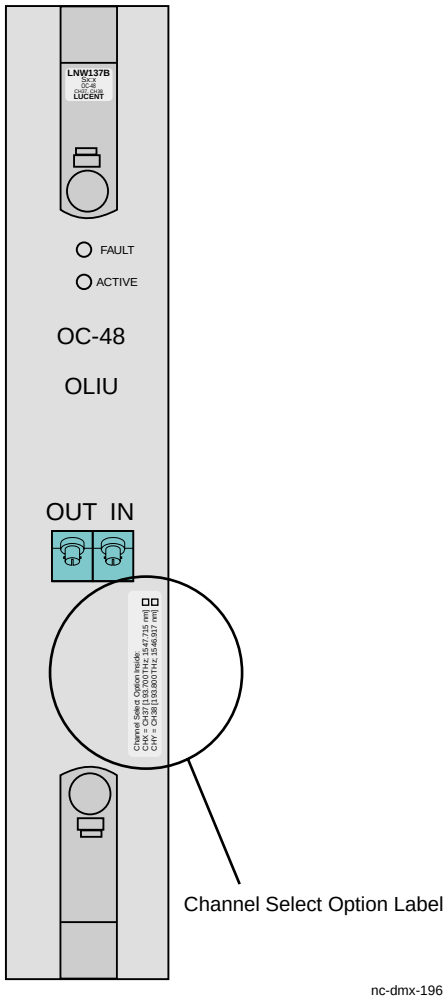
1 Are you installing an LNW121B-159B or LNW221-259 OLIU circuit pack?

If...	Then...
Yes	Continue with Step 2.
No	Proceed to Step 5.

2 From your work orders, determine the wavelength that you wish to set on the LNW121B-LNW159B or LNW221-LNW259 circuit pack. Use the Channel Select Option Label on the faceplate of the circuit pack to determine the correct channel.

Example: From the Channel Select Option Label on the faceplate of the LNW137B (Figure 10-4), we determine that for the desired CH37 wavelength (193.700 THz; 1547.715 nm), we must select CH X.

Figure 10-4 Channel Select Option Label on LNW137B



3 If you are installing an...

- LNW121B-159B (Figure 10-5)
  - Set the channel selection jumper on your circuit pack to either **CH X** or **CH Y** for your desired wavelength/channel.
  - Set the enhanced/normal jumper on your circuit pack to either **Enhanced** (switch fabric can cross-connect VT across any 12 STS-1s) or **Normal** (switch fabric can cross-connect VT across any 6 STS-1s).
- LNW221-259 (Figure 10-6)
  - Set the channel selection jumper on your circuit pack to either **CH X** or **CH Y** for your desired wavelength/channel.

Figure 10-5 Jumper Settings for LNW121B-159B

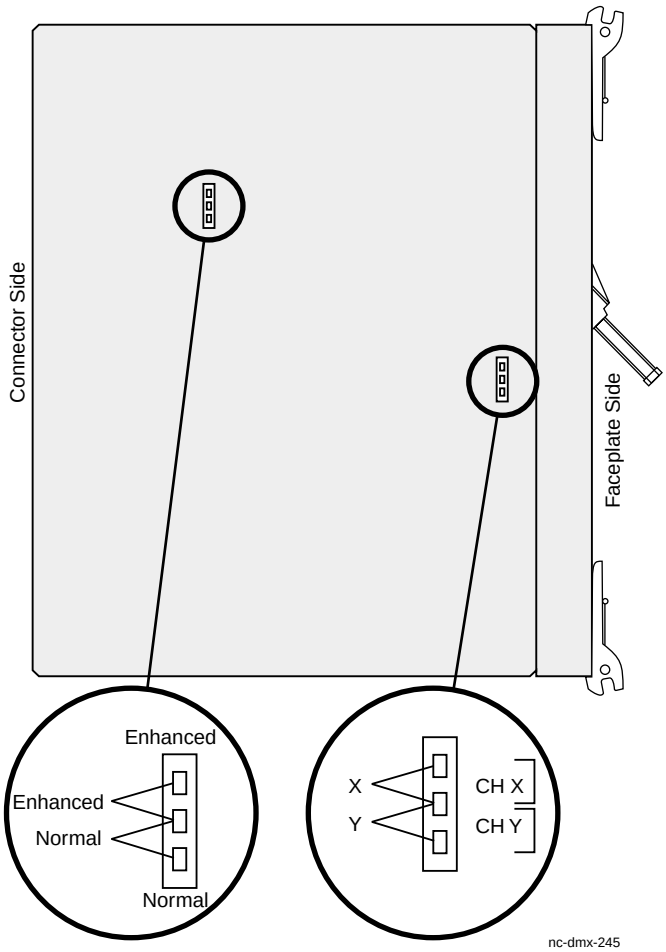
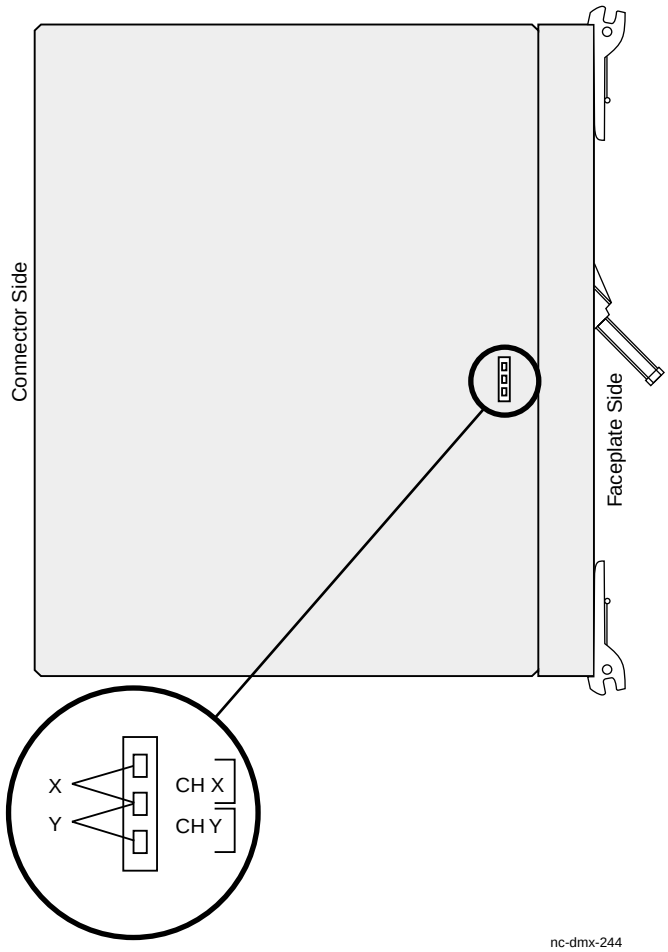


Figure 10-6 Jumper Settings for LNW221-259



4 Using an erasable marker or pencil, check the appropriate box on the Channel Select Option Label (Figure 10-4) that corresponds to your jumper setting.

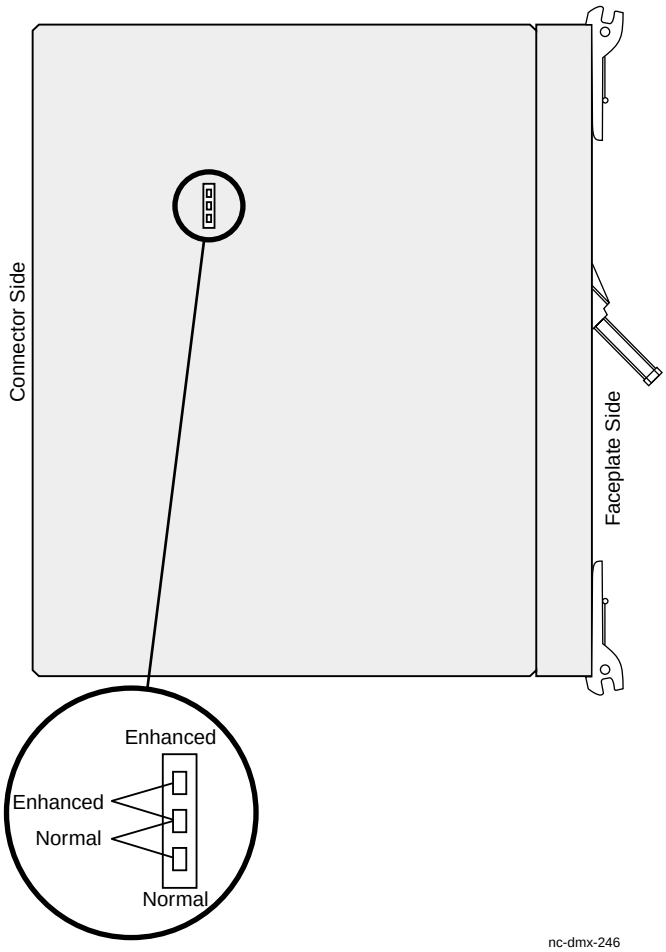
Important! This label is the only means available to identify the wavelength selected when the pack is fully-seated and/or in-service.

5 Are you installing an LNW26B OLIU circuit pack?

If...	Then...
Yes	Continue with Step 6.
No	Proceed to Step 7.

6 Set the enhanced/normal jumper on your circuit pack to either **Enhanced** (switch fabric can cross-connect VT across any 12 STS-1s) or **Normal** (switch fabric can cross-connect VT across any 6 STS-1s) (Figure 10-7).

Figure 10-7 Jumper Settings for LNW26B



7 Ensure all optical fiber connectors and couplings are properly cleaned.

Important! Signal performances may be degraded if the connections and couplings are not cleaned properly.

Reference: "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51)

8 Seat OC-48/OC-192 OLIU circuit pack in M1 slot by applying steady pressure to both faceplate latches.

Result: FAULT LED and ACTIVE LED lights. FAULT LED begins flashing after about 20 seconds. MJ or MN and NE alarm LEDs on the SYSCTL circuit pack light when an OC-48/OC-192 OLIU circuit pack is installed.

9 Seat second OC-48/OC-192 OLIU circuit pack in M2 slot by applying steady pressure to both faceplate latches.

Result: FAULT LED and ACTIVE LED lights. FAULT LED begins flashing after about 20 seconds. MJ or MN and NE alarm LEDs on the SYSCTL circuit pack light when an OC-48/OC-192 OLIU circuit pack is installed.

10 From the **System View** window, click on **Alarm List** button to view alarms, locks, loops, and switches for the ports on the circuit packs just installed, including OC-n LOS (loss of signal) and section-DCC channel failures.

Result: The **NE Alarm List** window opens.

11 Note the existing alarms associated with the OLIUs just installed, then click **Close** at the bottom of the **NE Alarm List** window.

12 Is there a signal present on the installed OC-48/OC-192 OLIU circuit pack?

If...	Then...
Yes	Proceed to Step 15.
No	Continue with Step 13.

13 Do you want to clear the alarms associated with the installed OC-48/OC-192 OLIU circuit packs?

If...	Then...
Yes	Continue with Step 14 to clear LOS alarms by looping the OLIU ports back on each other.
No	STOP! END OF TASK.

CAUTION

Possible equipment damage

Ensure that proper attenuation is used to prevent damage to the optical receiver.

14 Install optical loopbacks on the OC-48/OC-192 OLIU circuit packs just installed to clear LOS failures.

If you have...	Then...
packs installed in Main 1 and Main 2 (UPSR/BLSR)	install optical loopbacks from M1 out to M2 in and from M2 out to M1 in. DCC and LOS failures clear.
only one Main OLIU installed	install optical loopbacks from out to in on the Main OLIU. LOS failure clears.

Result: FAULT LED goes off after about 15 seconds.

Reference:

- "Task 400: Connect OLIU Optical Loopbacks" (11-3)
- "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

15 Are there alarms associated with the installed OC-48/OC-192 OLIU circuit packs?

If...	Then...
Yes	Refer to the appropriate task in the *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*.
No	STOP! END OF TASK.

END OF STEPS

Task 313: Install 12DS3/EC1 (LNW16) Circuit Pack

Purpose

Use this task to install 12DS3/EC1 (LNW16) circuit pack(s).

Required equipment

The following equipment is required:

- Personal computer (PC) with WaveStar® CIT software installed
- Wrist strap

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Prior to beginning this task:

1. Ensure that 12DS3/EC1 circuit pack(s) is available for installation.
2. If not previously completed, install generic and WaveStar® CIT software on the PC.

   Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

3. Connect PC and establish a WaveStar® CIT session.

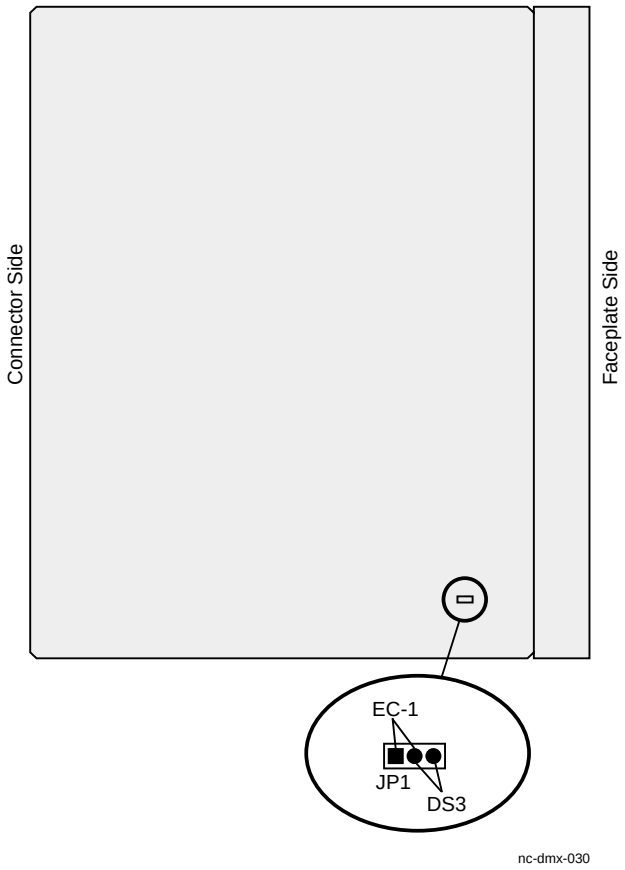
   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Task Complete the following steps to install 12DS3/EC1 circuit pack(s).

1 Determine the Function Unit slots (A, B, C, or D) being equipped with 12DS3/EC1 circuit packs.

2 Set the jumper on the 12DS3/EC1 circuit pack(s) for either DS3 or EC-1 service as illustrated in Figure 10-8.

Figure 10-8 Jumper Settings



Important! Metropolis® DMX, Release 3.0 supports port provisioning via the WaveStar® CIT. The new electrical interface (EIF) parameter has possible values of DS3 or EC-1. If you set the jumper and therefore the whole pack for DS3 or EC-1, you can still provision the ports individually for either DS3 or EC-1 service. The jumper setting only determines how the ports will come up during the initial installation of the circuit pack.

3 Seat the 12DS3/EC1 circuit pack in Function Unit slot A1, B1, C1, or D1 by applying steady pressure to both faceplate latches.

Result: FAULT LED on the 12DS3/EC1 circuit pack lights for approximately 20 seconds then goes off and then ACTIVE LED lights, indicating successful installation. The new pack appears in the GUI **System View**.

4 Is a second (protection) 12DS3/EC1 circuit pack required in Function Unit slot A2, B2, C2, or D2?

If...	Then...
Yes	Continue with Step 5.
No	Insert 177D Application Blank into the unequipped Function Unit slot A2, B2, C2, or D2. Proceed to Step 6.

5 Seat the second (protection) 12DS3/EC1 circuit pack in Function Unit slot A2, B2, C2, or D2 by applying steady pressure to both faceplate latches.

Result: FAULT LED on the 12DS3/EC1 circuit pack lights for approximately 20 seconds then goes off and then ACTIVE LED lights, indicating successful installation. The new pack appears in the GUI **System View**.

6 From the **System View** window, click on **Alarm List** button to verify that no alarms, locks, loops, or switches are present for the ports on the circuit packs just installed.

Result: The “NE Alarm List” window opens. No alarms should be present for the 12DS3/EC1 circuit pack just installed.

7 Do you wish to provision circuit pack and/or port parameters at this time?

If...	Then...
Yes	Refer to "Task 316: Provision 12DS3/EC1 Ports for New DS3 or EC-1 Service" (10-135).
No	STOP! END OF TASK.

END OF STEPS

Task 314: Install 28DS1/28DS1PM (LNW6/LNW7) Circuit Pack

Purpose

Use this task to install 28DS1/28DS1PM (LNW6/LNW7) circuit pack(s).

Required equipment

The following equipment is required:

- Personal computer (PC) with WaveStar® CIT software installed
- Wrist strap

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Prior to beginning this task:

1. Ensure that 28DS1/28DS1PM circuit pack(s) is available for installation.
2. If not previously completed, install generic and WaveStar® CIT software on the PC.

   Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

3. Connect PC and establish a WaveStar® CIT session.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Task Complete the following steps to install 28DS1/28DS1PM circuit pack(s).

. . . . . .

1 Determine the Function Unit slots (A, B, C, or D) being equipped with 28DS1/28DS1PM circuit packs.

. . . . . .

2 Determine from office records or circuit order the length of the DS1 cabling between the Metropolis® DMX and the DSX-1 cross-connect point and any other circuit pack parameters to be set.

. . . . . .

3 Seat the 28DS1/28DS1PM circuit pack in Function Unit slot A1, B1, C1, or D1 by applying steady pressure to both faceplate latches.

Result: FAULT LED on the 28DS1/28DS1PM circuit pack lights for approximately 20 seconds then goes off and then ACTIVE LED lights, indicating successful installation.

. . . . . .

4 Is a second (protection) 28DS1/28DS1PM circuit pack required in Function Unit slot A2, B2, C2, or D2?

If...	Then...
Yes	Continue with Step 5.
No	Insert 177D Application Blank into the unequipped Function Unit slot A2, B2, C2, or D2. Proceed to Step 6.

. . . . . .

5 Seat a second (protection) 28DS1/28DS1PM circuit pack in Function Unit slot A2, B2, C2, or D2 by applying steady pressure to both faceplate latches.

Result:

- FAULT LED on the 28DS1/28DS1PM circuit pack lights for approximately 20 seconds, then goes off.
  ACTIVE LED remains off.
- The new pack appears in the GUI view of the shelf.

6 From the **System View** window, click on **Alarm List** button to verify that no alarms, locks, loops, or switches are present for the ports on the circuit packs just installed.

Result: The "NE Alarm List" window opens. No alarms should be present for the DS1 circuit pack just installed.

7 Repeat this task from Step 1 for each 28DS1/28DS1PM circuit pack to be installed.

8 Do you wish to provision circuit pack and/or port parameters at this time?

If...	Then...
Yes	Refer to "Task 315: Provision 28DS1/28DS1PM Ports for New DS1 Service" (10-131)
No	STOP! END OF TASK.

END OF STEPS

Task 315: Provision 28DS1/28DS1PM Ports for New DS1 Service

Purpose

Use this task to provision ports on 28DS1/28DS1PM (LNW6/LNW7) circuit pack(s).

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Prior to performing this task:

- Ensure 28DS1/28DS1PM circuit pack(s) are installed.
- Connect PC and establish a WaveStar® CIT session.
- Obtain work instructions for this task.

Task Complete the following steps to provision 28DS1/28DS1PM circuit pack ports.

. . . . . .

1 From the **System View** window, click on **Alarm List** button to verify that no alarms, locks, loops, or switches are present for the ports on the circuit packs to be provisioned.

Result: The "NE Alarm List" window opens.

. . . . . .

2 From the **System View** menu, select **Configuration** > **Provision**.

Result: The "Provision Parameters for Equipment" window opens.

. . . . . .

3 Find the 28DS1/28DS1PM circuit pack with the ports being provisioned, then expand the equipment list by clicking on the plus (+) signs.

. . . . . .

4 Click (highlight) the port being provisioned, then click on **Provision** at the bottom of the window.

Result: The port parameters display on the right side of the window.

. . . . . .

5 Select and provision the required port parameters, according to your work instructions.

Important! When BPV=N (default), then incoming BPVs at the DS1 port are corrected by the port unit circuitry before the DS1 is mapped into the VT1.5 payload. Certain digital loop carrier (DLC) equipment (e.g., SLC-96) requires either a DS1 LOS or a DS1 LOF in order to effect a protection switch.

The DS1 port units in DMX need to be provisioned accordingly:

- For the DMX DS1 port unit connected to the DLC remote terminal, set BPV=Y.
- For the DMX port unit connected to the DLC central office terminal (COT), set LINECDE=AMI for DS1 LOS, or to B8ZS for DS1 LOF.

6 Click **Apply** at the bottom of the window to make your changes.

Result: A confirmation window appears: "Execution of provision may affect the NE service. Do you want to execute this command?"

7 Verify that you are provisioning the correct port, then click **Yes** to apply your changes.

8 Repeat this procedure for other ports to be provisioned.

END OF STEPS

Task 316: Provision 12DS3/EC1 Ports for New DS3 or EC-1 Service

Purpose

Use this task to provision ports on 12DS3/EC1 (LNW16) circuit pack(s).

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Prior to performing this task:

- Ensure 12DS3/EC1 circuit pack(s) are installed.
- Connect PC and establish a WaveStar® CIT session.
- Obtain work instructions for this task.

Task

Complete the following steps to provision 12DS3/EC1 circuit pack ports.

1 From the **System View** window, click on **Alarm List** button to verify that no alarms, locks, loops, or switches are present for the ports on the circuit packs to be provisioned.

Result: The "NE Alarm List" window opens.

2 From the **System View** menu, select **Configuration** > **Provision**.

Result: The "Provision Parameters for Equipment" window opens.

3 Find the 12DS3/EC1 circuit pack with the ports being provisioned, then expand the equipment list by clicking on the plus (+) signs.

4 Click (highlight) the port being provisioned, then click on **Provision** at the bottom of the window.

Result: The port parameters display on the right side of the window.

5 Select and provision the required port parameters, according to your work instructions.

6 Click **Apply** at the bottom of the window to make your changes.

Result: A confirmation window appears: "Execution of provision may affect the NE service. Do you want to execute this command?"

7 Verify that you are provisioning the correct port, then click **Yes** to apply your changes.

8 Repeat this procedure for other ports to be provisioned.

END OF STEPS

Task 317: Make VT1.5 or STS-n Cross-Connections, Single OC-48/OC-192 UPSR Ring Configuration

Purpose

Use this task as an example for VT1.5 or STS cross connections.

This procedure uses examples for DS1 and DS3 type cross-connections to illustrate the steps involved in cross-connections in a single UPSR ring configuration. This same procedure could also be used to make any allowable VT, STS-1, STS-3c, STS-12c, or STS-48c cross-connection using related AIDs and the appropriate rate type in the **ent-crs-( )** command or CIT Cross Connection Wizard.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Ensure you have the work instructions for this task.

Task Complete the following steps to make the necessary cross-connections.

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Log in to any node in each ring in the network and retrieve a map of the network which lists all the systems and how they are connected to each other. From the System View menu select **Administration > OSI Routing Map** or **Administration > OSI Neighbor Map**.

3 Verify that the system configuration is the same as specified on the work order or circuit order.

4 From work order or circuit order, determine the terminating (drop) nodes and the pass-through nodes for the service being established.

Important! In ring configurations, you should use the following general rules in establishing cross-connections in each ring.

Cross-Connect Rules

1. All cross-connections to/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 are dropping VT1.5s from the pass through node in the future, you should provision the pass-throughs as VT1.5 cross connections.

See Chapter 5, "Provisioning, Security, & Administration" and Chapter 2, "Platform Description" for more detailed information on types of cross-connections, and restrictions regarding rates, circuit pack types, and VT granularity.

5 At each node, verify that each shelf is properly equipped for the service being established. From the System View menu select V**iew > View Equipment Details**.

6 From work order or circuit order, determine the cross connections to be made at each node associated with the service to be established. See Figure 10-9 and Figure 10-10 for DS1/DS3 cross-connection examples.

> **Important!** Cross connections supporting DS3 services are STS-1 cross connections. Cross connections supporting DS1 services may be either STS-1 or VT1.5 cross connections. Use VT1.5 cross connections for DS1 services if you expect to cross connect only *some* of the VT1.5 signals in the STS-1 channel. If STS-1 cross connections are made at a shelf, there is a fixed mapping of all 28 VT1.5 cross connections to a specific shelf group.

7 Starting at one of the terminating nodes for the circuit being established, at each node in the ring use **View > Cross-Connections** from the System View menu to verify that the cross-connections specified on the work order or circuit order may be made. 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.

8 At all non-terminating nodes in the network, provision pass-through cross connections. From the System View menu select **Configuration > Cross-Connection**, then use the Cross-Connection Wizard to make the cross-connections. Select **2-Way Point-to-Point, Through** for pass through cross-connections.

> **Important!** The channel mode provisioning feature provides In-Service, Automatic, or Not Monitored states for VT and STS channels similar to the port modes for DS1 and DS3 ports. At installation, or when a cross connection is made to a point of termination, the channel is in the Automatic mode and alarming is suppressed until a valid signal is received. The channel must

receive a good signal from either ring to cause the channel to transition to in-service.

9 At the terminating (drop) nodes of the circuit being established, establish the terminating cross connections. From the System View menu select **Configuration > Cross-Connection**, then use the Cross-Connection Wizard to make the cross-connections.

10 Verify that the proper connection has been made. From the System View menu select **View > Cross-Connections**. If changes are required, return to the Cross-Connect Wizard to make them.

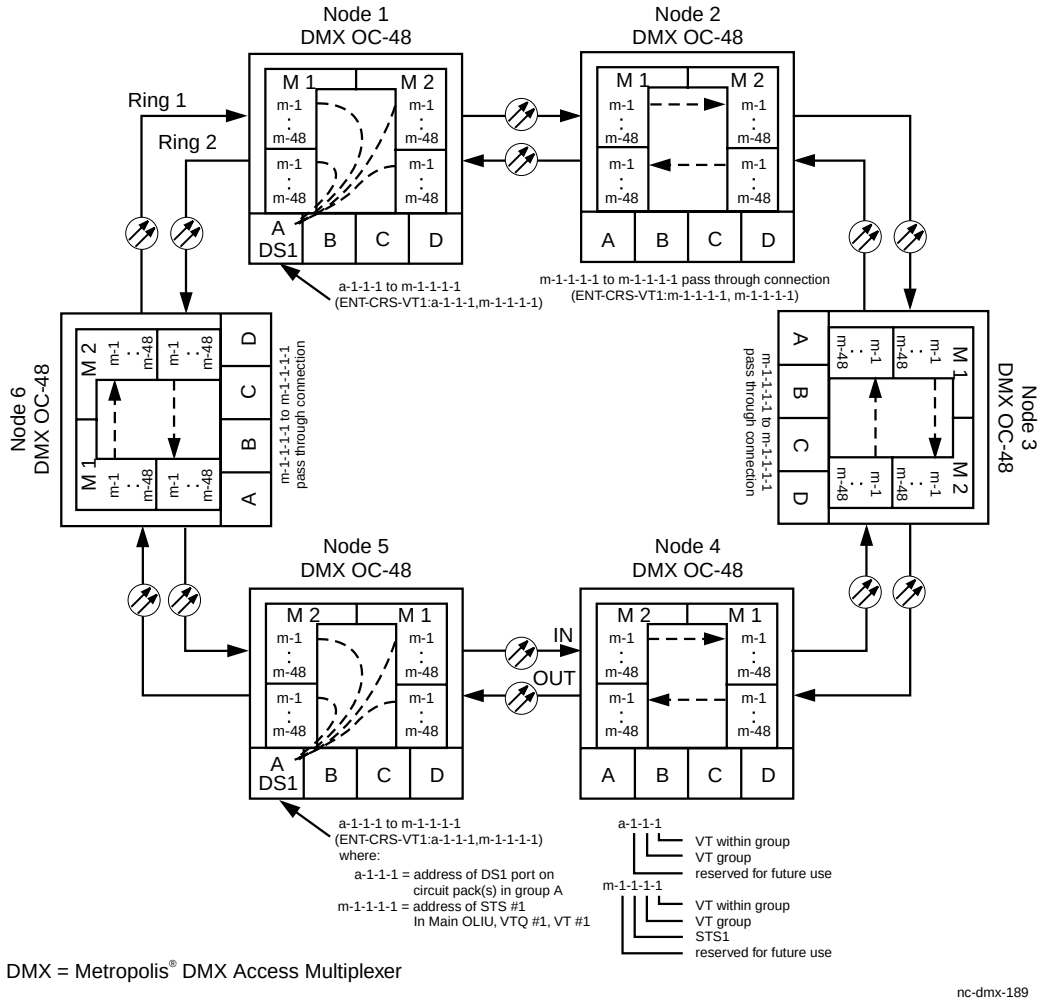
11 After all cross connections are made, verify no alarms are present. Click on the **Alarm List** button.

12 If ne-acty, inc. VT AIS, inc. STSn AIS, inc. VT unequipped, or inc. STSn unequipped alarms are present, look for missing or improperly made cross-connections at all nodes in the network.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

END OF STEPS

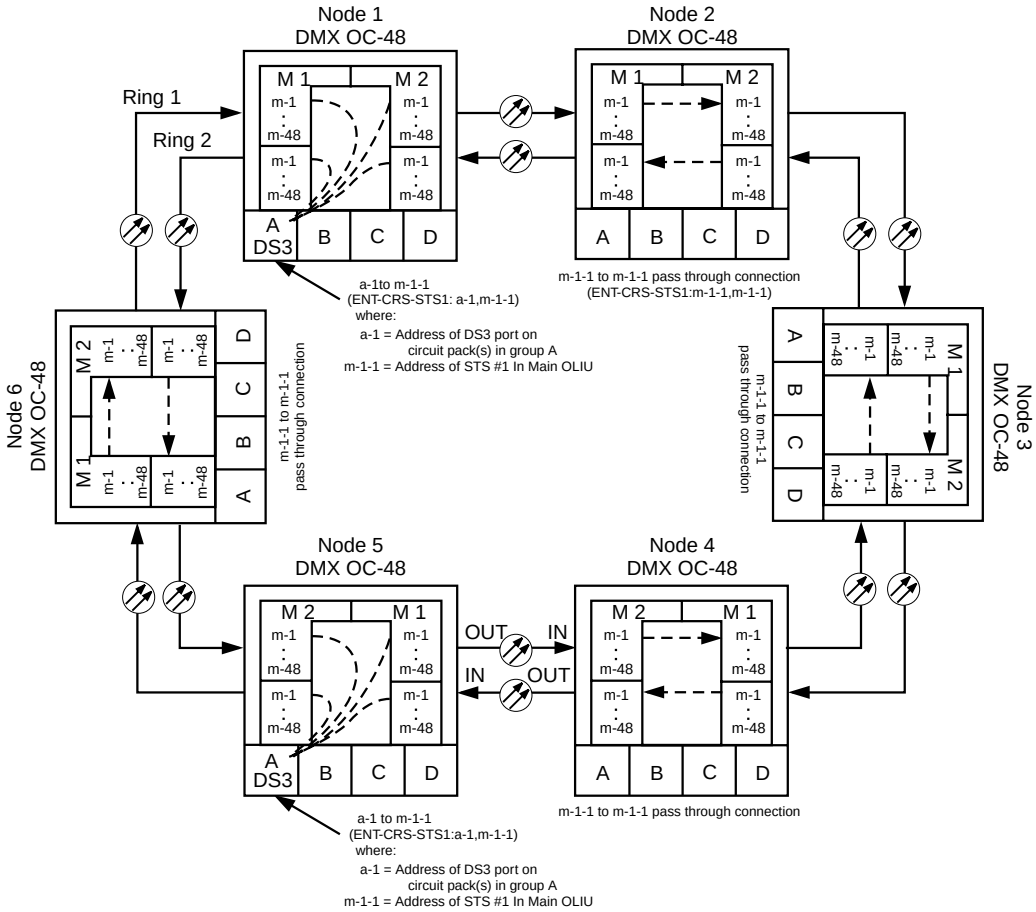
Figure 10-9 Path Protected OC-48 Ring Network (DS1 to DS1) with VT1.5 Cross-Connections



DMX = Metropolis® DMX Access Multiplexer

nc-dmx-189

Figure 10-10 Path Protected OC-48 Ring Network (DS3 to DS3) with STS-1 Cross-Connections



DMX = Metropolis® DMX Access Multiplexer

nc-dmx-190

Task 318: Establish Single-Homed OC-3/12/48 Access via Metropolis® DMX UPSR Backbone Ring

Purpose

Use this task to establish single-homed OC-3/12/48 access to a Metropolis® DMX Access Multiplexer UPSR ring.

Important! Note that the figures and examples used in this procedure depict a single-homed network for establishing a ring completion subnetwork through a Metropolis® DMX backbone ring. This configuration is the same as establishing a subtending UPSR ring "SE 340-1: Establish Subtending Low Speed OC-3/12/48 UPSR" (10-429) in Release 3, except for the cross-connection applications.

The figures used in this procedure illustrate a port application of 0X1 for Release 2 and earlier. For Release 3 and later, the 0X1 application is no longer supported. The equivalent functionality in Release 3 is supported by using a port application of UPSR and a channel application of UNSWITCHED (chappl=UNSWITCHED) in the cross-connection commands.

Note that in this single-homed configuration, the Metropolis® DMX UPSR backbone ring transports traffic from the single-homed ring without any protection switching by a Metropolis® DMX on the backbone ring. The end-of-path NEs terminating the traffic do the path protection switching.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- Optical Power Meter

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Verify that you have the necessary work instructions detailing the slots, circuit packs, ports, and network element parameters to be used for this task.
- Verify that the network ring containing the host Metropolis® DMX shelf is established and operating properly using the procedures in this manual.
- Verify that all systems being connected to the host Metropolis® DMX shelf have been equipped and operating properly.

Task Complete the following steps to establish the configuration.

1 Connect the PC to the host Metropolis® DMX and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 At the top of the System View window, verify that the host Metropolis® DMX shelves are equipped with Release 1.1 (or higher) software for OC-3/12 access or Release 2.0 or higher for OC-48 access.

3 Determine the network configuration. For example, see Figure 10-11.

At the host Metropolis® DMX node, select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Access each of the NEs identified and select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Repeat the above until the backbone ring can be sketched.

4 Determine the optical loss of each optical span from office records or by making the required measurements.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

5 At the host Metropolis® DMX node, verify/install OLIU circuit packs in Function Group or Growth slot pairs (A1 and A2, B1 and B2, C1 and C2, D1 and D2, or G1 and G2) being used for access.

Important! If the work order or office records do not specify OLIU types, refer to Chapter 2, "Platform Description", 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.

This single-homed ring configuration requires that the host OLIUs be installed in the same Function Group or Growth slot pairs. Note the following connectivity:

Important!

Function Group (A,B,C,D,G) 1	Connects to the M1 OLIU at the first NE from the Metropolis® DMX host shelf.
Function Group (A,B,C,D,G) 2	Connects to the M2 OLIU at the first NE from the Metropolis® DMX host shelf.

Reference: "Task 321: Install OLIU Circuit Packs in Function/Growth Slots" (10-169)

6 At the host Metropolis® DMX node, an *inconsistent DCC switches* alarm will occur when the OLIUs are looped back and DCC is enabled.

If an *inconsistent DCC switches* alarm is present, either ignore the alarm or clear the alarm during a fiber loopback by disabling the DCC. From the System View menu select **Configuration > DCC Terminations**, under **DCC Channel Parameter**: **Termination State**, select **Disable**d.

7 From the System View menu at each of the Metropolis® DMX host nodes, select **Configuration > Provision**, select the required port, and provision port parameters as required from your work instruction.

Important! For this configuration, ensure the **Application** port parameter is set to **UPSR** (Release 3 or later) or **0X1** (Release 2 or earlier) at the host nodes.

Reference: "Task 322: Provision Function/Growth OLIU Circuit Packs/Ports for New Service" (10-175)

8 Verify/Set Network Side/User Side parameters at each end of the optical spans being established.

From the System View menu at each Metropolis® DMX host node, select **Configuration > DCC Terminations**. Select the port, then under DCC Channel Parameters, set the **LAPD Role** to **User Side** or **Network Side**, as required. Set **Termination State** to **enabled**.

Important! The Network Side (NS)/User Side (US) parameters must be set opposite at each end of an optical span. The default for Function Unit or Growth slot 1 is network-side. The default for Function Unit or Growth slot 2 is user-side. The default for Main 1 is user-side and Main 2 is network-side in a DDM-2000, Metropolis® DMX, or Metropolis® DMX*press*.

Result: An *inconsistent DCC switches* alarm will occur if the optical interface ports are looped back.

9 Refer to the User Operations Guide for the systems you are connecting to the Metropolis® DMX to verify/set the following parameters:

- NS/US for this configuration
- Application parameter
- Timing mode or synchronization source
- Sbyte synch messaging
- Sync Autoreconfiguration

10 From work order, office records, or by using the **Administration > OSI Routing Map** command from the System View menu at a host node, verify that no NE in the existing network has the same TID name as the NEs being added to the network.

Important! Two or more NEs in the same network cannot have the same TID (system name).

11 If duplicate TIDs exist, determine new settings and use the **Administration > Set TID** command from the System View menu to change settings. Use the User Operations Guide for the new shelves you are connecting to the Metropolis® DMX to change settings.

12 Remove the optical loop from the OLIU ports associated with each end of the optical span being established, if installed. Start at the Metropolis® DMX host node and continue around the ring back to the host node.

Result: A loss of signal (LOS) alarm will occur if the port is being monitored.

If required, verify/set the Port Mode to **Monitored (IS)**. From the System View menu, select **Configuration > Provision**, select the required port, then click **Provision**. Under the OCn Primary State parameter section, verify/set the Port Mode to **Monitored (IS)**.

13 Perform optical fiber connections and verification of the integrity of the optical span being installed..

Reference: “Task 403: Perform Connection and Verification of Optical Facility” (11-25)

14 Perform end-to-end optical line test on the span being established.

Reference: “Task 414: Perform End-to-End Optical Line Test on Function/Growth OLIUs” (11-73)

15 Repeat this procedure from Step 12 through Step 14 for all optical spans back to the host Metropolis® DMX shelf.

16 Verify that there are no alarms associated with the network just established.

> **Reference:** *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

17 The single-homed access network is now ready for initial service to be established. For all terminations on the far-end shelf, use the procedures in that shelf's particular user operations guide to provision those shelves.

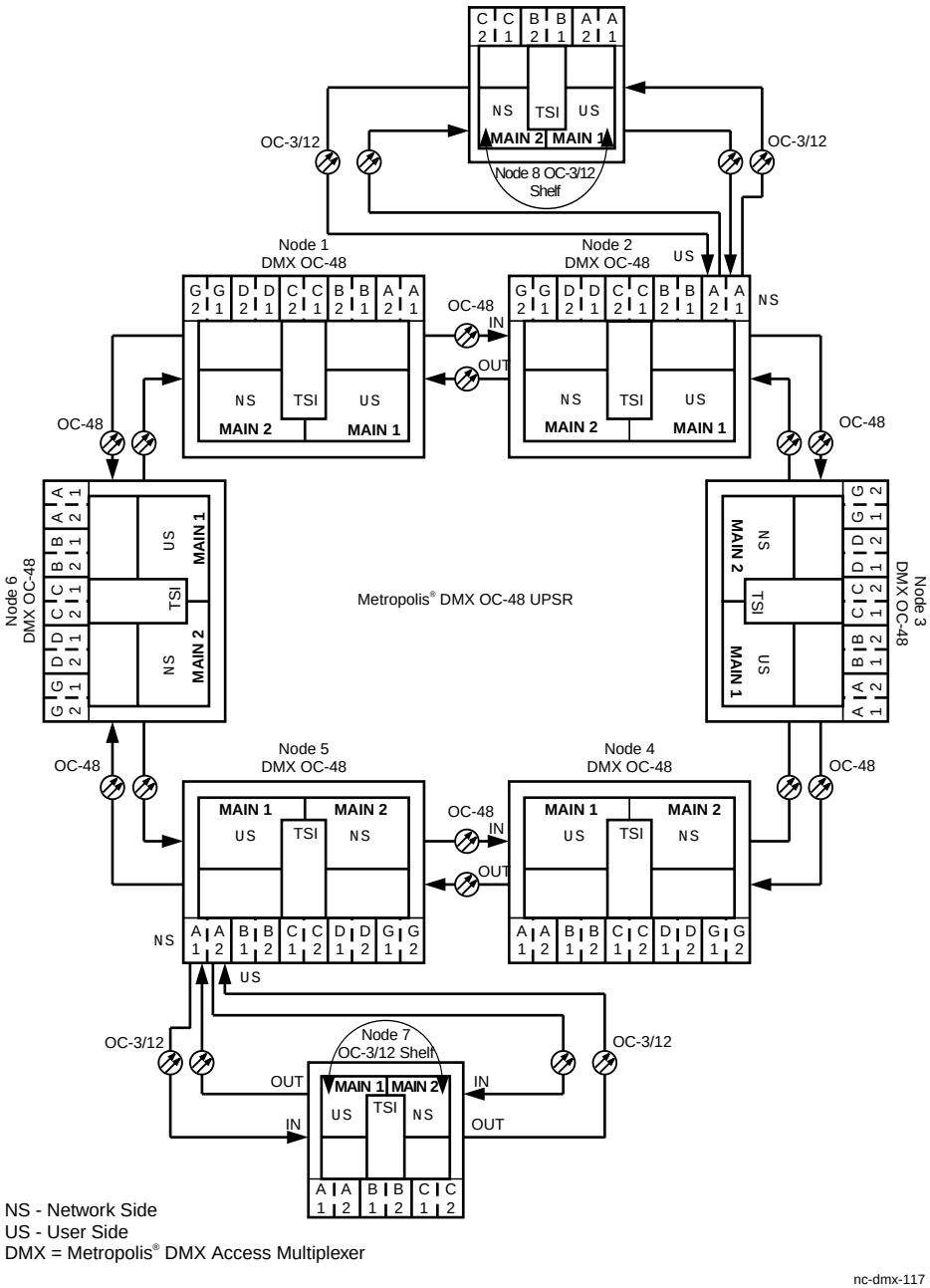
> **Important!** Establishing service requires that the proper slots in each terminating node be properly equipped with the correct circuit pack(s) for the type of service being established. It also requires numerous cross-connections in each of the nodes representing the path of the required service. Additionally, transmission tests should be performed to verify the continuity and quality of the established circuit.

END OF STEPS

Example Single-homed configuration

Figure 10-11 is an example of the single-homed configuration described in this task. Although this example illustrates OC3/12 rings single-homing to a OC-48 UPSR ring, the same procedure applies for OC-48 subtending rings to an OC-192 UPSR. Traffic flow is described following the figure.

Figure 10-11 Single-Homed Configuration



Traffic Flow

In the preceding figure, if Node 7 is the source and Node 8 the destination, traffic will flow as follows:

- From Node7:M1 to Node5:A1, then clockwise around the ring from Node5:M1 to Node2:M2. From Node2:A2 to Node8:M2.
- From Node7:M2 to Node5:A2, then counter-clockwise around the ring from Node5:M2 to Node2:M1. From Node2:A1 to Node8:M1.

Protection

The ports that connect the subtending shelves to the Metropolis® DMX (Node5:A1/A2, Node2:A1/A2) should be provisioned for 0x1 protection. The single-homed configuration transports traffic over the Metropolis® DMX UPSR without any protection switching by the Metropolis® DMX on the ring. The end-of-path NEs (Node7 and Node8) do the path protection switching.

Task 319: Establish Dual-Homed OC-3/12/48 Access via Metropolis® DMX Access Multiplexer UPSR Backbone Ring

Purpose

Use this task to establish dual-homed OC-3/12/48 access to host Metropolis® DMX Access Multiplexers. See Figure 10-12 and Figure 10-13 for examples in this procedure.

Important! Note that the figures and examples used in this procedure depict a dual-homed network for establishing a ring completion subnetwork through a Metropolis® DMX backbone ring.

The figures used in this procedure illustrate a port application of 0X1 for Release 2 and earlier. For Release 3 and later, the 0X1 application is no longer supported. The equivalent functionality in Release 3 is supported by using a port application of UPSR and a channel application of UNSWITCHED (chappl=UNSWITCHED) in the cross-connection commands.

Note that in this dual-homed configuration, the Metropolis® DMX UPSR backbone ring transports traffic from the dual-homed ring without any protection switching by a Metropolis® DMX on the backbone ring. The end-of-path NEs terminating the traffic do the path protection switching.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- Optical Power Meter

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Verify that you have the necessary work instructions detailing the slots, circuit packs, ports, and network element parameters to be used for this task.
- Verify that the network ring containing the host Metropolis® DMX shelves is established and operating properly.
- Verify that all systems being connected to the host Metropolis® DMX shelves have been equipped and operating properly.

Task

Complete the following steps to establish dual-homed ring connections.

. . . . . .

1 Connect the PC to a host Metropolis® DMX and establish a WaveStar®

CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 At the top of the System View window, verify that the host Metropolis® DMX shelves are equipped with Release 1.1 (or higher) software for OC-3/12 access or Release 2.0 or higher for OC-48 access.

3 From your work instructions, determine the network configuration. If possible, make a sketch of the existing network and the required dual-homed connections.

At one of the host Metropolis® DMX nodes, select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Access each of the NEs identified and select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Repeat the above until the backbone ring can be sketched.

4 From office records or local procedures, determine the optical loss of each optical span to be connected. Save this information for connecting the optical fibers later in this task.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

5 At the host Metropolis® DMX nodes (Nodes 4 and 5 in this example), verify/install OLIU circuit packs in Function Group or Growth slots (A1 or A2, B1 or B2, C1 or C2, D1 or D2, or G1 or G2) being used for access.

Important! If the work order or office records do not specify OLIU types, refer to Chapter 2, "Platform Description", 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.

This dual-homed ring configuration requires that the host OLIUs be installed in the following manner:

Important!

Function Group (A,B,C,D,G) 1	Connects to the M1 OLIU at the first NE from one of the Metropolis® DMX host shelves.
Function Group (A,B,C,D,G) 2	Connects to the M2 OLIU at the first NE from the second Metropolis® DMX host shelf.

Reference: "Task 321: Install OLIU Circuit Packs in Function/Growth Slots" (10-169)

. . . . . .

6 At the host Metropolis® DMX nodes, an *inconsistent DCC switches* alarm will occur when the OLIUs are looped back and DCC is enabled.

If an *inconsistent DCC switches* alarm is present, either ignore the alarm or clear the alarm during a fiber loopback by disabling the DCC. From the System View menu select **Configuration > DCC Terminations**, under **DCC Channel Parameter**: **Termination State**, select **Disable**d.

. . . . . .

7 From the System View menu at each of the Metropolis® DMX *host* nodes, select **Configuration > Provision**, select the required port, and provision port parameters as required from your work instruction.

Important! For this configuration, ensure the **Application** port parameter is set to **UPSR** (Release 3 or later) or **0X1** (Release 2 or earlier) at the host nodes.

Reference: "Task 322: Provision Function/Growth OLIU Circuit Packs/Ports for New Service" (10-175)

8 Verify/Set Network Side/User Side parameters at each end of the optical spans being established.

From the System View menu at each Metropolis® DMX host node, select **Configuration > DCC Terminations**. Select the port, then under DCC Channel Parameters, set the **LAPD Role** to **User Side** or **Network Side**, as required. Set **Termination State** to **enabled**.

Important! The Network Side (NS)/User Side (US) parameters must be set opposite at each end of an optical span. The default for Function Unit or Growth slot 1 is network-side. The default for Function Unit or Growth slot 2 is user-side. The default for Main 1 is user-side and Main 2 is network-side in a DDM-2000, Metropolis® DMX, or Metropolis® DMX*press*.

Result: An *inconsistent DCC switches* alarm will occur if the optical interface ports are looped back.

Example: Figure 10-12 and Figure 10-13

9 Refer to the manufacturer's documentation for each shelf/system connecting to the Metropolis® DMX nodes to verify/set the following parameters:

- DCC LAPD parameters (Network Side [NS]/User Side [US]) for this configuration
- DCC enabled
- No duplicate TIDs
- System timing (line timing, external timing)
- Sbyte sync messaging
- Sync Autoreconfiguration
- Network Service Address Point (NSAP)
- Alarm Gateway (AGNE) and alarm group numbers

Important! The Network Side (NS)/User Side (US) parameters must be set opposite at each end of an optical span.

If Sbyte (sync messaging) is enabled at any node in the network, it must be enabled at all nodes in the network.

10 From work order, office records, or by using the **Administration > OSI Routing Map** command from the System View menu at a host node, verify that no NE in the existing network has the same TID name as the NEs being added to the network.

Important! Two or more NEs in the same network cannot have the same TID (system name).

11 Remove the optical loop from the OLIU ports associated with each end of the optical span being established, if installed. Start at one of the Metropolis® DMX host nodes.

Result: A loss of signal (LOS) alarm will occur if the port is being monitored.

If required, verify/set the Port Mode to **Monitored (IS)**. From the System View menu, select **Configuration > Provision**, select the required port, then click **Provision**. Under the OCn Primary State parameter section, verify/set the Port Mode to **Monitored (IS)**.

12 Perform optical fiber connections and verification of the integrity of the optical span being installed. Start by connecting the first optical span from one of host nodes and the first NE on the subtending ring to be connected.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

13 Perform end-to-end optical line test.

Reference: "Task 414: Perform End-to-End Optical Line Test on Function/Growth OLIUs" (11-73)

14 Repeat Step 11 through Step 13 for all optical spans back to the other Metropolis® DMX host node.

15 Verify that there are no alarms associated with the network just established.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

16 The dual-homed access network is now complete.

END OF STEPS

Example Dual-homed configurations

Figure 10-12 and Figure 10-13 are examples of the dual-homed configuration described in this task. Although this example illustrates OC-3/12 rings dual-homing to a OC-48 UPSR ring, the same procedure applies for OC-48 subtending rings to an OC-192 UPSR. Note the traffic flow shown in the figures.

Figure 10-12 Dual-Homed Network Configuration Example 1

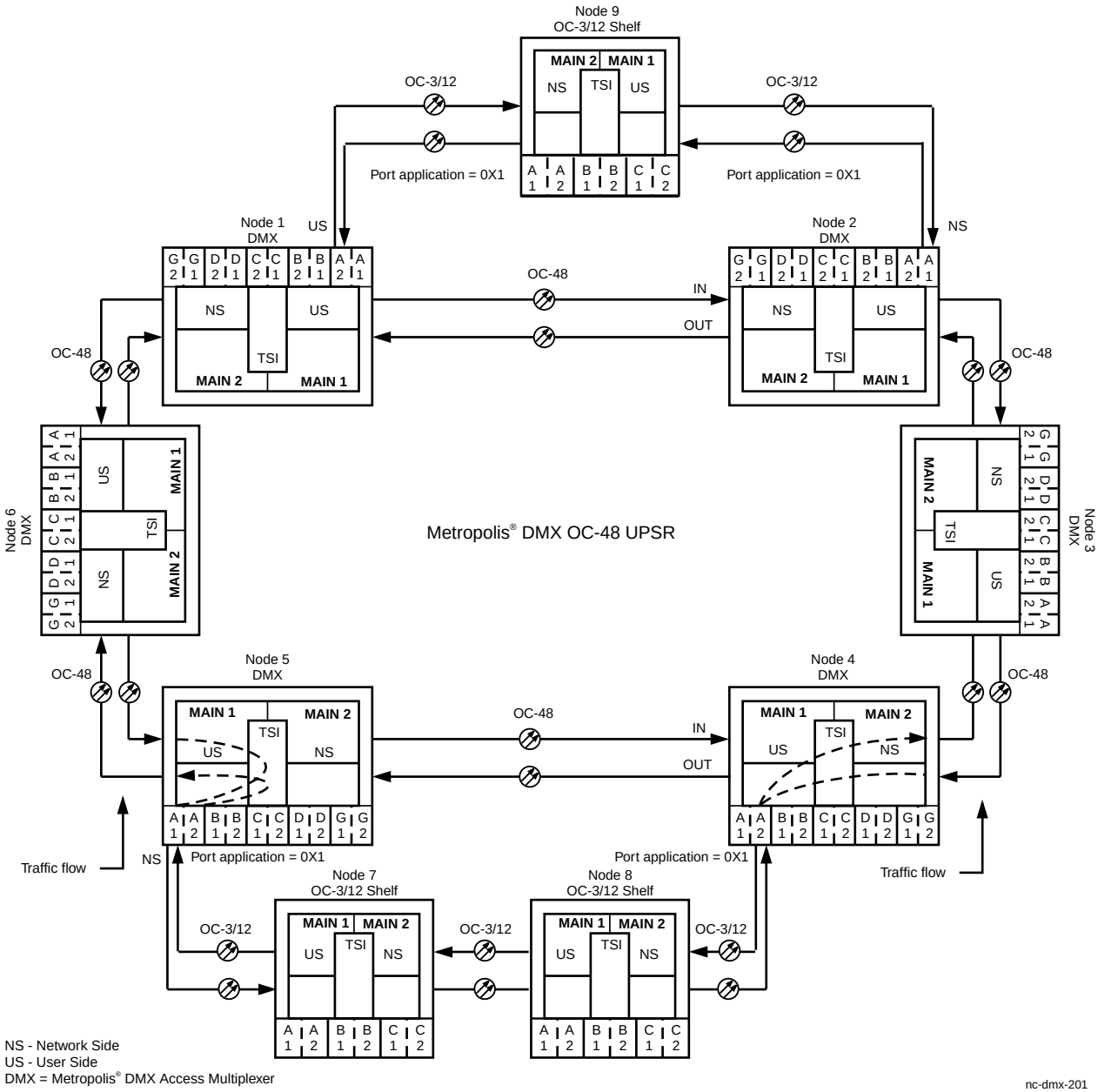
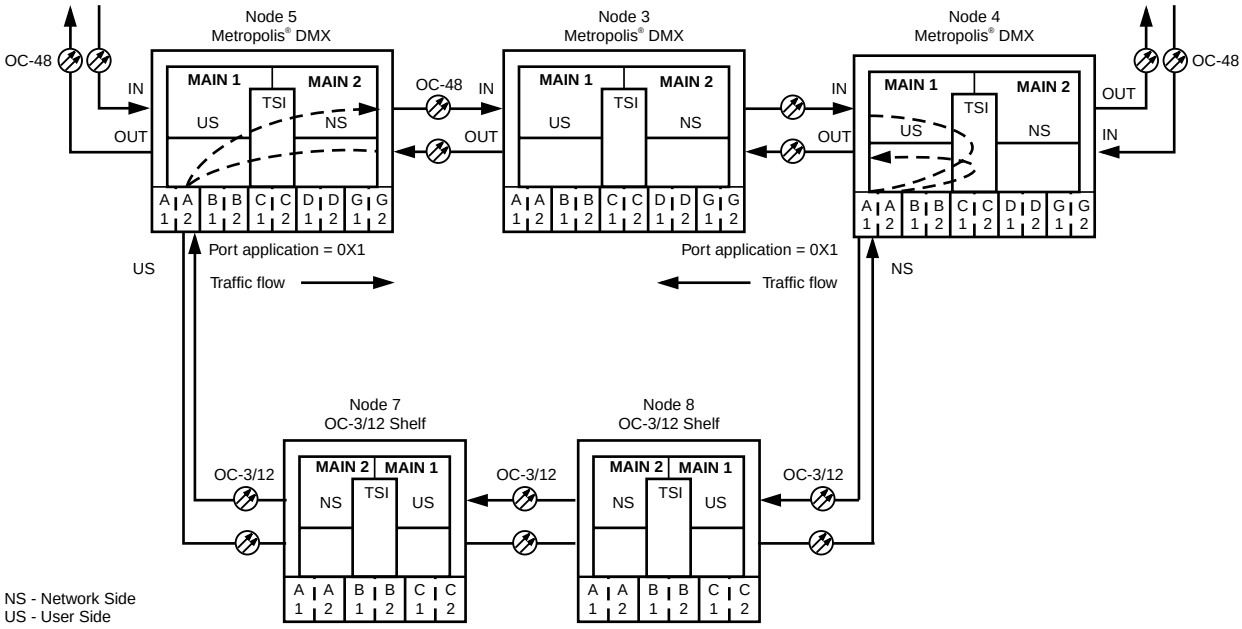


Figure 10-13 Dual-Homed Network Configuration Example 2



Task 320: Establish OC-3/12/48 1+1 Linear Extension via Metropolis® DMX Backbone Ring

Purpose

Use this task to establish OC-3/12/48 linear extensions.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Verify that you have the necessary work instructions detailing the slots, circuit packs, ports, and network element parameters to be used for this task.
- Verify that the network ring containing the host Metropolis® DMX shelf is established and operating properly.
- Verify that all systems being connected to the host Metropolis® DMX shelf have been equipped and operating properly.

Task

Complete the following steps to make the necessary cross connections.

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Determine the network configuration.

3 Verify that the host Metropolis® DMX shelves are equipped with Release 1.1 (or higher) software for OC-3/12 access or Release 2.0 or higher for OC-48 access. From the System View menu select **View > Software Generic**.

4 Determine the optical loss of each optical span from office records or by making the required measurements.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

5 At the host Metropolis® DMX node, verify/install OLIU circuit packs in Function Group slots (A, B, C, D, or G) being used for OC-3/12 access.

Important! If the work order or office records do not specify OLIU types, refer to Chapter 2, "Platform Description", 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.

The connections to the Metropolis® DMX shelf must be in two slots in the same group (for example: A1 and A2)

Important!

Function Group (A,B,C,D,G) 1	Connects to the M1 OLIU at the shelf you are connecting to the Metropolis® DMX.
Function Group (A,B,C,D,G) 2	Connects to the M2 OLIU at the shelf you are connecting to the Metropolis® DMX.

Reference: "Task 321: Install OLIU Circuit Packs in Function/Growth Slots" (10-169)

6 At the Metropolis® DMX node, an *inconsistent DCC switches* alarm may occur when the OLIUs are looped back and DCC is enabled. If an *inconsistent DCC switches* alarm is present, clear the alarm during a fiber loopback by disabling the DCC. From the System View menu select **Configuration > DCC Terminations**, under **DCC Channel Parameter**: **Termination State**, select **Disable**d.

7 From the System View menu at the Metropolis® DMX node, select **Configuration > Provision**, select the required port, and provision port parameters as required from your work instruction.

Important! For this application, ensure the Application port parameter is set to *1+1* at the host nodes.

Reference: "Task 322: Provision Function/Growth OLIU Circuit Packs/Ports for New Service" (10-175)

8 From the System View menu at the Metropolis® DMX node, select **Configuration > DCC Terminations**. Select the port, then under LAPD Parameters, set the LAPD User Role to **User Side** or **Network Side**, as required.

Important! The Network Side (NS)/User Side (US) parameters must be set opposite at each end of an optical span. The default for Function Unit or Growth slot 1 is NS. The default for Function Unit or Growth slot 2 is US.

9 Refer to the manufacturer's documentation for each shelf/system connecting to the Metropolis® DMX node to verify/set the following parameters:

- DCC LAPD parameters (Network Side [NS]/User Side [US]) for this configuration
- DCC enabled
- No duplicate TIDs
- System timing (line timing, external timing)
- Sbyte sync messaging
- Sync Autoreconfiguration
- Network Service Address Point (NSAP)
- Alarm Gateway (AGNE) and alarm group numbers

Important! The Network Side (NS)/User Side (US) parameters must be set opposite at each end of an optical span.

If Sbyte (sync messaging) is enabled at any node in the network, it must be enabled at all nodes in the network.

10 Set DCC Channel Parameter, Termination State to **Enabled**. From the System View menu select **Configuration > DCC Terminations**, set **DCC Channel Parameter: Termination State** to **Enabled**.

Important! The section data communications 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.

Result: An *inconsistent DCC switches* alarm may occur if the optical interface ports are looped back.

11 Remove the optical loop from the OLIU ports associated with each end of the optical span being established, if installed.

Result: A loss of signal (LOS) alarm will occur if the port is being monitored.

12 From the System View menu, select **Configuration > Provision**, select the required port, then click **Provision**. Under the OCn Primary State parameter section, verify/set the Port Mode to **Monitored (IS)**.

Result: A loss of signal (LOS) alarm will occur.

13 Perform optical fiber connections and verification of the integrity of the optical span being installed.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

14 Perform end-to-end optical line test.

Reference: "Task 414: Perform End-to-End Optical Line Test on Function/Growth OLIUs" (11-73)

15 Verify that there are no alarms associated with the network just established.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

16 The OC-3/12/48 linear extension is now ready for initial service to be established.

Important! 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.

END OF STEPS

Task 321: Install OLIU Circuit Packs in Function/Growth Slots

Purpose

Use this task to install OC-3/OC-12/OC-48 OLIU circuit packs in the Metropolis® DMX Access Multiplexer. These packs are installed in Function Unit slots (A1/A2, B1/B2, C1/C2, D1/D2), and Growth Unit slots (G1/G2).

Required equipment

The following equipment is required:

- Personal computer (PC) with WaveStar® CIT software installed
- Wrist strap
- Optical loopback cables, LBOs, and optical fiber cleaning tools (if loopbacks are performed)

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"

Before you begin

Prior to performing this task:

1. Ensure that correct OC-3/OC-12/OC-48 OLIU circuit pack(s) is available for installation.
2. If not previously completed, install generic and WaveStar CIT software on the PC.

   Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)
3. Connect PC and establish a WaveStar CIT session.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)
4. Obtain work instructions for this task.

   Important! If responses are not correct when installing OLIU circuit packs, check the connections. If the connections are correct, replace the circuit pack with the wrong response. (The red FAULT LED normally flashes when an OLIU circuit pack is monitored and there is no signal present.)

Task

Complete the following steps to install OLIU circuit packs.

1 Determine the Function Unit slot(s) (A1/A2, B1/B2, C1/C2, D1/D2) or Growth Unit slot(s) (G1/G2) being equipped with OLIU circuit packs.

2 Ensure all optical fiber connectors and couplings are properly cleaned.

Important! Signal performances may be degraded if the connections and couplings are not cleaned properly.

Reference: "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51)

3 Seat OLIU circuit pack into Function Unit slot A1, B1, C1, D1, or Growth Unit slot G1 slot by applying steady pressure to both faceplate latches.

Result: FAULT LED and ACTIVE LED lights. FAULT LED begins flashing after about 15 seconds. MN and NE alarm LEDs on the SYSCTL circuit pack light when an OLIU circuit pack is installed.

4 Is a second (protection) OLIU circuit pack required in Function Unit slot A2, B2, C2, D2, or Growth Unit slot G2?

If	Then
Yes	Continue with Step 5.
No	Insert 177D Application Blank into the unequipped Function Unit slot A2, B2, C2, D2, or Growth Unit slot G2. Proceed to Step 6.

5 Seat second (protection) OLIU circuit pack into A2, B2, C2, D2, or G2 slot by applying steady pressure to both faceplate latches.

Result: FAULT LED and ACTIVE LED lights. FAULT LED begins flashing after about 15 seconds. MN and NE alarm LEDs on the SYSCTL circuit pack light when an OLIU circuit pack is installed.

6 From the **System View** window, click on **Alarm List** button to verify the alarms for the ports ont eh circuit packs just installed.

Result: The “NE Alarm List” window opens.

7 Note the existing alarms associated with the OLIU circuit pack(s) just installed, then click **Close** at the bottom of the NE Alarm List window.

8 Do you want to clear the alarms associated with the installed OLIU circuit pack(s) using the WaveStar® CIT?

If	Then
Yes	Proceed to Step 10 to set the OLIU ports to Not Monitored (out of service [OOS])
No	Continue with Step 9 to clear the alarms by looping the OLIU ports back on each other.

9 Install optical loopbacks on all ports of the OLIU(s) just installed, then proceed to Step 20.

Result: All alarms clear. FAULT LED goes off after about 15 seconds.

Reference: "Task 400: Connect OLIU Optical Loopbacks" (11-3)

10 From the **System View** window, select **Configuration** > **Provision**.

Result: The **Provision Parameters for Equipment** window opens.

11 Find the OLIU circuit pack(s) just installed and expand the equipment list by clicking on the plus (+) sign next to the OLIU(s) just installed.

12 Click (highlight) the first port on the circuit pack to be provisioned, then click **Provision** at the bottom of the window.

Result: The port parameters display on the right side of the window.

13 Under the "OCn Primary State" section, set the **OCn Line State** to **Not Monitored**.

14 Click **Apply** at the bottom of the window to make your changes.

Result: "Execution of provision may affect the NE service. Do you want to execute this command?"

15 Verify that you are provisioning the correct port, then click **Yes** to apply your changes.

16 Repeat Step 10 through Step 15 for all ports being set to Not Monitored, then click **Close** at the bottom of the window.

17 Disable the DCC of each port of the OLIUs installed.

From the **System View** window,
select **Configuration > DCC terminations**.
Select the DCC port from the **Port Aid** pull-down and select **Termination State: Disabled**.

Click **Okay**.

Result: "Execution will affect the DCC termination for the DMX. Do you want to execute this command?"

18 Click **Yes**.

Result: After all the ports on an OLIU circuit pack are provisioned to Not Monitored and the DCC is provisioned for disabled, all alarms clear and the FAULT LED goes off immediately.

19 Click **Close**.

20 Do you wish to install another OLIU?

If	Then
Yes	Return to Step 1.
No	Return to Step 21.

21 Do you wish to provision circuit pack and/or port parameters for new service at this time?

If	Then
Yes	Refer to "Task 322: Provision Function/Growth OLIU Circuit Packs/Ports for New Service" (10-175)
No	STOP! END OF TASK.

END OF STEPS

Task 322: Provision Function/Growth OLIU Circuit Packs/Ports for New Service

Purpose

Use this task to provision OC-3/OC-12/OC-48 OLIU circuit pack ports in function/growth slots for new service in Metropolis® DMX.

Required equipment

The following equipment is required:

- Personal computer (PC) with WaveStar® CIT software installed
- Wrist strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"

Before you begin

Prior to performing this task:

1. Ensure OC-3/OC-12/OC-48 circuit pack(s) are installed.

   Reference: "Task 321: Install OLIU Circuit Packs in Function/Growth Slots" (10-169)

2. If not previously completed, install generic and WaveStar® CIT software on the PC.

   Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

3. Connect PC and establish a WaveStar CIT session.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

4. Obtain the work instructions for this task.

Task

Complete the following steps to provision ports on OC-3/OC-12/ OC-48 OLIU circuit packs.

. . . . . .

1 From the **System View** window, click on **Alarm List** button to verify that no alarms, locks, loops, or switches are present for the ports on the circuit packs just installed.

Result: The "NE Alarm List" window opens.

. . . . . .

2 From the **System View** window, select **Configuration** > **Provision**.

Result: The "Provision Parameters for Equipment" window opens.

. . . . . .

3 Find the OLIU circuit pack(s) with the ports being provisioned, then expand the equipment list by clicking on the plus (+) sign next to the OLIU.

. . . . . .

4 Click (highlight) the OLIU port being provisioned, then click on **Provision** at the bottom of the window.

Result: The port parameters display on the right side of the window.

5 Select and provision the required port parameters, according to your work instructions.

6 Click **Apply** at the bottom of the window to make your changes.

Result: "Execution of provision may affect the NE service. Do you want to execute this command?"

7 Verify that you are provisioning the correct port, then click **Yes** to apply your changes.

8 Are there additional OLIU ports to be provisioned on the OLIU circuit pack?

If...	Then...
Yes	Repeat this task from Step 4 for each port.
No	Continue with Step 9.

9 Are there additional OLIU circuit packs to be provisioned?

If...	Then...
Yes	Repeat task from Step 3 for each circuit pack.
No	Click **Close** to exit.

END OF STEPS

Task 323: Add IP Tunnel(s) Through Network

Purpose

Use this task to add an IP tunnel(s) through the data communications channel (DCC) OSI-based network.

Required equipment

A personal computer (PC) with WaveStar® CIT software installed is required to perform this task.

Important! Release 2 or later software is required to perform this task.

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 3, "Operations Interfaces"

IP Tunneling Scenarios

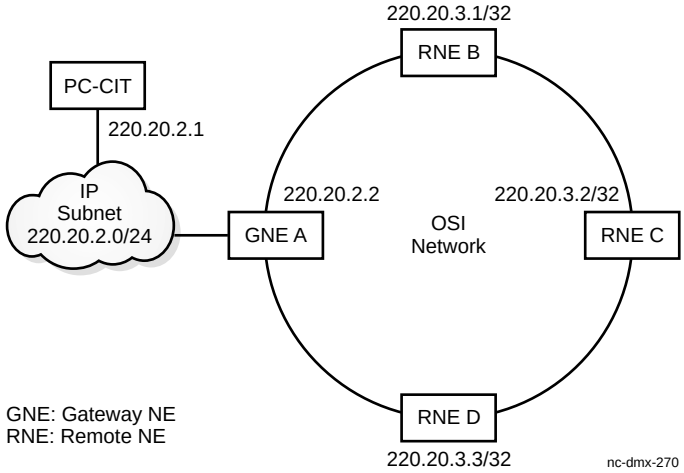
The following scenarios illustrate different methods of establishing IP Tunnels through a network.

Each example is followed by the necessary instructions to program that example. In addition, tables are provided that list the required provisioning for the PC-CIT, NEs, SNMS, Router, and AnyMedia OS for each scenario.

Example 1: Local Acces over LAN

In this example (Figure 10-14), the PC-CIT is both the OS and FTP Server and is connected on the same subnet as GNE i.e. local access over the Local Area Network (LAN).

Figure 10-14 Local Access over LAN



No manual route for the server needs to be added in GNE as it would appear in GNE's routing table as a local entry. The "advertise" flag will need to be enabled.

ALL NEs are connected over a ring (over OSI-based DCC) and communicate using OSI, identifying each other through the NSAP addresses. They all support IP stack and thus have IP addresses and subnet masks assigned. Here, they are standalone IP NEs but could also be connected to IP-only NEs (e.g. a case of IP Fringe discussed later).

How to Provision Example 1

Use the following information along with the Step instructions for this procedure to provision the tunnel illustrated in Example 1:

At ...	Provision ...
PC-CIT	Provision its own IP address (220.20.2.1) and subnet mask (24 or 255.255.255.0) Provision GNE with IP address 220.20.2.2 as default router
GNE	Provision its own IP address (220.20.2.2) and subnet mask (24 or 255.255.255.0) for rear LAN port. Enable TCP/IP on the rear LAN port. Enable IP tunneling. No need to provision manual tunnel/route to PC-CIT since GNE would advertise it as local entry within its own area Ensure that TAP advertising and learning is enabled.
RNE B	Provision its own IP address (220.20.3.1) and subnet mask (32 or 255.255.255.255) for DCC port. Enable TCP/IP on the DCC port. Enable IP tunneling. Enable Advertising of its own local entry. Ensure that TAP advertising and learning is enabled.

Use the following routing information at the PC-CIT to provision the tunnel illustrated in Example 1:

	Destination	Gateway	Interface	Comments
PC-CIT				
	220.20.2.1/24	-	lan	populated by stack
	default	220.20.2.2	lan	populated by stack

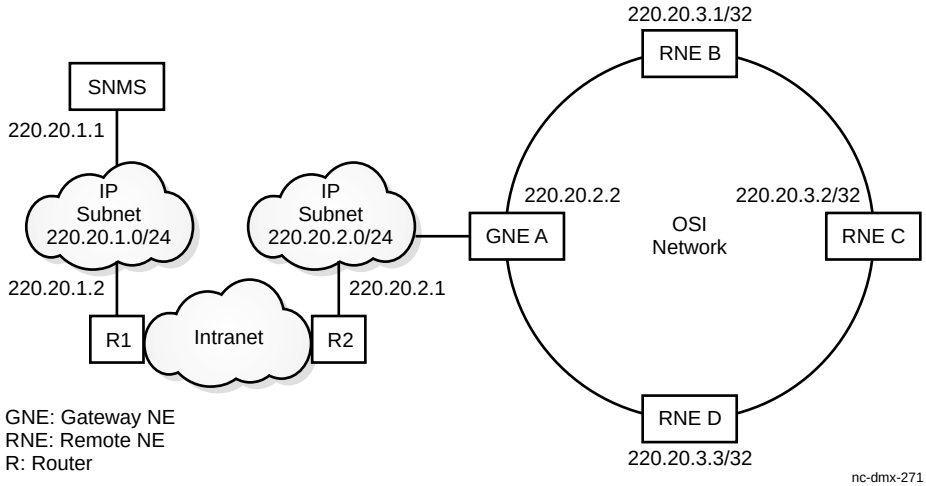
Use the following routing information at the GNE/RNE to provision the tunnel illustrated in Example 1:

	Destination	Next-Hop-Port	Next-Hop-Address	Owner	TAP-Advertisement	Cost
GNE						
	220.20.2.2/24	LAN	-	local	no	20
	220.20.2.1/24	LAN	220.20.2.1	local	yes	20
	220.20.3.1/32	CLNP_TUNNEL	<NSAP-B>	TAP	yes	20
	220.20.3.2/32	CLNP_TUNNEL	<NSAP-C>	TAP	yes	20
	220.20.3.3/32	CLNP_TUNNEL	<NSAP-D>	TAP	yes	20
RNE B						
	220.20.3.1/32	LAN	-	local	yes	20
	220.20.2.1/24	CLNP_TUNNEL	<NSAP-A>	TAP	yes	20
	220.20.3.2/32	CLNP_TUNNEL	<NSAP-C>	TAP	yes	20
	220.20.3.3/32	CLNP_TUNNEL	<NSAP-D>	TAP	yes	20

Example 2: Access over IP WAN

In this example (Figure 10-15), the GNE is accessed over the Internet Protocol Wide Area Network (IP WAN). The Subnetwork Management System (SNMS) (Navis™ Optical Element Management System) and the GNE are connected over a private internet/intranet via routers, R1 and R2.

Figure 10-15 Access over IP WAN



SNMS and router R1 are on the same subnet 220.20.1.0/24 and router R2 and GNE are on another subnet 220.20.2.0/24. ALL NEs are connected over a ring (over OSI-based DCC) and communicate using OSI and identify each other through the NSAP addresses. Here, they are standalone IP NEs but could also be connected to IP-only NEs (e.g. a case of IP Fringe discussed later).

How to Provision Example 2

Use the following information along with the Step instructions for this procedure to provision the tunnel illustrated in Example 2:

At ...	Provision ...
SNMS	Provision its own IP address (220.20.1.1) and subnet mask (24 or 255.255.255.0) Provision router, R1 with IP address 220.20.1.2 as default router
Router R1	Provision IP addresses for its all interfaces - IP address (220.20.1.2) and subnet mask (24 or 255.255.255.0) - IP address for the interface connecting to intranet and the subnet mask of the directly attached subnet - If routers don't autoshare static routes, then Provision a static route to a subnet address which can cover maximum number of RNEs e.g. 220.20.3.0/24 as destination and GNE's IP address 220.20.2.2 as next-hop-address
Router R2	Provision IP addresses for its all interfaces - IP address (220.20.2.2) and subnet mask (24 or 255.255.255.0) - IP address for the interface connecting to intranet and the subnet mask of the directly attached subnet Provision a static route to a subnet address which can cover maximum number of RNEs e.g. 220.20.3.0/24 as destination and GNE's IP address 220.20.2.2 as next-hop-address
GNE	Provision its own IP address (220.20.2.2) and subnet mask (24 or 255.255.255.0) for rear LAN port. Enable TCP/IP on the rear LAN port. Enable IP tunneling. Provision R2 as default router with IP address 220.20.2.1 Provision manual tunnel/route to SNMS which it would advertise within its own area. The manual route would have SNMS IP address 220.20.1.1/32 as destination and router R2's IP address 220.20.2.1 as next-hop-address. Ensure that TAP advertising and learning is enabled.
RNE B	Provision its own IP address (220.20.3.1) and subnet mask (32 or 255.255.255.255) for DCC port. Enable TCP/IP on the DCC port. Enable IP tunneling. Enable Advertising of its own local entry Ensure that TAP advertising and learning is enabled.

Use the following routing information at the SNMS and Router to provision the tunnel illustrated in Example 2:

	Destination	Gateway	Interface	Comments
SNMS				
	220.20.1.1/24	-	lan	populated by stack
	default	220.20.1.2	lan	populated by stack
Router				
R1	220.20.1.2/24	-	lan	populated by stack
	220.20.3.0/24	220.20.2.2	lan	*1.* populated by OSPF (if static routes autoshare) *2.* manual (if static routes not autoshare e.g. in Cajun 550)
R2	220.20.2.1/24	-	lan	populated by stack
	220.20.3.0/24	220.20.2.2	lan	manual

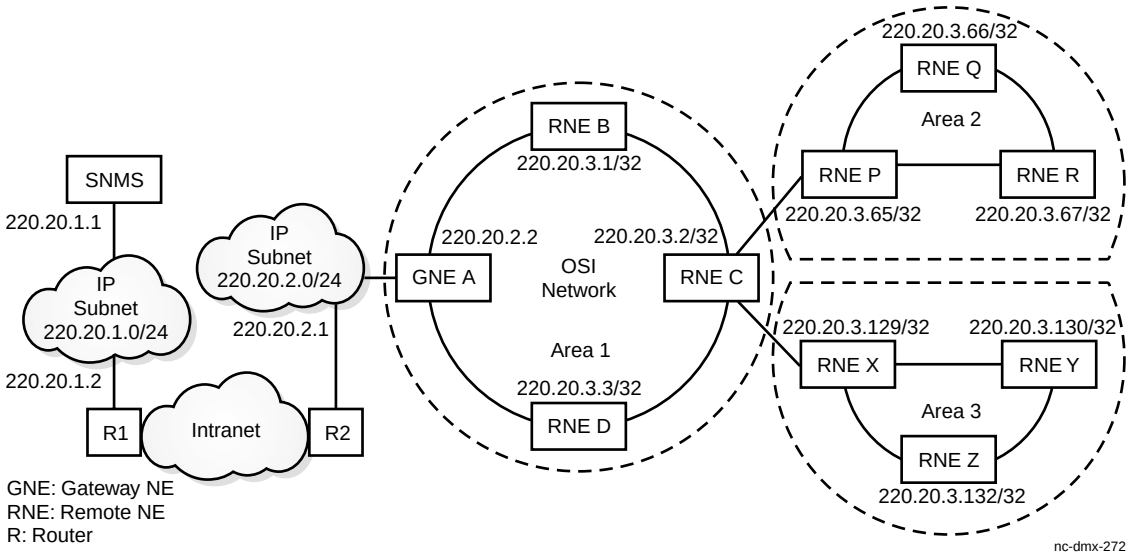
Use the following routing information at the GNE/RNE to provision the tunnel illustrated in Example 2:

	Destination	Next-Hop-Port	Next-Hop-Address	Owner	TAP-Advertisement	Cost
GNE						
	220.20.2.2/24	LAN	-	local	no	20
	default	LAN	220.20.2.1	local	no	20
	220.20.1.1/32	LAN	220.20.2.1	manual	yes	20
	220.20.3.1/32	CLNP_TUNNEL	<NSAP-B>	TAP	yes	20
	220.20.3.2/32	CLNP_TUNNEL	<NSAP-C>	TAP	yes	20
	220.20.3.3/32	CLNP_TUNNEL	<NSAP-D>	TAP	yes	20
RNE B						
	220.20.3.1/32	LAN	-	local	yes	20
	220.20.1.1/32	CLNP_TUNNEL	<NSAP-A>	TAP	yes	20
	220.20.3.2/32	CLNP_TUNNEL	<NSAP-C>	TAP	yes	20
	220.20.3.3/32	CLNP_TUNNEL	<NSAP-D>	TAP	yes	20

Example 3: Multi-Area Operations

In this example (Figure 10-16), an extension to Example 3, we have added other NEs that are deployed in different areas (1, 2, and 3). RNE C, P, and X are level-2 routers which enable communications across areas. But the manual tunnel to SNMS provisioned at GNE wouldn't be advertised by RNE C to other areas. This requires establishing manual tunnel across areas which are then advertised by Level 2 routers within their areas. Each area can be represented by a single subnet. This also requires adding static entries to each subnet in Router R2.

Figure 10-16 Multi-Area Operations



Careful planning and design of subnet addresses for these areas could reduce the number of static entries required at Router R2.

How to Provision Example 3

Use the following information along with the Step instructions for this procedure to provision the tunnel illustrated in Example 3:

At ...	Provision ...
SNMS	Provision its own IP address (220.20.1.1) and subnet mask (24 or 255.255.255.0) Provision router, R1 with IP address 220.20.1.2 as default router
Router R1	Provision IP addresses for its all interfaces - IP address (220.20.1.2) and subnet mask (24 or 255.255.255.0) - IP address for the interface connecting to intranet and the subnet mask of the directly attached subnet - If routers don't autoshare static routes, then Provision a static route to a subnet address which can cover maximum number of RNEs e.g. 220.20.3.0/24 as destination covers subnets 220.20.3.0/26, 220.20.3.64/26 and 220.20.3.128/26. The GNE's IP address 220.20.2.2 as next-hop-address
Router R2	Provision IP addresses for its all interfaces - IP address (220.20.2.2) and subnet mask (24 or 255.255.255.0) - IP address for the interface connecting to intranet and the subnet mask of the directly attached subnet Provision a static route to a subnet address which can cover maximum number of RNEs e.g. 220.20.3.0/24 as destination covers subnets 220.20.3.0/26, 220.20.3.64/26 and 220.20.3.128/26. The GNE's IP address 220.20.2.2 as next-hop-address
GNE	Provision its own IP address (220.20.2.2) and subnet mask (24 or 255.255.255.0) for rear LAN port. Enable TCP/IP on the rear LAN port. Enable IP tunneling. Provision R2 as default router with IP address 220.20.2.1 Provision manual tunnel/route to SNMS which it would advertise within its own area. The manual route would have SNMS IP address 220.20.1.1/32 as destination and router R2's IP address 220.20.2.1 as next-hop-address. Ensure that TAP advertising and learning is enabled. Provision manual tunnel/route for two areas with RNE P's and RNE X's IP addresses (220.20.3.65/26 and 220.20.3.129/26) as destination and their respective NSAP addresses as the next hop address. No need to advertise this entry. (In case, any area can't be covered with one subnet, more than one tunnel might have to be added)
RNE C	Provision its own IP address (220.20.3.2) and subnet mask (32 or 255.255.255.255) for DCC port. Enable TCP/IP on the DCC port. Enable IP tunneling. Enable Advertising of its own local entry. Ensure that TAP advertising and learning is enabled.
RNE P	Provision its own IP address (220.20.3.65) and subnet mask (32 or 255.255.255.255) for DCC port. Enable TCP/IP on the DCC port. Enable IP tunneling. Enable Advertising of its own local entry. Ensure that TAP advertising and learning is enabled. Provision manual tunnel/route to GNE which it would advertise within its own area. The manual route would have SNMS IP address 220.20.1.1/32 as destination and GNE's NSAP address as the next-hop address. Set advertise enable for this entry.

At ...	Provision ...
RNE X	Provision its own IP address (220.20.3.129) and subnet mask (32 or 255.255.255.255) for DCC port. Enable TCP/IP on the DCC port. Enable IP tunneling. Enable Advertising of its own local entry. Ensure that TAP advertising and learning is enabled. Provision manual tunnel/route to GNE which it would advertise within its own area. The manual route would have SNMS IP address 220.20.1.1/32 as destination and GNE's NSAP address as the next-hop address. Set advertise enable for this entry.
RNE R	Provision its own IP address (220.20.3.67) and subnet mask (32 or 255.255.255.255) for DCC port. Enable TCP/IP on the DCC port. Enable IP tunneling. Enable Advertising of its own local entry. Ensure that TAP advertising and learning is enabled.

Use the following routing information at the SNMS and NE (GNE/RNE) to provision the tunnel illustrated in Example 3:

	Destination	Gateway	Interface	Comments
SNMS				
	220.20.1.1/24	-	lan	populated by stack
	default	220.20.1.2	lan	populated by stack
Router				
R1	220.20.1.2/24	-	lan	populated by stack
	220.20.3.0/24	220.20.2.2	lan	*1.* populated by OSPF (if static routes autoshare) *2.* manual (if static routes not autoshare e.g. in Cajun 550)
R2	220.20.2.1/24	-	lan	populated by stack
	220.20.3.0/24	220.20.2.2	lan	manual

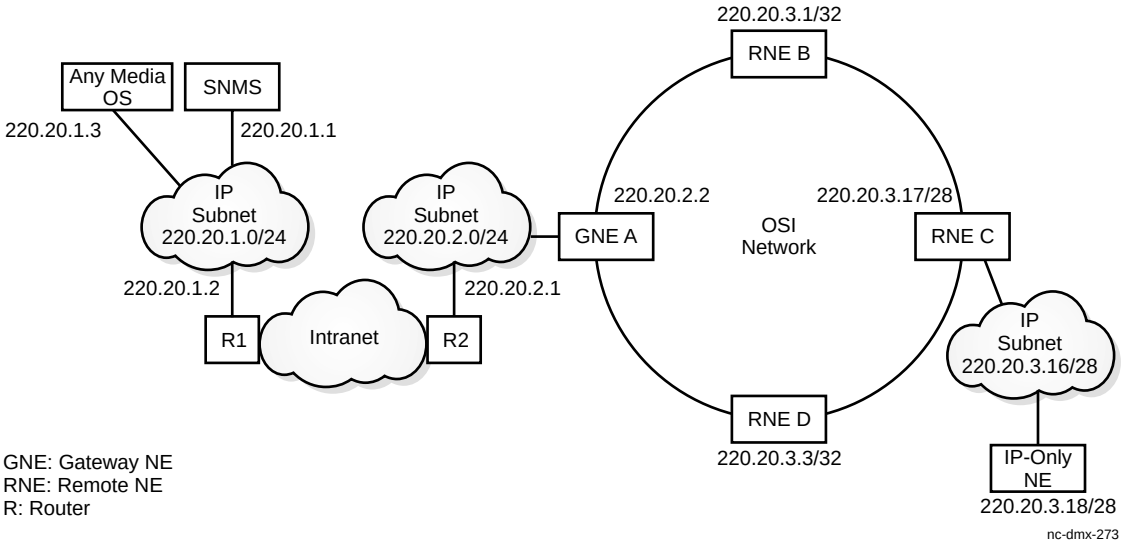
Use the following routing information at the GNE/RNE to provision the tunnel illustrated in Example 3:

	Destination	Next-Hop-Port	Next-Hop-Address	Owner	TAP-Advertisement	Cost
GNE						
	220.20.2.2/24	LAN	-	local	no	20
	default	LAN	220.20.2.1	local	no	20
	220.20.1.1/32	LAN	220.20.2.1	manual	yes	20
	220.20.3.65/32	CLNP_TUNNEL	<NSAP-P>	manual	no	20
	220.20.3.129/32	CLNP_TUNNEL	<NSAP-X>	manual	no	20
	220.20.3.1/32	CLNP_TUNNEL	<NSAP-B>	TAP	yes	20
	220.20.3.2/32	CLNP_TUNNEL	<NSAP-C>	TAP	yes	20
	220.20.3.3/32	CLNP_TUNNEL	<NSAP-D>	TAP	yes	20
RNE C						
	220.20.3.2/32	LAN	-	local	yes	20
	220.20.1.1/32	CLNP_TUNNEL	<NSAP-A>	TAP	yes	20
	220.20.3.1/32	CLNP_TUNNEL	<NSAP-B>	TAP	yes	20
	220.20.3.3/32	CLNP_TUNNEL	<NSAP-D>	TAP	yes	20
RNE P						
	220.20.3.65/32	LAN	-	local	yes	20
	220.20.1.1/32	CLNP_TUNNEL	<NSAP-A>	manual	yes	20
	220.20.3.66/32	CLNP_TUNNEL	<NSAP-Q>	TAP	yes	20
	220.20.3.67/32	CLNP_TUNNEL	<NSAP-R>	TAP	yes	20
RNE X						
	220.20.3.129/32	LAN	-	local	yes	20
	220.20.1.1/32	CLNP_TUNNEL	<NSAP-A>	manual	yes	20
	220.20.3.130/32	CLNP_TUNNEL	<NSAP-Y>	TAP	yes	20
	220.20.3.131/32	CLNP_TUNNEL	<NSAP-Z>	TAP	yes	20
RNE R						
	220.20.3.67/32	LAN	-	local	yes	20
	220.20.1.1/32	CLNP_TUNNEL	<NSAP-A>	TAPl	yes	20
	220.20.3.65/32	CLNP_TUNNEL	<NSAP-P>	TAP	yes	20
	220.20.3.66/32	CLNP_TUNNEL	<NSAP-Q>	TAP	yes	20

Example 4: IP NEs on the Fringe

In this example (Figure 10-17), another extension of Example 2, IP Tunneling is used to reach the IP-only NEs on the fringe of the OSI network, allowing termination of an IP connection at the IP-only host connected to RNE C on the same IP subnet. It can also be reached via additional routers).

Figure 10-17 IP NEs on the Fringe



The RNE C is connected via its LAN port and is given a real IP address 220.20.3.17 (rather 220.20.3.2) which belongs to the subnet 220.20.3.16/28. The RNE C is still reachable via the IP address 220.20.3.0/24 provisioned at Router R1 as destination for the entire OSI subnet.

This also requires manual provisioning of the route to AnyMedia OS at the GNE and RNE C being provisioned as default router at the IP-only NE.

How to Provision Example 4

Use the following information along with the Step instructions for this procedure to provision the tunnel illustrated in Example 4:

At ...	Provision ...
SNMS	Provision its own IP address (220.20.1.1) and subnet mask (24 or 255.255.255.0) Provision router, R1 with IP address 220.20.1.2 as default router
AnyMedia OS	Provision its own IP address (220.20.1.3) and subnet mask (24 or 255.255.255.0) Provision router, R1 with IP address 220.20.1.2 as default router
Router R1	Provision IP addresses for its all interfaces - IP address (220.20.1.2) and subnet mask (24 or 255.255.255.0) - IP address for the interface connecting to intranet and the subnet mask of the directly attached subnet - If routers don't autoshare static routes, then Provision a static route to a subnet address which can cover maximum number of RNEs e.g. 220.20.3.0/24 as destination and GNE's IP address 220.20.2.2 as next-hop-address.
Router R2	Provision IP addresses for its all interfaces - IP address (220.20.2.2) and subnet mask (24 or 255.255.255.0) - IP address for the interface connecting to intranet and the subnet mask of the directly attached subnet Provision a static route to a subnet address which can cover maximum number of RNEs e.g. 220.20.3.0/24 as destination and GNE's IP address 220.20.2.2 as next-hop-address.
GNE	Provision its own IP address (220.20.2.2) and subnet mask (24 or 255.255.255.0) for rear LAN port. Enable TCP/IP on the rear LAN port. Enable IP tunneling. Provision R2 as default router with IP address 220.20.2.1 Provision manual tunnel/route to SNMS which it would advertise within its own area. The manual route would have SNMS IP address 220.20.1.1/32 as destination and router R2's IP address 220.20.2.1 as next-hop-address Ensure that TAP advertising and learning is enabled. Provision a manual tunnel/route to AnyMedia OS similar to SNMS and IP address of AnyMedia OS, 220.20.1.3/24
RNE C	Provision its own IP address (220.20.3.17) and subnet mask (28 or 255.255.255.240) for LAN port. Enable TCP/IP on the LAN port. Enable IP tunneling. Enable Advertising of its own local entry. Ensure that TAP advertising and learning is enabled.
IP-only NE	Provision its own IP address (220.20.3.18) and subnet mask (28 or 255.255.255.240) Provision RNE C as its default router with IP address (220.20.3.17)

Use the following routing information at the SNMS and NE (GNE/RNE) to provision the tunnel illustrated in Example 4:

	Destination	Gateway	Interface	Comments
SNMS				
	220.20.1.1/24	-	lan	populated by stack
	default	220.20.1.2	lan	populated by stack
Router				
R1	220.20.1.2/24	-	lan	populated by stack
	220.20.3.0/24	220.20.2.2	lan	*1.* populated by OSPF (if static routes autoshare) *2.* manual (if static routes not autoshare e.g. in Cajun 550)
R2	220.20.2.1/24	-	lan	populated by stack
	220.20.3.0/24	220.20.2.2	lan	manual

Use the following routing information at the AnyMedia OS to provision the tunnel illustrated in Example 4:

	Destination	Gateway	Interface	Comments
AnyMedia OS				
	220.20.3.1/24	-	lan	populated by stack
	default	220.20.1.2	lan	populated by stack

Use the following routing information at the IP-only NE to provision the tunnel illustrated in Example 4:

	Destination	Next-Hop-Port	Next-Hop-Address	Owner	TAP-Advertisement	Cost
GNE						
	220.20.2.2/24	LAN	-	local	no	20
	default	LAN	220.20.2.1	local	no	20
	220.20.1.1/32	LAN	220.20.2.1	manual	yes	20
	220.20.1.3/32	LAN	220.20.2.1	manual	yes	20
	220.20.3.1/32	CLNP_TUNNEL	<NSAP-B>	TAP	yes	20
	220.20.3.2/32	CLNP_TUNNEL	<NSAP-C>	TAP	yes	20
	220.20.3.3/32	CLNP_TUNNEL	<NSAP-D>	TAP	yes	20
RNE C						
	220.20.3.17/28	LAN	-	local	yes	20
	220.20.3.18/28	LAN	-	local	no	20
	220.20.1.1/32	CLNP_TUNNEL	<NSAP-A>	TAP	yes	20
	220.20.3.1/32	CLNP_TUNNEL	<NSAP-B>	TAP	yes	20
	220.20.3.3/32	CLNP_TUNNEL	<NSAP-D>	TAP	yes	20

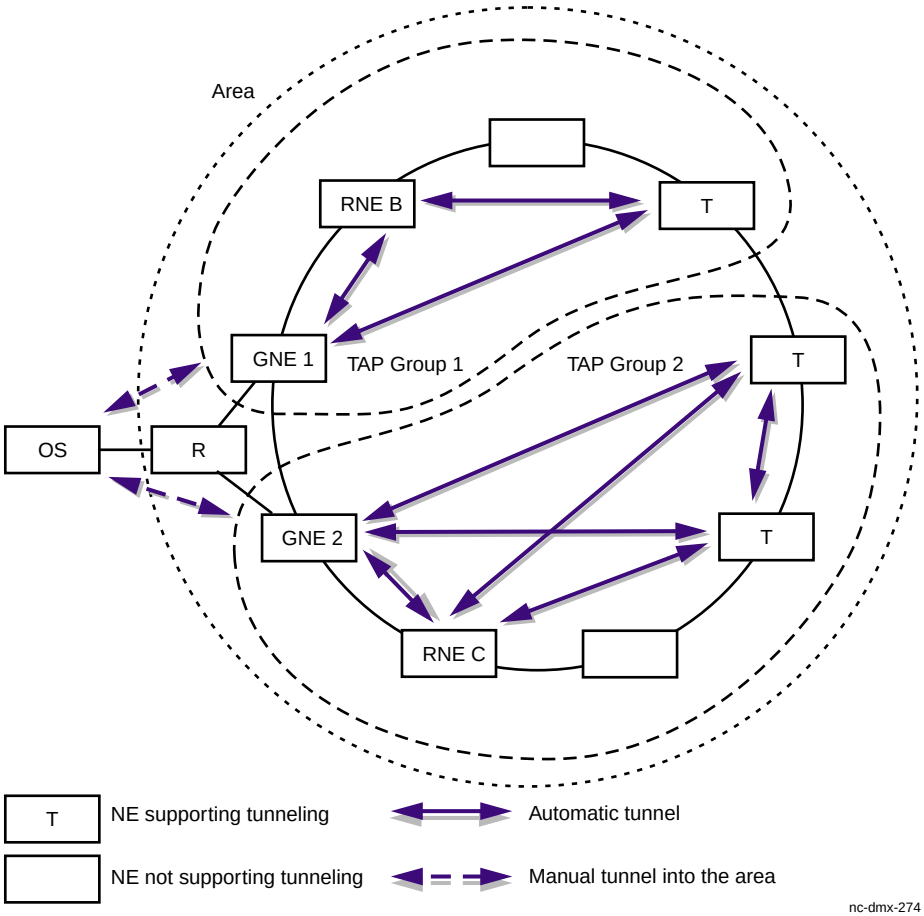
Use the following routing information at the IP-Only NE to provision the tunnel illustrated in Example 4:

	Destination	Gateway	Interface	Comments
IP-Only NE				
	220.20.3.18/28	-	lan	populated by stack
	default	220.20.3.17	lan	populated by stack

Example 5: Multiple GNEs Scenario

In this example (Figure 10-18), a single area has many NEs and if IP Tunneling is provisioned, the Tunnel Auto Provisioning (TAP) advertisement that would be exchanged would be significantly high and lot of such traffic would pass through GNE.

Figure 10-18 Multiple GNEs Scenario



To avoid the overloading on the network and particularly on GNE, TAP Groups are defined. With this, TAP enabled NEs wouldn't listen to the advertisements from NEs outside their TAP groups and thus don't form tunnels with them or through them.

Setting up TAP groups necessitates two GNEs, each with one manual route entry to OS and advertise in their respective TAP groups.

How to Provision Example 5

Use the following information along with the Step instructions for this procedure to provision the tunnel illustrated in Example 5:

At ...	Provision ...
OS	Provision its own IP address and subnet mask . Provision router as default router.
Router	Provision IP addresses for all interfaces. Provision 2 static routes (one to GNE 1 and one to GNE 2).
GNE 1	Provision its own IP address and subnet mask for rear LAN port. Enable TCP/IP on the rear LAN port. Enable IP tunneling. Provision default router . Provision manual route entry to OS with TAP Group 1. Ensure that TAP advertising and learning is enabled.
GNE 2	Provision its own IP address and subnet mask for rear LAN port. Enable TCP/IP on the rear LAN port. Enable IP tunneling. Provision default router . Provision manual route entry to OS with TAP Group 2. Ensure that TAP advertising and learning is enabled.
RNE B	Provision its own IP address and subnet mask for DCC port. Enable TCP/IP on the DCC port. Enable IP tunneling. Enable Advertising of its own local entry. Ensure that TAP advertising and learning is enabled for TAP Group 1.
RNE C	Provision its own IP address and subnet mask for DCC port. Enable TCP/IP on the DCC port. Enable IP tunneling. Enable Advertising of its own local entry Ensure that TAP advertising and learning is enabled for TAP Group 2.

Before you begin

Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the OS/FTP server, gateway network element, and remote network element.
- Verify that the work instructions specify the required provisioning at each network element (for example, IP addresses and subnet masks).
- If the FTP server is a local PC (WaveStar® CIT), verify that the PC's IP address and Subnet Mask parameters are provisioned and that a static route on the PC connects it to the remote NEs.
- If the FTP server is a remote OS, verify that the remote OS' IP address and Subnet Mask parameters are provisioned *and if* the remote OS and GNE are in different subnetworks, verify that the Default Router IP address is provisioned.

Task

Complete the following steps to add an IP tunnel(s) through the data communications channel (DCC) OSI-based network:

1 If the FTP server is a local PC, a static route on the PC must provide a path to the remote NEs. If packets are intended for the remote NE, then you must route to the gateway NE.

If the FTP server is a remote operations system, the static route must be entered on the router.

Example: If the FTP server is a local PC, from the MS-DOS prompt, enter **route add 120.20.20.0 MASK 255.255.255.0 120.20.30.1** . In this example 120.20.20.0 is the subnetwork address of the remote NE and 120.20.30.1 is the IP address of the gateway NE. The Subnet Mask of the Server and the Gateway is 255.255.255.0 while the Subnet Mask of the Remote NEs is 255.255.255.255.

2 If the remote OS and GNE are in different subnetworks, verify that the router in each subnetwork has IP addresses provisioned for all interfaces and that the static route, as described in Step 1, has been provisioned on the router.

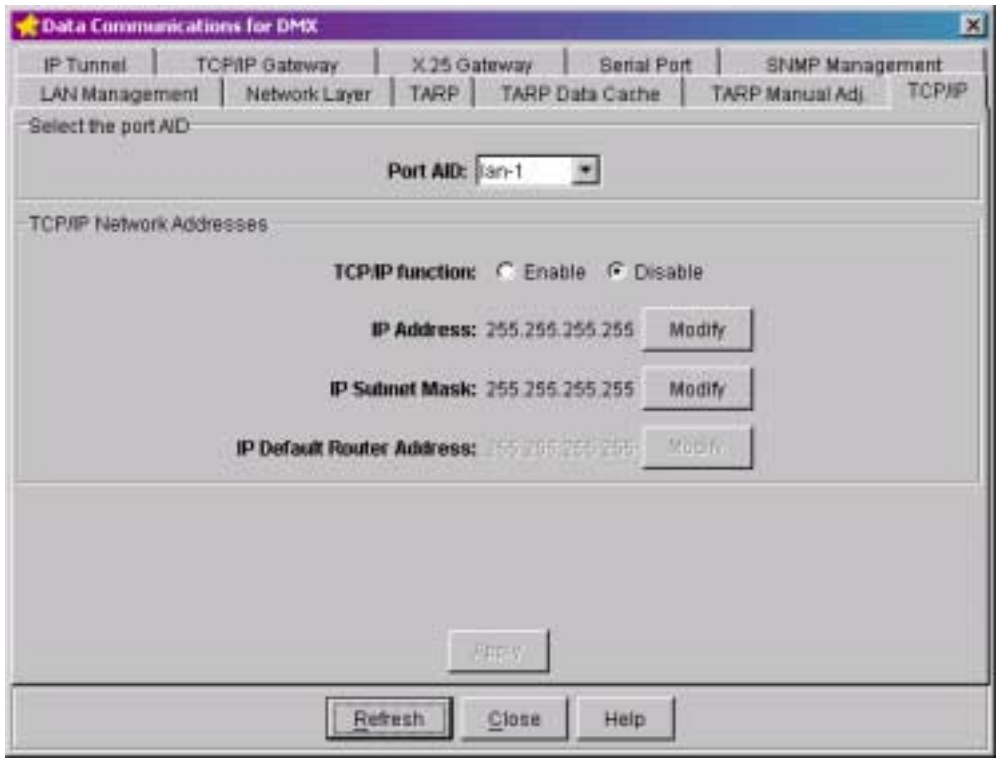
3 Establish a login session to the GNE.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

4 At the GNE:

1. From the **System View**, select **Administration>Data Communications...** The Data Communications screen appears.
2. Click on the **TCP/IP** tab.

   The following screen appears:



3. Click on the **Port AID:** drop-down menu and select *LAN-1* or *LAN-2* according to the work instructions.
4. *Enable* the **TCP/IP function**, and provision the **IP Address** and **IP Subnet Mask** parameters according to the work instructions.
5. If the remote OS and GNE are in different subnetworks, provision the **IP Default Router Address** parameter according to the work instructions.

6. Click on **Apply**. A dialog box appears stating that executing this command resets the network element. Click on **Yes** and the WaveStar® CIT disconnects from the network element.

   Important! Following a Metropolis® DMX system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). If automatic synchronization is unsuccessful, the date and time must be reset manually.

   Reference: "Task 354: Set Date and Time" (10-571).

. . . . . .

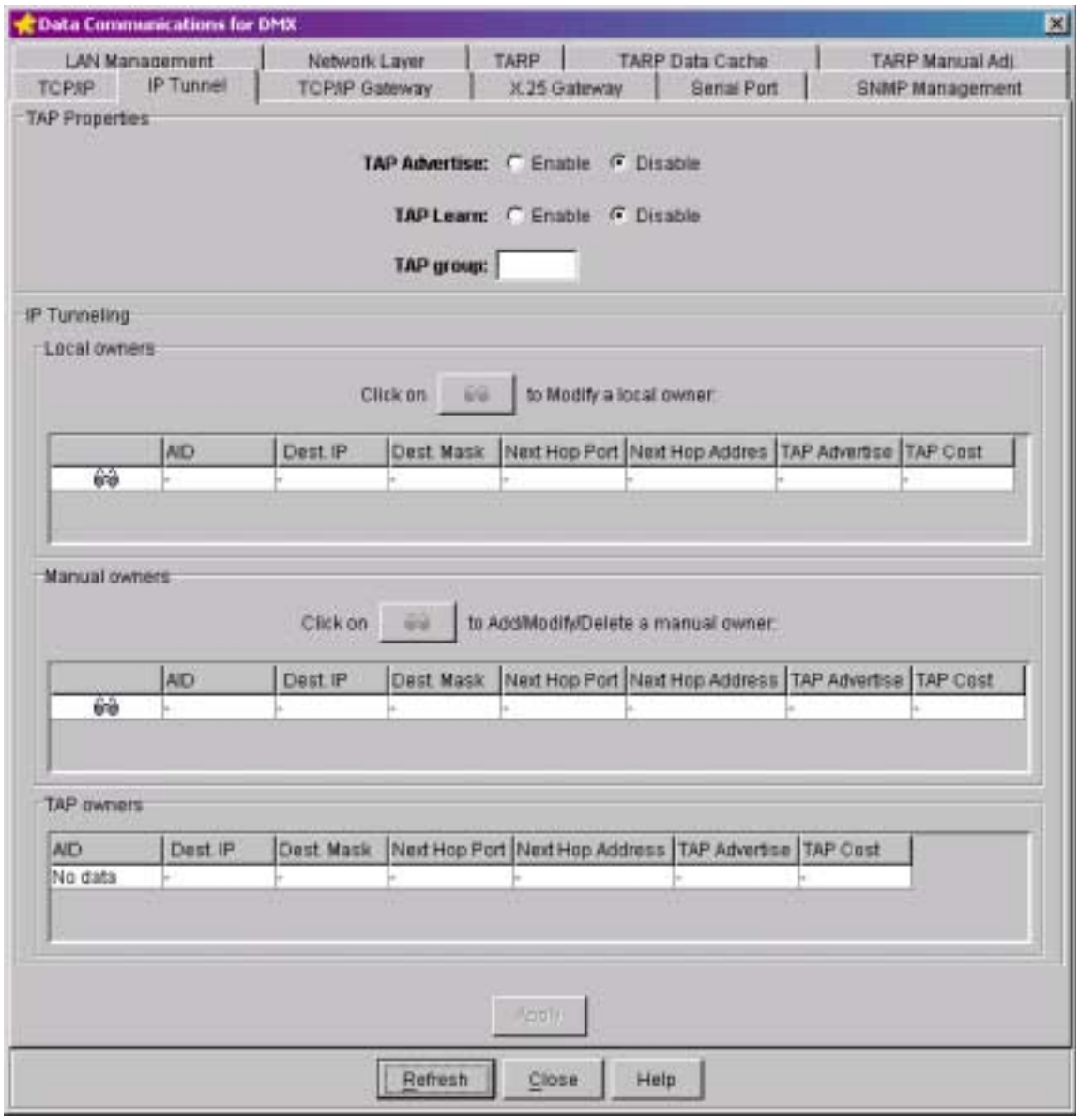
5 Re-establish the log in session to the GNE.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

6 At the GNE:

1. From **System View**, select **Administration>Data Communications...** The Data Communications screen appears.
2. Click on the **IP Tunnel** tab.

   The following screen appears:



3. Enable the **TAP Advertise** and **TAP Learn** parameters. Then provision the **TAP Group** parameter according to the work instructions and click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**.

. . . . . .

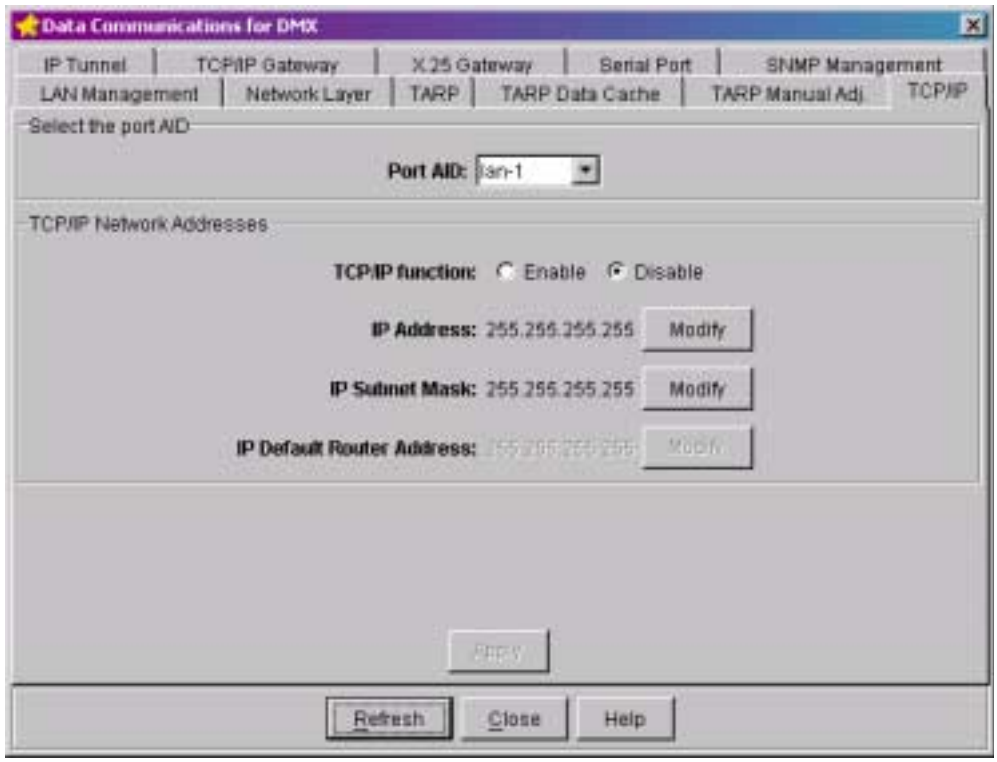
7 Log out of the GNE and log in to the remote NE.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

8 At the RNE:

1. From the **System View**, select **Administration>Data Communications...** The *Data Communications* screen appears.
2. Click on the **TCP/IP** tab.

   The following screen appears:



3. Click on the **Port AID:** drop-down menu and select the IP Tunnel.
4. Enable **IP Tunneling** parameter.
5. Provision the **IP Address** and **IP Subnet Mask** parameters according to the work instructions and click on **Apply**. A dialog box appears stating that executing this command resets the network element. Click on **Yes** and the WaveStar® CIT disconnects from the network element.

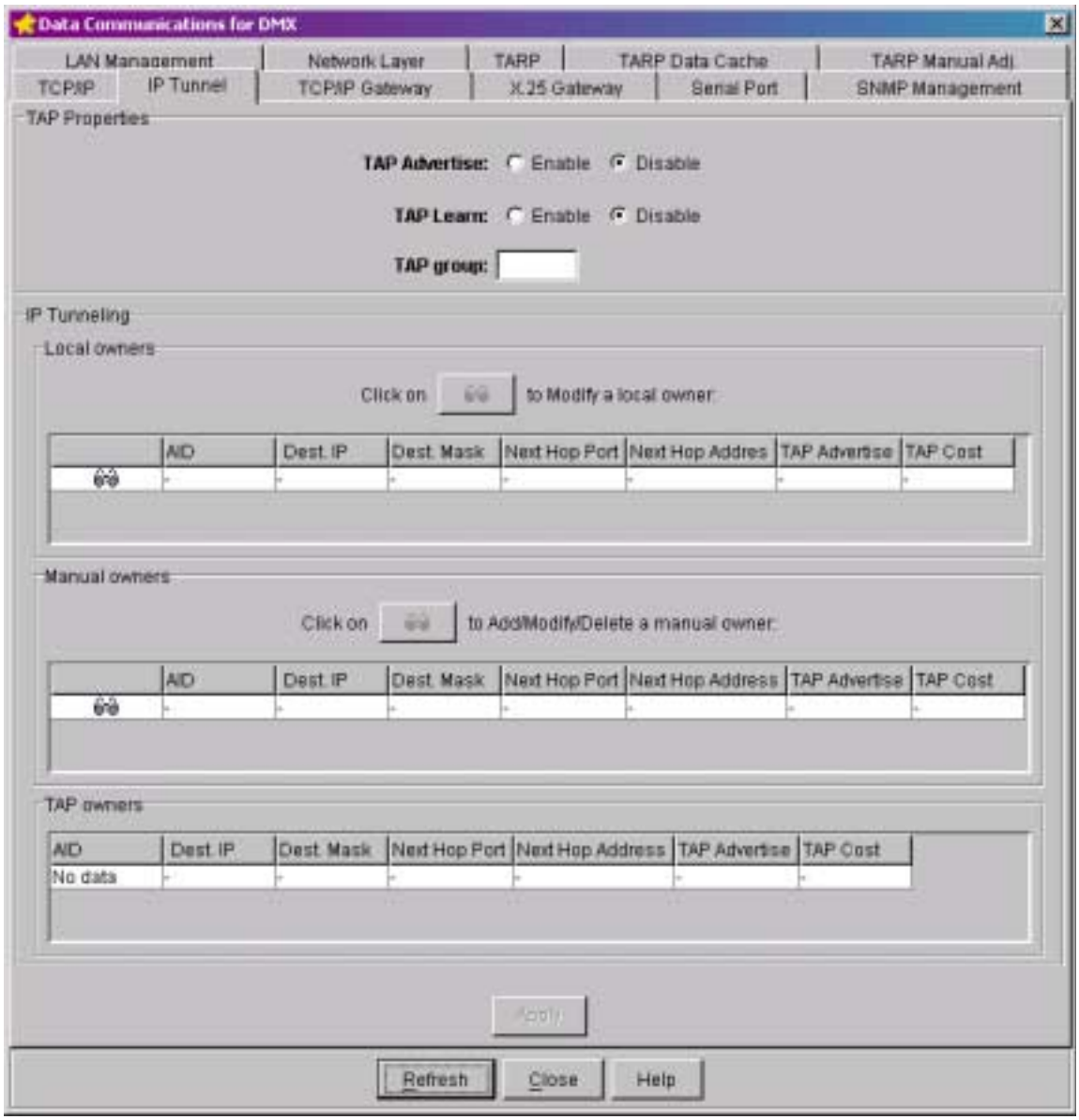
9 Re-establish the log in session to the RNE.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

10 At the RNE:

1. From the **System View**, select **Administration>Data Communications...** The *Data Communications* screen appears.
2. Click on the **IP Tunnel** tab.

   The following screen appears:



3. Enable the **TAP Advertise** and **TAP Learn** parameters. Then provision the **TAP Group** parameter according to the work instructions and click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**.

11 If required, repeat Step 7 through Step 10 at other RNEs.

END OF STEPS

Task 324: Provision/Enable/Disable TCP/IP on an IAO LAN Port

Purpose

Use this task to provision, enable, or disable TCP/IP on an IAO LAN Port.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Know which LAN port is being provisioned.
- Obtain the IP Address and IP Subnet Mask of the desired LAN port and the IP Default Router Address if you are connecting to a router.
- Be able to log in to a Metropolis® DMX with the WaveStar® CIT and be familiar with the functions of the WaveStar® CIT.

Task Perform the following steps to complete this task.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX being provisioned.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Determine which IAO LAN port(s) you want to use (front or rear).

Important! If you are using the rear IAO LAN port, use lan-2 as your AID. If you are using the front IAO LAN port, use lan-1 as your AID.

3 From the **System View** menu, select **Administration > Data Communications**.

Result: The **Data Communications** window opens.

4 In the **Data Communications** window, click on the **TCP/IP** tab at the top of the window.

Result: The TCP/IP parameters display.

5 Select and/or modify the following parameters:

1. Select the **Port Aid: (lan-1** [front] or **lan-2** [rear]) being provisioned.
2. One at a time, click the **Modify** button to set the **IP Address** and **IP Subnet Mask** of the desired LAN port and the **IP Default Router Address**, if you are connecting to a default router.

   When the provisioning window opens for the IP address being provisioned, enter the IP address as four dot-separated decimal numbers ranging from 0 to 255. Click **OK** to make your changes or **Cancel** to quit.
3. Select **Enable** to enable the **TCP/IP function**, or **Disable** to disable the **TCP/IP function**.

Important! If you enter duplicate IP addresses and/or IP subnet addresses, a warning appears: **Input, Data Not Valid, each IAO LAN port must have a unique IP subnet mask.** Scroll through the Port AID drop-down menu and identify the duplication, then assign correct addresses as necessary.

Important! If you select **Enable** and click **OK** to apply any changes, then execute the command when requested, the system will reset and you will be logged off the system. Selecting **Disable** allows you to stay logged on to the system to perform more provisioning. You can then come back to this window and enable the TCP/IP function.

Important! Following a Metropolis® DMX system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). If automatic synchronization is unsuccessful, the date and time must be reset manually.

Reference: "Task 354: Set Date and Time" (10-571).

6 Click **Apply** at the bottom of the window to make your changes.

Result: A warning window opens and asks if you want to execute this command.

7 Click **Yes** to execute the command.

Result: If you made changes and also enabled the TCP/IP function, the changes are applied, the system resets, and you are logged off the system. If you made changes and disabled the TCP/IP function, the changes are applied and you are still logged on to the system.

8 Click **Close** when you want to exit window if you are still logged into the system.

END OF STEPS

Task 325: Provision/Enable/Disable the Metropolis® DMX Access Multiplexer as a TL1 TCP/IP GNE

Purpose

Use this task to provision, enable, or disable the Metropolis® DMX as a TL1 TCP/IP GNE.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Complete "Task 324: Provision/Enable/Disable TCP/IP on an IAO LAN Port" (10-205) to provision and enable TCP/IP for the selected LAN port.
- Know which LAN port is being provisioned.
- Know the IP calling addresses, host names, and host types for the gateway hosts which will be allowed access to the Metropolis® DMX TL1 TCP/IP GNE.
- Be able to log in to a Metropolis® DMX with the WaveStar® CIT and be familiar with the functions of the WaveStar® CIT.

Task

Complete the following steps.

. . . . . .

1 Use the WaveStar® CIT to log in to the Metropolis® DMX TL1 TCP/IP GNE to be modified, enabled or disabled.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 On the **System View** menu, select **Administration > Data Communications**.

Result: The **Data Communications** window opens.

. . . . . .

3 In the Data Communications window, click on the **TCP/IP** tab at the top of the window.

Result: The TCP/IP parameters display.

. . . . . .

4 Verify that TCP/IP is properly provisioned and enabled for the required LAN port(s).

Reference: "Task 324: Provision/Enable/Disable TCP/IP on an IAO LAN Port" (10-205)

5 In the Data Communications window, click on the **TCP/IP Gateway** tab at the top of the window.

Result: The TCP/IP Gateway parameters display.

6 From your work instructions, determine which IP calling addresses will be allowed to access the Metropolis® DMX TL1 TCP/IP GNE.

7 Use the instructions on the screen to add, modify, or delete a gateway host from the **TCP/IP Gateway Host List**.

The following parameters apply:

- The OS Host IP address which is four dot-separated decimal numbers, each ranging from 0 to 255.
- The OS Host Name which may consist of 1 to 24 alpha-numeric characters.
- The OS Type which may consist of standard types or listed as other.

Repeat this step for each of the Host IP adresses you want to authorize for access to the Metropolis® DMX TL1 TCP/IP GNE. There may up to 50 provisioned entries in the list.

8 On the Data Communications window under **TCP/IP Gateway Control**, select **Enable** to enable the TCP/IP Gateway, or select **Disable** to disable the TCP/IP Gateway.

9 Click **Apply** at the bottom of the window.

Result: A warning window opens and asks if you want to execute this command.

10 Click **Yes** to execute the command, then click **Close** to exit window, if desired.

11 Repeat this procedure for each TL1 TCP/IP GNE to be modified, enabled, or disabled.

END OF STEPS

Task 326: Make Dual-Homed Cross-Connections to a Metropolis® DMX Access Multiplexer Backbone Ring

Purpose

Use this task as an example for making cross-connections in Metropolis® DMX dual-homed ring configurations:

This procedure uses an example for DS1 type cross-connections to illustrate the steps involved in cross-connections in a dual-homed UPSR ring configuration. This same procedure could also be used to make any allowable VT, STS-1, STS-3c, STS-12c, or STS-48c cross-connection using related AIDs and the appropriate rate type in the **ent-crs-( )** command or CIT Cross Connection Wizard. See "Cross-Connection Provisioning" (5-6) in Chapter 5, "Provisioning, Security, & Administration" and Appendix E, "Allowable Cross-Connections" (E-1) for rates, types, restrictions, and allowable cross-connections.

Important! The figures used in this procedure illustrate a port application of 0X1 for Release 2 and earlier. For Release 3 and later, the 0X1 application is no longer supported. The equivalent functionality in Release 3 is supported by using a port application of UPSR and a channel application of UNSWITCHED (chappl=UNSWITCHED) in the cross-connection commands.

Although this example illustrates OC-3/12 rings dual-homing to a OC-48 UPSR ring, the same procedure applies for OC-48 subtending rings to an OC-192 UPSR.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*
- "Task 319: Establish Dual-Homed OC-3/12/48 Access via Metropolis® DMX Access Multiplexer UPSR Backbone Ring" (10-153)

Before you begin

Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Verify that the dual-homed network has been established using the procedures in "Task 319: Establish Dual-Homed OC-3/12/48 Access via Metropolis® DMX Access Multiplexer UPSR Backbone Ring" (10-153).
- Determine the cross-connection types, rates, terminating nodes, pass-through nodes, and Metropolis® DMX host nodes.
- Be able to log in to a Metropolis® DMX with the WaveStar® CIT and be familiar with the functions of the WaveStar® CIT.

Task

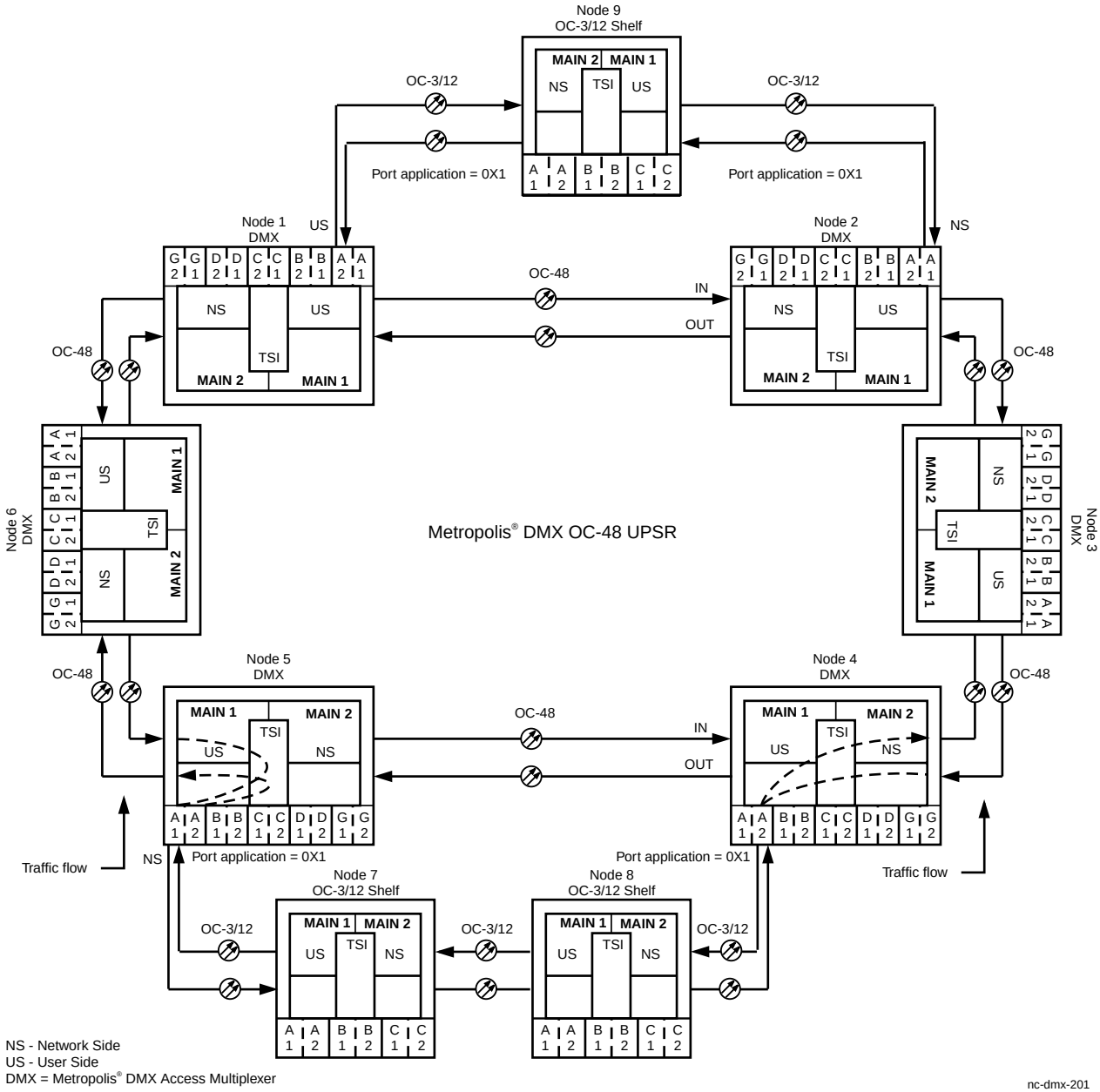
Complete the following steps to make the necessary cross-connections.

1 Use the WaveStar® CIT to log in to one of the Metropolis® DMX host nodes being used for dual homing.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Refer to Figure 10-19 for an example of a dual-homed Metropolis® DMX ring configuration. Note that this example uses an OC-48 ring as a backbone ring and OC-3/12 subtending nodes. Other applications may be at different optical rates.

Figure 10-19 Example of Metropolis® DMX Dual-Homed Ring Configuration



3 On the **System View** menu, select **Administration > OSI Routing Map** and/or **Administration > OSI Neighbor Map** to retrieve a node-to-node listing of every node on this Metropolis® DMX ring.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Routing Map" or "OSI Neighbor Map" window opens.

4 Verify that the ring configuration, Metropolis® DMX host nodes, terminating nodes, and pass-through nodes are the same as specified in the work instructions.

Important! All differences between the work instructions and the actual ring configuration must be resolved before continuing.

5 One at a time, use the WaveStar® CIT to log in to each Metropolis® DMX node. From the **System View** menu at each node, select **View > View Equipment Details**.

Result: The "View Equipment Details" window opens.

6 Find the circuit pack, port, and/or tributaries being used for this service. Select the entity to view, then click the **Select** button at the bottom of the window. View the provisioning details for the selected entity and verify the entities are properly provisioned.

7 Use product documentation for non Metropolis® DMX nodes in the network to verify proper circuit pack/port provisioning details.

8 If the entities are not provisioned properly, use the procedures in this document to provision the Metropolis® DMX circuit packs/ports for service.

9 From your work instructions, determine the type of cross-connections to be made at each node for the service being established. Figure 10-20 illustrates an example network with dual-homed cross-connections at Metropolis® DMX node 4 and node 5:

Note that in this example we use a port application of 0X1 at the host nodes and a cross-connection command of **ent-crs-vt1:tid:m-1-1-3-1:a-2-1-3-1:ctag** at the host nodes.

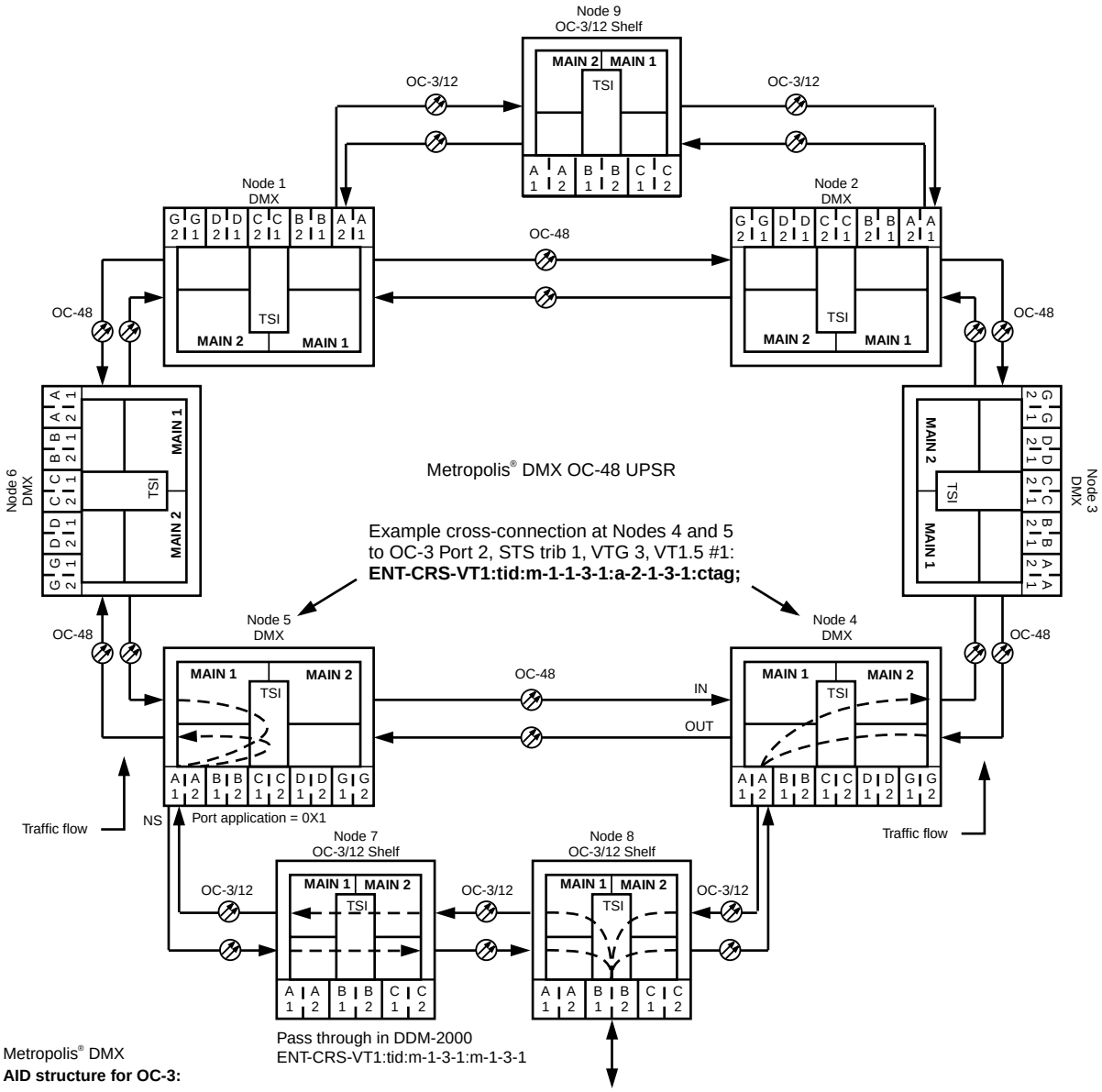
For applications in Release 3 or later using a port application of UPSR, the cross-connection command would include the cross-connection channel application parameter for this example:

ent-crs-vt1:tid:m-1-1-3-1:a-2-1-3-1:ctag:::chappl=unswitched.

Ports that connect the subtending ring to the Metropolis® DMX host nodes that are provisioned for 0x1 protection (Release 2 and earlier), or UPSR protection and the cross-connection channel application of UNSWITCHED (Release 3), transports traffic over the Metropolis® DMX UPSR without any protection switching by the Metropolis® DMX on the ring. The end-of-path NEs (Node 8 and Node 9) do the path protection switching.

Cross-connections supporting DS3 services are STS1 cross-connections. Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections. Use VT1.5 cross-connections for DS1 services if you expect to cross connect only a portion of the VT1.5 signals in the STS-1 channel. If STS1 cross-connections are made at a shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group.

Figure 10-20 Example of Metropolis® DMX Dual-Homed Cross-Connections



Metropolis® DMX

AID structure for OC-3:

Function Group	Port	STS trib	VT Group	VT1.5
{a,b,c,d,g}	{1-4}	{1-3}	{1-7,all}	{1-4,all}

AID structure for OC-12::

Function Group	Port	STS trib	VT Group	VT1.5
{a,b,c,d,g}	{1-2}	{1-12}	{1-7,all}	{1-4,all}

AID structure for OC-48 in Main:

Function Group	Port	STS trib	VT Group	VT1.5
{m}	{1}	{1-48}	{1-7,all}	{1-4,all}

AID structure for DS-1 in DDM-2000 OC-3

Function Group	Circuit Pack	Port
{a,b,c}	{1-7}	{1-4}

Example: ENT-CRS-VT1:tid:m-1-3-1,b-3-1:ctag;

DMX = Metropolis® DMX Access Multiplexer

nc-dmx-203

10 Starting at one of the "host" nodes for the circuit being established, select **View > Cross Connections** from the System View menu at each node in the ring to verify that that the cross-connections specified on the work instructions may be made. If cross-connections are already assigned or improperly assigned, refer trouble to the provisioning organization. Improperly assigned cross-connections may have to be deleted, or a different time-slot must be selected for the service being selected.

11 Select **Configuration > Cross-Connection** from the **System View** menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at all non terminating nodes in the network to provision pass-through cross-connections.

12 Use the Cross Connection Wizard at the terminating (add/drop) nodes of the circuit being established to make the terminating cross-connections. (Select **Configuration > Cross-Connection** from the **System View** menu to start the Cross Connection Wizard).

13 From the **System View** menu, select **View > Cross Connections** at each node to verify that the proper connection has been made.

14 After all cross-connections are made, click on the **Alarm List** button on the **System View** window and verify no alarms are present.

15 If *inc. STSn AIS*, *inc. STS1 unequipped*, *inc. VT AIS*, or *inc. VT unequipped* alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

END OF STEPS

Task 327: Make Single-Homed Cross-Connections to a Metropolis® DMX Access Multiplexer Backbone Ring

Purpose

Use this task as an example for making cross-connections in Metropolis® DMX single-homed ring configurations:

This procedure uses an example for DS1 type cross-connections to illustrate the steps involved in cross-connections in a single-homed UPSR ring configuration. This same procedure could also be used to make any allowable VT, STS-1, STS-3c, STS-12c, or STS-48c cross-connection using related AIDs and the appropriate rate type in the **ent-crs-( )** command or CIT Cross Connection Wizard. See "Cross-Connection Provisioning" (5-6) in Chapter 5, "Provisioning, Security, & Administration" and Appendix E, "Allowable Cross-Connections" (E-1) for rates, types, restrictions, and allowable cross-connections.

Important! The figures used in this procedure illustrate a port application of 0X1 for Release 2 and earlier. For Release 3 and later, the 0X1 application is no longer supported. The equivalent functionality in Release 3 is supported by using a port application of UPSR and a channel application of UNSWITCHED (chappl=UNSWITCHED) in the cross-connection commands.

Although this example illustrates OC-3/12 rings single-homing to a OC-48 UPSR ring, the same procedure applies for OC-48 subtending rings to an OC-192 UPSR.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*
- "Task 318: Establish Single-Homed OC-3/12/48 Access via Metropolis® DMX UPSR Backbone Ring" (10-143)

Before you begin

Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Verify that the single-homed network has been established using the procedures in "Task 318: Establish Single-Homed OC-3/12/48 Access via Metropolis® DMX UPSR Backbone Ring" (10-143).
- Determine the cross-connection types, rates, terminating nodes, and pass-through nodes.
- Be able to log in to a Metropolis® DMX with the WaveStar® CIT and be familiar with the functions of the WaveStar® CIT.

Task

Complete the following steps to make the necessary cross-connections.

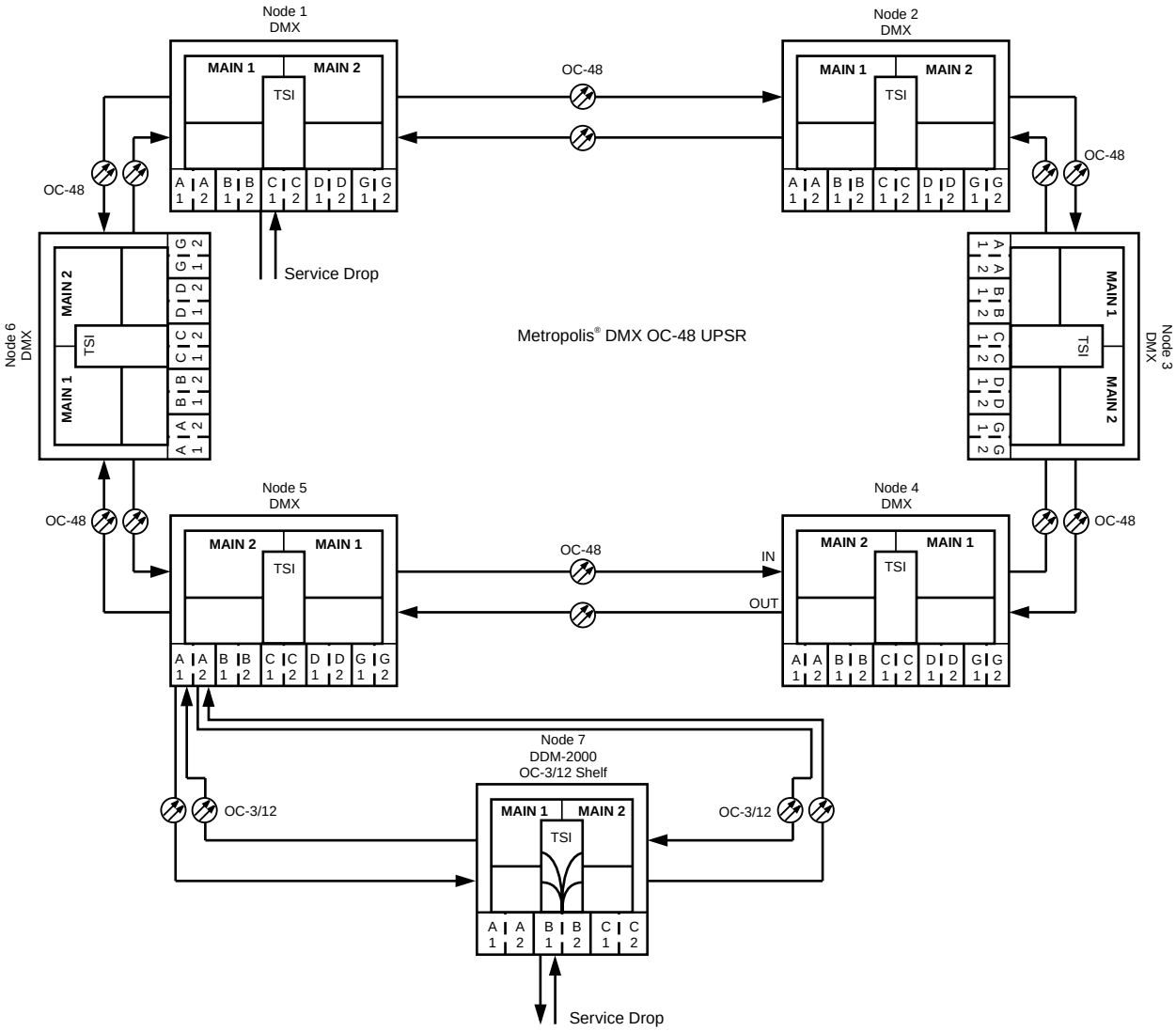
. . . . . .

1 Use the WaveStar® CIT to log in to the Metropolis® DMX host node being used for single homing.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Refer to Figure 10-21 for an example of a simple single-homed Metropolis® DMX ring configuration. Note that this example uses an OC-48 ring as a backbone ring and OC-3/12 subtending nodes. Other applications may be at different optical rates.

Figure 10-21 Example of a Single-Homed Metropolis® DMX Ring



3 On the **System View** menu, select **Administration > OSI Routing Map** and/or **Administration > OSI Neighbor Map** to retrieve a node-to-node listing of every node on this Metropolis® DMX ring.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Routing Map" or "OSI Neighbor Map" window opens.

4 Verify that the ring configuration is the same as specified in the work instructions.

Important! All differences between the work instructions and the actual ring configuration must be resolved before continuing.

5 From the work instructions, determine the terminating (add/drop) nodes and the pass-through nodes for the particular service that is being established.

6 One at a time, use the WaveStar® CIT to log in to each node. From the **System View** menu at each node, select **View > View Equipment Details**.

Result: The "View Equipment Details" window opens.

7 Find the circuit pack, port, and/or tributaries being used for this service. Select the entity to view, then click the **Select** button at the bottom of the window. View the provisioning details for the selected entity and verify the entities are properly provisioned.

8 Use product documentation for non Metropolis® DMX nodes in the network to verify proper circuit pack/port provisioning details.

9 If the entities are not provisioned properly, use the procedures in this section to condition the circuit packs/ports for service.

10 From your work instructions, determine the type of cross-connections to be made at each node for the service being established.

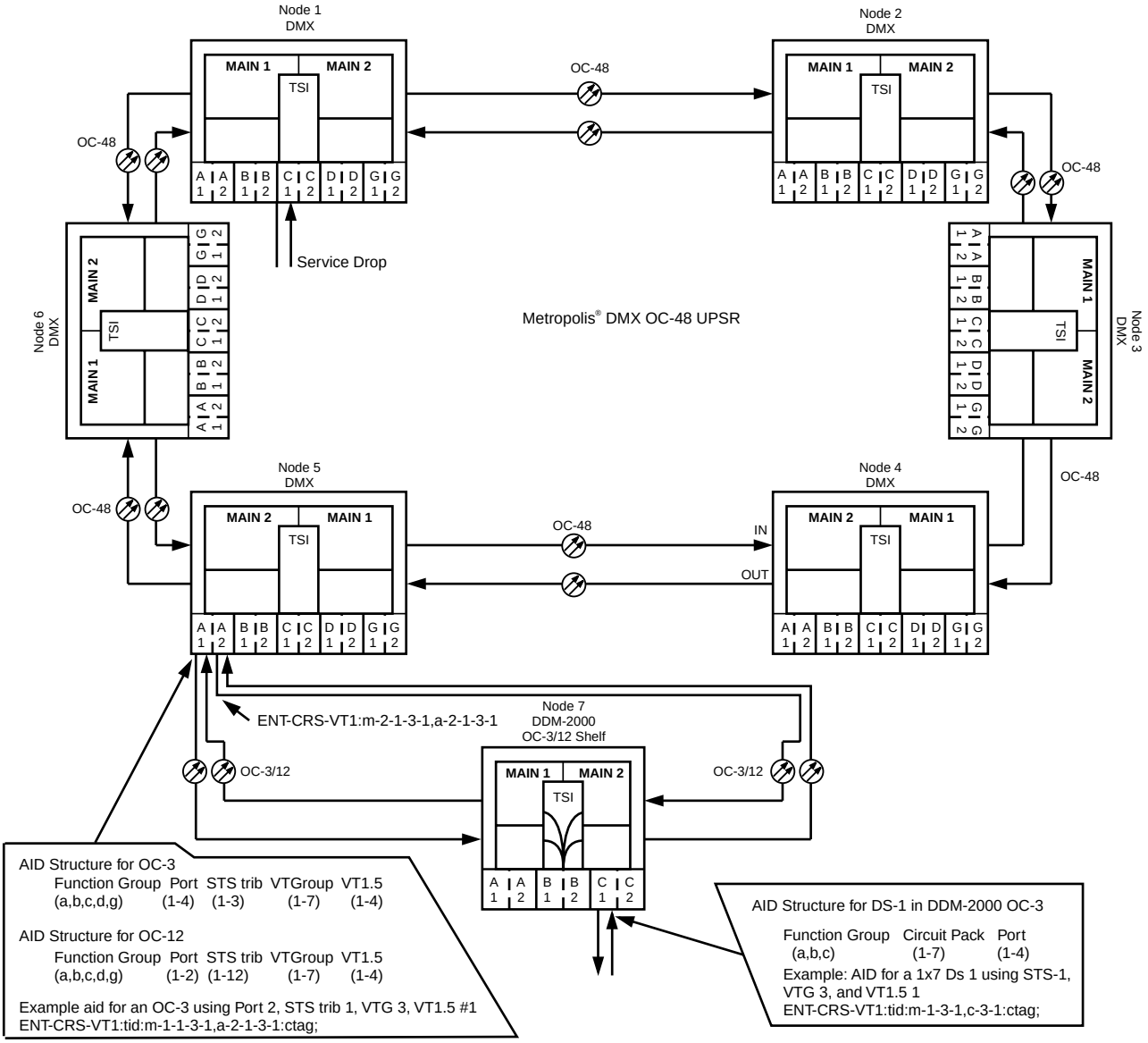
Figure 10-22 illustrates an example network with single-homed cross-connections at Metropolis® DMX node 5.

Note that in this example we use a port application of 0X1 at the host nodes and a cross-connection command of **ent-crs-vt1:tid:m-2-1-3-1:a-2-1-3-1:ctag** at the host nodes.

For applications in Release 3 or later using a port application of UPSR, the cross-connection command would include the cross-connection channel application parameter for this example: **ent-crs-vt1:tid:m-2-1-3-1:a-2-1-3-1:ctag:::chappl=unswitched.**

Ports that connect the subtending ring to the Metropolis® DMX that are provisioned for 0x1 protection (Release 2 and earlier), or UPSR protection and the cross-connection channel application of UNSWITCHED (Release 3), transport traffic over the Metropolis® DMX UPSR without any protection switching by the Metropolis® DMX on the ring. The end-of-path NEs [Node7 and Node8 (not shown)] do the path protection switching.

Figure 10-22 Example Network with Single-Homed Cross-Connections



DMX = Metropolis® DMX Access Multiplexer

nc-dmx-184

Important! Cross-connections supporting DS3 services are STS1 cross-connections. Cross-connections supporting DS1 services may be either STS1 or VT1.5 cross-connections. Use VT1.5 cross-connections for DS1 services if you expect to cross connect only a portion of the VT1.5 signals in the STS-1 channel. If STS1 cross-connections are made at a shelf, there is a fixed mapping of all 28 VT1.5 cross-connections to a specific shelf group.

. . . . . .

11 Starting at the host node for the circuit being established, select **View > Cross Connections** from the System View menu at each node in the ring to verify that that the cross-connections specified on the work instructions may be made. If cross-connections are already assigned or improperly assigned, refer trouble to the provisioning organization. Improperly assigned cross-connections may have to be deleted, or a different time-slot must be selected for the service being selected.

. . . . . .

12 Select **Configuration > Cross-Connection** from the **System View** menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at all nonterminating nodes in the network to provision pass-through cross-connections.

. . . . . .

13 Use the Cross Connection Wizard at the terminating (add/drop) nodes of the circuit being established to make the terminating cross-connections. (Select **Configuration > Cross-Connection** from the **System View** menu to start the Cross Connection Wizard).

. . . . . .

14 From the **System View** menu, select **View > Cross Connections** at each node to verify that the proper connection has been made.

. . . . . .

15 After all cross-connections are made, click on the **Alarm List** button on the **System View** window and verify no alarms are present.

16 If any alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

END OF STEPS

Task 328: Make 1+1 (Linear Extension) Cross-Connections

Purpose

Use this task to provision cross-connections at a Metropolis® DMX Access Multiplexer shelf serving as a *terminating* node for a 1+1 optical extension. See "Cross-Connection Provisioning" (5-6) in Chapter 5, "Provisioning, Security, & Administration" and Appendix E, "Allowable Cross-Connections" (E-1) for rates, types, restrictions, and allowable cross-connections.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*
- "Task 320: Establish OC-3/12/48 1+1 Linear Extension via Metropolis® DMX Backbone Ring" (10-163)

Before you begin

Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Verify that the 1+1 optical extension has been established using the procedures in "Task 320: Establish OC-3/12/48 1+1 Linear Extension via Metropolis® DMX Backbone Ring" (10-163).
- Determine the cross-connection types, rates, and terminating nodes for the optical extension.
- Be able to log in to a Metropolis® DMX with the WaveStar® CIT and be familiar with the functions of the WaveStar® CIT.

Task

Complete the following steps to make the necessary cross-connections.

. . . . . .

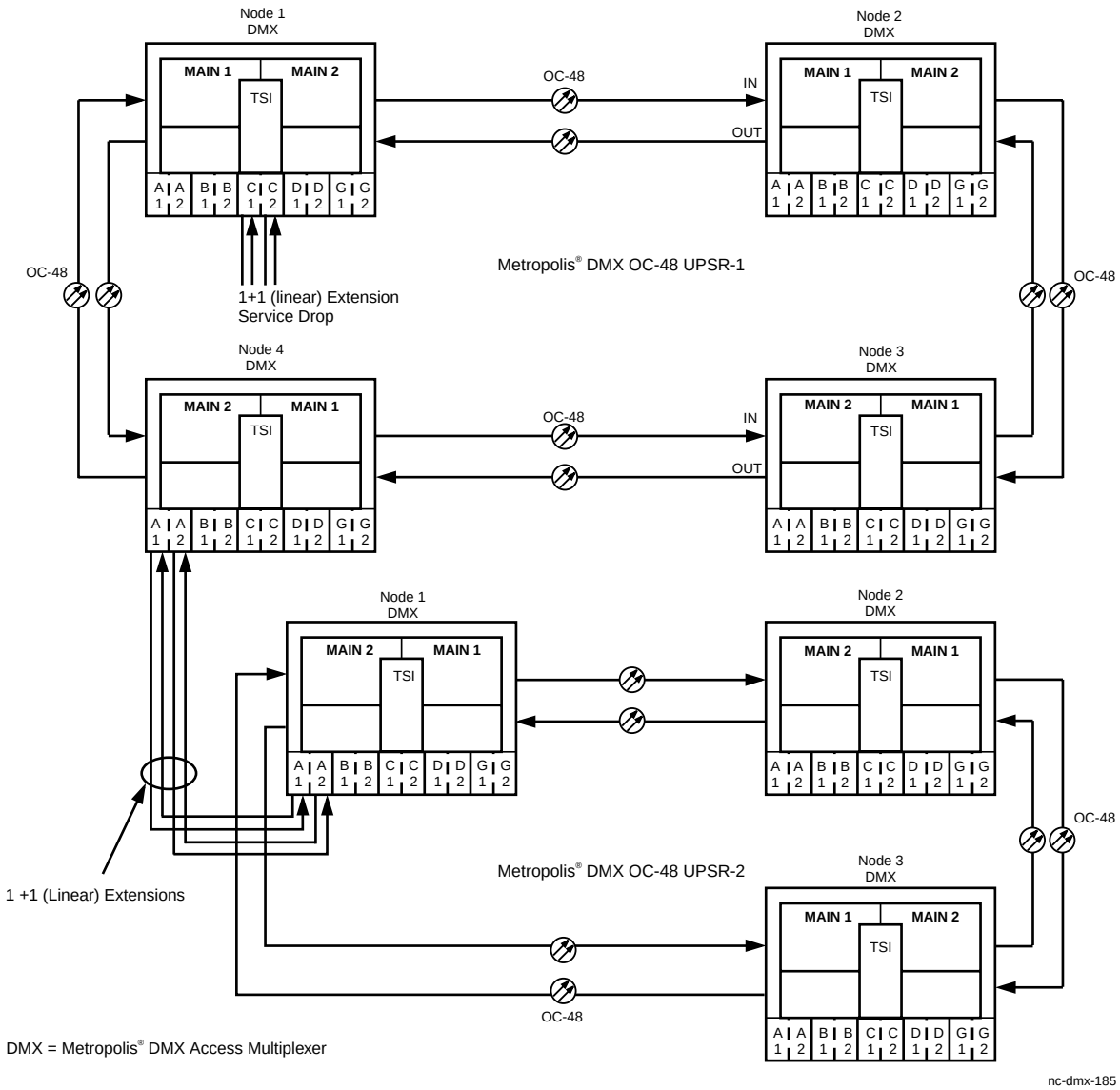
1 Use the WaveStar® CIT to log in to one of the Metropolis® DMX host nodes providing the 1+1 extension.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Refer to Figure 10-23 for an example of two Metropolis® DMX UPSRs connected in a 1+1 (linear extension) configuration.

Note that this example depicts OC-48 optical line rates. Other applications and line rates are also possible.

Figure 10-23 Two Metropolis® DMX UPSRs Connected in a 1+1 (Linear Extension)



. . . . . .

3 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node on the Metropolis® DMX rings.

> **Important!** If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.
>
> This command may take several minutes to complete depending on the size of the network.

Result: The "OSI Routing Map" window opens.

. . . . . .

4 Verify that the network configuration is the same as specified in the work instructions.

> **Important!** All differences between the work instructions and the actual ring configuration must be resolved before continuing.

. . . . . .

5 From the work instructions, determine the terminating (add/drop) nodes at each end of the 1+1 optical extension.

. . . . . .

6 One at a time, use the WaveStar® CIT to log in to each terminating node. From the System View menu at each node, select **View > View Equipment Details**.

Result: The "View Equipment Details" window opens.

. . . . . .

7 Find the circuit pack, port, and/or tributaries being used for this service. Select the entity to view, then click the **Select** button at the bottom of the window. View the provisioning details for the selected entity and verify the entities are properly provisioned.

. . . . . .

8 If the entities are not provisioned properly, use the procedures in this chapter to condition the circuit packs/ports for service.

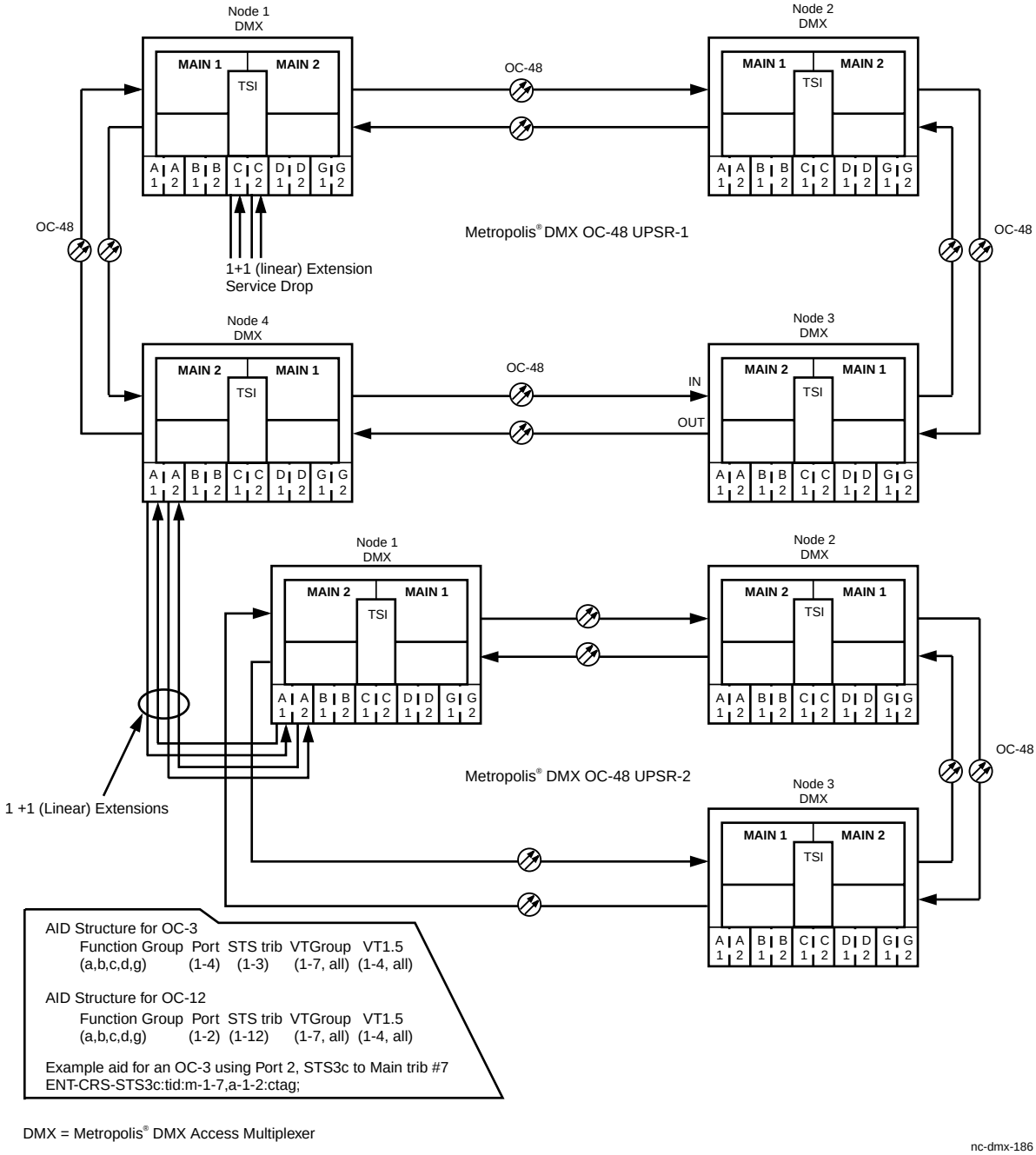
9 From your work instructions, determine the type of cross-connections to be made at each node for the service being established.

10 At each of the terminating nodes for the circuit being established, select **View > Cross Connections** from the System View menu to verify that the cross-connections specified on the work instructions may be made. If cross-connections are already assigned or improperly assigned, refer trouble to the provisioning organization. Improperly assigned cross-connections may have to be deleted, or a different time-slot must be selected for the service being selected.

11 Select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard to provision the add/drop cross-connections at each terminating node serving the optical extension.

Figure 10-24 illustrates an example network with 1+1 STS3c cross-connections at Metropolis® DMX node 4.

Figure 10-24 Example of 1+1 STS3c Cross-Connections



12 From the System View menu, select **View > Cross Connections** at each node to verify that the proper connection has been made.

13 If other cross-connections are to be made, for example, from a terminating node in one ring to a terminating node in the other ring, refer to the appropriate procedures in this chapter to establish the particular service.

14 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

15 If any alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

END OF STEPS

Task 329: Make Function Unit UPSR, Hairpin, and Main to Function Unit UPSR Cross-Connections

Purpose

Use this task as an example to provision a Metropolis® DMX Access Multiplexer shelf with UPSR cross-connections. See "Cross-Connection Provisioning" (5-6) in Chapter 5, "Provisioning, Security, & Administration" and Appendix E, "Allowable Cross-Connections" (E-1) for rates, types, restrictions, and allowable cross-connections.

Note that hairpin *VT1.5* cross-connections cannot be made within the same function or growth group.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Verify that the UPSR network configurations have been established using "Task 340: Establish Subtending Low Speed UPSR/BLSR Ring" (10-427), if required.
- Determine the slots, circuit packs, ports, cross-connection types and cross-connection rates.
- Be able to log in to a Metropolis® DMX with the WaveStar® CIT and be familiar with the functions of the WaveStar® CIT.

Task

Complete the following steps to make the necessary cross-connections.

. . . . . .

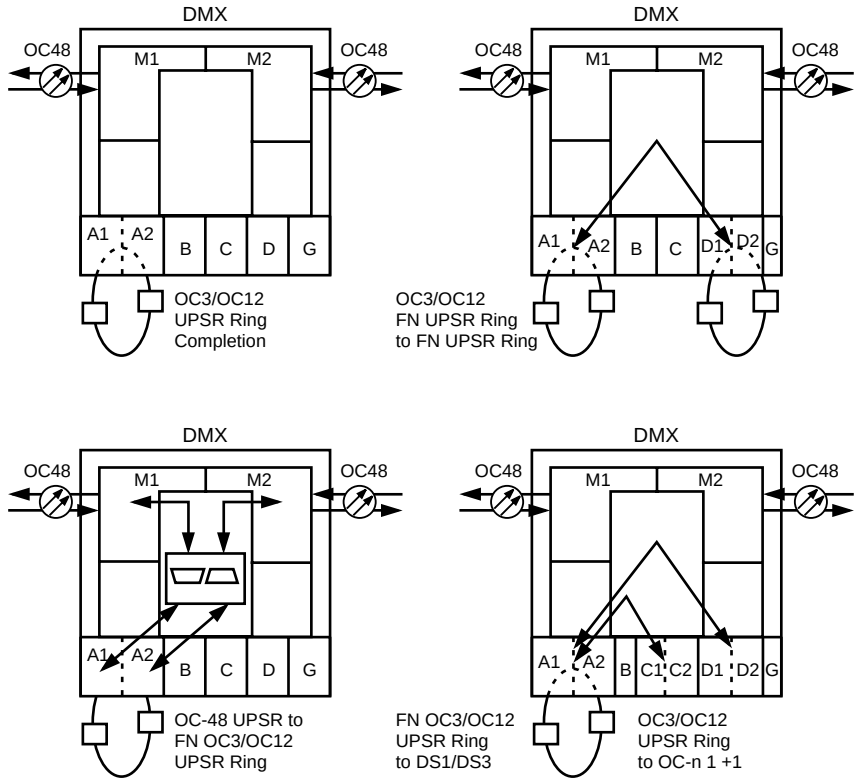
1 Use the WaveStar® CIT to log in to the Metropolis® DMX host node.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Refer to Figure 10-25 for examples of some of the possible cross-connections. Note that these examples use OC-48 and OC-3/12 optical rates in the examples. Other configurations with OC-192/48/12/3 are also applicable.

These examples are only brief descriptions of possible cross-connections. Refer to "*Appendix E: Allowable Cross-Connections*" for more information on allowable cross-connections.

Figure 10-25 Example Cross-connections



DMX = Metropolis® DMX Access Multiplexer

nc-dmx-179

3 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Routing Map" window opens.

4 Verify that the ring configurations are the same as specified in the work instructions.

Important! All differences between the work instructions and the actual ring configuration must be resolved before continuing.

5 From the System View menu of the subject Metropolis® DMX node, select **View > View Equipment Details**.

Result: The "View Equipment Details" window opens.

6 Find the circuit pack, port, and tributaries being used for this service. Select the entity to view, then click the **Select** button at the bottom of the window. View the provisioning details for the selected entity and verify the entities are properly provisioned.

7 If the entities are not provisioned properly, use the procedures in this section to condition the circuit packs/ports for service.

8 From your work instructions, determine the cross-connections to be made for the service being established.

9 From the System View menu, select **View > Cross Connections** to verify that the cross-connections specified on the work instructions may be made. If cross-connections are already assigned or improperly assigned, refer trouble to the provisioning organization. Improperly assigned cross-connections may have to be deleted, or a different time-slot must be selected for the service being selected.

10 Select **Configuration > Cross-Connection** from the **System View** menu to start the Cross Connection Wizard.

11 In the Cross Connection Wizard, select the type of cross-connection and follow the wizard directions:

- For Pass Through - select 2-way point to point through
- For Hairpin - select 2-way Hairpin
- For 0X1 - Select 2-way Point-to-Point, Add/Drop to UPSR, Unswitched
- For Add/Drop (main to function unit) - Select 2-way Point-to-Point, Add/Drop to UPSR, Unswitched

12 From the System View menu, select **View > Cross Connections** to verify that the proper connections have been made.

13 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

14 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

END OF STEPS

Task 330: Establishing Ethernet Services

Purpose

Use this task for examples on provisioning ethernet services.

This task provides references to numerous examples for provisioning ethernet services. They are intended to be used as reference only to provide you with general ethernet related provisioning. The examples given may not match your particular configuration. It is impossible to provide examples for all the configurations you may use.

> **Important!** This task assumes that the network system has already been established with all nodes of the network properly equipped and operating for standard SONET transmission.

Restrictions

A Metropolis® DMX Access Multiplexer equipped with LNW26 OC-48 OLIUs restrict ethernet service assignments to VCG v1 and v2 on the LNW67/68 2GbE circuit packs when they are installed in function slots A, B, or C. In slot D or Growth slot, VCGs v1, v2, v3, and v4 may be used.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, you must:

- Obtain the work instructions for the ethernet service being established.
- Be familiar with ethernet service provisioning or have complete work instructions detailing the particular service being established.

Task

Perform the following steps to provision ethernet services.

. . . . . .

1 Use the WaveStar® CIT to log in to a terminating Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 Click on the **Alarm List** button on the System View window and verify no alarms are present.

3 If any alarms are activated, they must be cleared prior to beginning this task.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

4 One at a time, use the WaveStar® CIT to log in to each Metropolis® DMX terminating end node. From the System View menu at each node, select **View > View Equipment Details**.

Result: The "View Equipment Details" window opens.

5 Verify that the ethernet circuit packs have been installed into the required slot 1 of Function Unit group (A, B, C, D, or G) at each NE providing ethernet service.

Reference:
"Task 334: Install 10/100T (LNW66) Fast Ethernet Circuit Pack" (10-413)

"Task 335: Install 1GSX/1GLX (LNW67/LNW68) Gigabit Ethernet Circuit Packs" (10-417)

6 Note the following general order of provisioning requirements for the type of service being provisioned:

1. Set tagging mode (No Tag, 802.1Q, Transparent) of the circuit pack using the *ed-eqpt* TL1 command (must be done first).

   Gigabit Ethernet circuit packs default to No Tag mode when installed. Fast Ethernet circuit packs default to 802.1Q mode when installed.
2. Create Virtual Switch and assign ports (must be done second, if required [does not apply to the No Tag mode]).
3. Establish SONET STS-1 cross-connections.
4. Create Spanning Tree groups and assign ports (does not apply to the No Tag mode or to UPSR protected services using 2waypr cross-connections)
5. Establish VLANs and assign ports (802.1Q Tag Mode ONLY).
6. Assign port tags (Transparent Tag mode ONLY).

7 Refer to one of the following to use as an example for the service being provided:

- "SE 330-1: Establish Point-to-Point UPSR Protected 1GbE Full Rate Private Line Service (No Tag Mode)" (10-249)
- "SE 330-2: Establish Point-to-Point UPSR Protected GbE Service (802.1q Mode)" (10-255)
- "SE 330-3: Establish Point-to-Point UPSR Protected GbE Service (Transparent Mode)" (10-265)
- "SE 330-4: Establish Ethernet Packet Ring on a UPSR Ring" (10-273)
- "SE 330-5: Establish 802.1q Mode Ethernet Service on Established Packet Ring (UPSR Ring)" (10-283)
- "SE 330-6: Establish Transparent Mode Ethernet Service on Established Packet Ring (UPSR Ring)" (10-289)
- "SE 330-7: Establish Ethernet Packet Ring on a BLSR w/o NUT" (10-293)
- "SE 330-8: Establish 802.1q Mode Ethernet Service on Established Packet Ring (BLSR Protected)" (10-303)
- "SE 330-9: Establish Transparent Mode Ethernet Service on Established Packet Ring (BLSR Protected)" (10-307)
- "SE 330-10: Editing Ethernet Port Parameters" (10-311)
- "SE 330-11: Editing VCG Parameters" (10-315)
- "SE 330-12: Editing Ethernet Circuit Pack Parameters" (10-319)
- "SE 330-13: Establish Point-to-Point BLSR Protected 1GbE Full Rate Private Line Service (No Tag Mode)" (10-323)
- "SE 330-14: Establish Point-to-Point BLSR Protected GbE Service (802.1q Mode)" (10-331)
- "SE 330-15: Establish Point-to-Point BLSR Protected GbE Service (Transparent Mode)" (10-341)
- "SE 330-16: Establish Ethernet Packet Ring on a BLSR With Non Preemptible Unprotected Traffic (NUT)" (10-349)
- "SE 330-17: Adding Bandwidth to a Point-to-Point UPSR/BLSR Protected GbE Service (802.1q Mode)" (10-359)
- "SE 330-18: Establish a Dedicated Multipoint Private Line UPSR Protected GbE Service (Transparent Mode)" (10-367)

- "SE 330-19: Add Fast Ethernet Services to Ethernet Packet Ring – FE to GbE Hairpin" (10-377)

END OF STEPS

SE 330-1: Establish Point-to-Point UPSR Protected 1GbE Full Rate Private Line Service (No Tag Mode)

Overview

This procedure provides an example for configuring point-to-point UPSR protected GbE full rate private line ethernet service using the No Tag tagging mode. See Figure 10-26 for an example.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

Important! On connected gigabit Ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See "Auto-negotiation disable" (7-5) in Chapter 7, "Ethernet" for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of 2waypr cross-connections to be made at each node.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring a point-to-point UPSR protected 1GbE full rate private line service (No Tag mode). See Figure 10-26 for an example.

1 Use the WaveStar® CIT to log in to one of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

This command may take several minutes to complete depending on the size of the network.

Result: The "OSI Routing Map" window opens.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at each node associated with the service to be established.

CAUTION

If the ethernet circuit pack is already in service, the existing tagging mode cannot be changed without removing all existing service.

5 CONFIGURE TAGGING MODE

Determine the existing tagging mode for the circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the CP, then click **Select**. Note the VLAN Tagging Mode.

6

If...	Then...
the tagging mode is set correctly to NO TAG,	Proceed to Step 11.
the tagging mode is NOT set to NO TAG,	Continue with Step 7.

7 If you are going to change the VLAN Tagging Mode that presently exists AND a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View > Data > Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Note if a virtual switch ID has been assigned.

8 If required, use the TL1 **dlt-vrtsw** command or select the **Configuration > Data > Delete A Virtual Switch** command from the System View menu, highlight the circuit pack being provisioned, then click **Select**. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

9 Use the TL1 **ed-eqpt** command or select the **Configuration > Provision** command from the System View menu. Select the circuit pack being provisioned, then click **Provision**.

10 Select **NOTAG** in the Select VLAN Tagging Mode box, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

11 ESTABLISH SONET CROSS-CONNECTIONS

Determine the necessary **2wayPR** STS-1 cross-connections to be made at each terminating and non terminating node in the network.

Note that full rate gigabit service requires 21 STS-1 cross-connections.

12 One at a time at each node in the network, use the TL1 **ent-crs-sts1** command to provision the **2waypr** cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at each of the nodes in the network to provision the **2wayPR** cross-connections.

Important! Note that cross-connections at the terminating nodes are add/drop and cross-connections at the non terminating nodes are pass-through.

Reference: "Task 331: Make STS1 Cross-Connections for Ethernet Service" (10-387)

13 From the System View menu, select **View > Cross Connections** at each node to verify that the proper connections have been made.

14 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

15 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

16 PROVISION LAN PORTS

Use the TL1 **ed-eport** command to provision the LAN port parameters, or select **Configuration > Provision** from the System View menu. Expand the details for the circuit pack, highlight the LAN Port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

17 Click **Apply**. Read the warning message, then click **Yes** to execute the command.

18 PROVISION VCGS

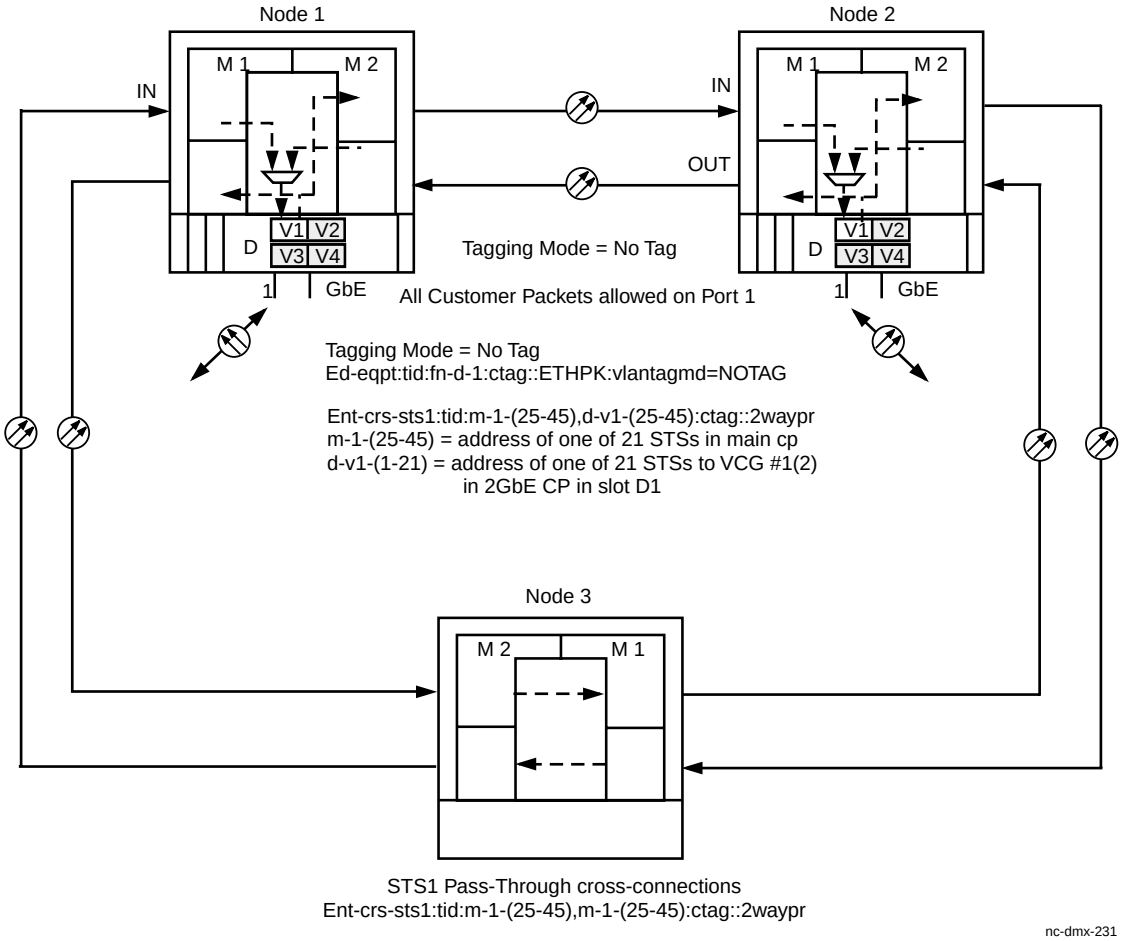
Use the **ed-vcg** TL1 command to provision the WAN (VCG) port parameters, or select **Configuration > Provision** from the System View menu, if window is not already open from the prevision step. Expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

19 Click **Apply**. Read the warning message, then click **Yes** to execute the command. Click **Close** to exit or repeat from Step 16 for other port provisioning.

END OF STEPS

Figure 10-26 Point-to-Point 1GbE Full Rate Private Line Example



SE 330-2: Establish Point-to-Point UPSR Protected GbE Service (802.1q Mode)

Overview

This procedure provides an example for configuring point-to-point UPSR protected GbE ethernet service using the 802.1q tagging mode. See Figure 10-27 for an example.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

Important! On connected gigabit Ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See "Auto-negotiation disable" (7-5) in Chapter 7, "Ethernet" for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of 2waypr cross-connections to be made at each node.
- The tagging mode (802.1q) and virtual switch ID.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring point-to-point UPSR protected GbE ethernet service using the 802.1q tagging mode. See Figure 10-27 for an example.

1 Use the WaveStar® CIT to log in to one of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

This command may take several minutes to complete depending on the size of the network.

Result: The "OSI Routing Map" window opens.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at each node associated with the service to be established.

CAUTION

If the ethernet circuit pack is already in service, the existing tagging mode cannot be changed without removing all existing service.

5 CONFIGURE TAGGING MODE

Determine the existing tagging mode and parameters for the circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the CP, then click **Select**. Note the VLAN Tagging Mode, Burst Size, and Credit Interval parameters.

6 Select one of the following:

If...	Then...
the tagging mode and all parameters are set correctly,	Proceed to Step 12.
the tagging mode is set correctly to 802.1TAG but other parameters are not correct,	Proceed to Step 9.
the tagging mode is NOT set to 802.1TAG,	Continue with Step 7.

7 If you are going to change the VLAN Tagging Mode that presently exists AND a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View > Data > Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Note if a virtual switch ID has been assigned.

8 If required, use the TL1 **dlt-vrtsw** command or select the **Configuration** > **Data** > **Delete A Virtual Switch** command from the System View menu, highlight the circuit pack being provisioned, then click **Select**. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

9 Use the TL1 **ed-eqpt** command or select the **Configuration** > **Provision** command from the System View menu. Select the circuit pack being provisioned, then click **Provision**.

10 Verify/Select **802.1TAG** in the Select VLAN Tagging Mode box.

11 Verify/Enter the **Burst Size** and **Credit Interval** parameter values as required, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

Reference: "SE 330-12: Editing Ethernet Circuit Pack Parameters" (10-319)

CAUTION

Once a virtual switch is created and service has been established on the circuit pack, you cannot delete the virtual switch without interrupting service. If the service you are establishing in this procedure is a second service on an existing GbE circuit pack with all LAN/WAN ports in the same virtual switch, then the existing virtual switch ID must be retained or the ports not in service must be removed from the existing virtual switch and a new virtual switch created.

12 ASSIGN VIRTUAL SWITCH ID

- For circuit packs not yet in service with no virtual switch assigned:
  - Use the TL1 **ent-vrtsw** command to create an assigned virtual switch ID or select **Configuration > Data > Create A Virtual Switch** command from the CIT System View menu.
- For circuit packs not yet in service with a virtual switch assigned:
  - Use the TL1 **dlt-vrtsw** command to delete an assigned virtual switch ID or select **Configuration > Data > Delete A Virtual Switch** command from the CIT System View menu, if a different virtual switch ID is required.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.
- For circuit packs in service, on only one set of ports, with a virtual switch assigned:
  - Use the TL1 **ed-vrtsw** command to change an assigned virtual switch ID or select **Configuration > Data > Provision A Virtual Switch** command from the CIT System View menu to add/remove ports from a virtual switch.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

13 ESTABLISH SONET CROSS-CONNECTIONS

Determine the necessary **2wayPR** STS-1 cross-connections to be made at each terminating and non terminating node in the network.

Note that full rate gigabit service requires 21 STS-1 cross-connections.

14 One at a time at each node in the network, use the TL1 **ent-crs-sts1** command to provision the **2waypr** cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at each of the nodes in the network to provision the **2wayPR** cross-connections.

Important! Note that cross-connections at the terminating nodes are add/drop and cross-connections at the non terminating nodes are pass-through.

Reference: "Task 331: Make STS1 Cross-Connections for Ethernet Service" (10-387)

15 From the System View menu, select **View > Cross Connections** at each node to verify that the proper connections have been made.

16 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

17 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

18 ASSIGN VLAN IDs

Use the TL1 **ent-vlan** command to assign the default VLAN ID for customer untagged frames or the customer VLAN ID for tagged frames to the associated LAN ports and VCG WAN ports. Or select **Configuration > Data > Create A VLAN** command from the CIT System View menu. For example, see Figure 10-27.

Example: In Figure 10-27, assume a GbE circuit pack is installed in function slot d-1 and LAN port 2 at each circuit pack is used for service.

Note that a service has been established between Node 1 and Node 2 for customer untagged frames using a default VLAN ID of 34.

Note that a service has been established between Node 1 and Node 2 for customer tagged frames using a VLAN ID of 55.

19 PROVISION LAN PORTS

Use the TL1 **ed-eport** command to provision the LAN port parameters, or select **Configuration > Provision** from the System View menu. Expand the details for the circuit pack, highlight the LAN Port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

20 Click **Apply**. Read the warning message, then click **Yes** to execute the command.

21 PROVISION VCGS

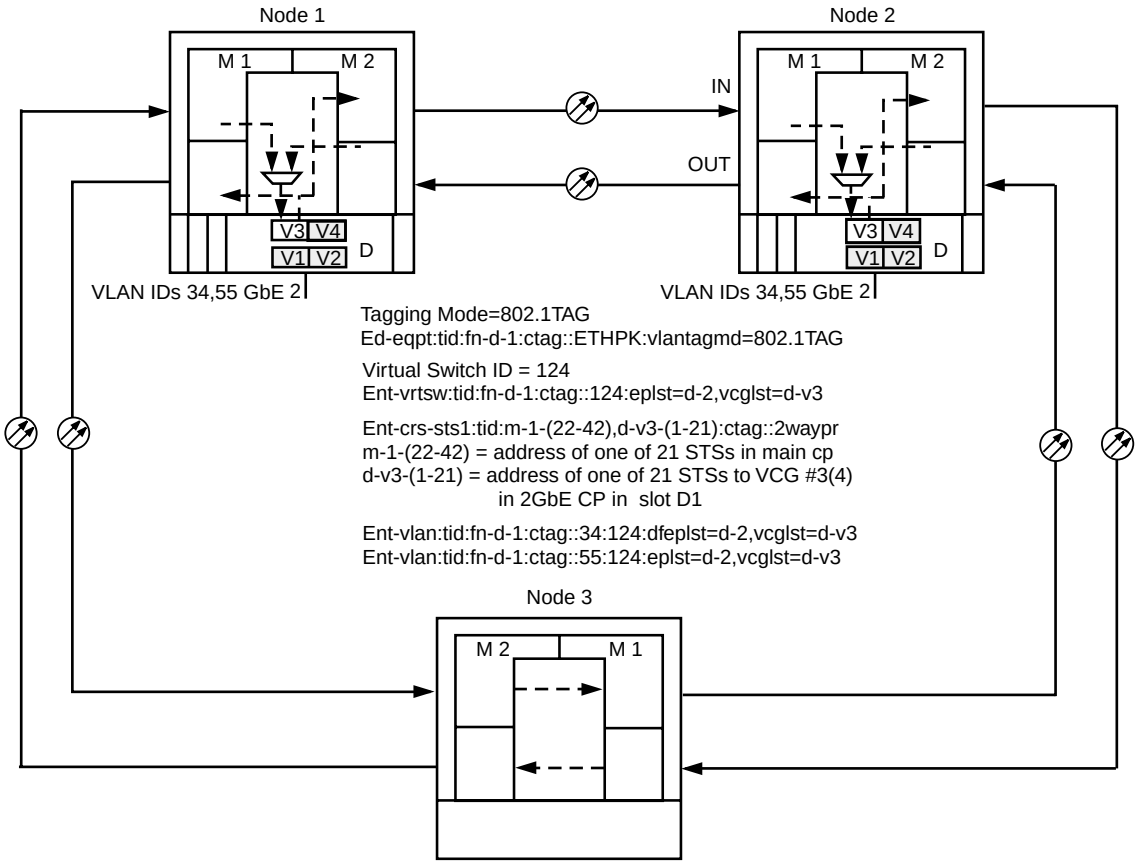
Use the **ed-vcg** TL1 command to provision the WAN (VCG) port parameters, or select **Configuration > Provision** from the System View menu, if window is not already open from the prevision step. Expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

22 Click **Apply**. Read the warning message, then click **Yes** to execute the command. Click **Close** to exit or repeat from Step 19 for other port provisioning.

END OF STEPS

Figure 10-27 Point-to-Point GbE Using 802.1q Tagging Mode



SE 330-3: Establish Point-to-Point UPSR Protected GbE Service (Transparent Mode)

Overview

This procedure provides an example for configuring point-to-point UPSR protected GbE ethernet service using the Transparent tagging mode. See Figure 10-28 for an example.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

Important! On connected gigabit Ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See "Auto-negotiation disable" (7-5) in Chapter 7, "Ethernet" for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of 2waypr cross-connections to be made at each node.
- The tagging mode (transparent) and virtual switch ID.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring point-to-point UPSR protected GbE ethernet service using the Transparent tagging mode.

. . . . . .

1 Use the WaveStar® CIT to log in to one of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

This command may take several minutes to complete depending on the size of the network.

Result: The "OSI Routing Map" window opens.

. . . . . .

3 Verify that the system configuration is the same as specified on your work instructions.

. . . . . .

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at each node associated with the service to be established.

CAUTION

If the ethernet circuit pack is already in service, the existing tagging mode cannot be changed without removing all existing service.

5 CONFIGURE TAGGING MODE

Determine the existing tagging mode and parameters for the circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the CP, then click **Select**. Note the VLAN Tagging Mode, Burst Size, and Credit Interval parameters.

6 Select one of the following:

If...	Then...
the tagging mode and all parameters are set correctly,	Proceed to Step 5.
the tagging mode is set correctly to TRANS but other parameters are not correct,	Proceed to Step 9.
the tagging mode is NOT set to TRANS,	Continue with Step 7.

7 If you are going to change the VLAN Tagging Mode that presently exists AND a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View > Data > Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Note if a virtual switch ID has been assigned.

8 If required, use the TL1 **dlt-vrtsw** command or select the **Configuration** > **Data** > **Delete A Virtual Switch** command from the System View menu, highlight the circuit pack being provisioned, then click **Select**. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

9 Use the TL1 **ed-eqpt** command or select the **Configuration** > **Provision** command from the System View menu. Select the circuit pack being provisioned, then click **Provision**.

10 Verify/Select **TRANS** in the Select VLAN Tagging Mode box.

11 Verify/Enter the **Burst Size** and **Credit Interval** parameter values as required, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

Reference: "SE 330-12: Editing Ethernet Circuit Pack Parameters" (10-319)

CAUTION

Once a virtual switch is created and service has been established on the circuit pack, you cannot delete the virtual switch without interrupting service. If the service you are establishing in this procedure is a second service on an existing GbE circuit pack with all LAN/WAN ports in the same virtual switch, then the existing virtual switch ID must be retained or the ports not in service must be removed from the existing virtual switch and a new virtual switch created.

12 ASSIGN VIRTUAL SWITCH ID

- For circuit packs not yet in service with no virtual switch assigned:
  - Use the TL1 **ent-vrtsw** command to create an assigned virtual switch ID or select **Configuration > Data > Create A Virtual Switch** command from the CIT System View menu.
- For circuit packs not yet in service with a virtual switch assigned:
  - Use the TL1 **dlt-vrtsw** command to delete an assigned virtual switch ID or select **Configuration > Data > Delete A Virtual Switch** command from the CIT System View menu, if a different virtual switch ID is required.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.
- For circuit packs in service, on only one set of ports, with a virtual switch assigned:
  - Use the TL1 **ed-vrtsw** command to change an assigned virtual switch ID or select **Configuration > Data > Provision A Virtual Switch** command from the CIT System View menu to add/remove ports from a virtual switch.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

13 ESTABLISH SONET CROSS-CONNECTIONS

Determine the necessary **2wayPR** STS-1 cross-connections to be made at each terminating and non terminating node in the network.

Note that full rate gigabit service requires 21 STS-1 cross-connections.

14 One at a time at each node in the network, use the TL1 **ent-crs-sts1** command to provision the **2waypr** cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at each of the nodes in the network to provision the **2wayPR** cross-connections.

Important! Note that cross-connections at the terminating nodes are add/drop and cross-connections at the non terminating nodes are pass-through.

Reference: "Task 331: Make STS1 Cross-Connections for Ethernet Service" (10-387)

15 From the System View menu, select **View > Cross Connections** at each node to verify that the proper connections have been made.

16 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

17 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

18 PROVISION LAN (Ethernet) PORTS

Use the TL1 **ed-eport** command to provision the Default Port Tag (**dftporttag**) and other parameters for the LAN port being provisioned. Or, select **Configuration > Provision** from the System View menu. Expand the details for the circuit pack, highlight the LAN Port, then click **Provision**. Provision the Default Port Tag and other parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

19 Click **Apply**. Read the warning message, then click **Yes** to execute the command.

20 PROVISION WAN (VCG) PORTS

Use the TL1 **ed-vcg** command to add port tags (**addporttag**) to the WAN (VCG) ports and provision other parameters as required. Or, select **Configuration > Provision** from the System View menu, if window is not already open from the prevision step. Expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Add the port tag to the VCG and provision the other parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

21 Click **Apply**. Read the warning message, then click **Yes** to execute the command. Click **Close** to exit or repeat from Step 18 for other port provisioning.

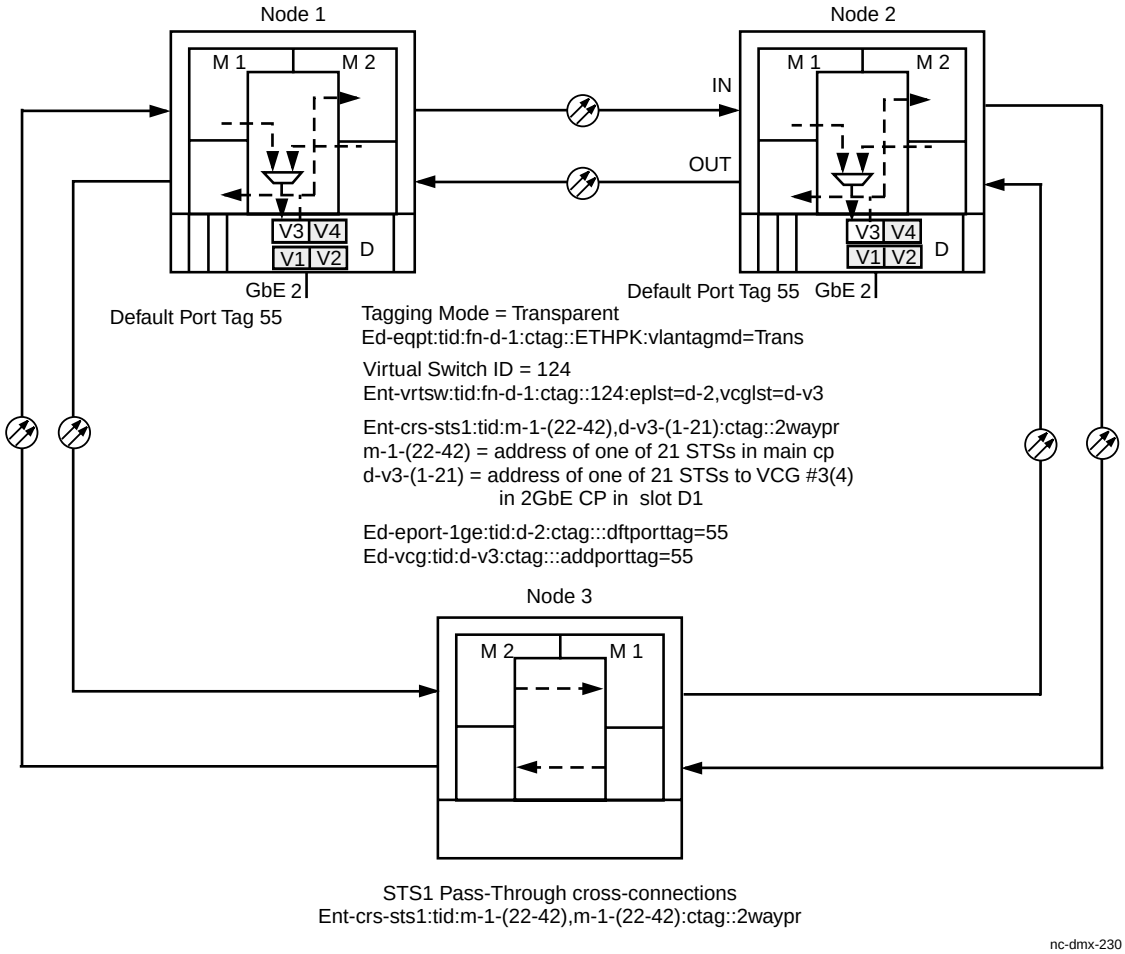
22 Note that this procedure provided the following example of point-to-point UPSR protected GbE service using Transparent tagging mode.

Example: In Figure 10-28, assume a GbE circuit pack is installed in function slot fn-d-1 and LAN port 2 at each circuit pack is used for service.

Note that a service has been established between Node 1 and Node 2 with a default port tag of 55.

END OF STEPS

Figure 10-28 Point-to-Point GbE Using Transparent Tagging Mode



SE 330-4: Establish Ethernet Packet Ring on a UPSR Ring

Overview

This procedure provides an example for establishing an ethernet packet ring on a unidirectional path switched ring (UPSR). A packet ring is a set of ethernet switches (ethernet circuit packs) connected to each other in a ring configuration. When the packet ring is first established, the capacity of the ring is predetermined by the number of multipoint (mltpt) STS-1 cross-connections (1-21) applied to the ring and switches. The tagging mode (**802.1TAG** or Transparent [**Trans**]), virtual switch ID, and spanning tree group is also predetermined. For example, see Figure 10-29.

This procedure assumes that the UPSR ring network configuration has already been established and no alarms are present.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

Service Interruption

In Release 3.0 and earlier, STS-1 cross-connection capacity may not be added to an in-service packet ring without the risk of service interruption.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the nodes participating in the packet ring network.
- The shelf slots, circuit packs, ports, VCGs involved in the packet ring network.
- The number and type of **mltpt** cross-connections to be made at each node.

  Note, that once the capacity of the packet ring is established, additional capacity (cross-connections) may not be added in service without the risk of service interruption.

- The tagging mode (transparent or 802.1q), virtual switch ID, and spanning tree group ID.

Procedure Use this procedure as an example to establish an ethernet packet ring on a UPSR ring. See Figure 10-29 for an example.

1 Use the WaveStar® CIT to log in to one of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

This command may take several minutes to complete depending on the size of the network.

Result: The "OSI Routing Map" window opens.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at each node associated with the packet ring being established.

5 Verify that the ethernet circuit packs have been installed into the required slot 1 of the Function Unit or Growth group (A, B, C, D, or G) at each NE providing ethernet service.

Reference:

"Task 334: Install 10/100T (LNW66) Fast Ethernet Circuit Pack" (10-413)

"Task 335: Install 1GSX/1GLX (LNW67/LNW68) Gigabit Ethernet Circuit Packs" (10-417)

6 CONFIGURE TAGGING MODE

Determine the existing tagging mode for the circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the CP, then click **Select**. Note the VLAN Tagging Mode, Burst Size, and Credit Interval parameters.

When GbE circuit packs are installed in the shelf, the default "NO TAG" mode is assigned to the circuit pack. When FE circuit packs are installed in the shelf, the default "802.1TAG" mode is assigned to the circuit pack.

7

If...	Then...
the tagging mode and all parameters are set correctly,	Proceed to Step 13.
the tagging mode is set correctly but other parameters are not correct,	Proceed to Step 10.
the tagging mode is NOT set correctly,	Continue with Step 8.

8 If you are going to change the VLAN Tagging Mode that presently exists AND a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View** > **Data** > **Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Note if a virtual switch ID has been assigned.

9 If required, use the TL1 **dlt-vrtsw** command or select the **Configuration** > **Data** > **Delete A Virtual Switch** command from the System View menu, select the circuit pack being provisioned, then click Select. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

10 Use the TL1 **ed-eqpt** command or select the **Configuration** > **Provision** command from the System View menu, select the circuit pack being provisioned, then click **Provision**.

11 Verify/Select the tagging mode (**802.1TAG** or Transparent [**Trans**]) in the Select VLAN Tagging Mode box.

12 Verify/Enter the **Burst Size** and **Credit Interval** parameter values as required, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

Reference: "SE 330-12: Editing Ethernet Circuit Pack Parameters" (10-319)

CAUTION

Once a virtual switch is created and service has been established on the circuit pack, you cannot delete the virtual switch without interrupting service. If the service you are establishing in this procedure is a second service on an existing GbE circuit pack with all LAN/WAN ports in the same virtual switch, then the existing virtual switch ID must be retained or the ports not in service must be removed from the existing virtual switch and a new virtual switch created.

13 ASSIGN VIRTUAL SWITCH ID

- For circuit packs not yet in service with no virtual switch assigned:
  - Use the TL1 **ent-vrtsw** command to create an assigned virtual switch ID or select **Configuration > Data > Create A Virtual Switch** command from the CIT System View menu.
- For circuit packs not yet in service with a virtual switch assigned:
  - Use the TL1 **dlt-vrtsw** command to delete an assigned virtual switch ID or select **Configuration > Data > Delete A Virtual Switch** command from the CIT System View menu, if a different virtual switch ID is required.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.
- For circuit packs in service, on only one set of ports, with a virtual switch assigned:
  - Use the TL1 **ed-vrtsw** command to change an assigned virtual switch ID or select **Configuration > Data > Provision A Virtual Switch** command from the CIT System View menu to add/remove ports from a virtual switch.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

14 ESTABLISH SONET CROSS-CONNECTIONS

Determine the necessary Multipoint (**mltpt**) STS-1 cross-connections to be made at each ethernet terminating node and any **2waypr** cross-connections to made at any non terminating nodes in the network.

15 One at a time at each node in the network, use the TL1 **ent-crs-sts1** command to provision the cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at each non terminating node to provision the **2-Way Point-to-Point, Through** pass-through cross-connections. Use the Cross Connection Wizard at each terminating node to provision the ethernet **mltpt** cross-connections. For example, see Figure 10-29.

Reference: Refer to "Task 331: Make STS1 Cross-Connections for Ethernet Service" (10-387) for cross-connection examples.

16 From the System View menu, select **View > Cross Connections** to verify that the proper connections have been made.

17 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

18 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

19 CREATE SPANNING TREE GROUP

If required, determine a preferred spanning tree configuration (span to be blocked under nominal conditions), the preferred root node, and spanning tree root priorities for this service.

Note that it is not necessary to determine a preferred spanning tree configuration. A default spanning tree configuration is configured when you establish the spanning tree group.

Reference: "Task 332: Determine Preferred Spanning Tree Configuration" (10-399)

20 Use the TL1 command **ent-stgrp** to assign and provision the parameters for the VCGs involved in the spanning tree group. Or select **Configuration > Data > Create A Spanning Tree Group** command from the CIT System View menu. For example, see Figure 10-29.

Important! Networks running 802.1d STP (Release 1.1) support a maximum of up to nine nodes participating in a spanning tree. Networks with more than nine nodes will not reconfigure properly. Spanning tree default parameters support a network of up to nine nodes.

Networks running 802.1w rapid spanning tree protocol (Release 2 or later) support more than nine nodes participating in a spanning tree. To support more than nine nodes in the spanning tree, the maximum age timer must be increased. Note that spanning tree restoration time increases as the number of nodes increase.

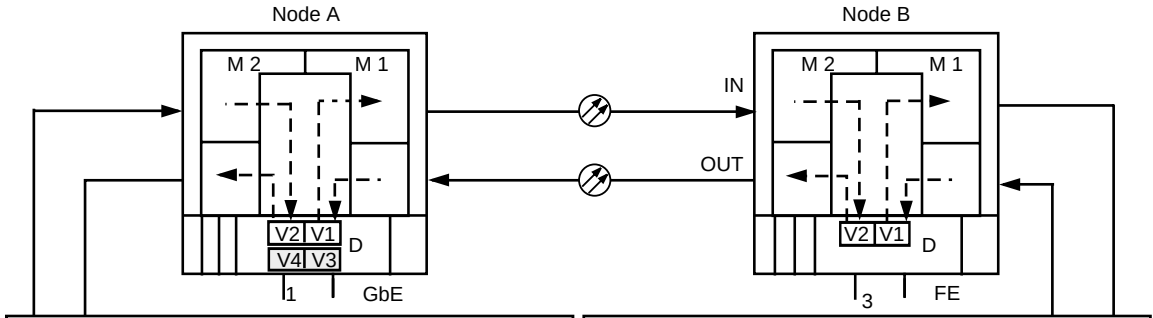
If the network consists of more than nine (9) nodes which are participating in the spanning tree configuration, use the following formula to determine the proper setting for the spanning tree maximum age timer (**stmaxage**): 2 x (N + 1), where N equals the number of nodes.

Example: If the network consists of 20 nodes, then the **stmaxage** timer should be set to 42 seconds: 2 x (20 + 1) = 42.

21 Repeat all the assignments in this procedure at each ethernet node in the network.

END OF STEPS

Figure 10-29 Ethernet Packet Ring on a UPSR



SE 330-5: Establish 802.1q Mode Ethernet Service on Established Packet Ring (UPSR Ring)

Overview

This procedure provides an example for configuring ethernet service using the 802.1q tagging mode on an established packet ring. See Figure 10-30 and Figure 10-31 for examples.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

Important! The packet ring must already be established on the UPSR before continuing. This procedure assumes the packet ring is established with the necessary tagging modes, virtual switch IDs, cross-connections, and spanning tree groups established. See "SE 330-4: Establish Ethernet Packet Ring on a UPSR Ring" (10-273).

On connected gigabit ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See "Auto-negotiation disable" (5-3) in Chapter 5, "Ethernet" for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of 2waypr cross-connections to be made at each node.
- The tagging mode (802.1q) and virtual switch ID.
- The VLAN IDs being assigned.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring ethernet service on a UPSR protected packet ring using the 802.1q tagging mode. See Figure 10-30 and Figure 10-31 for examples.

. . . . . .

1 Use the WaveStar® CIT to log in to one of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Routing Map" window opens.

. . . . . .

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the terminating nodes, circuit packs, LAN ports, virtual switch ID, and VLAN IDs associated with the service being established.

5 ASSIGN VLAN IDs TO ESTABLISH SERVICE

Use the TL1 **ent-vlan** command to assign the default VLAN ID for customer untagged frames or the customer VLAN ID for tagged frames to the associated LAN ports and VCG WAN ports. Or, select **Configuration > Data > Create A VLAN** command from the CIT System View menu. For example, see Figure 10-30.

Example: In Figure 10-30, assume a GbE circuit pack is installed in function slot d-1 at Node A using LAN port 1. Assume FE circuit packs are installed in function slot d-1 at Node B (using LAN port 3) and at Node C (using LAN port 10). Assume the packet ring has already been established.

Note that a service has been established between Node C, Node B, and Node A for customer tagged frames using a VLAN ID of 55.

6 PROVISION LAN PORTS

Use the TL1 **ed-eport** command to provision the LAN port parameters, or select **Configuration > Provision** from the System View menu, expand the details for the circuit pack, highlight the LAN port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

7 PROVISION VCGS

Use the **ed-vcg** TL1 command to provision the WAN (VCG) port parameters, or select **Configuration > Provision** from the System View menu, expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

END OF STEPS

Figure 10-30 Example 1 Service on UPSR Ring Using 802.1q Tagging Mode

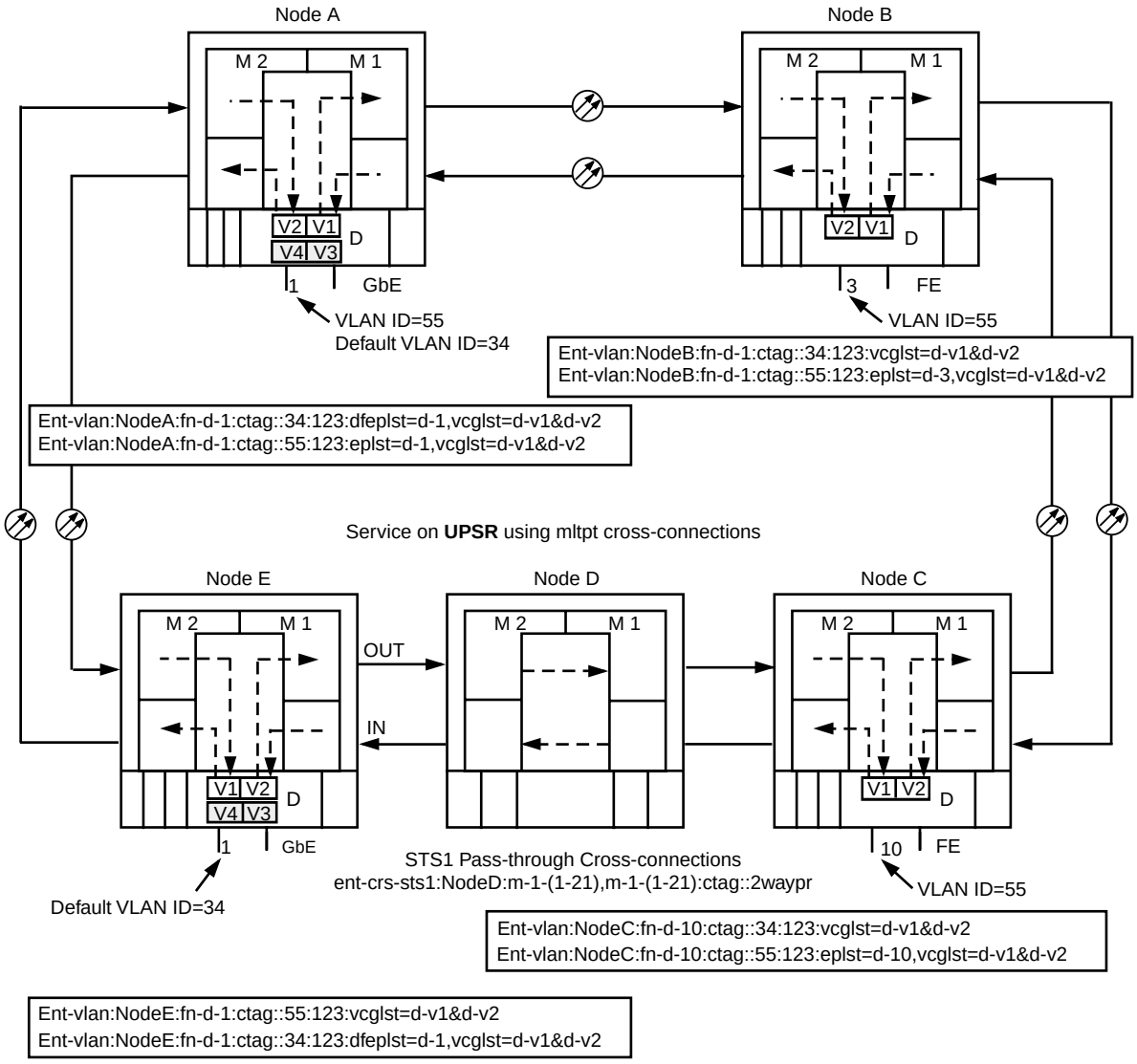
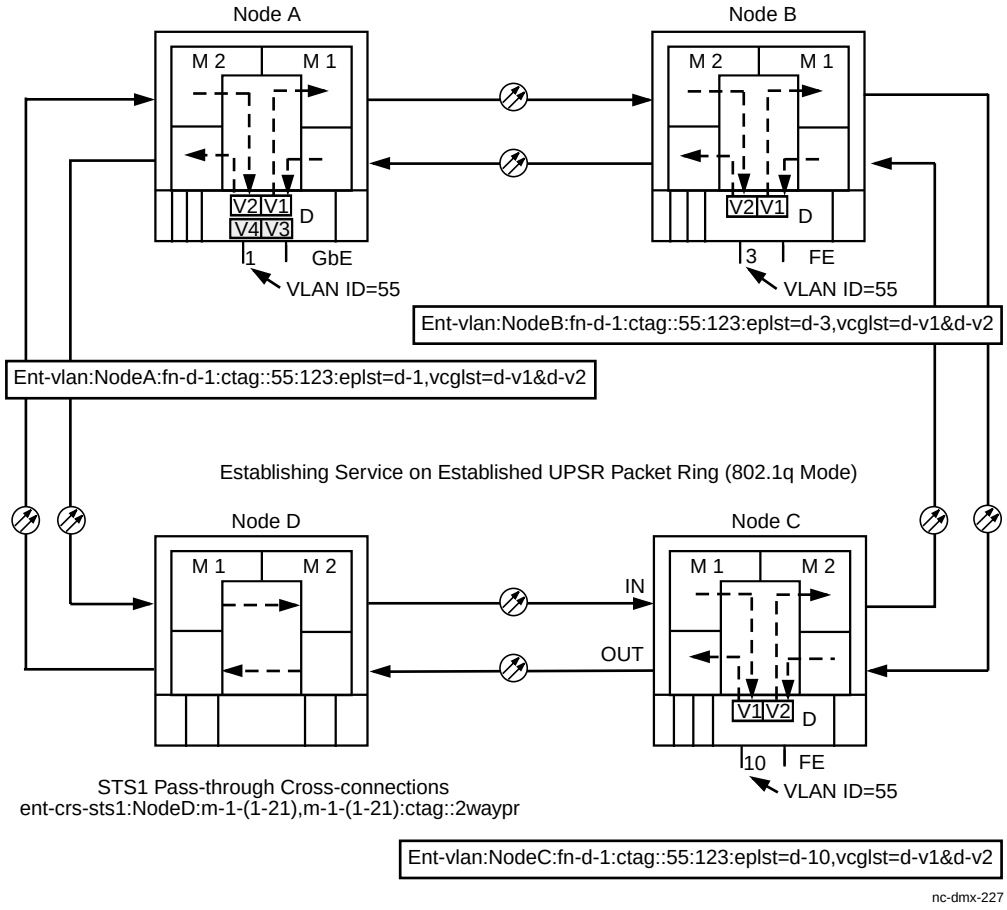


Figure 10-31 Example 2 Service on UPSR Ring Using 802.1q Tagging Mode



SE 330-6: Establish Transparent Mode Ethernet Service on Established Packet Ring (UPSR Ring)

Overview

This procedure provides an example for configuring ethernet service using the Transparent tagging mode on an established packet ring. See Figure 10-32 for an example.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

Important! The packet ring must already be established on the UPSR before continuing. This procedure assumes the packet ring is established with the necessary tagging modes, virtual switch IDs, cross-connections, and spanning tree groups established.

On connected gigabit Ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See “Auto-negotiation disable” (5-3) in Chapter 5, “Ethernet” for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of 2waypr cross-connections to be made at each node.
- The tagging mode (Transparent) and virtual switch ID.
- The Port Tags being assigned.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring ethernet service on a UPSR protected packet ring using the Transparent tagging mode. See Figure 10-32 for an example.

. . . . . .

1 Use the WaveStar® CIT to log in to one of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Routing Map" window opens.

. . . . . .

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the terminating nodes, circuit packs, LAN ports, virtual switch ID, and VLAN IDs associated with the service being established.

5 PROVISION LAN (Ethernet) PORTS

Use the TL1 **ed-eport** command to provision the Default Port Tag (**dftporttag**) and other parameters for the LAN port being provisioned. Or, select **Configuration > Provision** from the System View menu, expand the details for the circuit pack, highlight the LAN port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

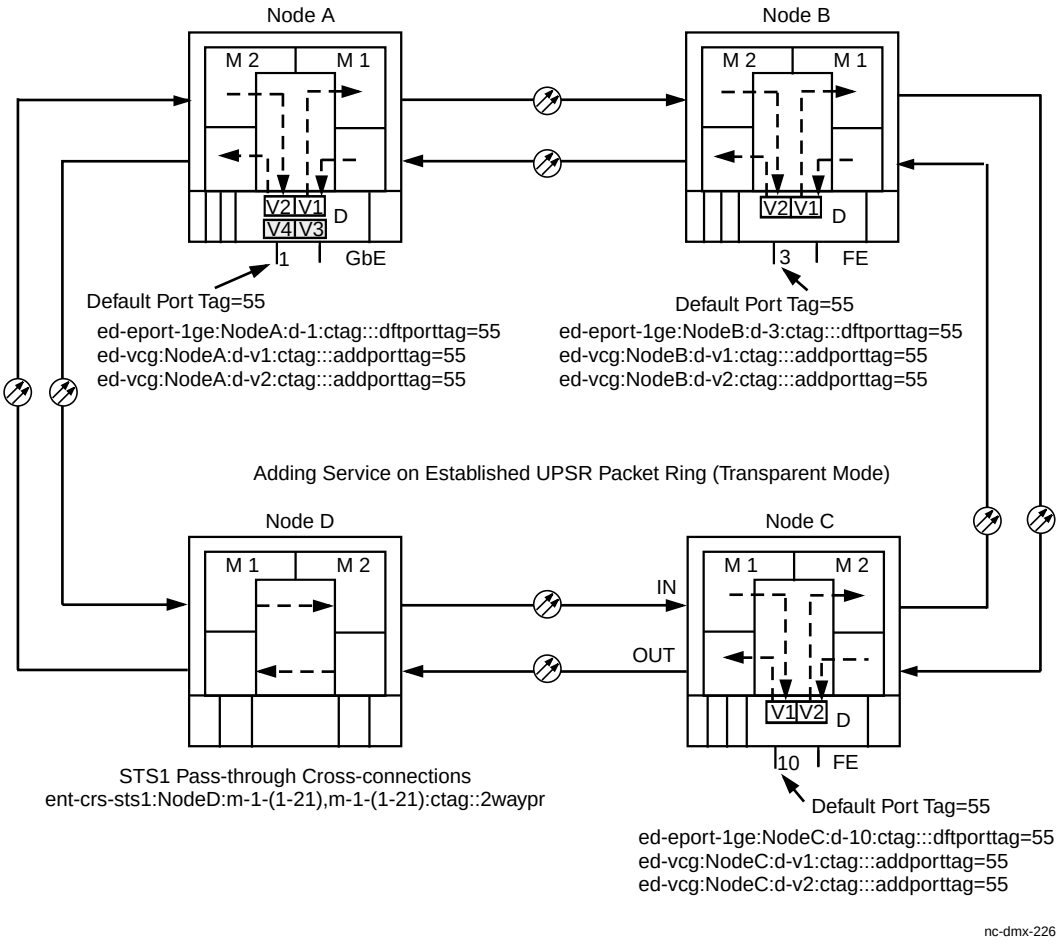
6 PROVISION WAN (VCG) PORTS

Use the TL1 **ed-vcg** command to add port tags (**addporttag**) to the WAN (VCG) ports and provision other parameters as required. Or, select **Configuration > Provision** from the System View menu, expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

END OF STEPS

Figure 10-32 Example Service on UPSR Ring Using Transparent Tagging Mode



SE 330-7: Establish Ethernet Packet Ring on a BLSR w/o NUT

Overview

This procedure provides an example for establishing an ethernet packet ring on a bidirectional line switched ring (BLSR) without using Nonpreemptible Unprotected Traffic (NUT) access (Release 3 or later). A packet ring is a set of ethernet switches (ethernet circuit packs) connected to each other in a ring configuration. When the packet ring is first established, the capacity of the ring is predetermined by the number of 2waypr STS-1 cross-connections (1-21) applied to the ring and switches. The tagging mode, virtual switch ID, and spanning tree group is also predetermined. For example, see Figure 10-33.

This procedure assumes that the BLSR ring network configuration has already been established and no alarms are present.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

Service Interruption

In Release 3.0 and earlier, STS-1 cross-connection capacity may not be added to an in-service packet ring without the risk of service interruption.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the nodes participating in the packet ring network.
- The shelf slots, circuit packs, ports, VCGs involved in the packet ring network.
- The number and type of 2waypr cross-connections to be made at each node.

  Note, that once the capacity of the packet ring is established, additional capacity (cross-connections) may not be added in service without the risk of service interruption.
- The tagging mode (transparent or 802.1q), virtual switch ID, and spanning tree group ID.

Procedure

Use this procedure as an example to establish an ethernet packet ring on a BLSR ring. See Figure 10-33 for an example.

. . . . . .

1 Use the WaveStar® CIT to log in to one of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

As an alternative, you can select **View > Ring Map > Ring Map** from the System View menu, then select the 2F BLSR port protection group and click **Select**. Select NVMRING in the Ring Map Source selection box. You may also Display Ring Map Graph using this command.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Routing Map" window opens if the **Administration > OSI Routing Map** command was used.

A list of NEs and NE neighbors is displayed if the **View > Ring Map > Ring Map** command was used.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at each node associated with the packet ring being established.

5 Verify that the ethernet circuit packs have been installed into the required slot 1 of the Function Unit or Growth group (A, B, C, D, or G) at each NE providing ethernet service.

Reference: "Task 335: Install 1GSX/1GLX (LNW67/LNW68) Gigabit Ethernet Circuit Packs" (10-417)

CAUTION

If the ethernet circuit pack is already in service, the existing tagging mode cannot be changed without removing all existing service.

6 CONFIGURE TAGGING MODE

Determine the existing tagging mode for the circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the CP, then click **Select**. Note the VLAN Tagging Mode, Burst Size, and Credit Interval parameters.

When GbE circuit packs are installed in the shelf, the default "NO TAG" mode is assigned to the circuit pack. When FE circuit packs are installed in the shelf, the default "802.1TAG" mode is assigned to the circuit pack.

7 Select one of the following:

If...	Then...
the tagging mode and all parameters are set correctly,	Proceed to Step 13.
the tagging mode is set correctly but other parameters are not correct,	Proceed to Step 10.
the tagging mode is NOT set correctly,	Continue with Step 8.

8 If you are going to change the VLAN Tagging Mode that presently exists AND a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View** > **Data** > **Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Note if a virtual switch ID has been assigned.

9 If required, use the TL1 **dlt-vrtsw** command or select the **Configuration** > **Data** > **Delete A Virtual Switch** command from the System View menu, select the circuit pack being provisioned, then click Select. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

10 Use the TL1 **ed-eqpt** command or select the **Configuration** > **Provision** command from the System View menu, select the circuit pack being provisioned, then click **Provision**.

11 Verify/Select the tagging mode (**802.1TAG** or Transparent [**Trans**]) in the Select VLAN Tagging Mode box.

12 Verify/Enter the **Burst Size** and **Credit Interval** parameter values as required, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

Reference: "SE 330-12: Editing Ethernet Circuit Pack Parameters" (10-319)

CAUTION

Once a virtual switch is created and service has been established on the circuit pack, you cannot delete the virtual switch without interrupting service.

13 ASSIGN VIRTUAL SWITCH ID

- For circuit packs not yet in service with no virtual switch assigned:
  - Use the TL1 **ent-vrtsw** command to create an assigned virtual switch ID or select **Configuration > Data > Create A Virtual Switch** command from the CIT System View menu.
- For circuit packs not yet in service with a virtual switch assigned:
  - Use the TL1 **dlt-vrtsw** command to delete an assigned virtual switch ID or select **Configuration > Data > Delete A Virtual Switch** command from the CIT System View menu, if a different virtual switch ID is required.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

14 ESTABLISH SONET CROSS-CONNECTIONS

Determine the necessary 2wayPR (**2waypr**) STS-1 cross-connections to be made at each terminating node and any **2waypr** cross-connections to made at any non terminating nodes in the network.

Important! In Release 3.0 and earlier, additional STS-1 cross-connection capacity may not be added in-service without the risk of service interruption.

15 One at a time at each node in the network, use the TL1 **ent-crs-sts1** command to provision the **2waypr** cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard to provision the **2F BLSR Add/Drop** ethernet and **2-Way Point-to-Point, Through (2wayPR)** pass-through cross-connections. For example, see Figure 10-33.

Reference: Refer to "Task 331: Make STS1 Cross-Connections for Ethernet Service" (-1) for cross-connection examples.

16 From the System View menu, select **View > Cross Connections** to verify that the proper connections have been made.

17 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

18 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

19 CREATE SPANNING TREE GROUP

If required, determine a preferred spanning tree configuration (span to be blocked under nominal conditions), the preferred root node, and spanning tree root priorities for this service.

Note that it is not necessary to determine a preferred spanning tree configuration. A default spanning tree configuration is configured when you establish the spanning tree group.

Reference: "Task 332: Determine Preferred Spanning Tree Configuration" (10-399)

20 Use the TL1 **ent-stgrp** command to assign and provision the parameters for the VCGs involved in the spanning tree group. Or select **Configuration > Data > Create A Spanning Tree Group** command from the CIT System View menu. For example, see Figure 10-33.

Important! Spanning tree default parameters support a network of up to nine nodes.

Networks running 802.1w rapid spanning tree protocol (Release 2 or later) support more than nine nodes participating in a spanning tree. To support more than nine nodes in the spanning tree, the maximum age timer must be increased. Note that spanning tree restoration time increases as the number of nodes increase.

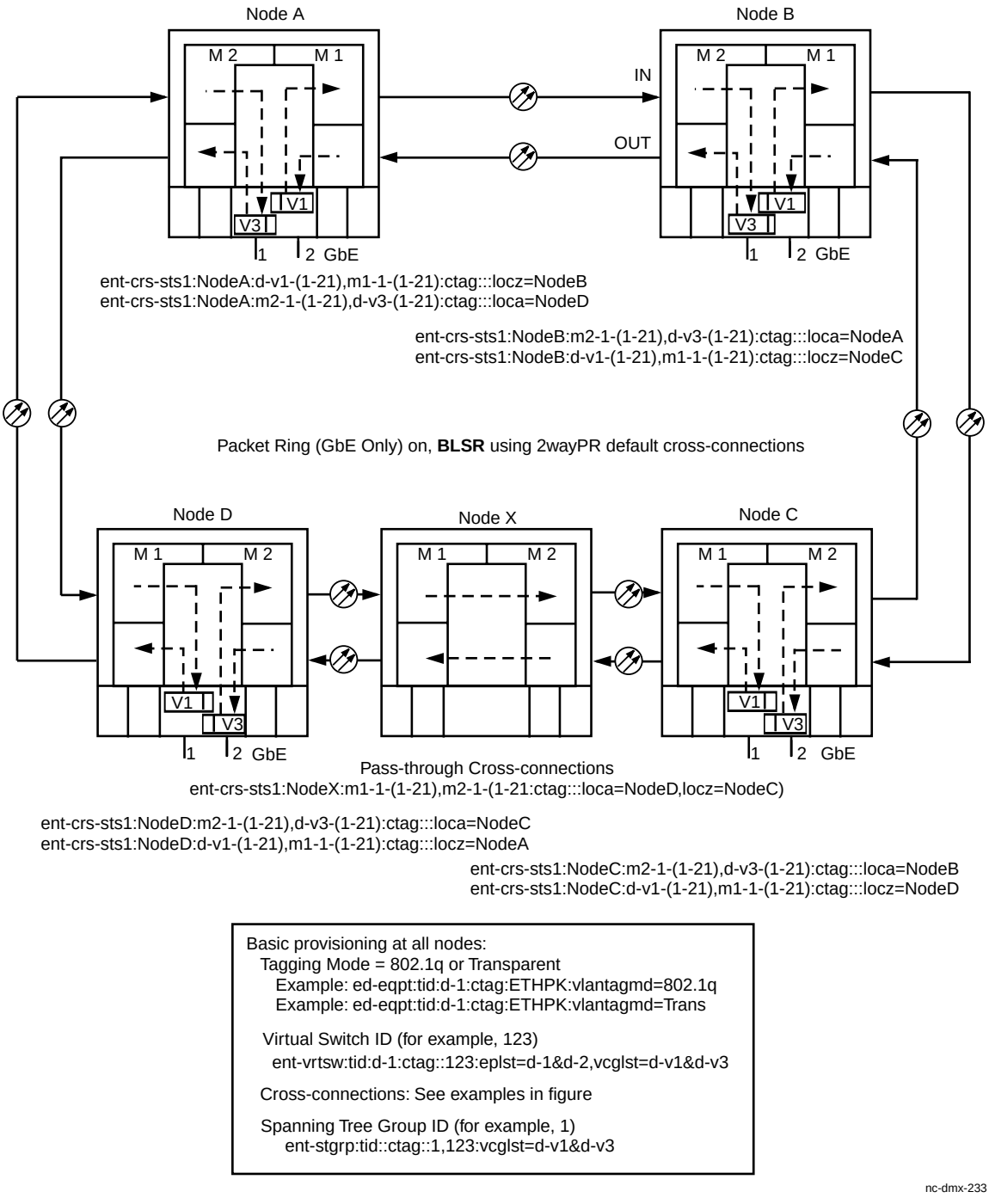
If the network consists of more than nine (9) nodes which are participating in the spanning tree configuration, use the following formula to determine the proper setting for the spanning tree maximum age timer (**stmaxage**): 2 x (N + 1), where N equals the number of nodes.

Example: If the network consists of 16 nodes, then the **stmaxage** timer should be set to 34 seconds: 2 x (16 + 1) = 34.

21 Repeat all the assignments in this procedure at each ethernet node in the network.

END OF STEPS

Figure 10-33 SONET Layer BLSR Protected Ethernet Packet Ring on a BLSR w/o NUT



SE 330-8: Establish 802.1q Mode Ethernet Service on Established Packet Ring (BLSR Protected)

Overview

This procedure provides an example for configuring ethernet service using the 802.1q tagging mode on an established packet ring on a BLSR. See Figure 10-34 for an example.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added in-service without the risk of service interruption.

Important! The packet ring must already be established on the BLSR before continuing. This procedure assumes the packet ring is established with the necessary tagging modes, virtual switch IDs, cross-connections, and spanning tree groups established.

On connected gigabit Ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See “Auto-negotiation disable” (5-3) in Chapter 5, “Ethernet” for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of 2waypr cross-connections to be made at each node.

- The tagging mode (802.1q) and virtual switch ID.
- The VLAN IDs being assigned.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring 802.1q tagging mode ethernet service on an established packet ring in a BLSR ring.

. . . . . .

1 Use the WaveStar® CIT to log in to one of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

As an alternative, you can select **View > Ring Map > Ring Map** from the System View menu, then select the 2F BLSR port protection group and click **Select**. Select NVMRING in the Ring Map Source selection box. You may also Display Ring Map Graph using this command.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Routing Map" window opens if the **Administration > OSI Routing Map** command was used.

A list of NEs and NE neighbors is displayed if the **View > Ring Map > Ring Map** command was used.

. . . . . .

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the terminating nodes, circuit packs, LAN ports, virtual switch ID, WAN (VCG) ports, and VLAN IDs associated with the service being established.

5 ASSIGN VLAN IDs TO ESTABLISH SERVICE

Use the TL1 **ent-vlan** command to assign the default VLAN ID for customer untagged frames and/or the customer VLAN ID for tagged frames to the associated LAN ports and VCG WAN ports. Or, select **Configuration > Data > Create A VLAN** command from the CIT System View menu. For example, see Figure 10-34.

Example: In Figure 10-34, assume a GbE circuit pack is installed in function slot d-1, LAN port 1 at each circuit pack is used for service, and the packet ring has already been established.

Note that a service has been established between Node D and Node A for customer untagged frames using a default VLAN ID of 34.

Note that a service has been established among Node C, Node B, and Node A for customer tagged frames using a VLAN ID of 55.

6 PROVISION LAN PORTS

Use the TL1 **ed-eport** command to provision the LAN port parameters, or select **Configuration > Provision** from the System View menu, expand the details for the circuit pack, highlight the LAN port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

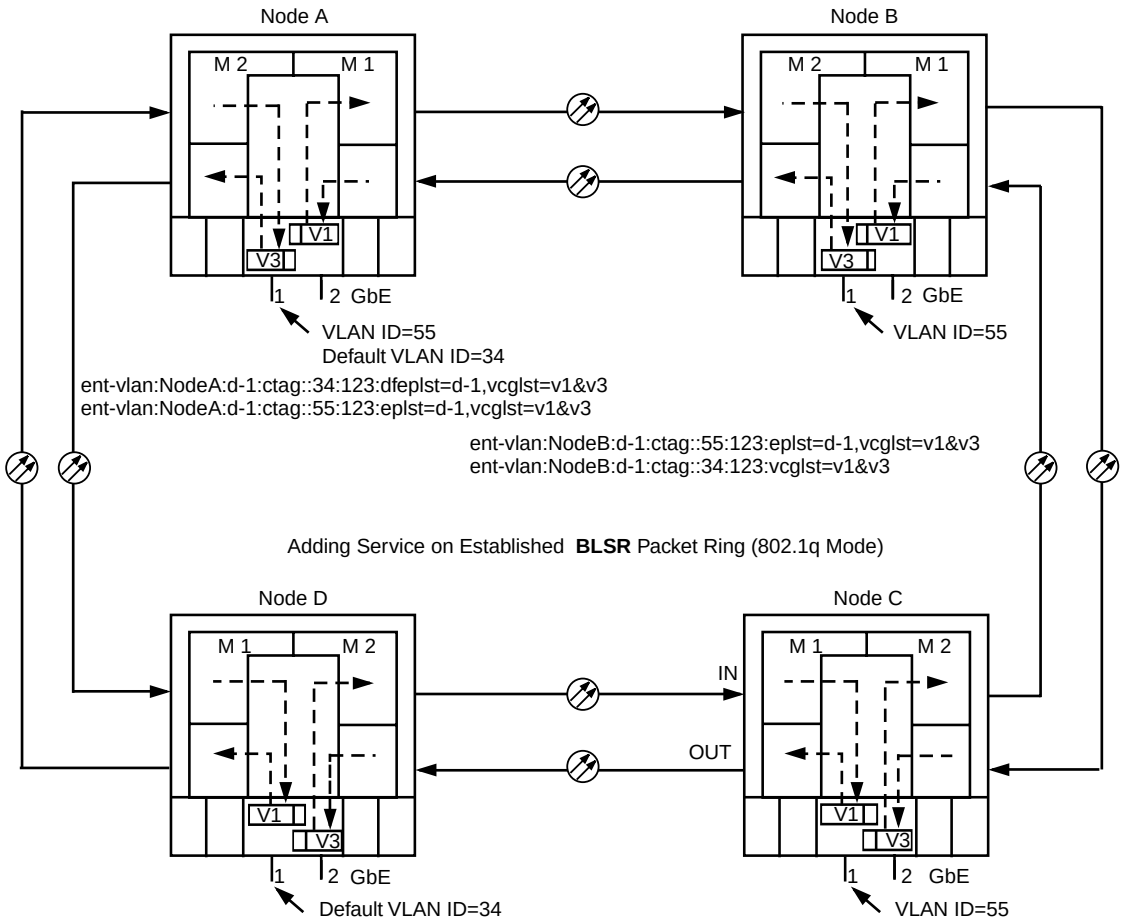
7 PROVISION VCGS

Use the **ed-vcg** TL1 command to provision the WAN (VCG) port parameters, or select **Configuration > Provision** from the System View menu, expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

END OF STEPS

Figure 10-34 Example Service on BLSR Using 802.1q Tagging Mode



SE 330-9: Establish Transparent Mode Ethernet Service on Established Packet Ring (BLSR Protected)

Overview

This procedure provides an example for configuring ethernet service using the Transparent tagging mode on an established packet ring on a BLSR. See Figure 10-35 for an example.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may not be added in-service without the risk of service interruption.

Important! The packet ring must already be established on the BLSR before continuing. This procedure assumes the packet ring is established with the necessary tagging modes, virtual switch IDs, cross-connections, and spanning tree groups established.

On connected gigabit Ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See “Auto-negotiation disable” (5-3) in Chapter 5, “Ethernet” for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of 2waypr cross-connections to be made at each node.

- The tagging mode (Transparent) and virtual switch ID.
- The Port Tags being assigned.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring Transparent tagging mode ethernet service on a BLSR.

. . . . . .

1 Use the WaveStar® CIT to log in to one of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

As an alternative, you can select **View > Ring Map > Ring Map** from the System View menu, then select the 2F BLSR port protection group and click **Select**. Select NVMRING in the Ring Map Source selection box. You may also Display Ring Map Graph using this command.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Routing Map" window opens if the **Administration > OSI Routing Map** command was used.

A list of NEs and NE neighbors is displayed if the **View > Ring Map > Ring Map** command was used.

. . . . . .

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the terminating nodes, circuit packs, LAN ports, virtual switch ID, WAN (VCG) ports, and VLAN IDs associated with the service being established.

5 PROVISION LAN (Ethernet) PORTS

Use the TL1 **ed-eport** command to provision the Default Port Tag (**dftporttag**) and other parameters for the LAN port being provisioned. Or, select **Configuration > Provision** from the System View menu, expand the details for the circuit pack, highlight the LAN port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

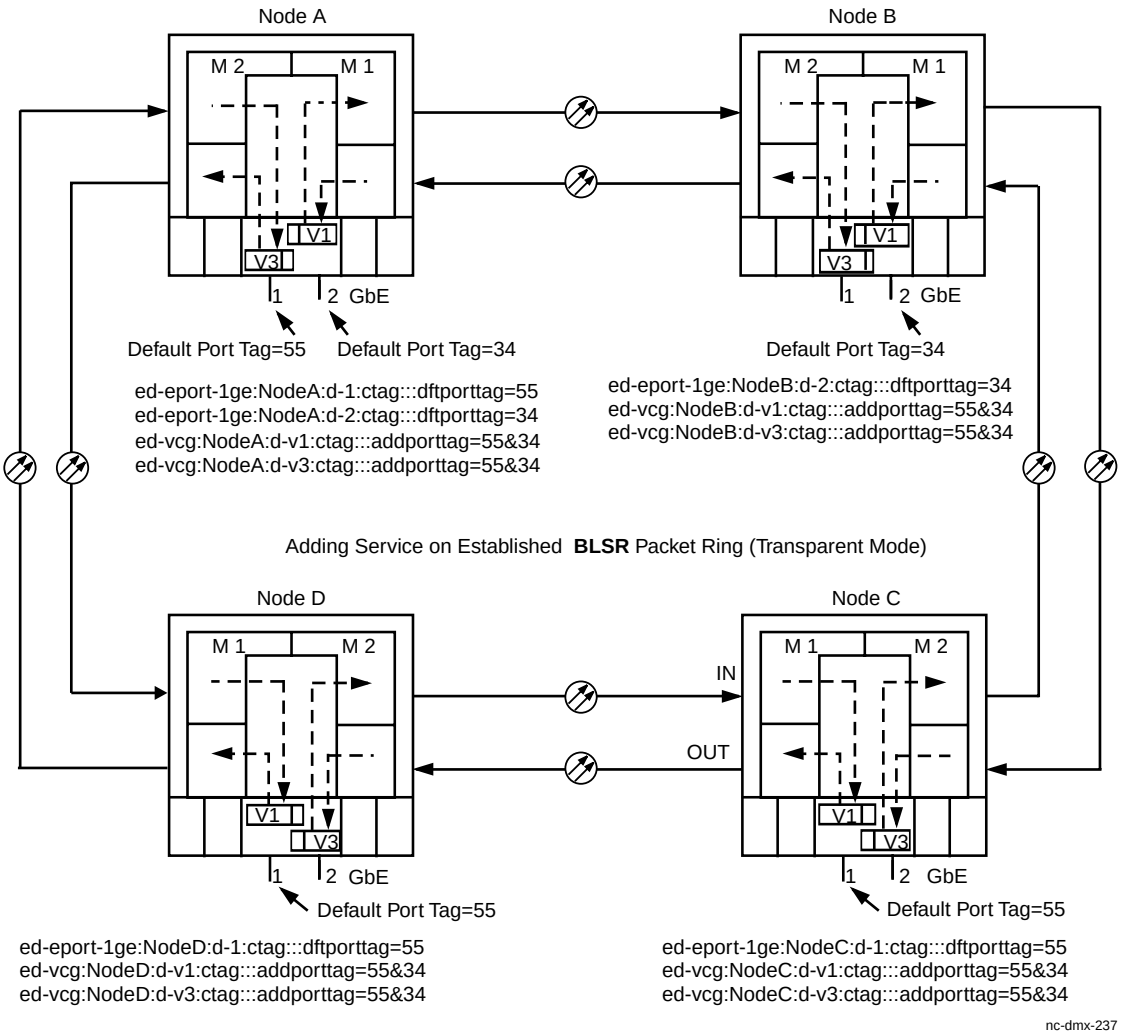
6 PROVISION WAN (VCG) PORTS

Use the TL1 **ed-vcg** command to add port tags (**addporttag**) to the WAN (VCG) ports and provision other parameters as required. Or, select **Configuration > Provision** from the System View menu, expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

END OF STEPS

Figure 10-35 Example Service on BLSR Using Transparent Tagging Mode



SE 330-10: Editing Ethernet Port Parameters

Purpose This procedure provides a list of provisionable parameters for ethernet LAN ports.

Procedure Use this procedure as a reference for provisionable LAN eport parameters.

1 Use the **ed-eport** TL1 command or select **Configuration > Data > LAN (Ethernet) Port** from the System View menu. Select the port to be provisioned, then click **Select**.

2 Use the following table to provision the necessary parameters from your work instructions.

> **Important!** Some of the parameters may have already been provisioned from earlier procedures for establishing service or packet rings.

END OF STEPS

ED-EPORT command parameters

The following table lists the provisionable parameters for the **ED-EPORT** command:

Table 10-1 ED-EPORT Command Provisionable Parameters

Parameter	Description
tid	Target identifier (system name). Refer to the RTRV-HDR command for the input parameter syntax and description of this parameter.
aid	Ethernet port Access Identifier (AID): Metropolis® DMX Access Multiplexer {a,b,c,d}-{1-24} for Fast Ethernet {a,b,c,d,g}-{1-2} for Gigabit Ethernet Metropolis® DMX*press* Access Multiplexer d-{1-16} for Fast Ethernet d-{1-2} for Gigabit Ethernet
ctag	Correlation tag. Refer to the RTRV-HDR command for the input parameter syntax and description of this parameter.
dplxmd	Duplex Mode may have one of the following values: HALF FULL AUTO (initial value) This parameter applies only to 10/100 Fast Ethernet ports.
epmode	Ethernet Port Monitoring Mode may have one of the following values: AUTO (initial value) NMON
eppm	This parameter controls whether Ethernet performance monitoring is enabled for the specified Ethernet port. Ethernet Port PM parameter may have one of the following values: ENABLE DISABLE (initial value)
fcmd	Flow Control Mode may have one of the following values: ENABLE (Enable Transmit & Receive) DISABLE (Disable Transmit & Receive) AUTO (initial vale)

Parameter	Description
Auto Negotiation	For a Gigabit Ethernet (GbE) circuit pack: • Auto-negotiation is disabled on the GE ports, if flow control (fcmd) is Enabled or Disabled. • Auto-negotiation is enabled on the GE ports, if flow control (fcmd) is set to AUTO. For a Fast Ethernet (FE) circuit pack: • Auto-negotiation is set to enable when *any* one of dplxmd, fcmd and lnrate parameters is set to AUTO. • Auto-negotiation is set to disable when *all* of the dplxmd, fcmd and lnrate parameters are set to other than AUTO.
lnrate	For 10/100 Fast Ethernet (FE), the port Line Rate may be assigned one of the following values:. 10M (sets the port as a 10 Mbs port) 100M (sets the port as a 100 Mbs port) AUTO (initial value [auto negotiates the port rate]) This parameter only applies to Fast Ethernet (FE) ports.
dftporttag	Default Port Tag (Default Vlan ID). Value: An integer in the range "1-4093", or" 0". A "0" means that the user does not want a default value to be set. For untagged frames from the customer, the default port tag must be set to the same as the default port tag used for the vcg group. This parameter is only valid when it is in TRANSPARENT mode and has already been assigned as a member of a Virtual Switch (VRTSW)
dftpri	Default priority values may be one of the following: High Low NA (default value) A high priority gives a port a higher priority for service than another port.
almlvl	Alarm Level. This parameter sets the alarm level for an incoming signal Failure and may have one of the following values: MJ (Major Alarm) MN (Minor Alarm) NA (No Alarm)

SE 330-11: Editing VCG Parameters

Purpose This procedure provides a list of provisionable parameters for virtual concatenation groups (VCGs).

Procedure Use this procedure as a reference for provisioning VCG parameters.

1 Use the **ed-vcg** TL1 command or select **Configuration > Data > WAN (VCG) Port** from the System View menu. Select the VCG port to be provisioned, then click **Select**.

2 Use the following table to provision the necessary parameters from your work instructions.

> **Important!** Some of the parameters may have already been provisioned from earlier procedures for establishing service or packet rings.

END OF STEPS

ED-VCG command parameters

The following table lists the provisionable parameters for the ED-VCG command:

Table 10-2 ED-VCG Command Provisionable Parameters

Parameter	Description
tid	Target identifier. Refer to the **RTRV-HDR** command for the input parameter syntax and description of this parameter.
aid	VCG Access Identifier. Metropolis® DMX Access Multiplexer {a,b,c,d}-v{1,2} for Fast Ethernet {a,b,c,d,g}-v{1-4} for Gigabit Ethernet Metropolis® DMX*press* Access Multiplexer d-v{1-2} for Fast Ethernet d-v{1-4} for Gigabit Ethernet
ctag	Correlation tag. Refer to the **RTRV-HDR** command for the input parameter syntax and description of this parameter.
stpp	Spanning Tree Port Priority. Values range from 0 to 255. The initial value is 128. This parameter not valid in NOTAG mode.
stpcost	Spanning Tree Path Cost. Value is an integer in the range from 1 to 65535. The default value is 10. This parameter not valid in NOTAG mode.
sthellotm	Spanning Tree Hello Timer. Value is an integer in the range from 1 to 10 seconds. The initial value is 2 seconds. This parameter not valid in NOTAG mode.
vmode	VCG Monitoring Mode may have one of the following values: AUTO (initial value) NMON
vss	VCG Spanning Tree Status. Values are as follows: ENABLE (Enable VCG port for spanning tree) DISABLE (Disable VCG port for spanning tree) The default is ENABLE. When enabling the VCG port for Spanning Tree, the retrieved spanning tree status could be “blocked”, “discarded”, or some other status value depending on the state of the spanning tree. This parameter is not valid in NOTAG mode.

Parameter	Description
addporttag	Composite list of port tag identifiers to be added. Values are an ampersand (&) separated list of port tage identifiers. Port tag identifiers are integers in the range from 1 to 4093. This parameter is valid only in TRANSPARENT mode.
psctl	Pause Control. Pause Control may have one of the following values: • TRANSPARENT (full rate end-to-end flow control) Enable Pause control pass-through Disable Pause control generation • LOCAL (default) (sub-rate local flow control) Disable Pause control pass-through Enable Pause control generation • NONE Disable Pause control pass-through Disable Pause control generation
almlvl	Alarm Level. This parameter sets the alarm level for an incoming signal Failure and may have one of the following values: MJ (Major Alarm) MN (Minor Alarm) NA (No Alarm)
vpm	This parameter controls when the performance monitoring is enabled for the specified VCG. VCG PM Enable may have one of the following values: ENABLE DISABLE (initial value)

SE 330-12: Editing Ethernet Circuit Pack Parameters

Procedure Use this procedure as a reference for provisioning ethernet circuit pack parameters.

1 Use the **ed-eqpt** TL1 command or select **Configuration** > **Provision** from the System View menu. Select the ethernet circuit pack being provisioned, then click **Select**.

2 Use the following table to provision the necessary parameters from your work instructions.

END OF STEPS

ED-Eqpt command parameters

The following table lists the provisionable parameters for the ethernet circuit packs:

Table 10-3 ED-EQPT Command Provisionable Parameters

Parameter	Description
tid	Target identifier. Refer to the **RTRV-HDR** command for the input parameter syntax and description of this parameter.
aid	Circuit Pack Access Identifier (AID). Metropolis® DMX Access Multiplexer fn-{a,b,c,d}-1 for Fast Ethernet fn-{a,b,c,d}-1 or growth-1 for Gigabit Ethernet Metropolis® DMX*press* Access Multiplexer fn-d-1 for Fast Ethernet or Gigabit Ethernet
ctag	Correlation tag. Refer to the **RTRV-HDR** command for the input parameter syntax and description of this parameter.
vlantagmd	**Vlan Tagging Mode**. • **802.1TAG** - IEEE 802.1Q mode. Default value for FE circuit packs. Allows VLAN ID assignments to LAN and VCG ports for customer identification. • **TRANS** - Transparent mode. Allows Port Tag provisioning independent of customer VLANs. • **NOTAG** - No VLAN or port tag assignments. Accepts all customer packets. Default value for Gigabit Ethernet circuit pack.

Parameter	Description
brst	**Burst Size (1-255):** Burst size determines the length or size of the burst that will be allowed by the PIR (peak information rate) policer. The valid range is 1 to 255. The default is 5. A larger value of burst size means that larger bursts will be allowed; a smaller value of burst size means that the PIR is more strictly enforced, i.e. less "burstability" is allowed. This parameter affects policing for all VLANs (in 802.1Q mode) or all port tags (in transparent mode). It does not apply to NO TAG mode.
cint	**Credit Interval (1-4095):** Credit interval for adding tokens to the token buckets used by the PIR (peak information rate) rate policer. The valid range is 1 to 4095. The default is 143, which corresponds to an interval of 75ms. The minimum value of 1 corresponds to an interval of 524us. The maximum value of 4095 corresponds to 2.15 sec. This parameter affects policing for all VLANs (in 802.1Q mode) or all port tags (in transparent mode). It does not apply to NOTAG mode.

SE 330-13: Establish Point-to-Point BLSR Protected 1GbE Full Rate Private Line Service (No Tag Mode)

Overview

This procedure provides an example for configuring point-to-point BLSR protected GbE full rate private line ethernet service using the No Tag tagging mode. See Figure 10-36 for an example.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

Important! On connected gigabit Ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See "Auto-negotiation disable" (7-5) in Chapter 7, "Ethernet" for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of 2waypr cross-connections to be made at each node.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring a point-to-point BLSR protected 1GbE full rate private line service (No Tag mode). See Figure 10-36 for an example.

1 Use the WaveStar® CIT to log in to each of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Access each of the NEs identified and select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Repeat the above until the backbone ring can be sketched.

As an alternative, you can select **View > Ring Map > Ring Map** from the System View menu, then select the 2F BLSR port protection group and click **Select**. Select NVMRING in the Ring Map Source selection box. You may also Display Ring Map Graph using this command.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Neighbor Map" window opens if the **Administration > OSI Neighbor Map** command was used.

A list of NEs and NE neighbors is displayed if the **View > Ring Map > Ring Map** command was used.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at each node associated with the service to be established.

CAUTION

If the ethernet circuit pack is already in service, the existing tagging mode cannot be changed without removing all existing cross-connections and virtual switch provisioning.

5 CONFIGURE TAGGING MODE

Determine the existing tagging mode for the circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the CP, then click **Select**. Note the VLAN Tagging Mode.

6

If...	Then...
the tagging mode is set correctly to NO TAG,	Proceed to Step 11.
the tagging mode is NOT set to NO TAG,	Continue with Step 7.

7 Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View > Data > Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Note if a virtual switch ID has been assigned.

If a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

8 If a virtual switch already exists, use the TL1 **dlt-vrtsw** command or select the **Configuration > Data > Delete A Virtual Switch** command from the System View menu, highlight the circuit pack being provisioned, then click **Select**. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

9 If a virtual switch has been provisioned, delete it by using the TL1 **ed-eqpt** command or select the **Configuration > Provision** command from the System View menu. Select the circuit pack being provisioned, then click **Provision**.

10 Select **NOTAG** in the Select VLAN Tagging Mode box, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

11 ESTABLISH SONET CROSS-CONNECTIONS

Determine the necessary **2wayPR** STS-1 cross-connections to be made at each non terminating node in the network and the **2F BLSR Add/Drop** cross-connections to be made at the terminating nodes.

Note that full rate gigabit service requires 21 STS-1 cross-connections.

12 One at a time at each node in the network, use the TL1 **ent-crs-sts1** command to provision the cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at each of the nodes in the network to provision the **2-Way Point-to-Point, Through (2wayPR)** and **2F BLSR Add/Drop** cross-connections.

Important! Note that cross-connections at the terminating nodes are add/drop and cross-connections at the non terminating nodes are pass-through.

Reference: "Task 331: Make STS1 Cross-Connections for Ethernet Service" (10-387)

13 From the System View menu, select **View > Cross Connections** at each node to verify that the proper connections have been made.

14 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

15 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

16 PROVISION LAN PORTS

Use the TL1 **ed-eport** command to provision the LAN port parameters, or select **Configuration > Provision** from the System View menu. Expand the details for the circuit pack, highlight the LAN Port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

17 Click **Apply**. Read the warning message, then click **Yes** to execute the command. Repeat from Step 16 for each LAN port being provisioned.

18 PROVISION VCGS

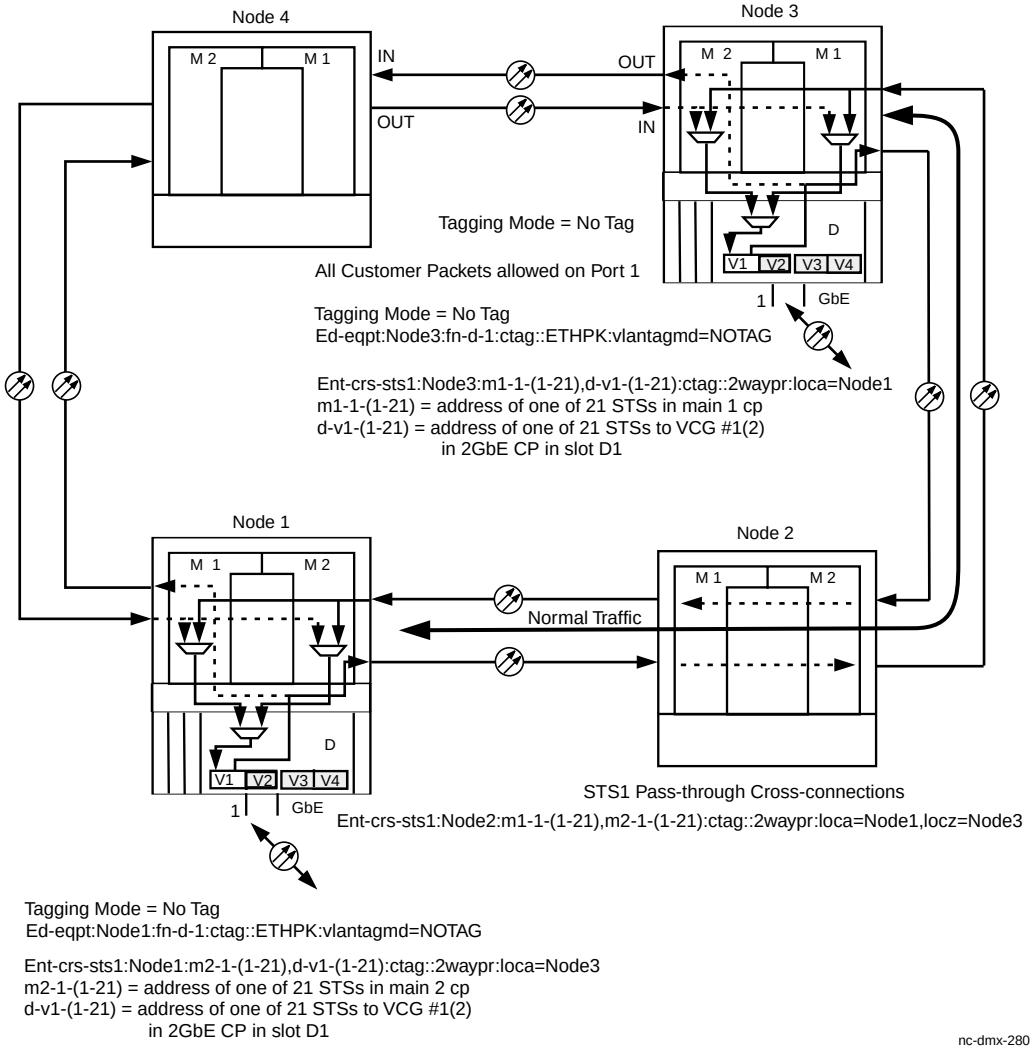
Use the **ed-vcg** TL1 command to provision the WAN (VCG) port parameters, or select **Configuration > Provision** from the System View menu, if window is not already open from the prevision step. Expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

19 Click **Apply**. Read the warning message, then click **Yes** to execute the command. Repeat from Step 18 for all WAN you want to provision. Click **Close** to exit.

END OF STEPS

Figure 10-36 Point-to-Point 1GbE Full Rate Private Line Example



SE 330-14: Establish Point-to-Point BLSR Protected GbE Service (802.1q Mode)

Overview

This procedure provides an example for configuring point-to-point BLSR protected GbE ethernet service using the 802.1q tagging mode. See Figure 10-37 for an example.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

Important! On connected gigabit Ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See "Auto-negotiation disable" (7-5) in Chapter 7, "Ethernet" for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of 2waypr cross-connections to be made at each node.
- The tagging mode (802.1q) and virtual switch ID.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring point-to-point BLSR protected GbE ethernet service using the 802.1q tagging mode. See Figure 10-37 for an example.

1 Use the WaveStar® CIT to log in to each of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Access each of the NEs identified and select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Repeat the above until the backbone ring can be sketched.

As an alternative, you can select **View > Ring Map > Ring Map** from the System View menu, then select the 2F BLSR port protection group and click **Select**. Select NVMRING in the Ring Map Source selection box. You may also Display Ring Map Graph using this command.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Neighbor Map" window opens if the **Administration > OSI Neighbor Map** command was used.

A list of NEs and NE neighbors is displayed if the **View > Ring Map > Ring Map** command was used.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at each node associated with the service to be established.

CAUTION

If the ethernet circuit pack is already in service, the existing tagging mode cannot be changed without removing all existing cross-connections and virtual switch provisioning.

5 CONFIGURE TAGGING MODE

Determine the existing tagging mode and parameters for the circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the CP, then click **Select**. Note the VLAN Tagging Mode, Burst Size, and Credit Interval parameters.

6 Select one of the following:

If...	Then...
the tagging mode and all parameters are set correctly,	Proceed to Step 12.
the tagging mode is set correctly to 802.1TAG but other parameters are not correct,	Proceed to Step 9.
the tagging mode is NOT set to 802.1TAG,	Continue with Step 7.

7 Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View > Data > Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Note if a virtual switch ID has been assigned.

If a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

8 If a virtual switch has been provisioned, delete it by using the TL1 **dlt-vrtsw** command or select the **Configuration > Data > Delete A Virtual Switch** command from the System View menu, highlight the circuit pack being provisioned, then click **Select**. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

9 Use the TL1 **ed-eqpt** command or select the **Configuration > Provision** command from the System View menu. Select the circuit pack being provisioned, then click **Provision**.

10 Verify/Select **802.1TAG** in the Select VLAN Tagging Mode box.

11 Verify/Enter the **Burst Size** and **Credit Interval** parameter values as required, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

Reference: "SE 330-12: Editing Ethernet Circuit Pack Parameters" (10-319)

CAUTION

Once a virtual switch is created and service has been established on the circuit pack, you cannot delete the virtual switch without interrupting service. If the service you are establishing in this procedure is a second service on an existing GbE circuit pack with all LAN/WAN ports in the same virtual switch, then the existing virtual switch ID must be retained or the ports not in service must be removed from the existing virtual switch and a new virtual switch created.

12 ASSIGN VIRTUAL SWITCH ID

- For circuit packs not yet in service with no virtual switch assigned:
  - Use the TL1 **ent-vrtsw** command to create an assigned virtual switch ID or select **Configuration > Data > Create A Virtual Switch** command from the CIT System View menu.
- For circuit packs not yet in service with a virtual switch assigned:
  - Use the TL1 **dlt-vrtsw** command to delete an assigned virtual switch ID or select **Configuration > Data > Delete A Virtual Switch** command from the CIT System View menu, if a different virtual switch ID is required.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.
- For circuit packs in service, on only one set of ports, with a virtual switch assigned:
  - Use the TL1 **ed-vrtsw** command to change an assigned virtual switch ID or select **Configuration > Data > Provision A Virtual Switch** command from the CIT System View menu to add/remove ports from a virtual switch.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

13 ESTABLISH SONET CROSS-CONNECTIONS

Determine the necessary **2F BLSR Add/Drop** and **2-Way Point-to-Point, Through** STS-1 cross-connections to be made at each terminating and non terminating node in the network.

Note that full rate gigabit service requires 21 STS-1 cross-connections.

14 One at a time at each node in the network, use the TL1 **ent-crs-sts1** command to provision the **2waypr** cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at each of the non terminating nodes in the network to provision the **2-Way Point-to-Point, Through** cross-connections, and at the terminating ethernet nodes to provision the **2F BLSR Add/Drop** cross-connections.

Important! Note that cross-connections at the terminating nodes are add/drop and cross-connections at the non terminating nodes are pass-through.

Reference: "Task 331: Make STS1 Cross-Connections for Ethernet Service" (10-387)

15 From the System View menu, select **View > Cross Connections** at each node to verify that the proper connections have been made.

16 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

17 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

18 ASSIGN VLAN IDs

Use the TL1 **ent-vlan** command to assign the default VLAN ID for customer untagged frames or the customer VLAN ID for tagged frames to the associated LAN ports and VCG WAN ports. Or select **Configuration > Data > Create A VLAN** command from the CIT System View menu. For example, see Figure 10-37.

Example: In Figure 10-37, assume a GbE circuit pack is installed in function slot d-1 and LAN port 2 at each circuit pack is used for service.

Note that a service has been established between Node 1 and Node 3 for customer untagged frames using a default VLAN ID of 34.

Note that a service has been established between Node 1 and Node 3 for customer tagged frames using a VLAN ID of 55.

19 PROVISION LAN PORTS

Use the TL1 **ed-eport** command to provision the LAN port parameters, or select **Configuration > Provision** from the System View menu. Expand the details for the circuit pack, highlight the LAN Port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

20 Click **Apply**. Read the warning message, then click **Yes** to execute the command.

21 PROVISION VCGS

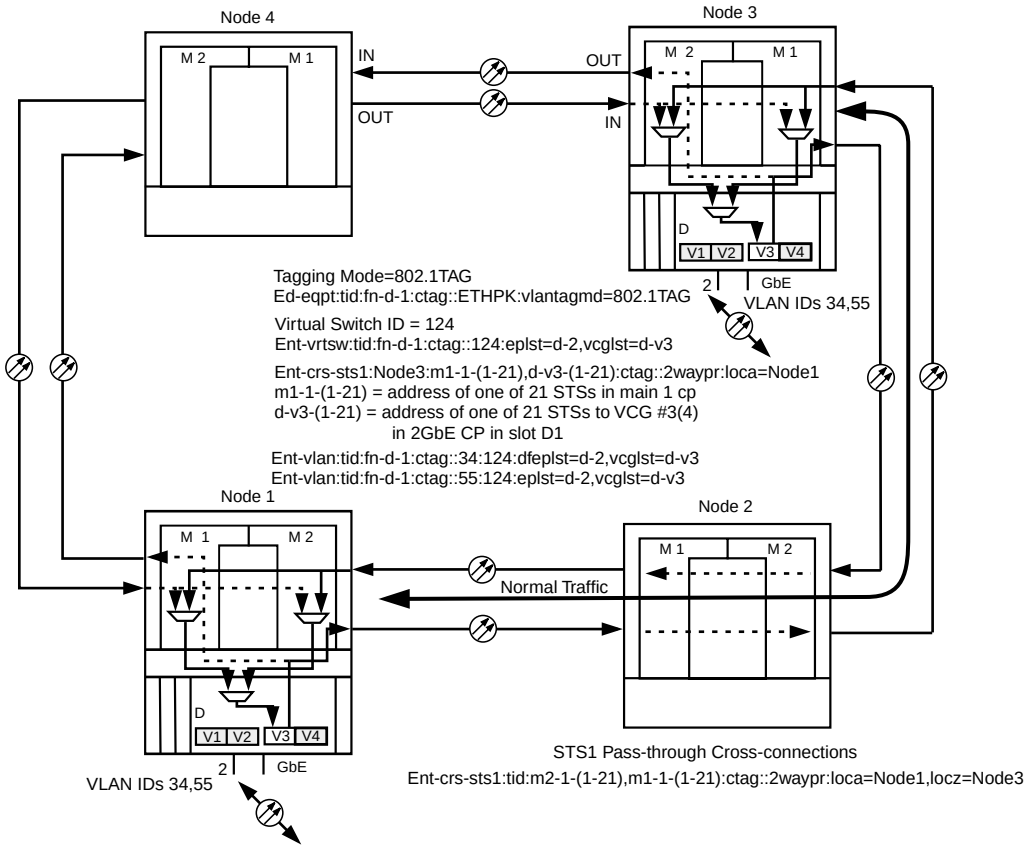
Use the **ed-vcg** TL1 command to provision the WAN (VCG) port parameters, or select **Configuration > Provision** from the System View menu, if window is not already open from the previous step. Expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

22 Click **Apply**. Read the warning message, then click **Yes** to execute the command. Click **Close** to exit or repeat from Step 19 for other port provisioning.

END OF STEPS

Figure 10-37 Point-to-Point GbE Using 802.1q Tagging Mode



SE 330-15: Establish Point-to-Point BLSR Protected GbE Service (Transparent Mode)

Overview

This procedure provides an example for configuring initial point-to-point BLSR protected GbE ethernet service using the transparent tagging mode. See Figure 10-38 for an example.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

Important! On connected gigabit Ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See "Auto-negotiation disable" (7-5) in Chapter 7, "Ethernet" for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of 2waypr cross-connections to be made at each node.
- The tagging mode (Transparent) and virtual switch ID.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring point-to-point BLSR protected GbE ethernet service using the transparent tagging mode. See Figure 10-38 for an example.

1 Use the WaveStar® CIT to log in to each of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Access each of the NEs identified and select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Repeat the above until the backbone ring can be sketched.

As an alternative, you can select **View > Ring Map > Ring Map** from the System View menu, then select the 2F BLSR port protection group and click **Select**. Select NVMRING in the Ring Map Source selection box. You may also Display Ring Map Graph using this command.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Neighbor Map" window opens if the **Administration > OSI Neighbor Map** command was used.

A list of NEs and NE neighbors is displayed if the **View > Ring Map > Ring Map** command was used.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at each node associated with the service to be established.

CAUTION

If the ethernet circuit pack is already in service, the existing tagging mode cannot be changed without removing all existing cross-connections and virtual switch provisioning.

5 CONFIGURE TAGGING MODE

Determine the existing tagging mode and parameters for the circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the CP, then click **Select**. Note the VLAN Tagging Mode, Burst Size, and Credit Interval parameters.

6 Select one of the following:

If...	Then...
the tagging mode and all parameters are set correctly,	Proceed to Step 12.
the tagging mode is set correctly to Trans but other parameters are not correct,	Proceed to Step 9.
the tagging mode is NOT set to Trans,	Continue with Step 7.

7 Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View > Data > Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Note if a virtual switch ID has been assigned.

If a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

8 If a virtual switch has been provisioned, delete it by using the TL1 **dlt-vrtsw** command or select the **Configuration > Data > Delete A Virtual Switch** command from the System View menu, highlight the circuit pack being provisioned, then click **Select**. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

9 Use the TL1 **ed-eqpt** command or select the **Configuration > Provision** command from the System View menu. Select the circuit pack being provisioned, then click **Provision**.

10 Verify/Select **Trans** in the Select VLAN Tagging Mode box.

11 Verify/Enter the **Burst Size** and **Credit Interval** parameter values as required, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

Reference: "SE 330-12: Editing Ethernet Circuit Pack Parameters" (10-319)

CAUTION

Once a virtual switch is created and service has been established on the circuit pack, you cannot delete the virtual switch without interrupting service. If the service you are establishing in this procedure is a second service on an existing GbE circuit pack with all LAN/WAN ports in the same virtual switch, then the existing virtual switch ID must be retained or the ports not in service must be removed from the existing virtual switch and a new virtual switch created.

12 ASSIGN VIRTUAL SWITCH ID

- For circuit packs not yet in service with no virtual switch assigned:
  - Use the TL1 **ent-vrtsw** command to create an assigned virtual switch ID or select **Configuration > Data > Create A Virtual Switch** command from the CIT System View menu.
- For circuit packs not yet in service with a virtual switch assigned:
  - Use the TL1 **dlt-vrtsw** command to delete an assigned virtual switch ID or select **Configuration > Data > Delete A Virtual Switch** command from the CIT System View menu, if a different virtual switch ID is required.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.
- For circuit packs in service, on only one set of ports, with a virtual switch assigned:
  - Use the TL1 **ed-vrtsw** command to change an assigned virtual switch ID or select **Configuration > Data > Provision A Virtual Switch** command from the CIT System View menu to add/remove ports from a virtual switch.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

13 ESTABLISH SONET CROSS-CONNECTIONS

Determine the necessary **2F BLSR Add/Drop** and **2-Way Point-to-Point, Through** STS-1 cross-connections to be made at each terminating and non terminating node in the network.

Note that full rate gigabit service requires 21 STS-1 cross-connections.

14 One at a time at each node in the network, use the TL1 **ent-crs-sts1** command to provision the **2waypr** cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at each of the non terminating nodes in the network to provision the **2-Way Point-to-Point, Through** cross-connections, and at the terminating ethernet nodes to provision the **2F BLSR Add/Drop** cross-connections.

Important! Note that cross-connections at the terminating nodes are add/drop and cross-connections at the non terminating nodes are pass-through.

Reference: "Task 331: Make STS1 Cross-Connections for Ethernet Service" (10-387)

15 From the System View menu, select **View > Cross Connections** at each node to verify that the proper connections have been made.

16 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

17 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

18 PROVISION LAN (Ethernet) PORTS

Use the TL1 **ed-eport** command to provision the Default Port Tag (**dftporttag**) and other parameters for the LAN port being provisioned. Or, select **Configuration** > **Provision** from the System View menu. Expand the details for the circuit pack, highlight the LAN Port, then click **Provision**. Provision the Default Port Tag and other parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

19 Click **Apply**. Read the warning message, then click **Yes** to execute the command.

20 PROVISION WAN (VCG) PORTS

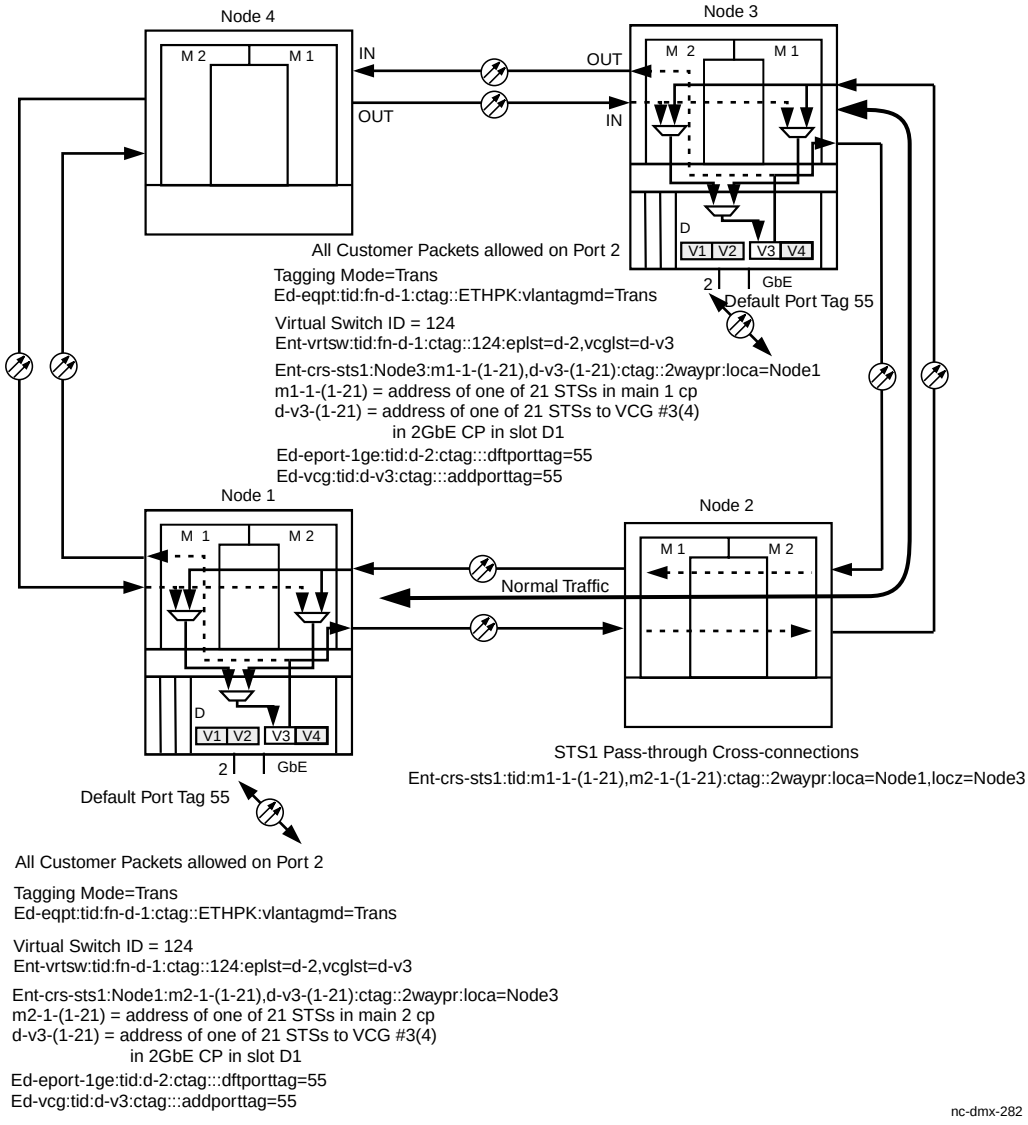
Use the TL1 **ed-vcg** command to add port tags (**addporttag**) to the WAN (VCG) ports and provision other parameters as required. Or, select **Configuration** > **Provision** from the System View menu, if window is not already open from the prevision step. Expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Add the port tag to the VCG and provision the other parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

21 Click **Apply**. Read the warning message, then click **Yes** to execute the command. Click **Close** to exit or repeat from Step 18 for other port provisioning.

END OF STEPS

Figure 10-38 Point-to-Point GbE Using Transparent Tagging Mode



SE 330-16: Establish Ethernet Packet Ring on a BLSR With Non Preemptible Unprotected Traffic (NUT)

Overview

This procedure provides an example for establishing an ethernet packet ring on a bidirectional line switched ring (BLSR) with Nonpreemptible Unprotected Traffic (NUT) access (Release 3 or later).

A packet ring is a set of ethernet switches (ethernet circuit packs) connected to each other in a ring configuration. When the packet ring is first established, the capacity of the ring is predetermined by the number of STS-1 cross-connections (1-21) applied to the ring and switches. The tagging mode, virtual switch ID, and spanning tree group is also predetermined. For example, see Figure 10-39.

This procedure assumes that the BLSR ring network configuration has already been established and no alarms are present.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, STS-1 cross-connection capacity may not be added to an in-service packet ring without the risk of service interruption.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the nodes participating in the packet ring network.
- The shelf slots, circuit packs, ports, VCGs involved in the packet ring network.
- The number and type of multipoint (mltpt) cross-connections to be made at each node.

  Note, that once the capacity of the packet ring is established, additional capacity (cross-connections) may not be added in service without the risk of service interruption.

- The tagging mode (transparent or 802.1q), virtual switch ID, and spanning tree group ID.

Procedure Use this procedure as an example to establish an ethernet packet ring on a BLSR ring using NUT. See Figure 10-39 for an example.

1 Use the WaveStar® CIT to log in to each of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Access each of the NEs identified and select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Repeat the above until the backbone ring can be sketched.

As an alternative, you can select **View > Ring Map > Ring Map** from the System View menu, then select the 2F BLSR port protection group and click **Select**. Select NVMRING in the Ring Map Source selection box. You may also Display Ring Map Graph using this command.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Neighbor Map" window opens if the **Administration > OSI Neighbor Map** command was used.

A list of NEs and NE neighbors is displayed if the **View > Ring Map > Ring Map** command was used.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at each node associated with the packet ring being established.

5 Verify that the ethernet circuit packs have been installed into the required slot 1 of the Function Unit or Growth group (A, B, C, D, or G) at each NE providing ethernet service.

Reference: "Task 335: Install 1GSX/1GLX (LNW67/LNW68) Gigabit Ethernet Circuit Packs" (10-417)

CAUTION

If the ethernet circuit pack is already in service, the existing tagging mode cannot be changed without removing all existing cross-connections and virtual switch provisioning.

6 CONFIGURE TAGGING MODE

Determine the existing tagging mode for the circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the CP, then click **Select**. Note the VLAN Tagging Mode, Burst Size, and Credit Interval parameters.

When GbE circuit packs are installed in the shelf, the default "NO TAG" mode is assigned to the circuit pack. When FE circuit packs are installed in the shelf, the default "802.1TAG" mode is assigned to the circuit pack.

7

If...	Then...
the tagging mode and all parameters are set correctly,	Proceed to Step 13.
the tagging mode is set correctly but other parameters are not correct,	Proceed to Step 10.
the tagging mode is NOT set correctly,	Continue with Step 8.

8 Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View > Data > Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Note if a virtual switch ID has been assigned.

If a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

9 If a virtual switch has been provisioned, delete it by using the TL1 **dlt-vrtsw** command or select the **Configuration > Data > Delete A Virtual Switch** command from the System View menu, select the circuit pack being provisioned, then click Select. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

10 Use the TL1 **ed-eqpt** command or select the **Configuration > Provision** command from the System View menu, select the circuit pack being provisioned, then click **Provision**.

11 Verify/Select the tagging mode (**802.1TAG** or Transparent [**Trans**]) in the Select VLAN Tagging Mode box.

12 Verify/Enter the **Burst Size** and **Credit Interval** parameter values as required, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

Reference: "SE 330-12: Editing Ethernet Circuit Pack Parameters" (10-319)

CAUTION

Once a virtual switch is created and service has been established on the circuit pack, you cannot delete the virtual switch without interrupting service. If the service you are establishing in this procedure is a second service on an existing GbE circuit pack with all LAN/WAN ports in the same virtual switch, then the existing virtual switch ID must be retained or the ports not in service must be removed from the existing virtual switch and a new virtual switch created.

13 ASSIGN VIRTUAL SWITCH ID

- For circuit packs not yet in service with no virtual switch assigned:
  - Use the TL1 **ent-vrtsw** command to create an assigned virtual switch ID or select **Configuration > Data > Create A Virtual Switch** command from the CIT System View menu.
- For circuit packs not yet in service with a virtual switch assigned:
  - Use the TL1 **dlt-vrtsw** command to delete an assigned virtual switch ID or select **Configuration > Data > Delete A Virtual Switch** command from the CIT System View menu, if a different virtual switch ID is required.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.
- For circuit packs in service, on only one set of ports, with a virtual switch assigned:
  - Use the TL1 **ed-vrtsw** command to change an assigned virtual switch ID or select **Configuration > Data > Provision A Virtual Switch** command from the CIT System View menu to add/remove ports from a virtual switch.

– Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.

. . . . . .

14 PROVISION NUT VALUES

Select **Configuration** > **Provision** from the System View menu. Or use the TL1 **ed-protn-acc** command to provision the NUT values.

Result: The Provision Parameters for ... window opens.

. . . . . .

15 Select **Ptn Grp** tab from the bottom of the window, then select the required *2F BLSR* group and click **Provision**.

Result: Parameters display for the selected protection group

. . . . . .

16 Under Local NUT,

- Select the **NUT Rate** as **STS1**
- Select the **Time Slot Number** (**1-24**) you are provisioning.
- Select the **NUT Protection Attribute** as **Not Protected.**

Important! Note that each time slot used for the multipoint cross-connections for the packet ring must be provisioned with the NUT attribute of **Not Protected**.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

17 ESTABLISH SONET CROSS-CONNECTIONS

Determine the necessary **Multipoint (mltpt)** STS-1 cross-connections to be made to each VCG at each terminating node. Determine any **2-Way Point-to-Point, Through (2wayPR)** pass through cross-connections to be made at any non terminating nodes in the network.

Note that for full rate gigabit packet rings on an OC-48 BLSR, cross-connections for the first packet ring using VCG 1(2) should use cross-connection time slots 1-21.

18 One at a time at each node in the network, use the TL1 **ent-crs-sts1** command to provision the cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard to provision the **Multipoint (mltpt)** ethernet and the **2-Way Point-to-Point, Through (2wayPR)** pass-through cross-connections. For example, see Figure 10-39.

Reference: Refer to "Task 331: Make STS1 Cross-Connections for Ethernet Service" (10-387) for cross-connection examples.

19 From the System View menu, select **View > Cross Connections** to verify that the proper connections have been made.

20 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

21 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

22 CREATE SPANNING TREE GROUP

If required, determine a preferred spanning tree configuration (span to be blocked under nominal conditions), the preferred root node, and spanning tree root priorities for this service.

Note that it is not necessary to determine a preferred spanning tree configuration. A default spanning tree configuration is configured when you establish the spanning tree group.

Reference: "Task 332: Determine Preferred Spanning Tree Configuration" (10-399)

23 Use the TL1 **ent-stgrp** command to assign and provision the parameters for the VCGs involved in the spanning tree group. Or select **Configuration > Data > Create A Spanning Tree Group** command from the CIT System View menu. For example, see Figure 10-39.

Important! Spanning tree default parameters support a network of up to nine nodes.

Networks running 802.1w rapid spanning tree protocol (Release 2 or later) support more than nine nodes participating in a spanning tree. To support more than nine nodes in the spanning tree, the maximum age timer must be increased. Note that spanning tree restoration time increases as the number of nodes increase.

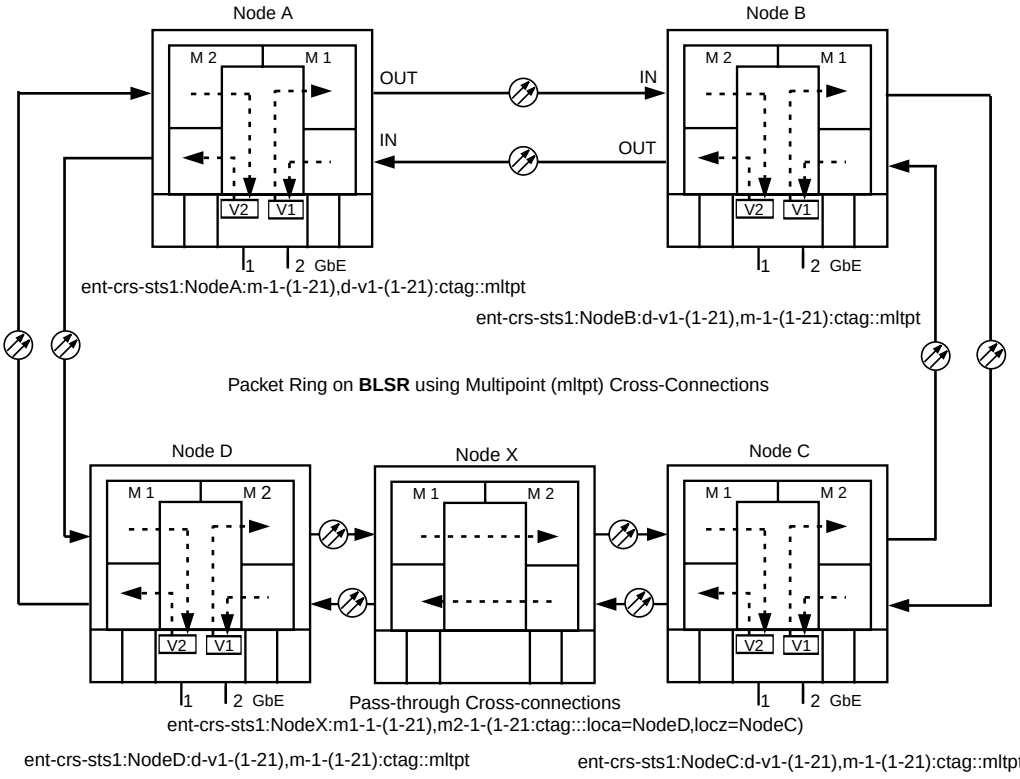
If the network consists of more than nine (9) nodes which are participating in the spanning tree configuration, use the following formula to determine the proper setting for the spanning tree maximum age timer (**stmaxage**): 2 x (N + 1), where N equals the number of nodes.

Example: If the network consists of 16 nodes, then the **stmaxage** timer should be set to 34 seconds: 2 x (16 + 1) = 34.

24 Repeat all the assignments in this procedure at each ethernet node in the network.

END OF STEPS

Figure 10-39 Ethernet Packet Ring on a BLSR with NUT



Basic Provisioning at all nodes with ethernet:
- Tagging Mode = 802.1q or Transparent
  - Example: ed-eqpt:tid:d-1:ctag:ETHPK:vlantagmd=802.1q
  - Example: ed-eqpt:tid:d-1:ctag:ETHPK:vlantagmd=Trans
  - Example: **Configuration > Provision,** select the ethernet circuit pack, click **Provision**, select Tagging Mode
- Virtual Switch ID (for example, 123)
  - ent-vrtsw:tid:d-1:ctag::123:eplst=d-1,vcglst=d-v1&d-v2
  - **Configuration > Data > Create A Virtual Switch,** select ethernet circuit pack, click **Select**, enter parameters.
- NUT Value for cross-connections:
  - **Configuration > Provision**, select **Ptn Grp**, select BLSR protection group, click **Provision.** Provision NUT Value to **Not Protected** for all timeslots being used.
- Cross-connections: See examples in figure above.
- Spanning Tree Group ID (for example, 1)
  - ent-stgrp:tid::ctag::1,123:vcglst=d-v1&d-v2
  - **Configuration > Data > Create A Spanning Tree**, select ethernet circuit pack, click **Select,** enter parameters.

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SE 330-17: Adding Bandwidth to a Point-to-Point UPSR/BLSR Protected GbE Service (802.1q Mode)

Overview

This procedure provides an example for adding bandwidth to an in service point-to-point UPSR/BLSR protected GbE ethernet service with minimal service interruption. This example uses the 802.1q tagging mode.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Cross-Connection Wizard to perform the cross-connection provisioning in this procedure and the **Configuration > Data > Create A VLAN** to provision new VLANS. From the System View menu, select **Configuration > Cross-Connections** to invoke the wizard.

See Figure 10-40 and Figure 10-41 for examples.

CAUTION

Service interruption will occur when adding bandwidth (STS-1s) to an in service ethernet circuit pack in Release 3 and earlier systems.

Important! To minimize service interruption, plan the addition of cross-connections. For example, do any new pass-through cross-connections first. Then at the appropriate time, coordinate and make the add/drop cross-connections at the terminating nodes at the same time, as close as possible.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.
- The number and type of additional cross-connections to be made at each node.
- The tagging mode (802.1q) and virtual switch ID.
- Notify the customers on the existing service of the impending service interruption and coordinate your activities accordingly.
- Plan the activity of adding cross-connections to minimize service interruption.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for adding bandwidth (cross-connections) to a point-to-point UPSR/BLSR protected GbE ethernet service using the 802.1q tagging mode.

. . . . . .

1 Use the WaveStar® CIT to log in to each of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Access each of the NEs identified and select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Repeat the above until the backbone ring can be sketched.

As an alternative, you can select **View > Ring Map > Ring Map** from the System View menu, then select the 2F BLSR port protection group and click **Select**. Select NVMRING in the Ring Map Source selection box. You may also Display Ring Map Graph using this command.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Neighbor Map" window opens if the **Administration > OSI Neighbor Map** command was used.

A list of NEs and NE neighbors is displayed if the **View > Ring Map > Ring Map** command was used.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the circuit pack, ports, and cross-connections to be made at each node associated with the service being added.

5 ESTABLISH SONET PASS THROUGH CROSS-CONNECTIONS

Determine the necessary **2-Way Point-to-Point, Through** STS-1 cross-connections to be made at each *non* terminating node in the network.

Important! In Release 3.0 and earlier, additional STS-1 cross-connection capacity may not be added in-service without the risk of service interruption.

6 One at a time at each *non* terminating node in the network, use the TL1 **ent-crs-sts1** command to provision the **2-WayPR** pass-through cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at each of the *non* terminating nodes in the network to provision the **2-Way Point-to-Point, Through** cross-connections.

> **Important!** Note that cross-connections at the terminating nodes are add/drop and cross-connections at the *non* terminating nodes are pass-through.

Reference: "Task 331: Make STS1 Cross-Connections for Ethernet Service" (10-387)

7 From the System View menu, select **View > Cross Connections** at each *non* terminating node to verify that the proper connections have been made.

8 ESTABLISH SONET ADD/DROP CROSS-CONNECTIONS

At each terminating node in the network, coordinate your activities to activate the necessary cross-connections at the same time. Note that there will be some service interruption.

Use The TL1 **ent-crs-sts1** command to provision the **2waypr** add/drop cross-connections. Or, select **Configuration > Cross-Connection** from the system view menu to start the cross connection wizard. Use the cross connection wizard at each of the terminating nodes in the network to provision the UPSR **2-Way Point-to-Point Add/Drop, Unswitched** or **2F BLSR Add/Drop** cross-connections.

> **Important!** Enter all your parameters for the cross-connections and coordinate with the other end as to when you enter/apply the command.

9 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

10 If alarms are present, look for missing or improperly made cross-connections.

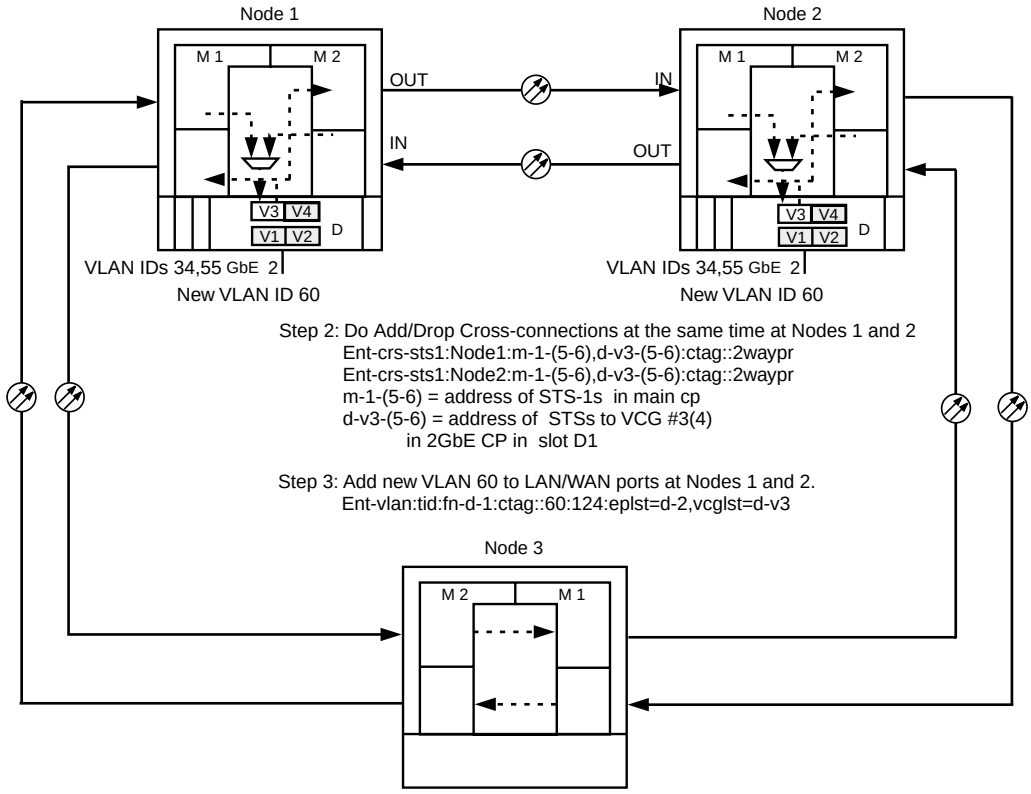
Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

11 ASSIGN VLAN IDs

If adding new customers, use the TL1 **ent-vlan** command to assign the new customer VLAN ID to the associated LAN ports and VCG WAN ports. Or select **Configuration > Data > Create A VLAN** command from the CIT System View menu to open the Create New VLAN provisioning window.

END OF STEPS

Figure 10-40 Example of Adding Bandwidth UPSR Ring



Original configuration:
Customer VLANs 34 and 55 share 4 STS1s in a point-to-point configuration.
Customers share 4 STS1s in Main, m-1-(1-4), connected to VCG timeslots 1-4.
Virtual Switch ID=124

New configuration:
Add 2 more cross-connections, m-1-5 and m-1-6, for additional bandwidth.
Add new VLAN, 60, at each of the terminating nodes, Node 1 and Node 2.
Virtual Switch ID=124

Steps:
1. Add 2-Way Point-to-Point, Through cross-connection at Node 3.
2. At the same time, add 2-Way Point-to-Point, Add/Drop to UPSR, Unswitched cross-connections at Nodes 1 and 2.
3. Add VLAN ID 60 at Nodes 1 and 2.

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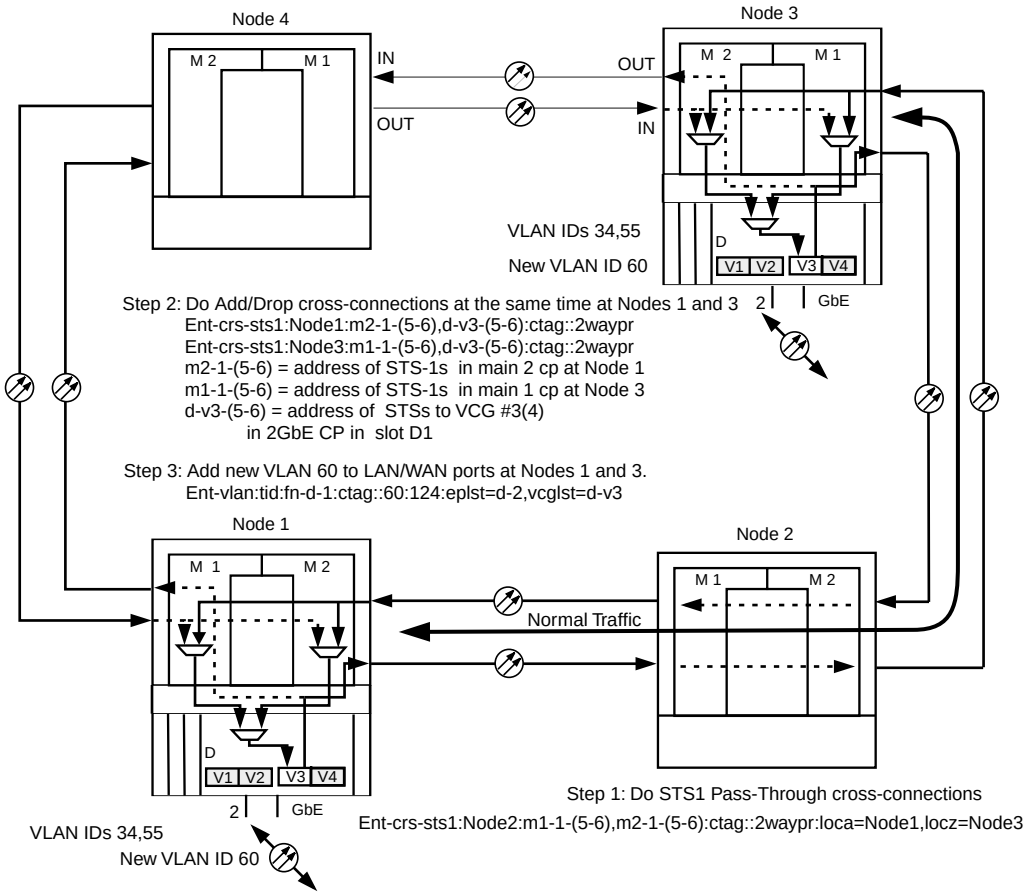
Figure 10-41 Example of Adding Bandwidth BLSR Ring



Original configuration:
Customer VLANs 34 and 55 share 4 STS1s in a point-to-point configuration.
Customers share 4 STS1s (1-4) in Main, connected to VCG timeslots 1-4.
Virtual Switch ID=124

New configuration:
Add 2 more cross-connections, timeslots 5-6, for additional bandwidth.
Add new VLAN, 60, at each of the terminating nodes, Node 1 and Node 3.
Virtual Switch ID=124

Steps:
1. Add **2-Way Point-to-Point, Through** cross-connection at Node 2.
2. At the same time, add **2F BLSR Add/Drop** cross-connections at Nodes 1 and 3.
3. Add VLAN ID 60 at Nodes 1 and 3.

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SE 330-18: Establish a Dedicated Multipoint Private Line UPSR Protected GbE Service (Transparent Mode)

Overview

This procedure provides an example for configuring a dedicated multipoint private line UPSR protected GbE ethernet service using the Transparent tagging mode.

This procedure illustrates a dedicated bandwidth, private line, service with per link bandwidth granularity with multiple connections. Although this procedure uses the transparent mode, this configuration could use the 802.1q tagging mode with VLAN assignments. Cross-connections and VCG assignments are the major considerations in this type of configuration. See Figure 10-42 and Figure 10-43.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

Important! On connected gigabit Ethernet devices with autonegotiation turned on/enabled, if transmission is interrupted in one direction of transmission on a gigabit ethernet device, then transmission will also be disabled in the other direction. For example, if one fiber in a transmit/receive pair is cut, then one-way transmission on the other fiber can be maintained only if autonegotiate is turned off/disabled and the link state is forced good at the transmit source equipment. See "Auto-negotiation disable" (7-5) in Chapter 7, "Ethernet" for more information.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the terminating ethernet nodes.
- The shelf slots, circuit packs, ports, and VCGs being provisioned.

- The number and type of 2waypr cross-connections to be made at each node.
- The tagging mode (transparent) and virtual switch ID.

Related information

For related information and explanation of TL1 commands and the WaveStar® CIT menus, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Procedure

Use this procedure as an example for configuring a dedicated multipoint private line UPSR protected GbE ethernet service using the Transparent tagging mode.

. . . . . .

1 Use the WaveStar® CIT to log in to each of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 On the System View menu, select **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Access each of the NEs identified and select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Repeat the above until the backbone ring can be sketched.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Neighbor Map" window opens.

. . . . . .

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at *each* node associated with the service to be established. Refer to Figure 10-42 and Figure 10-43 for provisioning at each node.

CAUTION

If the ethernet circuit pack is already in service, the existing tagging mode cannot be changed without removing all existing service.

5 CONFIGURE TAGGING MODE

Determine the existing tagging mode and parameters for the circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the CP, then click **Select**. Note the VLAN Tagging Mode, Burst Size, and Credit Interval parameters.

6 Select one of the following:

If...	Then...
the tagging mode and all parameters are set correctly,	Proceed to Step 12.
the tagging mode is set correctly to TRANS but other parameters are not correct,	Proceed to Step 9.
the tagging mode is NOT set to TRANS,	Continue with Step 7.

7 Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View > Data > Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Note if a virtual switch ID has been assigned.

If a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

8 If a virtual switch already exists, use the TL1 **dlt-vrtsw** command or select the **Configuration > Data > Delete A Virtual Switch** command from the System View menu, highlight the circuit pack being provisioned, then click **Select**. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

9 Use the TL1 **ed-eqpt** command or select the **Configuration > Provision** command from the System View menu. Select the circuit pack being provisioned, then click **Provision**.

10 Verify/Select **TRANS** in the Select VLAN Tagging Mode box.

11 Verify/Enter the **Burst Size** and **Credit Interval** parameter values as required, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

Reference: "SE 330-12: Editing Ethernet Circuit Pack Parameters" (10-319)

CAUTION

Once a virtual switch is created and service has been established on the circuit pack, you cannot delete the virtual switch without interrupting service. If the service you are establishing in this procedure is a second service on an existing GbE circuit pack with all LAN/WAN ports in the same virtual switch, then the existing virtual switch ID must be retained or the ports not in service must be removed from the existing virtual switch and a new virtual switch created.

12 ASSIGN VIRTUAL SWITCH ID

- For circuit packs not yet in service with no virtual switch assigned:
  - Use the TL1 **ent-vrtsw** command to create an assigned virtual switch ID or select **Configuration > Data > Create A Virtual Switch** command from the CIT System View menu.
- For circuit packs not yet in service with a virtual switch assigned:
  - Use the TL1 **dlt-vrtsw** command to delete an assigned virtual switch ID or select **Configuration > Data > Delete A Virtual Switch** command from the CIT System View menu, if a different virtual switch ID is required.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.
- For circuit packs in service, on only one set of ports, with a virtual switch assigned:
  - Use the TL1 **ed-vrtsw** command to change an assigned virtual switch ID or select **Configuration > Data > Provision A Virtual Switch** command from the CIT System View menu to add/remove ports from a virtual switch.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

13 ESTABLISH SONET CROSS-CONNECTIONS

Determine the necessary STS-1 cross-connections to be made at each terminating and non terminating node in the network.

Important! Note that cross-connections at the terminating nodes are add/drop and cross-connections at the non terminating nodes are pass-through.

14 One at a time at each node in the network, use the TL1 **ent-crs-sts1** command to provision the **2waypr** cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at each of the nodes in the network to provision the **2wayPR** cross-connections.

Note that the sum of the three individual STS-1 links in an OC-48 ring configuration cannot exceed a total of 48 STS-1s . In an OC-192 ring configuration, the total of the three links cannot exceed 63 STS-1s. An individual link cannot exceed the maximum of 21 STS-1s.

Reference: “Task 331: Make STS1 Cross-Connections for Ethernet Service” (10-387)

15 From the System View menu, select **View > Cross Connections** at each node to verify that the proper connections have been made.

16 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

17 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

18 PROVISION LAN (Ethernet) PORTS

Use the TL1 **ed-eport** command to provision the Default Port Tag (**dftporttag**) and other parameters for the LAN port being provisioned. Or, select **Configuration** > **Provision** from the System View menu. Expand the details for the circuit pack, highlight the LAN Port, then click **Provision**. Provision the Default Port Tag and other parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

19 Click **Apply**. Read the warning message, then click **Yes** to execute the command.

20 PROVISION WAN (VCG) PORTS

Use the TL1 **ed-vcg** command to add port tags (**addporttag**) to the WAN (VCG) ports and provision other parameters as required. Or, select **Configuration** > **Provision** from the System View menu, if window is not already open from the prevision step. Expand the details for the circuit pack, highlight the VCG port, then click **Provision**. Add the port tag to the VCG and provision the other parameters as required.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

21 Click **Apply**. Read the warning message, then click **Yes** to execute the command. Click **Close** to exit or repeat from Step 18 for other port provisioning.

END OF STEPS

Figure 10-42 Dedicated Multipoint GbE Using Transparent Tagging Mode

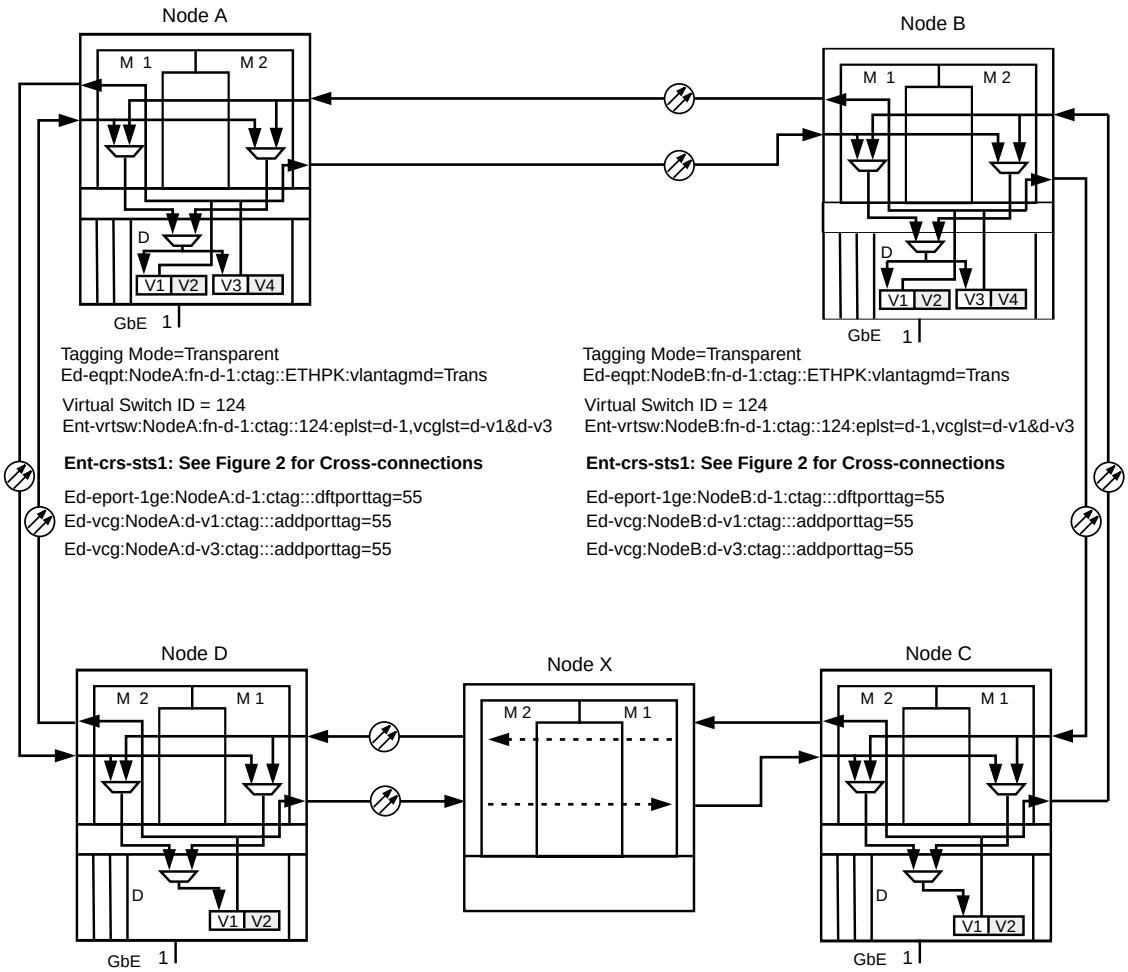
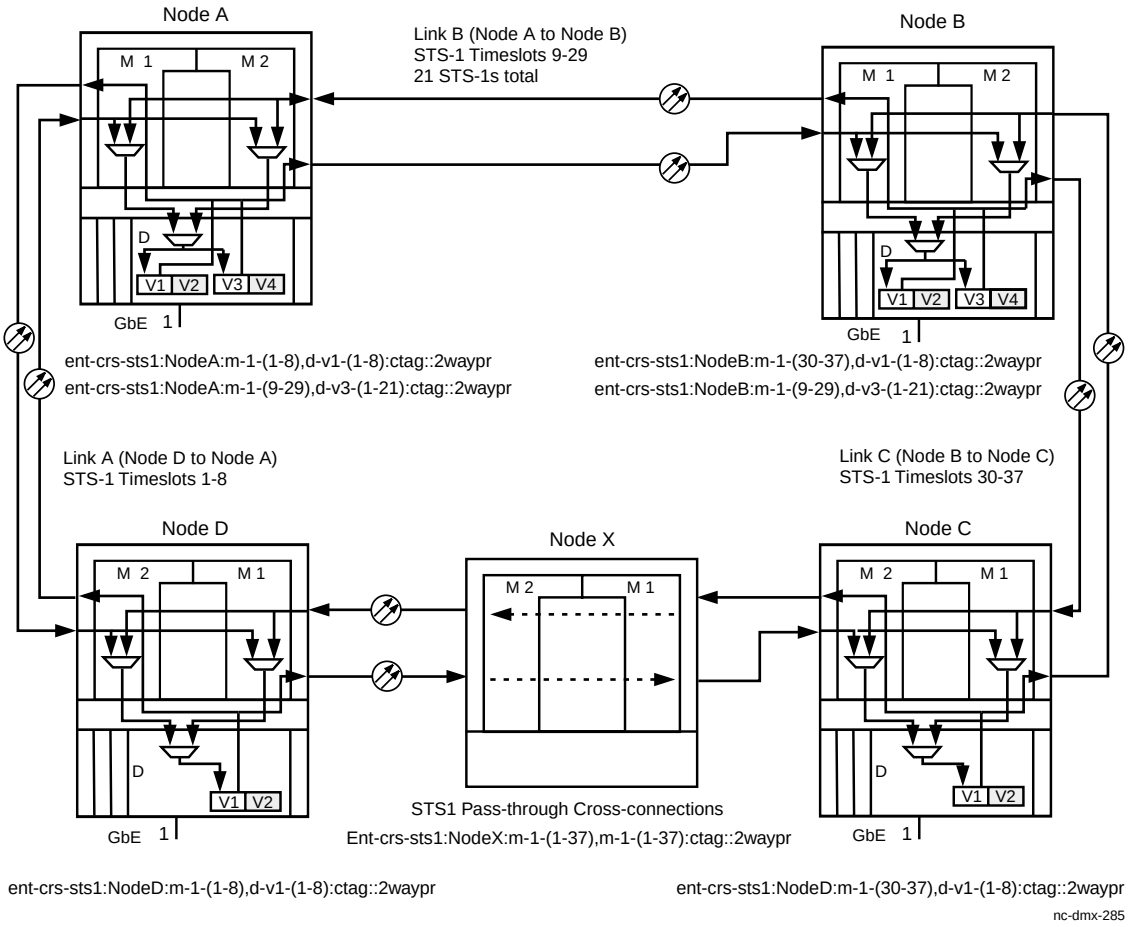


Figure 10-43 Dedicated Multipoint GbE Private Line Cross-Connections



SE 330-19: Add Fast Ethernet Services to Ethernet Packet Ring – FE to GbE Hairpin

Overview

This procedure provides an example for adding 10/100T Fast Ethernet (FE) circuit pack services to a GbE packet ring. This procedure uses hairpin cross-connections and parameter settings to bind the FE services into an existing packet ring. See Figure 10-44 and Figure 10-45 for an example.

When the packet ring is first established, the capacity of the ring is predetermined by the number of multipoint (mltpt) STS-1 cross-connections (1-21) applied to the ring and switches. The tagging mode (**802.1TAG** or Transparent [**Trans**]), virtual switch ID, and spanning tree group assigned to the GbE circuit pack is also predetermined. This procedure uses the 802.1q tagging mode.

This procedure assumes that a UPSR ring network configuration has already been established and no alarms are present.

This procedure uses TL1 commands and specific WaveStar® CIT menu selections to illustrate the detailed provisioning parameters. If you prefer, you can use the Data Provisioning Wizard to perform the provisioning in this procedure. From the System View menu, select **Configuration > Ethernet Service** to invoke the wizard.

CAUTION

Service Interruption

In Release 3.0 and earlier, STS-1 cross-connection capacity may not be added to an in-service packet ring without the risk of service interruption.

Before you begin

Before you begin this procedure, you must have complete work instructions for this task that detail:

- The network configuration and the nodes participating in the packet ring network.
- The shelf slots, circuit packs, ports, VCGs involved in the packet ring network.
- The number and type of **mltpt** cross-connections to be made at each node.

Note, that once the capacity of the packet ring is established, additional capacity (cross-connections) may not be added in service without the risk of service interruption.

- The tagging mode (transparent or 802.1q), virtual switch ID, and spanning tree group ID.

Procedure Use this procedure as an example to add FE services to an ethernet packet ring on a UPSR ring.

. . . . . .

1 Use the WaveStar® CIT to log in to each of the terminating nodes, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 On the System View menu, select **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Access each of the NEs identified and select the **Administration > OSI Neighbor Map** command and note the NEs connected to Main 1 and Main 2.

Repeat the above until the backbone ring can be sketched.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Neighbor Map" window opens.

. . . . . .

3 Verify that the system configuration is the same as specified on your work instructions.

. . . . . .

4 From your work instructions, determine the circuit pack, port, and cross-connections to be made at each node associated with this service.

5 Has the packet ring already been established? SeeFigure 10-44 for an example.

If...	Then...
No,	establish the packet ring first, then continue with the next step. **Reference:** "SE 330-4: Establish Ethernet Packet Ring on a UPSR Ring" (10-273)
Yes,	continue with the next step.

6 Verify/Install the Fast Ethernet ethernet circuit pack into the required slot 1 of the Function Unit group (A, B, C, or D) at the NE with the GbE circuit pack being used for the hairpin connections (Node A in this example).

Reference: "Task 334: Install 10/100T (LNW66) Fast Ethernet Circuit Pack" (10-413)

7 CONFIGURE FE TAGGING MODE

Determine the existing tagging mode for the FE circuit pack being provisioned. Use the TL1 **rtrv-eqpt** command or select **View > Equipment Details** from the System View menu, select the FE CP, then click **Select**. Note the VLAN Tagging Mode, Burst Size, and Credit Interval parameters.

When FE circuit packs are installed in the shelf, the default "**802TAG**" mode is assigned to the circuit pack.

8

If...	Then...
the tagging mode and all parameters are set correctly,	Proceed to Step 13.
the tagging mode is set correctly but other parameters are not correct,	Proceed to Step 11.
the tagging mode is NOT set correctly,	Continue with Step 9.

9 Determine if a virtual switch ID has already been assigned to the LAN/WAN ports used for this service. Use the TL1 **rtrv-vrtsw** command or select the **View > Data > Virtual Switch** command from the System View menu, select the FE circuit pack being provisioned, then click **Select.** Note if a virtual switch ID has been assigned.

If a virtual switch ID already exists, you must delete the existing virtual switch ID before changing the tagging mode.

10 If a virtual switch has been provisioned, delete it by using the TL1 **dlt-vrtsw** command or select the **Configuration > Data > Delete A Virtual Switch** command from the System View menu, select the circuit pack being provisioned, then click Select. Highlight the **VRTSW ID** being deleted, then click **Apply**.

Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

11 Use the TL1 **ed-eqpt** command or select the **Configuration > Provision** command from the System View menu, select the circuit pack being provisioned, then click **Provision**.

12 Verify/Select the tagging mode (**802.1TAG**) in the Select VLAN Tagging Mode box.

13 Verify/Enter the **Burst Size** and **Credit Interval** parameter values as required, then click **Apply**. Read the warning message, then click **OK** to make your changes. Click **Close** to exit.

Reference: "SE 330-12: Editing Ethernet Circuit Pack Parameters" (10-319)

CAUTION

Once a virtual switch is created and service has been established on the circuit pack, you cannot delete the virtual switch without interrupting service.

14 ASSIGN VIRTUAL SWITCH ID TO FE PORTS

- For circuit packs not yet in service with no virtual switch assigned:
  - Use the TL1 **ent-vrtsw** command to create an assigned virtual switch ID or select **Configuration > Data > Create A Virtual Switch** command from the CIT System View menu.

    Note that the Virtual Switch ID for this example should be set to *123*, the same ID as in the GbE circuit pack on the packet ring. Also note that LAN ports c-2 and c-3, and VCG c-v1 are assigned to the virtual switch.
- For circuit packs not yet in service with a virtual switch assigned:
  - Use the TL1 **dlt-vrtsw** command to delete an assigned virtual switch ID or select **Configuration > Data > Delete A Virtual Switch** command from the CIT System View menu, if a different virtual switch ID is required.
  - Use the TL1 command **ent-vrtsw** command or select **Configuration > Data > Create A Virtual Switch** to create a new virtual switch ID containing the selected LAN/WAN ports.

    Note that the Virtual Switch ID for this example should be set to *123*, the same ID as in the GbE circuit pack on the packet ring. Also note that LAN ports c-2 and c-3, and VCG c-v1 are assigned to the virtual switch.

15 Add VCG port to Virtual Switch ID on GbE, if required.

16 Note that in this example, Figure 10-44, we only assigned VCGs d-v1 and d-v2 to virtual switch ID 123 when we created the packet ring. We now need to add VCG d-v3 to the same virtual switch ID. Note that we should have added d-v3 to the virtual switch when we established the packet ring.

Use the TL1 **rtrv-vrtsw** command or select the **View > Data > Virtual Switch** command from the System View menu, select the GbE circuit pack being provisioned, then click **Select**. Determine if VCG d-v3 is already assigned to virtual switch ID 123.

If VCG d-v3 is *not* assigned to virtual switch ID 123, use the TL1 **ed-vrtsw** command or select the **Configuration > Data > Provision A Virtual Switch** command from the System View menu, select the circuit pack being provisioned, then click **Select**. Highlight and Select the Available AID d-v3 to move the **WAN (VCG) Port** d-v3 to the Selected AID column. Click **Apply**, then click **Close** to exit.

CAUTION

In Release 3.0 and earlier, additional STS-1 cross-connection capacity may NOT be added to an in-service ethernet circuit pack without the risk of service interruption.

17 ESTABLISH HAIRPIN CROSS-CONNECTIONS

Determine the necessary **2-Way Hairpin** STS-1 cross-connections to be made between the FE circuit pack and the GbE circuit pack.

Note that the **2-Way Hairpin** cross-connections between the FE and GbE in this example must be made between the FE and GbE v3(v4) since the GbE VCG group v1 and v2 are part of the multipoint packet ring cross-connection.

18 Use the TL1 **ent-crs-sts1** command to provision the cross-connections. Or, select **Configuration > Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard to provision the **2-Way Hairpin** cross-connections. For example, see Figure 10-44.

Reference: Refer to "Task 331: Make STS1 Cross-Connections for Ethernet Service" (10-387) for cross-connection examples.

19 From the System View menu, select **View > Cross Connections** to verify that the proper connections have been made.

20 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

21 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

22 ASSIGN VLAN IDs TO ESTABLISH SERVICE

Use the TL1 **ent-vlan** command to assign the default VLAN ID for customer untagged frames or the customer VLAN ID for tagged frames to the associated LAN ports and VCG WAN ports on the FE and GbE circuit packs. Or, select **Configuration > Data > Create A VLAN** command from the CIT System View menu. For example, see Figure 10-45.

23 PROVISION LAN PORTS

Use the TL1 **ed-eport** command to provision the LAN port parameters, or select **Configuration > Provision** from the System View menu, expand the details for the ethernet circuit pack, highlight the LAN port, then click **Provision**. Provision the parameters as required.

Reference: "SE 330-10: Editing Ethernet Port Parameters" (10-311)

24 PROVISION VCGS

Use the **ed-vcg** TL1 command to provision the WAN (VCG) port parameters, or select **Configuration > Provision** from the System View menu, expand the details for the ethernet circuit pack, highlight the VCG port, then click **Provision**. Provision the parameters as required.

Important! Enable full rate end-to-end flow control for the VCGs involved in the hairpin cross-connection by setting **Pause Control(psctl)** to **TRANSPARENT** for the VCGs involved in the hairpin cross-connection. In this example you would set Pause Control to **TRANSPARENT** for VCG c-v1 on the FE circuit pack, and for VCG d-v3 on the GbE circuit pack.

Reference: "SE 330-11: Editing VCG Parameters" (10-315)

END OF STEPS

Figure 10-44 Ethernet Packet Ring on a UPSR

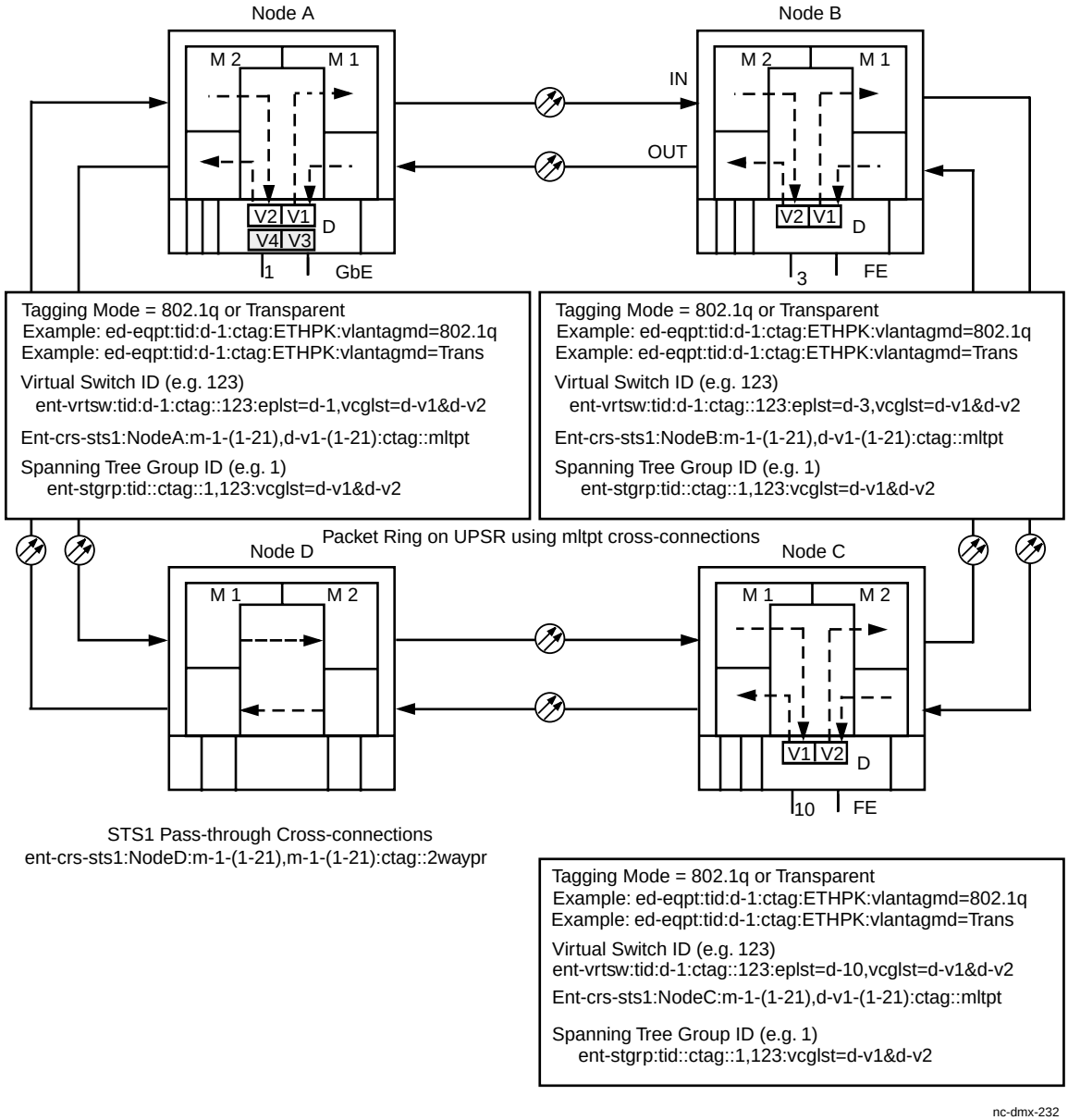
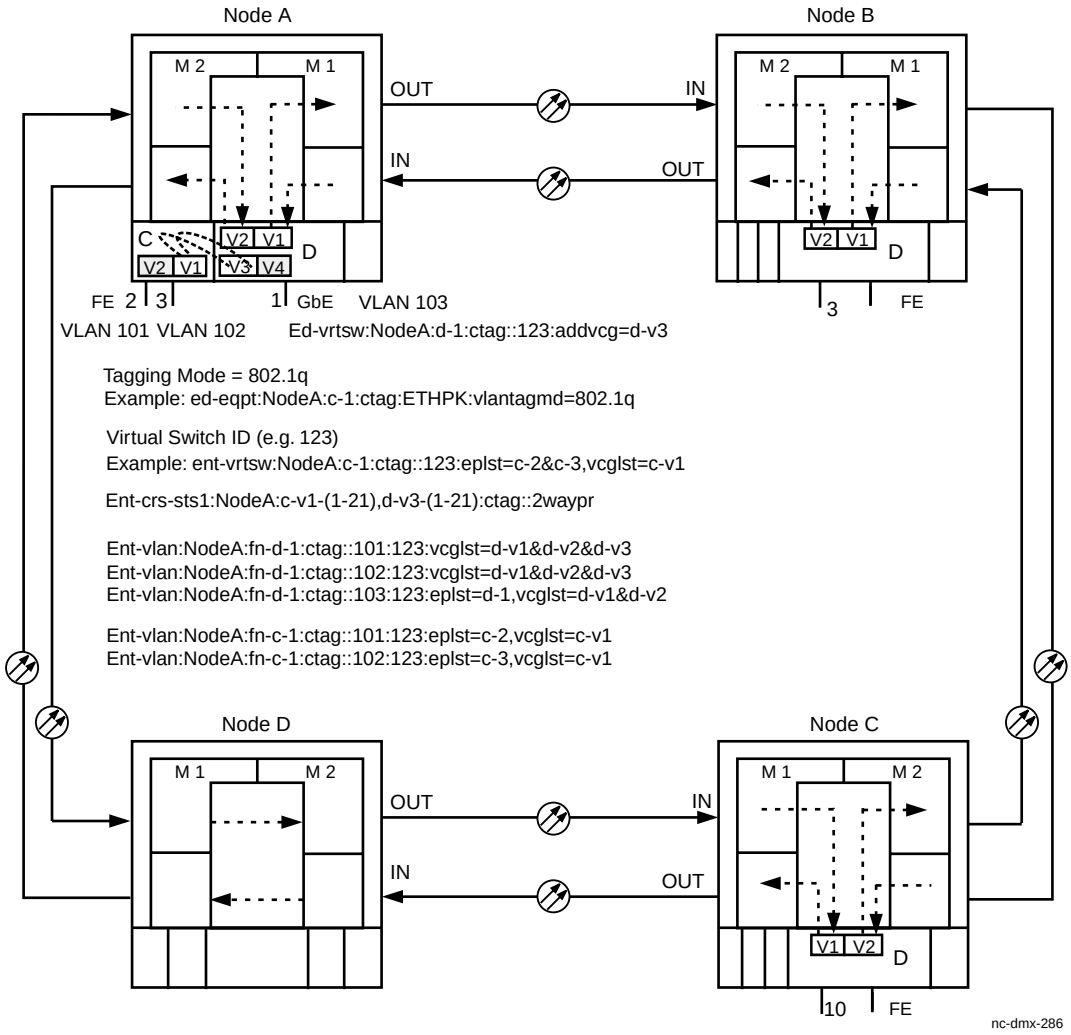


Figure 10-45 FE to GbE Ethernet Hairpin and Provisioning on Packet Ring



Task 331: Make STS1 Cross-Connections for Ethernet Service

Procedure Use this procedure as an example for making STS1 cross-connections for point-to-point UPSR and multipoint gigabit ethernet service.

1 Use the WaveStar® CIT to log in to one of the terminating nodes.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

It may take several minutes for this command to complete depending on the size of the network.

Result: The "OSI Routing Map" window opens.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions, determine the cross-connections to be made at each node associated with the service to be established.

Although the following figures illustrate the use of TL1 commands, the cross-connection rate (STS-1), type (2wayPR or mltpt), and STS-1 AID addresses remain the same when using the Cross Connection Wizard in the following steps.

- Figure 10-46 illustrates a path protected OC-48 ring network with 2wayPR STS1 cross-connections for ethernet service.
- Figure 10-47 and Figure 10-48 illustrate OC-48 ring networks with mltpt STS1 cross-connections for ethernet service.
- Figure 10-49 illustrates a BLSR protected OC-48 ring network with 2wayPR STS1 cross-connections for ethernet service.
- Figure 10-50 illustrates a BLSR protected OC-48 ring network with multipoint STS1 cross-connections using NUT for ethernet service.

5 Starting at one of the nodes in the ring for the circuit being established, select **View** > **Cross Connections** at each node in the ring to verify that that the cross-connections specified on the work instructions may be made.

If cross-connections are already assigned or improperly assigned, refer trouble to the provisioning organization. Improperly assigned cross-connections may have to be deleted, or a different time-slot must be selected for the service being selected.

6 One at a time, at each *non terminating node*, select **Configuration** > **Cross-Connection** from the System View menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at all *non terminating nodes* in the network to provision the 2waypr STS-1 pass-through cross-connections.

Reference: “SE 331-1: STS1 Cross-Connections for Ethernet” (10-395)

7 One at a time, at each terminating node, select **Configuration > Cross-Connection** from the **System View** menu to start the Cross Connection Wizard. Use the Cross Connection Wizard at all terminating nodes in the network to provision the STS-1 add/drop cross-connections.

Reference: "SE 331-1: STS1 Cross-Connections for Ethernet" (10-395)

8 From the System View menu, select **View > Cross Connections** at each node to verify that the proper connections have been made.

9 After all cross-connections are made, click on the **Alarm List** button on the System View window and verify no alarms are present.

10 If alarms are present, look for missing or improperly made cross-connections.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

END OF STEPS

Figure 10-46 2wayPR Cross-connections on a UPSR Ring

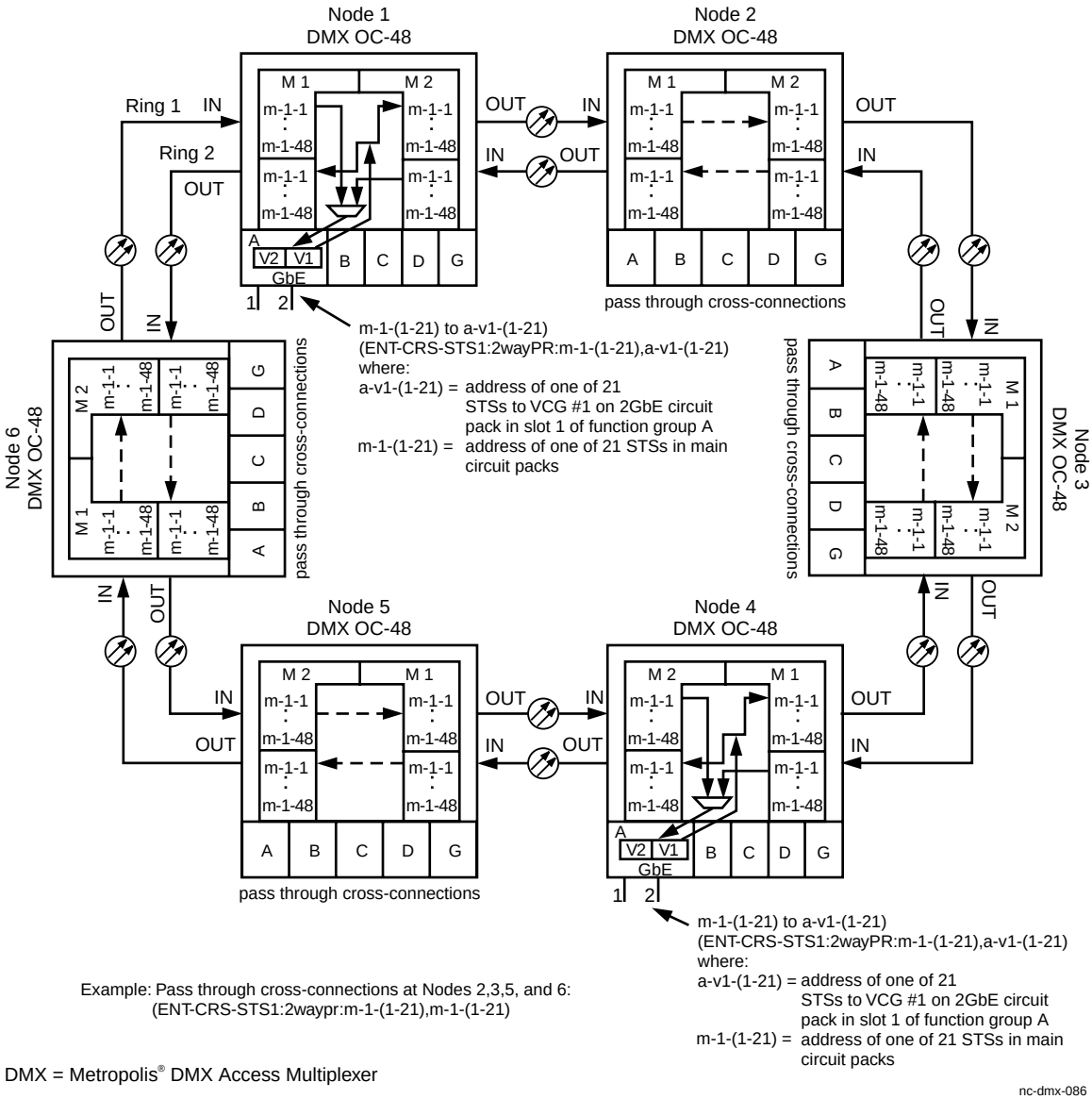
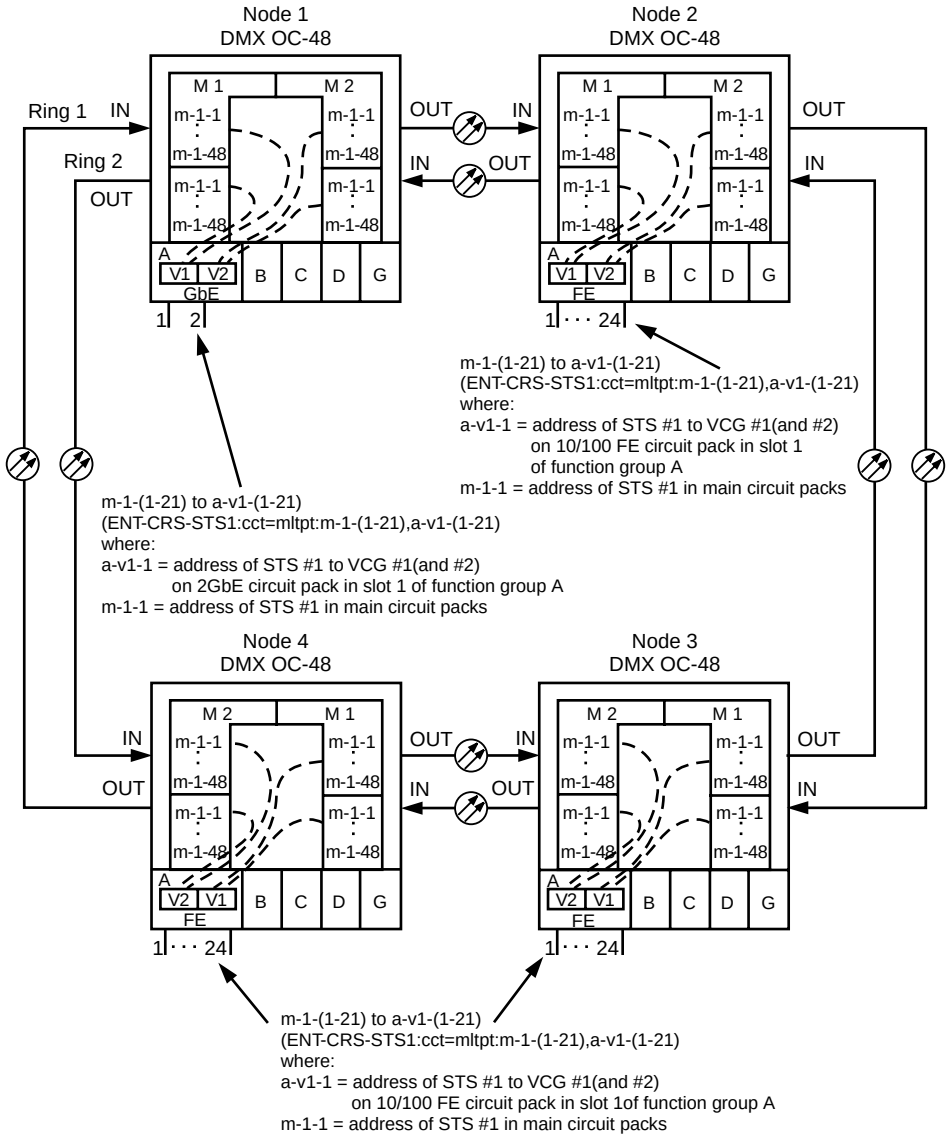


Figure 10-47 Multipoint Mixed GbE and FE Cross-connections on a UPSR Ring



DMX = Metropolis® DMX Access Multiplexer

nc-dmx-083

Figure 10-48 Multipoint GbE Cross-connections on a UPSR Ring

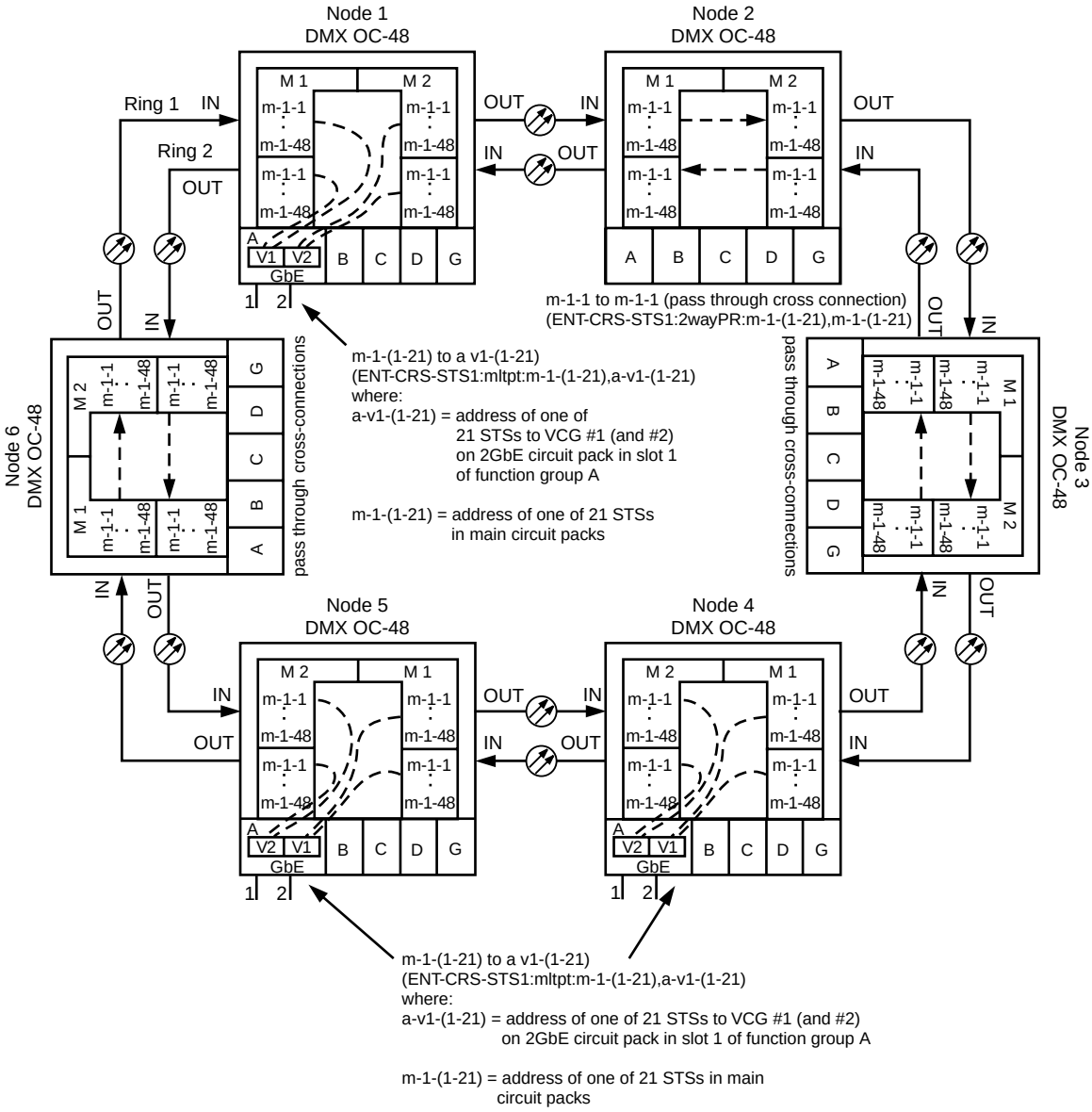


Figure 10-49 2waypr Cross-connections on a BLSR Ring Without NUT

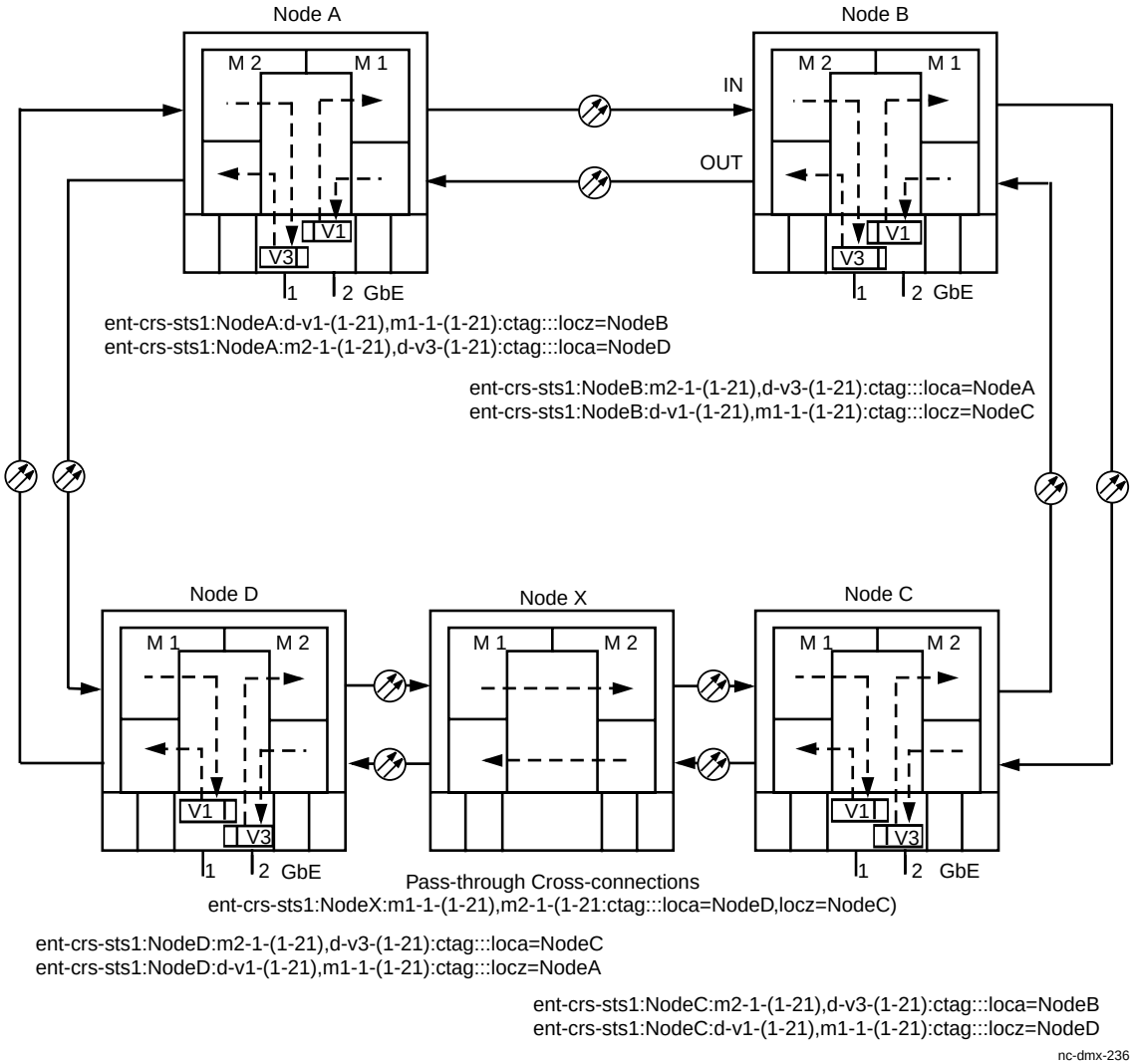
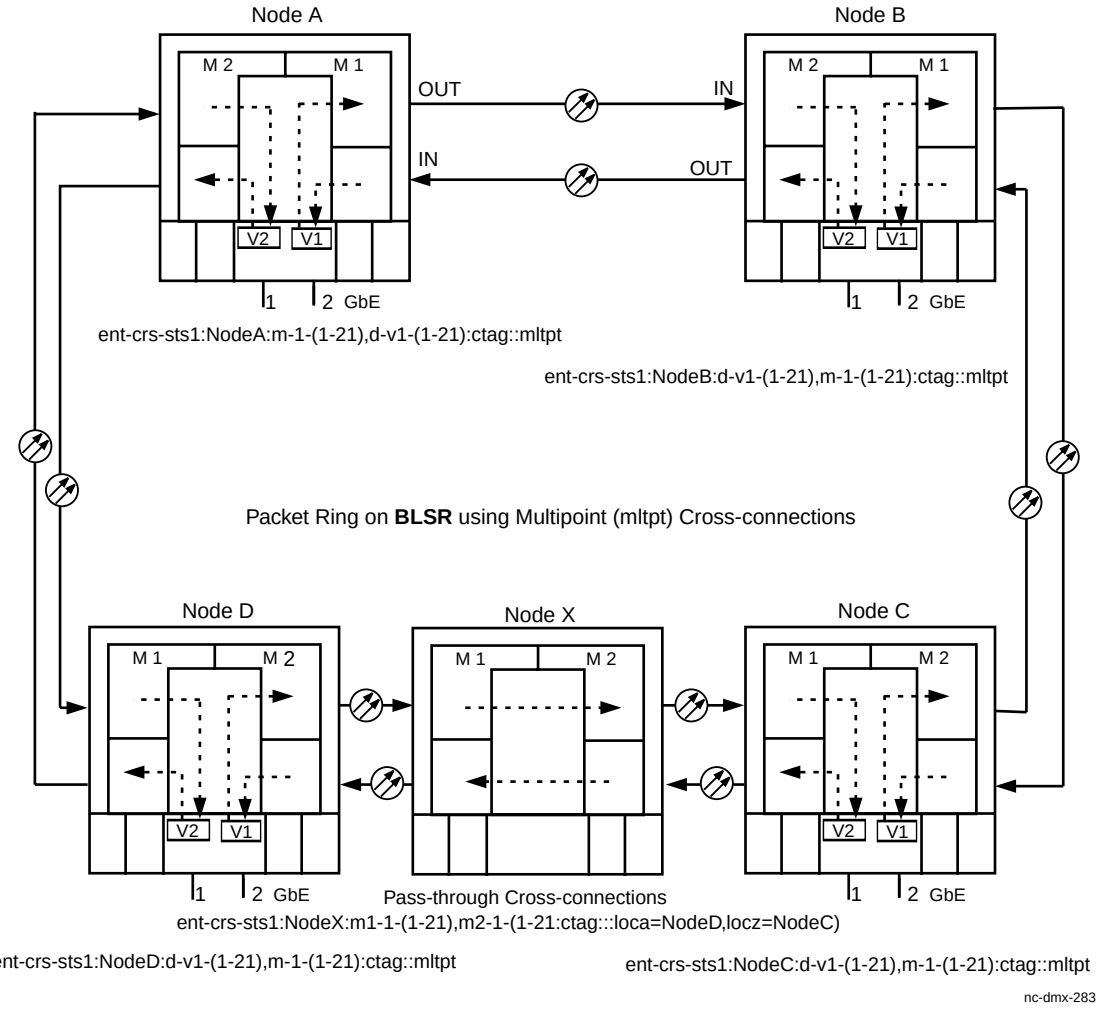

Node A
Node B
M 2
M 1
IN
OUT
V1
V3
1
2 GbE
ent-crs-sts1:NodeA:d-v1-(1-21),m1-1-(1-21):ctag:::locz=NodeB
ent-crs-sts1:NodeA:m2-1-(1-21),d-v3-(1-21):ctag:::loca=NodeD
ent-crs-sts1:NodeB:m2-1-(1-21),d-v3-(1-21):ctag:::loca=NodeA
ent-crs-sts1:NodeB:d-v1-(1-21),m1-1-(1-21):ctag:::locz=NodeC
Node D
Node X
Node C
Pass-through Cross-connections
ent-crs-sts1:NodeX:m1-1-(1-21),m2-1-(1-21:ctag:::loca=NodeD,locz=NodeC)
ent-crs-sts1:NodeD:m2-1-(1-21),d-v3-(1-21):ctag:::loca=NodeC
ent-crs-sts1:NodeD:d-v1-(1-21),m1-1-(1-21):ctag:::locz=NodeA
ent-crs-sts1:NodeC:m2-1-(1-21),d-v3-(1-21):ctag:::loca=NodeB
ent-crs-sts1:NodeC:d-v1-(1-21),m1-1-(1-21):ctag:::locz=NodeD
nc-dmx-236

Figure 10-50 Multipoint Cross-connections on a BLSR Ring With NUT



SE 331-1: STS1 Cross-Connections for Ethernet

STS1 Cross-Connections for Ethernet

Cross connections supporting Ethernet services are STS1 cross-connections. Each Ethernet virtual concatenation group (VCG) may have from 1 to 21 STS1s cross-connected to support the bandwidth assignment.

See Appendix E, "Allowable Cross-Connections" (E-1) for a list of allowable STS1 ethernet cross-connections.

Cross connect type (cct)

Cross-connect types consist of two-way path ring (*2waypr*) and multipoint (*mltpt*).

Important!

MLTPT Cross-connections

When a mltpt connection is made to an STS trib in VCG "n" (for example, v1), a connection is automatically made internally to the corresponding STS trib in VCG "n+1" (for example, v2). VCG v2 and associated trib then become unavailable for other connections. For example, if a-v1-1 is mltpt connected, then a-v2-1 is automatically connected as well and therefore becomes unavailable for any other connection.

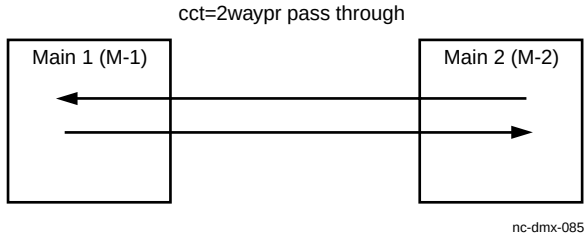
2WAYPR Cross-connections

When a twowaypr connection is made to an STS trib in VCG "n", then VCG "n+1" is unused and unavailable for any connection.

2waypr

2waypr requests a two-way add/drop or pass-through cross-connection be established between the source and destination in a ring. 2waypr is the default value. Figure 10-51 illustrates a 2waypr pass-through cross-connection from one side of the ring to the other.

Figure 10-51 2wayPR Pass-through Cross-connection



For Ethernet services, the *2waypr* cct value can be applicable to the 10/100 Fast Ethernet and the 1 GbE circuit packs at the STS-1 rate. If the cct value is null, the default value of 2WAYPR will be used as default.

Figure 10-52 illustrates an Ethernet 2waypr add/drop cross-connection on a UPSR ring.

Figure 10-52 UPSR 2wayPR Add/Drop Cross-connection

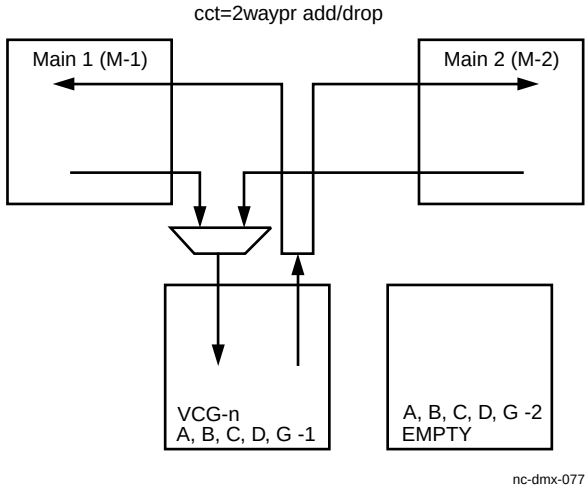


Figure 10-53 illustrates a 2wayPR hairpin cross-connection between a Fast Ethernet circuit pack and a Gigabit Ethernet circuit pack.

Figure 10-53 2wayPR FE to GbE Hairpin Cross-connection

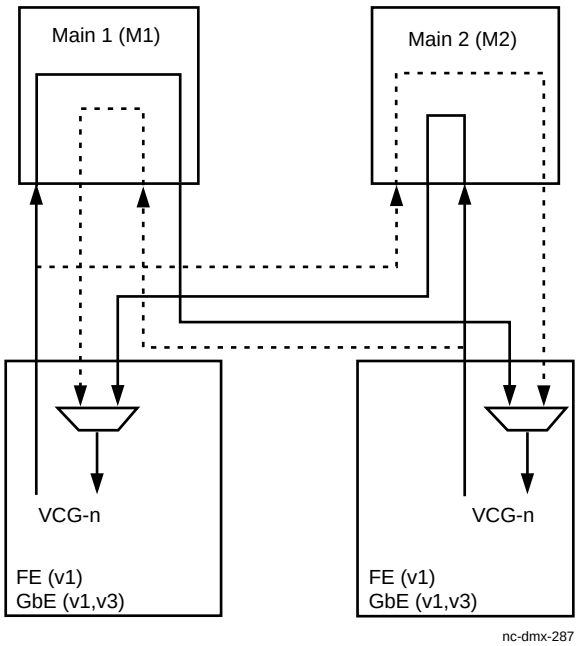
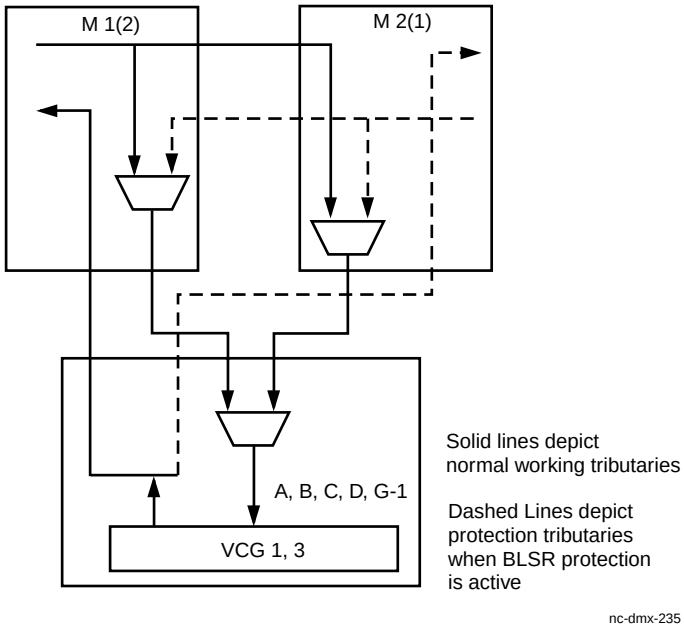


Figure 10-54 illustrates an Ethernet 2waypr add/drop cross-connection on a BLSR ring.

Figure 10-54 BLSR 2wayPR Add/Drop Cross-connection

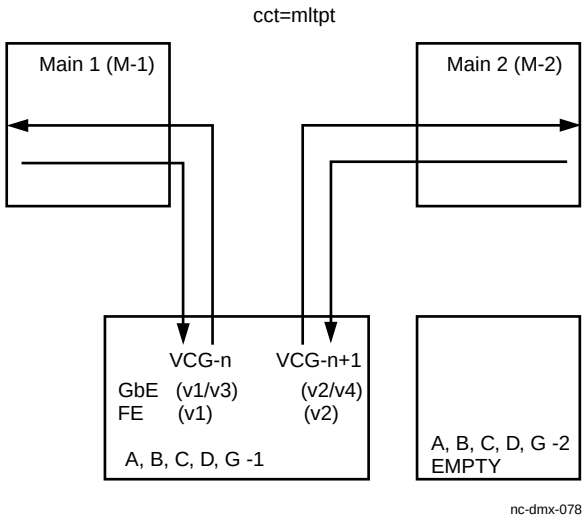


Mltpt

Mltpt requests a multipoint (unprotected) cross-connection be established between the source and destination in a non-path switched ring configuration. The *mltpt* cross-connect type for an STS-1 can only be selected if either the 10/100 Mb Fast Ethernet or the 1 GbE interface is being addressed. When using either the 10/100 Mb or the 1GbE interface and an STS-1 Trib is "*mltpt*" cross-connected, the signal locking mechanism is provided.

Figure 10-55 illustrates a multipoint cross-connection.

Figure 10-55 Multipoint Cross-connection



Task 332: Determine Preferred Spanning Tree Configuration

Purpose

This procedure provides an example for determining the preferred spanning tree configuration.

> **Important!** Networks running 802.1d STP (Release 1.1) support a maximum of up to nine nodes participating in a spanning tree. Networks with more than nine nodes will not reconfigure properly. Spanning tree default parameters support a network of up to nine nodes.
>
> Networks running 802.1w rapid spanning tree protocol (Release 2 or later) support more than nine nodes participating in a spanning tree. To support more than nine nodes in the spanning tree, the maximum age timer must be increased. Note that spanning tree restoration time increases as the number of nodes increase.
>
> If the network consists of more than nine (9) nodes which are participating in the spanning tree configuration, use the following formula to determine the proper setting for the spanning tree maximum age timer (**stmaxage**): 2 x (N + 1), where N equals the number of nodes.
>
> **Example:** If the network consists of 16 nodes, then the **stmaxage** timer should be set to 34 seconds: 2 x (16 + 1) = 42.

Before you begin

Before you begin this procedure, you should:

- Know your network configuration
- Know which nodes in the network are participating in the spanning tree configuration for the service being configured
- Have a knowledge of ethernet services and spanning tree configurations

Procedure

Use the following procedure as an example for determining the preferred spanning tree configuration.

1 Use the WaveStar® CIT to log in to a terminating Metropolis® DMX shelf.

> **Reference:** "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Routing Map" window opens.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions and the network map, determine the nodes in the ring at which ethernet services are provided and are part of the same spanning tree group.

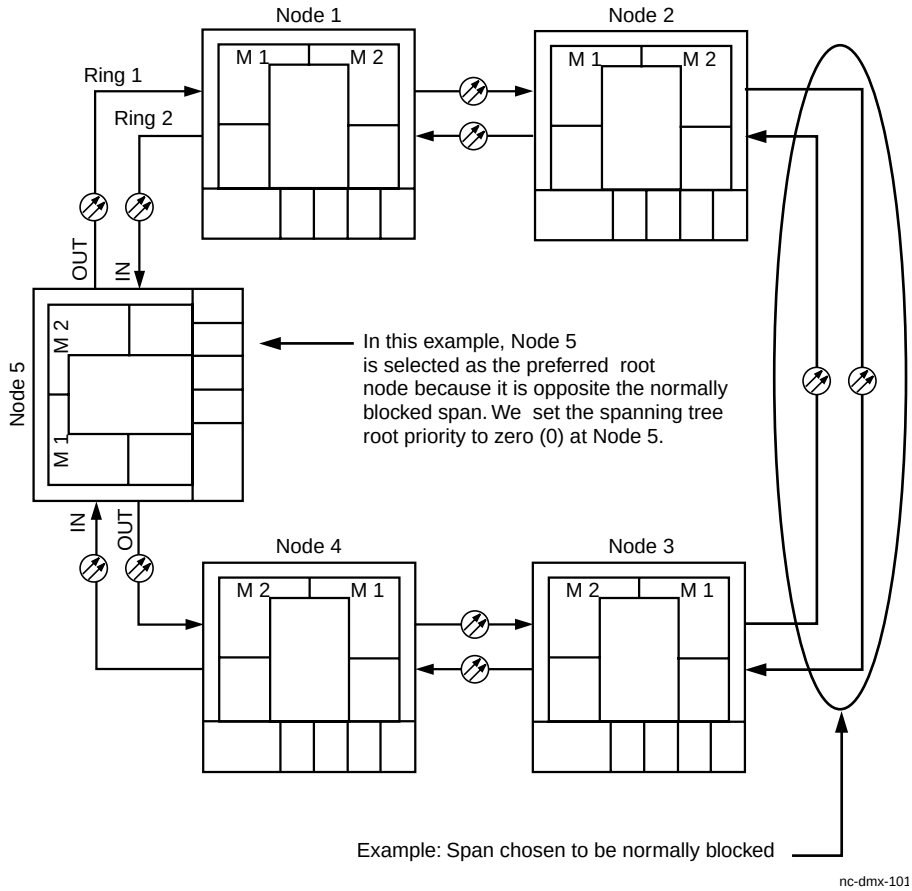
Important! When determining if the ring consists of an odd or even number nodes, count only the nodes at which ethernet service is being provided in the same spanning tree configuration. If a node in the ring has only SONET pass through cross-connections for ethernet services, that node is not counted in determining an odd or even configuration. The figures in this task assume all nodes are providing ethernet service.

5 Determine if the ring consists of an odd or even number of nodes.

If...	Then...
there are an ODD number of nodes in the ring,	Continue with Step 6.
there are an EVEN number of nodes in the ring,	Proceed to Step 10.

6 Refer to Figure 10-56 for rings with an odd number of nodes.

Figure 10-56 Spanning Tree Odd Node Example



7 Select the span that should be blocked under nominal conditions. The span should be selected based on traffic patterns to get the most efficient use of capacity on both sides of the ring during nominal conditions.

Example: The span between Nodes 2 and 3 was selected in this example.

. . . . . .

8 Determine the preferred root node. The preferred root node in an odd-number node ring is the node on the ring opposite the span which should be normally blocked.

Example: In the odd node configuration figure above, Node 5 is the preferred root node.

. . . . . .

9 Use the WaveStar® CIT to log in to the preferred root node.

. . . . . .

10 From the System View menu, select **Configuration > Create Spanning Tree Group** or use the **ent-stgrp** TL1 command.

Result: The "Create New Spanning Tree Group" window opens displaying the parameters for the spanning tree group.

. . . . . .

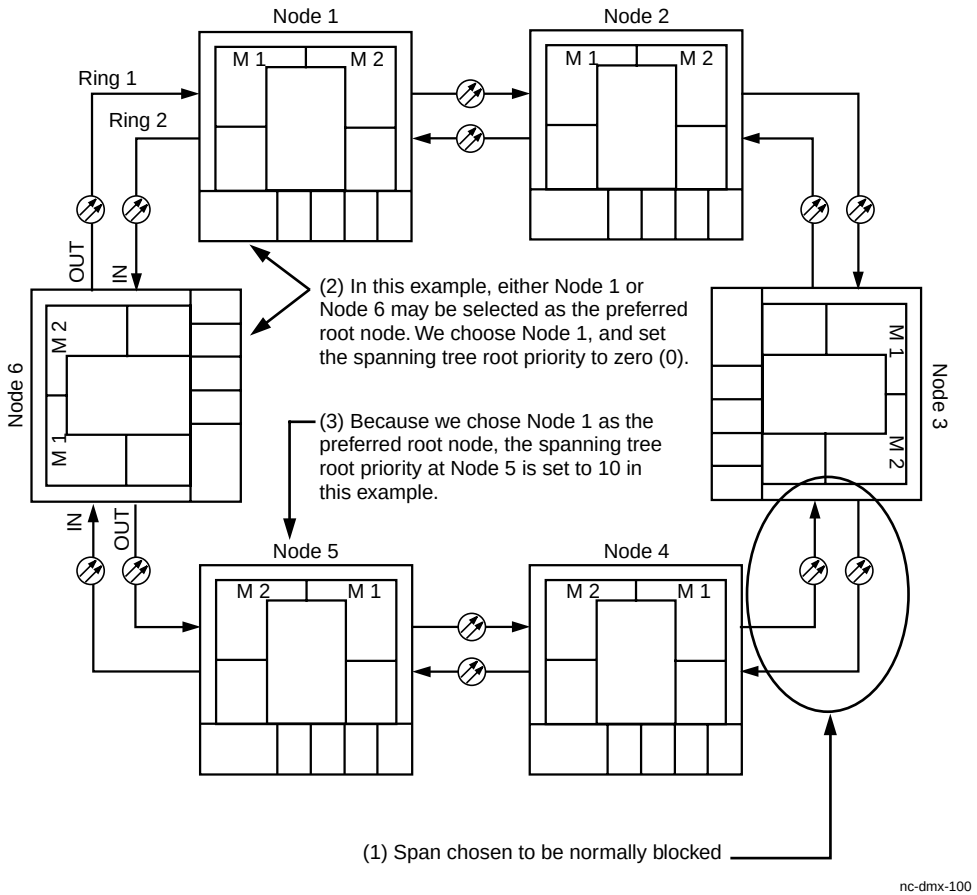
11 Set the spanning tree Root Priority parameter (*strp*) to zero (0) at the preferred root node (Node 5 in this example).

At ALL other ethernet nodes in the ring, set the spanning tree root priority to the default value of 32768.

END OF STEPS FOR ODD NODE EXAMPLE

12 Refer to Figure 10-57 for rings with an EVEN number of nodes:

Figure 10-57 Spanning Tree Even Node Example



13 Select the span that should be blocked under nominal conditions. The span should be selected based on traffic patterns to get the most efficient use of capacity on both sides of the ring during nominal conditions.

Example: The span between Nodes 3 and 4 was selected in this example.

14 Determine the preferred root node. The preferred root node in an even-number node ring may be either of the two nodes at the opposite ends of the span that is opposite to the span which is normally blocked.

Example: In the even node configuration figure above, either Node 1 or Node 6 may be selected as the preferred root node. Note that there are 2 spans between Node 3 and Node 1, and two spans between Node 4 and Node 6. In this example, we choose Node 1 to be the preferred root node.

15 Use the WaveStar® CIT to log in to the preferred root node.

16 From the **System View** menu, select **Configuration > Create Spanning Tree Group** or use the **ent-stgrp** TL1 command.

Result: The "Create New Spanning Tree Group" window opens displaying the parameters for the spanning tree group.

17 Set the spanning tree Root Priority parameter (*strp*) to zero (0) at the preferred root node (Node 1 in this example).

18 Determine the node opposite the selected preferred root node.

Example: In this example, Node 4 is the node opposite Node 1, the preferred root node. Note that there are two nodes on either side of the ring between Node 1 and Node 4.

19 At the node (in this example, Node 4) opposite the selected preferred root node, follow the span that is NOT normally blocked to the next node in that direction around the ring.

Example: In this example, the span to the right of Node 4 is normally blocked; therefore, you would follow the span to the left of Node 4 to Node 5.

20 At the node determined in the previous step (in this example, Node 5), use the WaveStar® CIT to log in to the node.

21 From the System View menu, select **Configuration > Create Spanning Tree Group** or use the **ent-stgrp** TL1 command.

Result: The "Create New Spanning Tree Group" window opens displaying the parameters for the spanning tree group.

22 Set the spanning tree Root Priority parameter (*strp*) to 10 (or any value from 1 to 32767).

Important! The spanning tree root priority for ALL other ethernet nodes in the ring should be set to the default value of 32768.

END OF STEPS

Task 333: Change an Existing Spanning Tree Configuration

Purpose

This procedure provides an example of how to change an existing spanning tree configuration by changing the spanning tree path cost at one of the nodes.

This procedure might be used if traffic patterns change and dictate that a reconfiguration would provide more efficient service.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX Access Multiplexer, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Service interruption

A minimal amount of service interruption may be encountered when performing this procedure. Be sure to follow your work instructions in performing this task.

Before you begin

Before you begin this procedure, you should:

- Know your network configuration.
- Know which nodes in the network are participating in the spanning tree configuration for the service being configured.
- Have a knowledge of ethernet services and spanning tree configurations.
- Have detailed work instructions for performing this task.
- Know which span in the spanning tree configuration is normally blocked and which span you are going to reconfigure as blocked.
- Know which node is the root node (root bridge) in the configuration.
- Know the spanning tree group ID (*stgrpid*) of the spanning tree group being reconfigured.

Procedure Use this procedure as an example to reconfigure an existing spanning tree configuration.

1 Use the WaveStar® CIT to log in to a terminating Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 On the System View menu, select **Administration > OSI Routing Map** to retrieve a node-to-node listing of every node in the network.

Important! If a drawing of the network is not provided with the work instructions, it is recommended that you draw a simple diagram of the ring (indicating node-to-node connections) and list each node's TID.

Result: The "OSI Routing Map" window opens.

3 Verify that the system configuration is the same as specified on your work instructions.

4 From your work instructions and the network map, determine the nodes in the ring at which ethernet services are provided and are part of the same spanning tree group. Figure 10-58 for an example.

5 Use the **rtrv-stgrp** command or the **View > Data > Spanning Tree** command from the System View menu at each node to determine which node is the root node (root bridge), the spanning tree root path cost (**strtpcost**), the VCG spanning tree port role (**stprole**), and the VCG spanning tree path cost (**stpcost**) for each VCG AID in the spanning tree group. Make a note of these parameter values at each node.

Example: See Figure 10-58. Assuming VCGs v1 and v2 are used at each node, if you logged into Node 5, the root bridge, you should see a root path cost of zero (0), and each VCG port would have a port role of *Designated*.

At Nodes 1 and 2, you should see Port Roles for VCG v1 at both nodes as being *root* port, indicating traffic toward the root bridge. At Nodes 3 and 4, you should see Port Roles for VCG v2 at both nodes as being *root* port, indicating traffic toward the root bridge.

6 PRINCIPLES OF SPANNING TREE AND PORT COST

Refer to Figure 10-58 and read the following to understand how spanning tree blocks a span:

To have spanning tree block a span, the spanning tree root path cost is set equally at the two bridges (nodes) at each end of the blocked span. The spanning tree root path cost (**strtpcost**) at a node (bridge) is the sum of the path costs of the root port VCGs that connect the node to the root node.

Example: Assume that in the original configuration the spanning tree path cost (**stpcost**) for each VCG is set to the default of 10 at each node. Node 2 is connected to root Node 5 through VCG v1 at Node 2 and VCG v1 at Node 1. Therefore, the root path cost of Node 2 is 20, which is the sum of the path costs of Node 2 VCG v1 and Node 1 VCG v1 (10 + 10 = 20).

Node 3 is connected to root Node 5 through VCG v2 at Node 3 and VCG v2 at Node 4. Therefore, the root path cost of Node 3 is also 20, which is the sum of the path costs of Node 3 VCG v2 and Node 4 VCG v2 (10 + 10 = 20).

7 Assume that your traffic studies indicate a more efficient service would be obtained by blocking the span between Node 3 and Node 4 instead of the presently blocked span between Node 2 and Node 3.

8 HOW TO CHANGE PATH COST TO RECONFIGURE SPANNING TREE

To change the spanning tree configuration to block the span between Nodes 3 and 4, we need to have the root path cost of Node 3 and Node 4 set equally.

We can increase the spanning tree path cost (**stpcost**) at the root port (VCG v2) on Node 4. Use either the **ed-vcg** command or **Configuration > Data > WAN (VCG) Port** command to change the path cost.

Example: Refer to Figure 10-59.

If the span between Nodes 3 and 4 is going to be blocked, then Node 3 will be connected to root Node 5 through Node 3 VCG v1, Node 2 VCG v1, and Node 1 VCG v1. The root path cost at Node 3 will then be 30, the sum of the path costs of root port VCG v1 at Nodes 3, 2, and 1 (10 + 10 +10 = 30).

We need to ensure the root path cost at Node 4 is also 30. Note that Node 4 is connected to root Node 5 only through Node 4's VCG v2. If we increase the path cost at Node 4 VCG v2 to 30, then the root path cost at Node 4 will also be 30.

Since the root path cost at Node 4 is now equal to the root path cost at Node 3, the span between Nodes 3 and 4 will be blocked.

END OF STEPS

Figure 10-58 Existing Spanning Tree Configuration

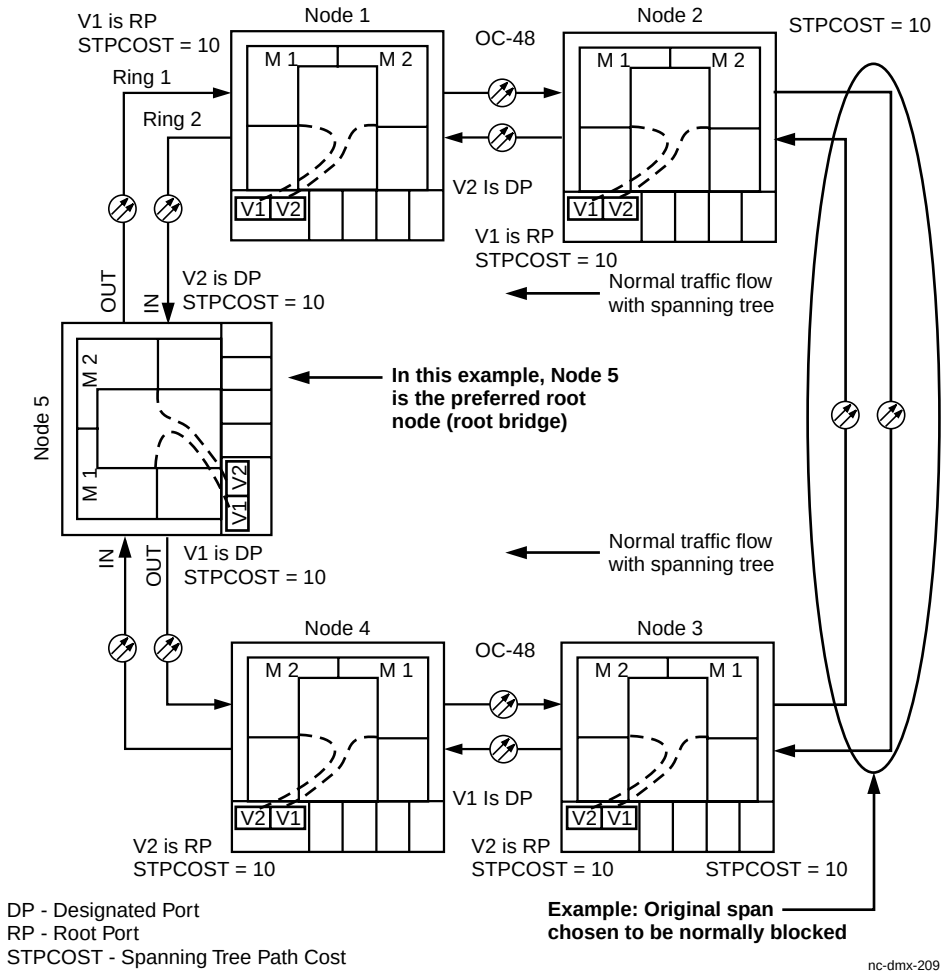
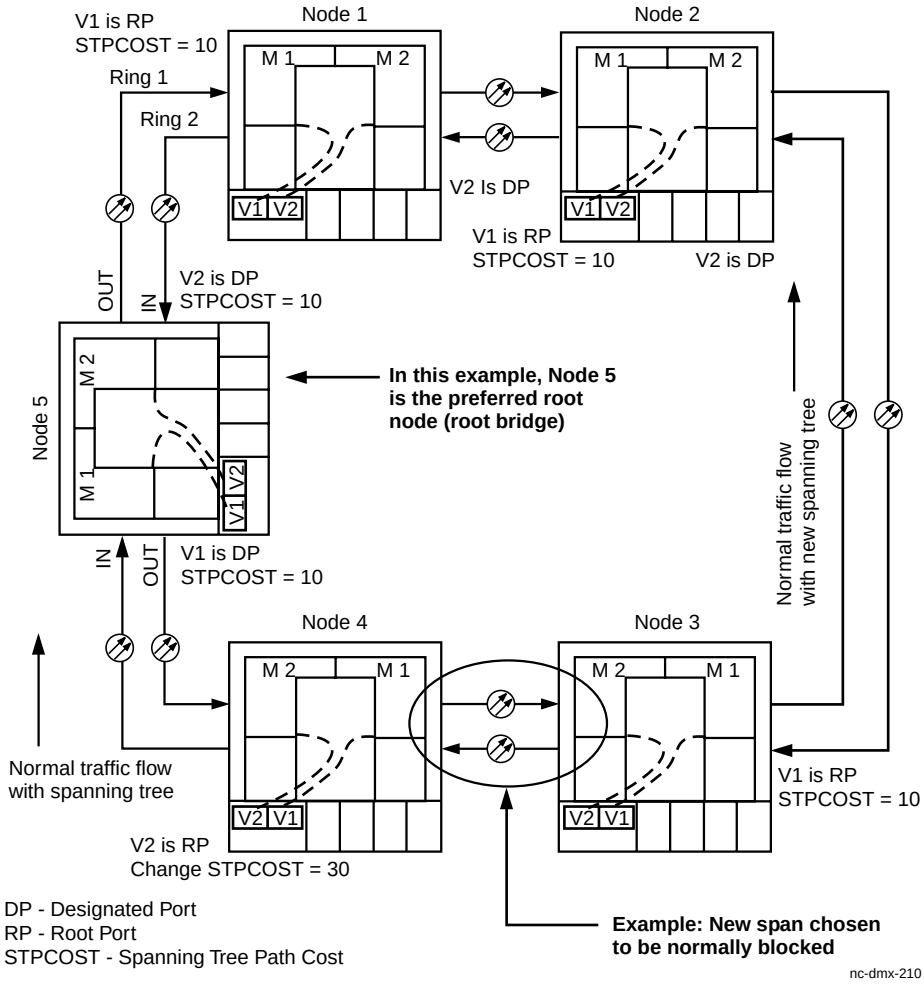


Figure 10-59 New Spanning Tree Configuration



Task 334: Install 10/100T (LNW66) Fast Ethernet Circuit Pack

Purpose

Use this task to install 10/100T (LNW66) Fast Ethernet circuit packs.

Required equipment

The following equipment is required:

- Personal computer (PC) with WaveStar® CIT software installed
- Wrist strap

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Prior to beginning this task:

1. Ensure that 10/100T circuit pack(s) is available for replace.
2. If not previously completed, install generic and WaveStar® CIT software on the PC.

   Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

3. Connect PC and establish a WaveStar® CIT session.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Task

Complete the following steps to install 10/100T circuit pack(s).

1 Determine the Function Unit slots (A1, B1, C1, and/or D1) being equipped with 10/100T circuit pack(s).

Important! Ethernet circuit packs may only be installed in slot 1 of a function group. The 10/100T circuits packs may be installed in slots A1, B1, C1, and/or D1.

10/100T circuits packs can not be installed in Growth slot G1.

2 Seat the 10/100T circuit pack in Function Unit slot A1, B1, C1, or D1.

Result: FAULT LED on the 10/100T circuit pack lights. After approximately 50 seconds, the ACTIVE LED lights and the FAULT LED goes off.

3 From the **System View** menu, select **View > Equipment Details**.

Result: The "View Equipment Details" window opens.

4 Verify presence of the new circuit pack in the equipment list.

5 Select (highlight) the new circuit pack, then click **Select** at bottom of window.

Result: Circuit pack parameter values display on right side of window.

6 Under State Information, verify the circuit pack is in an out-of-service (OOS) state.

7 Click **Close** to exit.

8 Repeat this task from Step 1 for each 10/100T circuit pack to be installed.

9 Do you wish to provision circuit pack and/or port parameters at this time?

If...	Then...
Yes	Refer to "Task 336: Provision 10/100T (LNW66) or 1GSX/1GLX (LNW67/ LNW68) Circuit Pack/Port for New Ethernet Service" (10-421)
No	STOP! END OF TASK.

END OF STEPS

Task 335: Install 1GSX/1GLX (LNW67/LNW68) Gigabit Ethernet Circuit Packs

Purpose

Use this task to install the 1GSX (LNW67) and 1GLX (LNW68) gigabit Ethernet circuit packs.

Required equipment

The following equipment is required:

- Personal computer (PC) with WaveStar® CIT software installed
- Wrist strap

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 7, "Ethernet"
- Appendix A, WaveStar® CIT Tutorial

- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Prior to beginning this task:

1. Ensure that 1GSX/1GLX Gigabit Ethernet circuit pack(s) is available for installation.
2. If not previously completed, install generic and WaveStar® CIT software on the PC.

   Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

3. Connect PC and establish a WaveStar® CIT session.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Task

Complete the following steps to install 1GSX/1GLX Gigabit Ethernet circuit pack(s).

. . . . . .

1 Determine the Function Unit slots (A1, B1, C1, D1 and/or G1) being equipped with 1GSX/1GLX Gigabit Ethernet circuit pack(s).

Important! Ethernet circuit packs may only be installed in slot 1 of a function group. Gigabit Ethernet circuit packs may be installed in slots A1, B1, C1, D1 and/or G1.
However, if you are *NOT* using an LNW27 OC-48 OLIU in Main1 or Main2, and you wish to use the full capacity (2 GB) of both ports for a "dedicated bandwidth" configuration, the 1GSX/1GLX Gigabit Ethernet circuit pack(s) must be installed in D1 and/or G1.

. . . . . .

2 Seat the 1GSX/1GLX Gigabit Ethernet circuit pack in Function Unit slot A1, B1, C1, D1 or G1.

Result: FAULT LED on the 1GSX/1GLX Gigabit Ethernet circuit pack lights. After approximately 50 seconds, the ACTIVE LED lights and the FAULT LED goes off.

. . . . . .

3 From the **System View** menu, select **View > Equipment Details**.

Result: The "View Equipment Details" window opens.

4 Verify presence of the new circuit pack in the equipment list.

5 Select (highlight) the new circuit pack, then click **Select** at bottom of window.

Circuit pack parameter values display on right side of window.

6 Under State Information, verify the circuit pack is in an out-of-service (OOS) state.

7 Click **Close** to exit.

8 Repeat this task from Step 1 for each 1GSX/1GLX Gigabit Ethernet circuit pack to be installed.

9 Do you wish to provision circuit pack and/or port parameters at this time?

If	Then
Yes	Refer to "Task 336: Provision 10/100T (LNW66) or 1GSX/1GLX (LNW67/ LNW68) Circuit Pack/Port for New Ethernet Service" (10-421)
No	STOP! END OF TASK.

END OF STEPS

Task 336: Provision 10/100T (LNW66) or 1GSX/1GLX (LNW67/ LNW68) Circuit Pack/Port for New Ethernet Service

Purpose

Use this task to provision ports on 10/100T (LNW66), 1GSX (LNW67), or 1GLX (LNW68) circuit pack(s).

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Prior to performing this task:

1. Ensure 10/100T or 1GSX/1GLX circuit pack(s) are installed.

   Reference: "Task 334: Install 10/100T (LNW66) Fast Ethernet Circuit Pack" (10-413) or "Task 335: Install 1GSX/1GLX (LNW67/LNW68) Gigabit Ethernet Circuit Packs" (10-417)

2. If not previously completed, install generic and WaveStar® CIT software on the PC.

   Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

3. Connect PC and establish a WaveStar® CIT session.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

4. Obtain work instructions for this task.

Task

Complete the following steps to provision 10/100T or 1GSX/1GLX circuit packs.

1 From the System View window, click on **Alarm List** button to verify that no alarms, locks, loops, or switches are present for the ports on the circuit packs to be provisioned.

Result: The "NE Alarm List" window opens.

2 From the **System View** window, select **Configuration** > **Provision**.

Result: The "Provision Parameters for Equipment" window opens.

3 Find the 10/100T or 1GSX/1GLX circuit pack with the ports being provisioned, then expand the equipment list by clicking on the plus (+) sign next to the circuit pack.

4 Click (highlight) the port being provisioned, then click on **Provision** at the bottom of the window.

Result: The port parameters display on the right side of the window.

5 Select and provision the required port parameters, according to your work instructions.

6 Click **Apply** at the bottom of the window to make your changes.

Result: A confirmation window appears: "Execution of provision may affect the NE service. Do you want to execute this command?"

7 Verify that you are provisioning the correct port, then click **Yes** to apply your changes.

8 Are there additional ports to be provisioned on the 10/100T or 1GSX/1GLX circuit pack?

If...	Then...
Yes	Repeat task from Step 4 for each port.
No	Continue with Step 9.

9 Are there additional 10/100T or 1GSX/1GLX circuit pack(s) to be provisioned?

If...	Then...
Yes	Repeat task from Step 3 for each circuit pack.
No	Click **Close** to exit.

END OF STEPS

Task 336: Provision 10/100T (LNW66) or 1GSX/1GLX (LNW67/LNW68) Circuit Pack/Port for New Ethernet Service

Task 337 through 339: Reserved for Future Use

Task 337 through 339: Reserved for Future Use

Task 340: Establish Subtending Low Speed UPSR/BLSR Ring

Purpose

Use this task to establish the following subtending low speed rings:

- OC-3/12/48 UPSR
- OC-48 BLSR (Release 3.0 and later)

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions specify the necessary port, circuit pack, slot, and network element parameters to be used for this task.
- Verify that the systems being connected to the host Metropolis® DMX have been equipped and operating properly.
- Verify that the WaveStar® CIT is available.

Task

Complete the following steps to establish a subtending low speed ring.

1 Connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Refer to one of the following procedures to establish a subtending ring.

- "SE 340-1: Establish Subtending Low Speed OC-3/12/48 UPSR" (10-429)
- "SE 340-2: Establish Subtending Low Speed OC-48 2-Fiber BLSR" (10-433)

END OF STEPS

SE 340-1: Establish Subtending Low Speed OC-3/12/48 UPSR

Overview

This procedure establishes a subtending low speed OC-3/12/48 UPSR. Note that this configuration differs from a single-home application in that it supports ring closure by providing path protection switching, and by allowing low speed unit pass-through 2-waypr cross-connections.

Procedure

Complete the following steps to establish a subtending low speed OC-3/12/48 UPSR.

1 Determine the network configuration.

Example: Figure 10-60

2 Refer to office records and verify that no duplicate TID settings exist among the existing network and the new subtending network.

Important! If duplicate TIDs exists - they must be resolved before continuing. Refer to "Task 342: Set/Change System TID" (10-459) to change a Metropolis® DMX TID. Refer to product documentation for the subtending shelves.

3 Determine the loss of each new optical span from office records or by making the required measurements using local procedures.

4 At the host Metropolis® DMX node install OLIU circuit packs in Function Group or Growth slots (A1 and A2, B1 and B2, C1 and C2, D1 and D2, or G1 and G2) being used.

Reference: "Task 321: Install OLIU Circuit Packs in Function/ Growth Slots" (10-169)

5 From the System View menu at the host Metropolis® DMX node, select **Configuration > Provision**, select the optical ports that are being used for this subtending UPSR, and verify/set the port parameters.

> **Important!** You must set the Application parameter to "*upsr*" for this configuration. Set the Port Mode to "*Monitored*" (default option) for the ports being used. Sync Messaging must be "*enabled*" for the ports if any node in the subtending ring has sync messaging enabled.

Reference: "Task 322: Provision Function/Growth OLIU Circuit Packs/Ports for New Service" (10-175)

6 Use the **Configuration > Provision** command to verify/provision the Port Mode parameter to *Not Monitored* for all of the unused optical ports to avoid generating an *OC-n LOS* alarm.

7 From the System View menu at the Metropolis® DMX host node, select **Configuration > DCC Terminations** and verify/set the following:

- **LAPD Role:** parameter as *network-side (NS)* at one end of the optical span and *user-side (US)* at the other end of the optical span
- **Termination State:** to *Enabled*.

Use documentation for other products to set product node parameters.

> **Important!** The *network-side (NS)/user-side (US)* parameters must be set opposite at each end of the optical span. It does not matter which side is *network-side* and which side is *user-side* as long as they are different. By default, low speed function or growth slot #1 is set to NS. Low speed function or growth slot #2 is set to US. By default, Main slot 1 is set to US and Main slot 2 is set to NS.

8 At each end of the optical span being established, remove any optical loops from the OLIU ports associated with the optical span being connected (LOS alarm will occur).

9 Perform optical fiber connections and verification of the integrity of the optical span being connected.

Important! The UPSR ring configuration requires that the host shelf Function Group **1 OLIU (A1, B1, C1, D1** or **G1)** be connected to the **M1 OLIU** of the subtending shelf and host shelf Function Group **2 OLIU (A2, B2, C2, D2** or **G2)** be connected to the **M2 OLIU** of the subtending shelf.

Example: Figure 10-60

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

10 Perform end-to-end optical line test at the host Metropolis® DMX node.

Reference: "Task 414: Perform End-to-End Optical Line Test on Function/Growth OLIUs" (11-73)

11 Repeat Step 8 through Step 10 for the other optical spans back to the host Metropolis® DMX shelf.

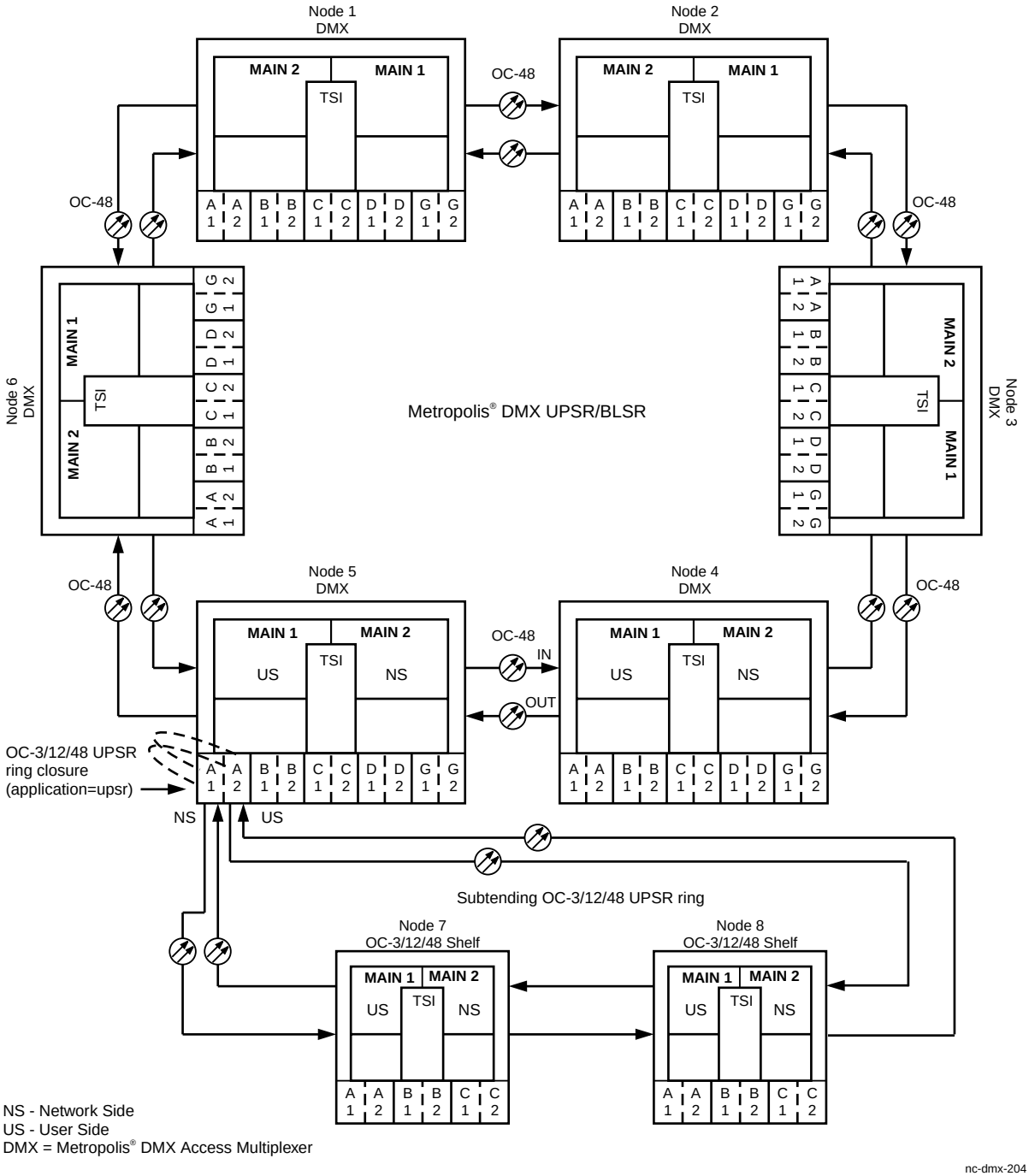
12 Refer to the product documentation for the other shelves in the subtending ring to set the following parameters:

- System timing parameters
- Sbyte sync messaging
- Sync Autoreconfiguration
- Far end communications or DCC terminations

13 The UPSR subtending ring access network is now ready for service to be established. For all service terminations on the subtending shelves, use that product's documentation to provision the shelves.

END OF STEPS

Figure 10-60 Subtending UPSR Configuration Example



SE 340-2: Establish Subtending Low Speed OC-48 2-Fiber BLSR

Procedure Complete the following steps to establish a subtending low speed OC-48 BLSR. (Refer to the example and 2-fiber bidirectional line switched ring worksheet at the end of this procedure when performing this task.).

1 Determine the network configuration. (Refer to the example at the end of this procedure.)

Important! When the Main slots are equipped with LNW26 or LNW26B OC-48 OLIU circuit packs, low speed OC-48 BLSRs are only supported in slots D1 and D2 or G1 and G2 only.

2 At the host Metropolis® DMX node install the OLIU circuit packs in the appropriate Function Unit or Growth slots (A1 and A2, B1 and B2, C1 and C2, D1 and D2, or G1 and G2).

Reference: "Task 321: Install OLIU Circuit Packs in Function/ Growth Slots" (10-169)

3 At the host Metropolis® DMX node (refer to the 2-fiber BLSR worksheet at the end of this task), select **Configuration** > **Provision...** from the System View screen.

Result: The *Provision Parameter for Equipment* screen appears.

4 Expand the appropriate *CP fn-{a,b,c,d}-1 (OC48/OLIU)* or *CP growth-1 (OC48/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OC48)* and **Provision**.

Result: The port provisionable parameters appear.

Important! The Application parameter must be provisioned *2F BLSR*.

5 Provision the port parameters according to the work instructions. Click on **Apply** and **Close**.

6 Select **View > View Equipment Details...**

Result: The *View Equipment Details* screen appears.

7 Expand the *CP fn-{a,b,c,d}-1 (OC48/OLIU)* or *CP growth-1 (OC48/OLIU)* circuit pack by clicking on the plus sign (+). Then click on *Port 1 (OC48)* and **Select**. Verify that the port parameters were provisioned correctly and click on **Close**.

8 At the opposite end of the optical span (refer to the 2-fiber BLSR example and worksheet at the end of the task), repeat Step 3 through Step 7 to provision the port on the *main-2* circuit pack.

9 At the host Metropolis® DMX node, select **Configuration > Provision...**.

Result: The *Provision Parameter for Equipment* screen appears.

10 Select the **Ptn Grp** tab and the appropriate 2-fiber BLSR protection group. Then click on **Provision**.

Result: The protection group parameters appear.

11 Provision the *Group Member* parameters (Ring ID, Wait to Restore, and Automatic Ring Discovery) according to the work instructions and click on **Apply**.

Result: A dialog box appears if you want to execute this command. Click on **Yes** and **Close**.

12 Select **View > Protection**.

Result: The *View Protection* screen appears.

13 Click on the appropriate protection group and **Select**. Verify that the protection group parameters were provisioned correctly and click on **Close**.

14 At the opposite end of the optical span (refer to the 2-fiber BLSR example and worksheet at the end of the task), repeat Step 9 through Step 13 to provision the 2-fiber BLSR protection group.

15 At the host Metropolis® DMX node, select **Configuration > DCC Terminations...**

Result: The *Provision DCC Terminations* screen appears.

Important! The LAPD parameter must be provisioned different values at each end of an optical span (refer to the 2-fiber BLSR example and worksheet at the end of the task).

16 Provision the DCC termination parameters according to the work instructions and click on **OK**.

Result: A dialog box appears asking if you want to execute this command. Click on **Yes** and **Close**.

17 Select **View > DCC Terminations...**. Verify that the DCC termination parameters were provisioned correctly and click on **Close**.

18 At the opposite end of the optical span (refer to the 2-fiber BLSR example and worksheet at the end of the task), repeat Step 15 through Step 17 to provision the DCC terminations.

19 At the host Metropolis® DMX node, provision synchronization functions according to work instructions. Repeat this step at the opposite end of the optical span (refer to the 2-fiber BLSR example and worksheet at the end of the task).

Reference: "Task 204: Network Synchronization Provisioning" (9-25)

Important! The BLSR ring configuration requires that the host shelf Function group 1 OLIU (A1, B1, C1, D1, or G1) be connected to the M2 OLIU of the subtending shelf, and the host shelf Function group 2 OLIU (A2, B2, C2, D2, or G2) be connected to the M1 OLIU of the subtending shelf. (Refer to the 2-fiber BLSR example and worksheet at the end of the task).

20 Perform optical fiber connections and verification of the integrity of the optical span being established (refer to the 2-fiber BLSR example and worksheet at the end of the task).

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

21

IF automatic ring discovery was provisioned...	THEN...
enabled at the host Metropolis® DMX node,	Continue with Step 22.
disabled at the host Metropolis® DMX node,	Establish a new manual ring map. Repeat this step at the opposite end of the optical span. **Reference:** "Task 305: Provision Manual Ring Map" (10-79)

22 Perform end-to-end optical line test.

Reference: "Task 404: Perform End-to-End Optical Line Test on Main OLIUs" (11-37)

23 Repeat this procedure from Step 3 for each optical span in the subtending 2-fiber BLSR network (refer to the 2-fiber BLSR example and worksheet at the end of the task).

24 To verify 2-fiber BLSR protection switching, at the host node:

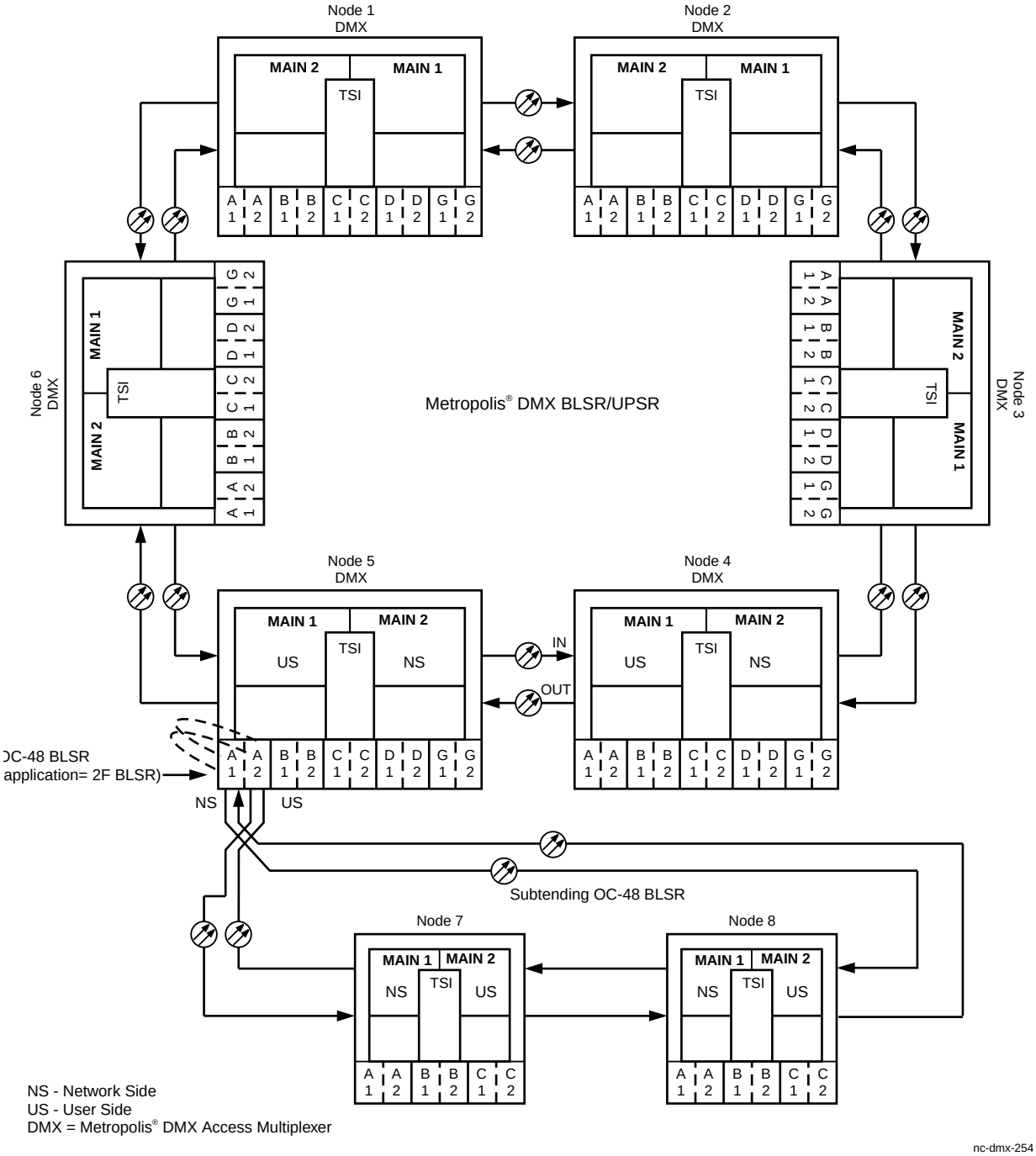
1. Select **Fault > Protection Switch....** Select the 2-fiber BLSR protection group and perform a protection switch in the **East** direction with switch type **Manual to Protection, Ring**.
2. Select **View > Protection....** Select the 2-fiber BLSR protection group and verify the 2-fiber BLSR protection switch was performed.
3. Select **Fault > Protection Switch....** Select the 2-fiber BLSR protection group and perform a protection switch in the **East** direction with switch type **Clear**.

Repeat this step for each optical span in the subtending 2-fiber BLSR network to verify 2-fiber BLSR protection switching.

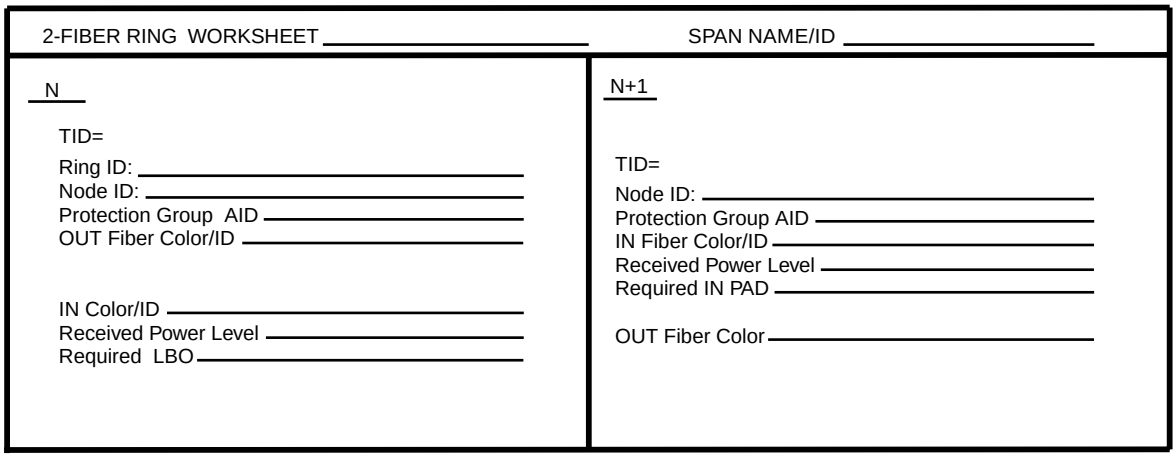
25

IF automatic ring discovery was provisioned...	THEN...
enabled at each node,	**Important!** As the ring is connected, nodes automatically communicate with each other using the data communications channel (DCC) and build a ring map. If successful, automatic ring discovery builds a ring map at each node. If unsuccessful, the ring map is not complete and alarms are reported. At the host node, select **View > Ring Map > Ring Map**. Then click on the appropriate ring and **Select**. **Result:** The ring map information appears. If the ring is incomplete and alarms are present, refer to *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*.
disabled at each node,	*STOP! End of Task.*

Subtending 2-Fiber BLSR Example



2-Fiber BLSR Worksheet


2-FIBER RING WORKSHEET
SPAN NAME/ID
N
TID=
Ring ID:
Node ID:
Protection Group AID
OUT Fiber Color/ID
IN Color/ID
Received Power Level
Required LBO
N+1
TID=
Node ID:
Protection Group AID
IN Fiber Color/ID
Received Power Level
Required IN PAD
OUT Fiber Color

NC-USM-216

Task 341: In-Service Upgrade of an OC-3 or OC-12 UPSR to a Metropolis® DMX OC-48/192 UPSR

Purpose

Use this task to perform an in-service upgrade of an existing OC-3 or OC-12 UPSR (Figure 10-61) to a Metropolis® DMX OC-48/192 UPSR. This procedure establishes a final configuration (Figure 10-67) with the Metropolis® DMX OC-48/192 UPSR serving as a backbone ring for the subtending OC-3/OC-12 ring.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- Optical power meter, to measure the level of received power
- Appropriate optical LBOs
- Technical assistance at the two (East and West) adjacent nodes.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

It is assumed that all Metropolis® DMX shelves in the system have passed the looped transmission test(s).

Reference: "Task 300: Equip Metropolis® DMX Shelf (Looped-Back)" (10-7).

Before you begin

Read and/or perform the following before performing this task:

- Notify the maintenance center of these planned upgrade activities and that alarms will be generated.
- At each DDM-2000 OC-3 or OC-12 UPSR node, verify that no alarms, lockouts, loopbacks, or switches are present. Refer to the DDM-2000 User Service Manual (USM) if you need additional instruction. Any existing alarms must be cleared before starting this task.
- This procedure is used to update a DDM-2000 OC-3/12 UPSR to a Metropolis® DMX OC-48/192 UPSR. It is assumed that the fiber being used in the current OC-3/12 ring will be used to build the new Metropolis® DMX UPSR.
- With minor changes, this procedure may also be used to move VT1.5 service onto an existing OC-48/192 ring. The fiber connecting the OC-48/192 nodes at each site would already be connected and the OC-48/192 ring would already be carrying service.
- This procedure uses an existing 3 node DDM-2000 OC-3/12 ring as an example for the OC-3/12 to OC-48/192 ring upgrade (See Figure 10-61). Other OC-3/12 network upgrades are possible and can be done using this procedure with minor modifications. Local procedures will have to be written, using the concepts of this procedure, to upgrade the particular configuration that you have.
- This procedure assumes that a Metropolis® DMX has been installed and equipped ("Task 300: Equip Metropolis® DMX Shelf (Looped-Back)" (10-7)) at each existing OC-3/12 shelf location. The Metropolis® DMX shelf must be equipped with **Main OLIUs** and **OC-3/12 OLIUs** (in the Function Group or Growth slots being used to connect to the DDM-2000).
- The application parameter of the OC-3/12 interfaces on the Metropolis® DMX must be set to **0x1** (Release 2 and earlier) or **UPSR** in Release 3 or later.

  Note that in Release 3 or later, the **0X1** application parameter is no longer valid, and you have to use the **UPSR** application parameter for this configuration. A new parameter has been added to the

cross-connection command to accomplish the function of 0X1 application. The new cross-connection parameter is channel application (**chappl**), with a value of **UNSWITCHED**.

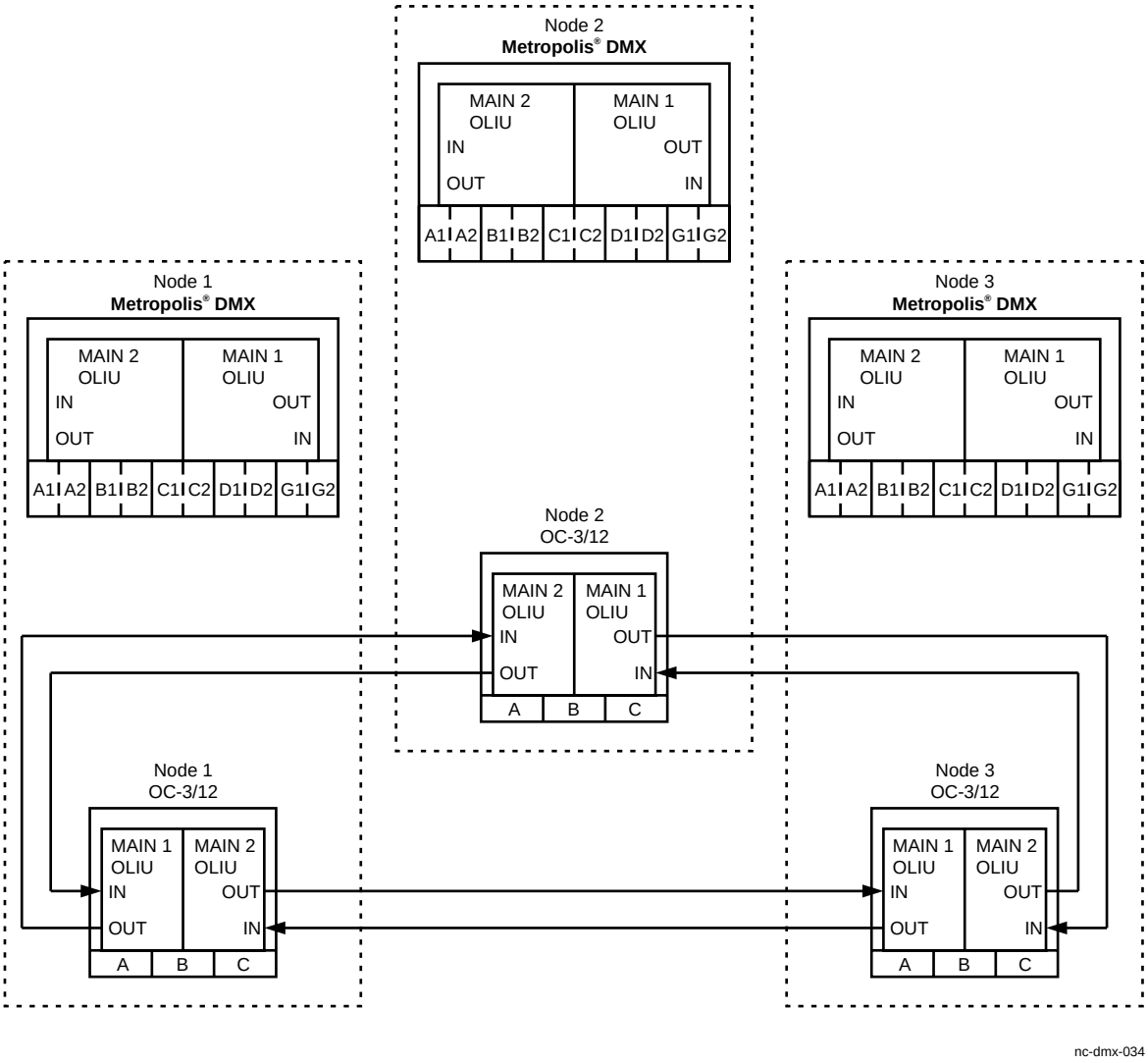
- TARP Release 15 or later ring software must be installed on the DDM-2000 shelves.
- You may also contact Lucent Technologies to perform this in-service upgrade. Experienced Lucent Technologies installers will help you plan and execute the network upgrade. For more information, contact your Lucent Technologies Account Representative.

Task Complete the following steps to convert an in-service OC-3/12 UPSR to a Metropolis® DMX OC-48/192 UPSR.

. . . . . .

1 Reference Figure 10-61 as the starting point for this procedure.

Figure 10-61 Initial Configuration for Upgrade



2 At each Metropolis® DMX node, connect the PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

3 At each Metropolis® DMX node, use the **Configuration** > **DCC Terminations** command to verify/set Network Side/User Side parameters at each end of the optical span being established.

Refer to the DDM-2000 user manual to verify/set NS/US parameters for this configuration.

Note that if the default settings were not changed in the DDM-2000 ring configuration and the default settings are retained in the function or growth slots of the Metropolis® DMX node, no changes should be required.

Important! The requirement is that one end of the optical fiber connection must be set to Network-Side and the other end must be set to User-Side.

. . . . . .

4 Refer to office records and verify that no duplicate TID settings exist among the existing network nodes and the new network nodes.

Important! If duplicate TIDs exist, they must be resolved before continuing. As appropriate, refer to "Task 342: Set/Change System TID" (10-459) to change a Metropolis® DMX TID. Or, to the User Service Manual of the OC-3/OC-12 subtending shelf.

If you need additional instructions to help you complete this step on the DDM-2000 NEs, refer to the DDM-2000 documentation.

. . . . . .

5 At the Metropolis® DMX Nodes (1, 2, and 3 in this example) use the **Configuration>Provision** command to verify/set the **Application** parameter to **0x1** (Release 2 and earlier) or **UPSR** (Release 3 and later) for the OC-3 or OC-12 interfaces that are being used for this single-homed configuration.

Reference: "Task 322: Provision Function/Growth OLIU Circuit Packs/Ports for New Service" (10-175)

6 At each of the Metropolis® DMX host nodes (nodes 1, 2, and 3 in this example), determine and provision the add/drop cross-connections to support each single-homed OC-3 or OC-12 node. From the System View menu, select **Configuration>Cross-Connections** to start the Cross-Connection Wizard. Refer to "Task 327: Make Single-Homed Cross-Connections to a Metropolis® DMX Access Multiplexer Backbone Ring" (10-221).

Important! Refer to the OLIU circuit pack descriptions in the descriptive chapters of this document to find the cross-connection capacities for Virtual Tributaries (VTs) for the OLIU circuit packs in the Metropolis® DMX.

Any channels that are presently in service or cross-connected in the existing DDM-2000 ring must be cross-connected to the single-homed function or growth group OLIUs in the Metropolis® DMX *nodes.*

In the case of a VT1.5 signal, the same STS-1 may be cross-connected to the OC-3/12 shelves at several Metropolis® DMX nodes until the STS-1 signal reaches its capacity of 28 VT1.5 signals.

In Release 3 or later, note that the single-homed cross-connections to the DDM-2000 shelves must be cross-connected in the Metropolis® DMX from the main OLIUs to the function or growth OLIUs using the cross-connection parameter of **chappl=UNSWITCHED**.

The connection between the DDM-2000 and Metropolis® DMX is a single-homed connection. In single-homed connections, the Function Group slot **A1, B1, C1, D1,** or Growth slot **G1 OLIU** in the Metropolis® DMX host shelf connects to the **M1 OLIU** at the first DDM-2000 shelf from the Metropolis® DMX host shelf. **M2 OLIU** at the first DDM-2000 shelf connects to Function Group slot **A2, B2, C2, D2,** or Growth slot **G2 OLIU** in the Metropolis® DMX host shelf. This procedure establishes the ring configuration starting from the Metropolis® DMX host node to the far-end DDM-2000 shelf and back to the host node.

7 At each Metropolis® DMX shelf, determine the channels to be *pass-through* cross-connected in the Metropolis® DMX. Use **Configuration > Cross-Connections** at each required Metropolis® DMX shelf to make all required *pass-through* cross-connections for the previously selected channels.

Important! At each Metropolis® DMX node in the ring, pass-through cross-connections must be made for each channel that is carrying traffic and that has not been cross-connected to a circuit pack in a Function or Growth slot in that Metropolis® DMX node. Critical or Major alarms will be generated if pass-through cross-connections are not made on each required Metropolis® DMX shelf in the ring.

Note that in the examples in this procedure there are no pass-through Metropolis® DMX nodes. All the Metropolis® DMX nodes serve as host nodes to support the single homed configuration. As an example, if another Metropolis® DMX node was placed between Metropolis® DMX Node 1 and Node 2, then you would provision the necessary pass-through cross-connections at that node.

8 At all Metropolis® DMX shelves in the network, select **Configuration > Timing/Sync** and click on the tab labeled *System Timing* and for the box that is labeled *Synchronization Autoreconfiguration* select option **disabled**.

Important! 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.

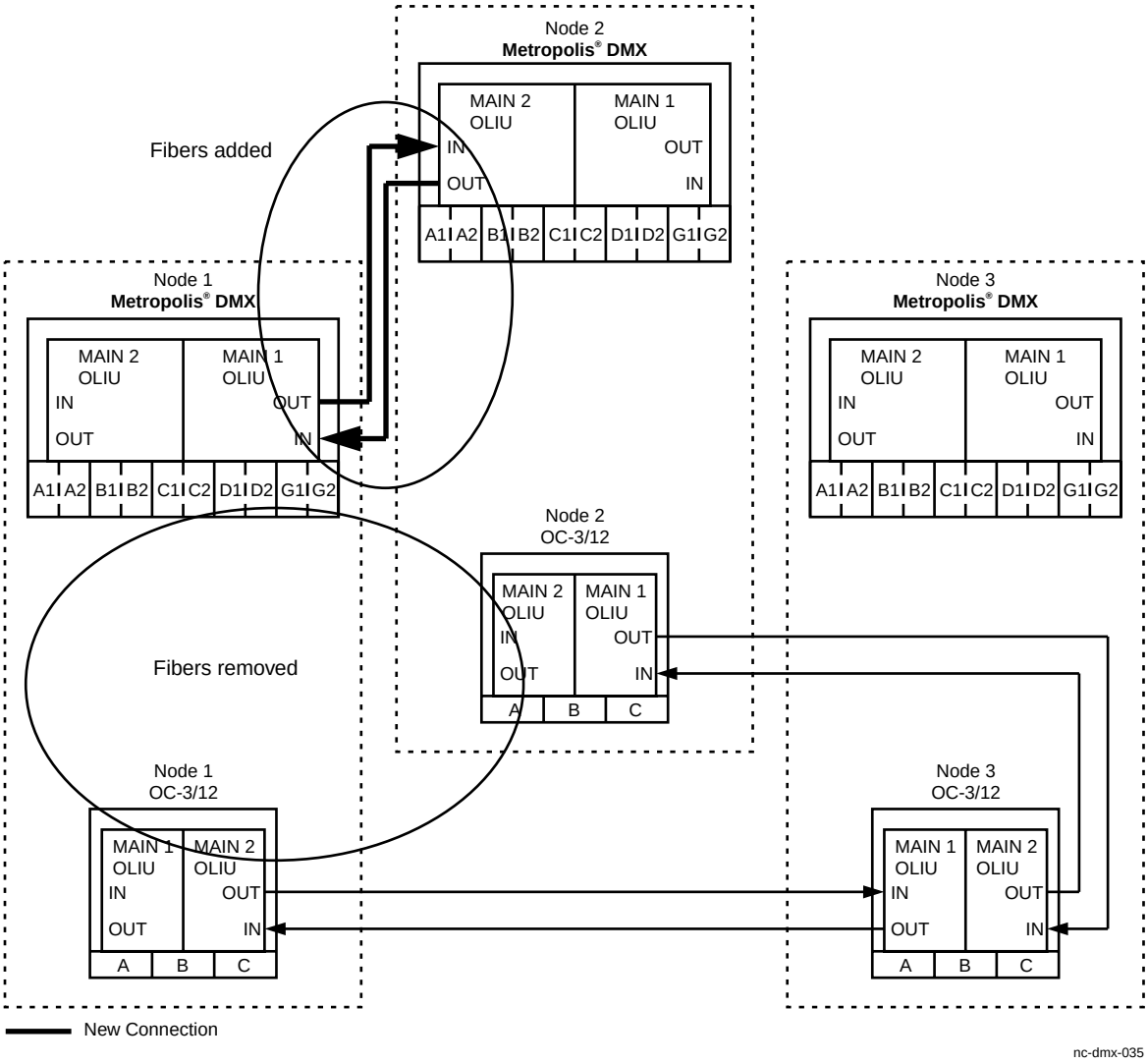
9 As appropriate, at each Metropolis® DMX node, select **Configuration > DCC Terminations** and for the field *DCC Channel Parameter Termination State* select option **enabled**.

Important! An **inconsistent DCC switches** alarm will occur when the Metropolis® DMX OLIUs are looped back and fecom is enabled. The alarm will clear as the OLIU loopbacks are removed and the Metropolis® DMX and DDM-2000 shelves are interconnected.

10 Starting at any location, disconnect the fiber pair between one DDM-2000 shelf and a neighboring DDM-2000 shelf.

For example, in Figure 10-62, disconnect the fiber pairs between DDM-2000 Node 1 and DDM-2000 Node 2. If required, use these fibers to connect Metropolis® DMX Node 1 and Metropolis® DMX Node 2.

Figure 10-62 First Figure in Upgrade Sequence



Important! A protection switch may occur when fibers are removed and cause a transmission hit.

This procedure begins at one location and progresses around the ring until all optical fiber connections are made.

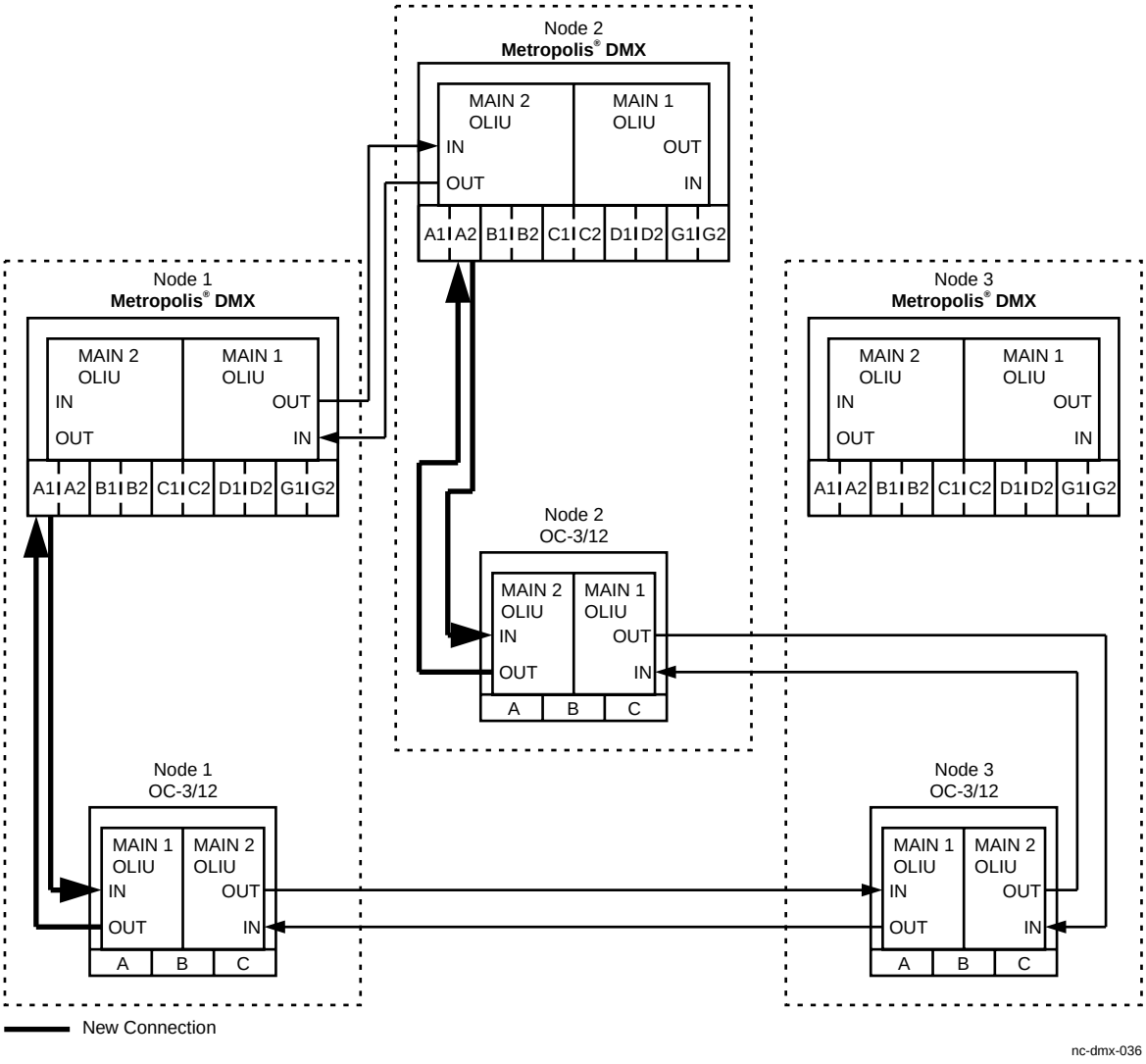
Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

11 At Metropolis® DMX Node 1, connect the optical fibers from DDM-2000 Node 1 **MAIN1** slot to Metropolis® DMX Function Group Slot **A1, B1, C1, D1,** or Growth slot **G1**. See Figure 10-63.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

12 At Metropolis® DMX Node 2, connect the optical fibers from DDM-2000 Node 2 **MAIN2** slot to Metropolis® DMX Function Group Slot **A2, B2, C2, D2,** or Growth slot **G2**. See Figure 10-63.

Figure 10-63 Second Figure in Upgrade Sequence



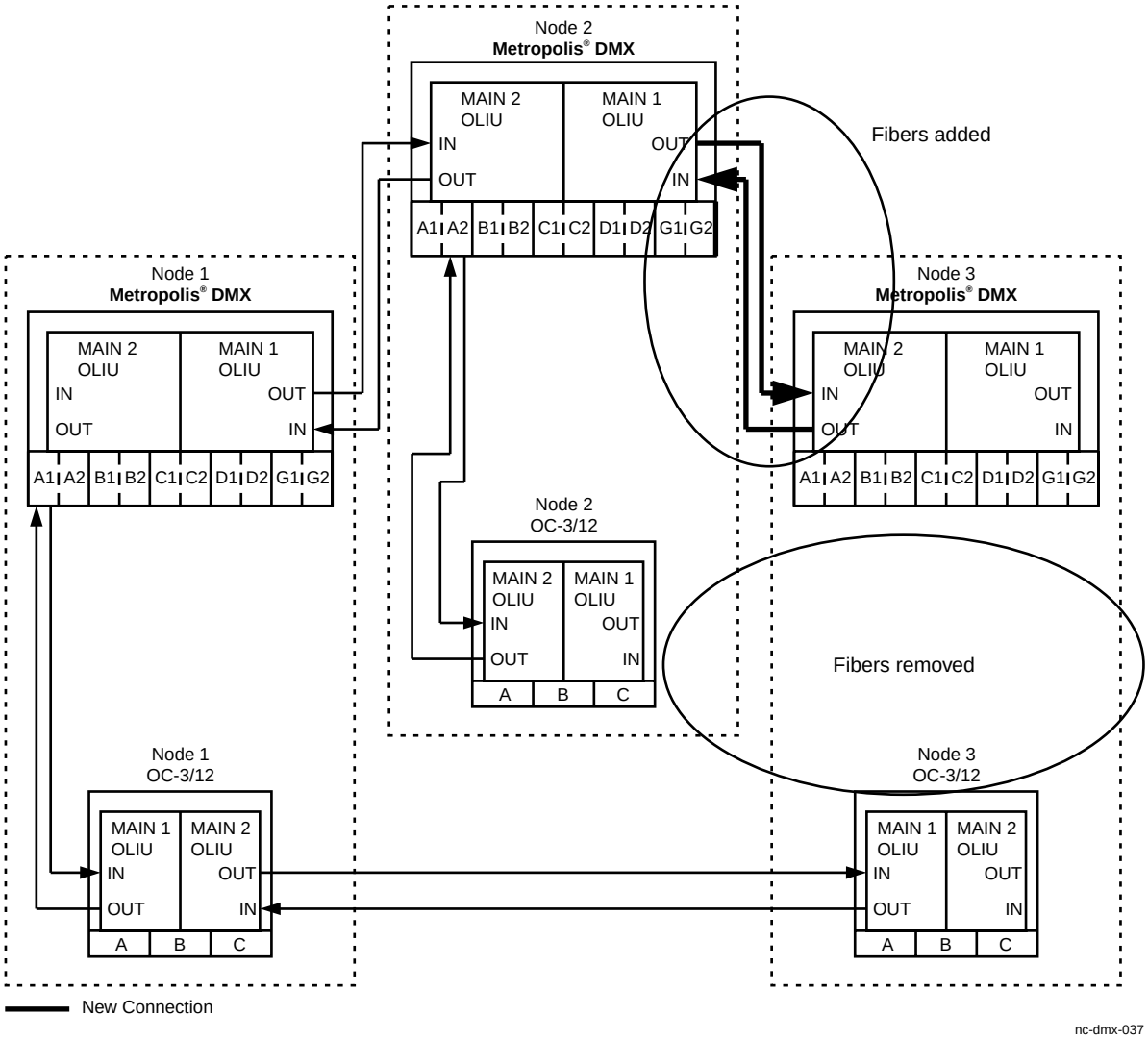
Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

. . . . . .

13 Click on the **Alarm List** button and verify that no alarms are being reported for channels that are connected between **MAIN-1** of the DDM-2000 shelf at **Node 1** (through the Metropolis® DMXs at Nodes 1 and 2) and **MAIN-2** of the DDM-2000 at **Node 2**. If there are any alarms, recheck the cross-connections at the Metropolis® DMXs.

14 See Figure 10-64. Disconnect the fiber pair between DDM-2000 Nodes 2 and 3. If required, use these fibers to connect Metropolis® DMX Node 2 and Node 3.

Figure 10-64 Third Figure in Upgrade Sequence



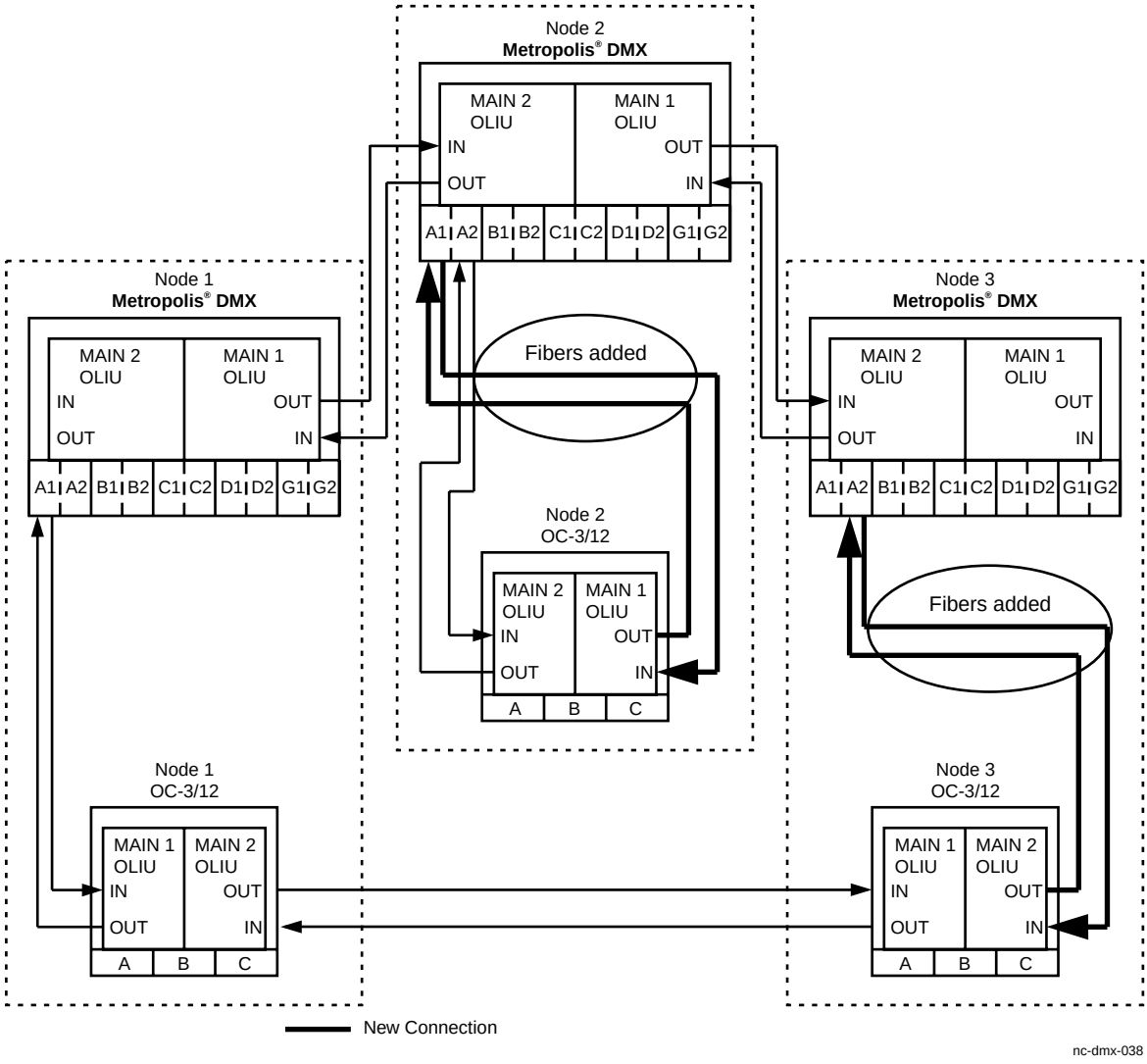
Reference: “Task 403: Perform Connection and Verification of Optical Facility” (11-25)

15 See Figure 10-65. At Metropolis® DMX Node 2, connect the optical fibers from DDM-2000 Node 2 **MAIN1** slot to Metropolis® DMX Function Group slot **A1, B1, C1, D1,** or Growth slot **G1**.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

16 At Metropolis® DMX Node 3, connect the optical fibers from DDM-2000 Node 3 **MAIN2** slot to Metropolis® DMX Function Group slot **A2, B2, C2, D2,** or Growth slot **G2**. See Figure 10-65.

Figure 10-65 Fourth Figure in Upgrade Sequence



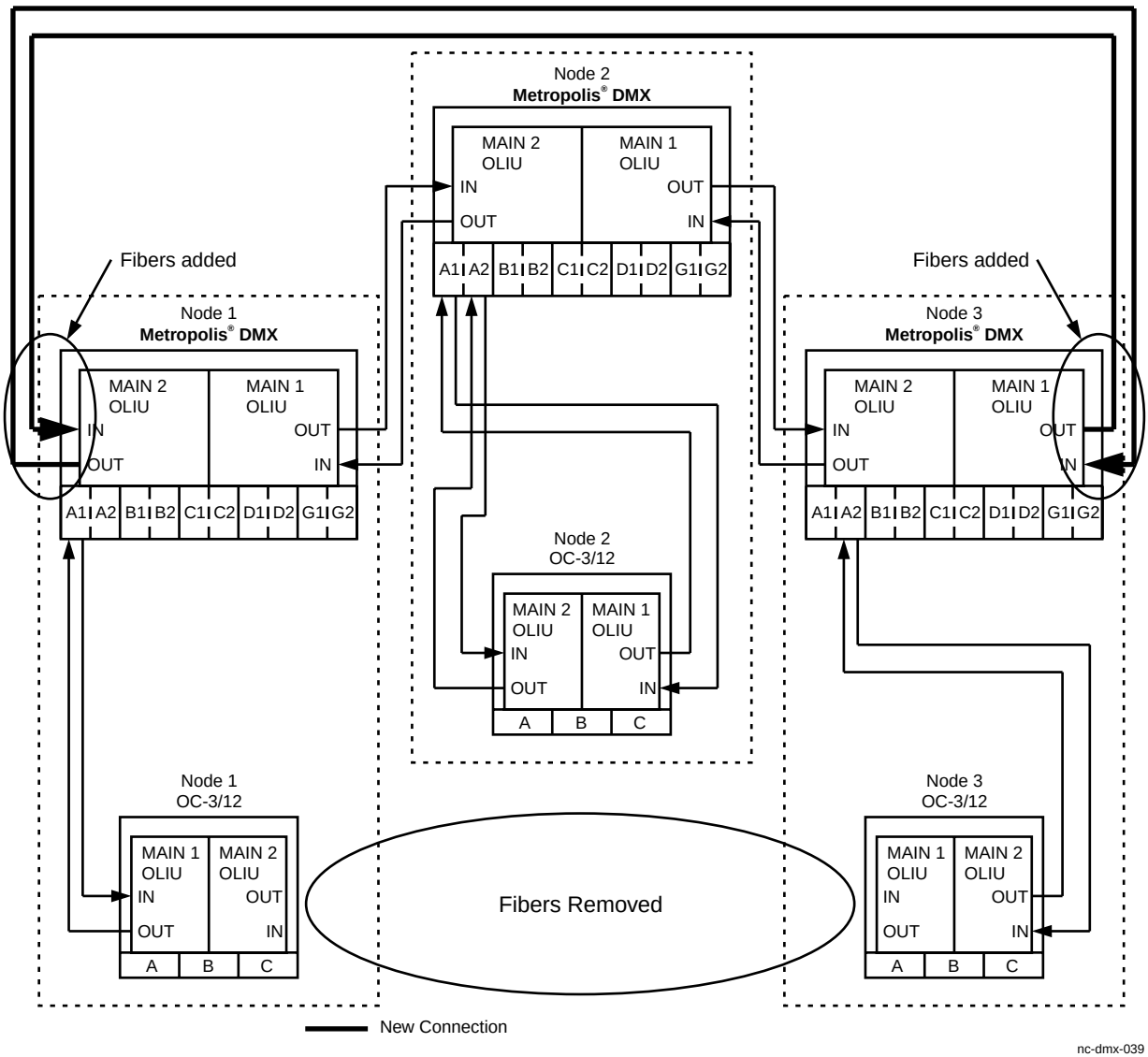
Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

. . . . . .

17 Click on the **Alarm List** button and verify that no alarms are being reported for channels that are connected between **MAIN-1** of the DDM-2000 shelf at **Node 2** (through the Metropolis® DMXs at Nodes 2 and 3) and **MAIN-2** of the DDM-2000 at **Node 3**. If there are any such alarms, recheck the cross-connections at the Metropolis® DMXs.

18 See Figure 10-66. Disconnect the fiber pair between DDM-2000 Nodes 2 and 3. If required, use these fibers to connect Metropolis® DMX Nodes 1 and 3.

Figure 10-66 Fifth Figure in Upgrade Sequence



Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

19 See Figure 10-67. At Metropolis® DMX Node 3, connect the optical fibers from DDM-2000 Node 3 **MAIN1** slot to Metropolis® DMX Function Group slot **A1, B1, C1, D1,** or Growth slot **G1**.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

20 At Metropolis® DMX Node 1, perform the optical fiber connections from DDM **MAIN2** slot to Metropolis® DMX Function Group Slot **A, B, C, D,** or **G 2**. See Figure 10-67.

Reference: "Task 403: Perform Connection and Verification of Optical Facility" (11-25)

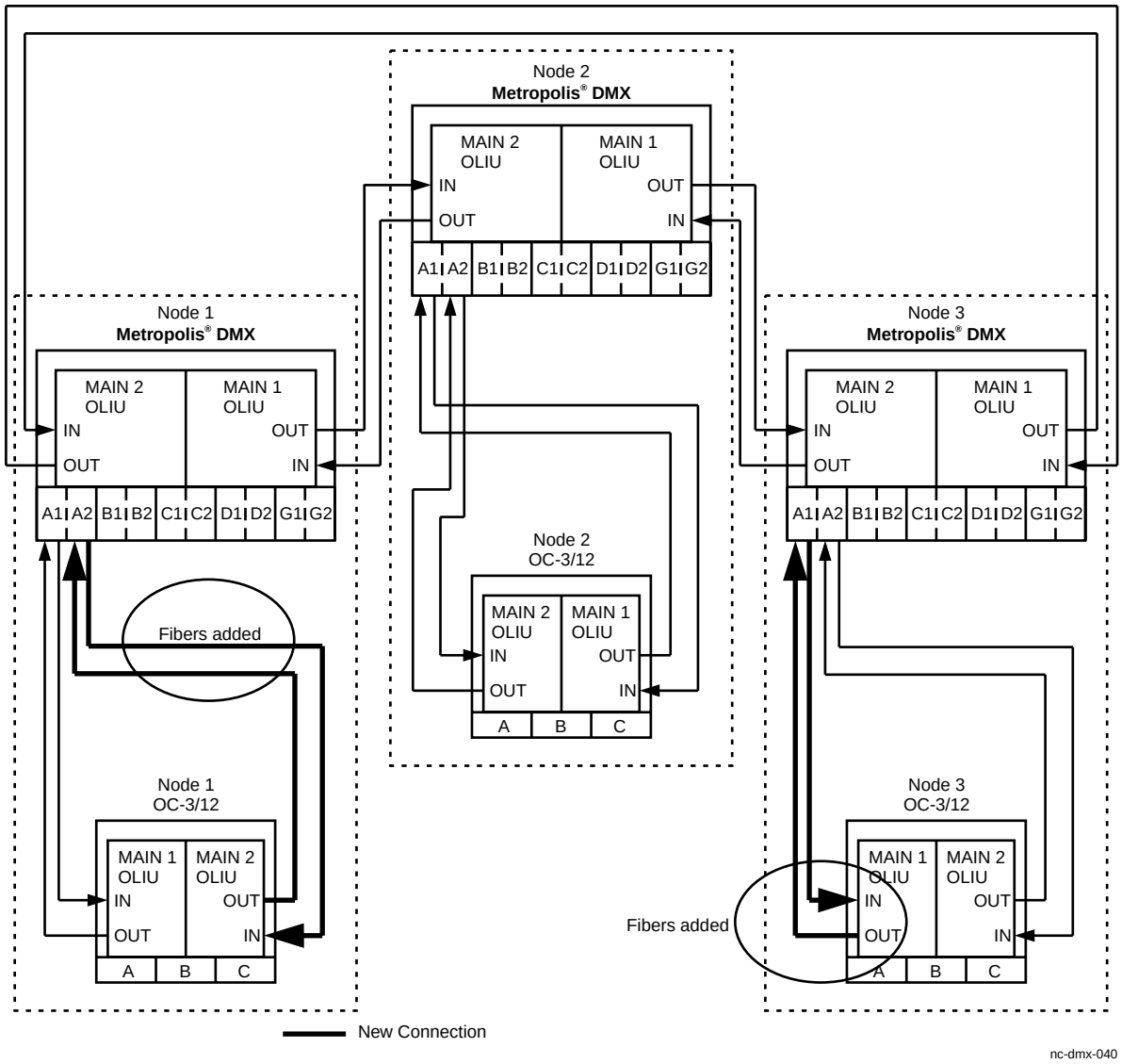
21 Click on the **Alarm List** button and verify that no alarms are being reported for channels that are connected between **MAIN-1** of the DDM shelf at **Node 3** (through the Metropolis® DMXs at Nodes 3, 2, and 1) and **MAIN-2** of the DDM at **Node 1**. If there are any such alarms, recheck the cross-connections at the Metropolis® DMXs.

22 Refer to the work instructions and determine the timing/synchronization plan for each node. Select **Configuration > Timing/Sync** from the System View menu at each node. Click on the tab that is labeled System Timing and select the appropriate options for that particular node.

Important! The simplest timing configuration would be to set one Metropolis® DMX node to receive external timing from the BITS clock, and all other nodes in the network to receive line timing. Many other timing configurations are possible.

23 At any one of the Metropolis® DMX nodes select **Administration>OSI Routing Map** in order to verify that the UPSR is functional.

Figure 10-67 Final Configuration in Upgrade Sequence



END OF STEPS

Task 342: Set/Change System TID

Purpose

Use this procedure to set or change the system Target Identifier (TID). The more common time to change a TID will be prior to placing the system in-service. However, this procedure can also be used to change the TID of an in-service system.

> **Important!** If the TID is changed for a node participating in a BLSR with manual ring provisioning, then you must update the FE NE Name List at each far end node in the ring.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye Damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*.

Before you begin

Prior to performing this task, you must:

- Obtain the TID from your work instructions.
- Be able to log in to the system with the WaveStar® CIT, and be familiar with the functions of the CIT.

Task

Complete the following steps to change an NE's TID.

1 Connect the PC and establish a WaveStar® CIT session with the NE being changed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From your work instructions, obtain the TID (also known as NE Name).

Important! The TID is a case insensitive ASCII character string from 1 to 20 characters and must be unique for each NE in the ring. The allowed characters are:

- Letters from "a" to "z" and "A" to "Z".
- Numbers from "0" to "9".
- Special characters: "#" (pound), "%" (percent), "+" (plus), "-" (hyphen), and "." (period).

3 From the System View menu, select **Administration > Set TID**, then:

1. In the **New TID/NE Name:** box, enter the new TID.
2. Confirm your entry in the **Confirm TID/NE Name:** box.
3. Click the **OK** button.
4. Read the information message, then click the **YES** button.

Important! If the TID is changed for an NE in a BLSR ring and automatic ring discovery is not on or available, then you must update the FE NE Name List at each far end node in the ring.

Following a Metropolis® DMX system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). If automatic synchronization is unsuccessful, the date and time must be reset manually.

Reference: "Task 354: Set Date and Time" (10-571)

Result: The NE performs an automatic reset and the current login session is terminated.

4

If...	Then...
this NE is an NE in a UPSR ring, or an NE in a BLSR ring with automatic ring discovery,	STOP! END OF TASK.
this NE is an NE in a BLSR ring with only manual ring provisioning,	Continue with Step 5.

5 One at a time, login to each far end NE in the ring. From the System View menu, select **Configuration > Change Far End NE Names**.

Result: The Change Far End NE Name window opens.

6 Select the ring ID or 2F BLSR port protection group, then click **Select**.

Result: The Change Far End NE Name for: ... window opens.

7 In the Far End NE Name List box, select the area to the right of the NE which still lists the old TID for the NE name you changed. Enter the new TID, then click **OK**. Read the warning message, then click **Yes** to execute the command.

8 Repeat from Step 5 for each far end node in the ring.

END OF STEPS

Task 343: Upgrade In-Service High Speed OC-48 OLIUs in UPSR/ BLSR Network

Purpose

Use this procedure to upgrade in-service the following high speed OC-48 OLIU circuit packs at a node(s) in a unidirectional path switched ring (UPSR) or bidirectional line-switched ring (BLSR).

- LNW26 OC-48 OLIU to LNW26B, LNW28, LNW77, or 121B-159B OC-48 OLIU
- LNW26 OC-48 OLIU to LNW27, LNW29, LNW76, or LNW221-259 OC-48 OLIU
- LNW26B, LNW28, LNW77, or 121B-159B OC-48 OLIU to LNW27, LNW29, LNW76, or LNW221-259 OC-48 OLIU

The LNW27, LNW29, LNW76, and LNW221-259 OC-48 OLIU circuit packs can cross-connect VT1.5 signals in up to 48 STS-1 signals.

The LNW26B, LNW28, LNW77, and 121B-159B OC-48 OLIU circuit packs can cross-connect VT1.5 signals in up to 6 STS-1 signals or 12 STS-1 signals. If the Normal/Enhanced jumper is in the *Normal* position, the circuit pack can cross-connect VT1.5 signals in up to 6 STS-1 signals. If the Normal/Enhanced jumper is in the *Enhanced* position, the circuit pack can cross-connect VT1.5 signals in up to 12 STS-1 signals.

The LNW26 OC-48 OLIU circuit pack can cross-connect VT1.5 signals in up to 6 STS-1 signals.

Required equipment

The following equipment is required to perform this task:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- 2 replacement OC-48 OLIU circuit packs for the OC-48 OLIU circuit packs in main slots **M1** and **M2**

Release 2.1 or later software is required to support the LNW27, LNW29, LNW76, and LNW221-259 OC-48 OLIU circuit packs.

Release 2.0 or later software is required to support the LNW26B, LNW28, LNW77, and 121B-159B OC-48 OLIU circuit packs.

Release 2.1 or later software is required to support the LNW26B, LNW28, LNW77, and 121B-159B OC-48 OLIU circuit packs with the Normal/Enhanced jumper in the *Enhanced* position.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

CAUTION

Do not rock circuit packs back and forth when removing and installing them. Carefully slide circuit packs in to or out of the shelf slot.

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Obtain the work instructions for this task and verify that the replacement circuit packs are compatible with the optical spans.
- Review the applicable *Metropolis® DMX Access Multiplexer Software Release Description* for any detailed procedures or cautions that may apply to this upgrade procedure.
- If the provisioned Timing Source is external, verify that both timing references (REF-1 and REF-2) are in-service (IS) before beginning this procedure.
- If the LNW26B, LNW28, LNW77, or LNW121B-159B OC-48 OLIU circuit packs are being installed, verify that the Normal/ Enhanced jumper is in the required position. Refer to "Task 312: Install Main OLIU Circuit Packs" (10-113).
- If the 121B-159B or LNW221-259 OC-48 OLIU circuit packs are being installed, verify that the channel selection jumper is in the required position. Refer to "Task 312: Install Main OLIU Circuit Packs" (10-113).
- Verify that the WaveStar® CIT is available.

Task

Complete the following steps to upgrade in-service the high speed OC-48 OLIU circuit packs at a node(s) in a UPSR/BLSR network.

. . . . . .

1 Log in to the node where the OC-48 OLIU circuit packs are to be replaced.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 To verify that no alarms are present, click on **Alarm List** in the top right corner of the System View.

To verify that no lockouts, loopbacks, or switches are present, from the System View menu, select **View > Rolling Events**. Under the line reading **RTRV-COND-ALL:tid::ctag** any lockouts, loopbacks, or switches are displayed.

Important! If an alarm is present, refer to the appropriate task in the *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302* to clear the alarm before continuing with this task.

Important! The OC-48 OLIU circuit pack in Main slot **M1** must be replaced first.

3 Replace the OC-48 OLIU circuit pack in Main slot **M1** with the replacement OC-48 OLIU circuit pack.

Result: The system reports an unexpected CP type alarm for Main slot **M1**. Transmission hits (less than 60 ms) may occur if active traffic exists on the circuit pack in the Main slot **M1.**

Reference: "Task 312: Install Main OLIU Circuit Packs" (10-113)

Important! The **UPD/INIT** button does not work during this upgrade.

4 From the System View select **Configuration > Update System**.

Result: The replacement OC-48 OLIU circuit pack in Main slot **M1** is autoprovisioned, and the system performs an automatic path protection switch. All traffic is now active on Main slot **M1.** The unexpected CP type alarm for Main slot **M1** is cleared, and the system reports an unexpected CP type alarm for Main slot **M2**.

If an LNW26 OC-48 OLIU is replaced with an LNW26B OC-48 OLIU and the provisioned Timing Source is External, the system may enter holdover mode after the system update, but will clear after approximately 15 seconds.

5 Replace the OC-48 OLIU circuit pack in Main slot **M2** with the replacement OC-48 OLIU circuit pack.

Result: All alarms are cleared and service is restored.

Reference: "Task 312: Install Main OLIU Circuit Packs" (10-113)

6 This completes the circuit pack upgrade at the local node. If other nodes in the UPSR/BLSR are to be upgraded, repeat Step 1 through Step 5 at each node beginning at the adjacent node connected to Main slot **M2**.

END OF STEPS

Task 344: Reserved for Future Use

Task 344: Reserved for Future Use

Task 345: Upgrade In-Service OC-48 UPSR to OC-192 UPSR

Purpose

Use this procedure to upgrade an in-service OC-48 UPSR with:

- LNW26/LNW26B OC-48 OLIU circuit packs at all nodes to an OC-192 UPSR
- LNW27 OC-48 OLIU circuit packs at one or more nodes to an OC-192 UPSR.

The LNW26/LNW26B OC-48 OLIU circuit packs in the Main slots **M1** and **M2** are upgraded at each node. Low speed OC-48 UPSR upgrades are not supported in this release.

This procedure assumes that in the UPSR, the circuit pack in the Main slot **M1** is always connected to the circuit pack in the Main slot **M2** of the adjacent node.

Important! The LNW27 OC-48 OLIU and LNW56 OC-192 OLIU circuit packs have large VT cross-connection fabrics. The LNW26/LNW26B OC-48 OLIU circuit pack has a small VT cross-connection fabric.

Important! Transmission hits will occur during this procedure whenever an OLIU circuit pack with a different line rate is installed or removed from a Main slot. The transmission hit is a result of an internal system timing adjustment to accommodate different line rates in the two Main slots.

Required equipment

The following equipment is required to perform this task:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- 1 LNW27 OC-48 OLIU circuit pack (temporarily required if the first node to be upgraded is equipped with LNW26/LNW26B OC-48 OLIU circuit pack)
- 2 replacement LNW56 OC-192 OLIU circuit packs for each node in the UPSR

Important! Release 2.1.2 or later software is required to support the OC-192 OLIU circuit packs.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

CAUTION

Do not rock circuit packs back and forth when removing and installing them. Carefully slide circuit packs in to or out of the shelf slot.

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Obtain the work instructions for this task.
- Review the applicable office records and verify that each fiber span in the UPSR is capable of supporting higher rate (OC-192) traffic. Verify that the fiber span does not exceed 40 kilometers.
- Review the applicable *Metropolis® DMX Access Multiplexer Software Release Description* for any detailed procedures or cautions that may apply to this upgrade procedure.
- Verify that the WaveStar® CIT is available.
- Verify that no alarms are present in the UPSR. If an alarm is present at a node, refer to the appropriate task in the *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302* to clear the alarm before beginning this task.

Task

Complete the following steps to upgrade in-service an OC-48 UPSR to an OC-192 UPSR.

1 From office records and work instructions, determine the current network configuration.

2 Refer to one of the following procedures to upgrade in-service an OC-48 UPSR to an OC-192 UPSR.

- “SE 345-1: Upgrade In-Service OC-48 UPSR (LNW26/LNW26B OC-48 OLIUs at All Nodes) to OC-192 UPSR” (10-475)
- “SE 345-2: Upgrade In-Service OC-48 UPSR (LNW27 OC-48 OLIUs at One or More Nodes) to OC-192 UPSR” (10-481)

END OF STEPS

SE 345-1: Upgrade In-Service OC-48 UPSR (LNW26/LNW26B OC-48 OLIUs at All Nodes) to OC-192 UPSR

Procedure Complete the following steps to upgrade an in-service OC-48 UPSR (equipped with LNW26/LNW26B OC-48 OLIU circuit packs at all nodes) to an OC-192 UPSR.

1 Log in to the starting node (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Important! The Ring Upgrade mode allows cross-connections/ data to be mapped to the new circuit pack and prohibits provisioning new cross-connections.

2 At the WaveStar® CIT System View, select **Configuration > Ring Upgrade Mode**.

Result: A dialog box appears asking you to confirm changing the NE Mode to Ring Upgrade mode. Click on **Yes**.

The **ABN** LED is lit on the SYSCTL circuit pack faceplate and the WaveStar® CIT alarm list shows the Ring Upgrade mode as Not Alarmed.

The node remains in the Ring Upgrade mode until manually provisioned back to the Normal mode. To prevent errors in the upgraded ring, keep all nodes in Ring Upgrade mode until all nodes have been upgraded.

Important! At the starting node, the LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M1** must be first replaced (temporarily) with the LNW27 OC-48 OLIU circuit pack. The LNW27 OC-48 OLIU circuit pack maintains traffic with the last node to be upgraded while slot **M2** and the other nodes in the ring are upgraded. As a final step, this LNW27 OC-48 OLIU circuit pack is upgraded.

3 Replace the LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M1** with the temporary LNW27 OC-48 OLIU circuit pack.

Result: The system reports an unexpected CP type alarm for Main slot **M1**. Transmission hits (less than 60 ms) may occur if active traffic exists on the circuit pack in the Main slot **M1.**

Important! The **UPD/INIT** button does not work during this upgrade.

4 At the System View select **Configuration > Update System**.

Result: A dialog box appears asking for Ring Upgrade Choice. Select *main-1* (default) and click on **OK**. A dialog box appears asking you to confirm executing this command. Click on **OK**.

The temporary LNW27 OC-48 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. The system performs an automatic path protection switch, and all traffic is now active on Main slot **M1**. The unexpected CP type alarm for Main slot **M1** is cleared, and the system reports an unexpected CP type alarm for Main slot **M2**.

5 Replace the LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M2** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The system reports an unexpected CP type status condition and an OC192 LOS / OC192 LOF alarm for Main slot **M2**.

This completes the first phase of the upgrade at the starting node. The starting node upgrade will be completed after all the other nodes in the ring are upgraded.

6 Log out of the node and log in to the adjacent node connected to Main slot **M2** (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Important! The Ring Upgrade mode allows cross-connections/ data to be mapped to the new circuit pack and prohibits provisioning new cross-connections.

7 At the System View, select **Configuration** > **Ring Upgrade Mode**.

Result: A dialog box appears asking you to confirm changing the NE Mode to Ring Upgrade mode. Click on **Yes**.

The node remains in the Ring Upgrade mode until manually provisioned back to the Normal mode. To prevent errors in the upgraded ring, keep all nodes in Ring Upgrade mode until all nodes have been upgraded.

8 Replace the LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M1** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The system reports an unexpected CP type alarm for Main slot **M1**. Transmission hits (less than 60 ms) may occur if active traffic exists on the circuit pack in the Main slot **M1.**

Important! The **UPD/INIT** button does not work during this upgrade.

9 At the System View select **Configuration > Update System**.

Result: A dialog box appears asking for Ring Upgrade Choice. Select *main-1* (default) and click on **OK**. A dialog box appears asking you to confirm executing this command. Click on **OK**.

The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. The system performs an automatic path protection switch, and all traffic is now active on Main slot **M1**.
The unexpected CP type alarm for Main slot **M1** is cleared, and the system reports an unexpected CP type alarm for Main slot **M2**.
Transmission hits (less than 60 ms) occur as active traffic switches from the circuit pack in the Main slot **M2** to the circuit pack in Main slot **M1**.

10 Replace the LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M2** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The unexpected CP type alarm condition for Main slot **M2** is cleared, and the system reports an OC192 LOS / OC192 LOF alarm for Main slot **M2**.

11 Except for the starting node, have all nodes in the UPSR been upgraded.

If...	Then...
No	Repeat Step 6 through Step 10 at the next node (refer to the upgrade example at the end of the procedure).
Yes	Continue with Step 12.

12 Log out of the node and log in to the starting node (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

13 Replace the temporary LNW27 OC-48 OLIU circuit pack in Main slot **M1** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. Transmission is now supported.
The system reports an unexpected CP type status condition for Main slot **M1**.

Important! The **UPD/INIT** button does not work during this upgrade.

14 At the System View, select **Configuration** > **Update System**.

Result: A dialog box appears asking for Ring Upgrade Choice. Select *main-1* (default) and click on **OK**. A dialog box appears asking you to confirm executing this command. Click on **OK**.

The unexpected CP type status condition for Main slot **M1** is cleared.

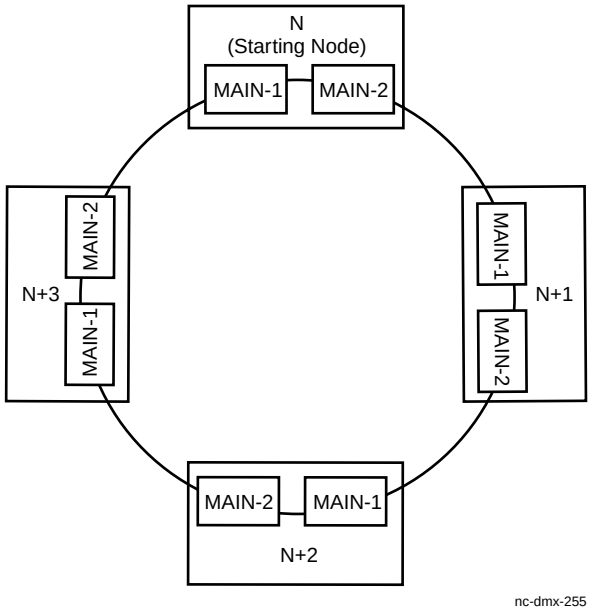
15 At the System View, select **Configuration** > **Normal Mode**. Repeat this step at each node in the ring.

Result: A dialog box appears asking you to confirm changing the NE Mode to Normal mode. Click on **Yes**.

The **ABN** LED is turned off on the SYSCTL circuit pack faceplate and the Ring Upgrade mode will be removed from the WaveStar® CIT alarm list.

END OF STEPS

UPSR Example



SE 345-2: Upgrade In-Service OC-48 UPSR (LNW27 OC-48 OLIUs at One or More Nodes) to OC-192 UPSR

Procedure Complete the following steps to upgrade an in-service OC-48 UPSR (equipped with LNW27 OC-48 OLIU circuit packs at one or more nodes) to an OC-192 UPSR.

Important! The starting node must be equipped with LNW27 OC-48 OLIU circuit packs in Main slots **M1** and **M2**.

1 Log in to the starting node (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Important! The Ring Upgrade mode allows cross-connections/ data to be mapped to the new circuit pack and prohibits provisioning new cross-connections.

2 At the WaveStar® CIT System View, select **Configuration > Ring Upgrade Mode**.

Result: A dialog box appears asking you to confirm changing the NE Mode to Ring Upgrade mode. Click on **Yes**.

The **ABN** LED is lit on the SYSCTL circuit pack faceplate and the WaveStar® CIT alarm list shows the Ring Upgrade mode as Not Alarmed.

The node remains in the Ring Upgrade mode until manually provisioned back to the Normal mode. To prevent errors in the upgraded ring, keep all nodes in Ring Upgrade mode until all nodes have been upgraded.

3 Replace the LNW27 OC-48 OLIU circuit pack in Main slot **M2** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The system reports an unexpected CP type status condition and an OC192 LOS / OC192 LOF alarm for Main slot **M2**.

This completes the first phase of the upgrade at the starting node. The starting node upgrade will be completed after all the other nodes in the ring are upgraded.

4 Log out of the node and log in to the adjacent node connected to Main slot **M2** (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Important! The Ring Upgrade mode allows cross-connections/ data to be mapped to the new circuit pack and prohibits provisioning new cross-connections.

5 At the System View, select **Configuration > Ring Upgrade Mode**.

Result: A dialog box appears asking you to confirm changing the NE Mode to Ring Upgrade mode. Click on **Yes**.

The node remains in the Ring Upgrade mode until manually provisioned back to the Normal mode. To prevent errors in the upgraded ring, keep all nodes in Ring Upgrade mode until all nodes have been upgraded.

6 Replace the OC-48 OLIU circuit pack in Main slot **M1** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. Transmission is now supported.
The system reports an unexpected CP type status condition for Main slot **M1**. Transmission hits (less than 60 ms) may occur if active traffic exists on the circuit pack in the Main slot **M1.**

Important! The **UPD/INIT** button does not work during this upgrade.

7 At the System View select **Configuration > Update System**.

Result: A dialog box appears asking for Ring Upgrade Choice. Select *main-1* (default) and click on **OK**. A dialog box appears asking you to confirm executing this command. Click on **OK**.

The unexpected CP type status condition for Main slot **M1** is cleared, and the system reports an unexpected CP type status condition for Main slot **M2**.
Transmission hits (less than 60 ms) occur as active traffic switches from the circuit pack in the Main slot **M2** to the circuit pack in Main slot **M1**.

8 Replace the OC-48 OLIU circuit pack in Main slot **M2** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The unexpected CP type alarm condition for Main slot **M2** is cleared, and the system reports an OC192 LOS / OC192 LOF alarm for Main slot **M2**.

9 Except for the starting node, have all nodes in the UPSR been upgraded.

If...	Then...
No	Repeat Step 4 through Step 8 at the next node (refer to the upgrade example at the end of the procedure).
Yes	Continue with Step 10.

10 Log out of the node and log in to the starting node (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

11 Replace the LNW27 OC-48 OLIU circuit pack in Main slot **M1** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. Transmission is now supported.
The system reports an unexpected CP type status condition for Main slot **M1**.

Important! The **UPD/INIT** button does not work during this upgrade.

12 At the System View, select **Configuration** > **Update System**.

Result: A dialog box appears asking for Ring Upgrade Choice. Select *main-1* (default) and click on **OK**. A dialog box appears asking you to confirm executing this command. Click on **OK**.

The unexpected CP type status condition for Main slot **M1** is cleared.

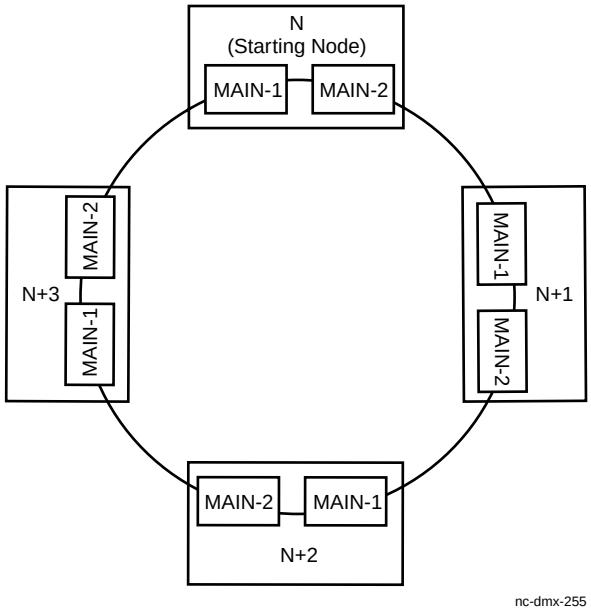
13 At the System View, select **Configuration** > **Normal Mode**. Repeat this step at each node in the ring.

Result: A dialog box appears asking you to confirm changing the NE Mode to Normal mode. Click on **Yes**.

The **ABN** LED is turned off on the SYSCTL circuit pack faceplate and the Ring Upgrade mode will be removed from the WaveStar® CIT alarm list.

END OF STEPS

UPSR Example



Task 346: Upgrade In-Service OC-48 BLSR to OC-192 BLSR

Purpose

Use this procedure to upgrade in-service an OC-48 BLSR with:

- LNW26/LNW26B OC-48 OLIU circuit packs at all nodes to an OC-192 BLSR
- LNW27 OC-48 OLIU circuit packs at one or more nodes to an OC-192 BLSR.

The LNW26/LNW26B OC-48 OLIU circuit packs in the Main slots **M1** and **M2** are upgraded at each node. Low speed OC-48 BLSR upgrades are not supported in this release.

This procedure assumes that in the BLSR, the circuit pack in the Main slot **M1** is always connected to the circuit pack in the Main slot **M2** of the adjacent node.

Important! The LNW27 OC-48 OLIU and LNW56 OC-192 OLIU circuit packs have large VT cross-connection fabrics. The LNW26/LNW26B OC-48 OLIU circuit pack has a small VT cross-connection fabric.

Required equipment

The following equipment is required to perform this task:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- 1 LNW27 OC-48 OLIU circuit pack (temporarily required if the first node to be upgraded is equipped with LNW26/LNW26B OC-48 OLIU circuit pack)
- 2 replacement LNW56 OC-192 OLIU circuit packs for each node in the BLSR

Important! Release 3.0 or later software is required to support the OC-192 OLIU circuit packs.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

CAUTION

Do not rock circuit packs back and forth when removing and installing them. Carefully slide circuit packs in to or out of the shelf slot.

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Obtain the work instructions for this task.
- Review the applicable office records and verify that each fiber span in the BLSR is capable of supporting higher rate (OC-192) traffic. Verify that the fiber span does not exceed 40 kilometers.
- Review the applicable *Metropolis® DMX Access Multiplexer Software Release Description* for any detailed procedures or cautions that may apply to this upgrade procedure.
- Verify that the WaveStar® CIT is available.
- Verify that no alarms are present in the BLSR. If an alarm is present at a node, refer to the appropriate task in the *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302* to clear the alarm before beginning this task.

Task

Complete the following steps to upgrade in-service an OC-48 BLSR to an OC-192 BLSR.

1 From office records and work instructions, determine the current network configuration.

2 Refer to one of the following procedures to upgrade in-service an OC-48 BLSR to an OC-192 BLSR.

- "SE 346-1: Upgrade In-Service OC-48 BLSR (LNW26/LNW26B OC-48 OLIUs at All Nodes) to OC-192 BLSR" (10-491)
- "SE 346-2: Upgrade In-Service OC-48 BLSR (LNW27 OC-48 OLIUs at One or More Nodes) to OC-192 BLSR" (10-499)

END OF STEPS

SE 346-1: Upgrade In-Service OC-48 BLSR (LNW26/LNW26B OC-48 OLIUs at All Nodes) to OC-192 BLSR

Procedure Complete the following steps to upgrade in-service an OC-48 BLSR (equipped with LNW26/LNW26B OC-48 OLIU circuit packs at all nodes) to an OC-192 BLSR.

1 Log in to the starting node (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Select **View** > **Protection**. Click on *2F BLSR main-1* and **Select**. Click on the Provisionable Parameters tab and observe the Automatic Ring Discovery parameter.

3 Is the Automatic Ring Discovery parameter *Enabled* or *Disabled*?

If Automatic Ring Discovery is...	Then...
Disabled,	click on **Close** and continue with Step 4.
Enabled,	click on **Close** and perform the following: 1. Select **Configuration** > **Provision...** 2. Select the **Ptn Grp** tab and the *2F BLSR main-1* protection group. Then click on **Provision**. 3. Provision the Automatic Ring Discovery parameter to *Disabled* and click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**.

Important! The Ring Upgrade mode allows cross-connections/ data to be mapped to the new circuit pack and prohibits provisioning new cross-connections.

4 At the WaveStar® CIT System View, select **Configuration** > **Ring Upgrade Mode**.

Result: A dialog box appears asking you to confirm changing the NE Mode to Ring Upgrade mode. Click on **Yes**.

The **ABN** LED is lit on the SYSCTL circuit pack faceplate and the WaveStar® CIT alarm list shows that the shelf is in the Ring Upgrade mode.

The node remains in the Ring Upgrade mode until manually provisioned back to the Normal mode. To prevent errors in the upgraded ring, keep all nodes in Ring Upgrade mode until all nodes have been upgraded.

Important! At the starting node, the LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M1** must be first replaced (temporarily) with the LNW27 OC-48 OLIU circuit pack. The LNW27 OC-48 OLIU circuit pack maintains traffic with the last node to be upgraded while slot **M2** and the other nodes in the ring are upgraded. As a final step, this LNW27 OC-48 OLIU circuit pack is upgraded.

5 Replace the LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M1** with the temporary LNW27 OC-48 OLIU circuit pack.

Result: The system reports an illegal CP type alarm for Main slot **M1**.

Important! The **UPD/INIT** button does not work during this upgrade.

6 At the System View select **Configuration > Update System**.

Result: The temporary LNW27 OC-48 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. The system performs an automatic protection switch, and all traffic is now active on Main slot **M1**.
The illegal CP type alarm for Main slot **M1** is cleared, and the system reports an illegal CP type alarm for Main slot **M2**.

7 Replace the LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M2** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The system reports an illegal CP type status condition and an OC192 LOS/LOF alarm for Main slot **M2**. The system also reports an automatic line switch for Main slot **M2**.

This completes the first phase of the upgrade at the starting node. The starting node upgrade will be completed after all the other nodes in the ring are upgraded.

8 Log out of the node and log in to the adjacent node connected to Main slot **M2** (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Important! The Ring Upgrade mode allows cross-connections/ data to be mapped to the new circuit pack and prohibits provisioning new cross-connections.

9 At the System View, select **Configuration > Ring Upgrade Mode**.

Result: A dialog box appears asking you to confirm changing the NE Mode to Ring Upgrade mode. Click on **Yes**.

The **ABN** LED is lit on the SYSCTL circuit pack faceplate and the WaveStar® CIT alarm list shows that the shelf is in the Ring Upgrade mode.

The node remains in the Ring Upgrade mode until manually provisioned back to the Normal mode. To prevent errors in the upgraded ring, keep all nodes in Ring Upgrade mode until all nodes have been upgraded.

10 Replace the LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M1** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. Transmission is now supported.
The system reports an unexpected CP type alarm/status condition for Main slot **M1**. The system also reports an automatic line switch for Main slot **M1**.

Important! The **UPD/INIT** button does not work during this upgrade.

11 At the System View select **Configuration > Update System**.

Result: The unexpected CP type status condition for Main slot **M1** is cleared, and the system reports an unexpected CP type alarm/status condition for Main slot **M2**. The system also reports an automatic line switch for Main slot **M2**.

12 Replace the LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M2** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The unexpected CP type alarm/status condition for Main slot **M2** is cleared, and the system reports an inc. OC192 LOS/LOF alarm for Main slot **M2**. The system also reports an automatic line switch for Main slot **M2**.

13 Except for the starting node, have all nodes in the BLSR been upgraded.

If...	Then...
No	Repeat Step 8 through Step 12 at the next node (refer to the upgrade example at the end of the procedure).
Yes	Continue with Step 14.

14 Log out of the node and log in to the starting node (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

15 Replace the temporary LNW27 OC-48 OLIU circuit pack in Main slot **M1** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. The system reports an unexpected CP type status condition for Main slot **M1**.

Important! The **UPD/INIT** button does not work during this upgrade.

16 At the System View, select **Configuration** > **Update System**.

Result: The unexpected CP type status condition for Main slot **M1** is cleared.

17 At the System View, select **Configuration > Normal Mode**. Repeat this step at each node in the ring.

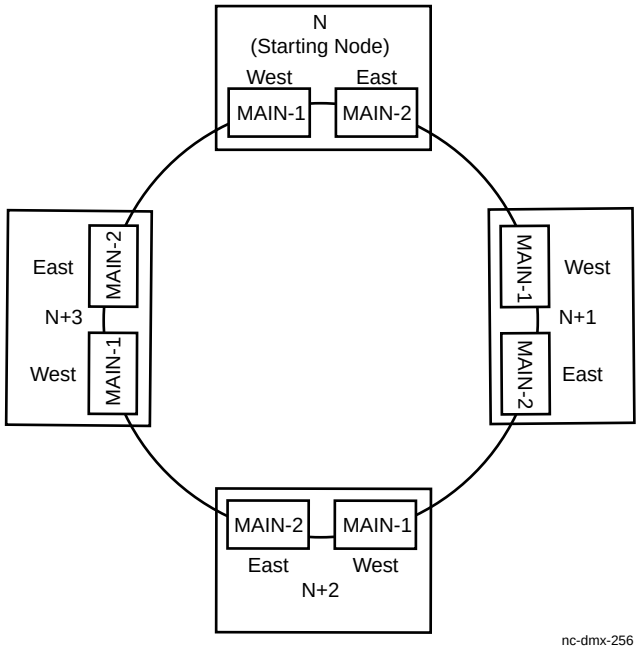
Result: A dialog box appears asking you to confirm changing the NE Mode to Normal mode. Click on **Yes**.

18

If Automatic Ring Discovery was...	Then...
Disabled in Step 3,	Perform the following to enable Automatic Ring Discovery. 1. Select **Configuration > Provision...**. 2. Select the **Ptn Grp** tab and the *2F BLSR main-1* protection group. Then click on **Provision**. 3. Provision the Automatic Ring Discovery parameter to *Enabled* and click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**.
not Disabled,	STOP! End of Task.

END OF STEPS

BLSR Examples



SE 346-2: Upgrade In-Service OC-48 BLSR (LNW27 OC-48 OLIUs at One or More Nodes) to OC-192 BLSR

Procedure Complete the following steps to upgrade in-service an OC-48 BLSR (equipped with LNW27 OC-48 OLIU circuit packs at one or more nodes) to an OC-192 BLSR.

Important! The starting node must be equipped with LNW27 OC-48 OLIU circuit packs in the Main slots **M1** and **M2**.

1 Log in to the starting node (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Select **View** > **Protection**. Click on *2F BLSR main-1* and **Select**. Click on the Provisionable Parameters tab and observe the Automatic Ring Discovery parameter.

3 Is the Automatic Ring Discovery parameter *Enabled* or *Disabled*?

If Automatic Ring Discovery is...	Then...
Disabled,	click on **Close** and continue with Step 4.
Enabled,	click on **Close** and perform the following: 1. Select **Configuration** > **Provision...** 2. Select the **Ptn Grp** tab and the *2F BLSR main-1* protection group. Then click on **Provision**. 3. Provision the Automatic Ring Discovery parameter to *Disabled* and click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**.

Important! The Ring Upgrade mode allows cross-connections/ data to be mapped to the new circuit pack and prohibits provisioning new cross-connections.

4 At the WaveStar® CIT System View, select **Configuration** > **Ring Upgrade Mode**.

Result: A dialog box appears asking you to confirm changing the NE Mode to Ring Upgrade mode. Click on **Yes**.

The **ABN** LED is lit on the SYSCTL circuit pack faceplate and the WaveStar® CIT alarm list shows that the shelf is in the Ring Upgrade mode.

The node remains in the Ring Upgrade mode until manually provisioned back to the Normal mode. To prevent errors in the upgraded ring, keep all nodes in Ring Upgrade mode until all nodes have been upgraded.

5 Replace the LNW27 OC-48 OLIU circuit pack in Main slot **M2** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The system reports an unexpected CP type status condition and an inc. OC192 LOS/LOF alarm for Main slot **M2**. The system also reports an automatic line switch for Main slot **M2**.

This completes the first phase of the upgrade at the starting node. The starting node upgrade will be completed after all the other nodes in the ring are upgraded.

6 Log out of the node and log in to the adjacent node connected to Main slot **M2** (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Important! The Ring Upgrade mode allows cross-connections/ data to be mapped to the new circuit pack and prohibits provisioning new cross-connections.

7 At the System View, select **Configuration > Ring Upgrade Mode**.

Result: A dialog box appears asking you to confirm changing the NE Mode to Ring Upgrade mode. Click on **Yes**.

The **ABN** LED is lit on the SYSCTL circuit pack faceplate and the WaveStar® CIT alarm list shows that the shelf is in the Ring Upgrade mode.

The node remains in the Ring Upgrade mode until manually provisioned back to the Normal mode. To prevent errors in the upgraded ring, keep all nodes in Ring Upgrade mode until all nodes have been upgraded.

8 Replace the OC-48 OLIU circuit pack in Main slot **M1** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. Transmission is now supported.
The system reports an unexpected CP type alarm/status condition for Main slot **M1**. The system also reports an automatic line switch for Main slot **M1**.

Important! The **UPD/INIT** button does not work during this upgrade.

9 At the System View select **Configuration > Update System**.

Result: The unexpected CP type status condition for Main slot **M1** is cleared, and the system reports an unexpected CP type alarm/status condition for Main slot **M2**. The system also reports an automatic line switch for Main slot **M2**.

10 Replace the OC-48 OLIU circuit pack in Main slot **M2** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The unexpected CP type alarm/status condition for Main slot **M2** is cleared, and the system reports an inc. OC192 LOS/LOF alarm for Main slot **M2**. The system also reports an automatic line switch for Main slot **M2**.

11 Except for the starting node, have all nodes in the BLSR been upgraded.

If...	Then...
No	Repeat Step 6 through Step 10 at the next node (refer to the upgrade example at the end of the procedure).
Yes	Continue with Step 12.

12 Log out of the node and log in to the starting node (refer to the upgrade example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

13 Replace the LNW27 OC-48 OLIU circuit pack in Main slot **M1** with the replacement LNW56 OC-192 OLIU circuit pack.

Result: The replacement LNW56 OC-192 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. Transmission is now supported.
The system reports an unexpected CP type status condition for Main slot **M1**.

Important! The **UPD/INIT** button does not work during this upgrade.

14 At the System View, select **Configuration > Update System**.

Result: The unexpected CP type status condition for Main slot **M1** is cleared.

15 At the System View, select **Configuration > Normal Mode**. Repeat this step at each node in the ring.

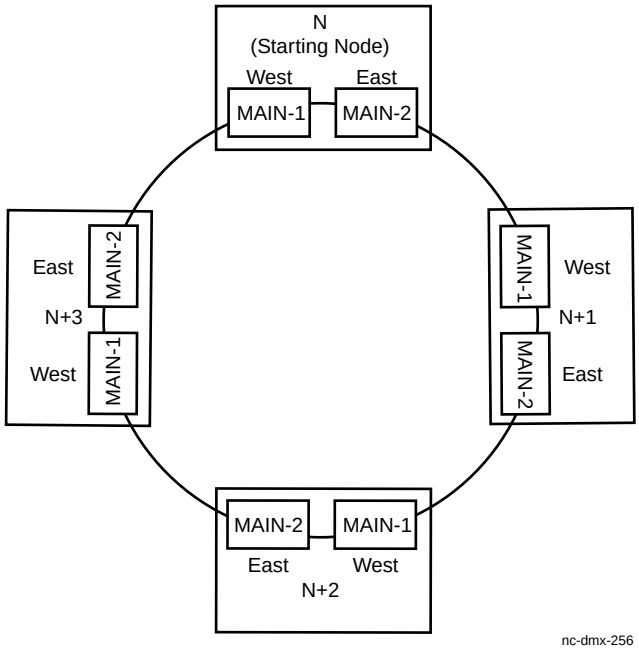
Result: A dialog box appears asking you to confirm changing the NE Mode to Normal mode. Click on **Yes**.

16

If Automatic Ring Discovery was...	Then...
Disabled in Step 3,	Perform the following to enable Automatic Ring Discovery. 1. Select **Configuration > Provision..**. 2. Select the **Ptn Grp** tab and the *2F BLSR main-1* protection group. Then click on **Provision**. 3. Provision the Automatic Ring Discovery parameter to *Enabled* and click on **Apply**. A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**.
not Disabled,	STOP! End of Task.

END OF STEPS

BLSR Example



Task 347: Install TMUX (LNW18) Circuit Pack

Purpose

Use this task to install LNW18 TMUX circuit pack(s).

Required equipment

The following equipment is required:

- Personal computer (PC) with WaveStar® CIT software installed
- Wrist strap

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Prior to beginning this task:

1. Ensure that TMUX circuit pack(s) is available for installation.
2. If not previously completed, install generic and WaveStar® CIT software on the PC.

   Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

3. Connect PC and establish a WaveStar® CIT session.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Task Complete the following steps to install TMUX circuit pack(s).

1 Determine the Function Unit slots (A, B, C, or D) being equipped with TMUX circuit packs.

2 Seat the TMUX circuit pack in Function Unit slot A1, B1, C1, or D1 by applying steady pressure to both faceplate latches.

Result: The following sequence occurs:

- The FAULT LED on the TMUX circuit pack lights for approximately 60 seconds,
- then the ACTIVE LED flashes for approximately 20 seconds.
- The FAULT LED goes off and the ACTIVE LED goes off indicating successful installation.
- The new pack appears in the GUI **System View**.

3 Is a second (protection) TMUX circuit pack required in Function Unit slot A2, B2, C2, or D2?

If...	Then...
Yes	Continue with Step 4.
No	Insert 177D Application Blank into the unequipped Function Unit slot A2, B2, C2, or D2. Proceed to Step 5.

4 Seat the second (protection) TMUX circuit pack in Function Unit slot A2, B2, C2, or D2 by applying steady pressure to both faceplate latches.

Result: The following sequence occurs:

- The FAULT LED on the TMUX circuit pack lights for approximately 60 seconds,
- then the ACTIVE LED flashes for approximately 20 seconds.
- The FAULT LED goes off and the ACTIVE LED goes off indicating successful installation.
- The new pack appears in the GUI **System View**.

5 From the **System View** window, click on **Alarm List** button to verify that no alarms, locks, loops, or switches are present for the ports on the circuit packs just installed.

Result: The **NE Alarm List** window opens. No alarms should be present for the TMUX circuit pack(s) just installed.

6 Do you wish to provision circuit pack and/or port parameters at this time?

If...	Then...
Yes	Refer to "Task 348: Provision TMUX Ports for New Service" (10-509).
No	STOP! END OF TASK.

END OF STEPS

Task 348: Provision TMUX Ports for New Service

Purpose

Use this task to provision ports on TMUX (LNW18) circuit pack(s).

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Prior to performing this task:

- Ensure TMUX circuit pack(s) are installed.
- Connect PC and establish a WaveStar® CIT session.
- Obtain work instructions for this task.

  From the work instructions,

  – for DS3 ports, determine the length of the DS3 cabling between the Metropolis® DMX and the DSX-3 cross-connect point.

  – for VT1.5 ports, determine the length of the DS1 cabling between the Metropolis® DMX and the DSX-1 cross-connect point.

Task Complete the following steps to provision TMUX circuit pack ports.

1 From the **System View** window, click on **Alarm List** button to verify that no alarms, locks, loops, or switches are present for the ports on the circuit packs to be provisioned.

Result: The **NE Alarm List** window opens.

2 From the **System View** menu, select **Configuration** > **Provision**.

Result: The **Provision Parameters for Equipment** window opens.

3 Find the TMUX circuit pack with the ports being provisioned, then expand the equipment list by clicking on the plus (+) signs.

4 Click (highlight) the port being provisioned, then click on **Provision** at the bottom of the window.

Result: The port parameters display on the right side of the window.

5 Select and provision the required port parameters, according to your work instructions.

6 Click **Apply** at the bottom of the window to make your changes.

Result: A confirmation window appears: **Execution of provision may affect the NE service. Do you want to execute this command?**

7 Verify that you are provisioning the correct port, then click **Yes** to apply your changes.

8 Repeat this procedure for other ports to be provisioned.

END OF STEPS

Task 349: Setting Optional System Parameters

Purpose

Use this task as reference for provisioning optional system parameters.

Depending on local procedures, types of configurations, and shelf equipage, some or none of the optional parameters may need to be set. It is assumed that local system administration is responsible for determining these parameter settings.

Some of the parameter values may be set during the initial shelf turn-up. Other parameter values may be set after the system is integrated into the network configuration.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, you must:

- Obtain the work instructions for the parameters being set.
- Be familiar with using the WaveStar® CIT.

Task

Use the procedures referenced in this task for setting optional system parameters.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Reference the following procedures to provision the required parameters from your work instructions.

Important! Some of the parameters may have already been provisioned from earlier procedures.

Reference:

"SE 349-1: Provision System Administration Parameters" (10-515)

"SE 349-2: View and/or Provision Performance Monitoring Parameters" (10-523)

"SE 349-3: Provision System Configuration Parameters" (10-527)

END OF STEPS

SE 349-1: Provision System Administration Parameters

Purpose

Use this task as reference for provisioning optional system administration parameters from the System View **Administration** menu.

Administration parameters allow you to:

- Change your own password (Change Password).
- Provision Security
- Provision Data Communications
- Set TL1 Message Map.
- Change NE Login Banner.
- Set Date and Time.
- Set TID (system name).
- Set NE defaults (FTP, AGNE, remote NE status).
- Network Time Protocol, provision.

Depending on local procedures, types of configurations, and shelf equipage, some or none of the optional parameters may need to be set. It is assumed that local system administration is responsible for determining these parameter settings.

Some of the parameter values may be set during the initial shelf turn-up. Other parameter values may be set after the system is integrated into the network configuration.

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Use the sections in this task as reference for setting optional system administration parameters.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Reference the sections in this procedure to provision the required Administration parameters from your work instructions.

Important! Some of the parameters may have already been provisioned from earlier procedures.

END OF STEPS

Change Password

This command allows any user to change his/her own password.

Administration > Change Password

"Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login" (9-15)

Security Parameters

Security parameters allow privileged users to perform the following:

- Perform SNMP User Provisioning.

  Administration > Security > SNMP User Provisioning

  "Task 355: Provision System SNMP Management Features and Users" (10-581)

  Related SNMP provisioning may require LAN port provisioning, IP tunneling, TCP/IP access.

- Lockout/Enable Logins

  Administration > Security > Lockout Logins
  Administration > Security > Enable Logins

  "Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login" (9-15)

  Enables or locks out all communication channels to the NE.

- User Provisioning

  Administration > Security > User Provisioning

  "Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login" (9-15)

  Allows you to create or modify another user's security data such as logins, passwords, user type, etc.

- Allow/Inhibit Autonomous messages

  Administration > Security > Allow/Inhibit Autonomous messages

  "Task 359: Enable/Disable Autonomous Messages" (10-609)

  Allows/Inhibits reporting of autonomous alarm and status messages on a user basis per login session. Select Enabled or Disabled as required.

Data Communications

Provisioning Data Communications parameters may consist of one or more of the following:

- IP Tunneling

  Administration > Data Communications > IP Tunnel

  "Task 323: Add IP Tunnel(s) Through Network" (10-179)

  Use this task to provision IP Tunneling functionality to utilize DCC Channels for IP communications

- TCP/IP Gateway control and host list

  Administration > Data Communications > TCP/IP Gateway

  "Task 325: Provision/Enable/Disable the Metropolis® DMX Access Multiplexer as a TL1 TCP/IP GNE" (10-209)

  Use this task to enable or disable the Metropolis® DMX as a TL1 TCP/IP GNE and provision authorized IP calling OS host addresses.

  Note that TCP/IP functionality must also be enabled and the required TCP/IP parameters provisioned for at least one of the NE's IAO LAN ports. See "TCP/IP — Enabling/Disabling TCP/IP function and assigning TCP/IP addresses." (10-519) below for reference.

- X.25 packet size and gateway host list

  Administration > Data Communications > X.25 Gateway

  "Task 361: Set X.25 Gateway Parameters" (10-613)

  This procedure allows you to provision the X.25 link packet size, OS host types, and virtual circuit types to the X.25 gateway.

- CIT serial port parameters

  Administration > Data Communications > Serial Port

  "Task 357: Set Serial Port CIT-1 and/or CIT-2 Parameters" (10-591)

  Use this task to provision the selected CIT-1 and/or CIT-2 serial port parameters.

- SNMP Management

  Administration > Data Communications > SNMP Management

  "Task 355: Provision System SNMP Management Features and Users" (10-581)

  Use this task to provision system SNMP management features and/or add, modify, or delete SNMP users.

  Related SNMP provisioning may require LAN port provisioning, IP tunneling, and TCP/IP access. Also, see "Perform SNMP User Provisioning." (10-516).

- Enabling/Disabling OSI LAN port status

  Administration > Data Communications > LAN Management

  "Task 360: Enable/Disable LAN Port Status" (10-611)

  This procedure allows you to enable or disable the OSI-LAN port status for LAN ports lan-1 and/or lan-2.

- Modification of Network Service Access Point (NSAP) addresses and Intermediate System Level 1 or Level 2 routing functions.

  Administration > Data Communications > Network Layer

  "Task 356: Modify Network Layer NSAP Address and/or Level 1 or Level 2 Routing Capability" (10-587)

  This procedure allows you modify the NSAP address for this NE and provision it as a Level 1 or Level 1&2 router.

  Values should not be changed from default values except by users who intend to provision the SONET subnetwork and partition DCC communications.

  Reference: Appendix C, IS-IS Level 2 Routing Guidelines

- TARP — Provisioning TARP functions
  - **TARP** — Provisioning TARP Propagation and Origination parameters

    Administration > Data Communications > TARP
  - **TARP Data Cache** — Provisioning TARP Data Cache entries

    Administration > Data Communications > TARP Data Cache
  - Provisioning TARP Manual Adjacencies

    Administration > Data Communications > TARP Manual Adj.

  “Task 351: Set TARP Parameters” (10-559)

  This procedure allows you to provision user settable fields and functions relating to TARP Propagation and Origination parameters, TARP Data Cache entries, and TARP Manual Adjacencies.

- **TCP/IP** — Enabling/Disabling TCP/IP function and assigning TCP/IP addresses.

  Administration > Data Communications > TCP/IP

  “Task 324: Provision/Enable/Disable TCP/IP on an IAO LAN Port” (10-205)

  Use this task to provision, enable, or disable TCP/IP on an IAO LAN Port.

Set TL1 Message Map

This command allows you to map TL1 autonomous message types to an OS type application context ID (ACID). TL1 autonomous messages are not reported unless they are assigned to an OS type. This command allows a user to assign specific TL1 autonomous message types, or none at all.

Administration > Set TL1 Message Map

“Task 352: Map TL1 Message Types to OS Applications” (10-563)

Change NE Login Banner

This command allows you to provision your own company proprietary notice at login. This command allows a privileged user to add a user defined proprietary notice at login to enhance system security.

Administration > Change NE Login Banner

“Task 353: Create or Edit Login Banner” (10-567)

Set Date and Time

This command allows you to manually set the Date and Time for this NE.

Administration > Set Date and Time

"Task 354: Set Date and Time" (10-571)

Note that this command is used to manually set the Date and Time for the NE. If you are using Network Time Protocol, reference the following:

Administration > Set Network Time Protocol

"Task 354: Set Date and Time" (10-571)

Set TID

This command allows you to set the Target Identifier (TID)/NE Name for this NE. The more common time to change a TID will be prior to placing the system in-service. However, this procedure can also be used to change the TID of an in-service system.

Administration > Set TID

"Task 342: Set/Change System TID" (10-459)

The TID is an ASCII character string from 1 to 20 characters and must be unique for each NE in the ring.

If the TID is changed for a node participating in a BLSR with manual ring provisioning, then you must update the FE NE Name List at each far end node in the ring using **Configuration > Change Far End NE Names**.

Set NE

This command allows you to provision the NE defaults for the following:

- Enable/Disable remote NE status.
- Enable/Disable File Transfer Protocol (FTP).
- Enable/Disable FTAM-FTP Gateway Control.
- Enable/Disable the NE as an Alarm Gateway Network Element (AGNE) and assign alarm group numbers.

Administration > Set NE

"Task 358: Set NE Defaults — Enabling/Disabling Alarm Gateway, Alarm Group, Remote NE Status, and FTP" (10-595)

Set Network Time Protocol

This command allows you to provision the Network Time Protocol (NTP) Server properties for this NE.

Administration > Set Network Time Protocol

"Task 354: Set Date and Time" (10-571)

Note that this command is used to provision the Network Time Protocol server for this NE. If you are not using NTP, manually set the Date and Time for this NE using the following:

Administration > Set Date and Time

"Task 354: Set Date and Time" (10-571)

If you are using NTP, it is assumed that either IP tunneling has already been established or each node has its own IP address.

SE 349-2: View and/or Provision Performance Monitoring Parameters

Purpose

Use this task as reference for viewing or provisioning performance monitoring parameters from the System View **Performance** menu. Also reference "Task 350: Provision Performance Monitoring (PM) Functions" (10-533).

Performance monitoring parameters allow you to:

- View PM Thresholds.
- Provision PM Thresholds.
- Initialize PM Registers.
- View PM Ports.
- Provision PM Ports.
- Schedule PM Reports.

Depending on local procedures, types of configurations, and shelf equipage, some or none of the optional parameters may need to be set. It is assumed that local system administration is responsible for determining these parameter settings.

Some of the parameter values may be set during the initial shelf turn-up. Other parameter values may be set after the system is integrated into the network configuration.

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Use the sections in this task as reference for viewing or provisioning optional performance monitoring parameters.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Reference the sections in this procedure to view and/or provision the required Performance Monitoring parameters from your work instructions.

Important! Some of the parameters may have already been provisioned from earlier procedures.

END OF STEPS

View PM Threshold

Allows you to view PM threshold information for ports and channels (tributaries).

Performance > View PM Thresholds then select ports or tributaries.

"SE 350-1: View or Provision Performance Monitoring (PM) Thresholds for Ports or Tributaries" (10-537)

Provision PM Threshold

Allows you to provision PM threshold information for ports and channels (tributaries).

Performance > Prov PM Thresholds then select ports or tributaries.

"SE 350-1: View or Provision Performance Monitoring (PM) Thresholds for Ports or Tributaries" (10-537)

Initialize PM Registers

Allows you to initialize all current daily and/or 15-minute PM registers.

Performance > Initialize PM Registers then select 15-min, 1-Day, or Both.

"SE 350-1: View or Provision Performance Monitoring (PM) Thresholds for Ports or Tributaries" (10-537)

View PM Ports

Allows you to view PM parameters for ports and tributaries.

Performance > View PM Ports then select the port.

"SE 350-3: View or Provision Performance Monitoring (PM) Parameters for Ethernet Ports or VCG Tributaries" (10-543)

Provision PM Ports

Provision PM parameters for ports and tributaries.

Performance > Prov PM Ports then select the port to provision.

"SE 350-3: View or Provision Performance Monitoring (PM) Parameters for Ethernet Ports or VCG Tributaries" (10-543)

Reports

Allows you to view Performance Monitoring reports for lines, paths, sections, ethernet, and threshold crossing alerts (TCAs).

Performance > Reports then choose the entity.

"SE 350-4: View Performance Monitoring (PM) Reports" (10-547)

Schedule PM Reports

Allows you to schedule PM reports.

Note that this is a TL1 command only at this time: **sched-pmrept**

"SE 350-5: Schedule PM Reports" (10-549)

Related Command to Clear TCA Counts

Use this related PM command to clear TCA counts, entered here for reference.

Fault > Clear TCA Counts

"SE 350-6: Clear TCA Counts on Logged In WaveStar® CIT" (10-557)

□

SE 349-3: Provision System Configuration Parameters

Purpose

Use this task as reference for provisioning optional system configuration parameters from the System View **Configuration** menu.

Depending on your requirements, default settings may be sufficient for many of the parameters. Other parameters in the Configuration menu are necessary for system and network operation but may not be listed here. They are accessed through various tasks associated with system turn-up, network configuration, and establishing service.

Configuration parameters may consist of one or more of the following:

- Provisioning general system (aid=system), circuit pack, port, and tributary parameters.
- Provisioning miscellaneous discretes.
- Provisioning DCC terminations
- Provisioning system timing and synchronization functions.
- Provisioning system alarm configurations
- Provisioning system software backup intervals

Depending on local procedures, types of configurations, and shelf equipage, some or none of the optional parameters may need to be set. It is assumed that local system administration is responsible for determining these parameter settings.

Some of the parameter values may be set during the initial shelf turn-up. Other parameter values may be set after the system is integrated into the network configuration.

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Use the sections in this task as reference for provisioning optional system configuration parameters.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: “Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session” (9-3)

2 Reference the sections in this procedure to provision the required system configuration parameters from your work instructions.

Important! Some of the parameters may have already been provisioned from earlier procedures.

END OF STEPS

Provision System, Circuit Packs, Ports, or Tribs

The following references commands and procedures associated with provisioning system, port, and tributary parameters that may apply for the entire system or circuit pack. Certain individual parameters may be provisioned in other procedures depending on the type of service, system configuration, and/or network configuration.

- General system configuration parameters

  Configuration > **Provision**, select the system (**aid=system**), then click **Provision**.

  "Task 362: Set General System Parameters" (10-617)

  Options include:

  – **Settings** tab: Provisioning IDLE Channel Signal (AIS, Unequipped)

  – **Settings** tab: Enabling/disabling Autonomous Message Reporting

  – **Date and Time** tab: Manually Setting Time and Date

    Note that Network Time Protocol must be disabled to manually set Date and Time.

  – **Date and Time** tab: Enabling/Disabling Network Time Protocol

  – **STSn Settings** tab: Provisioning Signal Degrade and Signal Threshold for entire system.

- Circuit packs, ports, and tributary parameters.

  Configuration > Provision, select the circuit pack, port, or tributary, then click **Provision**. Provision the parameters as required. Reference the following tasks, if required:

  Reference the following tasks to set the characteristics of individual circuit packs, ports, or tributaries.

  – "Task 315: Provision 28DS1/28DS1PM Ports for New DS1 Service" (10-131)

  – "Task 316: Provision 12DS3/EC1 Ports for New DS3 or EC-1 Service" (10-135)

  – "Task 322: Provision Function/Growth OLIU Circuit Packs/ Ports for New Service" (10-175)

  – "Task 336: Provision 10/100T (LNW66) or 1GSX/1GLX (LNW67/LNW68) Circuit Pack/Port for New Ethernet Service" (10-421)

  – "Task 348: Provision TMUX Ports for New Service" (10-509)

Miscellaneous Discretes

This command allows you to provision environmental miscellaneous discrete input and output controls.

Configuration > Misc. Discretes

"Task 310: Configure Miscellaneous Discrete Inputs and Outputs" (10-103)

DCC Terminations

This command allows you to provision DCC Terminations.

Configuration > DCC Terminations

"Task 364: Provision DCC Terminations" (10-625)

Configure/Activate Manual Ring Map

Use for *reference only*. These commands apply to setting up BLSR rings.

Configuration > Configure Manual Ring Map

Configuration > Activate Manual Ring Map

"SE 301-2: Establish High Speed OC-48/OC-192 2-Fiber BLSR" (10-23)

"Task 305: Provision Manual Ring Map" (10-79)

Change Far End NE Names

Use for *reference only*. Changing Far End NE Names apply to procedures related to changing TIDs in a BLSR ring network.

Configuration > Change Far End NE Names

"Task 342: Set/Change System TID" (10-459)

Data

Use for *reference only*. Data parameters apply to establishing ethernet service.

Configuration > Data

"Task 330: Establishing Ethernet Services" (-243)

Cross-Connection

Use for *reference only*. Invokes the Cross Connection Wizard for establishing cross-connections.

Configuration > Cross-Connection

The Cross-Connection wizard is referenced in other procedures relating to establishing specific services. If you have explicit work instructions and are familiar with the Cross Connection Wizard, use the wizard to make your cross-connections.

Timing/Sync

Allows you to provision system timing, and timing input and output ports.

Configuration > Timing/Sync

"Task 204: Network Synchronization Provisioning" (9-25)

Alarms

Allows you to provision system alarm clear delay, alarm generate delay, and the alarm level of power minor alarms.

Configuration > Alarms > Alarm Configuration

"Task 363: Provision System Alarm Configuration" (10-623)

Normal or Ring Upgrade Mode

Allows you to provision the NE for Normal operation or Ring Upgrade Mode.

Configuration > Normal Mode

Configuration > Ring Upgrade Mode

For *normal* operation, this parameter should say **Ring Upgrade Mode** in the menu indicating the system is in Normal Mode. Clicking on Ring Upgrade Mode allows you set the system mode for upgrade procedures referenced in other tasks.

Software

Allows you to provision certain software functions for the NE. Optional parameters not relating to downloading or copying software, or backup and restoring software include the automatic backup intervals.

Configuration > Software > Configure Auto Backup Interval

“Task 211: Backup and Restore” (9-85)

Task 350: Provision Performance Monitoring (PM) Functions

Purpose

This procedure is provided as a reference for all the performance monitoring tasks provided in this manual. Use this procedure to access all the following performance monitoring tasks:

- View/Provision PM thresholds for ports or tributaries
- Initialize PM registers
- View/Provision PM parameters for Ethernet ports and VCG tributaries
- View PM reports
- Clear TCA count on local CIT
- Schedule PM reports.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Task

Choose the task you want to perform from the tasks listed

. . . . . .

1 View/Provision PM thresholds for ports or tributaries.

Reference: "SE 350-1: View or Provision Performance Monitoring (PM) Thresholds for Ports or Tributaries" (10-537)

. . . . . .

2 Initialize PM registers.

Important! Use this task with Caution. This task is used to reset all selected registers to zero for selected ports or tributaries.

Reference: "SE 350-2: Initialize Performance Monitoring (PM) Registers" (10-541)

. . . . . .

3 View/Provision PM parameters for Ethernet ports and VCG tributaries.

Reference: "SE 350-3: View or Provision Performance Monitoring (PM) Parameters for Ethernet Ports or VCG Tributaries" (10-543)

. . . . . .

4 View PM reports.

Reference: "SE 350-4: View Performance Monitoring (PM) Reports" (10-547)

5 Schedule PM reports.

Reference: "SE 350-5: Schedule PM Reports" (10-549)

6 Clear TCA count on logged in CIT.

Reference: "SE 350-6: Clear TCA Counts on Logged In WaveStar® CIT" (10-557)

END OF STEPS

SE 350-1: View or Provision Performance Monitoring (PM) Thresholds for Ports or Tributaries

Purpose

Use this task as reference for viewing or provisioning performance monitoring (PM) Thresholds for port or tributaries.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 3, "Provisioning, Security, & Administration"
- Chapter 4, "Performance Monitoring"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Task

Perform the following steps to view or provision PM thresholds.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2

If...	Then...
you are viewing PM thresholds,	Continue with Step 3.
you are provisioning PM thresholds,	Proceed to Step 5.

3 VIEWING PM THRESHOLDS

From the System View menu, select **Performance** > **View PM Threshold** > then highlight the port or tributary you want to view.

Result: The View ( ) PM Threshold Screen opens for the port or tributary selected.

4 View the parameters, then click **Close** to exit.

5 PROVISIONING PM THRESHOLDS

From the System View menu, select **Performance** > **Prov PM Threshold** > then highlight the port or tributary you want to provision.

Result: The Provision ( ) PM Threshold Screen opens for the port or tributary selected.

6 In the table, double-click inside the table cell for the parameter being provisioned. Enter or edit the parameter values you require. Repeat for each parameter being provisioned.

For help on parameter values, click on the **Help** button at the bottom of the screen.

7 After all parameter values are entered, click **OK** at the bottom of the screen. Read the warning message, then click **Yes** to execute the command. Click **Close** to exit.

END OF STEPS

SE 350-2: Initialize Performance Monitoring (PM) Registers

Purpose

Use this task to initialize 15-min, 1-day, or both PM registers.

CAUTION

Executing the command in this procedure will reset and clear the PM registers selected. Ensure you want to execute this procedure before continuing.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 3, "Provisioning, Security, & Administration"
- Chapter 4, "Performance Monitoring"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Task

Perform the following steps to initialize (clear) PM registers.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Performance > Initialize PM Registers >** and then select the register or registers you want to initialize.

Result: A warning screen opens warning you that executing this command will reset the selected register(s).

3 Read the warning message, then click **Yes** to execute the command or **No** to abort.

END OF STEPS

SE 350-3: View or Provision Performance Monitoring (PM) Parameters for Ethernet Ports or VCG Tributaries

Purpose

Use this task as reference for viewing or provisioning performance monitoring (PM) Thresholds for port or tributaries.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Chapter 6, "Performance Monitoring"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Task Perform the following steps to view or provision PM thresholds.

. . . . . .

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2

If...	Then...
you are viewing PM Ports,	Continue with Step 3.
you are provisioning PM Ports,	Proceed to Step 6.

. . . . . .

3 VIEWING PM PORTS

From the System View menu, select **Performance > View PM Ports**.

Result: The View Parameters for Port Performance Monitoring Screen opens.

. . . . . .

4 Expand the details for the ethernet circuit pack. Then, highlight the port or VCG you want to view, then click **Select**.

. . . . . .

5 View the parameters, then click **Close** to exit.

. . . . . .

6 PROVISIONING PM PORTS

From the System View menu, select **Performance > Prov PM Ports**.

Result: The Provision Parameters for Port Performance Monitoring Screen opens.

. . . . . .

7 Expand the details for the ethernet circuit pack. Then, select the port or VCG you want to provision, then click **Select**.

8 Select Port Mode as **Auto** or **Not Monitored**, as required. Select **Enable** or **Disable** to enable or disable Ethernet Port PM. Click **Apply**, then click **Yes** to the warning message to execute the command. Click **Close** to exit.

END OF STEPS

SE 350-4: View Performance Monitoring (PM) Reports

Purpose

Use this task as reference for viewing performance monitoring (PM) reports.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 3, "Provisioning, Security, & Administration"
- Chapter 4, "Performance Monitoring"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Task Perform the following steps to view PM reports.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Performance** > **Reports** > then select the entity you want to report.

Result: The PM Parameters Selection Screen opens for the entity you chose.

3 Expand the details for the circuit pack and ports. Then, highlight the entity from which you want to report. Then click **Select**.

Result: A parameter selection details screen opens.

Note that if a TCA report was requested the report is displayed automatically.

4 Enter the time and date selection parameters for the report you want, if required. Then, select the parameters to report. Click **Apply**.

Result: The PM report is displayed.

5 At the bottom of the screen, choose an option to **Close**, **Print**, **Save As**, or **Refresh** the data, as required.

Click on the **Help** button for additional information if needed.

END OF STEPS

SE 350-5: Schedule PM Reports

Purpose

This task allows a user to Schedule Performance Monitoring data on a Metropolis® DMX. Performance monitoring can be scheduled to provide quarter hour and daily reports beginning at different time intervals.

In order to schedule PM reports, PM messaging must be enabled and you must use the WaveStar® CIT TL1 cut-through mode or the TL1 Command Builder.

Important! The WaveStar® CIT Graphical User Interface (GUI) does not, at this time, support this command.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Related information

For related information, see the following:

- Chapter 6, "Performance Monitoring"
- If you are unfamiliar with the parameters in this task, refer to **SCHED-PMREPT** in the *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Prior to beginning this task:

1. Ensure that Performance Monitoring is enabled for all circuit pack(s).

   Reference: Chapter 6, "Performance Monitoring"

2. If not previously completed, install generic and WaveStar® CIT software on the PC..

   Reference: "Task 214: Install Generic and WaveStar® CIT Software on the PC" (9-133)

3. Connect PC and establish a WaveStar® CIT session.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Task

Complete the following steps to schedule PM. The NE supports up to a maximum of 100 active scheduled PM reports, counting every aid as many times as it is scheduled (aid values that include ALL are counted multiple times). The NE accepts each **SCHED-PMREPT** as a request for a different scheduled PM report unless two requests are exact duplicates. **SCHED-PMREPT** command does not generate a **REPT DBCHG** message.

1 From the System View menu (GUI), verify that the PM message type has been enabled for the OSI Application Type being used by selecting **Administration > Set TL1 Message Map**.

Reference: "Task 352: Map TL1 Message Types to OS Applications" (10-563)

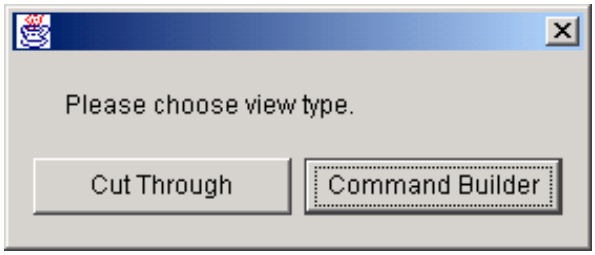
2 From the System View menu (GUI), select **File > NE Disconnect** and click **Yes** in the resulting confirmation window.

3 From the Network View, log back into the NE but this time click on **TL1** not Graphical.

Result: The Login screen appears.

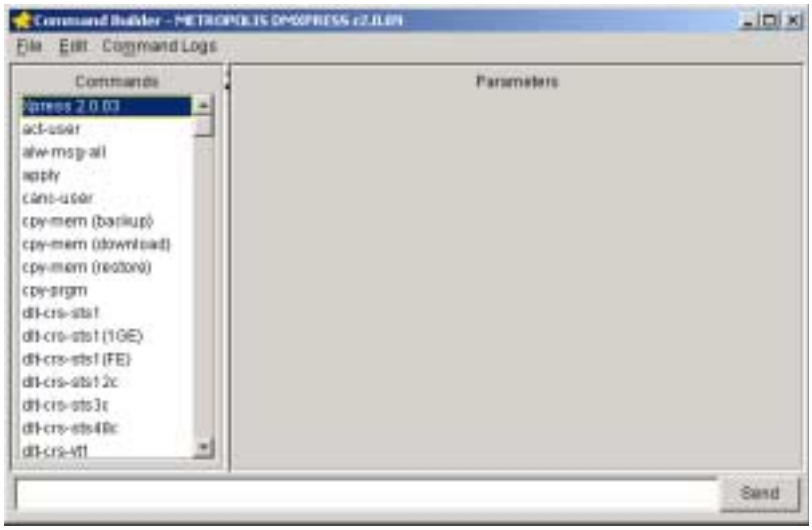
4 Enter your user ID and password. Defaults are **LUC01** and **DMXPRS2.5G**, respectively.

Result: The following screen appears:



5 Click on **Command Builder**.

Result: The following screen appears:



6 Perform an **act-user** command to the NE.

act-user:tid:uid:ctag::pid;

tid is LT-DMXPRESS, uid is LUC01 (default) and pid is DMXPRS2.5G (default).

. . . . . .

7 Perform a **sched-pmrept** command to the NE.
sched-pmrept-modifier:tid: aid: ctag:: [reptinvl], [reptstatm],[numrept], [montype],[monlev],[locn],[dirn],[tmper],[tmofst];

- Where **modifier** is listed in "List of Modifiers" (10-554).
- Where **AID** is any valid parameter specified in *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*, Appendix A.
- Where **reptinvl** is 15-MIN (every 15 minutes), (1-24)-HR (generates report every 1 to 24 hours), or 1-DAY generates 1 report every day.
- Where **reptstatm** is report start time. in HH-MM where HH =0 to 23 and MM =0 to 59
- Where **numrept** is the number of reports from 0 to 96. A Null character may be used to generate one report.

  Important! If **numrept** is NULL (default), the NE activates the PM report schedule indefinitely, that is, until the schedules deleted by a subsequent **sched-pmrept**, or a processor reset results in the deletion of all PM report schedules. If numrept is 0, the NE deletes any previous PM report schedule(s) that match based on all other input parameter values (except **ctag**).
- Where **montype** is equal to the monitored type. Null is all. For a complete list see "SCHED-PMREPT-T3:LT-TID123:b-1:123456::15-MIN,12-05,1,CVL,1-UP,NEND,,15-MIN,0.0&0.45&0.30&0.15;" (10-555).
- Where **monlev** is equal to Monitored Level. This has the format **LEV-DIRN**. The LEV value may be a decimal numeral. DIRN may have one of the following values: DN This requests PM data be reported for monval values equal to or less than the value of LEV. UP This requests PM data be reported for monval values equal to or greater than the value of LEV. The default for monlev is 1-UP.
- Where **locn** is equal to FEND and NEND. Null is both.
- Where **dirn** is equal to Direction. This requests PM data be reported for a specified direction. The value of direction must be NULL or NA (not applicable). If NULL, the default value is NA.

- Where **tmper** is equal to Time Period. This requests PM data for a specified time interval. This parameter must have one of the following values: 15-MIN This requests PM data in 15-minute intervals. 1-DAY This requests daily PM data. If tmper is NULL, the default value is 15-MI.
- Where **tmofst** is theTime Offset.
  This parameter specifies the start time of the time period (tmper) for which PM data is to be reported, by subtracting the tmofst from the time of the most recently completed time period (**tmper**). This has the format DD-HH-MM (day-hours-minutes). If tmper= 1-DAY, allowable values of tmofst are 0.0 and 1.0 only. If tmper = 15-MIN, allowable values of tmofst are 0-{0-7}-{0,15,30,45} and 0.0. In the specific case of tmofst = 0.0, the NE reports the PM data accumulated during the current time period (**tmper**)

END OF STEPS

Modifiers

Table 10-4 List of Modifiers

Modifier	Description
n EC1	n - this is for the electrical STS1 level external interfaces
n OC3	n -this is for optical OC-3 level external interfaces.
n OC12	n -this is for optical OC-12 level external interfaces.
n OC48	n -this is for optical OC-48 level external interfaces.
n OC192	n -this is for optical OC-192 level external interfaces.
n STS1	n -this is for STS1 channel.
n STS3c	n -this is for STS3c channels.
n STS12c	n -this is for STS12c channels.
n STS48c	n -this is for STS48c channels.
n T1	n -this is for the DS1 level external interfaces.
n T3	n -this is for the DS3 level external interfaces.
n VT1	n -this is for dropped VT channel interfaces.

EXAMPLE

Table 10-5 SCHED-PMREPT-T3:LT-TID123:b-1:123456::15-MIN,12-05,1,CVL,1-UP,NEND,,15-MIN,0.0&0.45&0.30&0.15;

Description	Meaning
n CVL	Coding Violation count - Line
n CVP	Coding Violation count - Path
n ESL	Errored Second count - Line
n ESA-L	Errored Second Type A count - Line
n ESB-L	Errored Second Type B count - Line
n PJC	STS pointer justification count - Line
n ESP	Errored Second count - Path
n ESA-P	Errored Second Type A count - Path,
n ESB-P	Errored Second Type B count - Path,
n SESL	Severely Errored Second count - Line
n SESP	Severely Errored Second count - Path
n SESV	Severely Errored Second count - VT1 Path
n UASL	Unavailable Second Count - Line
n UASP	Unavailable Second Count - Path
n UASV	Unavailable Second Count - VT1 Path

SE 350-6: Clear TCA Counts on Logged In WaveStar® CIT

Purpose

Use this task to clear TCA counts on the WaveStar® CIT.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 3, "Provisioning, Security, & Administration"
- Chapter 4, "Performance Monitoring"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Task Perform the following steps to clear TCA counts.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Fault > Clear TCA Counts**.

Result: The TCA counts are cleared.

END OF STEPS

Task 351: Set TARP Parameters

Purpose

This procedure allows you to provision user settable fields and functions relating to the following TARP capabilities for this NE:

- TARP Propagation and Origination parameters
- TARP Data Cache entries
- TARP Manual Adjacencies

Important! Values should not be changed from default values except by users who intend to provision the SONET subnetwork and partition DCC communications. All the Layer 4 parameters that can be provisioned and are needed for NE operation have default values. Therefore, it is not necessary to provision these parameters for the NE to operate in the network.

Required equipment

Personal Computer (PC) with WaveStar® CIT software installed

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- Appendix C, IS-IS Level 2 Routing Guidelines
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Perform the following steps to provision TARP parameters, as required.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Administration > Data Communications**.

Result: The Data Communications for ... window opens.

3 TARP ORIGINATION AND PROPAGATION

Select the TARP tab.

Result: The TARP Propagation and Origination parameters window opens.

4 Set the TARP Propagation timers as required.

5 Click on the **Set Parameters** button for the TARP Origination function.

Important! Note that the TARP Origination function is always enabled and cannot be changed.

Result: The Provision TARP Originator for system window opens.

6 Provision the **TARP Lifetime** and **TARP Timers**, as required. **Enable** or **Disable** TARP Data Cache as required. Click **OK**.

7 Click **Apply**, read the warning message, then click **Yes** to execute the command.

8 TARP DATA CACHE

Click on the **TARP Data Cache** tab.

Result: The TARP Data Cache Entry List window opens.

9 Click on the sunglasses icon to add, modify, or delete entries. Follow the directions in the subsequent windows to edit the TARP Data Cache Entry **NE Name** and **NSAP**.

10 Click **Apply**, read the warning message, then click **Yes** to execute the command.

11 TARP MANUAL ADJACENCIES

Click on the **TARP Manual Adj.** tab.

Result: The TARP Manual Adjancency window opens.

12 Up to two Manual Adjancencies may be provisioned. Select one to provision by clicking on the **Modify** button next to **MAJ1:** or **MAJ2:**.

Result: The NSAP Provisioning window opens.

13 Modify the NSAP as required, then click **OK**.

14 Click **Apply** at bottom of the window, read the warning message, then click **Yes** to execute the command or **No** to abort the command.

15 If you are finished provisioning Data Communications parameters, click **Close** to exit. Otherwise, continue with another tab.

END OF STEPS

Task 352: Map TL1 Message Types to OS Applications

Purpose

Use this task to map TL1 autonomous message types to an OS type application context ID (ACID). TL1 autonomous messages are not reported unless they are assigned to an OS type. This command allows a user to assign specific TL1 autonomous message types, or none at all.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin Verify that you have the work instructions for this task, particularly all relevant ACID/OS requirements.

Task Complete the following steps to map TL1 message types to the OS.

. . . . . .

1 Connect PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 From the **System View** menu, select **Administration > Set TL1 Message Map...** to bring up the **Provision TL1 Message Map for DMX** screen.

. . . . . .

3 From the **TL1 Message Type List**, select one of the following ACIDs from the **OS Application Type** column:

- **TL1MAINTENANCE** — Maintenance
  To be used by the systems that monitor alarms and performance monitoring.
  Defaults: Alarms, Events, and Command Response.
- **TL1MEMORYADMINISTRATION** — Memory Administration
  To be used by systems that provision cross-connections.
  Defaults: Database Changes and Command Response.
- **TL1TEST** — Test
  Defaults: Test and Command Response ONLY.
- **TL1PEERCOM** — Peer Communications
  Defaults: Command Response ONLY.
- **TL1OTHER1** — *Other* OS.
- **TL1OTHER2** — *Another* OS.

4 For the selected OS type, verify the desired status (**ENABLED** or **DISABLED**) for each of the following Message Types:

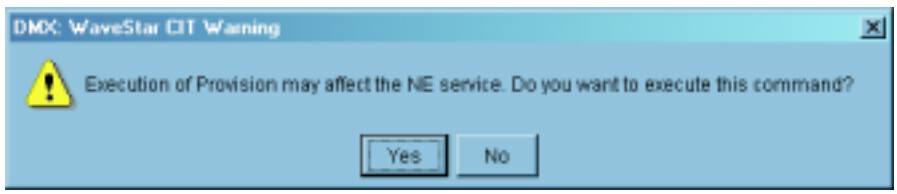
- **Alarm (ALM)** — Reports the occurrence of alarms.
- **Environment (ENV)** — Reports the occurrence of environmental alarms.
- **Conditions (CON)** — Periodically reports the active status conditions.
- **Database Changes (DB)** — Reports the occurrence of provisioning changes.
- **Events (EVT)** — Reports the occurrence of status conditions (events).
- **Performance Monitoring (PM)** — Reports performance monitoring data on a scheduled basis.
- **Protection Switch (SW)** — Reports automatic equipment protection switches.

5 To change an **ENABLED**/**DISABLED** status, double-left-click on the status cell and select the correct status from the dropdown menu.

6 Continue from Step 3 until all associations have been correctly defined.

7 When you have completed all changes click **OK**.

Result: The following screen appears:



If you agree to this, click **Yes**.

If you do not agree to this, click **No** and then **Close**.

END OF STEPS

Task 353: Create or Edit Login Banner

Purpose

Use this task to create or edit a user defined login banner for a Metropolis® DMX shelf.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, refer to Chapter 5, "Provisioning, Security, & Administration".

Before you begin

Determine the text you wish to appear on the login banner (you have a maximum of 11 lines with 58 characters per line).

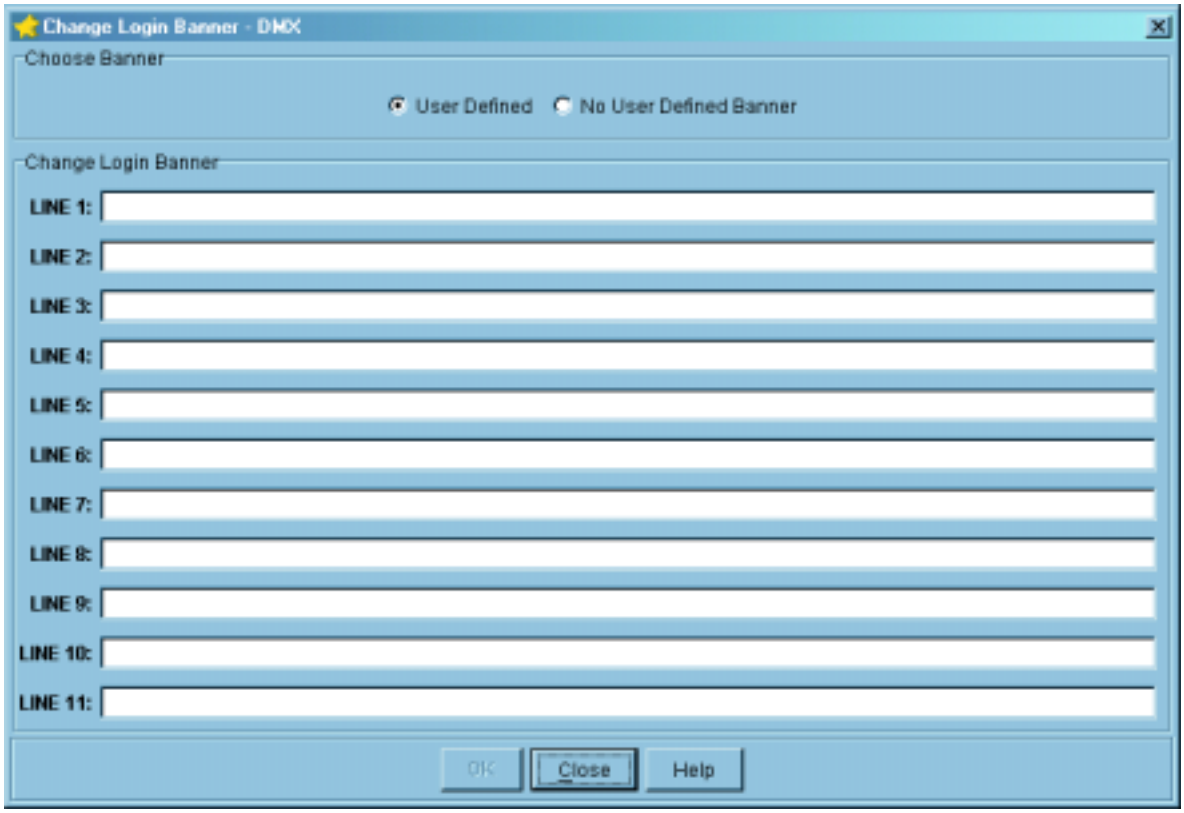
Task

Complete the following steps to create a user defined login banner:

1 Connect PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the **System View** menu, select **Administration > Change NE Login Banner...** to bring up the **Change Login Banner - DMX** screen.



3 From the **Choose Banner** panel, verify that **User Defined** is selected.

Important! If **No User Defined Banner** is selected, you will not be able to enter text in the 11 lines provided for the banner.

4 In the **Change Login Banner** panel, enter the text that you wish to appear on the login screen in the 11 lines provided.

Important! The following rules must be adhered to when populating the login banner:

- The first and last character of each line must be a quotation mark (**"**).
- Each line may contain up to 60 characters (including the quotation marks).
- The banner may begin on Line 1 or Line 2.
- Only one blank line may exist between each two populated rows.

5 Click **OK**.

6 Log off and back on to the NE to verify the changes to the Login Banner.

END OF STEPS

Task 354: Set Date and Time

Purpose

Use this task to set the system date and time. The default method allows the NE, upon turnup or reset, to query neighboring NEs for date and time. Network Time Protocol (NTP) allows the NE to query an NTP server for date and time.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Default (Non-NTP) Method for Time and Date Synchronization

Upon turnup or following a Metropolis® DMX system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). After 5 minutes (to allow for additional NE resets, as in the case of a network software upgrade), the shelf attempts an automatic synchronization of the time and date with another NE in the network. If the remote NE has not responded to the synchronization request within 2 minutes, the request is forwarded to another NE in the network. Each remote NE is allowed 2 minutes to respond. If a valid time and date is not found within the network, it must be entered manually.

NTP Method for Time and Date Synchronization

Upon turnup or following a Metropolis® DMX system reset, the date and time revert to January 1, 1970 (70-01-01) at midnight (00:00:00). The NE (NTP client) queries for Day and Time from an NTP server (a list of NTP servers is maintained on NE). NTP uses the Universal Time Coordinated (UTC) for synchronization.

For subsequent synchronization, the NTP client keeps monitoring all the NTP servers to determine the most reliable clock and compares the time reported with its current time (reliability is determined by clock selection procedures which include accessibility). If the time differs by more than the allowable amount of drift, it resets the time. The Metropolis® DMX NTP client adjusts its clock in small steps (gradually) or in a single step depending upon the significance of the offset from the system clock.

Related information

For related information, see the following:

- Chapter 3, “Operations Interfaces”
- Chapter 5, “Provisioning, Security, & Administration”
- “Task 323: Add IP Tunnel(s) Through Network” (10-179)
- “Task 324: Provision/Enable/Disable TCP/IP on an IAO LAN Port” (10-205)

Before you begin

Select a source for your time setting. If you are manually setting the date and time, determine the correct time from an established source. If you are using NTP, identify the NTP server(s) to be used as source.

If you are using NTP, it is assumed that IP tunneling has already been established or else each node has its own IP address.

Also, if you are using NTP, you will need to know the Universal Time Coordinated Offset (UTCo) for the time zone in which the NTP client is located.

Task

Complete the following steps to set the system time and date:

1 Connect PC and establish a WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Do you plan to use the Network Time Protocol?

If...	Then...
Yes	Proceed to Step 9.
No	Continue with Step 3.

3 From the **System View** menu, select **Administration > Set Date and Time** to bring up the **Set system's date and time for DMX** screen.

4 From the **Date** panel, select the **Year** and **Month** from the pulldown menus.

Result: A calendar is displayed for the month and year selected.

5 Click on the date from the calendar.

6 From the **Time** panel, select the **Hour**, **Minute**, and **Second** from the pulldown menus (based upon a twelve hour clock).

. . . . . .

7 Select **am** or **pm**.

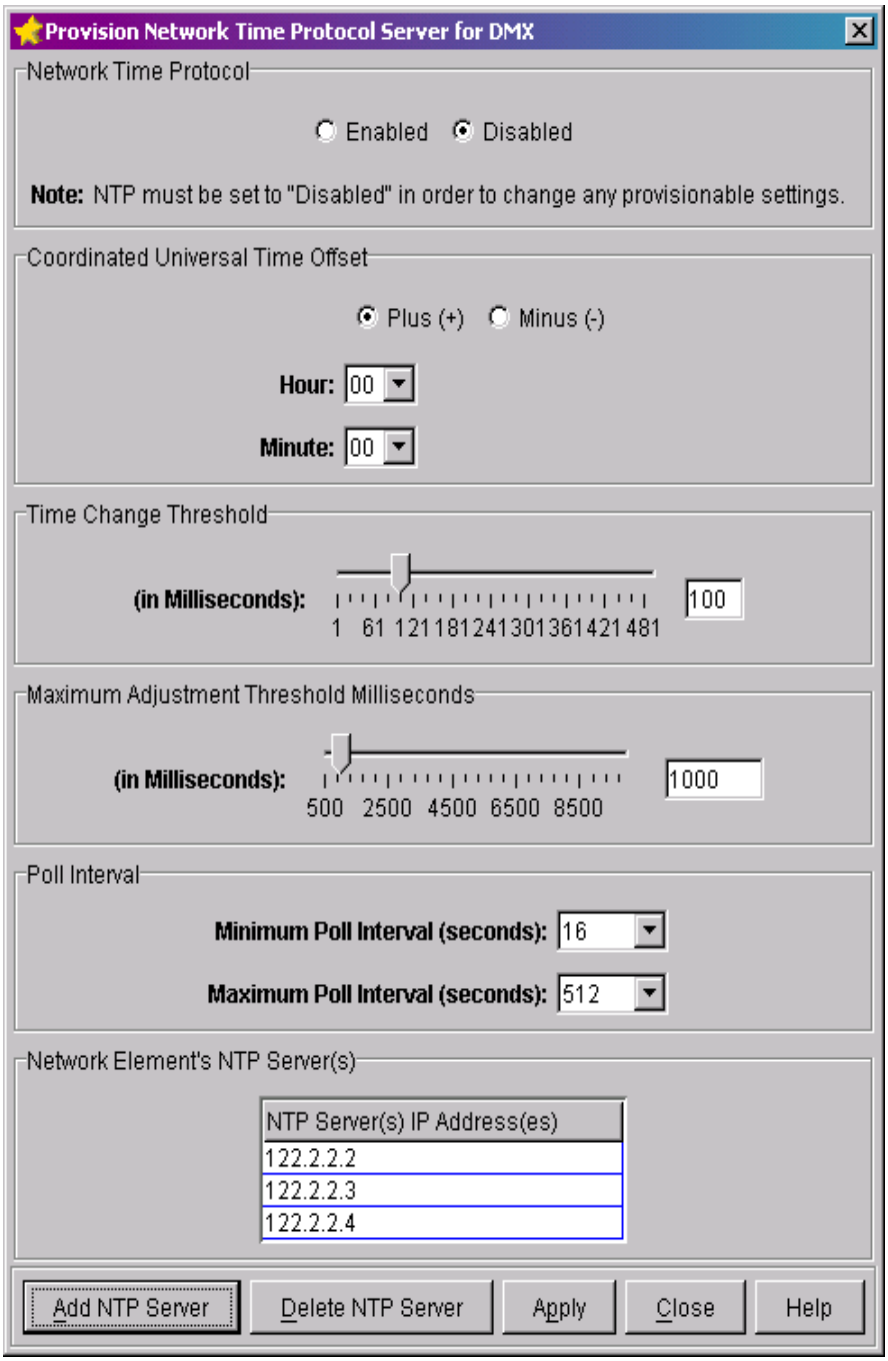
. . . . . .

8 Click **OK**.

Result: The new date and time appear in the lower right hand corner of the GUI **System View**.

STOP! END OF TASK.

9 From the **System View** menu, select **Administration > Set Network Time Protocol...** to bring up the **Provision Network Time Protocol Server for DMX** screen.



10 From the **Network Time Protocol** panel, select **Disabled.**
You will not be able to enter provisionable data while Enabled is selected. Disabling NTP prevents the NE from receiving NTP information from the designated NTP server.

11 From the **Coordinated Universal Time Offset** panel, enter the number of **hours** and **minutes** from the pulldown menus to indicate the time difference from the UTC to the NTP client. Then select **plus (+)** or **minus (-)** to indicate the direction of change.

Example: For New York on United States Eastern Standard Time, the offset would be -5 hours. For California on Pacific Standard Time (USA), the offset would be -8 hours.

In most cases, the **minutes** will be set to **00**. Very few time zones use an additional 30 minute offset.

12 From the **Time Change Threshold Milliseconds** panel, select a number between 1 and 499. The number may be selected by sliding the pointer until the desired number appears in the box to the left, or by simply typing the desired number into the box.

The number entered represents the number of milliseconds of clock adjustment that will generate an autonomous message to the WaveStar® CIT and OS.
This message indicates that NE clocks should be synchronized.

Important! Do not press Enter/Return on the keyboard if you opt to type in the number.

13 From the **Maximum Adjustment Threshold Milliseconds** panel, select a number between 500 and 10,000 (default is 1000). The number may be selected by sliding the pointer until the desired number appears in the box to the left, or by simply typing the desired number into the box.

The number entered represents the number of milliseconds of clock adjustment that will generate an autonomous message.
This message indicates that certain scheduled operations may be effected (e.g., performance monitoring), and usually only occurs at startup or system reset.

> **Important!** Do not press Enter/Return on the keyboard if you opt to type in the number.

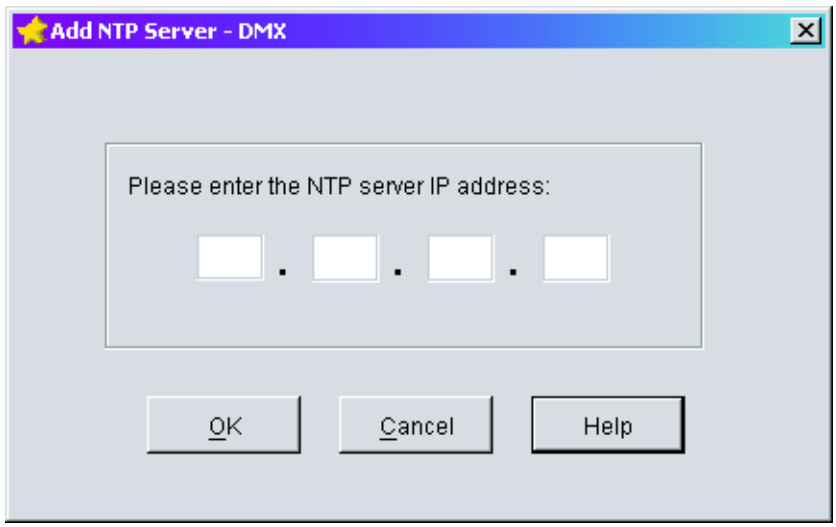
14 From the **Poll Interval** panel, select a **Minimum Poll Interval (seconds)** and a **Maximum Poll Interval (seconds)** from the pulldown menus. These numbers represent the least and most amount of time between the NTP client's queries to the server. Allowable values are between 2 and 4096 (seconds) and increment by powers of two (2, 4, 8, 16, ... 4096). The default minimum is 64 seconds and the default maximum is 1024 seconds.

Selecting a higher minimum interval will reduce the traffic generated by the poll. The poll interval gradually increases towards the maximum interval so long as the changes to the NE clock remain small and infrequent. If the changes to the clock become large and/or frequent, the poll interval shifts towards the minimum interval. NTP determines the interval that best maintains synchronization between the client and the server.

15 From the **Network Element's NTP Server(s)** panel, enter the IP address(es) of up to three known NTP Servers. NTP ranks these servers based upon availability and dependability. When a query is issued, NTP first attempts to synchronize with the most recently accessed server, and if it is unavailable, the query is issued to the highest ranked available server.

Note: There is no auto-discovery for NTP servers. This list must be entered and changed, manually.

Click the **Add NTP Server** button at the bottom of the screen. Enter the IP address of the server in the following screen (each segment of the address should be entered in a separate box, sequentially across the screen).

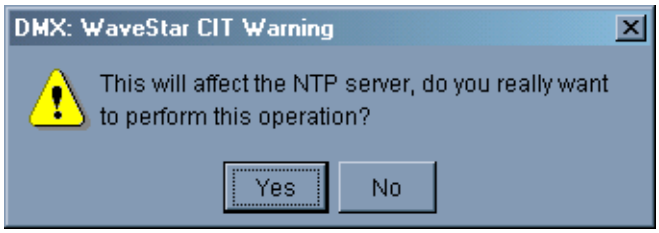


Click **OK**.

*Note: To remove an NTP server from the list, click to highlight one of the IP addresses in the **NTP Server(s) IP Address(es)** list. Click on **Delete NTP Server** button at the bottom of the screen.*

16 Once you have completed the NTP form, click **Apply**.

The following message will appear:



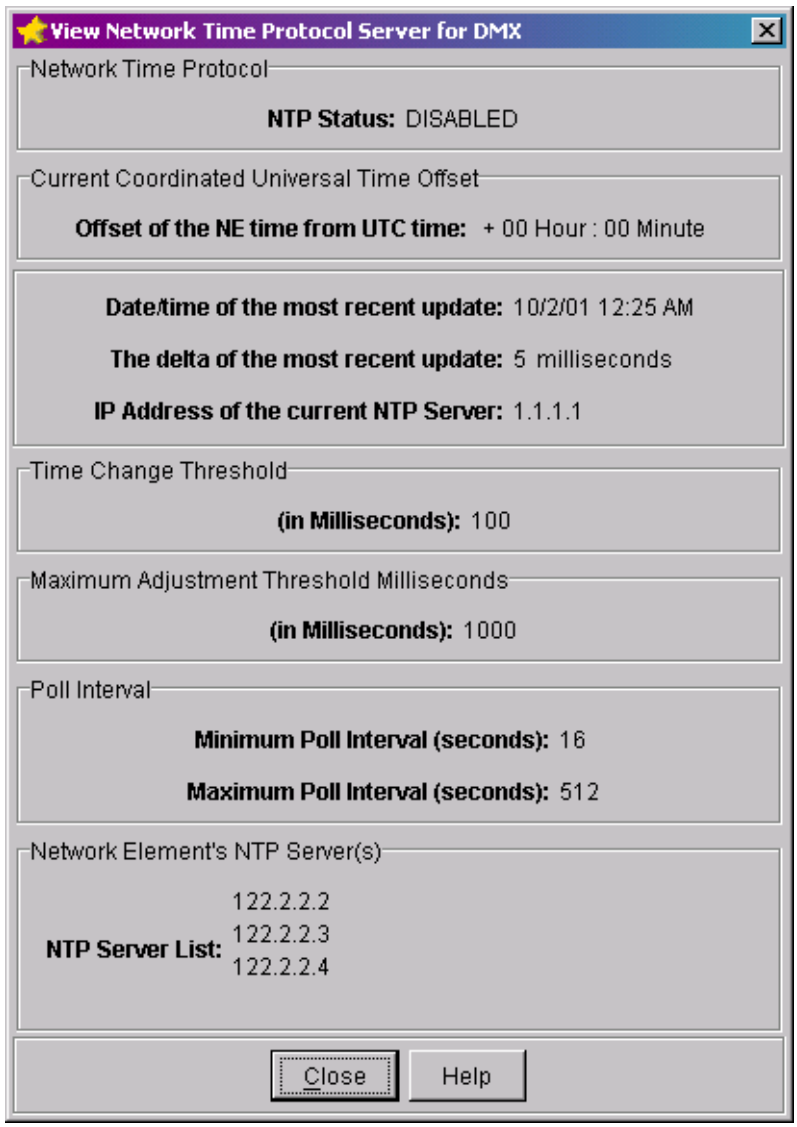
Click **Yes**.

17 From the **Network Time Protocol** panel, select **Enabled.**
You will not be able to enter provisionable data while Enabled is selected.

Important! In order for NTP parameter changes to take effect, the NTP has to be disabled and then re-enabled.

18 Click **Apply** and then **Close**.

19 Once you have completed the provisioning, you may verify NTP status at any time by selecting **Administration > View Network Time Protocol...** from the **System View**.



END OF STEPS

Task 355: Provision System SNMP Management Features and Users

Purpose

Use this task to provision system SNMP management features and/or add, modify, or delete SNMP users.

Provisioning of these parameters implements SNMP manager access to the system. SNMP management access to the system requires other provisioning functions in setting up the access routes to the system. This may require LAN port provisioning, TCP/IP addresses, TCP/IP Gateway control, and IP tunneling requirements.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Perform the following steps to provision the SNMP management feature.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2

If...	Then...
you are provisioning SNMP management and users for the first time,	Continue with Step 3.
you are adding, modifying, or deleting an SNMP user,	Proceed to Step 6.

3 SYSTEM SNMP MANAGEMENT FUNCTIONS

From the System View menu, select **Administration > Data Communications**.

Result: The Data Communications window opens.

4 Click on the **SNMP Management** tab to view parameters.

5 Enter the following parameters:

- NE Contact

  Contact Name: an alphanumeric string of up to 255 characters consisting of the name of the contact person for this NE and how to contact the person.

- NE Location

  Location Name: an alphanumeric string of up to 255 characters describing the physical location of this NE.

- SNMP Authenication Failure Trap

  SNMP Trap Control: Select Enable or Disable.

  Traps are the SNMP equivalent of SONET alarm and event autonomous messages.

  Enabling this feature sends an authentication failure trap to the SNMP manager if both the User Community ID and the source User IP Address of the request does not match the provisioned User Communtiy ID and User IP Address of the SNMP User.

  Disabling this feature prevents traps from being sent if there is an authentication failure.

6 ADDING/MODIFYING/DELETING SNMP USERS

From the System View menu, select **Administration > Security > SNMP User Provisioning.**

Result: The SNMP User Provisioning window opens to allow you to add, modify, or delete an SNMP user.

Any specific value of either SNMP Community ID or source IP address can be used to create more than one SNMP User, as long as the specific values of the pair of parameters are not duplicated.

This command can be used to create up to 20 SNMP Users. There can be a maximum of 10 SNMP Users enabled for request functionality (i.e., GetRequest, GetNextRequest, GetBulkRequest) and a maximum of up to 10 SNMP Users enabled for receiving traps.

7 ADDING A NEW USER

1. Select **New User** in the SNMP User Community ID Panel.
2. Enter the User Community Identifier as a case-sensitive alphanumeric string of 6 to 20 characters in the box provided.

   Note that spaces are *not* allowed in the string of characters.
3. Click on the **Modify** button under SNMP User IP Address Panel.

   The Provision SNMP User IP Address window opens.
4. Enter the 32-bit IP address consisting of four dot-separated decimal numbers from 0-255. Click **OK**.
5. Under Request Functionality Control, select **Enable** or **Disable** to enable or disable request functionality (i.e., GetRequest, GetNextRequest, GetBulkRequest). Default is **Enabled**.
6. Under Trap Functionality Control, select **Enable** or **Disable** to enable or disable the SNMP User for receiving traps. Default is **Enabled**.
7. Click **Add** at the bottom of the window. Read the warning message, then click **Yes** to execute the command.

MODIFYING AN EXISTING USER

1. Select **Existing User** in the SNMP User Community ID Panel.
2. In the drop-down box, select (highlight) the user to be modified.
3. Under Request Functionality Control, select **Enable** or **Disable** to enable or disable request functionality (i.e., GetRequest, GetNextRequest, GetBulkRequest). Default is **Enabled**.
4. Under Trap Functionality Control, select **Enable** or **Disable** to enable or disable the SNMP User for receiving traps. Default is **Enabled**.
5. Click **Modify** at the bottom of the window. Read the warning message, verify the user ID, then click **Yes** to execute the command.

DELETING AN EXISTING USER

1. Select **Existing User** in the SNMP User Community ID Panel.
2. In the drop-down box, select (highlight) the user to be deleted.
3. Click **Delete** at the bottom of the window. Read the warning message, verify the user ID, then click **Yes** to execute the command.

8 If you want to view, print, or save a file of current SNMP users, select **Administration > Security > View SNMP Users** from the System View menu.

END OF STEPS

Task 356: Modify Network Layer NSAP Address and/or Level 1 or Level 2 Routing Capability

Purpose

This procedure allows you to modify the network service address point (NSAP) and/or enable Level 1 and/or Level 2 routing capabilities for this NE.

> **Important!** Values should not be changed from default values except by users who intend to provision the SONET subnetwork and partition DCC communications.

Required equipment

Personal Computer (PC) with WaveStar® CIT software installed

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- Appendix C, IS-IS Level 2 Routing Guidelines
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task Perform the following steps to provision the network layer.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Administration > Data Communications**.

Result: The Data Communications for ... window opens.

3 Select the **Network Layer** tab.

Result: The Network Layer parameters window opens.

4 NETWORK SERVICE ACCESS POINT

Click on the **Modify** button to the right of the NSAP address if you want to modify the NSAP address for this NE.

Important! The first eight characters of the NSAPs are always the same and cannot be changed. The remaining 18 characters of the NSAP area address are provisionable but only the Area field should be changed to assign a node to a different area. The remainder of the NSAP includes the System Identifier field, which is unique to each node, and the Selector (SEL) field.

Result: The NSAP Provisioning window opens.

5 Modify the user settable parameters as required, then click **OK**.

Result: The Network Layer parameters window is again displayed.

6 Select the desired Routing Capability for this NE as either **Level 1** or **Level 1&2**.

7 Click **Apply** at bottom of the window, read the warning message, then click **Yes** to execute the command or **No** to abort the command.

Important! Note that the system will reset when you execute the command and you will be logged off. Also, if the system cannot resynchronize the date and time with other systems in the network, you may have to manually reset the date and time for this NE.

Reference: "Task 354: Set Date and Time" (10-571)

8 If you are finished provisioning Data Communications parameters, click **Close** to exit. Otherwise, continue with another tab.

END OF STEPS

Task 357: Set Serial Port CIT-1 and/or CIT-2 Parameters

Purpose

This procedure allows you to:

- Enable or disable timeout on the selected serial port(s).
- Set the baud rate for the serial port.
- Enable or disable command echo mode.
- Assign OS type application context IDs (ACIDs) to the serial ports.

Assigning an acid to a serial port determines the TL1 autonomous message types to be output by the local network element (NE), and any TL1-RNEs (remote NEs) accessed through that serial port.

Important! Note that changing the serial port parameters may affect access to the serial port. Software downloads using the cit-1 serial port generally use the default setting of 9600 baud. Changing this setting may affect default initial communications to this NE for future downloads. Also, changing the OS type and/or Timeout settings may also affect port communications. Changing settings for cit-2 may affect modem communications, if applicable.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Perform the following steps to provision CIT-1 and/or CIT-2 serial ports.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Administration > Data Communications**.

Result: The Data Communications parameters window opens.

3 Select the **Serial Port** tab.

Result: The Serial Port parameters window opens.

4 Select the **CIT Port** (**cit-1** or **cit-2**) you want to provision.

Important! Note that changing the serial port parameters may affect access to the serial port. Software downloads using the cit-1 serial port generally use the default setting of 9600 baud. Changing this setting may prevent default initial communications to this NE for future downloads. Also, changing the OS type and/or Timeout settings may also affect port communications. Changing settings for cit-2 may affect modem communications, if applicable.

5 Note the **Access State** of the selected CIT Port. If the **Access State** is **In Service** you may continue to provision the serial port. If the **Access State** is **Lockout**, the parameters are *not* provisionable at this time.

An **Access State** of **Lockout** indicates that login access to all ports has been locked out.

Administration > Security > Lockout Logins
Administration > Security > Enable Logins

Reference: "Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login" (9-15)

6 Provision the Serial Port Parameters as required.

- **Timeout** – Specifies the value of the inactivity timer. If no TL1 messages are transmitted or received during the time set, then *all* login sessions on the port are terminated. Values range from **Disabled** (no timeout), or from **1** to **120** minutes.
- **Echo** – Specifies whether or not TL1 messages received on the port are echoed back to the user. Values are **enabled** or **disabled**.
- **Baud Rate** – Specifies the baud rate at which TL1 messages are transmitted/received on the port. Values are **1200**, **2400**, **4800**, **9600** (default), or **19200**.
- **OS Type** – Specifies the Application Context Identifier from the following values:
  - **TL1PeerComm** (By default, TL1 Command Response Only)
  - **TL1Maintenance** (By default, TL1 Alarms, Events, and Command Responses)
  - **TL1MemoryAdministration** (By default, TL1 Database Changes and Command Responses)
  - **TL1Test** (By default, TL1 Test and Command Response Only)
  - **TL1CR** (By default, TL1 Command Response Only)
  - **TL1OTHER1** (Other OS1)
  - **TL1OTHER2** (Other OS2)

Important! Changing the baud rate will terminate any active login sessions on the selected port.

7 In the **Apply To:** box select **This CIT Port only** if the changes only apply to the selected port. Or, select **Both CIT Ports** to apply the changes to both cit-1 and cit-2.

8 Click **Apply** at bottom of the window, read the warning message, then click **Yes** to execute the command.

9 In order for the serial port provisioning to take effect, you must send an additional command to the NE before you log off the system. It is suggested that you click on the **Alarm List** button from the System View menu.

END OF STEPS

Task 358: Set NE Defaults — Enabling/Disabling Alarm Gateway, Alarm Group, Remote NE Status, and FTP

Purpose

Use this task to provision NE defaults. NE defaults as defined in the WaveStar® CIT consist of the following:

- Enabling/Disabling Remote NE Status
- Enabling/Disabling Alarm Gateway and assigning Alarm Groups
- Enabling/Disabling File Transfer Protocol (FTP) and/or FTAM-FTP Gateway Control

Provision these parameters using the **Administration > Set NE** command from the System View menu.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task Perform the following steps to provision NE defaults.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Administration > Set NE**.

Result: The Provision NE Defaults window opens.

3 Reference the following, as required, to provision NE defaults:

- "SE 358-1: Provision Alarm Gateway, Alarm Groups, Remote NE Status" (10-597)
- "SE 358-2: Enable/Disable FTP Protocol and/or FTAM-FTP Gateway Control Functions" (10-601)

END OF STEPS

SE 358-1: Provision Alarm Gateway, Alarm Groups, Remote NE Status

Purpose

Use this task to provision alarm groups, alarm gateways, and remote NE status, as required. This task might best be performed after all network elements have been equipped, tested, and integrated into the network. See below.

AGNE

The Alarm Gateway parameter may have a value of **Yes** or **No** (default). Setting the value to **Yes** designates the NE as an AGNE for its alarm group. One AGNE is needed for each alarm group to support the message communications for Remote NE Status feature. One other NE in the same alarm group may be provisioned as a backup AGNE, if required.

Any NE in an alarm group can be an AGNE. It is recommended that you NOT provision an NE as both an AGNE and a TCP/IP GNE or TL1/X.25 GNE.

Remote NE Status must be **Enabled** in order to provision the NE as an AGNE. An NE with Remote NE Status (rnestat) **Enabled** but no AGNE in its alarm group reports an "AGNE Communications failure" alarm.

Alarm Groups

Alarm group has a numeric value of 1 through 255. The default is 255. All NEs with DCC connectivity, whether nearby or not, that have the same Alarm Group number are members of the same alarm group. All members of an alarm group share Remote NE Status information with each other but not with NEs in different alarm groups.

Remote NE Status must be **Enabled** in order to assign an alarm group number to the NE.

Remote NE Status

Remote NE status may be **Enabled** or **Disabled** (default). Enabling this parameter activates support for far-end activity LED, remote office alarms, and remote alarm/status reports.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task Perform the following steps to provision the alarm group functions.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Administration > Set NE**.

Result: The Provision NE Defaults window opens.

3 For Remote NE Status, select **Enabled** to enable Remote NE Status.

Important! Note that Remote NE Status must be Enabled in order to provision the alarm group functions.

4 If this NE will serve as an Alarm Gateway, select **Yes** to provision this NE as an alarm gateway (AGNE). Otherwise, select **No**.

An NE serving as a backup AGNE should have this parameter set to **Yes**. In this configuration both NEs will actively serve as AGNEs to provide redundant alarm monitoring and distribution. The system does not assign one as primary and the other as secondary.

5 Enter or select the Alarm Group number (1-255) being assigned to this NE.

6 Ensure the other parameters in the window have not been changed, unless you are provisioning them also. Click **OK** at the bottom of the window.

7 Read the warning message, then click **Yes** to execute the command.

Important! An AGNE Communications failure alarm may occur if no AGNE has been selected for the alarm group. If you need to clear the alarm, select **Administration > Set NE**, then select **Disabled** to disable the Remote NE Status. You will have to enable the remote NE status again when the AGNE has been established in order for this NE to be part of the alarm group.

END OF STEPS

SE 358-2: Enable/Disable FTP Protocol and/or FTAM-FTP Gateway Control Functions

Purpose

This procedure allows you to:

- Enable/Disable the NE for FTP file transfers to and from the NE. File transfers may be directly to and from an FTP-GNE, or through an FTP-GNE to/from an FTP enabled remote NE using IP tunneling. Software downloads and provisionable database backup and restore are supported using FTP file transfers.
- Enable/Disable the NE as an FTAM-FTP Gateway (GNE). Enabling the NE as an FTAM-FTP Gateway allows the NE to act as a File Transfer Translation Device (FTTD) to perform file transfers between an FTP server and a remote NE using the FTAM protocol for file transfers.

  Important! Other provisioning may be necessary to use this function. Depending on your requirements, provisioning may include TCP/IP addressing and gateways, IP Tunneling, NSAP addresses, LAN port provision, and area routing.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- Task 206 - Software Generic Copy via FTP
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Perform the following steps to Enable/Disable FTP Protocol and/or FTAM-FTP Gateway Control Functions.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Administration** > **Set NE**, if not already performed.

Result: The Provision NE Defaults for ... window opens.

3 If FTP will be used on this NE, under File Transfer Protocol, select **Enabled** to enable FTP on this NE. Otherwise, select **Disabled** to disable FTP.

Important! If this NE is also being provisioned as an FTAM-FTP Gateway, then File Transfer Protocol must also be **Enabled**.

4 If this NE will be used as an FTAM-FTP Gateway, under FTAM-FTP Gateway Control, select **Enabled** to enable this NE as an FTAM-FTP Gateway. Otherwise, select **Disabled**.

5 Click **OK** at bottom of the window, read the warning message, then click **Yes** to execute the command.

END OF STEPS

SE 358-3: Enable/Disable Network Time Protocol (NTP)

Purpose

This procedure allows you to enable or disable the Network Time Protocol (NTP) function.

Enabling NTP allows an NE to synchronize its date/time (clock) with an NTP Server resident in the network. It achieves this by using the current autoset NE-NE feature for the date/time at boot up and for making subsequent corrections via the OS initiated ED-DAT command. With NTP, the NE works in UTC (Universal Time Code) format and provides aggregate time to the OS and other NEs using UTC Offset.

> **Important!** Other provisioning may be necessary to use this function. NTP servers and related parameters must be provisioned using the **Administration > Network Time Protocol** command ["Task 354: Set Date and Time" (-1)]. Depending on your requirements, other provisioning may include TCP/IP addressing and gateways, IP Tunneling, NSAP addresses, LAN port provision, and area routing.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"

- Chapter 5, "Provisioning, Security, & Administration"
- "Task 206: Release 3.0.0 Software Generic Download and Upgrade via FTP (In-Service System)" (9-31)
- "Task 323: Add IP Tunnel(s) Through Network" (10-179)
- "Task 324: Provision/Enable/Disable TCP/IP on an IAO LAN Port" (10-205)
- "Task 354: Set Date and Time" (10-571)
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Perform the following steps to enable/disable NTP for this NE.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Administration > Set NE**, if not already performed.

Result: The Provision NE Defaults for ... window opens.

3 Under Network Time Protocol, select **Enabled** to enable NTP on this NE, or select **Disabled** to disable NTP, as required.

Important! Disabling NTP prevents the NE from sending or receiving NTP information. Enabling NTP requires that NTP servers be configured.

4 Click **OK** at bottom of the window, read the warning message, then click **Yes** to execute the command.

END OF STEPS

Task 359: Enable/Disable Autonomous Messages

Purpose

This procedure allows you to enable or disable autonomous messages.

Enabling autonomous messages allows you to receive all active alarm and status conditions from the NE through autonomous messages. Disabling this feature inhibits the reporting of alarm and status conditions through autonomous messages.

Autonomous message reporting is enabled or disabled on an individual user basis for the current login session. When the user logs out, autonomous messaging is enabled by default.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task Perform the following steps to enable/disable autonomous message reporting from this NE.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Administration > Security > Allow/ Inhibit Autonomous messages**.

Result: The Allow/Inhibit Autonomous Messages for ... window opens.

3 For the Autonomous Message Options: Select **Enabled** to enable autonomous message reporting on this NE, or select **Disabled** to disable reporting, as required.

4 Click **OK** at bottom of the window, read the caution message, then click **Yes** to execute the command.

END OF STEPS

Task 360: Enable/Disable LAN Port Status

Purpose

This procedure allows you to enable or disable the OSI-LAN port status for LAN ports lan-1 and/or lan-2.

Required equipment

Personal Computer (PC) with WaveStar® CIT software installed

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Perform the following steps to enable/disable LAN port communication with this NE.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Administration** > **Data Communications**.

Result: The Data Communications for ... window opens.

3 Select the **LAN Management** tab.

Result: The LAN parameters window opens.

4 Select the **LAN Port**, **lan-1** or **lan-2**.

5 Note the **Access State** of the selected LAN Port. If the **Access State** is **In Service** you may continue to provision the LAN port. If the **Access State** is **Lockout**, the parameters are *not* provisionable at this time.

An **Access State** of **Lockout** indicates that login access to all ports has been locked out.

Administration > **Security** > **Lockout Logins**
Administration > **Security** > **Enable Logins**

Reference: "Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login" (9-15)

6 Select **Enabled** to enable OSI communications for the selected LAN port. Select **Disabled** to disable OSI communications on the selected LAN port.

7 Click **Apply** at bottom of the window, read the warning message, then click **Yes** to execute the command or **No** to abort the command.

8 Repeat from Step 4 if you want to provision the other LAN port, otherwise click **Close** to exit.

END OF STEPS

Task 361: Set X.25 Gateway Parameters

Purpose

This procedure allows you to provision the X.25 link packet size, OS host types, and virtual circuit types to the X.25 gateway.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 3, "Operations Interfaces"
- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task Perform the following steps to provision the X.25 Gateway.

. . . . . .

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 From the System View menu, select **Administration > Data Communications**.

Result: The Data Communications parameters window opens.

. . . . . .

3 Select the **X.25 Gateway** tab.

Result: The X.25 Gateway parameters window opens.

. . . . . .

4 Note the X.25 Port Status **Access State**. If the **Access State** is **In Service** you may continue to provision the X.25 Gateway parameters. If the **Access State** is **Lockout**, the parameters are *not* provisionable at this time.

An **Access State** of **Lockout** indicates that login access to all ports has been locked out.

Administration > Security > Lockout Logins
Administration > Security > Enable Logins

Reference: "Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login" (9-15)

. . . . . .

5 Select the **X.25 Packet Size:**, as required. Value may be **128** or **256** (default).

Important! Changing the X.25 packet size parameter at an NE with an active X.25 link will cause that X.25 link to be reset and all active TL1 logins will be automatically dropped. All established SVCs on the affected X.25 link will have to be reestablished.

6 Provision the X.25 Gateway Host List, as required. Click on the sunglasses icon to add/modify/delete a gateway host. Follow the instructions in the subsequent window.

- **OS Address** – The X.25 subnetwork point of attachment (SNPA) address for the OS.

  For a permanent virtual circuit (PVC), this is the logical channel number (LCN) 1, 2, 3, 4, 5, 6, 7, 8 or 9.

  For an switched virtual circuit (SVC), this is the Data Terminal Equipment (DTE) calling address, from a minimum of 1 to a maximum of 15 digits.

  Up to a total of nine virtual circuits may be mapped to any combination of PVCs and SVCs (that is, PVCs can be removed and replaced by SVCs).

- **OS Type** – Allows you to select the Application Context Identifier (ACID) from one of the following:
  - **TL1PeerComm** (By default, TL1 Command Response Only; SNPA=1). No autonomous message reporting.
  - **TL1Maintenance** (By default, TL1 Alarms, Events, and Command Responses; SNPA=2)
  - **TL1MemoryAdministration** (By default, TL1 Database Changes and Command Responses; SNPA=3)
  - **TL1Test** (By default, TL1 Test and Command Response Only)
  - **TL1CR** (By default, TL1 Command Response Only) No autonomous message reporting.
  - **TL1OTHER1** (Other OS1) No autonomous message reporting.
  - **TL1OTHER2** (Other OS2) No autonomous message reporting.
- **Virtual Circuit Type** – Allows you to assign the virtual circuit type. This parameter may be one of the following:
  - **SVC** – Switched Virtual Circuit
  - **PVC** – Permanent Virtual Circuit

7 Click **Apply** at bottom of the window, read the warning message, then click **Yes** to execute the command.

END OF STEPS

Task 362: Set General System Parameters

Purpose

Use this task to provision certain parameters that apply to the entire system (aid=system). System parameters as defined in the WaveStar® CIT consist of the following:

- **Settings**
  - **Idle Channel parameters**

    Determines whether or not an AIS or Unequipped signal should be inserted toward the SONET line in VT1.5 and STS-1, STS-3c, STS-12c channels that are not cross-connected.
  - **Autonomous Message Reporting**

    Allows the user to enable or disable all autonomous messages coming from the NE. Note that this parameter may also be set from **Administration > Security > Allow/Inhibit Autonomous messages.**
- **Date and Time**
  - Allows the user to manually set system Date and Time. See "Task 354: Set Date and Time" (10-571) for instructions on setting date and time. Note that Network Time Protocol (NTP) must be disabled in order to manually set date and time.
  - Allows the user to enable or disable **Network Time Protocol**. Note that NTP servers must be established in order to enable NTP. Also, enabling NTP prevents the manual setting of Date and Time.
- **STSn Settings**

  Allows the user to set the STSn and VT1.5 Signal Degrade and STSn Signal Failure Thresholds for ALL system signal rates.

Provision these parameters using the **Configuration > Provision** command from the System View menu, then select the system (aid=system).

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Perform the following steps to provision system parameters.

. . . . . .

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 From the System View menu, select **Configuration** > **Provision**.

Result: The Provision Parameters for ... window opens.

. . . . . .

3 Select (highlight) Metropolis® DMX Access Multiplexer or enter **system** in the **Enter AID** box. Click **Provision** at the bottom of the window.

Result: The Provision Parameters for Equipment window opens.

4 Click on the **Settings** tab.

Result: **System Settings** parameters display

Idle Channel Signal

- **AIS** – When idle is set to AIS (default), STS-1, STS-3c, STS-12c or VT1.5 AIS is inserted towards the SONET line from the 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** – When idle is set to UNEQUIPPED, the STS-1, STS-3c, STS-12c or VT1.5 UNEQUIPPED signal is inserted towards the SONET line from the 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

Autonomous Message Reporting

- **Enabled** – When set to Enabled, autonomous alarm and status messages from the NE are reported to the user.
- **Disabled** – When set to Disabled, autonomous alarm and status messages from the NE are *not* reported to the user.

5 Provision parameters as required, then click **Apply** at the bottom of window. Read the warning message, then click **Yes** to execute the command.

6 If you are finished provisioning, click **Close** at the bottom of window, otherwise continue with the next step.

7 Click on the **Date and Time** tab.

Important! Note that you cannot provision date and time settings manually if NTP is enabled. Disable NTP if you want to manually set date and time. Enable NTP if you are using Network Time Protocol (NTP).

Result: The current date and time settings are displayed.

Note that the date and time settings displayed are generally the current PC date and time settings if date and time have never been provisioned. Click **Refresh** at the bottom of the date and time parameters to get the correct settings.

8 Set the Date and Time parameters as required.

Reference: "Task 354: Set Date and Time" (10-571)

9 Provision parameters as required, then click **Apply** at the bottom of window. Read the warning message, then click **Yes** to execute the command.

10 If you are finished provisioning, click **Close** at the bottom of window, otherwise continue with the next step.

11 Click on the **STSn Settings** tab.

Result: The **Signal Degrade Thresholds** and **Signal Failure Thresholds** parameters display.

12 Use the drop down boxes to provision each parameter as required, then click **Apply** at the bottom of window. Read the warning message, then click **Yes** to execute the command.

13 Click **Close** to exit or select another entity from the left window that you want to provision.

END OF STEPS

Task 363: Provision System Alarm Configuration

Purpose

Use this task to provision system alarm clear delay, alarm generate delay, and power alarm level.

Provision these parameters using the **Configuration > Alarm > Alarm Configuration** command from the System View menu:

- **Alarm Clear Delay**

  Sets the time in seconds that the system waits before reporting an alarm condition is cleared.

- **Alarm Generate Delay**

  Sets the time in seconds that the system waits before reporting an incoming alarm condition.

- **Power Level Alarm**

  Allows you assign a value of **Major** or **Minor** to a power alarm.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Perform the following steps to provision system alarm parameters.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Configuration > Alarms > Alarm Configuration**.

Result: The Configure Alarm window opens.

3 Use the drop down box to set the **Alarm Clear Delay**. Values range from **0** to **30** seconds.

4 Use the drop down box to set the **Alarm Generate Delay**. Values range from **0** to **30** seconds.

5 Set the **Power Level Alarm** to **Major** or **Minor**, as required.

Allows you set an alarm level of Major or Minor to a power alarm associated with the loss of one -48 V power fuse.

6 Click **OK**, read the warning message, then click **Yes** to execute the command.

END OF STEPS

Task 364: Provision DCC Terminations

Purpose

This procedure allows you to enable or disable the DCC channel over OSI on a selected port, and/or provision the Link Access Protocol D-channel (LAPD) to user side or network side.

CAUTION

Do not change the LAPD settings on an inservice system unless you are directed to do so from another procedure. Changes in the LAPD parameter may affect system operations. Disabling the DCC channel may affect system communications.

Important! The LAPD parameter is generally set when the system is integrated into a network. Note that you cannot disable both OSI and TCP/IP on both LAN ports.

Required equipment

Personal Computer (PC) with WaveStar® CIT software installed

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product."

Related information

For related information, see the following:

- Chapter 5, "Provisioning, Security, & Administration"
- Appendix A, WaveStar® CIT Tutorial
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task, obtain the work instructions for the parameters being set.

Task

Perform the following steps to provision DCC terminations.

1 Use the WaveStar® CIT to log in to the Metropolis® DMX shelf, if not already performed.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 From the System View menu, select **Configuration > DCC Terminations**.

Result: The Provision DCC Terminations for ... window opens.

3 Note the DCC Termination State **Access State**. If the **Access State** is **In Service** you may continue to provision the DCC port. If the **Access State** is **Lockout**, the parameters are *not* provisionable at this time.

An **Access State** of **Lockout** indicates that login access to all ports has been locked out.

Administration > Security > Lockout Logins
Administration > Security > Enable Logins

Reference: "Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login" (9-15)

4 Select the DCC Port being provisioned from the **Port AID** drop-down box.

5 Set the DCC Channel Parameter **Termination State** to **enabled** or **disabled** as required.

6 Select the LAPD Parameter **LAPD Role** as **user-side** or **network-side**, as required.

Important! The LAPD parameter is generally set when the system is integrated into a network and should not be changed unless you are reconfiguring the network and have been directed to do so.

7 Click **OK** at bottom of the window, read the warning message, then click **Yes** to execute the command or **No** to abort the command.

8 Repeat from Step 4 if you want to provision other DCC ports, otherwise click **Close** to exit.

END OF STEPS

Task 365: Backout/Suspend OC-48 UPSR to OC-192 UPSR Upgrade

Purpose

Use this procedure to backout/suspend an OC-48 UPSR to OC-192 upgrade with:

- LNW26/LNW26B OC-48 OLIU circuit packs originally at all nodes
- LNW27 OC-48 OLIU circuit packs originally at one or more nodes.

The LNW27 OC-48 OLIU and LNW56 OC-192 OLIU circuit packs have large VT cross-connection fabrics. The LNW26/LNW26B OC-48 OLIU circuit pack has a small VT cross-connection fabric.

A ring upgrade is *suspended* by backing out of the node currently being upgraded and partially backing out of the upgrade at the previously upgraded adjacent node.

In a ring *backout* all nodes that have been upgraded are returned to their pre-upgrade state.

Important! Transmission hits will occur during this procedure whenever an OLIU circuit pack with a different line rate is installed or removed from a Main slot. The transmission hit is a result of an internal system timing adjustment to accommodate different line rates in the two Main slots.

Required equipment

The following equipment is required to perform this task:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- Original OC-48 OLIU circuit packs for each node to be backed out
- 2 LNW27 OC-48 OLIU circuit packs (temporarily required if the upgrade is suspended at a partially upgraded node originally equipped with LNW26/LNW26B OC-48 OLIU circuit packs)

Important! All nodes must be in the Ring Upgrade mode. If a node has been taken out of the Ring Upgrade mode, the node can not be returned to the original pre-upgrade state without affecting service.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

CAUTION

Do not rock circuit packs back and forth when removing and installing them. Carefully slide circuit packs in to or out of the shelf slot.

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306*

Before you begin

Before you begin this task:

- Review the applicable *Metropolis® DMX Access Multiplexer Software Release Description* for any detailed procedures or cautions that may apply to this suspend/backout procedure.
- Verify that the WaveStar® CIT is available.

Task

Complete the following steps to backout/suspend OC-48 UPSR to OC-192 UPSR upgrade.

1 From office records, determine the current network configuration.

2 Refer to one of the following procedures to backout/suspend an OC-48 UPSR to OC-192 UPSR upgrade.

- "SE 365-1: Backout/Suspend OC-48 UPSR to OC-192 UPSR Upgrade (LNW26/LNW26B OC-48 OLIUs Originally at All Nodes)" (10-633)
- "SE 365-2: Backout/Suspend OC-48 UPSR to OC-192 UPSR Upgrade (LNW27 OC-48 OLIUs Originally at One or More Nodes)" (10-639)

END OF STEPS

SE 365-1: Backout/Suspend OC-48 UPSR to OC-192 UPSR Upgrade (LNW26/LNW26B OC-48 OLIUs Originally at All Nodes)

Procedure

Important! This procedure starts at the last node upgraded.

Complete the following steps to backout/suspend an OC-48 to OC-192 UPSR upgrade (LNW26/LNW26B OC-48 OLIU circuit packs originally at all nodes).

1 Identify the last node that was upgraded.

If the last node upgraded is...	Then...
the starting node, and the ring upgrade is complete (all nodes are in the Ring Upgrade mode),	Log in to the starting node (refer to the UPSR example at the end of the procedure) and go to Step 2. **Reference:** "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)
not the starting node, and both Main slots **M1** and **M2** have been upgraded with OC-192 OLIU circuit packs,	Log in to the last node upgraded (refer to the UPSR example at the end of the procedure) and go to Step 4. **Reference:** "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)
not the starting node, and only Main slot **M1** has been upgraded with an OC-192 OLIU circuit pack,	Log in to the last node upgraded (refer to the UPSR example at the end of the procedure) and go to Step 7. **Reference:** "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Important! At the starting node, the LNW56 OC-192 OLIU circuit pack in Main slot **M1** must be first replaced (temporarily) with the LNW27 OC-48 OLIU circuit pack. The LNW27 OC-48 OLIU circuit pack maintains traffic while backing out of the upgrade. As a final step in backing out the ring upgrade, this LNW27 OC-48 OLIU circuit pack is replaced with the original LNW26/LNW26B OC-48 OLIU circuit pack.

2 Replace the LNW56 OC-192 OLIU circuit pack in Main slot **M1** with the temporary LNW27 OC-48 OLIU circuit pack.

Result: The temporary LNW27 OC-48 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. The system reports an unexpected CP type status condition and an OC48 LOS / OC48 LOF alarm for Main slot **M1**.

This completes the first phase of the backout at the starting node. The backout at the starting node will be completed after backing out of all the other nodes in the ring.

3 Log out of the current node and log in to the adjacent node connected to Main slot **M1** (refer to the UPSR example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

4

If...	Then go to...
Temporarily suspending the upgrade,	Step 5.
Backing out of the upgrade at all nodes,	Step 6.

5 Replace the LNW56 OC-192 OLIU circuit pack in Main slot **M2** with a temporary LNW27 OC-48 OLIU circuit pack.

Result: The temporary LNW27 OC-48 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The system reports an unexpected CP type status condition for Main slot **M2**.

End of Task! The upgrade procedure is now temporarily suspended.

6 Replace the LNW56 OC-192 OLIU circuit pack in Main slot **M2** with the original LNW26/LNW26B OC-48 OLIU circuit pack.

Result: The original LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The system reports an unexpected CP type alarm for Main slot **M2**.

Important! The **UPD/INIT** button does not work during this upgrade.

7 At the System View select **Configuration > Update System**.

Result: A dialog box appears asking for Ring Upgrade Choice. Select *main-2* and click on **OK**. A dialog box appears asking you to confirm executing this command. Click on **OK**.

The original LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The system performs an automatic path protection switch, and all traffic is now active on Main slot **M2**.
The unexpected CP type alarm for Main slot **M2** is cleared, and the system reports an unexpected CP type alarm for Main slot **M1**.
Transmission hits (less than 60 ms) occur as active traffic switches from the circuit pack in Main slot **M1** to the circuit pack in Main slot **M2**.

8 Replace the LNW56 OC-192 OLIU circuit pack in Main slot **M1** with the original LNW26/LNW26B OC-48 OLIU circuit pack.

Result: The original LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. The system reports an OC48 LOS / OC48 LOF alarm for Main slot **M1**.

This completes the backout at this node.

9 Except for the starting node, has the upgrade been backed out of all nodes in the UPSR.

If...	Then...
No	Repeat Step 3 through Step 8 at the next node (refer to the UPSR example at the end of the procedure).
Yes	Continue with Step 10.

10 Log out of the current node and log in to the starting node (refer to the UPSR example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

11 Replace the LNW56 OC-192 OLIU circuit pack in Main slot **M2** with the original LNW26/LNW26B OC-48 OLIU circuit pack.

Result: The system reports an unexpected CP type alarm for Main slot **M2**.

Important! The **UPD/INIT** button does not work during this upgrade.

12 At the System View select **Configuration > Update System**.

Result: A dialog box appears asking for Ring Upgrade Choice. Select *main-2* and click on **OK**. A dialog box appears asking you to confirm executing this command. Click on **OK**.

The original LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The system performs an automatic path protection switch, and all traffic is now active on Main slot **M2**.
The unexpected CP type alarm for Main slot **M2** is cleared, and the system reports an unexpected CP type alarm for Main slot **M1**.
Transmission hits (less than 60 ms) occur as active traffic switches from the circuit pack in Main slot **M1** to the circuit pack in Main slot **M2**.

13 Replace the temporary LNW27 OC-48 OLIU circuit pack in Main slot **M1** with the original LNW26/LNW26B OC-48 OLIU circuit pack.

Result: The original LNW26/LNW26B OC-48 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. Transmission is now supported.

Important! This completes the backout procedure, except for taking the nodes out of the Ring Upgrade mode. The decision to take the nodes out of the Ring Upgrade mode or leave them depends on the reason the backout was necessary, and what is required before again starting the upgrade. In the Ring Upgrade mode, UPSR cross-connections can not be created or removed.

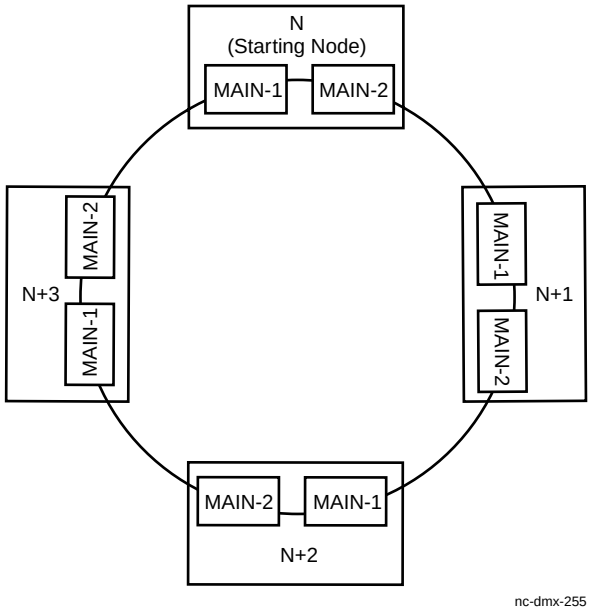
14 If required, at the System View select **Configuration > Normal Mode**. Repeat this step at each node in the ring.

Result: A dialog box appears asking you to confirm changing the NE Mode to Normal mode. Click on **Yes**.

The **ABN** LED is turned off on the SYSCTL circuit pack faceplate and the Ring Upgrade mode will be removed from the WaveStar® CIT alarm list.

END OF STEPS

UPSR Example



SE 365-2: Backout/Suspend OC-48 UPSR to OC-192 UPSR Upgrade (LNW27 OC-48 OLIUs Originally at One or More Nodes)

Procedure

Important! This procedure starts at the last node upgraded.

Complete the following steps to backout/suspend an OC-48 to OC-192 UPSR upgrade (LNW27 OC-48 OLIU circuit packs originally at one or more nodes).

1 Identify the last node that was upgraded.

If the last node upgraded is...	Then...
the starting node, and the ring upgrade is complete (all nodes are in the Ring Upgrade mode),	Log in to the starting node (refer to the UPSR example at the end of the procedure) and go to Step 2. **Reference:** "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)
not the starting node, and both Main slots **M1** and **M2** have been upgraded with OC-192 OLIU circuit packs,	Log in to the last node upgraded (refer to the UPSR example at the end of the procedure) and go to Step 4. **Reference:** "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)
not the starting node, and only Main slot **M1** has been upgraded with an OC-192 OLIU circuit pack,	Log in to the last node upgraded (refer to the UPSR example at the end of the procedure) and go to Step 7. **Reference:** "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Replace the LNW56 OC-192 OLIU circuit pack in Main slot **M1** with the original LNW27 OC-48 OLIU circuit pack.

Result: The original LNW27 OC-48 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. The system reports an unexpected CP type status condition and an OC48 LOS / OC48 LOF alarm for Main slot **M1**.

This completes the first phase of the backout at the starting node. The backout at the starting node will be completed after backing out of all the other nodes in the ring.

3 Log out of the current node and log in to the adjacent node connected to Main slot **M1** (refer to the UPSR example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

4

If...	Then go to...
Temporarily suspending the upgrade,	Step 5.
Backing out of the upgrade at all nodes,	Step 6.

5

If Main slot M2 was originally equipped with an...	Then replace the LNW56 OC-192 OLIU circuit pack in Main slot M2 with...
LNW26/LNW26B OC-48 OLIU,	a temporary LNW27 OC-48 OLIU circuit pack.
LNW27 OC-48 OLIU,	the original LNW27 OC-48 OLIU circuit pack

Result: The OC-48 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The system reports an unexpected CP type status condition for Main slot **M2**.

End of Task! The upgrade procedure is now temporarily suspended.

6 Replace the LNW56 OC-192 OLIU circuit pack in Main slot **M2** with the original OC-48 OLIU circuit pack.

Result: The original OC-48 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. If the original circuit pack is the LNW26/LNW26B OC-48 OLIU, the system reports an unexpected CP type alarm for Main slot **M2**. If the original circuit pack is the LNW27 OC-48 OLIU, the system reports an unexpected CP type status condition for Main slot **M2**.

Important! The **UPD/INIT** button does not work during this upgrade.

7 At the System View select **Configuration > Update System**.

Result: A dialog box appears asking for Ring Upgrade Choice. Select *main-2* and click on **OK**. A dialog box appears asking you to confirm executing this command. Click on **OK**.

The original OC-48 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. The system performs an automatic path protection switch, and all traffic is now active on Main slot **M2**.
The unexpected CP type alarm/status condition for Main slot **M2** is cleared, and the system reports an unexpected CP type alarm/status condition for Main slot **M1**.
Transmission hits (less than 60 ms) occur as active traffic switches from the circuit pack in the Main slot **M1** to the circuit pack in Main slot **M2**.

8 Replace the LNW56 OC-192 OLIU circuit pack in Main slot **M1** with the original OC-48 OLIU circuit pack.

Result: The original OC-48 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. The system reports an OC48 LOS / OC48 LOF alarm for Main slot **M1**.

This completes the backout at this node.

9 Except for the starting node, has the upgrade been backed out of all nodes in the UPSR.

If...	Then...
No	Repeat Step 3 through Step 8 at the next node (refer to the UPSR example at the end of the procedure).
Yes	Continue with Step 10.

10 Log out of the current node and log in to the starting node (refer to the UPSR example at the end of the procedure).

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

Important! The **UPD/INIT** button does not work during this upgrade.

11 At the System View select **Configuration** > **Update System**.

Result: A dialog box appears asking for Ring Upgrade Choice. Select *main-1* (default) and click on **OK**. A dialog box appears asking you to confirm executing this command. Click on **OK**.

The original LNW27 OC-48 OLIU circuit pack in Main slot **M1** is tested and autoprovisioned. The system performs an automatic path protection switch, and all traffic is now active on Main slot **M1**.
The unexpected CP type status condition for Main slot **M1** is cleared, and the system reports an unexpected CP type status condition for Main slot **M2**.
Transmission hits (less than 60 ms) occur as active traffic switches from the circuit pack in the Main slot **M2** to the circuit pack in Main slot **M1**.

12 Replace the LNW56 OC-192 OLIU circuit pack in Main slot **M2** with the original LNW27 OC-48 OLIU circuit pack.

Result: The original LNW27 OC-48 OLIU circuit pack in Main slot **M2** is tested and autoprovisioned. Transmission is now supported.

Important! This completes the backout procedure, except for taking the nodes out of the Ring Upgrade mode. The decision to take the nodes out of the Ring Upgrade mode or leave them depends on the reason the backout was necessary, and what is required before again starting the upgrade. In the Ring Upgrade mode, UPSR cross-connections can not be created or removed.

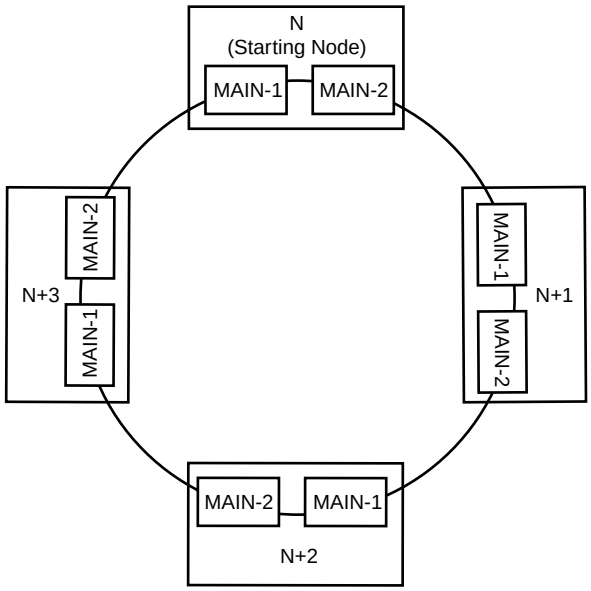
13 If required, at the System View select **Configuration > Normal Mode**. Repeat this step at each node in the ring.

Result: A dialog box appears asking you to confirm changing the NE Mode to Normal mode. Click on **Yes**.

The **ABN** LED is turned off on the SYSCTL circuit pack faceplate and the Ring Upgrade mode will be removed from the WaveStar® CIT alarm list.

END OF STEPS

UPSR Example



SE 365-2: Backout/Suspend OC-48 UPSR to OC-192 UPSR Upgrade (LNW27 OC-48 OLIUs Originally at One or More Nodes)

11 Supporting Tasks

Overview

Purpose The following procedures are detailed step-by-step instructions that are used in support of Acceptance Tasks, Operations Tasks, and Circuit Order/Provisioning Tasks.

Contents

Task 400: Connect OLIU Optical Loopbacks

Purpose

Use this task to loop back an **out-of-service** optical line at the OLIU faceplate connectors.

Required equipment

The following equipment is required:

- Wrist strap
- One lightguide jumper (MS1A40LC-A40LC-2, Comcode 108918269) for each optical line to be looped back (LC-type connections)
- Lightguide buildout (LBO)
  - 5-dB loss LBO (code ABLCS-05.0: comcode 108279381) or
  - 10-dB loss LBO (code ABLCS-10.0: comcode 108279431) or
  - 15-dB loss LBO (code ABLCS-15.0: comcode 108279480)

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Equipment damage

Avoid excessive bending of the optical jumper used to loop the OLIU on itself.

CAUTION

Equipment damage

Ensure all optical fiber connectors, adapters, and LBOs are properly cleaned "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51). Signal performance may be degraded if the connectors, adapters, and LBOs are not cleaned.

CAUTION

Equipment damage

Use a static ground wrist strap whenever handling circuit packs or working on the Metropolis® DMX system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in the "About This Information Product" Section.

Related information

For related information, see Chapter 2, "Platform Description" this document.

Task Complete the following steps to loop back an **out-of-service** optical line at the OLIU faceplate connectors.

1 Obtain the correct LBO and lightguide jumper:

IF the OLIU is ...		THEN obtain a ...
Long Reach (LR) Optics	LNW26/26B OC-48 LNW27 OC-48 LNW28 OC-48 LNW29 OC-48 LNW121B-159B OC-48 LNW221-259 OC-48 LNW421-459 OC-48	lightguide jumper (MS1A40LC-A40LC-2, Comcode 108918269) and a **15-dB** LBO (code ABLCS-15.0, comcode 108279480 for LC connectors)
	LNW36 OC-3	No LBO required (attenuation not needed)
	LNW46 OC-12	lightguide jumper (MS1A40LC-A40LC-2, Comcode 108918269) and a **10-dB** LBO (code ABLCS-10.0, comcode 108279431 for LC connectors)
Intermediate Reach (IR) Optics	LNW31 OC-48 LNW77 OC-48	No LBO required (attenuation not needed)
	LNW56 OC-192	lightguide jumper (MS1A40LC-A40LC-2, Comcode 108918269) and a **5-dB** LBO (code ABLCS-05.0, comcode 108279381 for LC connectors)
Short Reach (SR) Optics	LNW76 OC-48 LNW58 OC-192	No LBO required (attenuation not needed)

2 If required, remove the optical line connections from the OLIU faceplate. Make a record of these disconnections so they can be replaced.

3 Remove the LBO (if equipped) from the **IN** connector of the OLIU faceplate. Make a note of the value.

Reference: "Task 411: Install/Remove LC Lightguide Buildouts (LBOs)" (11-67)

4 Remove the protector caps from the ends of the lightguide jumper (loopback cable).

CAUTION

Ensure all optical fiber connectors/adapters, fiber, and LBOs are properly cleaned. Signal performance may be degraded if the connectors/ adapters, fiber, and LBOs are not cleaned.

5 Clean the LBOs, fiber, and connectors.

Reference: "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51)

6 Install the appropriate LBO, if required. The list of circuit packs and their corresponding LBOs may be found in Step 1.

Reference: "Task 411: Install/Remove LC Lightguide Buildouts (LBOs)" (11-67)

7 Using the lightguide angled boot jumper (MS1A40LC-A40LC-2, Comcode 108918269), connect the **IN** connector and the corresponding **OUT** connector on the same OLIU.

Important! The LC LBOs and lightguide jumpers connect to the LC-shielded, angled adapter on the OLIU faceplate.

Result: After a short time, the **FAULT** LED on the OLIU stops flashing. The **ACTIVE** LED remains on. The MJ and NE LEDs on the SYSCTL circuit pack extinguish.

The following alarms are also present:

- Inconsistent DCC Switches
- Section DCC Channel Failed

8 If responses are not as indicated, check connections and the lightguide jumper. Clean connections and repeat Step 7.

If responses are still not correct, replace the OLIU.

Reference: "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51)

9 Repeat Step 1 through Step 8 for additional ports.

10 When you have completed all ports, return the connectors with LBOs to their original positions.

END OF STEPS

Task 401: Perform DS1 Transmission Test

Purpose

Use this task to perform a DS1 transmission test at a stand-alone (Main OLIUs optically looped) Metropolis® DMX shelf or in a Metropolis® DMX network.

When this procedure is being used to perform DS1 transmission tests in a Metropolis® DMX network, it is assumed that the complete end-to-end system has already been tested and that only a particular DS1 port is being tested at this time.

In end-to-end testing, one shelf is 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.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"

Before you begin

Before you begin this task:

1. Obtain the work instructions for this task and note the assigned AIDs.
2. Verify that the WaveStar® CIT is connected and logged in to the Metropolis® DMX.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

3. Verify that the DS1 port parameters have been provisioned correctly, according to the work orders, at the terminating Metropolis® DMX shelf(s) of the circuit being tested (use **View>View Equipment Details...**).

   If required, make DS1 port provisioning changes. (use **Configuration>Provision** and "Task 315: Provision 28DS1/ 28DS1PM Ports for New DS1 Service" (10-131))

Task

Complete the following steps to perform a DS1 transmission test.

Important! Proper terminating and pass through cross-connections must exist at each shelf (including stand-alone shelves) to establish continuity for the DS1 circuit being tested.

1 Make/verify that the proper STS-1/VT1(DS1) cross-connections have been made for the DS1 circuit to be tested, as required.

Reference: "Task 317: Make VT1.5 or STS-n Cross-Connections, Single OC-48/OC-192 UPSR Ring Configuration" (10-137)

2

If the DS1 transmission test is to be performed ...	Then...
at a standalone shelf in the *Terminal* direction (toward the fiber),	At the Main OLIUs, loop back the fiber. (Refer to Figure 11-1.) **Reference:** "Task 400: Connect OLIU Optical Loopbacks" (11-3)
at a standalone shelf in the *Facility* direction (toward the DSX),	At the DSX, connect a patch cord from the **OUT** jack to the **IN** jack associated with the DS1 circuit being tested. (Refer to Figure 11-2.)
in a Metropolis® DMX network (end-to-end)	At the far end DSX, connect a patch cord from the **OUT** jack to the **IN** jack associated with the DS1 circuit being tested, *OR* log in to the far end Metropolis® DMX shelf and perform a *Terminal* loopback on the DS1 circuit being tested using the **Fault>Loopback** command. (Refer to Figure 11-3.)

Result: The following figures show the test arrangements.

Figure 11-1 Standalone Shelf with Main OLIU Loop Back

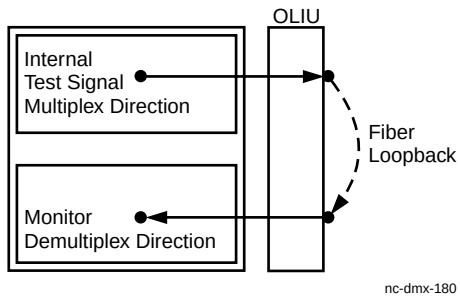


Figure 11-2 Standalone Shelf with DSX Loop Back

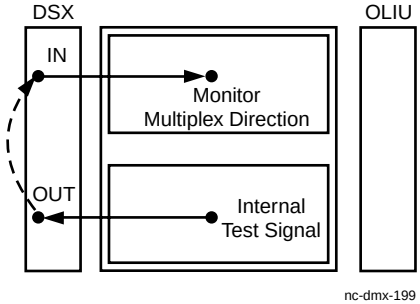
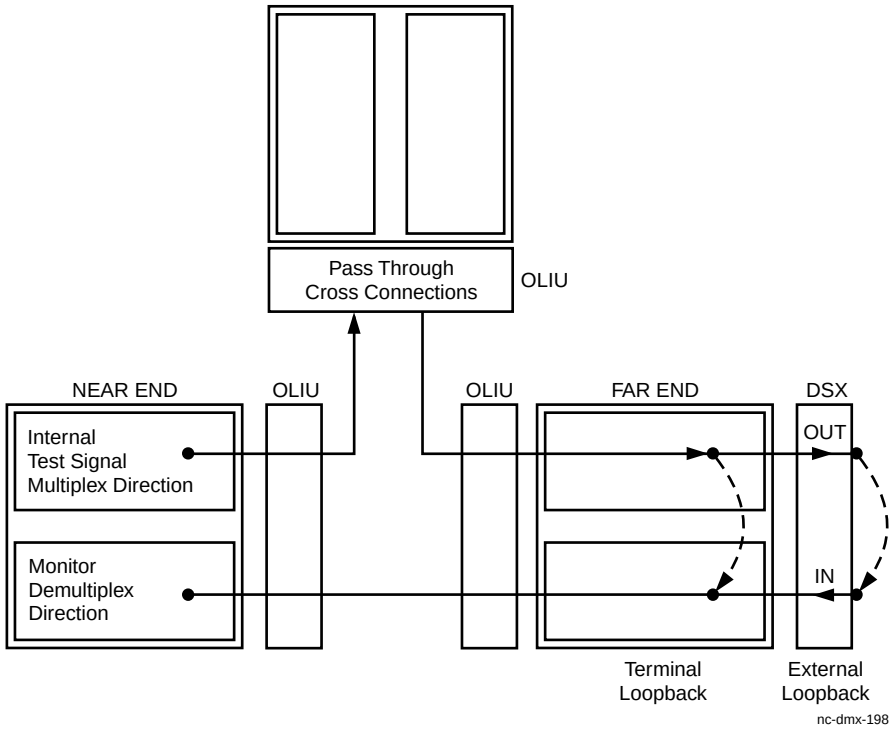


Figure 11-3 End-to-End DS1 Circuit with Far End Loop Back



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3

If the DS1 transmission test is to be performed ...	Then...
at a standalone shelf in the *Terminal* direction (toward the fiber),	Either perform a *terminal* transmission test on the DS1 using the **Fault > Test > Test Transmission** command, or connect a DS1 test set to the port to be tested at the DSX panel and apply a DS1 test signal.
at a standalone shelf in the *Facility* direction (toward the DSX),	Perform a *facility* transmission test on the DS1 using the **Fault > Test > Test Transmission** command.
in a Metropolis® DMX network (end-to-end),	Either perform a *terminal* transmission test on the DS1 using the **Fault > Test > Test Transmission** command, or connect a DS1 test set to the port to be tested at the DSX panel and apply a DS1 test signal.

4 Was the test successful (error free)?

If...	Then...
Yes	Continue with Step 5.
No	Proceed to Step 26.

5 Are you performing this test for a stand-alone (Main OLIUs optically looped) Metropolis® DMX shelf or for end-to-end testing within a Metropolis® DMX network?

If...	Then...
Stand-alone test,	Continue with Step 6.
End-to-end test,	Proceed to Step 13.

6 Is the protection slot associated with the DS1 circuit under test equipped with a companion DS1 circuit pack?

If...	Then...
Yes	Continue with Step 7.
No	Proceed to Step 9.

7 Use the **Fault > Protection Switch** command to switch from the service circuit pack to the protection circuit pack. This may cause a hit and register some errors during the switch.

8 Was the switch successful (recovered error free)?

If...	Then...
Yes	If the pack is protected, repeat task from Step 3 for the protection pack and then continue with Step 9. If the pack is not protected, continue with Step 9.
No	Proceed to Step 24.

9 In the **System View** screen, click on the **Update Alarms** button to retire any existing alarms caused by this procedure.

10 Repeat Step 1 through Step 9 for each DS1 circuit to be tested.

11 Delete any cross connections entered to perform this procedure.

Reference: "Task 307: Discontinue End-to-End DS1 Service" (10-87)

12 STOP! END OF TASK.

13 Use the **View > Protection** command to determine the active path.

14 Use the **Fault > Protection Switch** command to switch the path of the circuit under test to the other ring. This may cause a hit to the test signal and register some errors during the switch.

15 Use the **View > Protection** command to verify the switch.

16 Was the switch successful (recovered error free)?

If...	Then...
Yes	Repeat task from Step 3 for the other ring and the continue with Step 17.
No	Proceed to Step 24.

17 At the near-end, disconnect the DS1 test set from the DSX-1 panel, if required.

18 Delete any cross connections entered to perform this procedure.

Reference: "Task 307: Discontinue End-to-End DS1 Service" (10-87)

19 At the far-end, release the *terminal* loopback using the **Fault > Loopback** command, or remove the patch cords at the DSX panel for the circuit under test.

20 In the System View screen, click on the **Update Alarms** button in order to retire existing alarms caused by this procedure.

21 If required, return to Step 3 and repeat this procedure for each DS1 circuit to be tested.

22 Delete any cross-connections entered to perform this procedure.

Reference: "Task 307: Discontinue End-to-End DS1 Service" (10-87)

23 STOP! END OF TASK.

24 Has the DS1 circuit pack that failed this test been replaced?

If...	Then ...
Yes	Proceed to Step 26.
No	Continue with Step 25.

25 Replace the DS1 circuit pack and repeat this procedure.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

26 Trouble may be in the DSX cross-connect wiring, T1 interface wiring, VT1/STS-1 cross-connections in the ring network, or the shelf backplane.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

END OF STEPS

Task 402: Perform DS3 Transmission Test

Purpose

Use this task to perform a DS3 transmission test at a stand-alone (Main OLIUs optically looped) Metropolis® DMX shelf or in a Metropolis® DMX network.

When this procedure is being used to perform DS3 transmission tests in a Metropolis® DMX network, it is assumed that the complete end-to-end system has already been tested and that only a particular DS3 port is being tested at this time.

In end-to-end testing, one shelf is 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.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in “About this Information Product”.

Related information

For related information, see the following:

- Chapter 2, “Platform Description”
- Chapter 5, “Provisioning, Security, & Administration”

Before you begin

Before you begin this task:

1. Obtain the work instructions for this task and note the assigned AIDs.
2. Verify that the WaveStar® CIT is connected and logged in to the Metropolis® DMX.

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

3. Verify that the DS3 port parameters have been provisioned correctly, according to the work orders, at the terminating Metropolis® DMX shelf(s) of the circuit being tested (use **View>View Equipment Details...**).

   If required, make DS3 port provisioning changes. (use **Configuration>Provision** and "Task 316: Provision 12DS3/EC1 Ports for New DS3 or EC-1 Service" (10-135))

Task

Complete the following steps to perform the DS3 transmission test.

Important! Proper terminating and pass-through cross-connections must exist at each shelf (including stand-alone shelves) to establish the continuity for the DS3 circuit being tested.

1 Make/verify that the proper STS-1 cross-connections have been made for the DS3 circuit to be tested, as required.

Reference: "Task 317: Make VT1.5 or STS-n Cross-Connections, Single OC-48/OC-192 UPSR Ring Configuration" (10-137)

2

If the DS3 transmission test is to be performed...	Then...
at a standalone shelf in the *Terminal* direction (toward the fiber),	At the Main OLIUs, loop back the fiber. (Refer to Figure 11-4.) **Reference:** "Task 400: Connect OLIU Optical Loopbacks" (11-3)
in a Metropolis® DMX network (end-to-end)	At the far end DSX, connect a patch cord from the **OUT** jack to the **IN** jack associated with the DS3 circuit being tested, *OR* log in to the far end Metropolis® DMX shelf and perform a *Terminal* loopback on the DS3 circuit being tested using the **Fault>Loopback** command. (Refer to Figure 11-5.)

Result: The following figures show the test arrangements.

Figure 11-4 Standalone Shelf with Main OLIU Loop Back

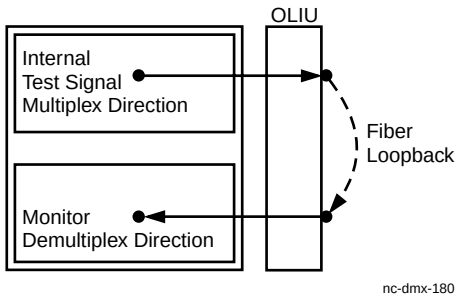
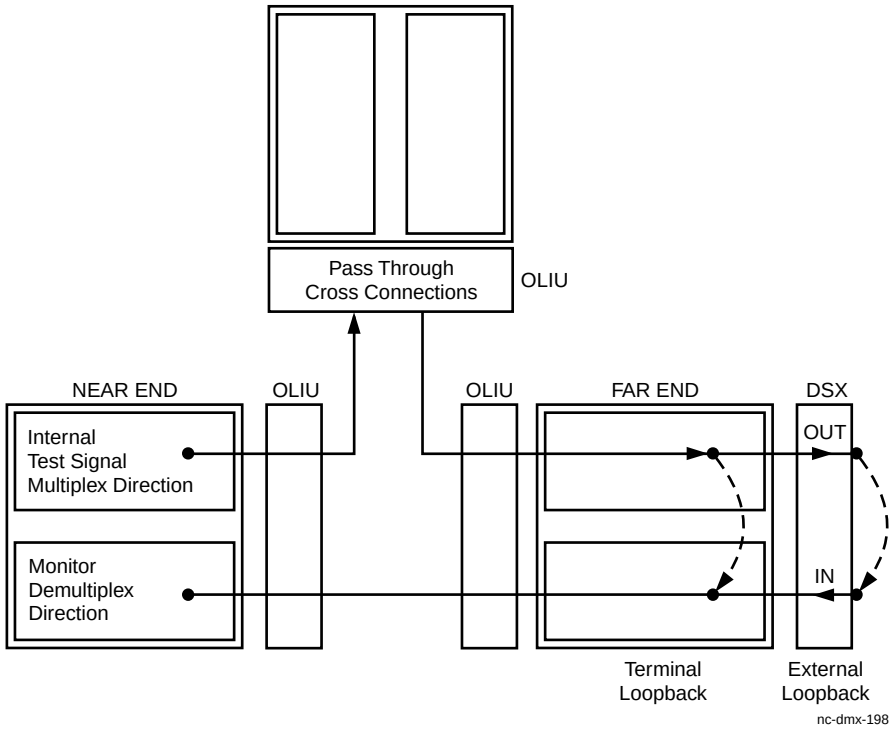


Figure 11-5 End-to-End DS3 Circuit with Far End Loop Back



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3 Perform a *terminal* transmission test on the DS3 circuit using the **Fault** > **Test** > **Test Transmission** command, or connect a DS3 test set to the port to be tested at the DSX panel and apply a DS3 test signal.

4 Was the test successful (error free)?

If...	Then...
Yes	Continue with Step 5.
No	Proceed to Step 24.

5 Are you performing this test for a stand-alone (Main OLIUs optically looped) Metropolis® DMX shelf or for end-to-end testing within a Metropolis® DMX network?

If...	Then...
Stand-alone test,	Continue with Step 6.
End-to-end test,	Proceed to Step 17.

6 Is the protection slot associated with the DS3 circuit under test equipped with a companion DS3 circuit pack?

If...	Then...
Yes	Continue with Step 7.
No	Proceed to Step 13.

7 Use the **Fault > Protection** Switch command to switch from the service circuit pack to the protection circuit pack. This may cause a hit and register some errors during the switch.

8 Was the switch successful (recovered error free)?

If...	Then...
Yes	If the pack is protected, repeat task from Step 3 for the protection pack and then continue with Step 9. If the pack is not protected, continue with Step 9.
No	Proceed to Step 24.

9 In the **System View** screen, click on the **Update Alarms** button to retire any existing alarms caused by this procedure.

10 Repeat Step 1 through Step 9 for each DS3 circuit to be tested.

11 Delete any cross-connections entered to perform this procedure.

Reference: "Task 311: Discontinue End-to-End DS3 or EC-1 Service" (10-107)

12 STOP! END OF TASK.

13 Use the **View > Protection Switch** command to determine the active path.

14 Use the **Fault > Protection Switch** command to switch the path of the circuit under test to the other ring. This may cause a hit to the test signal and register some errors during the switch.

15 Use the **View > Protection Switch** command to verify the protection switch.

16 Was the protection switch successful (recovered error free)?

If...	Then...
Yes	Repeat task from Step 3 for the other ring and the continue with Step 17.
No	Proceed to Step 24.

17 At the near-end, disconnect the DS3 test set from the DSX-3 panel, if required.

18 Delete any cross-connections entered to perform this procedure.

Reference: "Task 311: Discontinue End-to-End DS3 or EC-1 Service" (10-107)

19 At the far-end, release the *terminal* loopback using the **Fault > Loopback** command, or remove the patch cords at the DSX-3 panel for the circuit under test.

20 In the System View screen, click on the **Update Alarms** button to retire any existing alarms caused by this procedure.

21 If required, return to Step 3 and repeat this procedure for each DS3 circuit to be tested.

22 Delete any cross-connections entered to perform this procedure.

Reference: "Task 311: Discontinue End-to-End DS3 or EC-1 Service" (10-107)

23 STOP! END OF TASK.

24 Has the DS3 circuit pack that failed this test been replaced?

If...	Then...
Yes	Proceed to Step 26.
No	Continue with Step 25.

25 Replace the DS3 circuit pack and repeat this procedure.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

26 Trouble may be in the DSX cross-connect wiring, T3 interface wiring, STS-1 cross-connections in the ring network, or the shelf backplane.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

END OF STEPS

Task 403: Perform Connection and Verification of Optical Facility

Purpose

Use this task to connect and verify an OC-3, OC-12, OC-48, or OC-192 optical facility.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- Lightguide Jumpers
- Lightguide Buildouts (LBOs)

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

WARNING

Equipment damage

Avoid excessive bending of the optical jumper used to loop the OLIU on itself.

Related information

For related information, see Chapter 2, "Platform Description" in this document.

Single-mode lightguide jumpers

The following single-mode lightguide angled boot jumpers are available for connecting the OLIUs to the optical span.

Code	Comcode	Length (ft.)	Connectors
MS1A40LC-A40LC-2	108918269	2	LC-LC
MS1A40LC-A40LC-4	108918707	4	LC-LC
MS1A40LC-A40LC-E/W	108918715	Customer Specified	LC-LC
MS1A40LC-LC-2	108918830	2	LC-LC
MS1A40LC-LC-4	108918855	4	LC-LC
MS1A40LC-LC-6	108918863	6	LC-LC
MS1A40LC-LC-8	108918871	8	LC-LC
MS1A40LC-LC-10	108918889	10	LC-LC
MS1A40LC-LC-15	108918897	15	LC-LC
MS1A40LC-LC-20	108918913	20	LC-LC
MS1A40LC-LC-25	108918921	25	LC-LC
MS1A40LC-LC-30	108918939	30	LC-LC
MS1A40LC-LC-35	108918947	35	LC-LC
MS1A40LC-LC-40	108918962	40	LC-LC
MS1A40LC-LC-50	108918970	50	LC-LC
MS1A40LC-LC-E/W	108918988	Customer Specified	LC-LC

Code	Comcode	Length (ft.)	Connectors
MS1A40LC-SC-2	108919002	2	LC-SC
MS1A40LC-SC-4	108919010	4	LC-SC
MS1A40LC-SC-6	108919028	6	LC-SC
MS1A40LC-SC-8	108919036	8	LC-SC
MS1A40LC-SC-10	108919044	10	LC-SC
MS1A40LC-SC-15	108919051	15	LC-SC
MS1A40LC-SC-20	108919069	20	LC-SC
MS1A40LC-SC-25	108919077	25	LC-SC
MS1A40LC-SC-30	108919085	30	LC-SC
MS1A40LC-SC-35	108919093	35	LC-SC
MS1A40LC-SC-40	108919101	40	LC-SC
MS1A40LC-SC-50	108919119	50	LC-SC
MS1A40LC-SC-E/W	108919996	Customer Specified	LC-SC
MS1A40LC-FC-2	108918723	2	LC-FC
MS1A40LC-FC-4	108918731	4	LC-FC
MS1A40LC-FC-6	108918749	6	LC-FC
MS1A40LC-FC-8	108918756	8	LC-FC
MS1A40LC-FC-10	108918764	10	LC-FC
MS1A40LC-FC-15	108918772	15	LC-FC
MS1A40LC-FC-20	108918780	20	LC-FC
MS1A40LC-FC-25	108918798	25	LC-FC
MS1A40LC-FC-30	108918806	30	LC-FC
MS1A40LC-FC-35	108918814	35	LC-FC
MS1A40LC-FC-40	108918822	40	LC-FC
MS1A40LC-FC-50	108918848	50	LC-FC
MS1A40LC-FC-E/W	108918905	Customer Specified	LC-FC

Code	Comcode	Length (ft.)	Connectors
MS1A40LC-EP-2	108919713	2	LC-ST
MS1A40LC-EP-4	108919721	4	LC-ST
MS1A40LC-EP-6	108919739	6	LC-ST
MS1A40LC-EP-8	108919747	8	LC-ST
MS1A40LC-EP-10	108919754	10	LC-ST
MS1A40LC-EP-15	108919770	15	LC-ST
MS1A40LC-EP-20	108919788	20	LC-ST
MS1A40LC-EP-25	108919796	25	LC-ST
MS1A40LC-EP-30	108919804	30	LC-ST
MS1A40LC-EP-35	108919812	35	LC-ST
MS1A40LC-EP-40	108919820	40	LC-ST
MS1A40LC-EP-50	108919838	50	LC-ST
MS1A40LC-EP-E/W	108919846	Customer Specified	LC-ST

Important! The single-mode angled boot lightguide jumpers used to connect the OLIUs must be equipped with LC connectors.

LC-type lightguide buildouts

The following lightguide buildouts are required for attenuating the OLIUs.

Code	Comcode	Loss (dB)	Fiber Type	Color
ABLCS-05.0	108279381	5	SM	Yellow
ABLCS-10.0	108279431	10	SM	Yellow
ABLCS-15.0	108279480	15	SM	Yellow

Metropolis® DMX shelf optical power and required LBO

The following information is required to install the proper LBO on the system OLIUs.

Optics	Circuit Pack	Received Power (dBm)	LBO (dB)
Long Reach (LR) Optics	LNW26/26B OC-48 LNW27 OC-48 LNW28 OC-48 LNW29 OC-48 LNW121B-159B OC-48 LNW221-259 OC-48 LNW421-459 OC-48	+3.0 to -9.0	15
		-9.0 to -29.0	0
	LNW36 OC-3	0.0 to -34.0	0
	LNW46 OC-12	+2.0 to -8.0	10
		-8.0 to -30.0	0
Intermediate Reach (IR) Optics	LNW31 OC-48 LNW77 OC-48	0.0 to -18.0	0
	LNW56 OC-192	+2.0 to -1.0	5
		-1.0 to -14.0	0
Short Reach (SR) Optics	LNW76 OC-48	-3.0 to -18.0	0
	LNW58 OC-192	-1.0 to -11.0	0

Before you begin

Before you begin this task:

1. Verify that the correct lightguide buildouts and jumpers are available.
2. Ensure all optical fiber connectors and couplings have been properly cleaned. Signal performances may be degraded if the connections and couplings are not cleaned properly.

   Reference: "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51)
3. Verify that the WaveStar® CIT is connected and logged in to the Metropolis® DMX .

   Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)
4. Ensure that technicians are available at both ends of the optical span(s).

Task

Complete the following steps to determine system loss and required attenuation.

. . . . . .

1 At the near-end Metropolis® DMX, connect personal computer and establish WaveStar® CIT session.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 Dress optical cables in the fiber tray at bottom front of the shelf.

. . . . . .

3 Route the optical jumpers from the bottom of the shelf. See "Single-mode lightguide jumpers" (11-26).

. . . . . .

4 Establish communication with technician at other end of the optical span.

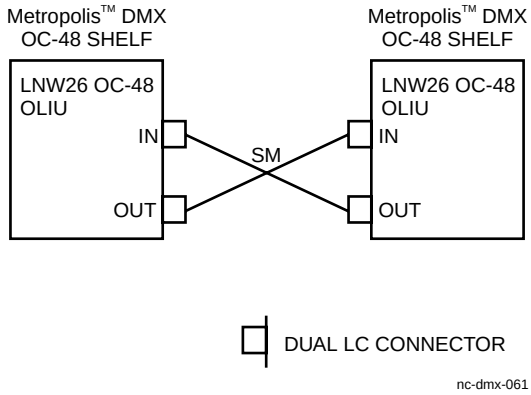
. . . . . .

5 At both ends of the optical span, remove protective covers from receive and transmit optical jumper cables and clean LC connectors.

Important! The Metropolis® DMX OLIUs require single-mode lightguide cable. Single-mode optical fibers connecting this shelf with the far-end shelf should not be connected to the OLIU until at least 45 seconds after an optical loopback is removed. It may take from 15 seconds to 3.5 minutes for the FAULT LEDs to stop flashing after the cables are connected, depending on the setting of the OC-48 signal degrade threshold.

Reference: "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51)

6 At both ends of the optical span, ensure that only the dual LC adapter is installed on the OLIU (no LBOs) as indicated in the following figure:



Important! For Metropolis® DMX OC-48 ring configurations, optical fibers extend in two different directions to make up the ring. At each shelf (node) in the ring, the **M1** OLIU will connect to the **M2** OLIU in one adjacent node, and the **M2** OLIU will connect to the **M1** OLIU in the other adjacent node. Likewise, when the Metropolis® DMX is interfacing with other equipment at low-speeds (OC-3 or OC-12) using 0x1 protection, FN-**1** will connect to **Main 1** on whatever shelf the Metropolis® DMX is being connected to. FN-**2** will connect to **Main 2** on whatever shelf the Metropolis® DMX is being connected to.

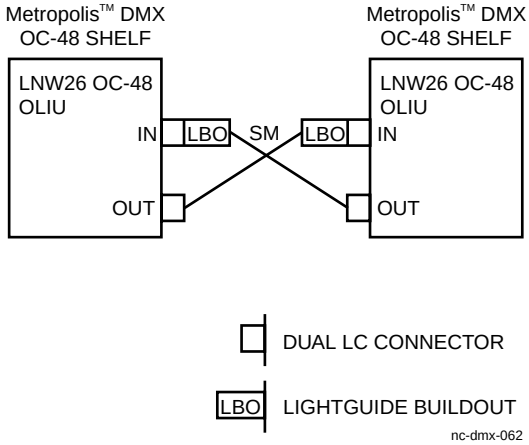
7 At each end of the optical span, connect the optical fiber transmit cables to the OLIU OUT connectors.

8 Have you determined the value of the LBOs for this span?

If...	Then...
Yes	Proceed to Step 10.
No	Continue with Step 9.

9 At each end of the optical span, measure the optical power of the optical fiber receive cables using an optical power meter.

10 Clean LC LBOs and install LBO assemblies as shown in the following figure:



Refer to the table under "Metropolis® DMX shelf optical power and required LBO" (11-29), if required.

Reference: "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51)

11 At the far end, connect the input optical fiber to the proper OLIU IN connector.

12 Did FAULT LED go off on the far-end?

If...	Then...
No	Continue with Step 13.
Yes	Proceed to Step 14.

13 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. Verify output power level from the fiber. If power level is okay, replace the LBO. If the FAULT LED did not go off, replace the OLIU with the flashing LED. Verify proper systems have been connected by using the **Administration > OSI Neighbor** command. Continue with this task when trouble is cleared.

14 At near end, connect the input optical fiber(s) to the corresponding OLIU IN connector.

15 Did FAULT LED go off on the near-end OLIU?

If...	Then...
No	Continue with Step 16.
Yes	Proceed to Step 17.

16 Check optical fiber connections at both ends of the fiber. Verify the integrity of the fiber connections by ensuring the OLIU output at one end is connected to the correct OLIU input at the other end. Verify output power level from the fiber. If power level is okay, replace LBO. If the FAULT LED did not go off, replace the OLIU with the flashing LED. Verify proper systems have been connected by using the **Administration > OSI Neighbor** command. Continue with this task when trouble is cleared.

17 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.

18 Verify that nodes have been connected properly and that they can communicate with each other. Use the **Administration > OSI Routing Map** and **Administration > OSI Neighbor** commands to retrieve a map of the network.

19 After all connections and tests have been made, verify optical fiber cables are placed correctly in fiber tray and properly routed in bay framework.

END OF STEPS

Task 404: Perform End-to-End Optical Line Test on Main OLIUs

Purpose

Use this task to verify the integrity of the OC-48/OC-192 fiber lines between two Metropolis® DMX shelves.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Before you begin this task, verify that the WaveStar® CIT is available for this test.

Important! It is assumed that each Metropolis® DMX node has passed the local (looped) transmission tests. If these tests have not been completed, refer to the appropriate task and perform the tests.

Task

Complete the following steps to perform the optical line test.

1 Connect the PC and establish a WaveStar® CIT session.

Important! This test must be performed locally at each Metropolis® DMX shelf location associated with the optical span(s) being tested.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Enter the **Performance>Initialize PM Registers>Both** command, if allowed.

CAUTION
Service affecting

The command Performance>Initialize PM Registers>Both *clears all current day and all current quarter-hour performance-monitoring storage registers.*

Important! If local tasks prohibit you from doing the **Performance >Initialize PM Registers>Both** command, you may perform the following in Step 4 and Step 5. Use the **Performance >Reports >OCn Line** command to obtain the line performance monitoring status report, note the readings on the current time line in the report, wait 20 seconds and then obtain another report. There should be no change in readings from the first report.

3 Wait 20 seconds.

. . . . . .

4 From the menu bar select **Performance > Reports > OCn Line**. This will result in producing the screen titled *OCn Line PM Parameters Selection.* Select the OC-48/OC-192 Port.

OR

enter **main-1-1** or **main-2-1** in the field labeled *Enter AID:*.

Result: These reports will indicate the status of the equipment.

. . . . . .

5 Has performance-monitoring report been obtained from all shelf locations associated with optical span(s) being tested?

If...	Then...
Yes	Proceed to Step 7.
No	Continue with Step 6.

. . . . . .

6 Repeat this task from Step 1 at other locations.

. . . . . .

7 Did report indicate any errors?

If...	Then...
Yes	Continue with Step 8.
No	STOP! END OF TASK.

8 Trouble may be in optical and/or fiber connections. Trouble may also be in OLIUs. If report indicated trouble when the report was obtained from the near end of the span, trouble may be in the receive direction. 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.

Reference: "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51)

If no trouble found in the optical fibers, replace OLIU(s) associated with the address indicated in the report.

END OF STEPS

Task 405: Reserved for Future Use

Task 406: Test Function Unit Equipment Protection Switching

Purpose

Use this task to test Metropolis® DMX function unit 1+1 equipment protection switching.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Before you begin this task, verify that the WaveStar® CIT is available for this test and the function unit group to be tested contains a pair of identical circuit packs.

Task Complete the following steps to perform the protection switching test.

. . . . . .

1 Connect the PC and establish a WaveStar® CIT session.

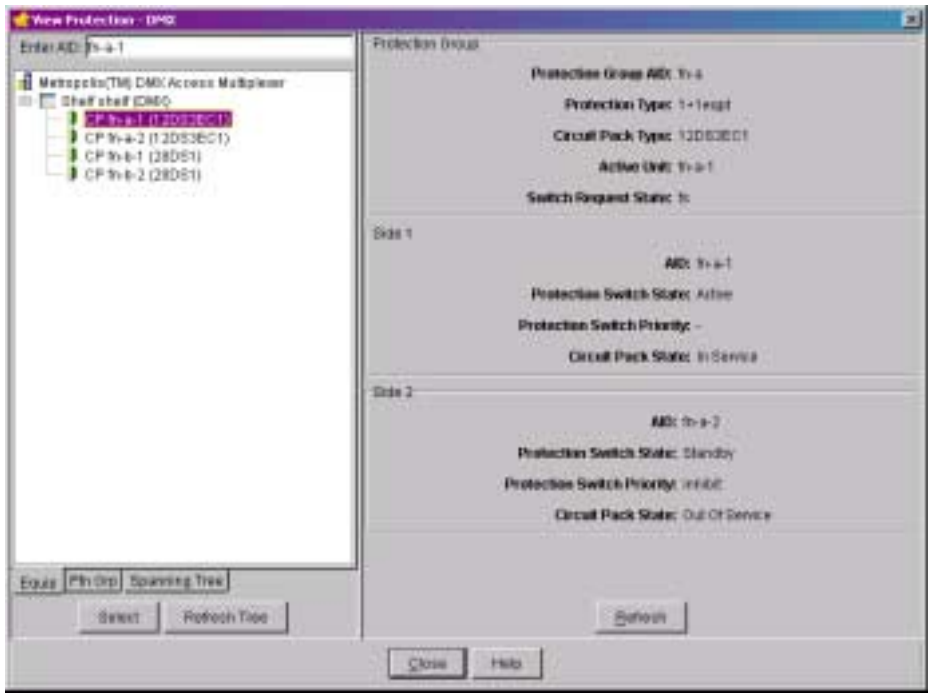
Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

. . . . . .

2 Display the current protection status.

From the **System View** menu,
select **View** > **Protection**.

When the **View Protection** screen appears, select the **Equip** tab:



Select the Protection Group that you wish to view by double-clicking on one of the ports in the group.
In this example, Function Group A was selected by double-clicking on the 12DS3/EC1 in fn-a-1. (Double-clicking fn-a-2 would display the same result.)

. . . . . .

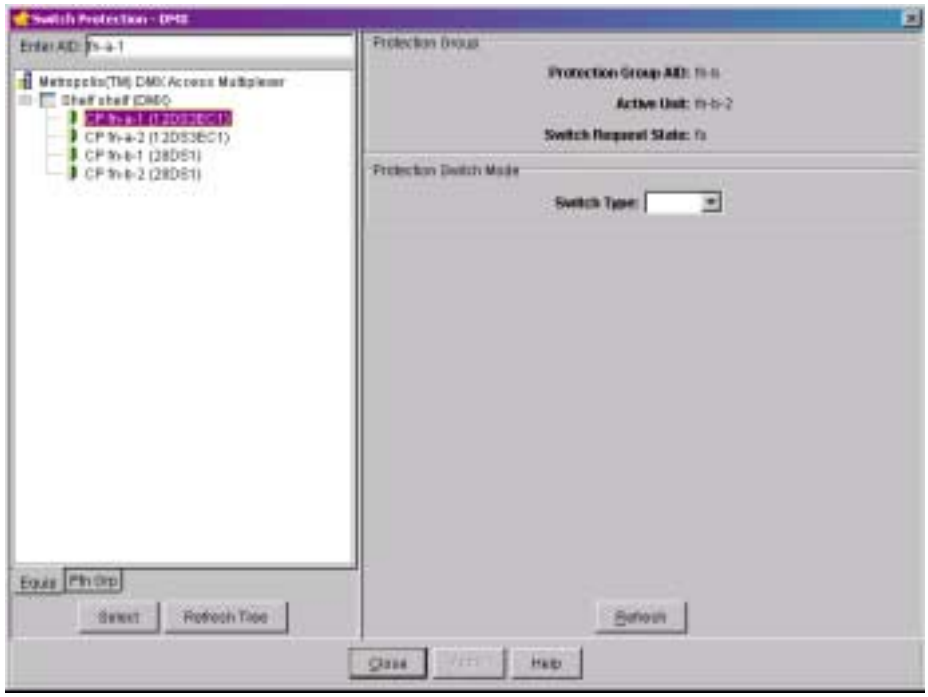
3 Note the active pack [Side 1 (fn-a-1) in the example from Step 2].

Click **Close**.

4 Perform a switch.

From the **System View** menu,
select **Fault > Protection Switch**.

When the **Switch Protection** screen appears, select the **Equip** tab:

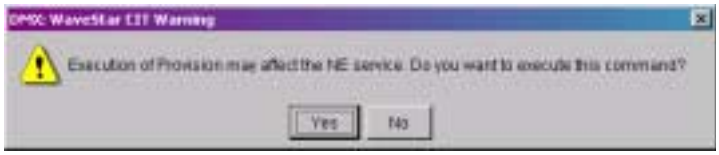


Select the Protection Group that you wish to switch by double-clicking on one of the ports in the group.
In this example, Function Group A was selected by double-clicking on the 12DS3/EC1 in fn-a-1. (Double-clicking fn-a-2 would display the same result.)

5 In the **Protection Switch Mode** panel,
select **Normal** as the **Switch Type** from the pull-down menu.

Click **Apply**.

The following warning appears:



Click **Yes** and then **Close**.

6 Verify that the switch was done.

Repeat Step 2 and Step 3 to verify that the active and standby states have reversed for the packs in the Protection Group.

END OF STEPS

Task 407: Check -48 V DC Office Battery

Purpose

Use this task to check the office battery voltage.

Required equipment

The following equipment is required:

- Wrist strap
- Multimeter capable of measuring voltage in the 40 to 60 volt range

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Risk of shock

-48 volt DC is present in the input power cables at the rear of the Metropolis® DMX shelf.

CAUTION

Service affecting

If system is in service, service interruption will occur if both power cables are disconnected.

Related information

For related information, see Chapter 2, "Platform Description" this document.

Before you begin

Before you begin this task, verify that a multimeter is available for this test.

Task

Complete the following steps to perform the office battery test.

1 Obtain multimeter for measuring the DC voltage.

2 Remove ONE of the input power cables at the rear of the Metropolis® DMX shelf.

3 Use multimeter to measure DC voltage in the power cable connector. Place negative probe in power cable connector and positive probe to a solid chassis ground.

Result: Voltage measurement is between -40.0 and -60.0 volts DC.

4 Was requirement met?

If...	Then...
Yes	Proceed to Step 7.
No	Continue with Step 5.

5 Trouble in power feeder(s) or office battery distribution. Refer trouble to organization that installed the shelf.

6 STOP! END OF TASK.

7 Have both power cables been checked?

If...	Then...
Yes	Proceed to Step 9.
No	Continue with Step 8.

8 Reinstall power cable if removed. Remove other power cable and repeat this task from Step 3 for other power cable.

. . . . . .

9 Are both power cables installed?

If...	Then...
Yes	Proceed to Step 11.
No	Continue with Step 10.

. . . . . .

10 Install BOTH power cables at rear of Metropolis® DMX shelf.

. . . . . .

11 Is any circuit breaker tripped?

If...	Then...
Yes	Continue with Step 12.
No	Proceed to Step 16.

. . . . . .

12 Reset circuit breaker.

. . . . . .

13 Did circuit breaker trip again?

If...	Then...
Yes	Continue with Step 14.
No	Proceed to Step 16.

. . . . . .

14 Trouble in backplane connector. Refer trouble to the organization that installed the shelf.

. . . . . .

15 STOP! END OF TASK.

16 Are PWR A and B LEDs lighted?

If...	Then...
Yes	STOP! END OF TASK.
No	Continue with Step 17.

17 Trouble in backplane connector. Refer trouble to the organization that installed the shelf.

END OF STEPS

Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)

Purpose

This task describes the Lucent recommended method for the cleaning and inspection of optical connectors using specific tools and materials that have been proven to be effective in the assembly and testing of optical transmission equipment.

> **Important!** It is critical that connector faces are clean and free from particular contamination to assure proper performance and reliability of lightwave systems. With the modern high speed, high power, and wider bandwidth optical transmission systems, clean connectors along the optical path are essential for successful operation.

Required equipment

The following table lists required and recommended equipment for proper cleaning:

Product	Model/ Description	Comcode	ITE #	Installation Order #
Optical Fiber Scope	Noyes OFS 300-200X	408197028	ITE-7129	33712900
2.5mm Universal adapter cap	For use with the Noyes OFS 300-200X	408197044	ITE-7129D1	33712901
1.25mm Universal adapter cap	For use with the Noyes OFS 300-200X	408197069	ITE-7129D2	33712902
Video Fiber Scope1	Noyes VFS-1	TBD	TBD	TBD
Individual presat-urated alcohol wipes	99% pure isopropyl alcohol	901375147	ITE-7136	33713600
CLETOP Cleaning Cassette	Type A Reel	901375154	ITE-7137	33713700

Product	Model/ Description	Comcode	ITE #	Installation Order #
CLETOP Cleaning Cassette Replacement Reel	Type A Reel	901375014	ITE-7137 D1	33713701
Luminex Stick port cleaners	1.25 mm	901375030	ITE-7134	33713400
Luminex Stick port cleaners	2.5 mm	901375022	ITE-7135	33713500
Luminex Cloth	5.5” x 5.5”	408201226	R6033	23603300
Note 1: This equipment may not be necessary at all locations. It is to be used when the ports need to be verified for cleanliness. If care is exercised when cleaning fibers, the video scope may not be needed. *Note 2:*The equipment and material listed above has been tested and is proven effective when used in conjunction with this procedure. Substitution of equipment or materials is at the discretion of the user and is not recommended				

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

WARNING

Alcohol is flammable and is harmful if swallowed, inhaled or absorbed through the skin. Keep alcohol away from heat, sparks, or flame. Avoid contact with eyes, skin and clothing.

CAUTION

Equipment damage

When handling optical pigtails of jumpers, keep bending radius as large as possible.

Related information

A course on connector cleaning and the connector inspection process is now offered through Lucent Technologies Learning and Performance Center, Course Code: LMC200H "*Understanding Fiber Optic Cleaning, Inspection and Testing*." To learn more about this course, consult your local Lucent Account Representative.

The procedure that follows utilizes the "Wet/Dry" method for connector cleaning. This method first applies a "wet" solvent such as high purity alcohol to the connector endface to dissolve/remove any organic particulate or oily films, followed by a "dry" double clean wipe using the CLETOP cleaning cassette.

This procedure is recommended for connector ferrules 2.5 mm and 1.25 mm in diameter associated with ST, SC, FC, and LC connectors. The ferrule of a fiber optic connector consists of a ceramic or stainless steel cylinder with a hole located longitudinally down the center of its axis, allowing enough tolerance for a fiber to pass through.

All optical connectors should be cleaned prior to being connected. Keep the protective ferrule dust cap on the connector until initiating the cleaning process.

Task The following cleaning procedure is acceptable for field service/ installation activities.

. . . . . .

1 Remove the dust cap from the connector ferrule, thus exposing the connector endface

. . . . . .

2 Open an individual foil packet of pre-saturated isopropyl alcohol (99% pure) wipe.

Grasp the connector housing and place the connector ferrule endface perpendicular to the alcohol wipe

Drag it against the wipe three (3) times in a figure eight pattern. This action applies the alcohol solvent to the endface and initially loosens and scrubs away organic/solid contaminates.

. . . . . .

3 If a CLETOP cassette cleaner is not available, proceed to Step 7. Otherwise, hold the CLETOP cassette cleaner in the palm of your hand with the cassette shutter door facing up.

Rotate the cassette lever all the way down with your thumb. Do not release the lever. The lever advances the “dry” Luminex cleaning cloth inside the case and simultaneously opens the shutter. The CLETOP cassette shutter door is now open and ready for cleaning the connector.

4 Insert and press the connector ferrule endface perpendicular against the cleaning cloth in the first of two slots of the cleaner.

Refer to the figure in "Connector inspection" (11-56)

Drag it down (in the direction indicated by the arrows on the cleaner). Make certain not to release the lever of the cassette.

5 Lift the connector from the first slot and rotate it 90 degrees and repeat the downward motion using the second slot. Be sure the ferrule is pressed snug against the cleaning cloth while dragging the ferrule to assure the proper cleaning action.

6 Release the cassette lever allowing the shutter door to close to its initial position. Proceed to Step 8.

7 Wrap a Luminex cleaning cloth around the ferrule and rotate the connector housing, cleaning the outside periphery of ferrule.

Follow this by folding an unused portion of the cloth over the end of the ferrule endface and then with light pressure from the thumb, slightly drag the cloth from the center of the ferrule to the edge while rotating the connector 360 degrees. If the Luminex cleaning cloth is not available, a lint free cleanroom optic wipe can be used. The Luminex cleaning cloth is washable and can be used multiple times, optic wipes are single use and disposable.

8 Inspect the connector for cleanliness. If necessary, repeat the cleaning process.

Proceed to "Connector inspection" (11-56)

END OF STEPS

Connector inspection

WARNING

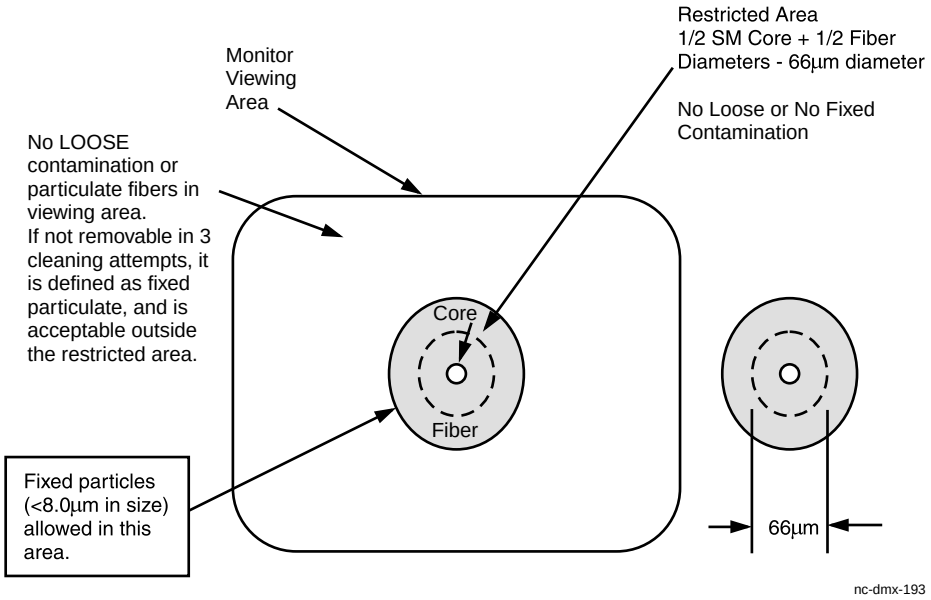
Eye damage

When using an optical power meter to verify the connector and fiber to be clean, take special precaution to make sure the no power is being emitted from the fiber before viewing.

After cleaning the connector, inspect the ferrule endface to ensure that it is free from any particulate contamination using an optical fiber inspection scope of at least 200X magnification. When using an optical fiber scope (for example, the Noyes OFS 300-200X) exercise extreme caution to assure fiber being examined is de-energized.

1 Follow the instructions in the manual provided with the Optical Fiber Scope to view the ferrule endface of the fiber under inspection.

2 The visual area of the ferrule endface (ferrule and fiber) as observed by the inspection system/scope should be free of any contaminates.



Repeat the Cleaning Procedure if the fiber endface does not meet the following requirements:

- No fixed type of contamination (contaminates that remain at the same location after 3 wet-dry cleaning cycles), regardless of size, is allowed in the restricted area of the glass fiber endface.

  Important: The restricted area is defined as ~66 microns (µm) diameter for both singlemode and multimode fibers.
- No chips, cracks or scratches are allowed near the core of the glass fiber endface.
- No large floating (loose) contaminates are allowed on the glass fiber and ceramic ferrule endface.

3 After the connector has been verified to be cleaned, it should be immediately inserted into the adapter buildout of the optical component. This will assure maximum cleanliness and effectiveness of the connector.

4 If the cleaned connector can not be immediately connected to a corresponding adapter, the connector ferrule must be protected with a connector dust cap. Before placing the cap on the ferrule, make sure the cap is clean. This can be accomplished by inserting a CLETOP stick cleaner (swab) of the same inside diameter as the cap (either 2.5 or 1.25 mm) and rotate the stick 360 degrees three (3) times. Following this procedure, carefully place the cap over the ferrule. When the cleaned connector is ready for assembly, it should be re-inspected for cleanliness prior to connection.

END OF STEPS

Fiber adapters/circuit pack connectors

CAUTION

Equipment damage

Do not attempt to clean ports equipped with yellow lightguide buildout (LBO) attenuators. Attenuators contain a thin glass lens that is extremely fragile. The LBO will be damaged if cleaned using this method.

During testing and/or trouble shooting activities it may be necessary to clean the optical buildout adapter or the circuit pack connector. The following procedure is recommended

1 Using the appropriate CLETOP stick cleaner (2.5 mm for SC, ST, and FC connectors, 1.25 mm for LC connectors) dampen the stick cleaner with Ethyl alcohol using the alcohol wipe. Insert the stick cleaner into the adapter rotating the stick 360 degrees while inserting. Push/rotate stick until the stick cleaner makes contact with the connector. Apply slight pressure upon contact and rotate stick 360 degrees at least three (3) times.

2 Remove the stick cleaner rotating it upon removal.

3 Using a dry CLETOP stick cleaner of appropriate diameter, repeat the above cleaning procedure. This procedure will clean the side walls of the adapter and the endface of the circuit pack connector.

4 Gently insert the Video Fiber Scope probe into the port until the fiber ferrule comes into view.

5 Verify that the fiber ferrule is clean. Repeat Step 1 through Step 3 if the fiber does not meet the requirements specified in "Connector inspection" (11-56).

END OF STEPS

Task 409: Replace Defective Fan Unit

Purpose

Use this task to replace a fan unit.

Required equipment

The following equipment is required:

- Wrist Strap
- Small phillips-head screwdriver
- Small flat-blade screwdriver

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see Chapter 3, "Operations Interfaces" in this document.

Before you begin

Ensure that the replacement fan unit is the same type as the original fan unit.

Task

Complete the following steps to replace the fan unit.

1 Unscrew screw locks and disconnect power and alarm cable from fan unit on the Metropolis® DMX shelf or the Metropolis® DMX high capacity shelf.

2 Back out the screws securing the fan unit.

Figure 11-6 illustrates the location of the screws on the Metropolis® DMX shelf.

Figure 11-6 Metropolis® DMX Fan Unit Screws

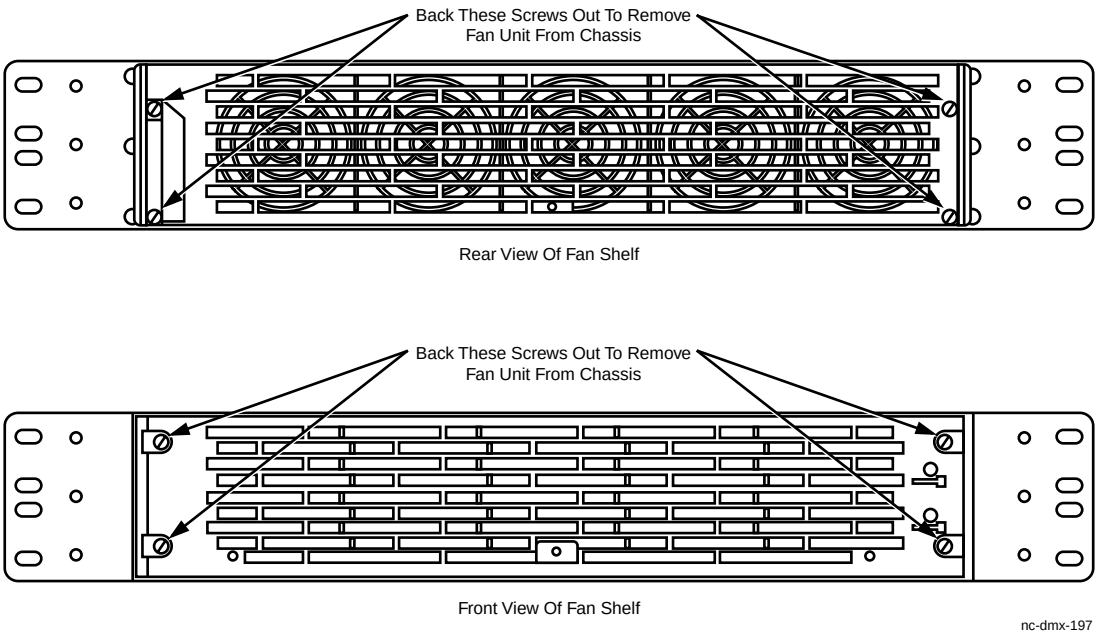
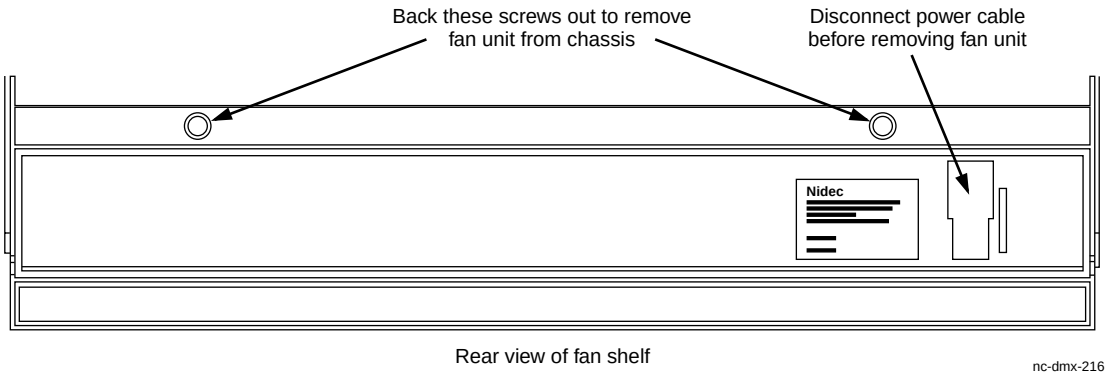


Figure 11-7 illustrates the location of the screws on the Metropolis® DMX high capacity shelf.

Figure 11-7 Metropolis® DMX High Capacity Shelf Fan Unit Screws



3 Slide the old fan unit out from the fan chassis.

4 Slide the new fan unit back into the fan chassis. Tighten all screws located in the front and back of the fan unit for the Metropolis® DMX shelf or the Metropolis® DMX high capacity shelf.

Hand tighten the #4 steel thread fasteners until “snug tight” and then 1/2 turn with a wrench/screwdriver (torque should be approximately 8 in.-lb.).

5 Reconnect the power and alarm cable to the back of the fan shelf on the Metropolis® DMXshelf or the Metropolis® DMX high capacity shelf.

END OF STEPS

Task 410: Reserved for Future Use

Task 411: Install/Remove LC Lightguide Buildouts (LBOs)

Purpose

Use this task to install or remove an LC lightguide buildout (LBO).

> **Important!** All LC LBOs should be cleaned before making initial connections or reconnections per "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51). Only the components being assembled at this time should be cleaned.

Required equipment

A wrist strap is required to perform this task.

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

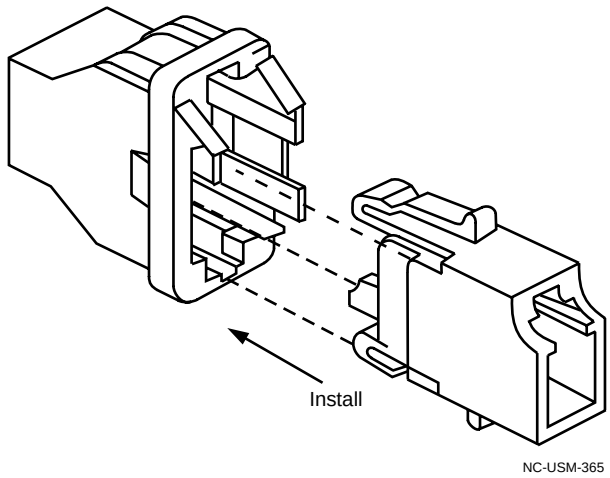
For related information, see the *Metropolis® DMX Access Multiplexer Applications and Planning Guide, 365-372-300*.

Task Complete the following steps to install or remove an LC lightguide buildout (LBO).

. . . . . .

1 Remove the protector caps and plugs (if equipped) from the LC LBO and the dual adapter, and store them in a clean container.

Figure 11-8 LC LBO



. . . . . .

2 Is LC LBO being installed or removed?

IF the LC LBO is being...	THEN...
Installed,	Continue with Step 3.
Removed,	Proceed to Step 5.

. . . . . .

3 Align the LBO with the slot in the adapter, depress locking tab, and push the LBO into the dual adapter until a click is heard. The LBO is now locked into position.

. . . . . .

4 STOP! END OF TASK

5 Depress the locking tab on the LBO and pull the LBO out of the dual adapter.

CAUTION

Equipment damage

The locking tab must only be pushed along a line perpendicular to the LBO body in the direction towards the LBO in order to avoid damage to the locking tab.

END OF STEPS

Task 412 and 413: Reserved for Future Use

Task 414: Perform End-to-End Optical Line Test on Function/Growth OLIUs

Purpose

Use this task to verify the integrity of the OC-3/OC-12/OC-48 fiber lines between two Metropolis® DMX shelves.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

WARNING

Eye damage

Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with optical instruments. Avoid direct exposure to the beam.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 4, "Synchronization Interfaces"

Before you begin

Before you begin this task, verify that the WaveStar® CIT is available for this test.

Important! It is assumed that each Metropolis® DMX has passed the local (looped) transmission tests. If these tests have not been completed, refer to the appropriate task and perform the tests.

Task

Complete the following steps to perform the optical line test.

1 Connect the PC and establish a WaveStar® CIT session.

Important! This test must be performed locally at each Metropolis® DMX shelf location associated with the optical span(s) being tested.

Reference: "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3)

2 Enter the **Performance > Initialize PM Registers> Both** command, if allowed.

CAUTION
Service affecting

This step initializes (clears) all current day and/or all current quarter-hour performance-monitoring storage registers.

Important! If local tasks prohibit you from doing the **Performance >Initialize PM Registers >Both** command, you may perform the following in Step 4 and Step 5. Use the **Performance >Reports >OCn Line** command to obtain the line performance monitoring status report, note the readings on the current time line in the report, wait 20 seconds and then obtain another report. There should be no change in readings from the first report.

3 Wait 20 seconds.

. . . . . .

4 From the menu bar select **Performance > Reports > OCn Line**. This will result in producing the screen titled *OCn Line PM Parameters Selection.* Select the OC-3/OC-12/OC-48 Port.

Result: These reports will indicate the status of the equipment.

. . . . . .

5 Has performance-monitoring report been obtained from all shelf locations associated with optical span(s) being tested?

If...	Then...
Yes	Proceed to Step 7.
No	Continue with Step 6.

. . . . . .

6 Repeat this task from Step 1 through Step 5 at other locations.

. . . . . .

7 Did reports indicate any errors?

If...	Then...
Yes	Continue with Step 8.
No	STOP! END OF TASK.

8 Trouble may be in optical and/or fiber connections. Trouble may also be in OLIUs. If report indicated trouble when the report was obtained from the near end of the span, trouble may be in the receive direction. 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

Reference: "Task 408: Clean Optical Fibers, Dual LC Adapters and LC Lightguide Buildouts (LBOs)" (11-51).

If no trouble found in the optical fibers, replace OLIU(s) associated with the address indicated in the report.

END OF STEPS

Task 415: Perform EC-1 Transmission Test

Purpose

Use this task to perform an EC-1 transmission test at a stand-alone (Main OLIUs optically looped) Metropolis® DMX shelf or in a Metropolis® DMX network.

Required equipment

The following equipment is required:

- Personal Computer (PC) with WaveStar® CIT software installed
- Wrist Strap
- EC-1 SONET Test Set

Safety precautions

To assure both personal safety and the proper functioning of the Metropolis® DMX, it is imperative to review and understand these warnings and precautions prior to performing this task.

CAUTION

Electrostatic discharge

Use a static ground wrist strap whenever handling circuit packs or working on a system to prevent electrostatic discharge damage to sensitive components. See "Electrostatic discharge" in "About this Information Product".

Related information

For related information, see the following:

- Chapter 2, "Platform Description"
- Chapter 5, "Provisioning, Security, & Administration"

Before you begin

Before you begin this task:

1. Obtain the work instructions for this task and note the assigned AIDs.
2. Verify that the WaveStar® CIT is connected and logged in to the Metropolis® DMX.

   Refer to "Task 200: Connect Personal Computer (PC) and Establish WaveStar® CIT Session" (9-3) if necessary.
3. Verify that the EC-1 port parameters have been provisioned correctly (using the **View>View Equipment Details...** command) at the terminating Metropolis® DMX shelf(s) of the circuit being tested. If required, use the **Configuration>Provision** to make EC-1 port provisioning changes.

When this procedure is being used to perform EC-1 transmission tests in a Metropolis® DMX network, it is assumed that the complete end-to-end system has already been tested and that only a particular EC-1 port is being tested at this time.

In end-to-end testing, one shelf is 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.

Task

Complete the following steps to perform the EC-1 transmission test.

. . . . . .

1 Make/verify that the proper STS-1 cross-connections have been made for the EC-1 circuit to be tested, as required.

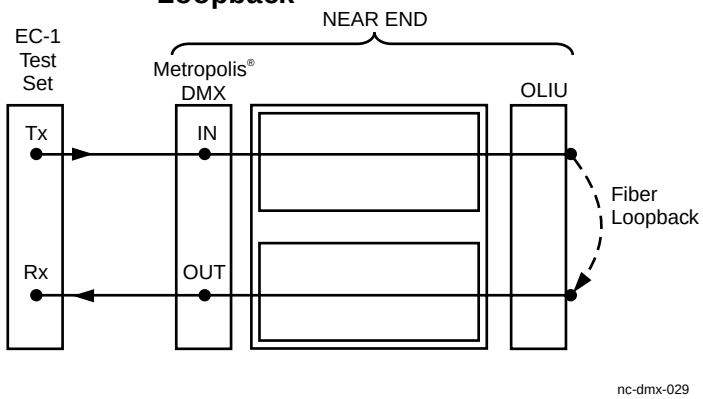
Important! Proper cross-connections must be made at each shelf (including stand-alone shelves) to establish the continuity for the path of the EC-1 circuit being tested.

Reference: "Task 317: Make VT1.5 or STS-n Cross-Connections, Single OC-48/OC-192 UPSR Ring Configuration" (10-137)

2 If stand-alone tests are being performed, the fiber loopbacks at the Main OLIUs must be in place.

Figure 11-9 illustrates a near-end shelf with OLIU loop back:

Figure 11-9 Standalone EC-1 Transmission Test with OLIU Loopback



If end-to-end tests are being performed, connect a patch cord from the OUT jack to the IN jack at the far-end DSX-3 (or other EC-1 interface) associated with the EC-1 circuit to be tested.

Figure 11-10 illustrates a far-end shelf with DSX loopback:

Figure 11-10 End-to-End EC-1 Transmission Test with DSX Loopback

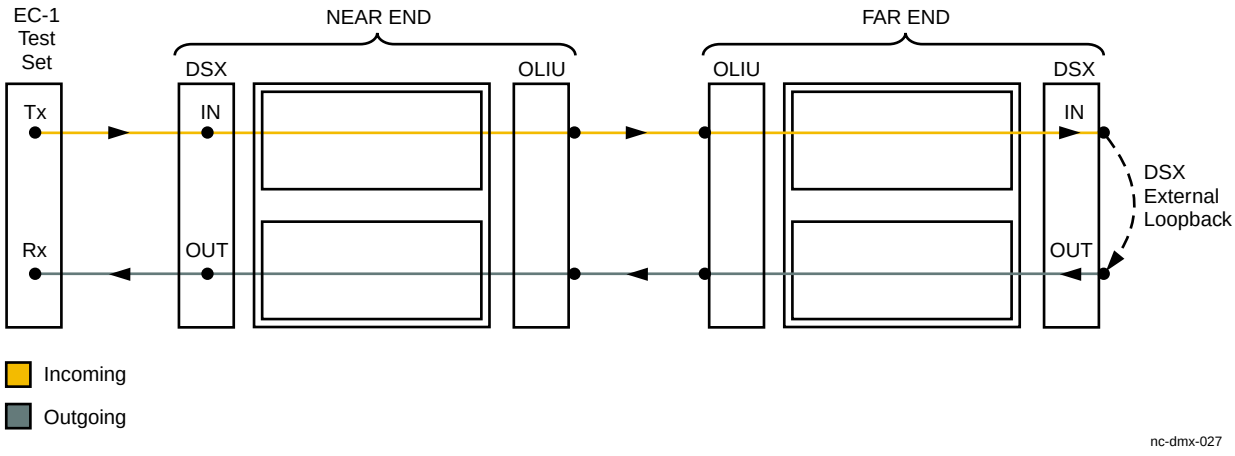
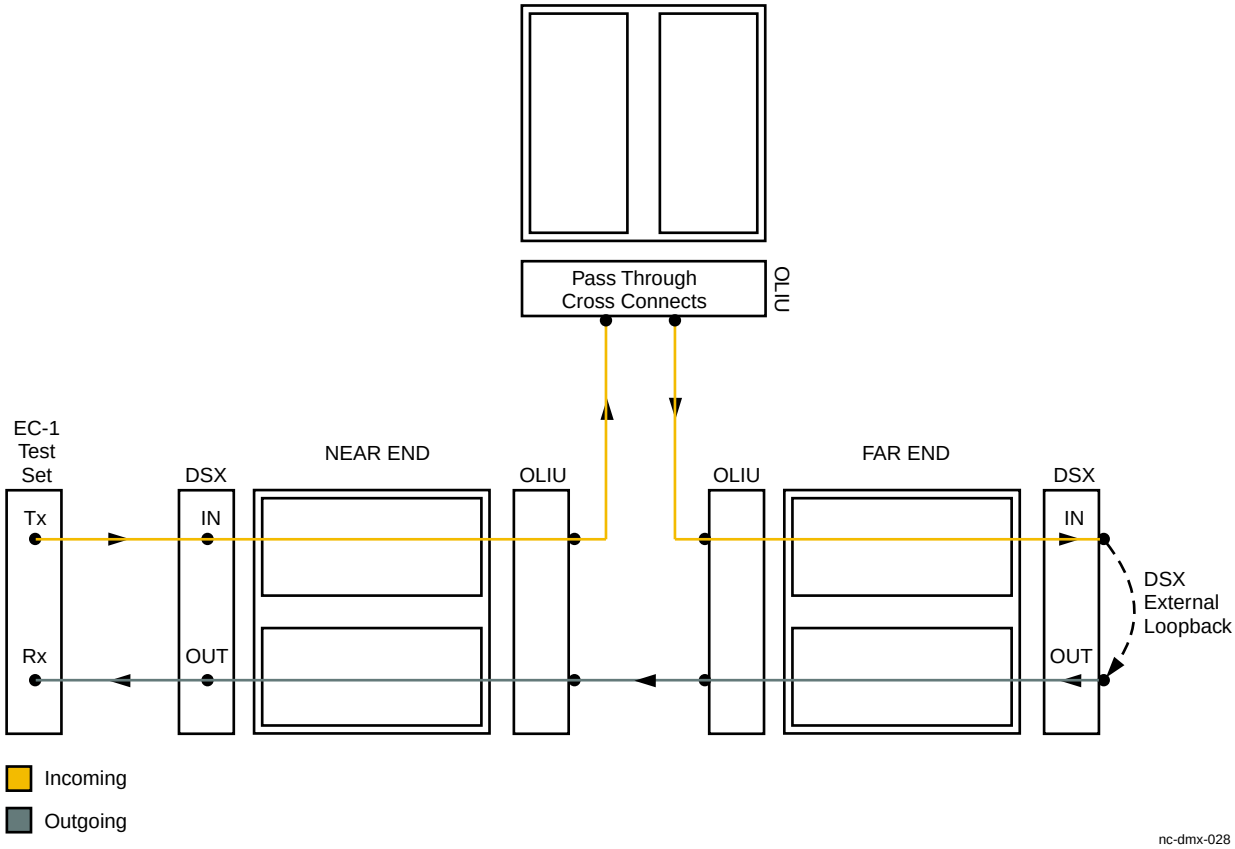


Figure 11-11 illustrates a three node ring with DSX loop back:

Figure 11-11 End-to-End EC-1 Transmission Test for Multi-Node Ring with DSX Loopback



Reference: “Task 400: Connect OLIU Optical Loopbacks” (11-3)

. . . . . .

3 At the near-end, connect the EC-1 test set to the corresponding port to be tested on the DSX patch panel and apply a EC-1 test signal.

. . . . . .

4 Was the test successful (error free)?

If...	Then...
Yes	Continue with Step 5.
No	Proceed to Step 24.

5 Are you performing this test for a stand-alone (Main OLIUs optically looped) Metropolis® DMX shelf or for end-to-end testing within a multi-node Metropolis® DMX network?

If...	Then...
Stand-alone test	Continue with Step 6.
End-to-end test	Proceed to Step 14.

6 Is the protection slot associated with the EC-1 circuit under test equipped with a companion 12DS3/EC1 circuit pack?

If...	Then...
Yes	Continue with Step 7.
No	Proceed to Step 9.

7 Use the **Fault>Protection** Switch command to switch from the service circuit pack to the protection circuit pack. This may cause a hit and register some errors during the switch.

8 Was the switch successful (recovered error free)?

If...	Then...
Yes	Continue with Step 9.
No	Proceed to Step 24.

9 If required, disconnect the EC-1 test set from the DSX-3.

> **Important!** Unterminated EC-1 circuits require a 75 ohm termination or loopback at the DSX to prevent incoming alarm indications.

10 In the System View screen, click on the **Update Alarms** button to retire any existing alarms caused by this procedure.

11 Repeat Step 1 through Step 10 for each EC-1 circuit to be tested.

12 Delete the cross-connections entered to perform this procedure.

Reference: "Task 311: Discontinue End-to-End DS3 or EC-1 Service" (10-107)

13 STOP! END OF TASK.

14 Use the **View >Protection Switch** command to determine the active path.

15 Use the **Fault >Protection Switch** command to switch the path of the circuit under test to the other ring. This may cause a hit to the test signal and register some errors during the switch.

16 Use the **View >Protection Switch** command to verify the protection switch.

17 Was the protection switch successful (recovered error free)?

If...	Then...
Yes	Continue with Step 18.
No	Proceed to Step 26.

18 At the near-end, disconnect the EC-1 test set from the DSX-3 panel, if required.

19 At the far-end, release the *terminal* loopback using the **Fault >Loopback** command, or remove the patch cords at the DSX-3 panel for the circuit under test.

20 In the System View screen, click on the **Update Alarms** button to retire any existing alarms caused by this procedure.

21 If required, return to Step 1 and repeat this procedure for each EC-1 circuit to be tested.

22 Delete any cross-connections entered to perform this procedure.

Reference: "Task 311: Discontinue End-to-End DS3 or EC-1 Service" (10-107)

23 STOP! END OF TASK.

24 Has the 12DS3/EC1 circuit pack that failed this test been replaced?

If...	Then...
Yes	Proceed to Step 26.
No	Continue with Step 25.

25 Replace the 12DS3/EC1 circuit pack and repeat this procedure.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

26 Trouble may be in the DSX cross-connect wiring, T3 interface wiring, STS-1 cross-connections in the ring network, or the shelf backplane.

Reference: *Metropolis® DMX Access Multiplexer Alarm Messages and Trouble Clearing Guide, 365-372-302*

END OF STEPS

Appendix A: WaveStar® CIT Tutorial

Overview

Objectives

This tutorial shows, through a series of exercises, the features of the WaveStar® CIT software. It is strongly recommended that this tutorial only be used with a Metropolis® DMX Access Multiplexer that is **out of service**.

This tutorial provides introductory information for new personnel about using the WaveStar® CIT. After completing this tutorial, the user will know:

1. How to log in to the WaveStar® CIT
2. How to determine user security privileges
3. How to recognize the WaveStar® CIT, System View, Cut Through, and Command Builder screens.
4. How to determine which WaveStar® CIT software release is running on the PC
5. How to determine which network element (NE) software release is running on the NE
6. How to determine which NE software releases are supported by the WaveStar® CIT
7. How to view a shelf
8. How to access help information
9. How to view parameter defaults

10. How to provision a parameter
11. How to view and interpret an NE alarm list

How to use this tutorial

It is strongly recommended that users start at the beginning of this tutorial and complete each task in sequence until the last task is completed. Many tasks require that certain functions have previously been completed before the task can be performed. For example, before you can provision cross-connections, you must be logged in to the WaveStar® CIT.

Related information

Metropolis® DMX Access Multiplexer *Software Release Description*

Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306

Contents

This appendix provides the following information topics.

WaveStar® CIT Overview

Minimum hardware and software requirements

For detailed information about the minimum hardware and software requirements for the WaveStar® CIT, refer to the applicable *Metropolis® DMX Access Multiplexer Software Release Description.*

System Administration

The system administrator installs the WaveStar® CIT software and provisions the operating environment for other users.

The system administration functions include:

- Assigning login IDs
- Assigning an initial password for each login ID
- Customizing the access privileges and security attributes for each login ID.

The WaveStar® CIT system administrator can customize the access privileges and security attributes on a per login ID basis. This allows centralized operation, decentralized operation, or a combination of both.

Cable connections

The WaveStar® CIT connects to the WaveStar network element using the following different physical connection arrangements:

- A LAN 10BaseT cross-over cable is used to connect the WaveStar® CIT LAN port directly to the **CIT LAN** connector on the SYSCTL circuit pack faceplate.
- A LAN 10BaseT cross-over cable is used to connect the WaveStar® CIT LAN port directly to the **J16 IAOLAN** connector on the Metropolis® DMX shelf backplane.
- The CIT cable assembly (848748869) is used to connect the WaveStar® CIT serial port directly to the **CIT RS232** connector on the SYSCTL circuit pack faceplate.

To install the cables, refer to the *Metropolis® DMX Access Multiplexer, Installation Manual, 365-372-304*.

Important! In this tutorial, it is assumed that the WaveStar® CIT cables are already installed.

Default login IDs

The WaveStar® CIT has two default/system logins: LUC01 with password LUC+01, and LUC02 with password LUC+02. (The default/system login IDs can be changed by the user.) Additional logins can also be created. To create additional logins, refer to "Task 202: Enable or Lockout System Security and/or Edit, Delete, or Enter a User's Login" (9-15).

Login sessions

The WaveStar® CIT supports one active login session at a time (one active WaveStar® CIT screen). From the single active WaveStar® CIT screen a user can establish only one login session to a particular network element. However, a user can establish multiple simultaneous logins to different network elements. Users can log in to a new network element without logging out from another network element.

WaveStar® CIT installation

To install the WaveStar® CIT software, refer to the applicable *Metropolis® DMX Access Multiplexer Software Release Description*.

> **Important!** In this tutorial, it is assumed that the WaveStar® CIT software is already installed on the PC. If your PC is running a different software release and/or build number of WaveStar® CIT software, there may be some differences between the screens shown in this tutorial and what is displayed on your PC.

Metropolis® DMX software installation

To install the Metropolis® DMX software, refer to the applicable *Metropolis® DMX Access Multiplexer Software Release Description*.

> **Important!** In this tutorial, it is assumed that the Metropolis® DMX software is already installed on all NEs within the subnetwork. If your PC is running a different software release of Metropolis® DMX software, there may be some differences between the screens shown in this tutorial and what is displayed on your PC.

Apply and OK buttons

The **OK** button is used to execute the selected action and close the screen.

The **Apply** button is used to execute the selected action and return to the screen for further provisioning. If no further provisioning is desired and the **OK** button is used, the command is executed again and the screen is closed.

The **Close** button is used to close the screen without executing any commands.

Log in to the WaveStar® CIT and NE

Login to WaveStar® CIT screen

Perform the following to access and log in to the WaveStar® CIT.

1 At the Windows NT desktop, use the mouse to select **Start-Programs-WaveStar CIT-WaveStar CIT**. Or, double-click on the WaveStar® CIT icon that was created when the WaveStar® CIT software was installed.

Result: The *Login to WaveStar CIT* screen appears. (Refer to Figure A-1). If your PC is running a different software release and/or build number of WaveStar® CIT software, there may be some differences between the screens shown in this tutorial and what is displayed on your PC.

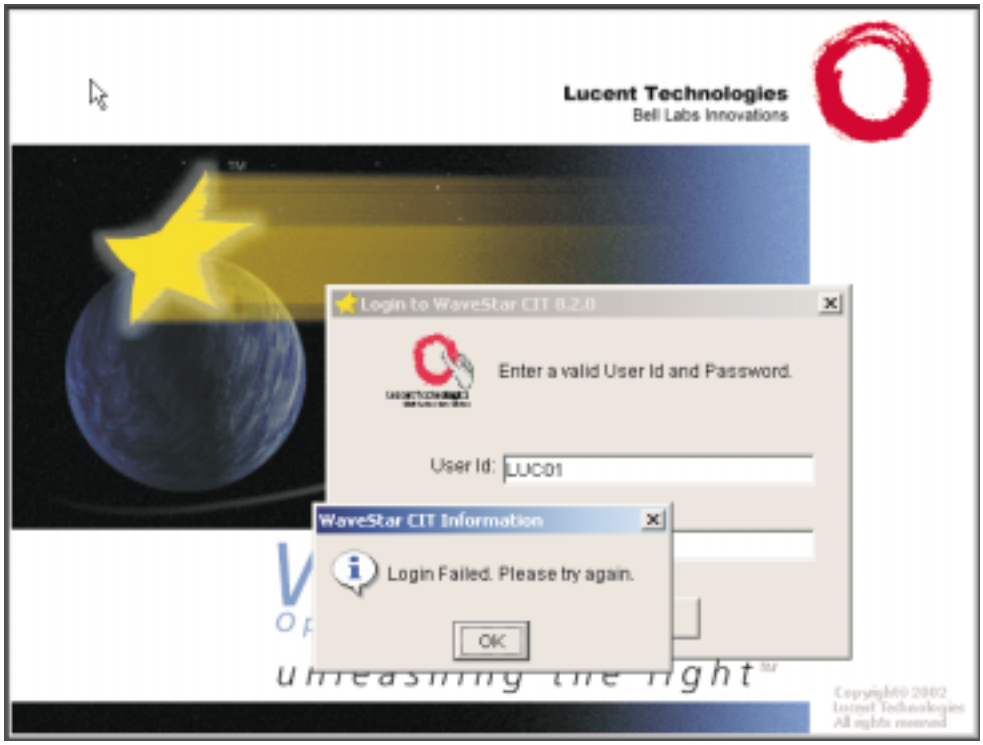
Figure A-1 Login to WaveStar® CIT Screen

2 Click in the **User Id:** field and enter a valid login (obtained from the system administrator).

3 Click in the **Password:** field and enter an incorrect password. Click on **OK**.

Result: The Login Failed message appears. (Refer to Figure A-2.) The password entered did not match the password in the database.

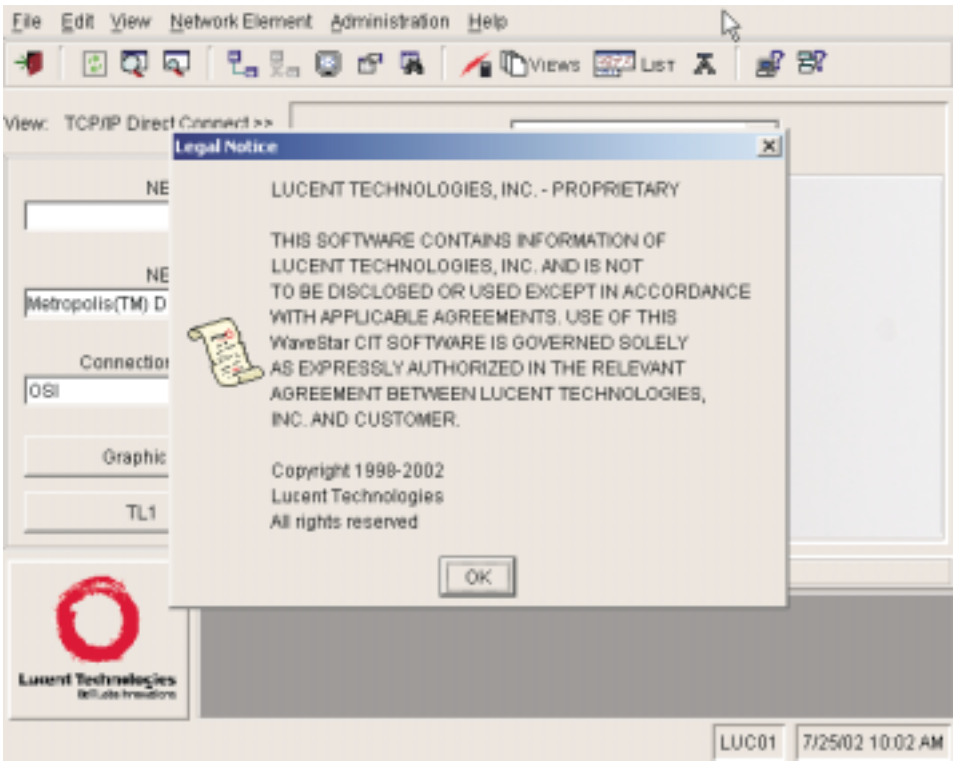
Figure A-2 Login Failed Message



4 Click on **OK**, then click in the **Password**: field and enter the correct password.

Result: The WaveStar® CIT screen and the Legal Notice appear. (Refer to Figure A-3.)

Figure A-3 WaveStar® CIT Screen and Legal Notice



5 Read the Legal Notice and click on **OK** to continue.

Result: The WaveStar® CIT screen appears. (Refer to Figure A-4.)

END OF STEPS

WaveStar® CIT screen

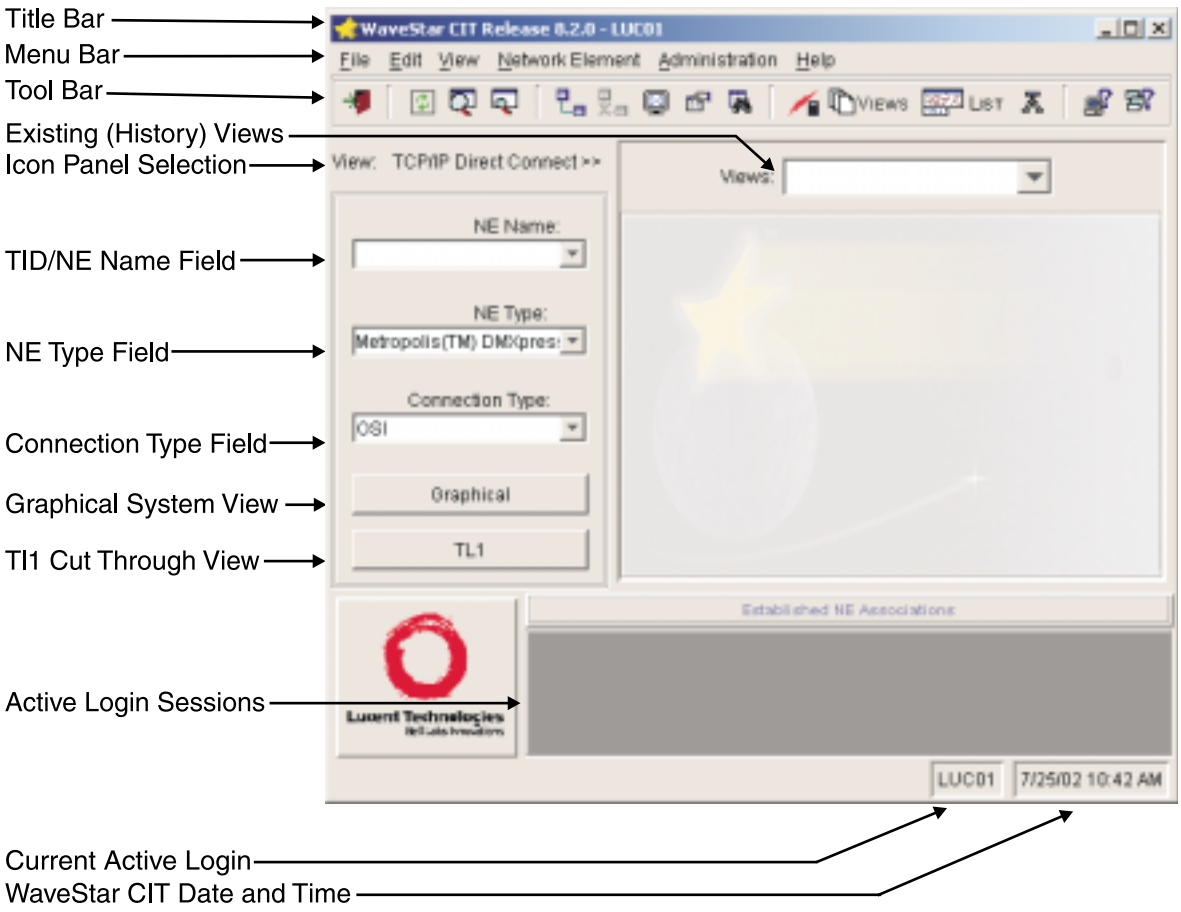
Important! The WaveStar® CIT has a menu bar across the top of the screen, a toolbar immediately below the menu bar, and status indicators across the bottom of the screen. Each item on the menu bar has a pull-down menu. Some menu items have additional submenu items.

The WaveStar® CIT is designed to MicroSoft Windows standards.

1 Observe the WaveStar® CIT screen, toolbars, and status indicators. (Refer to Figure A-4.)

Important! If your PC is running a different version of WaveStar® CIT software, there may be some differences between the screens shown in this tutorial and what is displayed on your PC.

Figure A-4 WaveStar® CIT Screen



2 The WaveStar® CIT screen supports tool-tips. To determine the meaning of a toolbar item, place the cursor over that item, hold for two seconds, and its name/function is displayed. Repeat for all items on the toolbar.

Important! In the Figure A-4, the *WaveStar® CIT Time and Date* field is the WaveStar® CIT Time and Date. The WaveStar® CIT time/date is separate from an NE time/date. Changing an NE time/date does not change the WaveStar® CIT time and date.

3 Observe the WaveStar® CIT screen menus and submenus. (Refer to the following table.)

Important! Some menu items have an associated shortcut keys. For example, the shortcut key for Graphical is Ctrl+T.

Menus	Submenus
File	Save Setting Login as New User... Exit
Edit	Copy Icon(s) To>
View	Refresh OSI View Ctrl+R Large Icons Small Icons Arrange Icons> NE Name NE Type Preferences...
Network Element	Graphical... Ctrl+T TLl... Ctrl+U Disconnect from NE... Disconnect from All NEs FSTS Find... Ctrl+F Properties... Ctrl+P

Administration	View CIT Administration... Change Password... Security> View User Logins User Provisioning Change Superuser Login ID Prepare PCMCIA Disks... Data Communications... Serial COM Selection... Address List... Administer Views... Defaults... Auto Router Discovery... FTP Administration... SDS Administration...
Help	About WaveStar® CIT Help, Contents, Index & Find Ctrl+L Supported NEs

END OF STEPS

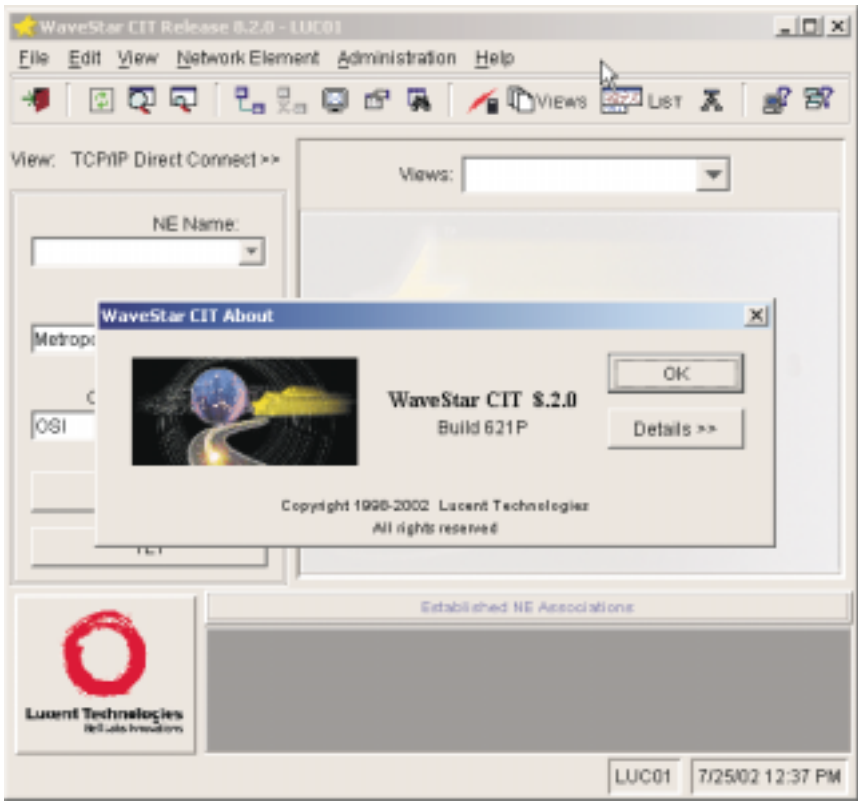
Identify the WaveStar® CIT software release and supported NE types

Perform the following to identify the WaveStar® CIT software release.

1 Using the mouse, click on the menu item **Help>About WaveStar CIT**.

Important! The WaveStar® CIT software Release and Build number (BLD####) are displayed. (Refer to Figure A-5.) *Your PC may be running a different software release and/or build number.*

Figure A-5 WaveStar® CIT About Screen



2 Click on **OK** to close the WaveStar® CIT About screen.

Important! The WaveStar® CIT software (depending on whether the installation was a "Custom" or "Full") may function with different types of NEs (for example, Metropolis® DMX, WaveStar BandWidth Manager, and WaveStar 2.5G/10G).

3 Click on **Help>Supported NEs** to obtain a list of NE types the WaveStar® CIT supports.

4 Click on **OK** to close the WaveStar® CIT Information screen.

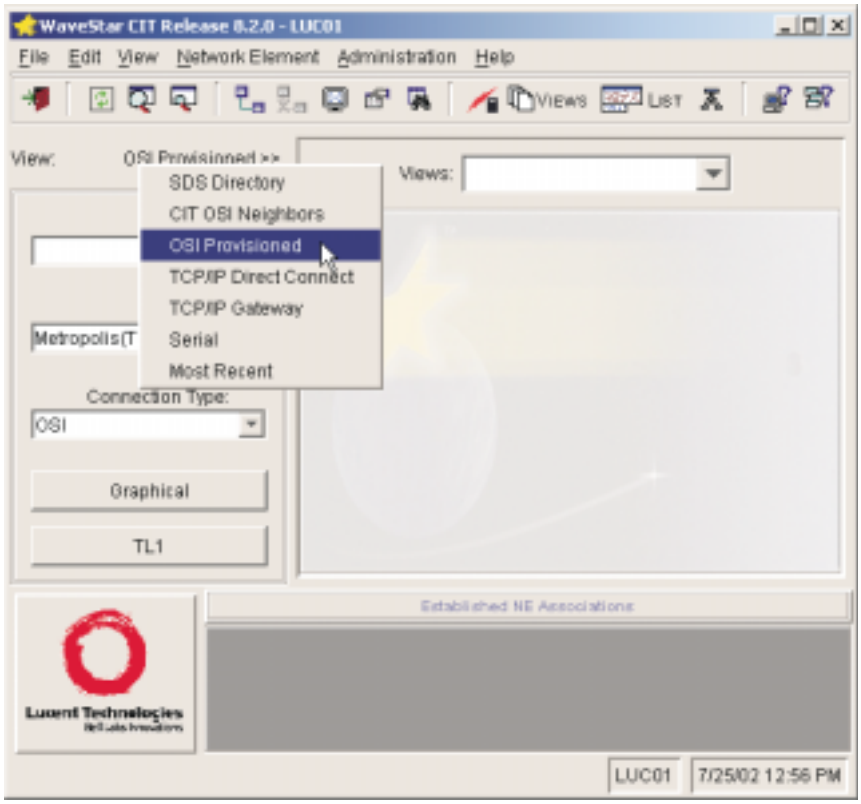
END OF STEPS

Icon Panel Selection button

When the Icon Panel Selection button is selected, displays a drop-down list containing seven different views. The right-hand part of the screen changes to the proper format for the selected view. The drop-down list includes: (a) SDS Directory, (b) CIT OSI Neighbor, (c) OSI Provisioned, (d) TCP/IP Direct Connect, (e) TCP/IP Gateway, (f) Serial, (g) Most Recent.

1 Click on the Icon Panel Selection button and select **OSI Provisioned**. (Refer to Figure A-6.)

Figure A-6 Icon Panel Selection Button



END OF STEPS

Display System View of all NEs within your selected subnetwork

1 Enter the appropriate NE Name/TID in the **NE Name:** field.

> **Important!** This tutorial uses the NE name **dmx**. Your NE name will differ. This procedure assumes that the WaveStar® CIT is already connected to the network/subnetwork via a LAN.

2 In the **NE Type:** field, click on the drop-down arrow and select **Metropolis®** DMX Access Multiplexer.

3 Verify that **OSI** is displayed in the **Connection Type:** field and click on **Graphical**. The WaveStar® CIT is connected to the NE via the LAN.

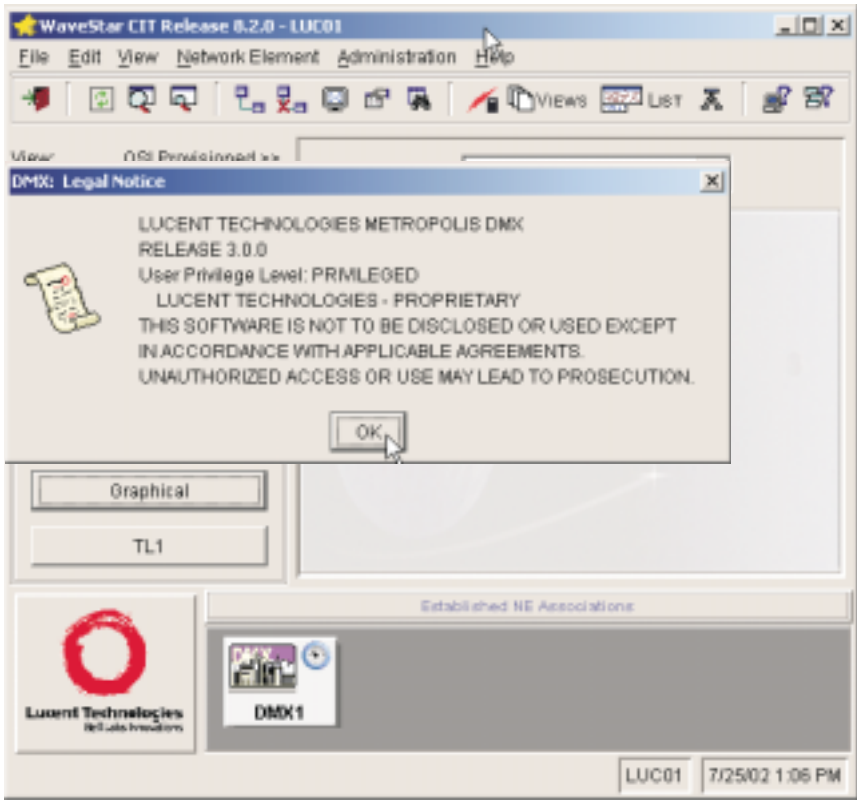
> **Important!** If direct access to the specified TID is denied, then you must enter a valid User ID and password. The default user IDs are LUC01, LUC02, and LUC03. The default password is DMX2.5G10G.

Users are always asked for the login and password with the first NE connection. The login and password can be saved for subsequent connections, but the login and password can not be saved past the current CIT session.

4 After a successful login attempt, the NE Legal Notice screen appears. (Refer to Figure A-7.) Read and observe the software Release (for example, **3.0.0**), and the User Privilege Level (for example, **Privileged**). Click on **OK** to continue.

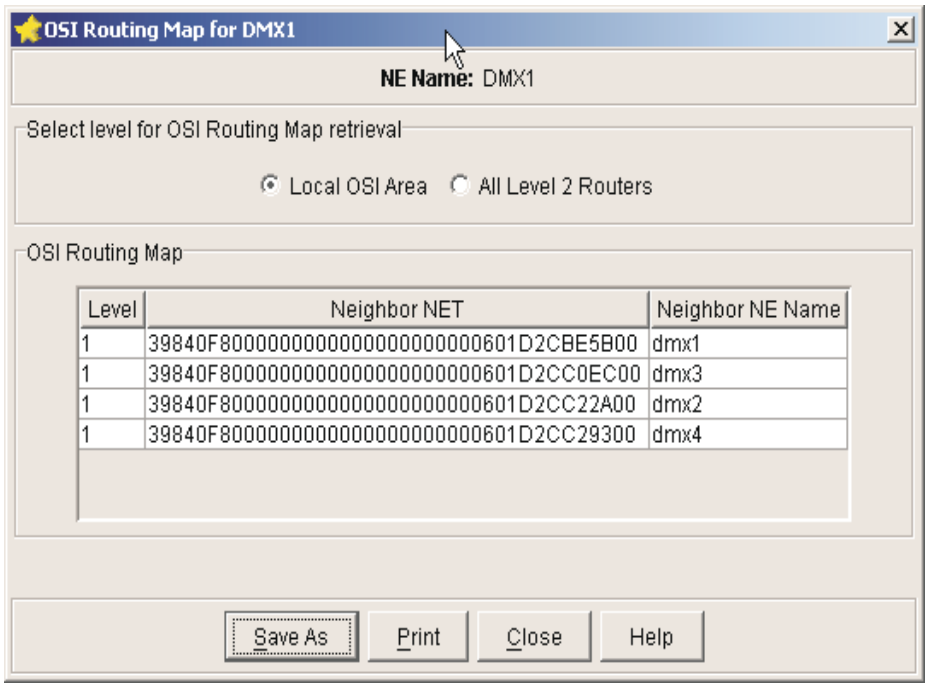
Important! Your NE software Release number and User Privilege Level may be different. Your screen should be similar to Figure A-7.

Figure A-7 NE Level Legal Notice



5 From the menu, select **Administration>OSI Routing Map**. Your screen should be similar to Figure A-8.

Figure A-8 OSI Routing Map for Level 1 Network and Level 2 Subnetworks.



Important! Observe that the *Level 1 area* is the default listing, and (as an option) *Level 2* can also be included/displayed. With this example, only four NEs are listed. Your network may include more NEs and look different. The columns may be resized by dragging and dropping the vertical bar to the left or right of the column header.

6 Click on **Close**.

END OF STEPS

View and Understand the System View Screen

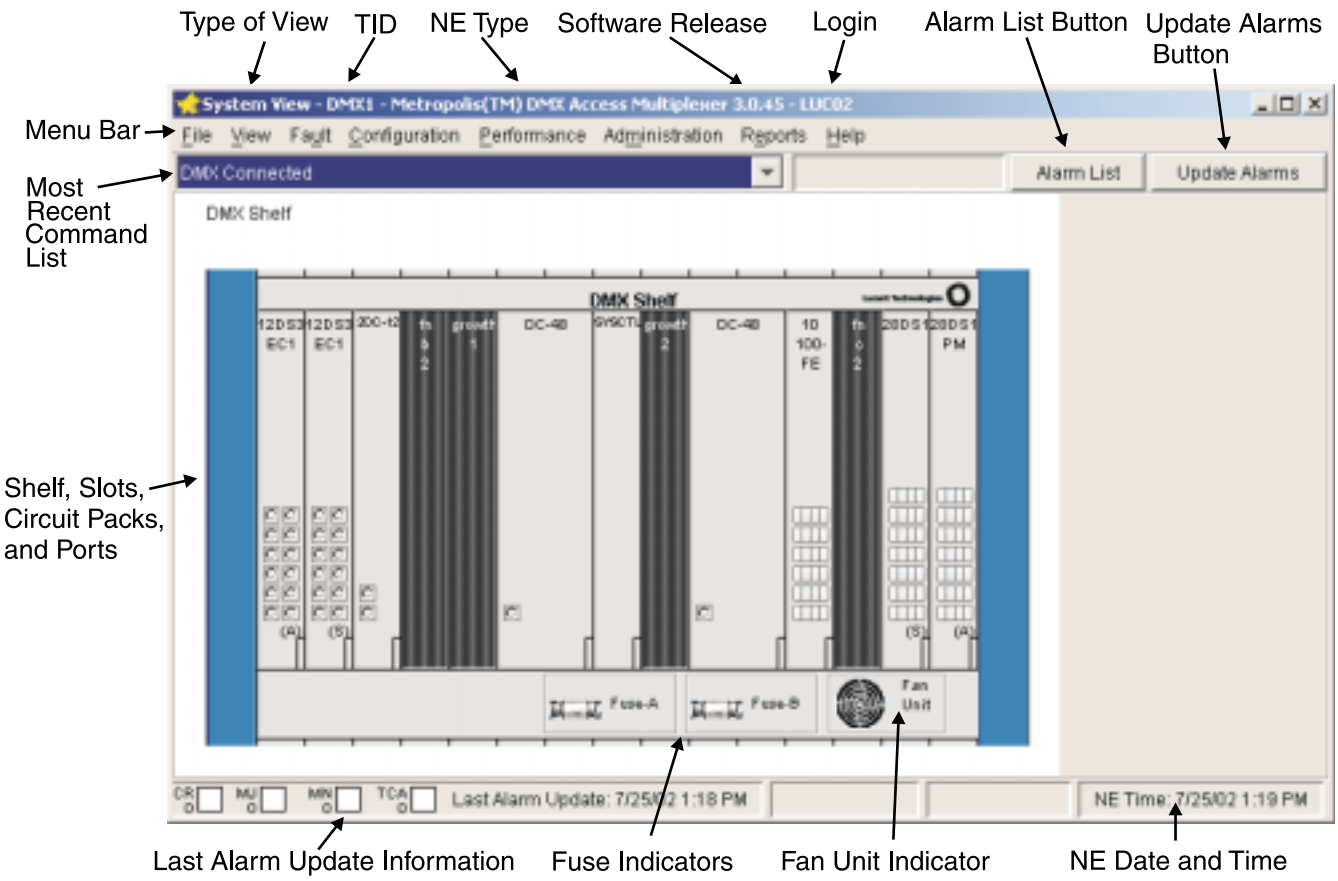
View the NE System View Screen

Important! This series of steps assumes that a successful login has already been established to the desired NE. After a brief time interval the *System View* screen (sometimes referred to as shelf view) is displayed. Thus, there are now two screens: (1) WaveStar® CIT screen, and (2) *System View* screen, displayed.

Important! The *System View* screen shows a graphical representation of the shelf, its circuit packs, and alarms. You can interact with these components by using the cursor. The shelf equipage and alarms may be different for your displayed TID.

1 Observe the System View screen. (Refer to Figure Figure A-9.) *Your software release may be different.*

Figure A-9 System View Screen



Important! Depending on the particular software Release/BLD#### that you are using, there may be some variations in the contents of some menus. If a menu item is visible but "grayed-out" – then (a) that item is not selectable from the current environment, or (b) the lighted-out item may not be selectable at anytime from this particular Metropolis product.

2 Observe the System View screen menus and submenus. (Refer to the following table.)

Menu	Submenus
File	Enable TL1 Logging... Disable TL1 Logging... Set/Change TL1 Logging File... NE Disconnect
View	View Equipment Details... View Rolling Events View Rolling TCA Events Protection... Loopback... Ring Map> Ring Map View Alarms> View Alarm Configuration Cross Connections... DCC Terminations... Data> VLAN Details... LAN (Ethernet) Port... WAN (VCG) Port... Spanning Tree... Virtual Switch... Misc. Discretes... Timing/Sync... Software Generic Refresh Equipment... Refresh System View... Preferences View Tree

Fault	NE Alarm List... Remote NE Alarms List... Protection Switch... Loopback... Test> LED... Test IAO LAN... Test System Controller... Test Transmission... Reset> System Controller... Initialize System... Alarm Cutoff... Clear TCA Count Timing/Sync> Clock Mode Switch Protection Switch System Timing Reference/ Source Switch Main Circuit Pack Timing Switch Operate Output Misc. Discretes...

Configuration	Provision... Ethernet Service... Misc Discretes... DCC Terminations... Configure Manual Ring Map... Activate Manual Ring Map... Change Far End NE Names... Data> Create A Virtual Switch... Delete A Virtual Switch... Provision A Virtual Switch Create A VLAN... Delete A VLAN... Provision A VLAN... Create A Spanning Tree Group Delete A Spanning Tree Group Provision A Spanning Tree Cross-Connections... Timing/Sync Alarms> Alarm Configuration.. Update System Normal Mode *or* Ring Upgrade Mode Software> Remote Backup... Remote Restore... Configure Auto Backup Interval Download Software... Copy Software... Apply Software... FTP Browser...

Performance	View PM Threshold>	DS1 (Near End)
	Prov PM Threshold>	DS1 (Far End)
		DS3 (Near End)
		DS3 (Far End)
		OC3...
		OC12...
		OC48...
		OC192...
		EC1...
		STS1...
		STS3C...
		STS12C...
		STS48C...
		VT1...
	Initialize PM Registers>	15-Min
		1-Day
		Both
	View PM Ports...	
	Prov PM Ports...	
	Reports>	DS1 Line...
		DS1 Path...
		DS3 Line...
		DS3 Path...
		OCn Section...
		OCn Line...
		EC1 Line...
		STSn Path...
		VT1.5 Path...
		TCA...
		Ethernet...

Administration	Change Password... Security> View User Logins... View SNMP Users View Logged In Users Lockout Logins Enable Logins User Provisioning SNMP User Provisioning Allow/Inhibit Automous Messages View NE Administration... View MAC Addresses... IAO LAN Reset... Data Communications... Set TL1 Message Map... View X.25 State... OSI Routing Map... OSI Neighbor Map... Change NE Login Banner Set Date and Time... Set TID... Set NE... View Network Time Protocol... Set Network Time Protocol...
Reports	Equipment Lists> Pack... Port... VCG... Trib... Misc. Discretes... Status Lists> Pack... Port... Trib... Path Protection List... Cross Connection List... NE Alarm List Remote NE Alarms List NE History Log...

Help	About This Network Element... Help Contents, Index, & Find... View Documents> Alarm Messages and Trouble Clearing Guide User Operations Guide Applications and Planning Guide TL1 Message Details

END OF STEPS

Determine your security level

Perform the following to determine the security level of your login.

Important! Each login is provisioned for a certain security level. Four different levels are available. They are: (a) privileged, (b) maintenance, (c) general, and (d) reports-only.

1 From the System View screen select **Administration>Security>User Provisioning**.

Result: The User Provisioning screen appears. The User Provisioning screen is used to (a) create/ modify logins, (b) perform initial password administration, and (c) provision a login's Security Level.

2 Select the Existing User in the User ID Panel. Then select the desired user login from the drop down listing. (Refer to Figure A-10.)

Figure A-10 User Provisioning Screen

3 Observe the Security Level in the User Privilege panel.

If you are logged in as LUC01, LUC02, or LUC03; then your Security Level is *Privileged*. If you are using a login other than one of these three, then your user privilege code may be different.

An alternate method to view (only) the security level of all login IDs is to select: **Administration>Security>View User Logins**.

A detailed explanation of each User Security Level is contained in Chapter 5, "Provisioning, Security, & Administration".

4 Click the **Close** button to continue.

END OF STEPS

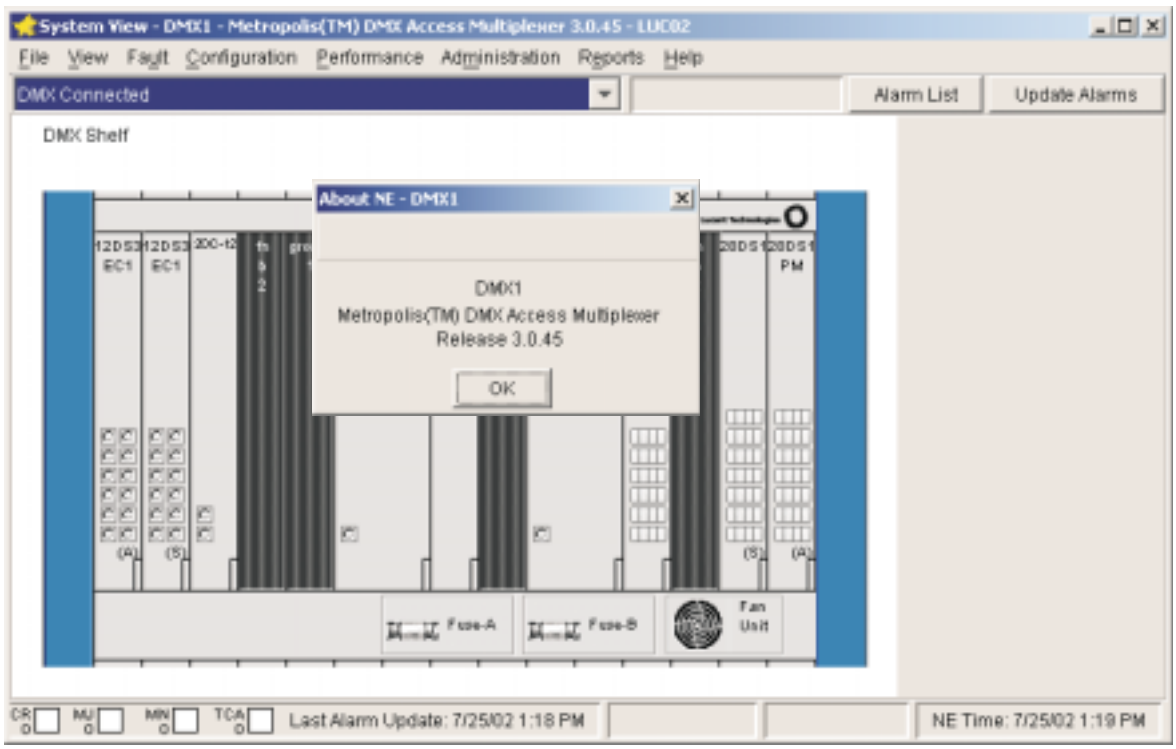
Identify the active NE software release and the available generics

Perform the following to identify the active NE software release and the available generics.

1 Select **Help>About This Network Element.**

Result: The About NE screen appears. (Refer to Figure A-11.) The software release currently running on your NE may be different.

Figure A-11 System View and About NE Screen



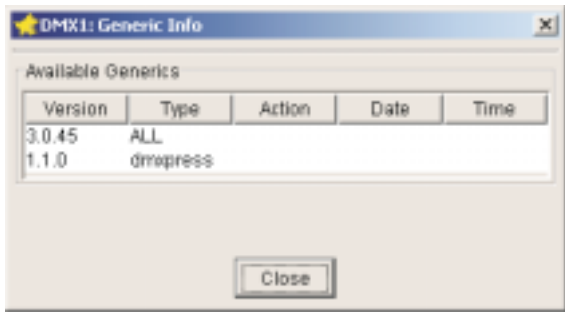
2 Determine the current NE software release and click on **OK**.

Important! The software release currently running on your WaveStar NE may be different.

3 Select **View>Software Generic.**

Result: The Generic Info screen appears. (Refer to Figure A-12.) The contents of your screen (for example, version, date, and time) may be different.

Figure A-12 Generic Info Screen



4 Observe the active software version and the available generics. Then, click on **Close**.

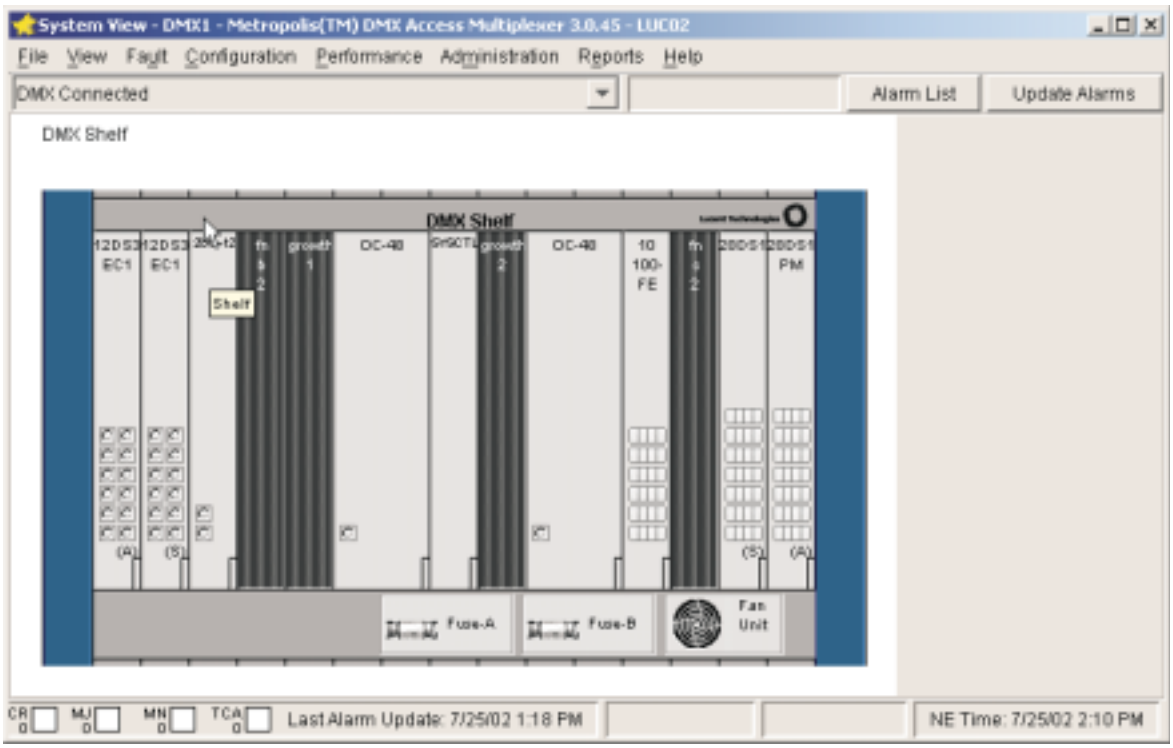
Important! The contents of your screen (for example, version, date, and time) may be different.

END OF STEPS

Display the contents of a shelf

1 Position the cursor on the shelf panel and observe that Tool-Tips displays (Shelf). Your screen should look similar to Figure A-13.

Figure A-13 System View Screen with Shelf Tool Tips



2 ***Things to observe***:

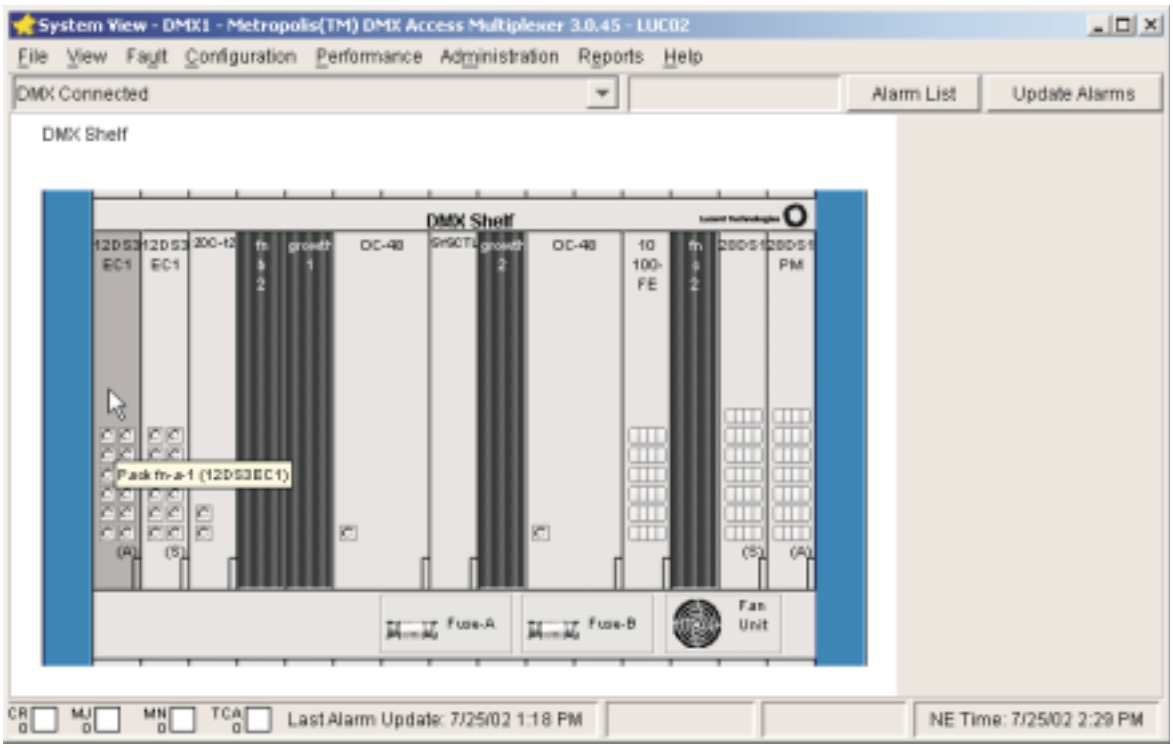
1. Top left corner displays the word **Shelf**
2. Circuit pack slot positions
3. Empty slots (for example, growth-2 and fn-d-1) are shown with a dark gray color
4. Equipped slots are shown with the label of the occupying circuit pack (for example, slot fn-a-1 = 12DS3EC1, slot fn-b-1 = 28DS1).
   Note: Equipage for your shelf may be different.
5. Electrical circuit packs that are protected are shown with one being active (A) and the other being standby (S). The (A) or the (S) are indicated just above the latch handle.

6. Circuit packs with I/O ports are shown with an indicator for each port. This indicator reports alarm status for that port. Similarly, circuit packs with an active alarm are shown with a color indicator to exhibit the active alarm's level.

   Note: DS1 port icons are shown as rectangles. Ethernet, DS3, and OC-n port icons are shown as circles.

3 Position the cursor over the left-most circuit pack faceplate that is labeled 12DS3EC1. Hold until "Pack fn-a-1(12DS3EC1)" is displayed. Your display should look similar to Figure A-14.

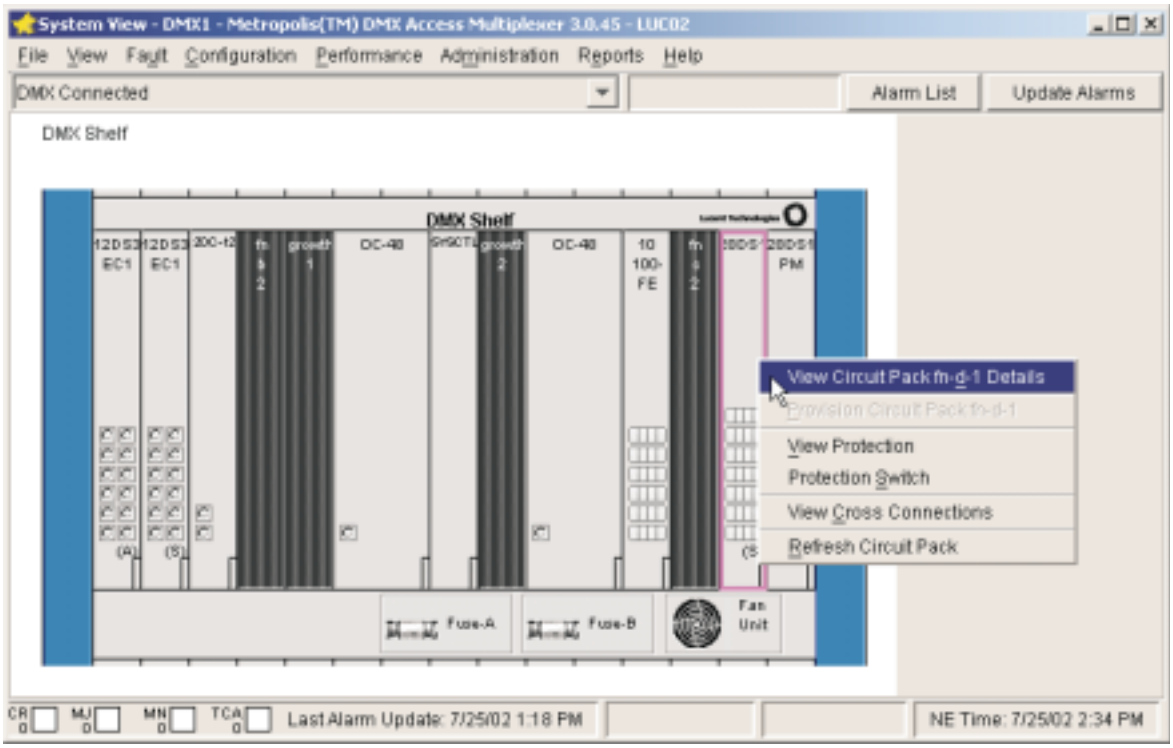
Figure A-14 System View Screen with Slot Tool Tips



4 Position the cursor over a circuit pack faceplate that is labeled 28DS1. Right-click on this slot and the pop-up circuit pack menu appears.

Your display should look similar to Figure A-15.

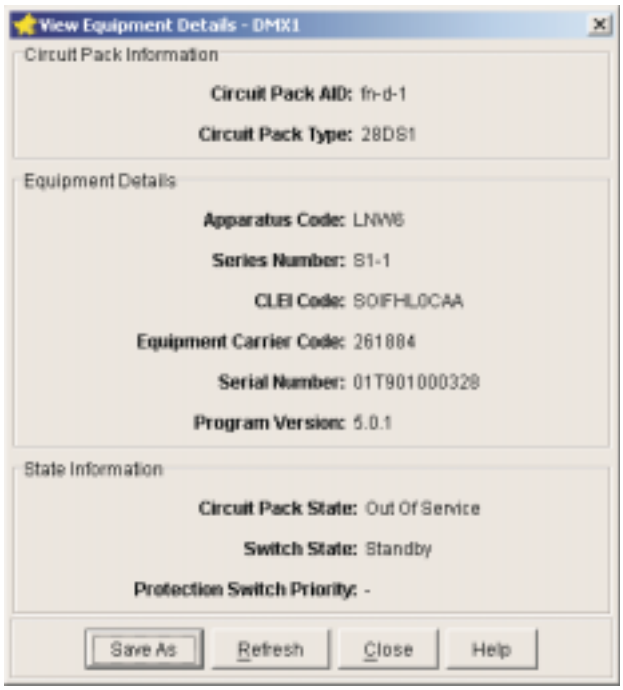
Figure A-15 System View Screen and Circuit Pack Menu



5 Click on menu item *View Circuit Pack fn-d-1 Details*.

Result: The View Equipment Details screen appears. Your display should look similar to Figure A-16.

Figure A-16 View Equipment Details Screen for a Circuit Pack



6 Observe the View Equipment Details screen.

7 Click on **Close**.

Important! Ports are shown with an individual indicator for each port. A port ID (for example, PORT 1) and alarm status is indicated by the color of the indicator (White = no alarm, Red = critical alarm, Yellow = major alarm, or Cyan = minor alarm).

8 A 28DS1 circuit pack has seven rows of four indicators per row. Assuming that your shelf equipage includes a 28DS1 circuit pack in fn-d-1:

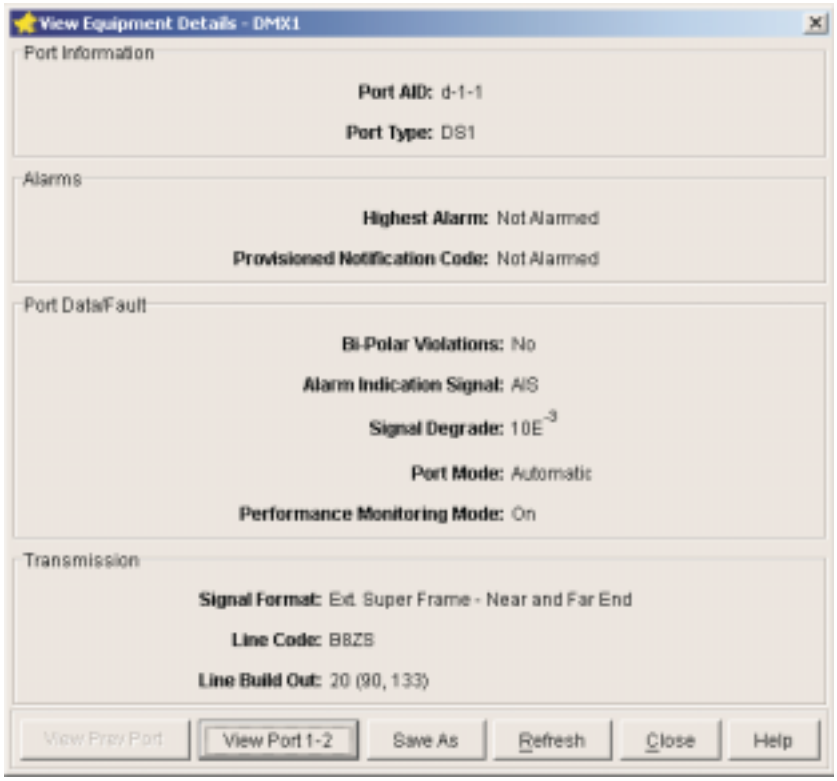
1. Position the cursor over the top series of indicators.
2. Hold until "DS1 Ports: d-1-1, d-1-2, d-1-3, d-1-4" is displayed and right click.

Result: The Details of Ports screen appears. Your screen should look similar to Figure A-17.

Figure A-17 Details of Ports Screen

9 Select and double-click list item **DS1 Port d-1-1**. (Or, you can right-click on each port in the **Details of Ports** screen and bring up a submenu). Your display should look similar to Figure A-18.

Figure A-18 View Equipment Details Screen for a Port



Important! The port alarm status and provisionable parameters can be ***viewed*** from View Equipment Details screen.

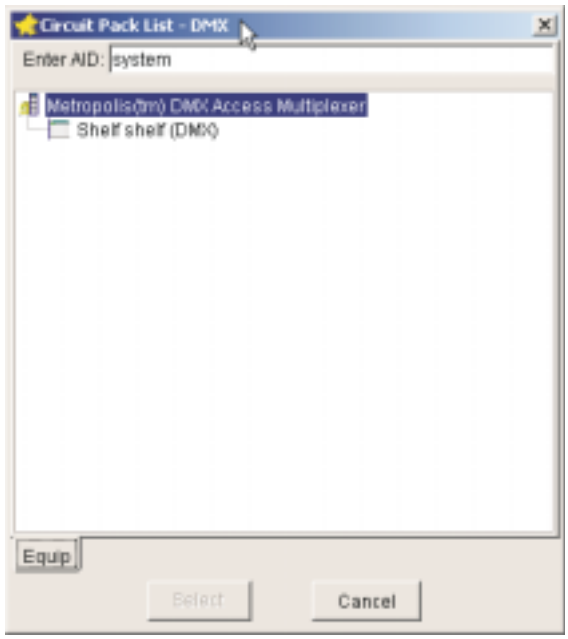
10 Observe the View Equipment Details screen.

11 Click on **Close** (or on the boxed "X" at the upper right-hand corner of screen).

12 Click on **Close** in the *Details of Ports* ..... box (or on the boxed "X" at upper right-hand corner of screen).

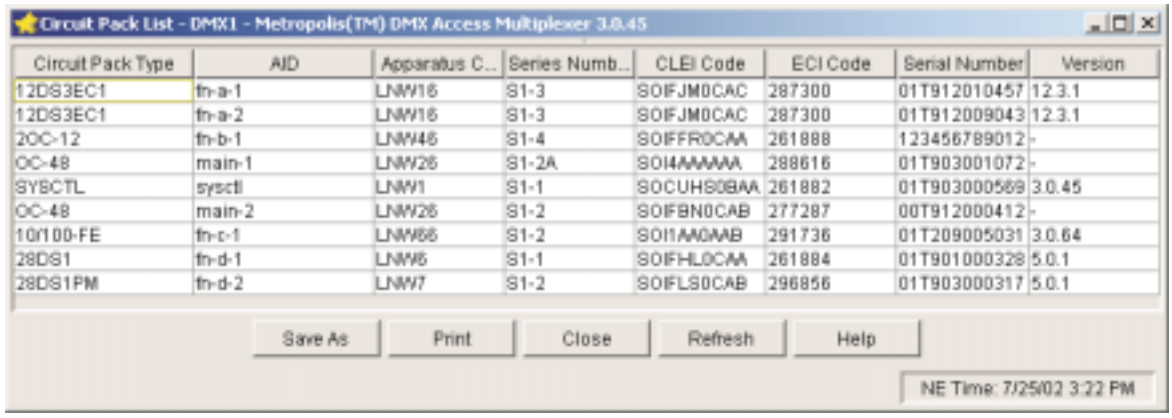
13 From the System View menu bar select **Reports>Equipment Lists>Pack**. A screen, in the form of a directory tree, is displayed. High-light list item **Shelf shelf (DMX).** Your screen should look like Figure A-19.

Figure A-19 Circuit Pack List Screen



14 Click on **Select**. Your screen should look similar to Figure A-20.

Figure A-20 Circuit Pack List Report



Important! The columns may be rearranged by selecting the column header and dragging it left or right as desired. Columns can be resized by dragging and dropping the vertical bar to the left or right of the column header. Also, you can click on a column header and reorder that column by alphabetical order.

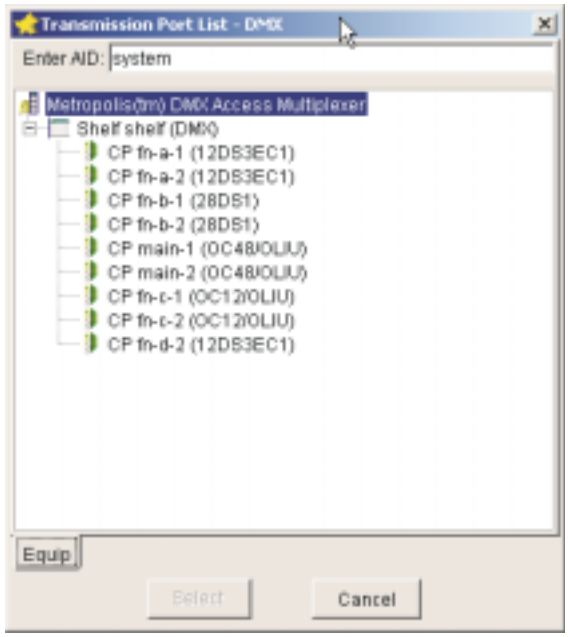
15 Rearrange the columns in the report as desired.

16 Click on **Close**.

17 From the menu bar select **Reports>Equipment Lists>Port**.

Result: The Transmission Port List Selection screen appears. Your screen should look similar to Figure A-21.

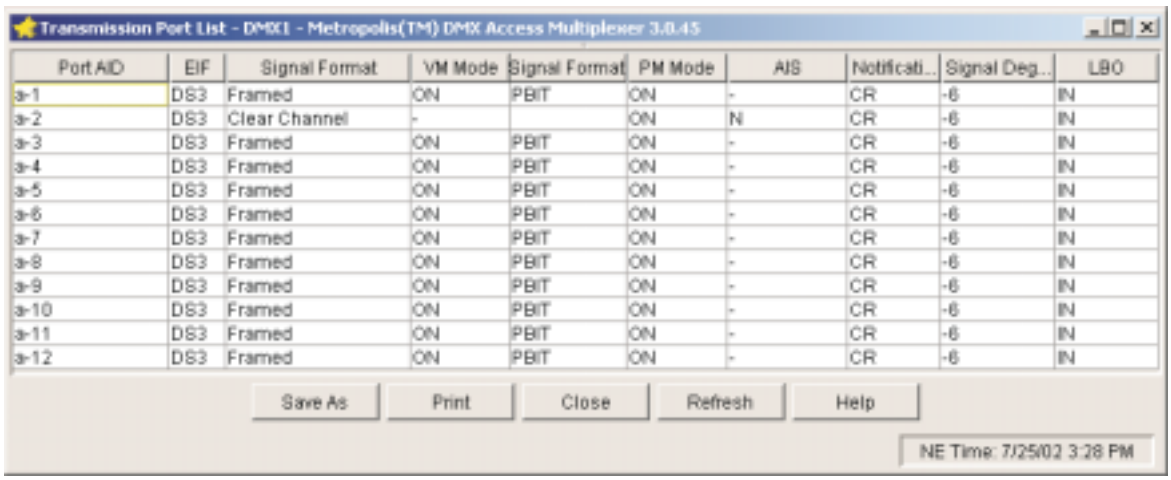
Figure A-21 Transmission Port List Selection Screen



18 Highlight one of the circuit packs; for example, CP fn-a-1 (12DS3EC1), and click on **Select**.

Result: Transmission Port List screen appears. Your screen should look similar to Figure A-22.

Figure A-22 Transmission Port List Screen



19 Observe the following things about the Transmission Port List:

- Columns may be arranged (from left to right) as desired.
- The *Port AID* column lists ports numerically (default arrangement). Click on this column header to arrange in alphabetical order
- This report lists all of the provisionable parameters for every port of the selected circuit pack.

20 Click on **Close**.

END OF STEPS

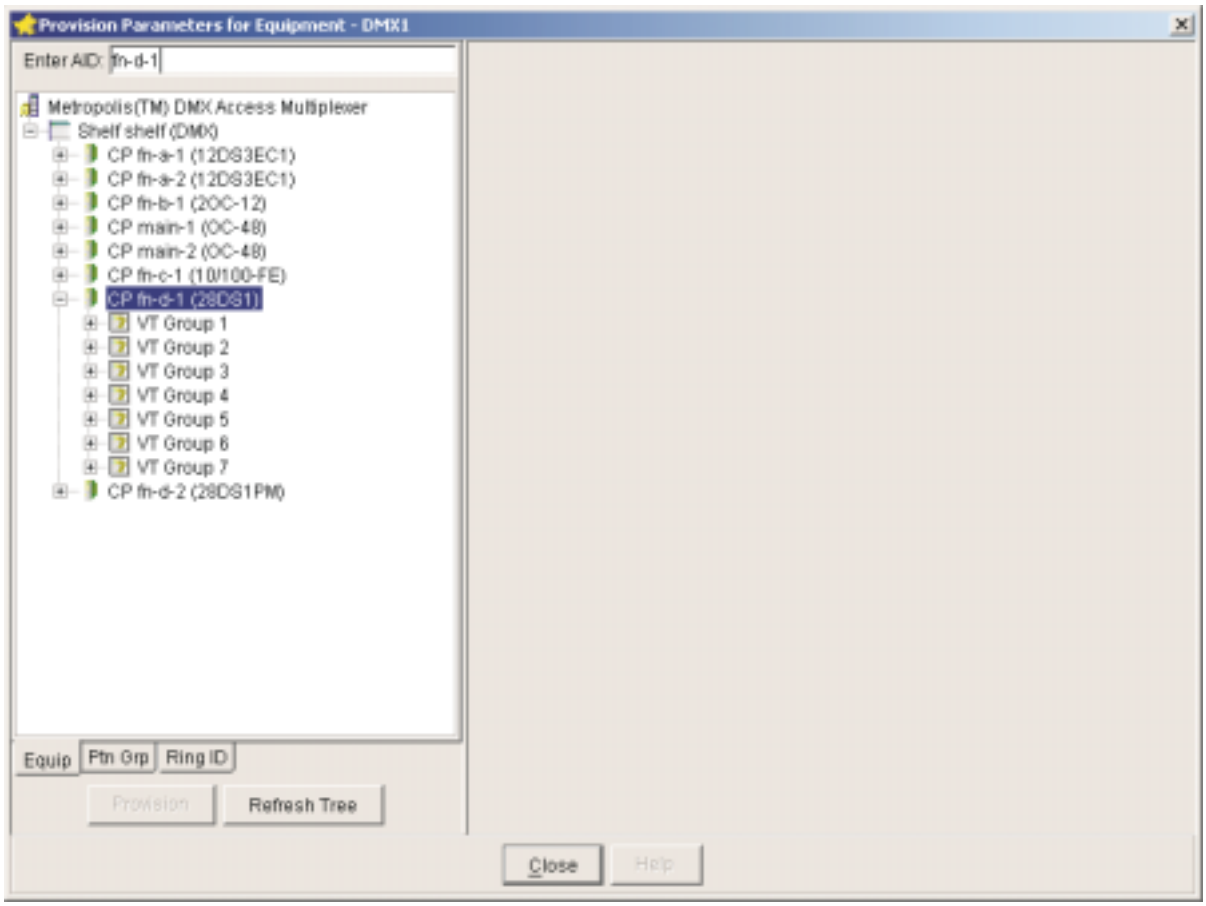
Change existing/default provisioned parameters

1 From the *System View* screen:

- Highlight four DS1 port indicators; for example, ***DS1 Ports: d-1-1, d-1-2, d-1-3, d-1-4.***
- Go to the menu bar and select **Configuration>Provision.**

Result: The Provision Parameters for Equipment Selection screen appears. (Your screen should be similar to Figure A-23.)

Figure A-23 Provision Parameters for Equipment Selection Screen

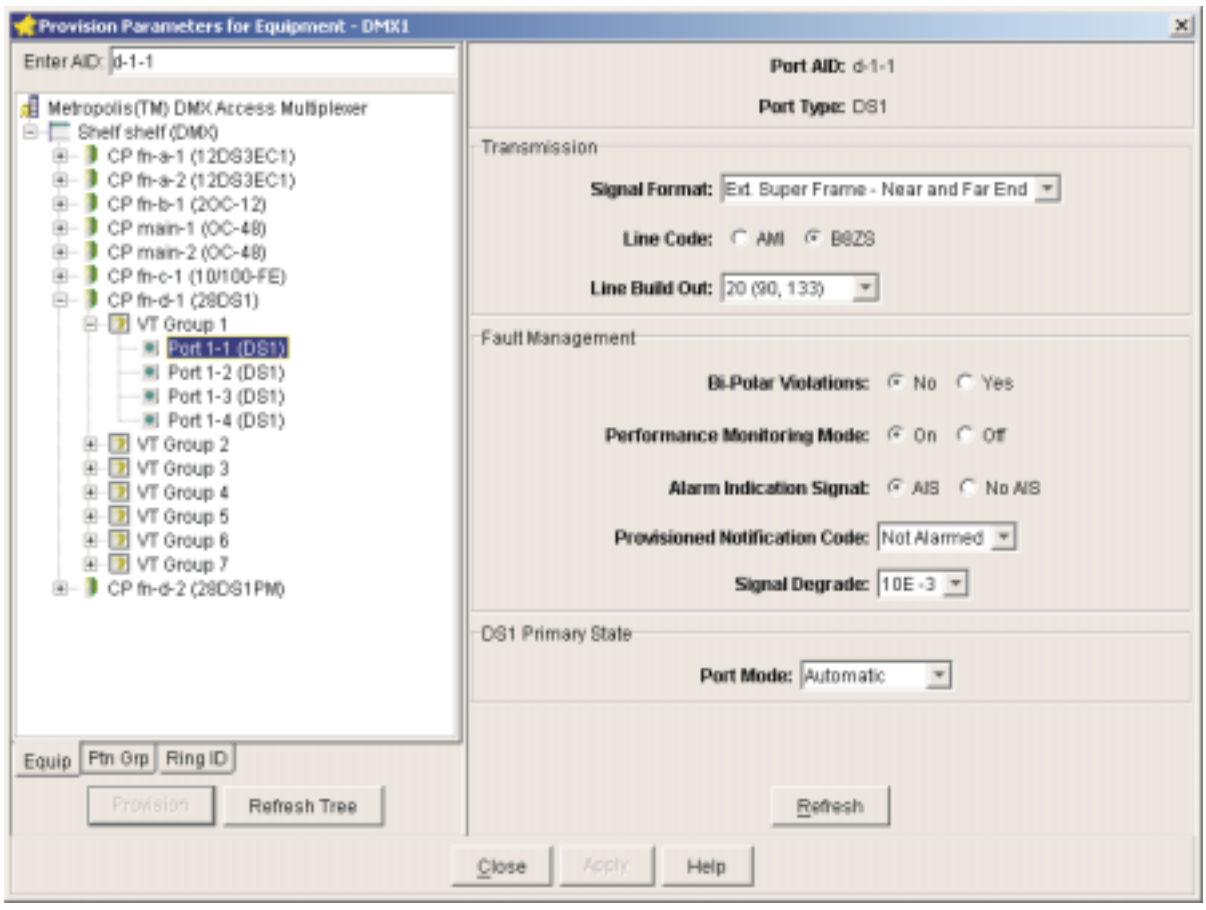


2 Click on:

1. the (+) sign to the left of highlighted entry (VT Group 1)
2. item **Port 1-1 (DS1)**
3. **Provision** button.

Result: The Provision Parameter for Equipment screen appears. Your screen should look similar to Figure A-24.

Figure A-24 Provision Parameters for Equipment Screen



3 Perform the following:

- Change the value of the **Alarm Indication Signal:** field to AIS.
- Change the value of the **Port Mode:** field to Not Monitored.
- Click on **Apply.**
- Read the confirm message and click on **Yes.**
- Click on **Close**.

END OF STEPS

Familiarize yourself with the cross-connection wizard

1 Primary points to understand:

1. Existing cross-connections can be displayed at any of the following different levels:
   - System (shelf - all cross-connections)
   - Circuit Pack (only those for the specified circuit pack)
   - Port (only the specified port).
2. To display (view) existing cross-connections select from the menu bar either:
   a. **Reports>Cross-Connection List** and select the desired level, OR
   b. **View>Cross Connections** and select the desired level

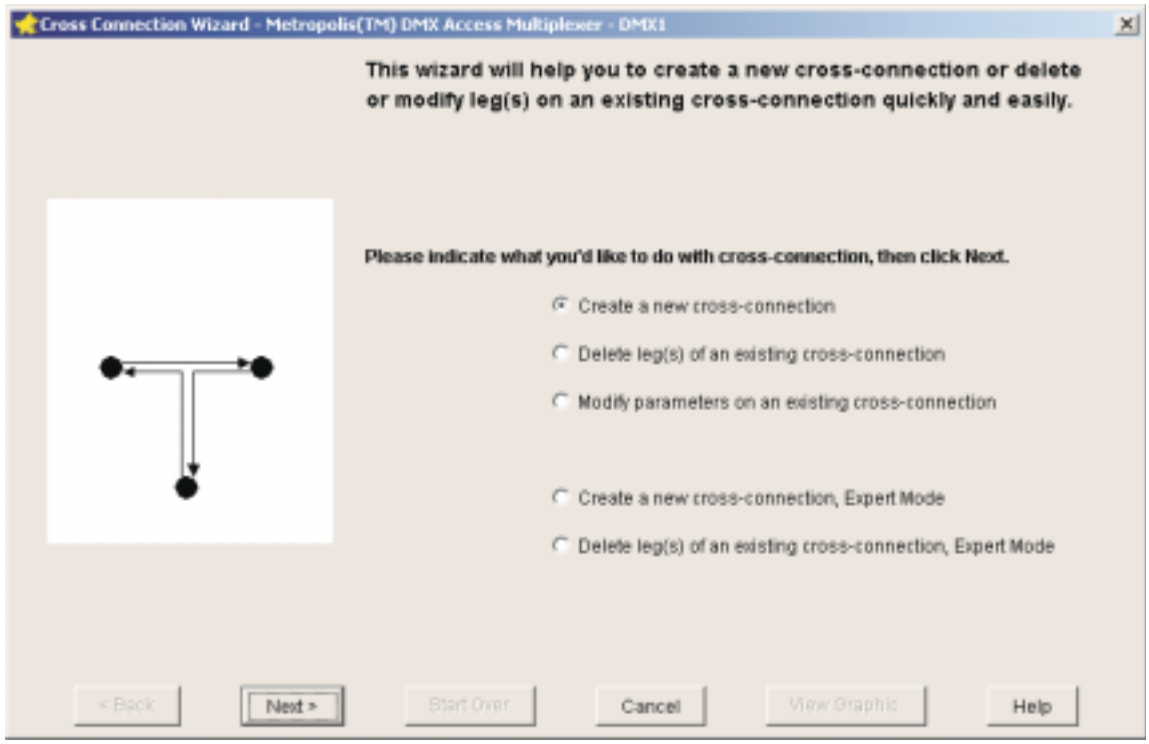
   The **View>Cross Connection** screen includes a **Browse** button — which permits you to move up and or down the directory structure and easily view different circuit packs and ports.
3. To create or delete a cross-connection:
   a. Select from the menu bar **Configuration>Cross-Connection**

   Note: This brings up the *Cross Connection Wizard* series of screens — which instructs/guides you through the process of creating (or deleting) a Cross-Connection.
   b. The following information is required by the wizard:
      - Whether the action is to Create or Delete
      - Rate (STS1, STS3, STS12, STS48, or VT1.5)
      - Type (2-Way Point-to-Point, UPSR)
      - Source tributary
      - Destination Tributary

2 From the menu bar select **Configuration>Cross Connection**.

Result: The *Cross-Connection Wizard* screen appears. (Refer to Figure A-25.)

Figure A-25 Cross Connection Wizard Screen



Important! The Cross-Connection Wizard leads you through the process of creating different types of cross-connections, modifying existing cross-connection, and deleting cross-connections.

3 Select the desired operation and click on **Next**.

4 Read the instructions on each screen, verify that the correct information is selected, and proceed as required.

END OF STEPS

Use the Ethernet Service Data Wizard

Perform the following to become familiar with the Ethernet Service data wizard.

1 At the System View screen, select **Configuration>Ethernet Service....**

Result: The Ethernet Service Data wizard screen appears. (Refer to Figure A-26.)

Figure A-26 Ethernet Service Data Wizard (Screen 1)

Important! The Ethernet Service Data wizard leads you through the process of creating different types of ethernet service. The wizard includes steps to establish cross-connections, a virtual switch, spanning trees, and VLANs, as required per service type.

2 Select the *Service Type* and click on **Next**.

3 Read the instructions on each screen, verify that the correct information is selected, and proceed as required per service type.

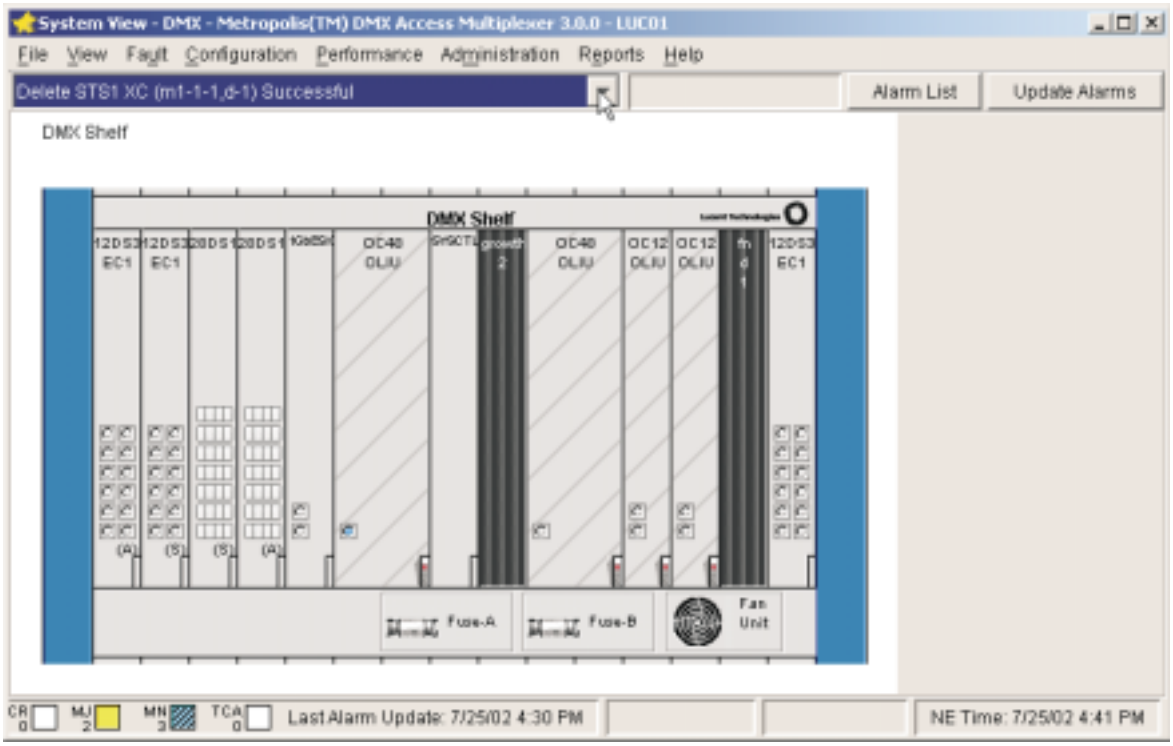
END OF STEPS

Display and review the command list

Perform the following to display and review the command list.

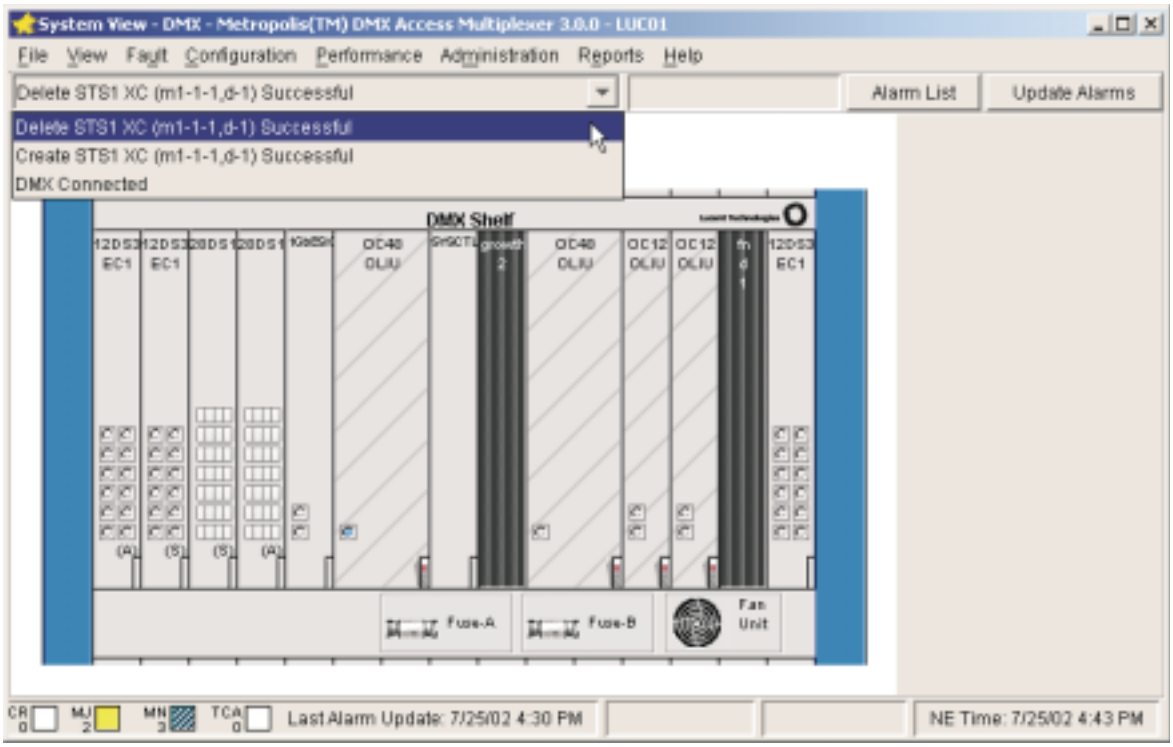
1 The most recently executed command (for example, *DMX Connected*) is displayed on a command line near the top of the System View screen. Place your cursor on the drop-down arrow for this command line. Do not click. Your screen should look similar to Figure A-27.

Figure A-27 Screen View and the Last NE Command



2 To display a list of the last attempted commands, both those that were executed successfully and unsuccessfully, click on the “drop-down” arrow. Your screen should look similar to Figure A-28.

Figure A-28 System View and Drop-Down List of NE Commands



Important! The list of commands on your screen may be different.

The list displays a maximum of the last 5 attempted commands.

3 Click on this same drop-down arrow to collapse this command list.

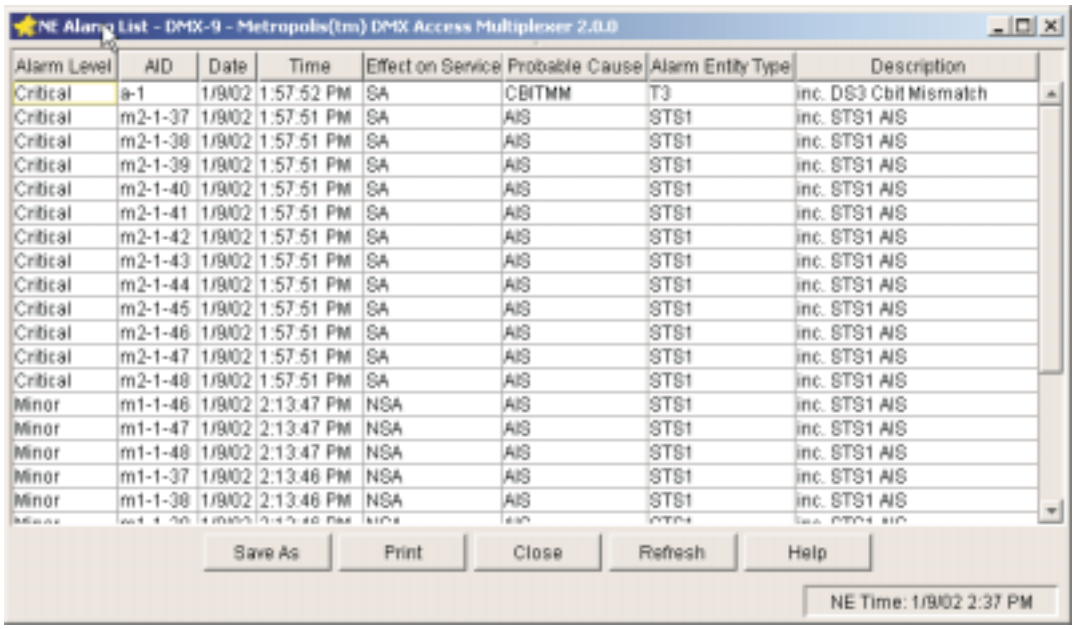
END OF STEPS

Display and understand the alarm list

The Alarm List is accessible from the System View screen.

1 Immediately to the right of this same drop-down arrow is the **Alarm List** button. Click on this button and you will display a list of all currently active alarms. Your screen should look similar to Figure A-29; however, your list of alarms (if any) and software release may be different.

Figure A-29 NE Alarm List

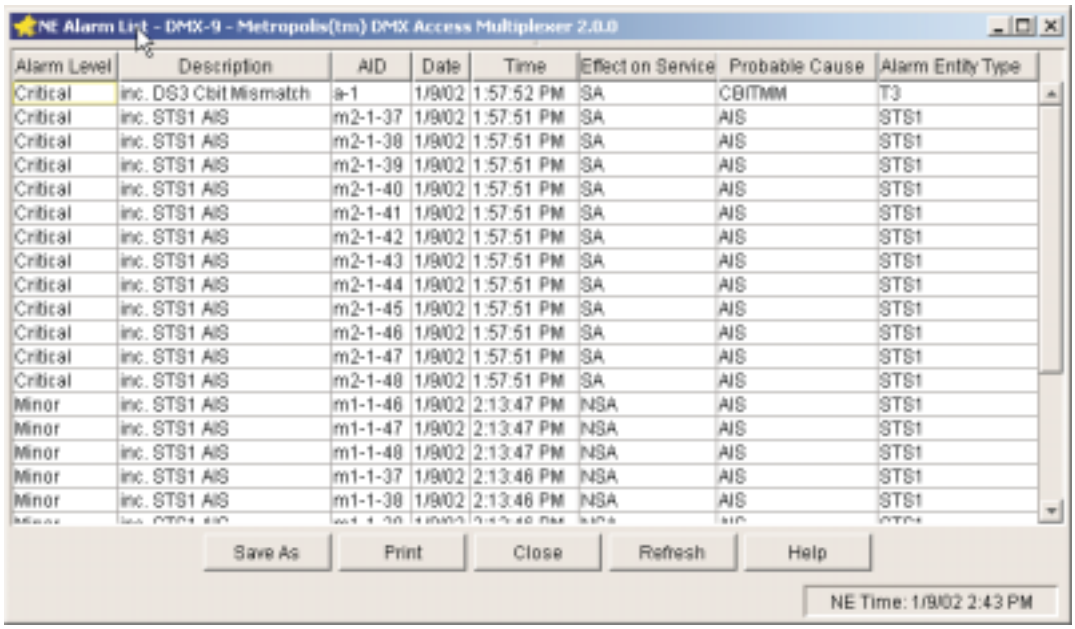


Important! Your list of alarms, if you have any, will be different.

The Alarm List column headings are selectable. This permits the list to be sorted (top-to-bottom) according to the selected column heading (for example, by alarm level or effect on service). Also, the individual columns may be re-sized (expanded or contracted) and rearranged according to your preference.

2 Select the column headers (click, hold, drag-and-drop) and arrange them so that your Alarm List is ordered like the Alarm List in Figure A-30. Your list of alarms (if any) and software release may be different.

Figure A-30 Re-ordered NE Alarm List



Important! Observe the number of Critical, Major, and/or Minor alarms shown in your report. Also note that the number of Critical, Major, and/or Minor alarms is shown at the bottom of the System View screen.

Also, and as desired, you can save the displayed alarm list to a file by clicking on **Save As** and specifying the file name. Or, you can obtain a paper copy of the alarm list by clicking on the print button.

3 Click on **Close** or **Cancel** (the boxed "X" at top right corner of menu bar).

Important! The NE Alarm List may also be obtained and filtered using the **Fault>NE Alarm List...** command.

4 Select **Fault>NE Alarm List...**.

Result: The Alarm Selection Panel screen appears.

Important! The Alarm Selection Panel allows users to filter the NE Alarm List by Alarm Category, Alarm Level, Effect on Service, and Signal Level Affected.

5 Click on the Alarm Level drop down list and select Major. Then click on **OK**.

Result: The NE Alarm List appears showing any Major alarms present in the system.

6 Observe the NE Alarm List and click on **Close**. Then click on **Close** to exit the Alarm Selection Panel screen.

END OF STEPS

Update alarms

1 Immediately to the right of the **Alarm List** is the **Update Alarm** button. During certain maintenance activities, such as whenever an activity has occurred that would result in clearing or generating an alarm, it may be desirable to click this button to obtain an instant update of the alarms. Otherwise, there may be a number of minutes before the alarm list is updated by normal system operations.

END OF STEPS

Disconnect from the NE

1 Go to the menu bar and click on **File-NE Disconnect**.

Important! Subsequently, an information dialog box is displayed and you must select **YES** to confirm your selection.

END OF STEPS

Provision an I/O port without viewing the shelf/circuit pack

1 From the WaveStar® CIT screen, place your cursor over the icon panel selection box and click on directory item **Most Recent**.

Result: An icon for the last selected NE (for example, dmx) will be displayed.

2 Double click on the **dmx** icon.

3 Click on **OK** in response to the Legal Notice.

4 In the System View screen, go to the menu bar and click on **Configuration-Provision**.

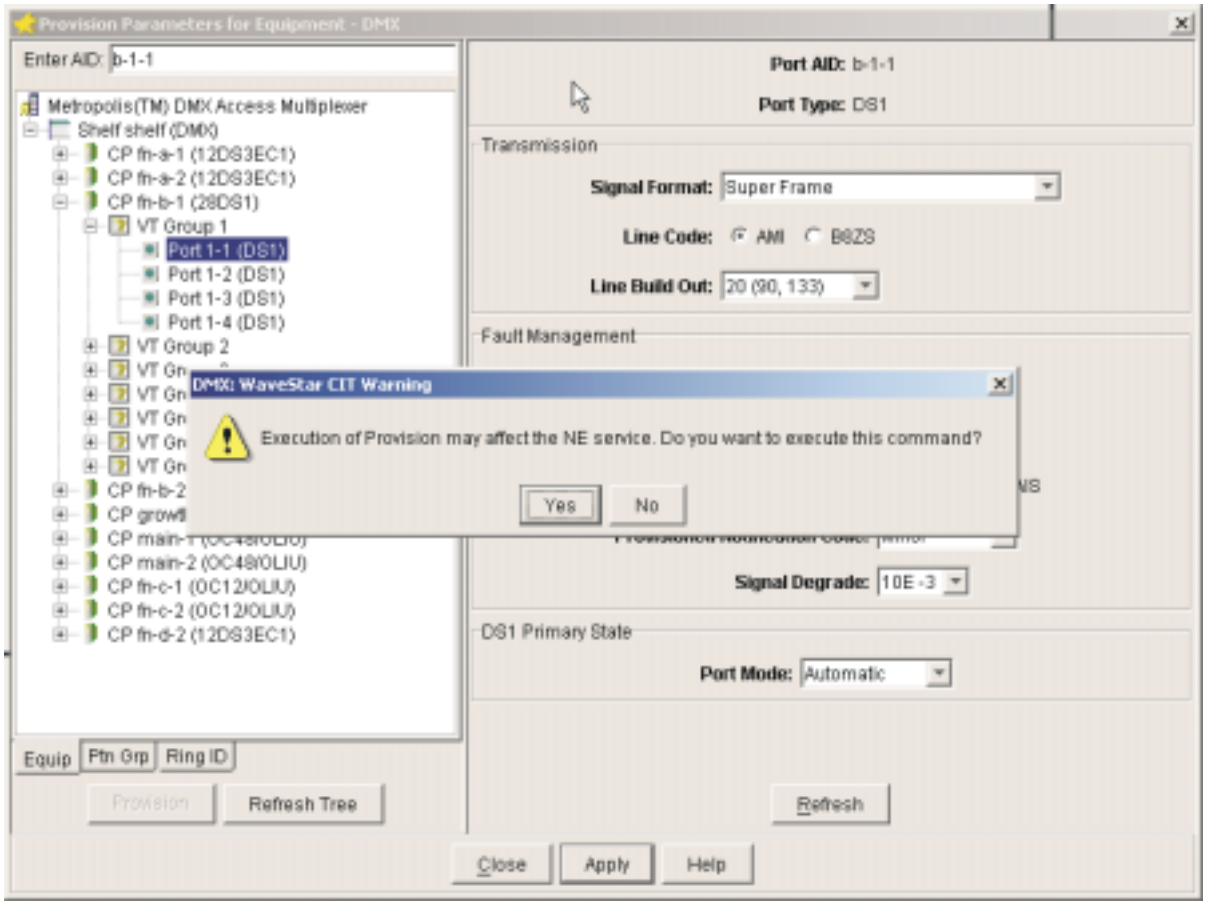
Important! There are two methods to specify/identify a particular circuit pack. First, you can make multiple selections following down the directory tree until finally selecting the desired circuit pack. Secondly, if you know the AID of the circuit pack, then you can enter it directly into the field labeled **Enter AID:**. As you make each selection, the directory tree will display that entry.

Assume, for purposes of this tutorial, that we desire to change the provisioning for a DS1 circuit pack (for example, circuit pack b-1-1).

5 Highlight the **Enter AID**: field and perform the following:

1. type b-1-1
2. highlight item Port 1-1 (DS1) and click on **Provision**
3. change the value for *Alarm Indication Signal* from No AIS to AIS
4. change the value for *Port Mode* to Automatic
5. Click on **Apply**. Your screen should look similar to Figure A-31.

Figure A-31 Provision Parameters for Equipment Screen



6 Click on **Yes** to close the dialog box and click on **Close** to exit the provisioning screen.

END OF STEPS

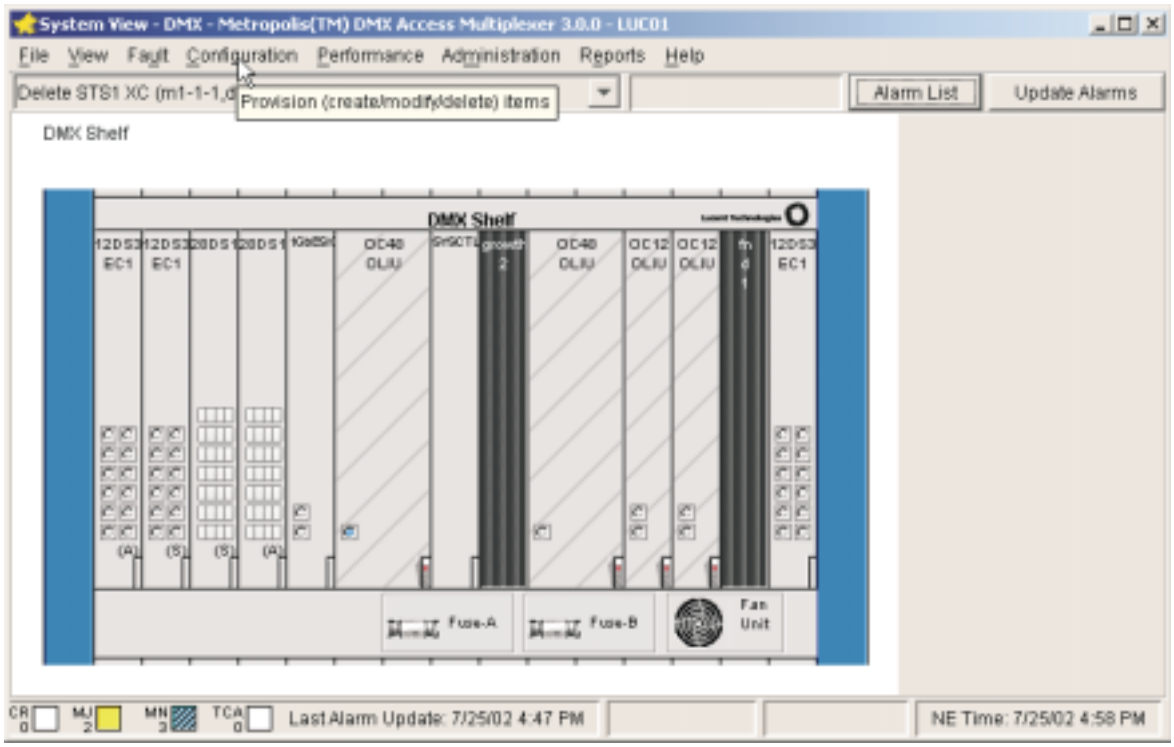
Use On-Line Help

Procedure Perform the following to become familiar with the different types of on-line help.

1 From the System View screen, position the cursor over *Configuration* in the Menu bar.

Result: The tool tip automatically appears for the Configuration menu item. (Refer to Figure A-32.)

Figure A-32 System View Screen and Menu Tool Tip

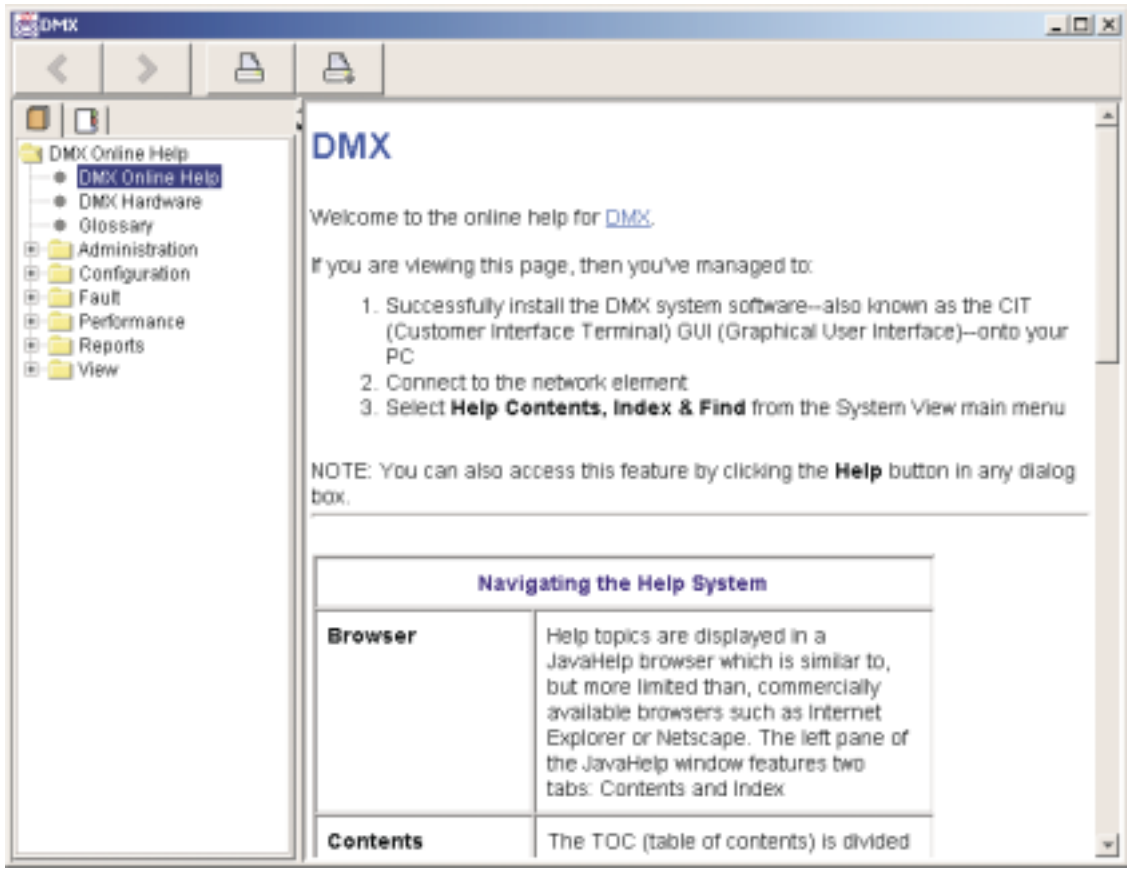


2 Position the cursor over the other System View Menu items and observe the tool tips.

3 From the System View screen, select **Help>Help Contents, Index & Find...** .

Result: The On-Line Help screen appears. (Refer to Figure A-33.)

Figure A-33 On-Line Help Screen



4 Read the information about navigating the help system. Then, click on several items in the left part of the screen and observe the help information displayed in the right part of the screen.

5 Close the On-line Help screen by clicking on the boxed X in the upper right portion of the screen. From the System View menu, select **File-NE Disconnect** to disconnect from the network element.

END OF STEPS

Working with TL1 Commands

Cut Through view

As an alternative to using the graphical System View screen, the WaveStar® CIT also provides a TL1 views of a network element. The WaveStar® CIT allows users to choose the Cut Through screen or the Command Builder screen. For more information about TL1 commands refer to 365-372-306, *Metropolis*® DMX Access Multiplexer *Command Manual*. Users can execute TL1 commands on a one-at-a-time basis or in a series/script.

CAUTION

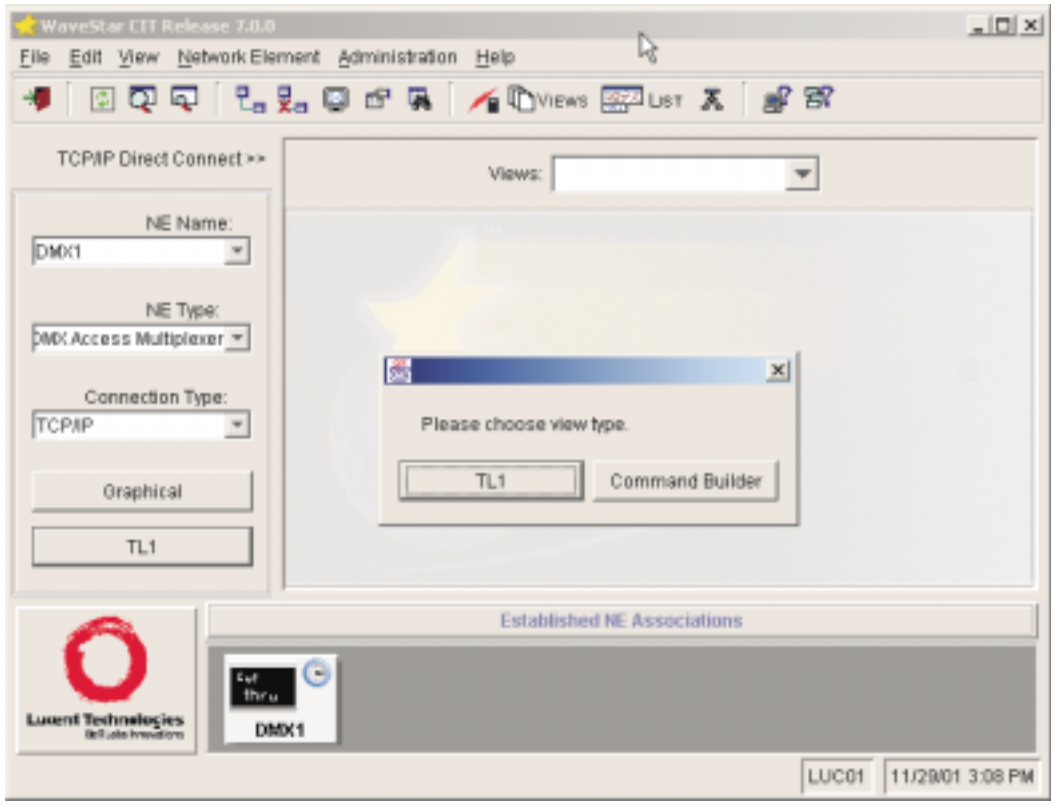
The System View screen provides error-checking for the various fields and users are alerted with a warning message to inform them that if they follow through with their command, it could impact service. As a contrast, TL1 and Command Builder do not provide any warning message and thus the user does not get a second opportunity to review/consider the consequences of his/her command.

1 From the WaveStar® CIT screen:

1. For the field that is labeled NE Name: enter (or select) the TID of the NE that you wish to establish a Cut-Through session (for this example, enter dmx, or whatever is appropriate for your application).
2. For the field that is labeled NE Type: select **Metropolis®** DMX Access Multiplexer.

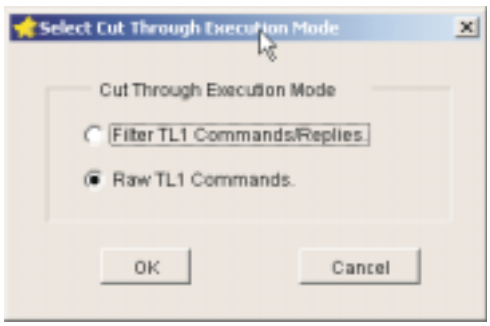
3. Click the **TL1** option. Your screen should resemble Figure A-34.

Figure A-34 TL1 (Cut-Through) or Command Builder Selection Screen



2 Click on the **TL1** button. Your screen should look similar to Figure A-35.

Figure A-35 Select Cut Through Execution Mode Screen



END OF STEPS

Select Cut-Through Execution Mode

As an option you may select either the: (a) Raw mode, or (b) Filtered mode to execute your TL1 commands.

1 The default option is “Raw.” Select "Filtered" and then click on the **OK** button.

Result: The network element Cut Through screen appears.

END OF STEPS

Filtered Mode

The Filtered Mode provides separation between the user’s input commands and the NE’s responses/outputs. Some pre-processing (for example, syntax parsing) is performed on the user’s inputs.

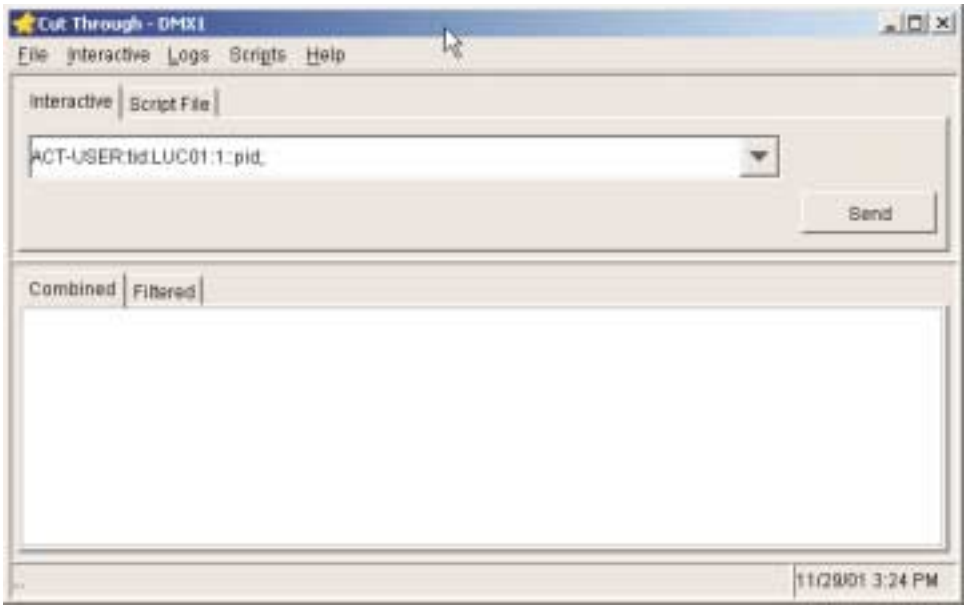
Raw Mode

The Raw Mode is equivalent to a "de-bug" mode. Exactly what the user enters in the form of a TL1 command is sent to the subject NE. Inputs and outputs are grouped together - there is no separation between a user’s commands and the NE’s responses.

Interactive – execute TL1 commands one-at-a-time

1 You can now execute TL1 commands on an interactive (one-at-a-time) basis. For example, let us assume that login=LUC01 wants to achieve a login session to the NE that has TID = DMX. This can be accomplished with the first TL1 command in the drop-down list. Click on the first command to select/place it on the command line. (Refer to Figure A-36.)

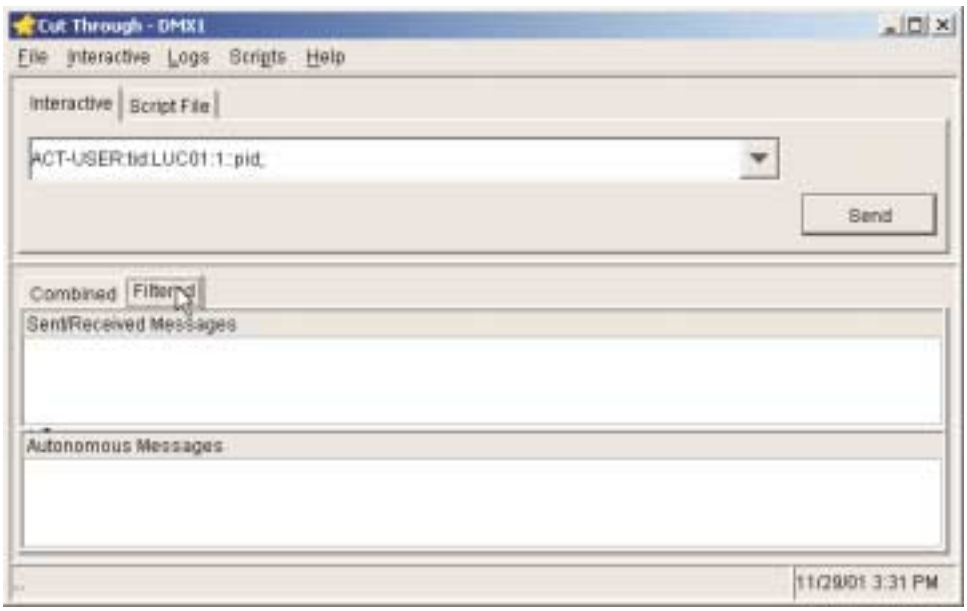
Figure A-36 Cut-Through Screen for Interactive Command Mode



2 Click on **Send**.

3 The system responses may be viewed in a combined format or a filtered format. Click on the tab labeled **Filtered**. Your screen should look similar to Figure A-37.

Figure A-37 Cut Through Screen Showing the Filtered Response



Important! The combined format displays commands, in the order that they are sent along, with the received replies. Because of delays, a command and its received reply may be separated by other commands and replies from other commands. This is especially true when sending commands from a script file where the commands are separated by a small delay interval.

The filtered format separates autonomous messages from the sent commands and their received replies. A sent command will not be displayed until its corresponding reply is received. Demarcation banners are added to help distinguish between sent/received messages.

END OF STEPS

Interactive – manage a listbox file

From the Cut Through screen menu bar, select **Interactive** and you can:

1. Select an existing **TL1 Listbox file** that already exists on the PC hard drive. The text contained within the newly selected file will replace the previous text displayed in the interactive TL1 box

2. Edit a **TL1 Listbox file** by opening up the Wordpad application. The Wordpad application will open the file selected from item “a” above, or will default to the originally displayed TL1 list box found in the default file of **[drive:]\Program Files\Lucent Technologies\WaveStar CIT\bin\tl1-listbox.txt**. The user may also manually overwrite the TL1-listbox.txt file outside of the WaveStar® CIT so that it becomes the new default.

3. Add the last TL1 command to the **TL1 Listbox and file**. No NE operations are performed in this step. The last command sent from the interactive command line will be added to the interactive TL1 listbox.

END OF STEPS

Working with logs

From the Cut Through screen menu bar, select **Logs>Start**, and you will be prompted to:

1. Enter the name for a new or existing log file (for example, **[drive:]\Program Files\Lucent Technologies\WaveStar CIT\bin\logs\new-log-file)**, or

2. Enter the full path name of an existing log file.

3. Start the TL1 logging process by clicking on **OK**. All TL1 commands sent/received are logged in a filtered format.

4 Once TL1 logging is started, the next time that menu bar item **Logs** is selected, the start menu item will toggle to stop. Simply select **Stop** to stop logging TL1 commands and close the user's log file.

5 From the menu bar, select menu item **Logs-View**, and you will be prompted to enter the name of an existing log file that you wish to view.

The selected log file is displayed using Wordpad. You can view and/or print the log file.

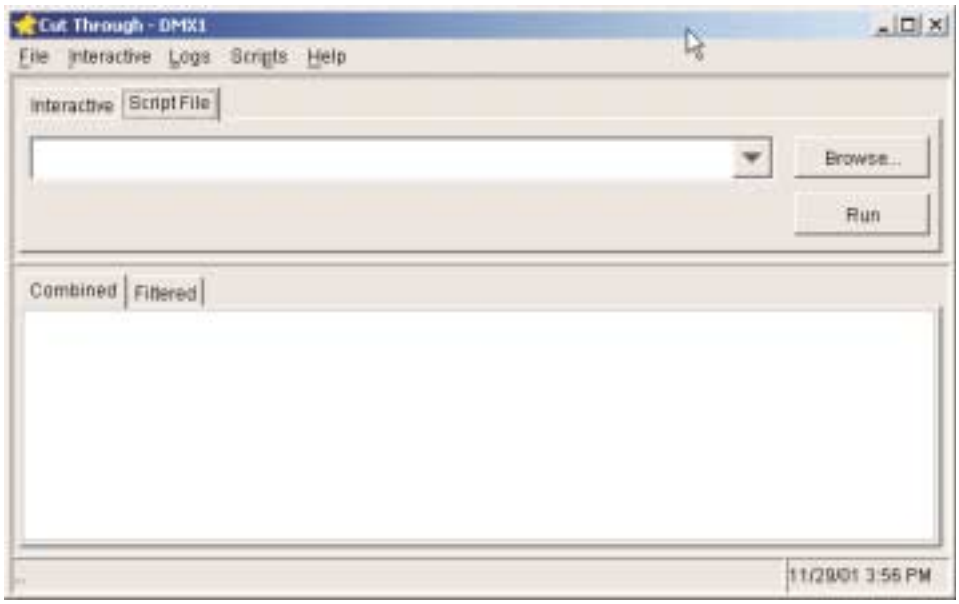
6 From the menu bar, select menu item Logs-Time/Date Stamp to toggle (on/off) the time and date stamp. The time and date stamp, when on, is listed at the beginning of the command head for both the filtered view and the log file.

END OF STEPS

Working with script files

1 An existing file consisting of TL1 commands, which is referred to as a Script File, can be selected by using the Browse button. Select Script File. Your screen should look similar to Figure A-38.

Figure A-38 WaveStar Screen to Select and Run Script File



Important! The script file(s) exists on the PC hard disk. The Browse button is simply the means to move up and down the directory structure in order to locate the desired script file.

2 Having previously located and selected a script file, you can now execute that file with the **Run** button.

Additional information concerning the use of script files includes the following:

1. A script file can contain any number lines of ASCII text.
2. Any line not containing a valid command will be displayed in an **Invalid TL1** message box.
3. Lines beginning with forward-slash forward-slash // are ignored.

4. A log file can be created (automatically) for each script file by inserting **#logfile=on** on any single line. This can be inserted/turned-on at anytime during the script file and can be turned on multiple times. Each time that a new **#logfile=on** command is executed, the previous logfile is closed. The generated log file will have a unique name consisting of the current *time/date-stamp* plus the name of the current *script* file.
5. A log file can also change the interval at which a command is sent by having **#delayP00** on a single line where 5000, in this case, is 5 seconds. This delay may be increased or decreased as often as desired.
6. A script file may be edited from the script menu, and a script may be stopped at any time by selecting stop from the script menu.
7. When beginning to execute a script file, you are prompted once to select one of the following three execution modes:
   - **Pause and Prompt each command**
   - **Stop on deny from NE**
   - **Send all commands**.

3 Choose **File Exit**.

Result: A dialog appears box appears asking you to confirm executing this command. Click on **Yes**.

END OF STEPS

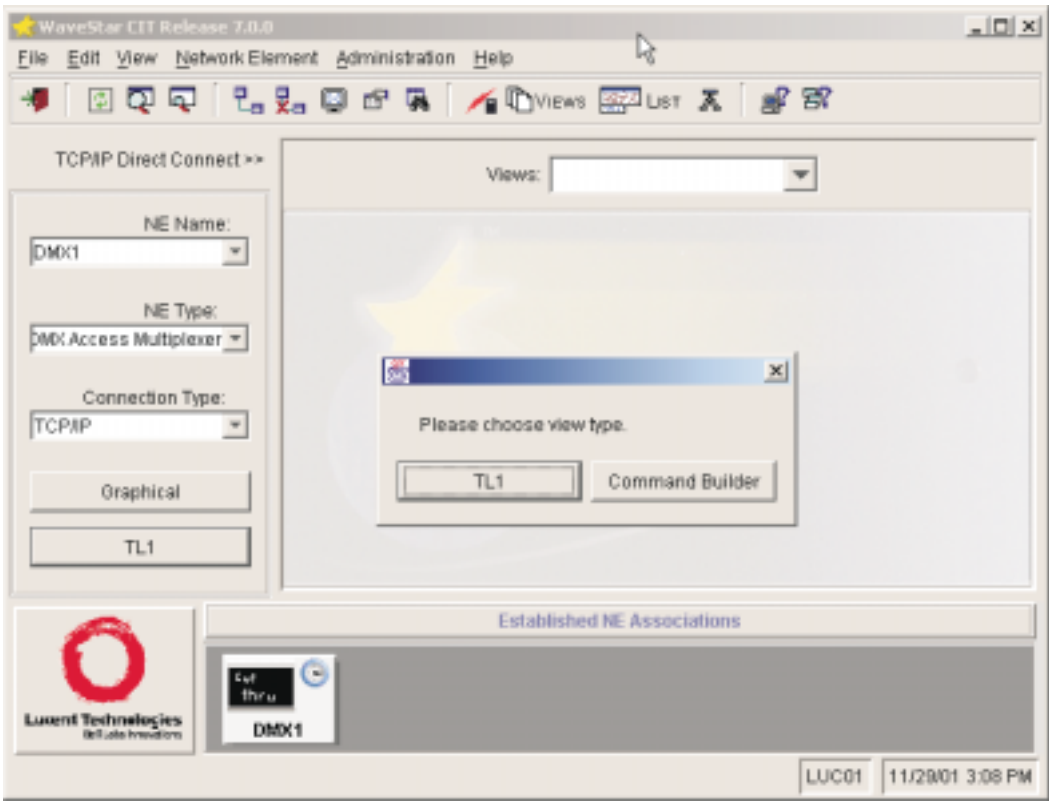
Using the command builder

Perform the following to become familiar with the Command Builder.

1 From the WaveStar® CIT screen:

1. In the *NE Name*: field, enter (or select) the TID of the NE that you wish to establish a Command Builder session (for this example, enter dmx, or whatever is appropriate for your application).
2. In the *NE Type:* field select **Metropolis®** DMX Access Multiplexer.
3. Click the **TL1** option. Your screen should be similar to Figure A-39.

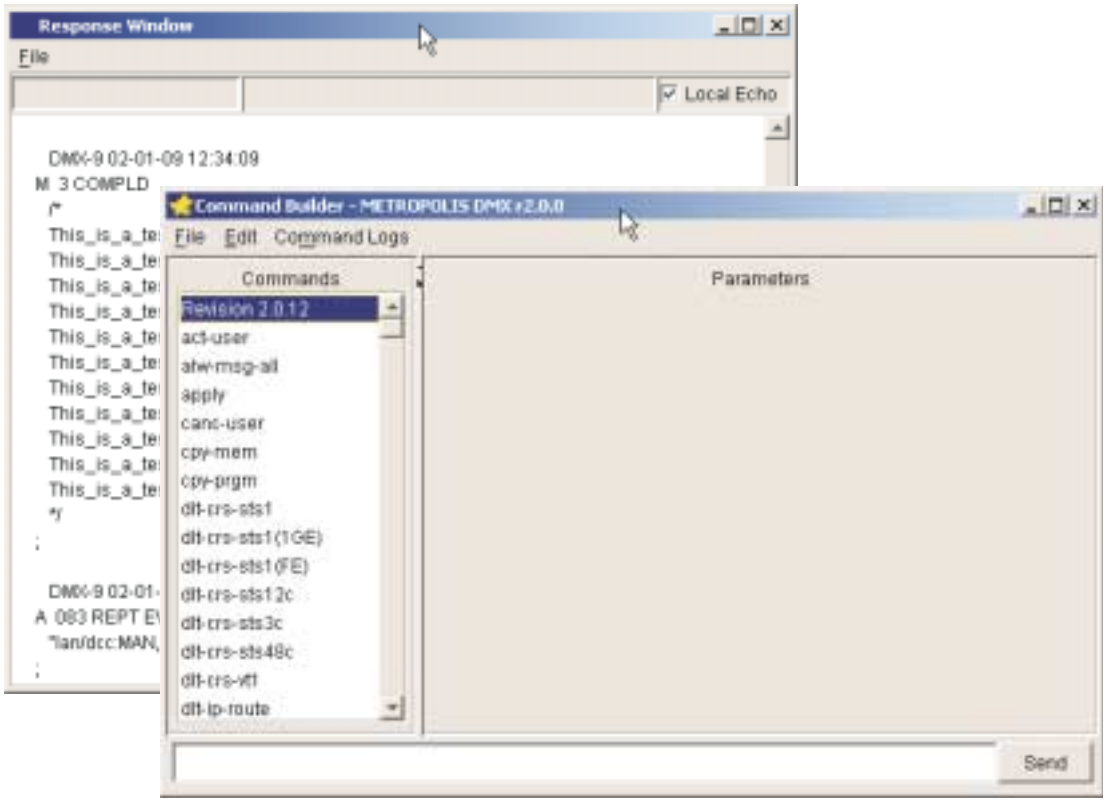
Figure A-39 TL1 (Cut-Through) or Command Builder Selection Screen



2 Click on **Command Builder**.

Result: The Command Builder and Response Window screens appear. (Refer to Figure A-40.)

Figure A-40 Command Builder and Response Window Screens



3 Observe the Command Builder screen.

The screen is divided in two sections. The *Commands* section lists the available TL1 commands. The *Parameters* section lists the available parameters for the selected command.

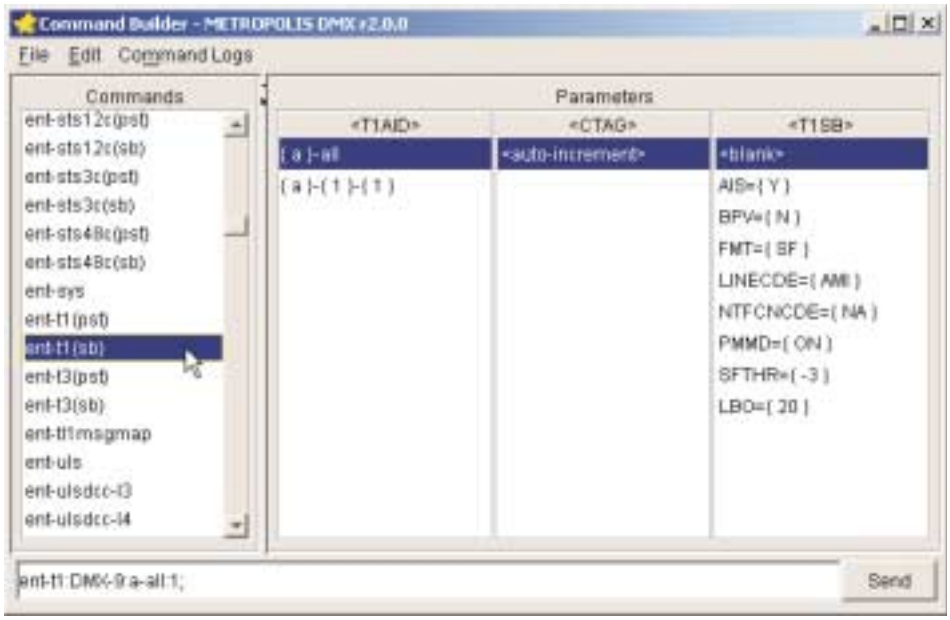
The Command Builder screen also has a line at the bottom to show the TL1 command being built. The *Send* button is used to transmit the command to the network element.

The Response Window screen shows the network element responses to the commands.

4 Scroll down the TL1 command list in the *Commands* section and click on the **ent-t1(sb)** command.

Result: The parameters for the **ent-t1(sb)** command appear in the *Parameters* section of the screen and the command line appears at the bottom of the screen. (Refer to Figure A-41.)

Figure A-41 Example of Command Parameters



5 Observe the list of parameters.

The first parameter displayed for most commands is the access identifier (AID) of the port, slot, or entity. The Command Builder screen shows all available AIDs, parameters, and options.

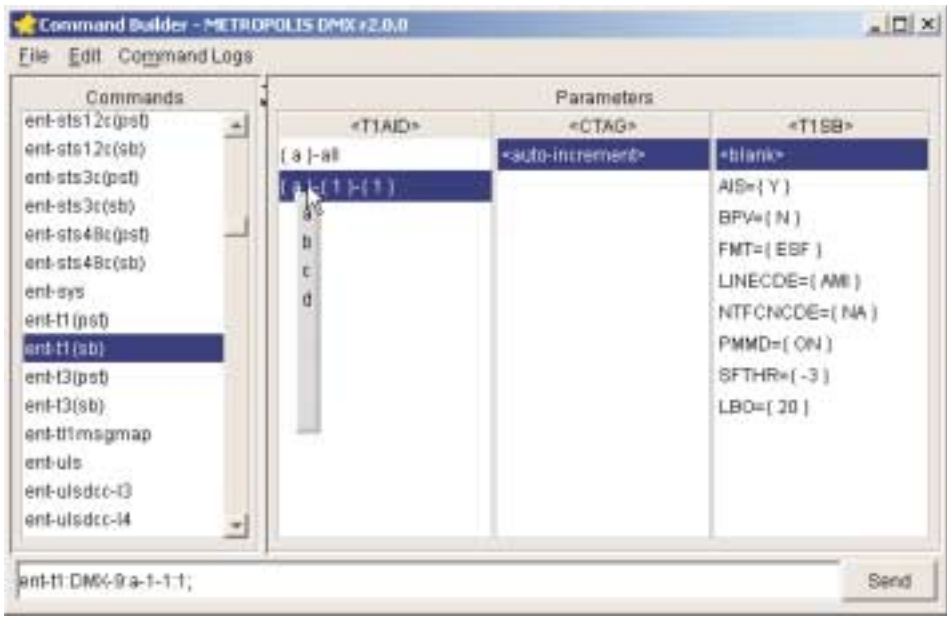
Important! Any parameter value enclosed in brackets {} has an associated drop-down menu showing all possible values. Double-clicking inside the brackets displays the drop-down menu. Clicking on a value in the drop-down menu changes the display in the Parameters section and in the command line at the bottom of the screen.

Parameter values enclosed in square brackets [] must be edited on the command line at the bottom of the screen.

6 Double-click on the *{a}* in *{a}-{1}-{1}* (second entry in the AID column).

Result: All the possible provisionable values for that parameter appear. (Refer to Figure A-42.)

Figure A-42 Drop Down Menu Showing Possible Values



7 Select another value from the drop-down menu.

Result: The drop-down menu disappears and the new value appears in the *Parameters* section and in the command line at the bottom of the screen.

Important! To add more than one parameter to the command line hold down the Control key and click on the parameter. To add a range of parameters, select the first parameter, hold down the Shift key and select the last parameter.

8 Hold down the Control key and click on the AIS, LINECDE, and INTFCNCDE parameters.

Result: The AIS, LINECDE, and INTFCNCDE parameters and their provisioned values appear on the command line at the bottom of the screen.

Commands can also be edited in the command line at the bottom of the screen using common editing commands.

Previous commands sent to the network element can also be accessed by clicking in the command line and using the up and down arrow keys. The command can then be resent by clicking on the *Send* button.

9 Click on **File>Exit** in the Command Builder screen menu to exit the Command Builder.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**.

10 From the WaveStar® CIT screen, select **File Exit**.

Result: A dialog box appears asking you to confirm executing this command. Click on **Yes**.

END OF STEPS

Appendix B: Technical Specifications

Overview

Purpose

This appendix contains the technical specifications for the Metropolis® DMX Access Multiplexer.

Contents

This appendix contains the following sections:

Transmission interface standards

The following table lists the transmission interface standards for electrical, optical, and Ethernet interfaces.

Table B-1 Transmission Interface Standards

Interface	Standard	Comments
DS1 DS3 EC-1	*ANSI* T1.231-1997 GR-499-CORE, Issue 2, 1998	DS1: B8ZS/AMI option, SF/ESF DS3: VMR, VM, or clear channel
OC-3 OC-12 OC-48 OC-192	GR-253-CORE, Issue 2, 1995 GR-496-CORE, Issue 1, 1998 GR-1400-CORE, Issue 3, 2001 *ANSI* T1.231-1997	
10/100T 1GSX 1GLX	IEEE 802.3 IEEE 802.3 *ANSI* T1X1.5/2001-024R5 ITU G.7041	

Electrical Interfaces

Overview

Purpose This section contains the technical specifications for the low-speed electrical interfaces.

Contents This section provides information on the following interfaces:

28DS1 (LNW6) and 28DS1PM (LNW7)

Electrical specification

The 28DS1PM low-speed interface transmits and receives a standard electrical DS1 signal as specified in GR-499-CORE (1.544 Mb/s nominal rate, DSX-1 interconnect specification). Line coding is provisionable per DS1 port to alternate mark inversion (AMI) or AMI with bipolar 8-zero substitution (B8ZS).

Format specification

The 28DS1 low-speed interface provides clear channel transport of any DSX-1 compatible signal. There are no format constraints on this interface. The 28DS1PM interface can be provisioned for the following DS1 formats: clear channel (default), superframe (SF), or extended superframe (ESF) as specified in GR-499-CORE, Section 10. In the case of SF or ESF format selections, DS1 performance monitoring information is collected by monitoring the associated DS1 framing format per *ANSI* T1.231-1997.

Alarm thresholding

The following parameters are monitored on the DS1 interface:

- Loss of signal (LOS): 28DS1 and 28DS1PM
- Bit error rate threshold (BER) based on line coding violations (CV-L): 28DS1PM only

The alarm level for the monitored parameters can be provisioned to critical (CR), major (MJ), and minor (MN), or status. B8ZS and AMI coding violation failure thresholds are user setable to 10^{-3} through 10^{-8}.

Loopbacks

The following loopbacks are supported on the 28DS1(PM) low-speed interface:

- Per-port DS1 facility loopback
- Per-port DS1 terminal loopback.

Line build outs (LBOs)

Line build-outs are software-provisionable. The maximum distance depends on the cable type (maximum 665 feet).

Performance monitoring

For a detailed list of performance monitoring parameters and thresholds, refer to Chapter 6, “Performance Monitoring”.

12DS3/EC1 (LNW16)

Electrical specification (DS3)

The low-speed DS3 interface transmits/receives a standard electrical DS3 signal as specified in GR-499-CORE, Section 9 (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.

Electrical specification (EC-1)

The EC-1 low-speed interface provides clear channel transport of any STS-1 signal compatible with the electrical STS-1 interface specification in GR-253-CORE, Issue 3. The EC-1 low-speed port can be provisioned to provide STS-1 path termination functions for a VT1.5 structured STS-1 with an asynchronous DS1 mapping.

The low-speed EC-1 interface transmits/receives a standard electrical EC-1 signal as specified in GR-253-CORE, Issue 3 (51.844 Mb/s rate, STSX-1 interconnect specification, bipolar 3-zero substitution (B3ZS) encoded and scrambled).

Performance monitoring

For a detailed list of performance monitoring parameters and thresholds, refer to Chapter 6, "Performance Monitoring".

TMUX (LNW18)

Electrical specification

The DS3 interfaces transmit/receive a standard electrical DS3 signal as specified in GR-499-CORE, Section 9 (44.736 Mb/s rate, DSX-3 interconnect specification, bipolar 3-zero substitution (B3ZS) encoding).

The DS1 interfaces transmit/receive a standard electrical DS1 signal as specified in GR-499-CORE (1.544 Mb/s nominal rate, DSX-1 interconnect specification). Line coding is provisionable per DS1 port to alternate mark inversion (AMI) or AMI with bipolar 8-zero substitution (B8ZS).

Transmit functions

The TMUX circuit pack provides the following transmit functions:

- Receives a B3ZS-encoded DS3 signal from a DSX-3
- Recovers DS3 clock and NRZ data
- Calculates parity errors on the DS3 input
- Demultiplexes the M13 or C-bit formatted DS3 signal into 28 DS1s
- Maps the 28 DS1s into VT1.5s and then into an STS-1
- Inserts STS-1 path overhead
- Provides the STS-1 signal to the OLIU circuit packs

Receive functions

The TMUX circuit pack provides the following receive functions:

- Interprets the STS-1 pointer values
- Terminates the STS-1 path
- Disinterleaves the STS-1 signal into 28 VT1.5s and interprets VT pointer values
- Converts the VT1.5 signals to 28 DS1 signals
- Multiplexes the 28 DS1 signals to an M13 or C-bit formatted DS3 signal
- B3ZS encodes the outgoing DS3 signal
- Pre-equalizes the DS3 signal (with LBO) and transmits it to a DSX-3

10/100T (LNW66)

Electrical specification

The LNW66 circuit pack provide a 24-port, 100BASE-TX, IEEE 802.3-compliant interface. The ports perform protocol transparent filtering and bridging of incoming media access control (MAC) frames. MAC frames with a destination address on the local bus are filtered by the LNW66 circuit pack to prevent unnecessary transmission of frames over the wide area network (WAN). The interface auto-negotiates mode (full/half duplex) and speed (10/100 Mb/s) when interfacing with other 802.3-compliant devices over twisted pair media. The LNW66 circuit pack must be housed in slot 1 of a Function Unit group and are not equipment protected. However, facility protection is provided through the WAN via SONET UPSR/BLSR or through the IEEE 802.1D spanning tree algorithm.

Transmission standards

The LNW66 circuit pack complies with the following transmission standards:

- standard IEEE 802.1D for transparent bridging and spanning tree protection
- standard IEEE 802.3, Section 25 for 10/100 Mb autonegotiation (including flow control, full-duplex transmission, and half-duplex transmission).

Format specification

The LNW66 circuit pack complies with the following formatting standards:

- standard IEEE 802.1Q VLANs
- standard *ANSI* T1X1.5/2000-147 generic framing procedure (encapsulating Ethernet frames and mapping them into a SONET payload.
- standard ITU G.707 STS-1 virtual concatenation.

Performance monitoring

For a detailed list of performance monitoring parameters and thresholds, refer to Chapter 6, “Performance Monitoring”.

Optical Interfaces

Overview

Purpose This section contains technical specifications for the low- and high-speed Metropolis® DMX optical interfaces.

Contents The following optical interfaces are discussed in this section:

Quad OC-3 OLIU (LNW36)

Optical specification

The LNW36 OLIU photonics meet or exceed SONET long-reach specifications (SONET LR-1 DFB category). The distributed feedback (DFB) laser transmitter supplies a 1310 nm, scrambled non-return-to-zero (NRZ) coded signal (155.52 Mb/s).

The LNW36 OLIU long reach OC-3 interface supports span lengths up to 55 km. Refer to the "SONET Optical Specifications: OC-3 and OC-12 OLIUs" (B-14) section in this appendix for detailed system, transmitter, receiver, and link budget specifications.

Alarm thresholding

The following parameters are monitored on the OC-3 interface:

- LOS
- LOF
- LOP
- AIS-L
- RDI-L (FERF)
- Path AIS
- Path Unequipped
- Signal degrade (BER)
- Signal fail (BER)

Performance monitoring

SONET line and path performance monitoring complies with the standards outlined in GR-253-CORE. For a detailed list of performance monitoring parameters and thresholds, refer to Chapter 6, "Performance Monitoring".

Dual OC-12 OLIU (LNW46)

Optical specification

The LNW46 OLIU photonics meet or exceed SONET long-reach specifications (SONET LR-1 DFB category). The distributed feedback laser (DFB) supplies a 1310 nm, scrambled NRZ-coded signal (622.08 Mb/s). For direct optical loopbacks, at least 10 dB of optical attenuation is needed for the LNW46.

The LNW46 OC-12 interface supports span lengths up to 53 km. Refer to the "SONET Optical Specifications: OC-3 and OC-12 OLIUs" (B-14) section in this appendix for detailed system, transmitter, receiver, and link budget specifications.

Alarm thresholding

The following parameters are monitored at the OC-12 interface.

- LOF
- LOS
- LOP
- AIS-L
- RDI-L (FERF)
- Path AIS
- Path Unequipped
- Signal Degrade (BER)
- Signal Fail (BER)

Performance monitoring

SONET line and path performance monitoring complies with the standards outlined in GR-253-CORE. For a detailed list of performance monitoring parameters and thresholds, refer to Chapter 6, "Performance Monitoring".

OC-48 OLIUs (LNW26, LNW26B, LNW27, LNW28, LNW29, LNW31, LNW76, LNW77, LNW121B-159B, LNW221-259, and LNW421-459)

Overview

Refer to the following sections in this appendix for detailed system, transmitter, receiver, and link budget specifications.

- "SONET Optical Specifications: OC-48 OLIUs (LNW26/LNW26B, LNW27, LNW28, LNW29, and LNW31)" (B-17)
- "SONET Optical Specifications: OC-48 OLIU (LNW76)" (B-21)
- "SONET Optical Specifications: OC-48 OLIU (LNW77)" (B-24)
- "OC-48 Passive DWDM Optics (LNW121B-LNW159B, LNW221-LNW259, and LNW421-LNW459)" (B-27)

Optical specification

LNW26, LNW26B, LNW27, and LNW28

The LNW26, LNW26B, and LNW28 meet or exceed SONET OC-48 1310 nm LR-1 specifications.

These interfaces supports span lengths up to 51 km.

LNW29

The LNW29 meets or exceeds SONET OC-48 1550 LR-2 specifications.

These interfaces supports span lengths up to 81 km.

LNW31 and LNW77

The LNW31 and LNW77 meet or exceed SONET OC-48 1310 nm IR-1 specifications.

These interfaces support span lengths up to 20 km.

LNW76

The LNW76 meets or exceed SONET OC-48 1310 nm SR-1 specifications.

These interfaces support span lengths up to 600 meters.

LNW121B through LNW159B, LNW221 through LNW259, and LNW421 through LNW459

The LNW121B - LNW159B and LNW221 - LNW259 are passive dense wavelength division multiplexing (DWDM) 100 GHz-spacing OLIUs that exceed SONET OC-48 1550 LR-2 specifications.

Without passive filters, these interfaces can support span lengths up to 85 km.

Alarm thresholding

The following parameters are monitored on the OC-48 interface:

- LOS
- LOF
- LOP
- AIS-L
- RDI-L (FERF)
- Line AIS
- Path Unequipped
- Signal Degrade (BER)
- Signal Fail (BER)

Performance monitoring

SONET line and path performance monitoring complies with the standards outlined in GR-253-CORE. For a detailed list of performance monitoring parameters and thresholds, refer to Chapter 6, “Performance Monitoring”.

OC-192 OLIUs (LNW56 and LNW58)

Optical specification

This section briefly details the optical specifications for the OC-192 OLIU circuit packs.

LNW56

The LNW56 OC-192 OLIU circuit pack is an intermediate reach OLIU that meets or exceeds SONET OC-192 1550 IR-2 specifications. The LNW56 circuit pack bridges span lengths up to 40 km.

LNW58 (optical interface for intra-office applications)

The LNW58 OC-192 OLIU circuit pack is a very short reach (VSR) OC-192 OLIU that meets or exceeds ITU G.693 VSR600-2R1 specifications. The LNW58 circuit pack bridges span lengths up to 600 meters.

Reference

For detailed system, transmitter, receiver, and link budget specifications, refer to "SONET Optical Specifications: OC-192 OLIU (LNW56 and LNW58)" (B-32).

Alarm thresholding

The following parameters are monitored on the OC-192 interface:

- LOS
- LOF
- LOP
- AIS-L
- RDI-L (FERF)
- Line AIS
- Path Unequipped
- Signal Degrade (BER)
- Signal Fail (BER).

Performance monitoring

SONET line and path performance monitoring complies with the standards outlined in GR-253-CORE. For a detailed list of performance monitoring parameters and thresholds, refer to Chapter 6, "Performance Monitoring".

SONET Optical Specifications: OC-3 and OC-12 OLIUs

Overview

The following tables present the optical specifications for the OC-3 OLIU (LNW36) and OC-12 OLIU (LNW46).

System specifications

The following table lists the LNW36 and LNW46 OLIU system specifications.

Table B-2 SONET Optical System Specifications

System Information	LNW36	LNW46
Optical Line Rate	155.52 Mb/s	622.08 Mb/s
Optical Line Coding	Scrambled NRZ	Scrambled NRZ
Optical Wavelength	1310 nm	1310 nm
Performance	SONET LR-1 (Long Reach)	SONET LR-1 (Long Reach)
Temperature Range	OSP Hardened	OSP Hardened

Transmitter specifications

The following table lists the OLIU transmitter information.

Table B-3 SONET Optical Transmitter Information

Transmitter Info.	LNW36	LNW46
Optical Device Temperature Controller	None	None
FDA Classification	Class I	Class I
Optical Source	Distributed Feed-Back (DFB) Laser / Fabry Perot (FP)	Distributed Feed-Back (DFB) Laser
Faceplate Optical Connector	LC connector	LC connector

Receiver specifications

The following table lists OLIU receiver information.

Table B-4 SONET Optical Receiver Information

Receiver Information	LNW36	LNW46
Optical Detector	InGaAsP PIN	InGaAsP PIN
Faceplate Optical Connector	LC connector	LC connector

Link budgets The following table lists the LNW36 and LNW46 OLIU link budgets.

Table B-5 SONET Optical Link Budgets

Parameter	LNW36 (Note 1)	LNW46 (Note 1)
Minimum Wavelength	1280 nm	1280 nm
Maximum Wavelength	1335 nm	1335 nm
Spectral Width (@ 20 dB)	1.0 nm	1.0 nm
Maximum Transmitter Power	0.0 dBm	+2.0 dBm
Minimum Transmitter Power	-5.0 dBm	-2.5 dBm
Maximum Received Power	0.0 dBm	-7.0 dBm
Minimum Received Power	-34.0 dBm	-30.5 dBm
System Gain (see Note 2)	29.0 dB	28.0 dB
Optical Path Penalty (see Note 3)	1.0 dB	1.0 dB
Additional Connector Loss Margin (see Note 4)	1.5 dB	1.5 dB
Additional Unallocated Margin (see Note 5)	1.5 dB	1.5 dB
Minimum Loss Budget (see Note 6)	0.0 dB	9.0 dB
Maximum Loss Budget (see Note 7)	25.0 dB	24.0 dB
Approximate Span Length (see Note 8)	55 km	53 km

Notes:

1. All terminology is consistent with GR-253-CORE, Issue 3. All values are worst-case end of life.

2. The System Gain includes connector loss at the transmitter and receiver points S and R in GR-253-CORE, Issue 3.

3. Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path. The optical path penalty for 1310 nm optics is normally 1.0 dB.

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

5. Additional unallocated margin, or safety margin, can be 0-3 dB. Typically, a 1.5 dB value is assumed.

6. The LNW46 requires an external lightguide build-out (optical attenuator) as part of the connector assembly for optical loopbacks and for loss budgets less than 10 dB to avoid overloading the optical receiver.

7. The stated maximum loss budget equals the System Gain, less the Optical Path Penalty, the Additional Connector Loss Margin, and the Additional Unallocated Margin. The resultant Maximum Loss Budget is available for station cable loss, transmission cable loss, and splice loss.

8. The Approximate Span Length values are calculated per an attenuation assumption. As a general rule, for attenuation-limited systems, an attenuation of 0.45 dB/km is used for 1310 nm optics. This estimate includes typical cable loss (0.40 dB/km) and up to 11 splice losses (0.2 dB per splice). For 1310 nm OC-3 and OC-12 systems, dispersion is not a limiting factor, and the applications are attenuation-limited. Approximate span lengths can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules.

SONET Optical Specifications: OC-48 OLIUs (LNW26/LNW26B, LNW27, LNW28, LNW29, and LNW31)

Overview The following tables present the optical specifications for the OC-48 OLIUs.

System specifications The following table lists the OC-48 OLIU system specifications.

Table B-6 SONET Optical System Specifications

System Information	LNW26/LNW 26B	LNW27	LNW28	LNW29	LNW31
Optical Line Rate	2.488 Gb/s	2.488 Gb/s	2.488 Gb/s	2.488 Gb/s	2.488 Gb/s
Optical Line Coding	Scrambled NRZ	Scrambled NRZ	Scrambled NRZ	Scrambled NRZ	Scrambled NRZ
Optical Wavelength	1310 nm	1310 nm	1310 nm	1550 nm	1310 nm
Performance	SONET LR-1 (Long Reach)	SONET LR-1 (Long Reach)	SONET LR-1 (Long Reach)	SONET LR-2 (Long Reach)	SONET IR-1 (Intermediate Reach)
Temperature Range	Central Office	Central Office	OSP Hardened	Central Office	Central Office

Transmitter specifications The following table lists the OC-48 OLIU transmitter information.

Table B-7 SONET Optical Transmitter Information

Transmitter Info.	LNW26/LNW26B	LNW27	LNW28	LNW29	LNW31
Optical Device Temperature Controller	None				
FDA Classification	Class I				
Optical Source	Distributed Feed-Back (DFB) Laser				
Faceplate Optical Connector	LC connector				

Receiver specifications The following table lists the OC-48 OLIU receiver information.

Table B-8 SONET Optical Receiver Information

Receiver Information	LNW26/LNW26B	LNW27	LNW28	LNW29	LNW31
Optical Detector	Avalanche Photodiode (APD)	Avalanche Photodiode (APD)	Avalanche Photodiode (APD)	Avalanche Photodiode (APD)	PIN
Faceplate Optical Connector	LC connector	LC connector	LC connector	LC connector	LC connector

Link budgets The following table lists the OC-48 OLIU link budgets.

Table B-9 SONET Optical Link Budgets

Parameter	LNW26/LNW26B (Note 1)	LNW27 (Note 1)	LNW28 (Note 1)	LNW29 (Note 1)	LNW31 (Note 1)
Minimum Wavelength	1280 nm	1280 nm	1280 nm	1530 nm	1280 nm
Maximum Wavelength	1335 nm	1335 nm	1335 nm	1565 nm	1335 nm
Spectral Width (@ 20 dB)	1.0 nm	1.0 nm	1.0 nm	1.0 nm	1.0 nm
Maximum Transmitter Power	+1.5 dBm	+1.5 dBm	+1.5 dBm	+3.0 dBm	0.0 dBm
Minimum Transmitter Power	-2.0 dBm	-2.0 dBm	-2.0 dBm	-2.0 dBm	-5.0 dBm
Maximum Received Power	-8.0 dBm	-8.0 dBm	-8.0 dBm	-8.0 dBm	0.0 dBm
Minimum Received Power	-29.0 dBm	-29.0 dBm	-29.0/ -28.0 dBm*	-29.0 dBm	-18.0 dBm
System Gain (see Note 2)	27.0 dB	27.0 dB	27.0/ 26.0 dB*	27.0 dB	13.0 dB
Optical Path Penalty (see Note 3)	1.0 dB	1.0 dB	1.0 dB	2.0 dB	1.0 dB
Additional Connector Loss Margin (see Note 4)	1.5 dB	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Additional Unallocated Margin (see Note 5)	1.5 dB	1.5 dB	1.5 dB	1.5 dB	1.5 dB
Minimum Loss Budget (see Note 6)	9.5 dB	9.5 dB	9.5 dB	11.0 dB	0.0 dB
Maximum Loss Budget (see Note 7)	23.0 dB	23.0 dB	23.0/ 22.0 dB*	22.0 dB	9.0 dB
Approximate Span Length (see Note 8)	51 km	51 km	51/49 km	81 km	20 km

* The LNW28 is an environmentally hardened OLIU (it is capable of operating in outside plant temperature ranges). The first number applies to standard CO applications; the second number applies to deployment where temperature excursions (found in OPS environments) may occur.

Notes:

1. All terminology is consistent with GR-253-CORE, Issue 3. All values are worst-case end of life.

2. The System Gain includes connector loss at the transmitter and receiver points S and R in GR-253-CORE, Issue 3.

3. Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path. The optical path penalty for 1310 nm optics is normally 1.0 dB. The optical path penalty for 1550 nm optics is 2.0 dB.

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

5. Additional unallocated margin, or safety margin, can be 0-3 dB. Typically, a 1.5 dB value is assumed.

6. The LNW26/LNW26B, LNW28, and LNW29 require an external lightguide build-out (optical attenuator) as part of the connector assembly for optical loopbacks and for loss budgets less than 11 dB to avoid overloading the optical receiver.

7. The stated maximum loss budget equals the System Gain, less the Optical Path Penalty, the Additional Connector Loss Margin, and the Additional Unallocated Margin. The resultant Maximum Loss Budget is available for station cable loss, transmission cable loss, and splice loss.

8. The Approximate Span Length values are calculated per an attenuation assumption. As a general rule, for attenuation-limited systems, an attenuation of 0.45 dB/km is used for 1310 nm optics. This estimate includes typical cable loss (0.40 dB/km) and up to 11 splice losses (0.2 dB per splice). For 1310 nm OC-48 systems, dispersion is not a limiting factor, and the applications are attenuation-limited. For 1550 nm optics, an attenuation of 0.278 dB/km is used. Appropriate fiber-cable loss and numerous splice losses are included. For long reach 1550 nm optics, dispersion my be a limiting factor. Approximate Maximum span lengths can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules.

SONET Optical Specifications: OC-48 OLIU (LNW76)

Overview

The following tables present the optical specifications for the OC-48 OLIU (LNW76).

System specifications

The following table lists the OLIU (LNW76) system specifications.

Table B-10 SONET Optical System Specifications

System Information	LNW76
Optical Line Rate	2.488 Gb/s
Optical Line Coding	Scrambled NRZ
Optical Wavelength	1310 nm
Performance	SONET SR-1 (Short Reach)
Temperature Range	Central Office

Transmitter specifications

The following table lists the OLIU (LNW76) transmitter information.

Table B-11 SONET Optical Transmitter Information

Transmitter Info.	LNW76
Optical Device Temperature Controller	None
FDA Classification	Class I
Optical Source	Fabry Perot (FP)
Faceplate Optical Connector	LC connector

Receiver specifications

The following table lists the OLIU (LNW76) receiver information.

Table B-12 SONET Optical Receiver Information

Receiver Information	LNW76
Optical Detector	InGaAsP PIN
Faceplate Optical Connector	LC connector

Link budgets

The following table lists the OC-48 OLIU (LNW76) link budgets.

Table B-13 SONET Optical Link Budgets

Parameter	LNW76
Minimum Wavelength	1266 nm
Maximum Wavelength	1360 nm
Spectral Width (Maximum RMS)	4.0 nm
Maximum Transmitter Power	-3.0 dBm
Minimum Transmitter Power	-10.0 dBm
Maximum Received Power	-3.0 dBm
Minimum Received Power	-18.0 dBm
Minimum System Gain (see Note 2)	8.0 dB
Optical Path Penalty (see Note 3)	1.0 dB
Additional Connector Loss Margin (see Note 4)	1.5 dB
Additional Unallocated Margin (see Note 5)	1.5 dB
Minimum Loss Budget	0.0 dB
Maximum Loss Budget (see Note 6)	4.0 dB
Approximate Span Length (see Note 7)	2 km

Notes:

1. All terminology is consistent with GR-253-CORE, Issue 3. All values are worst-case end of life.

2. The System Gain includes connector loss at the transmitter and receiver points S and R in GR-253-CORE, Issue 3.

3. Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path. The optical path penalty for 1310 nm optics is normally 1.0 dB.

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

5. Additional unallocated margin, or safety margin, can be 0-3 dB. Typically, a 1.5 dB value is assumed.

6. The stated maximum loss budget equals the System Gain, less the Optical Path Penalty, the Additional Connector Loss Margin, and the Additional Unallocated Margin. The resultant Maximum Loss Budget is available for station cable loss, transmission cable loss, and splice loss.

7. The Approximate Span Length values are calculated per an attenuation assumption. As a general rule, for attenuation-limited systems, an attenuation of 0.45 dB/km is used for 1310 nm optics. This estimate includes typical cable loss (0.40 dB/km) and up to 11 splice losses (0.2 dB per splice). For 1310 nm OC-48 systems, dispersion is not a limiting factor, and the applications are attenuation-limited. Approximate span lengths can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules. However, the short-reach Multi-Longitudinal Mode (MLM) laser (also known as Fabry Perot) is only recommended for spans of up to 2 kilometers.

SONET Optical Specifications: OC-48 OLIU (LNW77)

Overview

The following tables present the optical specifications for the OC-48 OLIU (LNW77).

System specifications

The following table lists the OLIU (LNW77) system specifications.

Table B-14 SONET Optical System Specifications

System Information	LNW77
Optical Line Rate	2.488 Gb/s
Optical Line Coding	Scrambled NRZ
Optical Wavelength	1310 nm
Performance	SONET IR-1 (Intermediate Reach)
Temperature Range	Central Office

Transmitter specifications

The following table lists the OLIU (LNW77) transmitter information.

Table B-15 SONET Optical Transmitter Information

Transmitter Info.	LNW77
Optical Device Temperature Controller	None
FDA Classification	Class I
Optical Source	Distributed Feed-Back (DFB) Laser
Faceplate Optical Connector	LC connector

Receiver specifications

The following table lists the OLIU (LNW77) receiver information.

Table B-16 SONET Optical Receiver Information

Receiver Information	LNW77
Optical Detector	InGaAsP PIN
Faceplate Optical Connector	LC connector

Link budgets

The following table lists the OC-48 OLIU (LNW77) link budgets.

Table B-17 SONET Optical Link Budgets

Parameter	LNW77
Minimum Wavelength	1280 nm
Maximum Wavelength	1335 nm
Spectral Width (@ 20 dB)	1.0 nm
Maximum Transmitter Power	0.0 dBm
Minimum Transmitter Power	-5.0 dBm
Maximum Received Power	0.0 dBm
Minimum Received Power	-18.0 dBm
Minimum System Gain (see Note 2)	13.0 dB
Optical Path Penalty (see Note 3)	1.0 dB
Additional Connector Loss Margin (see Note 4)	1.5 dB
Additional Unallocated Margin (see Note 5)	1.5 dB
Minimum Loss Budget	0.0 dB
Maximum Loss Budget (see Note 6)	9.0 dB
Approximate Span Length (see Note 7)	20 km

Notes:

1. All terminology is consistent with GR-253-CORE, Issue 3. All values are worst-case end of life.

2. The System Gain includes connector loss at the transmitter and receiver points S and R in GR-253-CORE, Issue 3.

3. Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path. The optical path penalty for 1310 nm optics is normally 1.0 dB.

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

5. Additional unallocated margin, or safety margin, can be 0-3 dB. Typically, a 1.5 dB value is assumed.

6. The stated maximum loss budget equals the System Gain, less the Optical Path Penalty, the Additional Connector Loss Margin, and the Additional Unallocated Margin. The resultant Maximum Loss Budget is available for station cable loss, transmission cable loss, and splice loss.

7. The Approximate Span Length values are calculated per an attenuation assumption. As a general rule, for attenuation-limited systems, an attenuation of 0.45 dB/km is used for 1310 nm optics. This estimate includes typical cable loss (0.40 dB/km) and up to 11 splice losses (0.2 dB per splice). For 1310 nm OC-48 systems, dispersion is not a limiting factor, and the applications are attenuation-limited. Approximate span lengths can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules. However, the short-reach Multi-Longitudinal Mode (MLM) laser (also known as Fabry Perot) is only recommended for spans of up to 2 kilometers.

OC-48 Passive DWDM Optics (LNW121B-LNW159B, LNW221-LNW259, and LNW421-LNW459)

Overview

The following tables present the optical specifications for the OC-48 passive DWDM circuit packs (LNW121B-LNW159B, LNW221-LNW259, and LNW421-LNW459: - odd numbers only).

System specifications

The following table lists the passive DWDM (LNW121B-LNW159B, LNW221-LNW259, and LNW421-LNW459) system specifications.

Table B-18 SONET Optical System Specifications

System Information	LNW121B-LNW159B LNW221-LNW259, and LNW421-LNW459
Optical Line Rate	2.488 Gb/s
Optical Line Coding	Scrambled NRZ
Optical Wavelength	1530 nm - 1560 nm
Performance	SONET LR-2 (Long Reach) + DWDM
Temperature Range	Central Office

Transmitter specifications

The following table lists the passive DWDM (LNW121B-LNW159B, LNW221-LNW259, and LNW421-LNW459) transmitter information.

Table B-19 SONET Optical Transmitter Information

Transmitter Information	LNW121B-LNW159B LNW221-LNW259, and LNW421-LNW459
Optical Device Temperature Controller	None
FDA Classification	Class I
Optical Source	Distributed Feed-Back (DFB) Laser or Externally Modulated Laser (EML)
Faceplate Optical Connector	LC connector

Receiver specifications

The following table lists the receiver information for the LNW121B-LNW159B, LNW221-LNW259, and LNW421-LNW459 OC-48 OLIUs.

Table B-20 SONET Optical Receiver Information

Receiver Information	LNW121B-LNW159B LNW221-LNW259, and LNW421-LNW459
Optical Detector	Avalanche Photodiode (APD)
Faceplate Optical Connector	LC connector

Operating wavelengths

The following table lists the operating wavelengths (channels) for the OC-48 passive DWDM circuit packs.

Important! Each circuit pack is hardware tunable to one of the two wavelengths listed (CH X or CH Y).

Table B-21 OC-48 Passive DWDM Operating Wavelengths

Port Unit	Wavelength (nm)	
	CH X	CH Y
LNW121B, LNW221, LNW421	1560.61	1559.79
LNW123B, LNW223, LNW423	1558.98	1558.17
LNW125B, LNW225, LNW425	1557.36	1556.56
LNW127B, LNW227, LNW427	1555.75	1554.94
LNW131B, LNW231, LNW431	1552.52	1551.72
LNW133B, LNW233, LNW433	1550.92	1550.12
LNW135B, LNW235, LNW435	1549.32	1548.52
LNW137B, LNW237, LNW437	1547.72	1546.92
LNW143B, LNW243, LNW443	1543.73	1542.94
LNW145B, LNW245, LNW445	1542.14	1541.35
LNW147B, LNW247, LNW447	1540.56	1539.77
LNW149B, LNW249, LNW449	1538.98	1538.19
LNW153B, LNW253, LNW453	1535.82	1535.04
LNW155B, LNW255, LNW455	1534.25	1533.47
LNW157B, LNW257, LNW457	1532.68	1531.90
LNW159B, LNW259, LNW459	1531.12	1530.33

Link budgets The following table lists the OC-48 passive DWDM link budgets.

Table B-22 SONET Optical Link Budgets

Parameter	LNW121B-LNW159B, LNW221-LNW259, and LNW421-LNW459 (Note 1)
Interface Type	OC-48 Custom LR-2 for DWDM
Minimum Wavelength	1530.334 nm
Maximum Wavelength	1560.606 nm
Maximum Spectral Width (@ 20 dB)	0.5 nm
Dispersion (limited at)	1800 ps/nm
Maximum Transmitter Power	+2.0 dBm
Minimum Transmitter Power	-1.0 dBm
Maximum Received Power	-8.0 dBm
Minimum Received Power	-29.0 dBm
Minimum System Gain (see Note 2)	28.0 dB
Optical Path Penalty (see Note 3)	2.0 dB
Additional Connector Loss Margin (Note 4)	1.5 dB
Additional Unallocated Margin (see Note 5)	1.5 dB
Minimum Loss Budget (see Note 6)	10.0 dB
Maximum Loss Budget (see Note 7)	26.0 dB
Approximate Span Length (see Note 8)	85 km*
* This span length assumes no passive optical unit is being used.	

Notes:

1. All terminology is consistent with GR-253-CORE, Issue 3. All values are worst-case end of life.

2. The System Gain includes connector loss at the transmitter and receiver points S and R in GR-253-CORE, Issue 3.

3. Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path. The optical path penalty for 1550 nm optics is normally 2.0 dB.

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

5. Additional unallocated margin, or safety margin, can be 0-3 dB. Typically, a 1.5 dB value is assumed.

6. The LNW 121B-159B, LNW221-259, and LNW421-459 series all require an external lightguide build-out (optical attenuator) as part of the connector assembly for optical loopbacks and for loss budgets less than 10 db to avoid overloading the optical receiver.

7. The stated maximum loss budget equals the System Gain, less the Optical Path Penalty, the Additional Connector Loss Margin, and the Additional Unallocated Margin. The resultant Maximum Loss Budget is available for station cable loss, transmission cable loss, and splice loss. The stated maximum loss budget is conservative; i.e., if the additional connector loss margin and additional unallocated margin are not needed, an additional 3 dB budget is available.

8. The Approximate Span Length values are calculated per an attenuation assumption. As a general rule, for attenuation-limited systems, an attenuation of 0.27 dB/km is used for 1550 nm optics. This estimate includes typical cable loss (0.22 dB/km) and up to 11 splice losses (0.2 dB per splice). For 1550 nm OC-48 systems, dispersion can also be limiting factor. Approximate Span Lengths can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules.

□

SONET Optical Specifications: OC-192 OLIU (LNW56 and LNW58)

Overview

The following tables present the optical specifications for the LNW56 and LNW58 OC-192 OLIU.

System specifications

The table below lists the LNW56 AND LNW58 OC-192 OLIU system specifications.

Table B-23 SONET Optical System Specifications

System Information	LNW56	LNW58
Optical Line Rate	9953.28 Mb/s	9953.28 Mb/s
Optical Line Coding	Scrambled NRZ	Scrambled NRZ
Optical Wavelength	1550 nm	1310 nm
Performance	SONET IR-2 (Intermediate Reach)	ITU-T G.693 VSR 600-2R1 (Very Short Reach)
Temperature Range	Central Office	Central Office

Transmitter specifications

The table below lists the LNW56 AND LNW58 OC-192OLIU transmitter information.

Table B-24 SONET Optical Transmitter Information

Transmitter Info.	LNW56	LNW58
Optical Device Temperature Controller	None	None
FDA Classification	Class I	Class I
Optical Source	InGaAsP Laser, SLM Structure	InGaAsP Laser, FP/DFB Structure
Faceplate Optical Connector	LC connector	LC connector

Receiver specifications

The table below lists the LNW56 AND LNW58 OC-192 OLIU receiver information.

Table B-25 SONET Optical Receiver Information

Receiver Information	LNW56	LNW58
Optical Detector	PIN Diode	PIN Diode
Faceplate Optical Connector	LC connector	LC connector

Link budgets

The table below lists the OC-192 LNW56 AND LNW58 OLIU link budgets.

Table B-26 SONET Optical Link Budgets

Parameter (Note 1)	LNW56	LNW58
Minimum Wavelength	1530 nm	1260 nm
Maximum Wavelength	1565 nm	1360 nm
Spectral Width	1.0 nm	NA
Maximum Transmitter Power	+2.0 dBm	-1.0 dBm
Minimum Transmitter Power	-1.0 dBm	-6.0 dBm
Maximum Received Power	-1.0 dBm	-1.0 dBm
Minimum Received Power	-14.0 dBm	-11.0 dBm
Minimum System Gain (see Note 2)	13.0 dB	5.0 dB
Optical Path Penalty (see Note 3)	2.0 dB	1.0 dB
Minimum Loss Budget (see Note 4)	3.0 dB	0.0 dB
Maximum Loss Budget (see Note 5)	11.0 dB	4.0 dB
Approximate Span Length (see Note 6)	40 km	600 meters

Notes:

1. All terminology is consistent with GR-253-CORE, Issue 3. All values are worst-case end of life.

2. The system gain includes connector loss at the transmitter and receiver points S and R in GR-253-CORE, Issue 3.

3. Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path. The optical path penalty for 1310 nm is a maximum of 1.0 dB. The optical path penalty for 1550 nm is a maximum of 2.0 dB.

4. The LNW56 requires an external lightguide build-out (optical attenuator) as part of the connector assembly for optical loopbacks and for loss budgets less than 3.0 dB to avoid overloading the optical receiver.

5.Maximum loss budget available for both station and transmission cable and splices.

6. The Approximate Span Length values are calculated per an attenuation assumption. As a general rule, for attenuation-limited systems, an attenuation of 0.27 dB/km is used for 1550 nm optics. This estimate includes typical cable loss (0.22 dB/km) and up to 11 splice losses (0.2 dB per splice). For 1550 nm OC-192 systems, dispersion can also be limiting factor. Approximate Span Lengths can be calculated more precisely based on particular fiber and splice characteristics and local engineering rules. However, the VSR OC-192 LNW58 is recommended for spans of up to 600 meters only.

1GSX (1000BASE-SX) Ethernet (LNW67)

Optical specification

The 1GSX circuit pack provides a short-reach, 2-port, 1000BASE-SX, IEEE 802.3-compliant interface. The LNW67 circuit pack performs protocol transparent filtering and bridging of incoming media access control (MAC) frames. MAC frames with a destination address on the local bus are filtered by the LNW67 to prevent unnecessary transmission of frames over the wide area network (WAN). The LNW67 must be housed in slot 1 of a Function Unit group and is not equipment protected. However, protection is provided via SONET UPSR, BLSR, or through the IEEE 802.1D spanning tree algorithm.

The LNW67 1GSX Ethernet interface complies with the following transmission standards:

- Standard IEEE 802.1D for transparent bridging and spanning tree protection
- Standard IEEE 802.3 autonegotiation (for flow control).

System specifications

The following are the 1GSX system specifications:

- Optical Line Rate: 1.25 Gb/s +/- 100 ppm
- Optical Line Coding: 8B/10B
- Performance: Short-reach.

Operating range

The following table shows the operating range for the 1GSX optical Ethernet interface. A 1000BASE-SX compliant transceiver supports both 50 µm and 62.5 µm fiber media types. A transceiver that exceeds the operational range requirement while meeting all other optical specifications is considered compliant (e.g., a 50 µm solution operating at 600 m meets the minimum range requirement of 2 to 550 m).

Table B-27 1GSX Operating Range Over Each Optical Fiber Type

Fiber Type	Modal Bandwidth @ 850 nm (minimum overfilled launch) (MHz-km)	Minimum Range (meters)
62.5 µm MMF	160	2 to 220
62.5 µm MMF	200	2 to 275
50 µm MMF	400	2 to 500
50 µm MMF	500	2 to 550
10 µm SMF	Not supported	Not supported

Transmitter specifications

The following table shows 1GSX optical transmitter specifications. The 1000BASE-SX transmitter meets these specifications per measurement techniques define in IEEE 802.3, Section 38, Clause 6.

Table B-28 1GSX Transmit Specifications

Description	62.5/50 μm MMF	Unit
Transmitter type	Shortwave Laser	
Signaling speed (range)	1.25 +/- 100 ppm	GBd
Wavelength (l, range)	770 to 860	nm
T_{rise}/T_{fall} (max; 20%-80%; l > 830 nm)	0.26	ns
T_{rise}/T_{fall} (max; 20%-80%; l £ 830 nm)	0.21	ns
RMS spectral width (max)	0.85	nm
Average launch power (max)	**Note 1**	dBm
Average launch power (min)	-9.5	dBm
Average launch power of OFF transmitter (max) **(Note 2)**	-30	dBm
Extinction ratio (min)	9	dB
RIN (max)	-117	dB/Hz
Coupled Power Ratio (CPR) (min) **(Note 3)**	9 < CPR	dB

Notes:

1.The 1000BASE-SX launch power shall be the lesser of the class 1 safety limit as defined by IEEE 802.3, Section 38, Clause 7.2 or the average receiver power (maximum) defined by Table B-29.

2.Examples of an OFF transmitter are as follows: no power supplied to the Physical Medium Dependent (PMD), laser shutdown for safety conditions, and activation of a “transmit disable” or other optional module laser shut-down conditions. During all conditions when the Physical Medium Attachment (PMA) is powered, the ac signal (data) into the transmit port will be valid encoded 8B/10B patterns (this is a requirement of the Physical Coding Sublayer [PCS]) except for short durations during system power-on-reset or diagnostics when the PMA is placed in a loopback mode.

3.Radial overfilled launches (described in IEEE 802.3, Section 38A, Clause 2) should be avoided even if they meet CPR ranges.

Receiver specifications

The 1000BASE-SX receiver meets the specifications defined in the following table, per measurement techniques defined in IEEE 802.3, Section 38, Clause 6. The sampling instant is defined to occur at the eye center. The receive sensitivity includes the extinction ratio penalty.

Table B-29 1GSX Receive Specifications

Description	62.5 μm MMF	50 μm MMF	Unit
Signaling speed (range)	1.25 +/- 100 ppm	1.25 +/- 100 ppm	GBd
Wavelength (range)	770 to 860	770 to 860	nm
Average receive power (max)	0	0	dBm
Receive sensitivity	-17	-17	dBm
Return loss (min)	12	12	dB
Stressed receive sensitivity (see Notes 1 and 2)	-12.5	-13.5	dBm
Vertical eye-closure penalty (see Note 3)	2.60	2.20	dB
Receive electrical 3 dB upper cutoff frequency (max)	1500	1500	MHz

Notes:

1.Measured with conformance test signal at TP3 (see IEEE 802.3, Section 38.6.11) for BER at the eye center.

2.Measured with a transmit signal having a 9 dB extinction ratio. If another extinction ratio is used, the stressed receive sensitivity should be corrected for the extinction ratio penalty.

3.Vertical eye-closure penalty is a test condition for measureing stressed receive sensitivity. It is not a required characteristic of the receiver.

Link budgets

The worst-case power budget and link penalties for a 1000BASE-SX channel are shown in the following table.

Table B-30 1GSX Link Budgets and Penalties

Parameter	62.5 μm MMF		50 μm MMF		Unit
Modal bandwidth as measured at 850 nm (minimum, overfilled launch)	160	200	400	500	MHz-km
Link power budget	7.5	7.5	7.5	7.5	dB
Operating distance	220	275	500	550	m
Channel insertion loss (see Notes 1 and 2)	2.38	2.60	3.37	3.56	dB
Link power penalties (see Note 2)	4.27	4.29	4.07	3.57	dB
Unallocated margin in link power budget (see Note 2)	0.84	0.60	0.05	0.37	dB

Notes:

1.Operating distances used to calculate the channel insertion loss are the maximum values specified in Table B-28 and B-29.

2.A wavelength of 830 nm is used to calculate the channel insertion loss, link power penalties, and unallocated margin.

Format specification

The LNW67 1GSX Ethernet interface complies with the following formatting standards:

- standard IEEE 802.1Q VLAN encapsulation (user assigned or network assigned)
- standard ANSI T1X1.5/2001-024R4 generic framing procedure (encapsulating Ethernet frames mapping them into a SONET payload)
- standard ITU G.GFP STS-1 virtual concatenation.

Performance monitoring

For a detailed list of performance monitoring parameters, refer to Chapter 6, “Performance Monitoring”.

1GLX (1000BASE-LX) Ethernet (LNW68)

Optical specification

The 1GLX circuit pack provides a long-reach, 2-port, 1000BASE-LX, IEEE 802.3-compliant interface. The LNW68 circuit pack performs protocol transparent filtering and bridging of incoming media access control (MAC) frames. MAC frames with a destination address on the local bus are filtered by the LNW68 to prevent unnecessary transmission of frames over the wide area network (WAN). The LNW68 must be housed in slot 1 of a Function Unit group and is not equipment protected. However, protection is provided via SONET UPSR, BLSR, or through the IEEE 802.1D spanning tree algorithm.

The LNW68 1GLX Ethernet interface complies with the following transmission standards:

- standard IEEE 802.1D for transparent bridging and spanning tree protection
- standard IEEE 802.3 autonegotiation (for flow control).

System specifications

The following are the 1GLX system specifications:

- Optical Line Rate: 1.25 Gb/s +/- 100 ppm
- Optical Line Coding: 8B/10B
- Performance: Long-reach.

Operating range

The following table shows the operating range for the 1GLX optical Ethernet interface. A 1000BASE-LX compliant transceiver supports 50 µm, 62.5 µm, 10 µm fiber media types. A transceiver that exceeds the operational range requirement while meeting all other optical specifications is considered compliant (e.g., a 50 µm solution operating at 5500 m meets the minimum range requirement of 2 to 5000 m).

Table B-31 1GLX Operating Range Over Each Optical Fiber Type

Fiber Type	Modal Bandwidth @ 1300 nm (minimum overfilled launch) (MHz-km)	Minimum Range (meters)
62.5 µm MMF	500	2 to 550
50 µm MMF	400	2 to 550
50 µm MMF	500	2 to 550
10 µm SMF	N/A	2 to 5000

Transmitter specifications

The following table describes the transmit specifications for LNW68. The 1000BASE-LX transmitter meets these specifications per measurement techniques define in IEEE 802.3, Section 38, Clause 6.

Table B-32 1GLX Transmit Specifications

Description	62.5 μm MMF	50 μm MMF	10 μm SMF	Unit
Transmitter type	Longwave Laser			
Signaling speed (range)	1.25 +/- 100 ppm			GBd
Wavelength (l, range)	1270 to 1335			nm
T_{rise}/T_{fall} (max; 20%-80% response time)	0.26			ns
RMS spectral width (max)	4			nm
Average launch power (max)	-3			dBm
Average launch power (min)	-11.5	-11.5	-11.0	dBm
Average launch power of OFF transmitter (max)	-30			dBm
Extinction ratio (min)	9			dB
RIN (max)	-120			dB/Hz
Coupled Power Ratio (CPR) (min) (see Note 1)	28 < CPR < 40	12 < CPR < 20	N/A	dB

Notes:

1. Due to dual media (single-mode and multimode) support of the 1GLX transmitter, fulfillment of this specification requires a single-mode fiber offset-launch mode-conditioning patch cord (as described in IEEE 802.3, Section 38.11.4) for MMF and SMF operation. This patch cord is not used for single-mode operation.

Receiver specifications

The 1000BASE-LX receiver meets the specifications defined in the following table, per measurement techniques defined in IEEE 802.3, Section 38.6. The sampling instant is defined to occur at the eye center. The receive sensitivity includes the extinction ratio penalty.

Table B-33 1GLX Receive Specifications

Description	62.5 μm MMF	Unit
Signaling speed (range)	1.25 +/- 100 ppm	GBd
Wavelength (range)	1270 to 1355	nm
Average receive power (max)	-3	dBm
Receive sensitivity	-19	dBm
Return loss (min)	12	dB
Stressed receive sensitivity (see Notes 1 and 2)	-14.4	dBm
Vertical eye-closure penalty (see Note 3)	2.60	dB
Receive electrical 3 dB upper cutoff frequency (max)	1500	MHz

Notes:

1.Measured with conformance test signal at TP3 (see IEEE 802.3, Section 38.6.11) for BER at the eye center.

2.Measured with a transmit signal having a 9 dB extinction ratio. If another extinction ratio is used, the stressed receive sensitivity should be corrected for the extinction ratio penalty.

3.Vertical eye-closure penalty is a test condition for measureing stressed receive sensitivity. It is not a required characteristic of the receiver.

Link budgets

The worst-case power budget and link penalties for a 1000BASE-LX channel are shown in the following table.

Table B-34 1GLX Link Budgets and Penalties

Parameter	62.5 µm MMF	50 µm MMF	50 µm SMF	10 µm SMF	Unit
Modal bandwidth as measured at 850 nm (minimum, overfilled launch)	500	400	500	N/A	MHz-km
Link power budget	7.5	7.5	7.5	8.0	dB
Operating distance	550	550	550	10000	m
Channel insertion loss (see Notes 1 and 2)	2.35	2.35	2.35	4.57 (See Note 3)	dB
Link power penalties (see Note 2)	3.48	5.08	3.96	3.27 (See Note 3)	dB
Unallocated margin in link power budget (see Note 2)	1.67	0.07	1.19	0.16 (See Note 3)	dB

Notes:

1.Operating distances used to calculate the channel insertion loss are the maximum values specified in Table B-32 and B-33.

2.A wavelength of 1270 nm is used to calculate the channel insertion loss, link power penalties, and unallocated margin.

3.These figures are better than specified and will be updated in a future release.

Format specification

The LNW68 1GLX Ethernet interface complies with the following formatting standards:

- standard IEEE 802.1Q VLAN encapsulation (user assigned or network assigned)
- standard ANSI T1X1.5/2000-147 generic framing procedure (encapsulating Ethernet frames and mapping them into SONET format)
- standard ITU G.707 STS-1 virtual concatenation.

Performance monitoring

For a detailed list of performance monitoring parameters and thresholds, refer to Chapter 6, “Performance Monitoring”.

Lightguide Jumpers and Buildouts

Overview

The Metropolis® DMX provides standard LC-type connectors on all optical interfaces. 5 dB, 10 dB, 15 dB, and 20 dB attenuating build-outs are supported.

Single-mode jumpers

The OC-3, OC-12, OC-48, OC-192, and 1GLX lightguide interfaces use single-mode jumpers for connecting to and from the outside plant *LGX* panel and the Metropolis® DMX.

Multi-mode jumpers

The 1GSX interface must use multi-mode jumpers.

Build-outs

Metropolis® DMX supports the use of single-mode to single-mode (SM-SM) fiber exclusively, except on the 1GSX interface.

Reference

For more information, including a complete list of available jumpers and build-outs, refer to the *Metropolis® DMX Access Multiplexer Applications and Planning Guide, 365-372-300*.

System Performance

Overview

Purpose

This section provides performance specifications for the Metropolis® DMX Access Multiplexer.

Contents

The following performance specifications are discussed in this section:

SONET Overhead Bytes

Overview Metropolis® DMX uses SONET transport and path overhead bytes as specified in GR-253-CORE.

V4 byte The reserved V4 byte in the VT1.5 superframe is sometimes used for internal error detection in a Metropolis® DMX shelf. This internal usage of the V4 byte may cause the value of a transmitted V4 byte to vary. The Metropolis® DMX always ignores the value of the V4 byte received from another network element as required by GR-253-CORE.

Wander/Jitter

Maximum time interval error (MTIE)

For SONET optical interfaces, the maximum time interval error (MTIE) does not exceed 60 nanoseconds phase variation when timed with a wander-free reference.

Wander requirements

Wander transfer, tolerance, and generation requirements are met as specified in GR-253-CORE.

Jitter requirements

Jitter transfer, tolerance, and generation requirements are met as specified in GR-253-CORE and GR-499-CORE.

Short-term stability

The SONET interfaces meet the T1.101 OC-N output short-term stability mask as specified in GR-253-CORE, Section 5.

Signal Performance

Overview The following specifications apply to the standard networks defined in GR-499-CORE, Issue 3.

DS1 rate For systems interfacing at the DS1 rate, the number of errored seconds during a 7-hour, one-way loopback test, is less than 10.

DS3 rate For systems interfacing at the DS3 rate, the number of errored seconds during a 2-hour, one-way loopback test, is less than 29.

BER The BER is less than $2x10^{-10}$ for both the DS1 and DS3 rates. Burst-errored seconds are excluded.

Burst-errored seconds The frequency of burst-errored seconds, other than those caused by protection switching induced by hard equipment failures, averages less than 4 per day.

Synchronization

Overview

The embedded Stratum 3 Timing Generator meets the specifications of GR-253-CORE, SONET Transport Systems Generic Criteria. The timing generator function is embedded in the 1x1 protected optical interface circuit packs in the main slot pair.

Timing modes

The timing generator supports four timing modes:

- **External timing**

  Locked to an external Stratum 3 (+/- 4.6 ppm) or better DS1 reference.

- **Line timing**

  Locked to recovered clock from an OC-N signal (from Main OC-48 only).

- **Free running**

  Timing derived from high-stability temperature-compensated voltage-controlled crystal oscillator (TCVCXO) with a long-term accuracy of +/- 4.6 ppm and temperature stability of -40^{o} C to +65^{o} C.

- **Holdover**

  Timing derived from the internal oscillator in the case of an unprotected synchronization reference failure. In this instance, the Stratum Timing Generator switches to “holdover mode” and continues to provide system timing, using the internal oscillator to maintain the last known good reference frequency. If the DS1 timing output is enabled for network synchronization, DS1 AIS will be inserted on detection of unprotected optical reference failure. In holdover mode, the accuracy is +/-.37 ppm over the full -40 to +65^{o} C temperature range.

- **DS1 timing outputs**

  In addition, each timing generator (main circuit pack) provides a single DS1 sync output derived from a received optical interface signal (OC-N). These DS1 timing outputs may be used to provide a timing reference signal to a local BITS clock.

DS1 timing functions

The DS1 timing reference inputs and outputs meet the specifications of GR-499-CORE for DS1 interfaces and GR-253-CORE for timing references. The following are the DS1 timing functions:

- Two DS1 timing reference inputs
- Two DS1 timing reference outputs
- Software-provisionable line build-outs for DS1 timing outputs (up to 655 feet depending on cable type)
- Alarms (Out of Frame, AIS, BER).

□

Protection Switching

1+1 networks

Metropolis® DMX complies with SONET 1+1 unidirectional nonrevertive protection switching requirements as specified in GR-253-CORE. Automatic line switches are initiated by signal fail and signal degrade conditions on the received OC-3/OC-12 low-speed optical signal OC-48 high speed signal. The automatic line switches are completed within 50 milliseconds of a signal failure. The signal's BER is calculated from violations of the SONET line overhead B2 parity bytes. Signal fail is declared for incoming LOS, LOF, line AIS, or a BER exceeding 10^{-3}, while a BER exceeding a provisionable threshold between 10^{-5} and 10^{-9} causes a signal degrade to be declared. Manual switch commands are available through the local and remote operations interfaces.

High-speed UPSR 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, LOF, LOP, path unequipped, path AIS, and path BER performance. On pass-through paths, all detected hard failures (LOS, LOF, LOP, line AIS, or STS-1 path AIS) result in VT AIS insertion in the outgoing signals. This allows the terminating node to be aware of the failure and to switch to protection. Protection switching is completed within 50 milliseconds of failure detection.

Under normal conditions, both incoming SONET path signals to the switch selection point are of high quality, and the signal can be selected from either ring. A failure or transmission degradation on one of the rings requires that the other ring path be selected. The Metropolis® DMX 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.

High-speed BLSR networks

In Release 2.1 and later releases, Metropolis® DMX supports standards compliant OC-48 2-fiber bidirectional line-switched ring protection switching. In Release 3.0 and later releases, Metropolis® DMX also supports standards compliant OC-192 2-fiber bidirectional line-switched ring protection switching.

Low-speed BLSR networks

In Release 3.0, Metropolis® DMX supports a single standards compliant low speed OC-48 2-fiber bidirectional line-switched ring.

Low-speed UPSR networks

On low-speed SONET optical interfaces (OC-3/12), UPSR is optional and protection switching is provisionable (UPSR or 1+1) on a per-line basis.

□

Transient Performance

Power loss restart

After system shutdown due to power loss, the system will exhibit a 2-second error free transmission interval which begins within 1 minute of restoration of power.

Transmission start-up on signal application

The system, after having no signal applied for greater than 1 minute at the DSX-n interface, will exhibit a 2-second error free transmission interval which begins within 5 seconds of the reapplication of a signal.

□

Transmission Delay

One-way transmission delay

The following tables show the measured one-way transmission delay (microseconds) between Metropolis® DMX interfaces using STS-n and VT1.5 cross-connections.

Table B-35 High Speed OC-n to High Speed OC-n Pass Through Transmission Delay

Interface	Delay (µs)	
	STS-n Cross-Connection	VT1.5 Cross-Connection
OC-192 to OC-192 (LNW56)	2.5	-
OC-48 to OC-48 (LNW27)	2.5	-

Table B-36 High Speed OC-n to Low Speed OC-n Add/Drop Transmission Delay

Interface	Delay (µs)	
	STS-n Cross-Connection	VT1.5 Cross-Connection
OC-192 to OC-48 (LNW56 to LNW31)	5.5	-
OC-192 to OC-12 (LNW56 to LNW46)	5	-
OC-192 to OC-3 (LNW56 to LNW36)	5	-
OC-48 to OC-48 (LNW27 to LNW31)	4.5	-
OC-48 to OC-12 (LNW27 to LNW46)	4	-
OC-48 to OC-3 (LNW27 to LNW36)	4	-

Table B-37 Low Speed OC-n to Low Speed OC-n Hairpin Transmission Delay

Interface	Delay (µs)	
	STS-n Cross-Connection	VT1.5 Cross-Connection
OC-48 to OC-48 (LNW31)	8	-
OC-12 to OC-12 (LNW46)	8	-
OC-3 to OC-3 (LNW36)	8	-

Table B-38 Low Speed OC-n to Low Speed OC-n Pass Through Transmission Delay

Interface	Delay (µs)	
	STS-n Cross-Connection	VT1.5 Cross-Connection
OC-48 to OC-48 (LNW31)	2.5	-
OC-12 to OC-12 (LNW46)	2.5 - 3	-
OC-3 to OC-3 (LNW36)	2.5 - 3	-

Table B-39 DS1 to High Speed OC-n or High Speed OC-n to DS1 Transmission Delay

Interface	Delay (µs)
	VT1.5 Cross-Connection
DS1 to OC-192 (LNW56)	60
DS1 to OC-48 (LNW27)	60

Table B-40 DS3 to High Speed OC-n or High Speed OC-n to DS3 Transmission Delay

Interface	Delay (µs)
	STS-1 Cross-Connection
DS3 to OC-192 (LNW56)	5.5 - 6
DS3 to OC-48 (LNW27)	4.5 - 5

Table B-41 EC-1 to High Speed OC-n or High Speed OC-n to EC-1 Transmission Delay

Interface	Delay (µs)
	STS-1 Cross-Connection
EC-1 to OC-192 (LNW56)	5
EC-1 to OC-48 (LNW27)	3.5

Operations Interfaces

Overview

Purpose

This section presents the operation interfaces that are required to support technician access to the system and allow alarms and status information generated by the system to be reported. The operation interfaces include the CIT interface, IAO LAN (via OSI or TCP/IP), SYSCTL faceplate LEDs, and equipment indicators. Metropolis® DMX supports office alarms, user-definable miscellaneous discretes, and TL1/X.25.

Contents

The following operation interfaces are discussed in this section:

Craft Interface Terminal (CIT)

Overview

The WaveStar® CIT is the primary tool used to interface with the Metropolis® DMX. It is a personal computer (PC) with the Metropolis® DMX user-interface software installed. The WaveStar® CIT is compatible with PCs running Microsoft Windows NT and Windows 2000 (PCs running Windows 2000 can *not* access Metropolis® DMX through the rear IAO LAN port). In Release 3.0 and later releases, the WaveStar® CIT is also compatible with Microsoft Windows XP.

Minimum PC requirements

For a detailed list of the minimum personal computer requirements, refer to the applicable software release description.

TL1/LAN

Overview

Metropolis® DMX supports a TL1 over TCP/IP interface or TL1 over OSI LAN interface for communication between a Metropolis® DMX NE and an Element Management System (EMS) of a Network Management System (NMS). TL1 over TCP/IP LAN complies with requirements specified in IEEE 802.3 and NSIF-AR-9806-088R11.

TL1 translation device (T-TD Gateway)

The T-TD is a device that translates TL1 messages over a TCP/IP connection to a TL1 over OSI association, providing a TL1 TCP-OSI gateway. The T-TD, when used in conjunction with the WaveStar® CIT, is an open system interconnection (OSI) proxy that accepts TCP/IP connections and sets up matching OSI connections. This requires the support of the TCP/IP stack and the seven-layer OSI stack.

Front IAO LAN interface

The Metropolis® DMX provides an RJ45-compatible front IAO LAN interface that is intended for use with a local PC. This interface will support a TL1/TCP gateway via an IEEE 802.3-compliant interface with a graphical user interface (GUI) in future releases.

Rear IAO LAN interface

TL1 over TCP/IP or TL1 over OSI LAN is supported via an RJ45-compatible IAO LAN rear interface (R1.1) on the Metropolis® DMX, enabling the Metropolis® DMX to connect with any NMS possessing a compatible TCP/IP or OSI interface (such as the SNMS or the WaveStar® CIT). This allows TL1 communication over a data network between several different NEs. For instance, Lucent's Subnetwork Management System (SNMS) can communicate with a DDM-2000 that is on the same network as the Metropolis® DMX connected to the SNMS via the rear IAO LAN interface. The IAO LAN complies with OSI requirements as specified in GR-253-CORE, Section 8.

SONET DCC

The SONET DCC provides TL1 over OSI connections with remote NEs in a subnetwork.

LEDs, Indicators, and Office Alarms

SYSCTL Faceplate

The LNW1 SYSCTL circuit pack faceplate contains the following push-button switches and LEDs:

- FAULT LED
- Critical (CR) LED
- Major (MJ) LED
- Minor (MN) LED
- Abnormal (ABN) LED
- Far End Activity (FE) LED
- Near End Activity (NE) LED
- Alarm Cut-Off/Test (ACO) LED
- ACO/TEST (ACO SW) button
- Select (SEL) button
- Update/Initialize (UPD INIT) button
- 7-segment numeric display

The seven segment numeric display is used to identify the remote system presently displayed on the local user panel.

A green PWR ON LED is lighted when the shelf is receiving -48 V power. A green ACO LED is lighted when the ACO function is active.

The SEL, ACO SW, and UPD INIT push-buttons are provided to control system operation.

Equipment indicators

A red LED FAULT indicator is provided on all circuit packs. A green LED ACTIVE indicator is provided on all 1x1 protected circuit packs to indicate which circuit packs are actively carrying traffic.

Office Alarms

The office alarms interface is a set of discrete relays that control office audible and visual alarms. Separate relays handle CR, MJ, and MN alarms. Each contact closure is rated at 1 A, 60 V maximum. The CR and MJ alarms can be wire-ORed. The CR alarm relays are fail safe against unprotected power failures.

TL1/X.25 Interface

Overview

Metropolis® DMX supports a TL1/X.25 interface via a rear-access, synchronous, **EIA-232-D (V.24)** port capable of speeds up to 115,000 baud (at least 9600 baud is recommended to avoid TL1/X.25 output buffer overflow).

The Metropolis® DMX automatically assumes the role of a TL1/X.25 GNE when its X.25 interface is connected. TL1 commands *RTRV-SYS* and *RTRV-STATE-X25* indicate if Metropolis® DMX is an active TL1/X.25 GNE.

A TL1 *RTRV-STATE-X25* command addressed to a Metropolis® DMX TL1/X.25 GNE retrieves the status of the X.25 communications, including the X.25 packet size and an X.25 event history. TL1 command *ENT-SYS* can be used to provision the X.25 packet size.

TL1 Messages Reference

The *Metropolis® DMX Access Multiplexer TL1 Command Manual, 365-372-306,* specifies the supported TL1 messages in detail.

X.25 Virtual Circuits (VCs)

The X.25 circuits between a Metropolis® DMX TL1/X.25 GNE and the OSs may be transported via an X.25 packet network, dedicated private line, or circuit-switched network at the user's option. Multiple Metropolis® DMX X.25 Physical links may be combined through an external X.25 concentrator, but that would be independent of the Metropolis® DMX shelf or bay.

A Metropolis® DMX TL1/X.25 GNE supports up to 9 permanent virtual circuits (PVCs) or up to 9 switched virtual circuits (SVCs). Any combination of PVCs and SVCs is supported, but no more than a total of 9 VC are allowed. The Metropolis® DMX TL1/X.25 GNE default VC assignments are shown in the following table.

Table B-42 TL1/X.25 Interface Default VC Assignments

PVC ID*	SVC ID*	Logical Group #	Logical Channel #	Default TL1 Messages (ACID)
1		0	1	Command/Responses (tl1peercomm)
2		0	2	Autonomous Maintenance Messages and Command/Responses (tl1maintenance)
3		0	3	Autonomous Provisioning Messages (REPT DBCHG) and Command/Responses (tl1memoryadminstration)
	1	0	16	Command/Responses (tl1peercomm)
	2	0	17	Command/Responses (tl1peercomm)
	3	0	18	Command/Responses (tl1peercomm)
	4	0	19	Command/Responses (tl1peercomm)
	5	0	20	Command/Responses (tl1peercomm)
	6	0	21	Command/Responses (tl1peercomm)
*** Default Values**				

X.25 Packet Layer

At the packet layer, Metropolis® DMX is configured as a passive data-terminating equipment (DTE) with the following parameters as shown in the following table.

Table B-43 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
***** Metropolis® DMX uses the M bit when more than one packet is required to output a TL1 message.	

For SVC facilities, the parameters listed in the following table should be set to the specified values for communication to take place.

Table B-44 X.25 Packet Layer Parameters for SVC Facilities

Parameter	Value
Window negotiation	2
Packet size negotiation	7 (128 bytes), 8 (256 bytes)[(a)]
Modulo	8
Reverse charging	Don't care[(b)]
Closed user group	Don't care

Notes:

(a) Metropolis® DMX accepts this facility only if it matches Metropolis® DMX's provisioned X.25 packet size. Otherwise, the call will be cleared.

(b) The Metropolis® DMX always accepts the call request packet should these facilities be present, but it does not attempt to validate the information.

X.25 Link layer

At the link layer, Metropolis® DMX uses the standard link access procedure “B” (LAPB) protocol with the following parameters as shown in the following table.

Table B-45 LAPB Link Layer Parameters

Parameter	Value
Maximum Frame Size	2104 bits
Modulo	8
Window Size	7 frames
n2	7 retries
T1	3 seconds
T3*	20 seconds
* Metropolis® DMX uses synchronous, full duplex, continuos carrier communication.	

X.25 Pin connections

Metropolis® DMX uses synchronous, full duplex, continuous carrier communication. Data rates of up to 115,000 baud are supported, and at least 9600 baud are recommended (to avoid TL1/X.25 output buffer overflow). The rear X.25 port is configured as DTE, using the pin connections specified in the following table.

Table B-46 EIA-232-D (V-24) Pin Connections

Pin	Description
2	Transmitted Data (TD)
3	Received Data (RD)
4	Request to Send (RTS)
5	Clear to Send (CTS)
6	DCE Ready (DSR)
7	Signal Ground (SG)
8	Received Line Signal Detector (DCD)
15	Transmitter Signal Element Timing (DCE to DTE) (TC)
17	Receiver Signal Element Timing (DCE to DTE) (RC)
20	DTE Ready (DTR) (always on when Metropolis® DMX is powered)

User-Setable Miscellaneous Discrete Interface

Overview

The user-setable miscellaneous discrete interface allows an operations system (OS) to control and monitor equipment collocated with the Metropolis® DMX through a set of input and output contact closures. Miscellaneous discrete environmental inputs can monitor conditions like open doors or high temperature, miscellaneous discrete outputs control equipment such as fans and generators. The status of the miscellaneous discrete environmental inputs can be queried on demand via the WaveStar® CIT. Metropolis® DMX collects miscellaneous discrete alarms and automatically sends them to the operations system (OS).

External customer equipment

Any external customer equipment to be monitored by Metropolis® DMX must provide the electrical equivalent of a contact closure across the corresponding environmental input wiring pairs. The contact closure must be capable of passing at least 10 mA of drive current.

Power source

The power source to enable the control of external customer equipment may have a voltage range from a minimum of 3 V to a maximum of 72 V. Metropolis® DMX provides a unidirectional opto-isolator connection across each corresponding control output wiring pair. The load current across each control output wiring pair must be limited by the external customer equipment and must not exceed 35 mA.

Reference

For detailed wiring information, refer to the *Metropolis*® DMX Access Multiplexer *Installation Manual*, 365-372-304 and *Metropolis*® DMX Access Multiplexer *Application Schematic*, SD8C500-01.

□

Physical Specifications

Overview

Purpose This section provides Metropolis® DMX physical characteristics, including environmental and power specifications.

Contents The following specifications are included in this section:

Physical Specifications

Metropolis® DMX shelf physical characteristics

The Metropolis® DMX shelf has the following characteristics:

- Width: 17.6 inches
- Height without Fan Unit: 16 inches
- Height with Fan Unit: 19.5 inches
- Depth (front to back): 15 inches
- Weight (Max.): 20 pounds.

Metropolis® DMX High Capacity shelf physical characteristics

The Metropolis® DMX High Capacity shelf has the following characteristics:

- Width: 17.6 inches
- Height: 19 inches (includes integral fan unit)
- Depth (front to back): 13.75 inches
- Weight (with circuit packs): 57 pounds
- Weight (without circuit packs): 38 pounds

Environmental Specifications

Temperature and humidity

The Metropolis® DMX shelf meets Telcordia Technologies' Network Equipment Building System ("*NEBS Generic Equipment Requirements*," GR-63-CORE) requirements for use in CO environments.

A Fan Assembly is required in any environment or cabinet application above any Metropolis® DMX shelf. The Metropolis® DMX High Capacity Shelf has a fan unit built into the bottom of the shelf.

The Metropolis® DMX is environmentally hardened and will function at temperatures of -40°C to +65°C and humidity of 5 to 95 percent (noncondensing) in all TDM applications when equipped with the LNW28 circuit pack. In all other applications (GbE or FASTE) the Metropolis® DMX functions at temperatures of 0°C to +50°C.

EMC requirements

The Metropolis® DMX has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio-frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residence is likely to cause harmful interference in which case the user will be required to correct the interference at the user's own expense.

Earthquake requirements

Metropolis® DMX meets the earthquake requirements defined in Telcordia Technologies GR-63-CORE and Pacific Bell Standard PBS-000-102PT.

Fire resistance

Metropolis® DMX meets ignitability requirements specified in *ANSI* T1.307-1997. In addition, the Metropolis® DMX meets the fire resistance requirements of *UL* 60950, 3rd Edition.

Underwriters Laboratories

The Metropolis® DMX is *UL* recognized for restricted access installations in business and customer premises applications installed in accordance with Articles 110-16 and 110-17 of the *National Electric Code*, *ANSI*/NFPA Number 70-87. Other installations exempt from the requirements of the National Electric Code may be engineered according to the accepted practices of the local telecommunications utility.

Canadian Standards Association

The Metropolis® DMX has been certified by the Canadian Standards Association per standard CAN/CSA-C22.2 Number 60950-00.

Heat dissipation

The following table shows the maximum and average heat dissipation specifications for the Metropolis® DMX shelves.

Table B-47 Shelf Heat Dissipation

Shelf	Heat Dissipation in Watts			
	Average @ –48 V	Maximum @ –48 V	Average @ –40 V	Maximum @ –40 V
Metropolis® DMX Shelf	260 W (5.4 Amps)	700 W (14.6 Amps)	260 W (6.5 Amps)	700 W (17.5 Amps)
Metropolis® DMX High Capacity Shelf	260 W (5.4 Amps)	1100 W (22.9 Amps)	260 W (6.5 Amps)	1100 (27.5 Amps)

Power Specifications

Power supply

The following table lists Metropolis® DMX shelf power requirements.

Table B-48 Metropolis® DMX Shelf Power Supply Requirements

Item	Description
Voltage range, all components	–40.0 V DC to –60.0 V DC
Power Feeders	two –48V power feeders [BREAKER (A) and BREAKER (B)]
Circuit Breakers (two per shelf)	20.0 A

The following table lists Metropolis® DMX High Capacity shelf power requirements.

Table B-49 Metropolis® DMX High Capacity Shelf Power Supply Requirements

Item	Description
Voltage range, all components	–40.0 V DC to –60.0 V DC
Power Feeders	two –48V power feeders [BREAKER (A) and BREAKER (B)]
Circuit Breakers (two per shelf)	30.0 A

The fan unit in the Metropolis® DMX High Capacity shelf is equipped with a PWB-mounted, *UL*-recognized, 125 V DC, 7 A fuses (F1, F2).

Circuit breakers

Metropolis® DMX uses on-board power conversion eliminating the need for slots for bulk power converters. Two independent -48V office power feeders (A and B) enter each shelf through connectors and are filtered and distributed to the circuit packs through circuit breakers. Power conversion is performed through modular power converters located on the circuit packs. In each circuit pack, the 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 circuit breaker. The green Power LEDs located next to each circuit breaker (A and B) indicate power is being fed to the breaker.

Current drains

The following table provides the maximum and average current drain requirements for a shelf.

Table B-50 Shelf Current Drains

Shelf	Current Drains per Feeder in Amperes			
	Average @ –48V	**Maximum @ –48V**	**Average @ –40V**	**Maximum @ –40V**
Metropolis® DMX Shelf	6.3	14.5	7.5	17.5
Metropolis® DMX High Capacity Shelf	6.3	23.0	7.5	27.5

The following table provides the maximum and average current drain requirements for a bay equipped with four shelves.

Table B-51 Bay Current Drains

Bay	Current Drains per Feeder in Amperes			
	Average @ –48V	**Maximum @ –48V**	**Average @ –40V**	**Maximum @ –40V**
Bay equipped with four Metropolis® DMX Shelves	25.2	58.0	30.0	70.0
Bay equipped with four Metropolis® DMX High Capacity Shelves	25.2	92.0	30.0	110.0

External Equipment Specifications

Overview

Purpose This section provides external equipment specifications.

Contents The following specifications are included in this section.

External Optical Amplifier

Overview The following tables present the optical specifications for the external optical amplifier.

Optical specifications The table below lists the optical specifications for the amplifier.

Table B-52 Optical specifications

Parameter	Minimum	Maximum (or basic value if there is no min/max measurement.
Wavelength Range	1530 nm	1563 nm
Input Power Range	-27 dBm	4 dBm
Output Power		17 dBm
Signal Gain	13 dB	22 dB
Noise	7.0 (for 22 dB Gain)	16.0 (for 13 dB Gain)
Signal Gain	13 dB	22 dB
FDA Classification		Class IM (viewing the laser output with optical instruments can pose an eye hazard.
Polarization Mode Dispersion		0.5 ps @ -20 dBm input
Faceplate Optical Connector		SC-UPC connector
Faceplate Optical Connector		SC-UPC connector

Appendix C: IS-IS Level 2 Routing Guidelines

Overview

Purpose This appendix details the guidelines for IS-IS Level 2 Routing in networks larger than 50 OSI nodes.

Contents The following topics are included in this appendix:

Introduction

Overview

If network sizes of more than 50 OSI nodes are required, hierarchical routing makes it possible to increase the number of nodes in an OSI management domain, (for example, NEs with OSI LAN and/or DCC connectivity for operations communications among the NEs). Increasing the number OS nodes is achieved through the use of IS-IS Level 2 Routing.

IS-IS Level 2 Routing involves assigning NEs to multiple areas of 50 nodes or less. Level 2 routers support OSI communications between the NEs in different areas. Both the assignment of NEs to areas and the enabling of NEs as Level 2 routers is accomplished by provisioning (refer to "Area Address Assignment" (C-5) and "Level 2 Router Assignment" (C-7), respectively).

OSI Node vs. NE terminology

Each Metropolis® DMX is an OSI node, but some other NEs support multiple OSI nodes within a single NE, so the term "OSI node", or simply "node", is generally used in this context instead of "NE".

Advantages

The primary advantage of IS-IS Level 2 Routing is to limit the OSI routing information that needs to be maintained by each node. Each node within an area maintains routing tables to route OSI LAN and DCC messages to the other nodes in the same area. If a node needs to route a message to a node in a different area, the node relies on a Level 2 router in its own area to route the message to a Level 2 router in the target area and from that Level 2 router to the target node within that area.

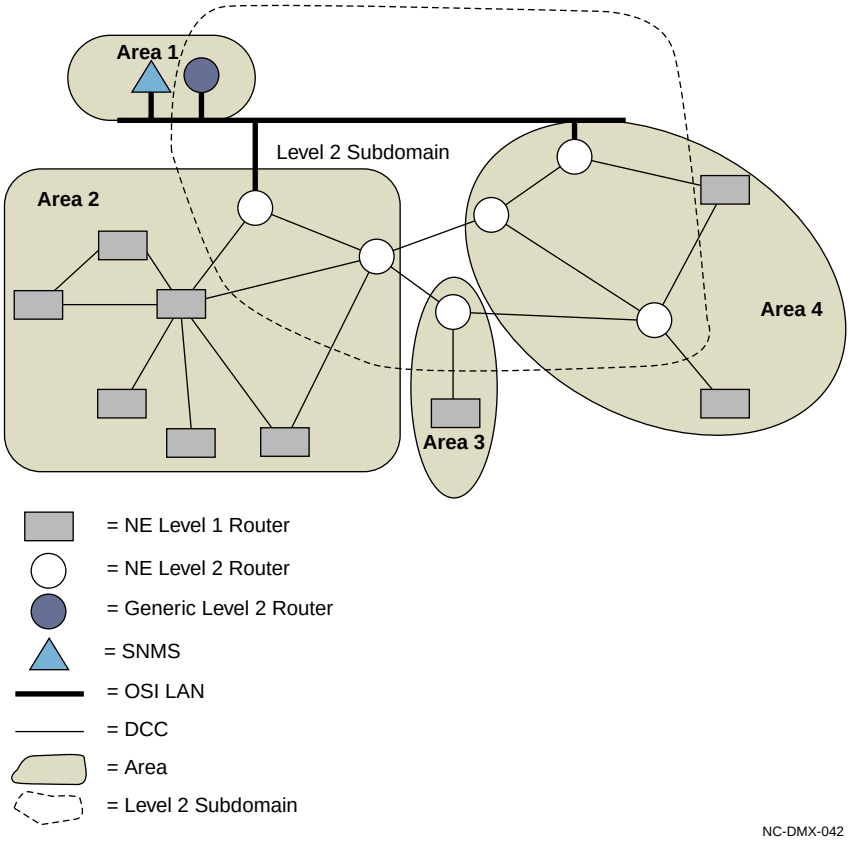
The Level 2 routers route messages between nodes in different areas. These messages include all of the NE-NE (and OS-NE) OSI communications required for the supported OI applications, (for example, TL1 login messages from TL1-GNEs to TL1-RNEs.)

In addition to maintaining a routing table to route messages to other nodes in the same area, Level 2 routers need to maintain routing information for the Level 2 routers in all other areas (but not for all nodes within each of those other areas).

Symbols

The graphical examples is this appendix use the symbols that are defined in the following figure. Figure C-1 illustrates an example network with nodes assigned to four different areas connected by Level 2 routers.

Figure C-1 Network with Level 2 Routers



Area Address Assignment

Area address

The area address is the first 26 characters of each Metropolis® DMX Network Services Access Point (NSAP). [Metropolis® DMX supports a fixed-length 40-character (20-byte) NSAP only.] The first eight characters of the NSAPs are always the same and cannot be changed. The remaining 18 characters of the NSAP area address are provisionable but only the Area field should be changed to assign a node to a different area. The remainder of the NSAP includes the System Identifier field, which is unique to each node, and the Selector (SEL) field.

The following table provides a break-down of an NSAP.

Table C-1 Area Addresses

NSAP Field:	AFI	IDI	IDI PAD	DFI	Organization ID	RES	RD	Area	System Identifier	SEL
Bytes:	1	2		1	3	2	2	2	6	1
Default Value: (hex)	39	840	F	80	000000	0000	0000	0000	none	00
	not provisionable				user provisionable				not provisionable	

A group of nodes are assigned to an area by changing each node's NSAP Area field to the same value. The entire NSAP area address must be identical for all nodes in an area and different from the NSAP area addresses for all other areas.

If more than one separate area with the same area address exists, routing to these areas from other areas would not be predictable and couldn't be expected to function properly.

Area field

The Area field consists of four hexadecimal characters, with a default value of 0000 (hex). TL1 command **ENT-ULSDCC-L3** can be used to change the Area field.

Area Terminology

Despite the technical differences between the area address and the Area field described previously, the term area address is commonly used to refer to the Area field value. Thus, for convenience, the term area address is used throughout this document.

Multiple area addresses

Multiple area addressing is the capability for a node to be assigned more than one area address. The provisioning of multiple area addresses is not supported on Metropolis® DMX, directly. However, if multiple area addresses are provisioned in another node, Metropolis® DMX would recognize its own primary area address plus up to two other area addresses. The use of multiple area addresses is not recommended.

□

Level 2 Router Assignment

Overview

OSI communications is supported within a network which may consist of a single area or multiple areas. Level 1 routers provide interconnectivity between nodes in an area (all Metropolis® DMXs are Level 1 routers). Level 2 routers provide connectivity between areas.

Guidelines and default

In a network with multiple areas, each area must contain at least one Level 2 router. An area without a Level 2 router would be isolated from the rest of the network. The adjacent set of Level 2 routers form the Level 2 subdomain. For proper OSI routing, every Level 2 router should have at least one neighbor (via OSI LAN or DCC) that is also a Level 2 router. At least one of the Level 2 routers in an area must be adjacent to a Level 2 router in another area, otherwise, the former area would be isolated from the rest of the network.

Each Metropolis® DMX is not a Level 2 router by default. TL1 command **ENT-ULSDCC-L3** can be used to enable any Metropolis® DMX as a Level 2 router.

□

IS-IS Level 2 Routing Remote Provisioning Sequence

Avoid isolating nodes

An important goal is to avoid isolating any nodes when provisioning area addresses and Level 2 routers remotely. Isolating a node may require craft dispatch to the isolated node to recover. To avoid isolating nodes, the sequence for remote provisioning is established with respect to the local node to which the WaveStar® CIT is connected or the TL1-GNE through which Navis™ Optical Element Management System (Navis™ Optical EMS) is connected. Typically, the local node or TL1-GNE is provisioned to be a Level 2 router first, but its area address is not changed initially. This general sequence can be modified in networks with redundant OSI LAN or DCC connectivity between and within areas.

1. The nodes and sub-tending rings that are furthest away from this local node or TL1-GNE are provisioned first.
2. Work back toward the local node or TL1-GNE's sub-tending ring.
3. Provision the local node or TL1-GNE's sub-tending ring.
4. Provision the local node or TL1-GNE last.

If Navis™ Optical EMS is part of the network via an OSI LAN or WAN interface, provision the area address for the Navis™ Optical EMS.

> **Important!** Before assigning area addresses and Level 2 routers in a network, be sure no alarms (especially DCC failure alarms) exist; otherwise, even the recommended remote provisioning sequence might result in isolated nodes. To confirm the network alarm status, it is recommended that a centralized maintenance center with TL1 OS support be consulted.

Provisioning sub-tending rings

Always provision new area addresses for a sub-tending ring by starting with a node that is adjacent to the node that connects this sub-tending ring to the rest of the network, and then provision the area address for each sequential adjacent node going around the sub-tending ring. Provision the area address of the connecting node last, especially if the connecting node supports multiple sub-tending rings.

For single-homed sub-tending rings, provision the node that will be the Level 2 router node last; otherwise, nodes in its area could be isolated. For dual-homed rings, provision one of the nodes that will be Level 2 router first, so that OSI connectivity is established with provisioned nodes as soon as they complete their controller resets.

Minimizing OSI communications disruption

Another important goal is to provision the network in such a way that OSI communications disruption is minimized. Changing a node's area address and/or enabling a node as a Level 2 router causes the node to reset its controller. The reset is immediate and is part of the completion of the command. In addition to temporarily disrupting OSI communications, controller resets temporarily disable automatic transmission protection switching.

As one node is undergoing a controller reset in an area, the next adjacent node should be provisioned to minimize the overall time required to provision the nodes in an area and minimize the time that OSI communications with the nodes in the area are lost.

Changing a node's area address and enabling a node as a Level 2 router, if appropriate, should usually both be done with a single command per node.

□

IS-IS Level 2 Routing Provisioning Confirmation

Overview

TL1 **RTRV-MAP-NETWORK** commands can be used to confirm the area address and Level 2 router assignments of all nodes with OS LAN or DCC connectivity in a network.

Small networks

In a small network without IS-IS Level 2 Routing, the **RTRV-MAP-NETWORK** response includes the NSAPs (including the embedded area address field) of the local node and all remote nodes. This command may also be useful to confirm the uniqueness of the area addresses before combining two existing networks into one large network requiring IS-IS Level 2 Routing.

Large networks

In large networks with IS-IS Level 2 Routing, the **RTRV-MAP-NETWORK** response can vary based on whether or not the local node is a Level 2 router itself.

1. If the local node is not a Level 2 router, the response includes only remote nodes in the same OSI area as the local node and indicates which remote node is the default Level 2 router for the local node.

   The default Level 2 router is the node that the local node would rely on to route an OSI message outside the local NE's own area. When there are multiple Level 2 routers in the same area, not all nodes in the area would identify the same default Level 2 router typically.

2. If the local node is a Level 2 router, user input dictates whether the response includes:

   a. only remote nodes in the same OSI area as the local node (as in #1 above) but indicating which of those remote nodes are Level 2 routers

   b. all remote nodes that are Level 2 routers across all OSI areas.

Thus, with a **RTRV-MAP-NETWORK** command to one Level 2 router in each area, all nodes in a large network with IS-IS Level 2 Routing can be identified. One **RTRV-MAP-NETWORK** command at at time per area should suffice and is recommended to avoid unnecessarily burdening the network with many simultaneous or redundant TARP queries.

Problem isolation

TL1 command **RTRV-MAP-NEIGHBOR** may indicate and help resolve IS-IS Level 2 Routing provisioning mistakes. This command highlights any neighbors with which DCC is enabled but OSI communications is not fully functional. When addressed to a reachable node with an unreachable neighbor, this command identifies the NSAP area address and the Level 2 router status, if known, of the unreachable neighbor. The unreachable neighbor may simply have the wrong area address or both nodes may need to be enabled as Level 2 routers.

There is no standing alarm or status condition at a node with Level 2 router functionality enabled or disabled. There is no automatic means of determining whether the area address is consistent with the rest of the network. The user must confirm that all IS-IS Level 2 Routing rules have been followed to ensure successful OSI communications among the nodes in a network.

Maximum Number of OSI Nodes

Rules

The total number of nodes within an area cannot exceed 50. In each area with Metropolis® DMX enabled as a Level 2 router, the 50-node maximum is reduced one-for-one by the number of other Level 2 routers in the same OSI domain.

Maximum number of nodes per area and OSI domain

The following table illustrates the relationship between the number of Level 2 routers and the maximum number of nodes allowed in areas with Metropolis® DMX enabled as a Level 2 router. The maximum number of nodes is determined by multiplying the number of Level 2 routers by the maximum number of nodes per area, up to a maximum of 256.

Table C-2 Maximum Number of Nodes with Level 2 Routers

Number of Metropolis® DMX Level 2 Routers	Maximum Nodes per Area	Maximum Nodes per OSI Domain*
0	50	50
2	48	96*
3	47	141*
4	46	184*
5	45	225*
6	44	256
7	43	256
8	42	256
9	41	256
10	40	256
11	39	256
12	38	256
13	37	256
14	36	256
15	35	256
16	34	256
17	33	256
18	32	256
19	31	256
20	30	256

Number of Metropolis® DMX Level 2 Routers	Maximum Nodes per Area	Maximum Nodes per OSI Domain*
21	29	256
22	28	256
23	27	256
24	26	256
25	25	256
26	24	256
27	23	256
28	22	256
29	21	256
30	20	256
31	19	256
32	18	256
33	17	256
34	16	256
35	15	256
36	14	256
37	13	256
38	12	256
39	11	256
40	10	256
41	9	256
42	8	256
43	7	256
44	6	256
45	5	225*
46	4	184*
47	3	141*
48	2	96*
49	1	49*

* These are theoretical maximum numbers, assuming the number of Level 2 routers equals the number of areas (that is, one Level 2 router per area) and each area includes the maximum number of nodes allowed per area with Metropolis® DMX enabled as a Level 2 router.

Engineering Rules and Guidelines

Overview

To use IS-IS Level 2 Routing, the user must plan and engineer the provisioning of Level 2 routers and area addresses in the network.

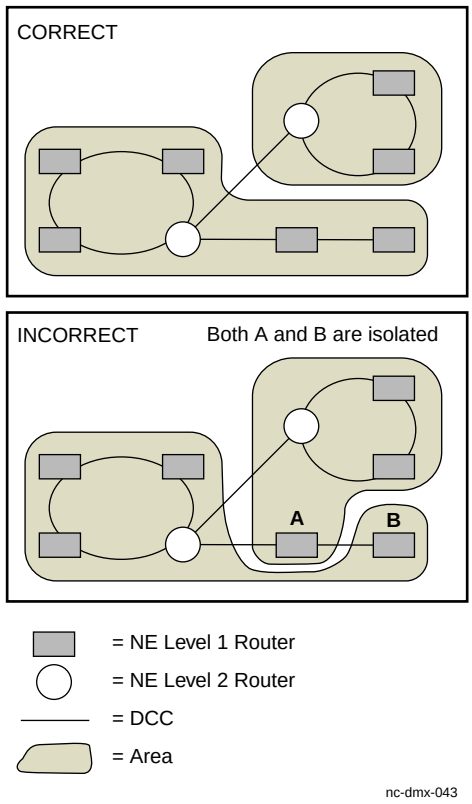
The goal is to create a network with all nodes having OSI LAN or DCC connectivity with each other so that access to all the nodes can be gained from any node in the network.

Rules must be followed to assure OSI LAN and DCC message routing. Guidelines are recommendations that add survivability in the event of a node, OSI LAN or DCC failure. Rules *must* be followed. Guidelines *should* be followed. There may be customer applications that cannot adhere to some or all of the guidelines. In most cases, the potential consequence is that a single failure would at least partially disrupt operations communications.

Rule: OSI LAN or DCC connectivity within an area

All nodes in an area must have OSI LAN or DCC connectivity within the area to all other nodes in the same area. Otherwise, the area would be segmented and message routing could not be expected to function properly. Figure C-2 illustrates a correct and an incorrect example of assigning nodes to areas.

Figure C-2 Assigning Areas

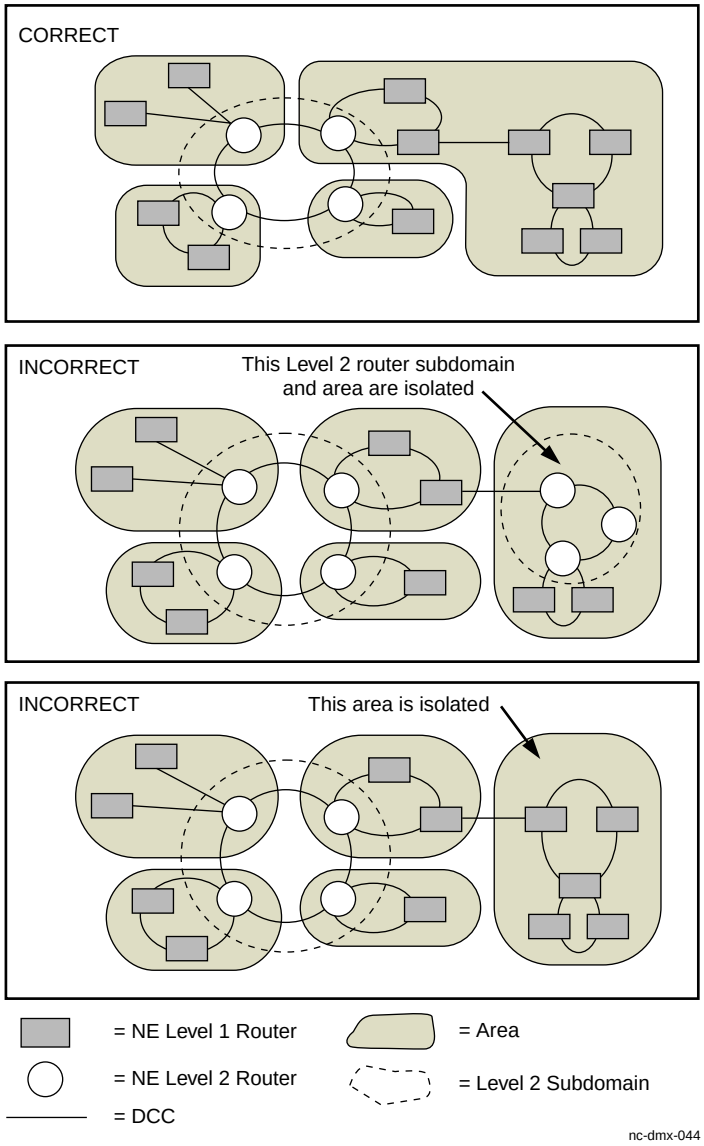


Rule: single Level 2 router subdomain

All Level 2 routers must have OSI LAN or DCC connectivity, either directly or indirectly via other Level 2 routers, to all other Level 2 routers in the network to form a single Level 2 router subdomain that provides connectivity to all areas. If more than one Level 2 router subdomain exists, the network becomes segmented and routing will not function properly.

Figure C-3 illustrates a correct and two incorrect examples of assigning a Level 2 router subdomains.

Figure C-3 Assigning Subdomains

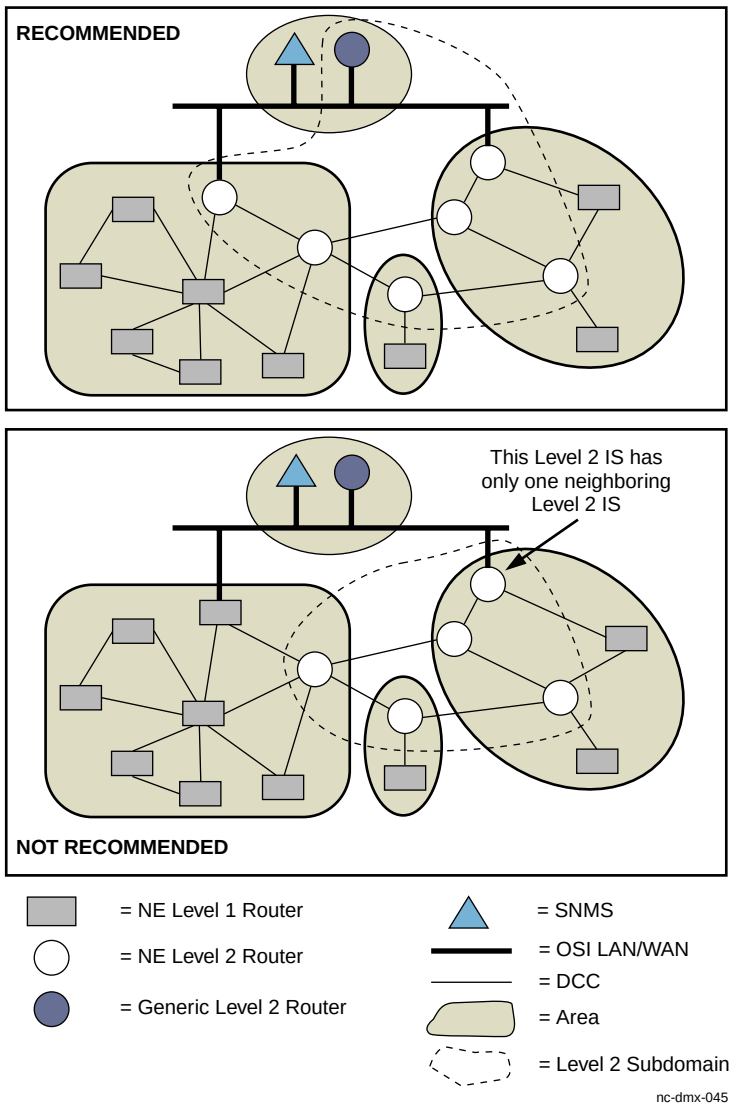


Guideline: redundant routes within the Level 2 subdomain

When practical, redundant routes in the Level 2 subdomain should be available between all Level 2 routers to ensure that proper routing will occur in the event of a single failure. To satisfy this guideline, every Level 2 router has at least two other Level 2 routers as direct neighbors.

Figure C-4 illustrates a recommended example and an example that is not recommended for redundant routes within the Level 2 subdomain:

Figure C-4 Redundant Routes with the Level 2 Subdomain



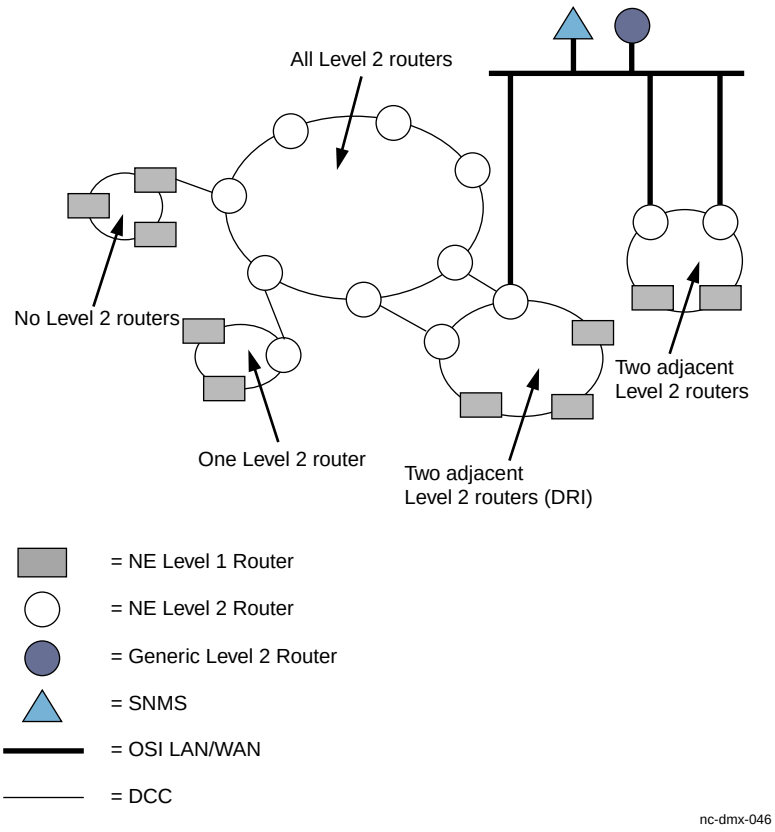
Guideline: Level 2 router assignment in a ring

The recommended number of Level 2 routers in a ring may be one of the following:

- None
- One
- All nodes in the ring
- Two; for example, when dual-homing or dual ring interworking (DRI) is used.

Figure C-5 illustrates examples of recommended Level 2 router assignments in various ring configurations.

Figure C-5 Recommended Level 2 Router Assignments



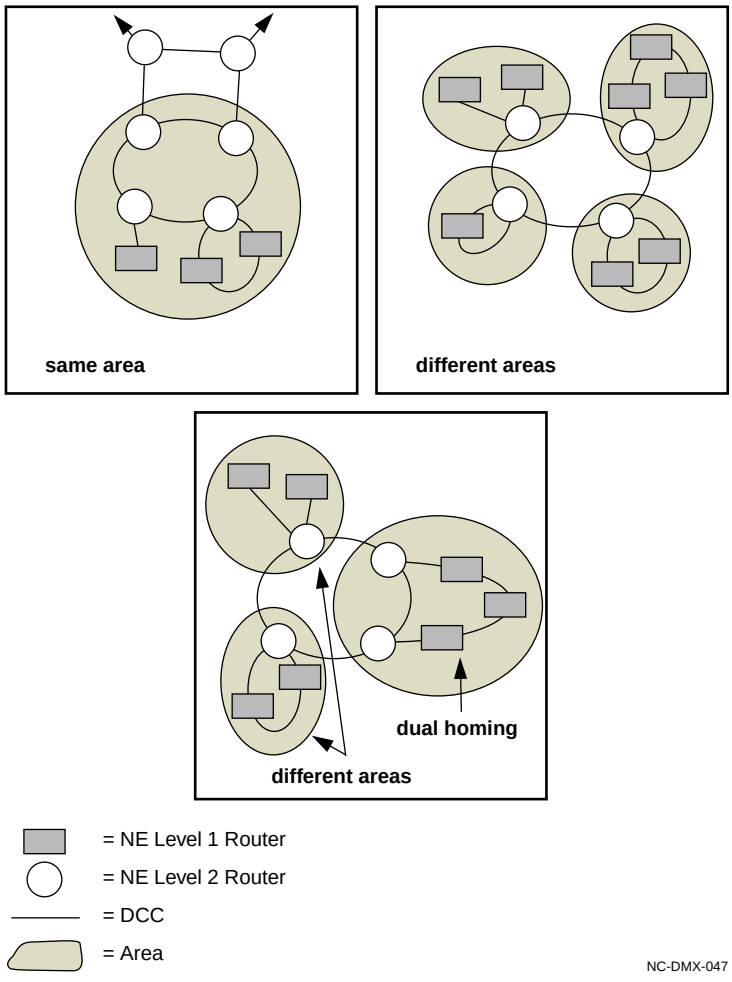
Guideline: Level 2 router area assignments in a ring

For a ring of Level 2 routers, the recommended area assignments may be one of the following:

- All Level 2 routers are part of the same area.
- Each Level 2 router is part of a different area.
- A pair of adjacent Level 2 routers are in the same area (for example, with dual-homing or DRI), with either the other Level 2 routers similarly paired off or individually in different areas.

Figure C-6 illustrates examples of recommended Level 2 router area assignments in a ring.

Figure C-6 Recommended Area Assignments

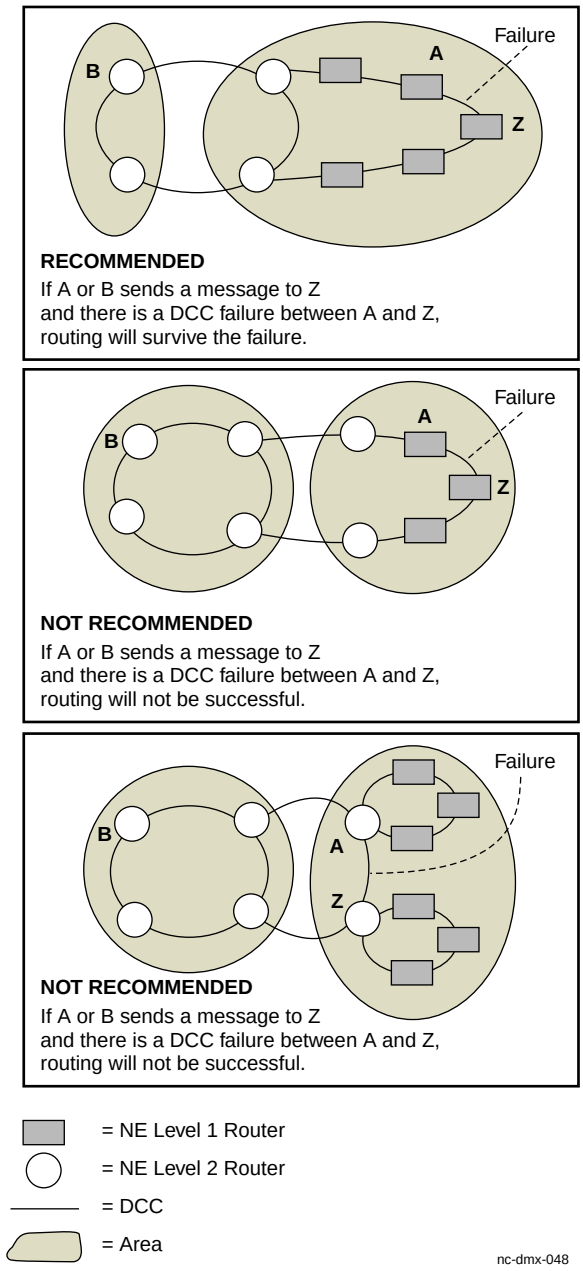


Guideline: adjacent Level 2 routers within an area

It is recommended that dual Level 2 routers in an area be adjacent to each other and have a redundant route within the area. Failure to meet this guideline would result in some messages not being routed properly in the event of a single failure that divides an area into two separate islands.

Figure C-7 illustrates a recommended example and two examples that are not recommended of dual Level 2 routers in an area:

Figure C-7 Recommended Placement of Level 2 Routers



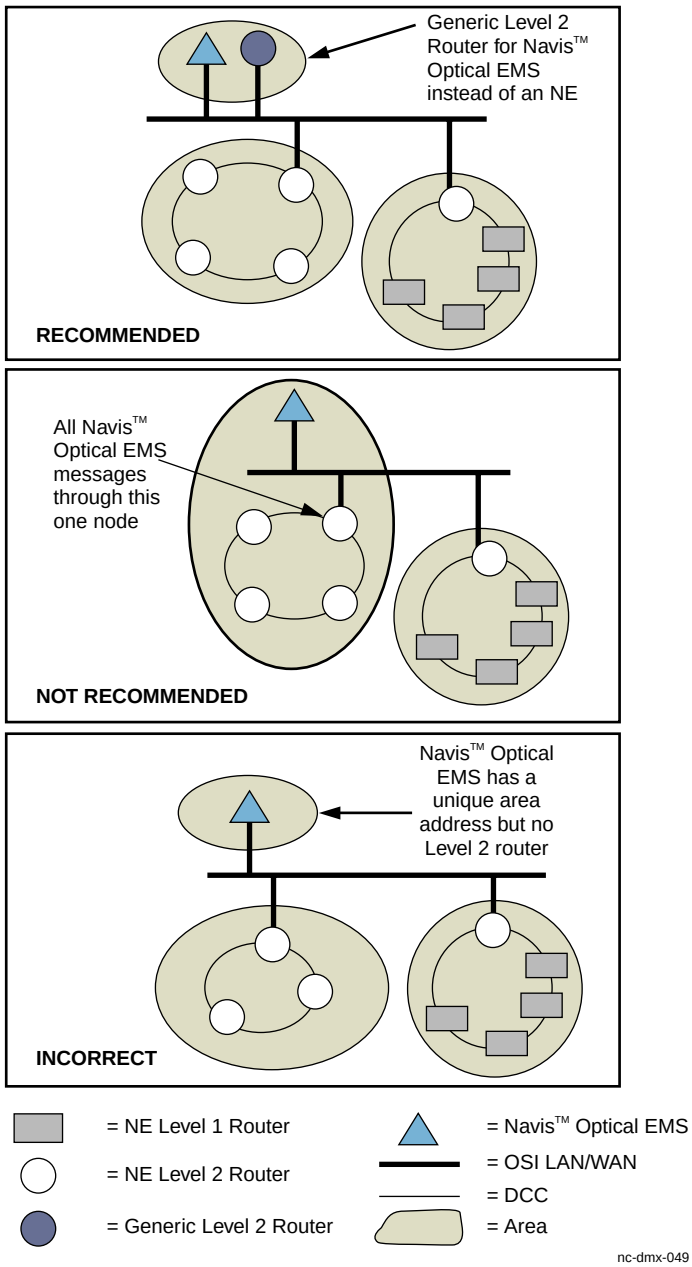
Guideline: Navis™ Optical EMS own area address and Level 2 router

If Navis™ Optical EMS (or any other OS) access is via OSI LAN (or WAN), Navis™ Optical EMS should be assigned to a different area and rely on a generic Level 2 router to communicate with a large network. (Navis™ Optical EMS is not expected to be a Level 2 router itself.) This is recommended to avoid routing all messages to/from Navis™ Optical EMS through a single NE serving as a Level 2 router.

Although not shown in the examples below, Navis™ Optical EMS can support a second, redundant OSI LAN port. Each Navis™ Optical EMS OSI LAN port has its own unique NSAP but both must be assigned the same area address.

Figure C-8 illustrates a recommended example, an example that is not recommended, and an incorrect example of Navis™ Optical EMS access via OSI LAN/WAN.

Figure C-8 Recommended Navis™ Optical EMS Access via OSI LAN/WAN

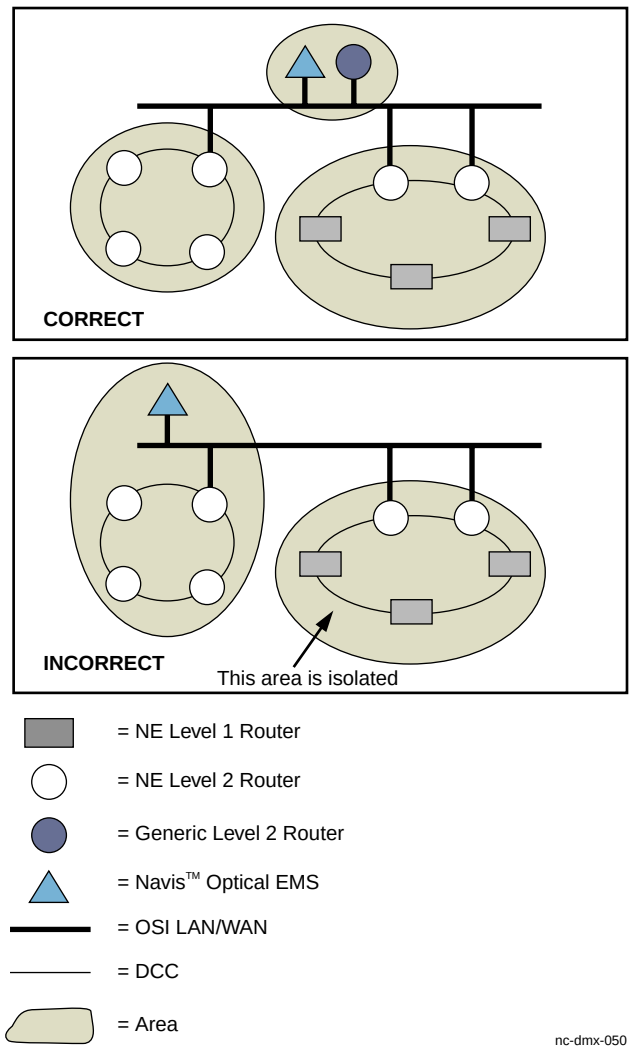


Rule: Level 2 routers on an OSI LAN

If an OSI LAN (or WAN) is used to connect between areas, then at least one node in each area on the OSI LAN must be provisioned to be a Level 2 router. Otherwise, the areas won't route to each other via the OSI LAN.

Figure C-9 illustrates a correct and an incorrect example of Level 2 router assignments on an OSI LAN:

Figure C-9 Level 2 Router Assignments on an OSI LAN

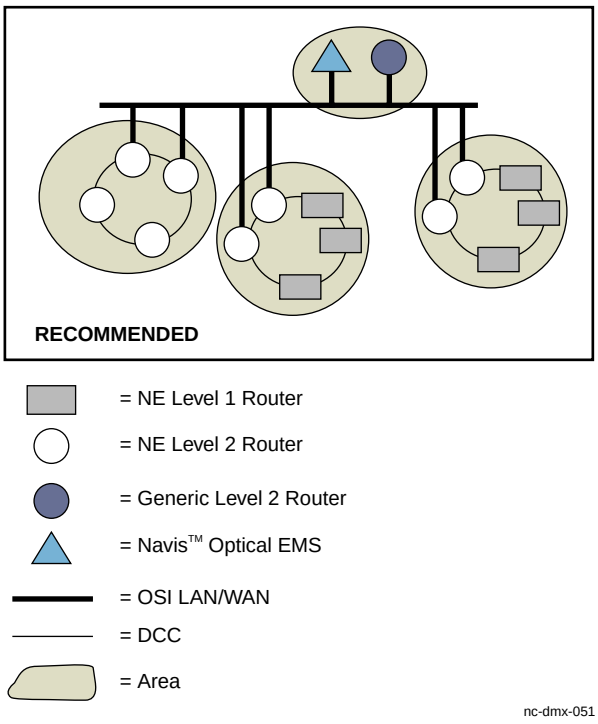


Guideline: OSI LAN redundancy

If an OSI LAN (or WAN) is the only method of connecting between areas, then at least two Level 2 routers directly connected to the OSI LAN for each area are recommended for redundancy purposes. A second, separate OSI LAN hub would provide additional redundancy.

Figure C-10 illustrates a recommended example for providing redundancy between areas connected solely by OSI LANs:

Figure C-10 OSI LAN Redundancy



Appendix D: An Introduction to SONET

Overview

Purpose

This appendix provides an introduction to Synchronous Optical NETwork (SONET) as defined by the American National Standards Institute (ANSI).

Contents

The following topics are included in this appendix:

History of SONET

Overview

This section highlights the historical milestones in the development of SONET.

History of the SONET name

The American National Standards Institute (ANSI) recognized the need for an optical signal standard for future broadband transmission, and a committee began working on optical signal and interface standards in 1984.

In 1985, Bellcore proposed a network approach to fiber system standardization to T1X1. In the proposal, Bellcore suggested the following:

- Hierarchical family of signals whose rates would be integer multiples of a basic modular signal
- Synchronous multiplexing technique, leading to the coining of the term *Synchronous Optical Network* (SONET)

CCITT interest in SONET

The International Telegraph and Telephone Consultative Committee (CCITT) was interested in SONET and held conferences in 1987 and 1988 which resulted in coordinated specifications and approval of both the American National Standard (SONET) and the CCITT-International Standard, Synchronous Digital Hierarchy (SDH) in 1988.

> **Important!** The CCITT is now named International Telecommunication Union, Telecommunication Standardization Sector (ITU-T). For more information refer to the "Standards: Their Global Impact" in the *IEEE Communications Magazine*, Vol. 32, No. 1, January 1994.

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 the networks of today, as well as those planned for the future.

SONET currently defines standard rates and formats and optical interfaces. Today, mid-span meet is possible at the optical transmission level. These and other related issues continue to evolve through the ANSI committees.

ANSI addressed issues

The set of American National Standards defines:

- Optical parameters
- Multiplexing schemes to map existing digital signals (that is, DS1 and DS3) into SONET payload signals
- Overhead channels to support standard operation, administration, maintenance, and provisioning (OAM&P) functions
- Criteria for optical line automatic protection switch (APS)

References

For more detailed information on SONET, refer to:

- ANSI T1.105 – 1995 American National Standard for Telecommunications, Synchronous Optical Network (SONET)
- ANSI T1.106-1988 American National Standard for Telecommunications – Digital Hierarchy Optical Interface Specifications, Single Mode
- ITU Recommendations G.707, G.708, G.709
- R. Ballart and Y. C. Ching, SONET: Now It's the Standard Optical Network, *IEEE Communications Magazine*, Vol. 27, No. 3 (March 1989): 8-15

□

SONET Signal Hierarchy

Overview

This section describes the basics of the SONET hierarchy.

STS-1 frame

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 D-1.

- The STS-1 frame has:
  - A recurring rate of 8000 frames a second
  - The frame rate of 125 microseconds
- The STS-1 frame consists of:
  - 90 columns
  - 9 rows

Important! Each cell in the matrix represents an 8-bit byte.

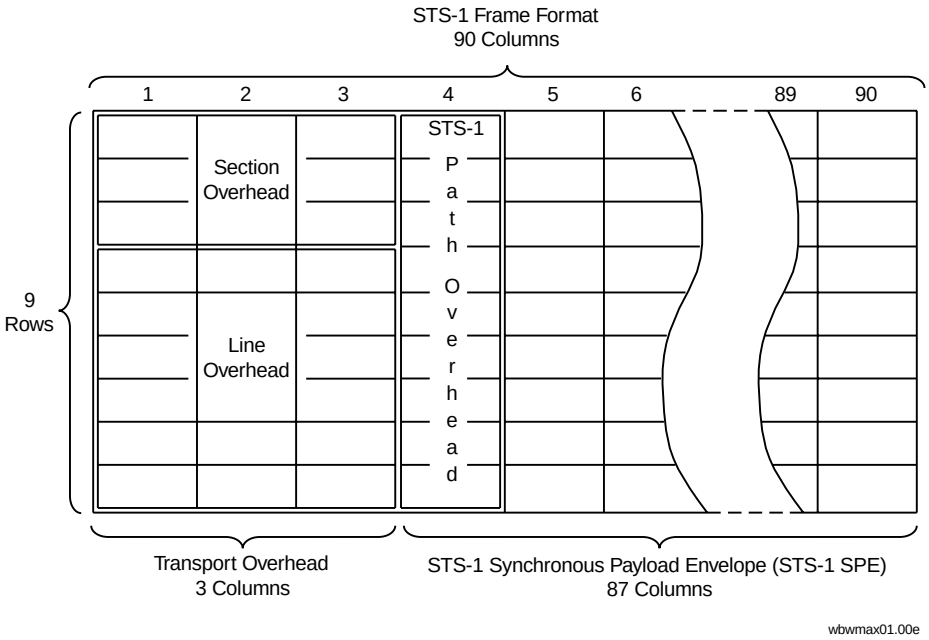
Transmitting signals

The STS-1 frame is transmitted serially starting from the left with row 1 column 1 through column 90, then row 2 column 1 through 90, continuing on, row-by-row, until all 810 bytes (9x90) of the STS-1 frame have been transmitted. Because 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 a second, at the STS-1 signal rate of 51,840,000 (6480x8000) bits a second.

Figure of SONET STS-1 Frame

Figure D-1 illustrates the SONET STS-1 frame.

Figure D-1 SONET STS-1 Frame Simplified Version



Transport overhead

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.

Synchronous payload envelope

Columns 4 through 90 (the remainder of the frame), are reserved for payload signals (for example, DS1 and DS3) 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 after scrambling.

□

SONET Layers

Overview

SONET divides its processing functions into the following three layers:

- Section
- Line
- Path

These three layers are associated with:

- Equipment that reflects the natural divisions in network spans
- Bytes that carry information used by various network elements

Equipment layers

The following table lists and defines each SONET equipment layer.

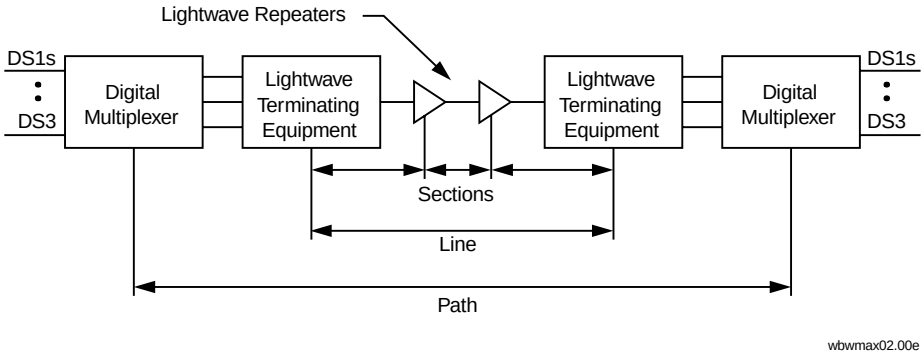
Table D-1 SONET Equipment Layers

Layer	Definition
Section and Section Terminating Equipment	The transmission spans (Spans between regenerators are also referred to as sections.) between lightwave terminating equipment and the regenerators. This equipment provides regenerator functions which terminate 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-connects) that provides line performance monitoring.
STS-1 and Virtual Tributary (VT) Path Terminating Equipment	The SONET portion of the transmission span for an end-to-end tributary (DS1 or DS3) signal that provides signal labeling and path performance monitoring for signals as they are transported through a SONET network. STS-1 path terminating equipment also provides cross-connections for lower-rate, (that is, DS1) signals. A VT is a sub-DS3 payload and is described later in more detail.

Figure

Figure D-2 illustrates the equipment layers (section, line, and path) in a signal path.

Figure D-2 Section, Line, and Path Definitions



Overhead byte layers

The following table lists and defines the overhead associated with each SONET layer.

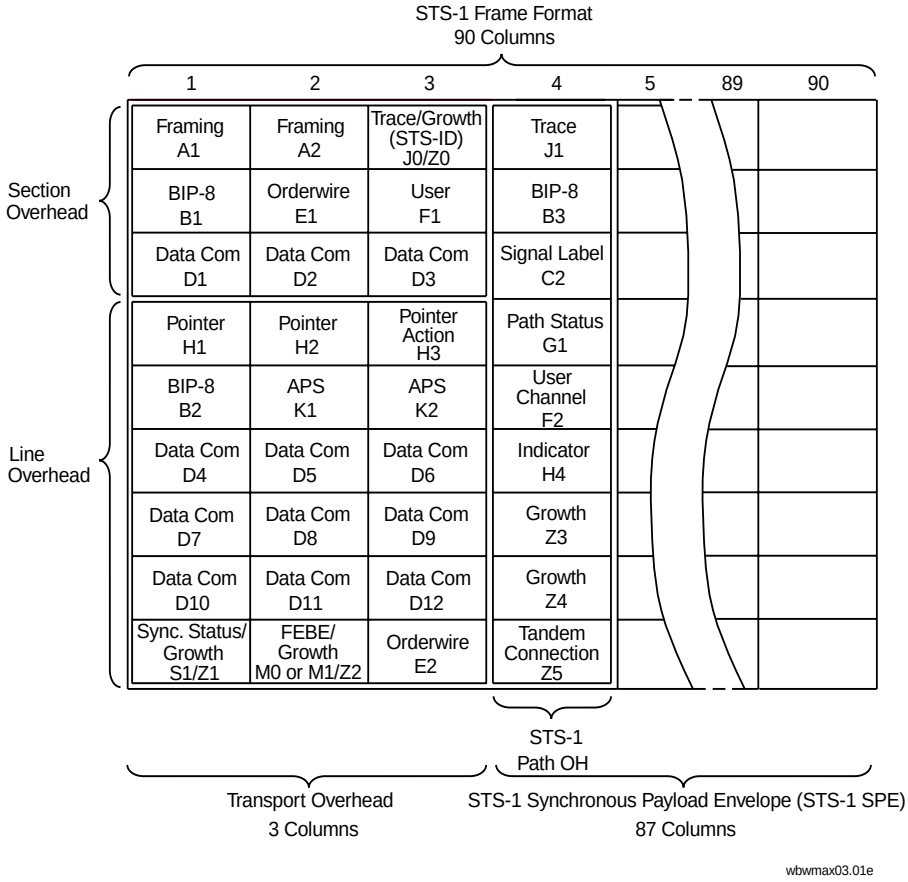
Table D-2 Overhead Byte Layers

Overhead Byte Layer	Definition
Section	Contains information that is used by all SONET equipment including repeaters.
Line	Used by all SONET equipment except repeaters.
Path	Carried within the payload envelope across the end-to-end path with: • STS-1 remaining with the STS-1 SPE until its payload is demultiplexed • VTN (N= 1.5, 2, 3, or 6) remaining with the VTN until it is demultiplexed to its asynchronous signal

Figure of SONET frame format

Figure D-3 illustrates each SONET layer and its set of overhead bytes.

Figure D-3 SONET Frame Format



SONET Frame Structure

Overview

This section provides detailed information on the locations and functions of various overhead bytes for each of the following SONET layers:

- Section
- Line
- Path (STS-1 and VT)

Section overhead

The following table identifies the location and function of each section overhead byte.

Table D-3 Section Overhead Bytes

Byte	Location and Function
Framing (A1 & A2)	Provides framing for each STS-1.
Trace/Growth (J0/Z0)	The Section Trace and Section Growth bytes replace STS-1 ID (C1). J0/Z0 are for future use and the locations are as follows: • J0 byte is in the first STS-1 of an STS-N. • Z0 byte is in the second through N^{th} STS-1 of the STS-N.
Section Bit Interleaved Parity (BIP-8) (B1)[a]	Provides section performance monitoring and is calculated over all bits of the previous STS-N frame.
Section Orderwire (E1)[a]	Provides a local orderwire for voice communication channel between regenerators.
Section User Channel (F1)[a]	Set aside for the purpose of the user.
Section Data Communications Channel (D1-D3)[a]	A 192 kb/s message-based channel that is used for alarms, maintenance, control, monitoring, and other communication needs between section terminating equipment.

Notes:

a) Defined only for STS-1 #1 of an STS-N signal.

Line overhead

The following table identifies the location and function of each line overhead byte.

Table D-4 Line Overhead Bytes

Byte	Location and Function
Pointer (H1, H2)	Two bytes indicating 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)	Allocated for frequency justification.
Line Bit Interleaved Parity (BIP-8) (B2)	Provided for line performance monitoring in all STS-1 signals within an STS-N signal.
Automatic Protection Switching (APS) (K1, K2)[a]	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).
Line Data Communications Channel (D4 - D12)	A 576 kb/s message-based channel that is used for alarms, maintenance, control, monitoring, and other communication needs between section terminating equipment.
Synchronization Status (S1)	• Located in the first STS-1 of an STS-N. • Conveys the synchronization status of the Network Element.
Growth (Z1)	• Located in the second through N^{th} STS-1 of an STS-N. • Reserved for future growth.
Line Orderwire (E2)[a]	Allocated to be used as an express orderwire between line entities.

Notes:

a) Defined only for STS-1 #1 of an STS-N signal.

STS-1 path overhead

The STS-1 path overhead is assigned to and remains with the STS-1 SPE until the payload is demultiplexed and is used for functions that are necessary to transport all synchronous payload envelopes.

Use the following table to determine the location and function of each STS-1 path overhead byte.

Table D-5 STS-1 Path Overhead Bytes

Byte	Location and Function
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 Label (C2)	Indicates the construction of the STS-1 synchronous payload envelope (SPE).
Path Status (G1)	Conveys the STS-1 path terminating status, performance, and remote defect indication (RDI) signal conditions back to an originating STS-1 path terminating equipment.
Path User Channel (F2)	Reserved for user communication.
Indicator (H4)	Provides a general multiframe indicator for VT-structured payloads.
Path Growth (Z3 - Z4)	Reserved for future growth.
Tandem Connection (Z5)	Allocated for Tandem Connection Maintenance and the Path Data Channel, as specified by ANSI T1.105.05.

SPE values

The following table lists the types of STS-1 synchronous payload envelope values and their meanings. The system can generate 00, 01, or 04 and can carry any of the other values within the path layer overhead.

Table D-6 Synchronous Payload Envelopes

Hexidecimal Code	STS-1 SPE
00	Unequipped
01	Equipped nonspecific payload
02	VT-Structured STS-1 SPE
04	Asynchronous mapping for DS3
12	DS4NA Asynchronous mapping
13	Mapping for ATM
14	Mapping for DQDB
15	Asynchronous mapping FDDI

VT path overhead

Virtual tributary (VT) path overhead provides important functions for managing sub-STS-1 payloads; such as, error checking, path status, and signal label. These functions are similar to those provided for STS-1 paths.

SONET Digital Multiplexing

Overview

SONET provides the following two multiplexing schemes:

- Asynchronous
- Synchronous

Asynchronous multiplexing

When fiber optic facilities are used to carry DS3 signals, the signal consists of a combination of the following payload signals:

- 28 DS1s
- 14 DS1s
- 7 DS2s

M23 format

Typically, 28 DS1 signals are multiplexed into a DS3 signal, using the M23 format. The M23 format involves bit interleaving of four DS1 signals into a DS2 signal and then bit interleaving of seven DS2 signals into a DS3. In addition, 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.

Disadvantages of M23 format

When using an M23 format, identification of DS0s contained in any DS-N signal is complex, and DS0s cannot be directly extracted. An asynchronous DS3 signal must be demultiplexed down to the DS1 level to access and cross-connect DS0 and DS1 signals. In addition, the M23 format does not provide an end-to-end overhead channel for use by OAM&P groups.

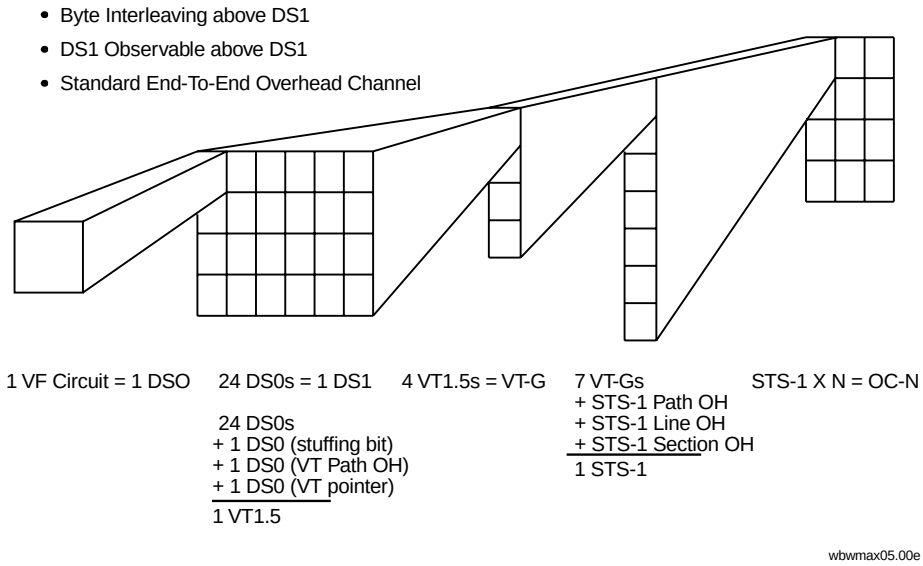
Synchronous multiplexing

Synchronous multiplexing is the SONET method of byte interleaving DS1s to a higher signal rate, which 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.

Figure of synchronous multiplexing

Figure D-4 illustrates the SONET technique of mapping a single asynchronous DS1 signal into an STS-1 SPE.

Figure D-4 Synchronous Multiplexing



Transporting SONET payloads

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. There are four sizes of VTs: 1.5, 2, 3, and 6.

Table Digital signals DS1 and DS3 are the most important asynchronous signals in the current network. Broadband payloads, such as ATM, are also of great importance.

The following table provides the digital signals that can be transported as SONET payloads.

Table D-7 SPE Payloads

Input Tributary	Voice Channels (DS0s)	Rate	SONET Signal	Rate
DS1	24 DS0s	1.544 Mb/s	VT1.5	1.728 Mb/s
E1 (CEPT)	32 DS0s	2.048 Mb/s	VT2	2.304 Mb/s
DS1C	48 DS0s	3.152 Mb/s	VT3	3.456 Mb/s
DS2	96 DS0s	6.312 Mb/s	VT6	6.912 Mb/s
DS3	672 DS0s	44.736 Mb/s	STS-1	51.840 Mb/s
DS4NA	2016 DS0s	139.264 Mb/s	STS-3c	155.520 Mb/s
ATM	2016 DS0s	149.760 Mb/s	STS-3c	155.520 Mb/s
FDDI	2016 DS0s	125.000 Mb/s	STS-3c	155.520 Mb/s

SONET Interface

Overview

This section describes the SONET interface.

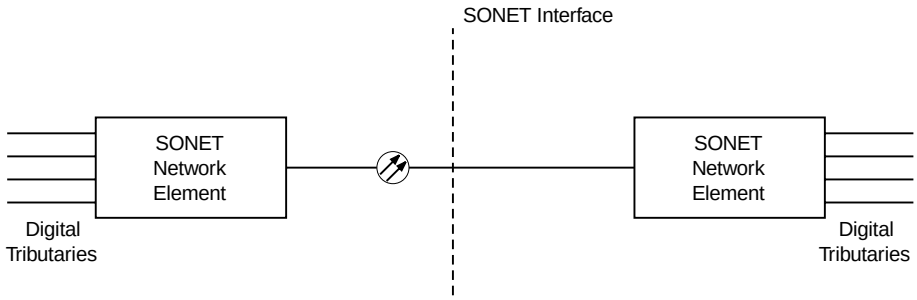
Description

The SONET interface provides the optical mid-span meet between SONET network elements. A SONET network element is the hardware and software that affects the termination or repeating of a SONET standard signal.

Figure of SONET interface

Figure D-5 illustrates the SONET interface.

Figure D-5 SONET Interface



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

wbwmax06.00e

SONET Multiplexing Process

Overview

SONET provides for multiplexing of asynchronous DS1s, synchronous DS1s, and asynchronous DS3s.

Multiplexing Process

The following describes the process for multiplexing a signal.

1 Input DS1 or DS3 tributary is mapped.

In the case of DS1 inputs, three time slots (DS0s) are added to the incoming signal, 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.

Important! 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 mux/demux steps required by asynchronous signal formats.

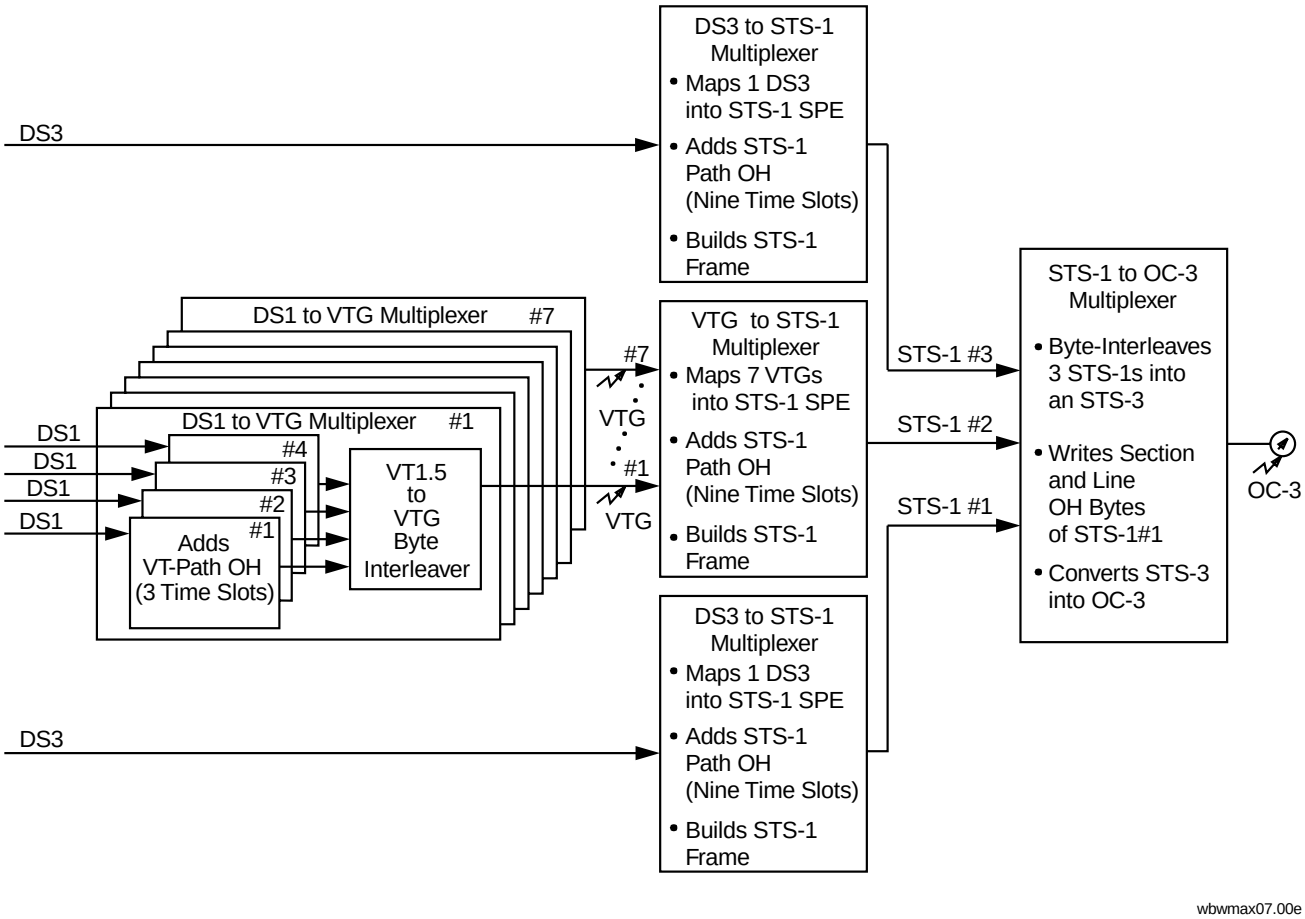
2 After VTs are multiplexed into the STS-1 SPE, the path, line, and section overhead is added.

3 Scrambled STS-N signal is transported to the optical stage.

Figure

Figure D-6 illustrates the SONET multiplexing process.

Figure D-6 SONET Multiplexing Process



SONET Demultiplexing Process

Overview

Demultiplexing is the inverse of multiplexing. This topic describes how to demultiplex a signal.

Demultiplexing Process

The following describes the process for demultiplexing an STS-1 signal to a DS1 signal.

1 The unscrambled STS-1 signal from the optical conversion stages is processed to extract the section and line overhead and accurately locate the SPE.

2 The STS-1 path overhead is processed to locate the VTs. The individual VTs are then processed to extract VT overhead and, via the VT pointer, accurately locate the DS1.

3 The DS1 is desynchronized, providing a standard DS1 signal to the asynchronous network.

Key points

Remember the following key points when demultiplexing a signal:

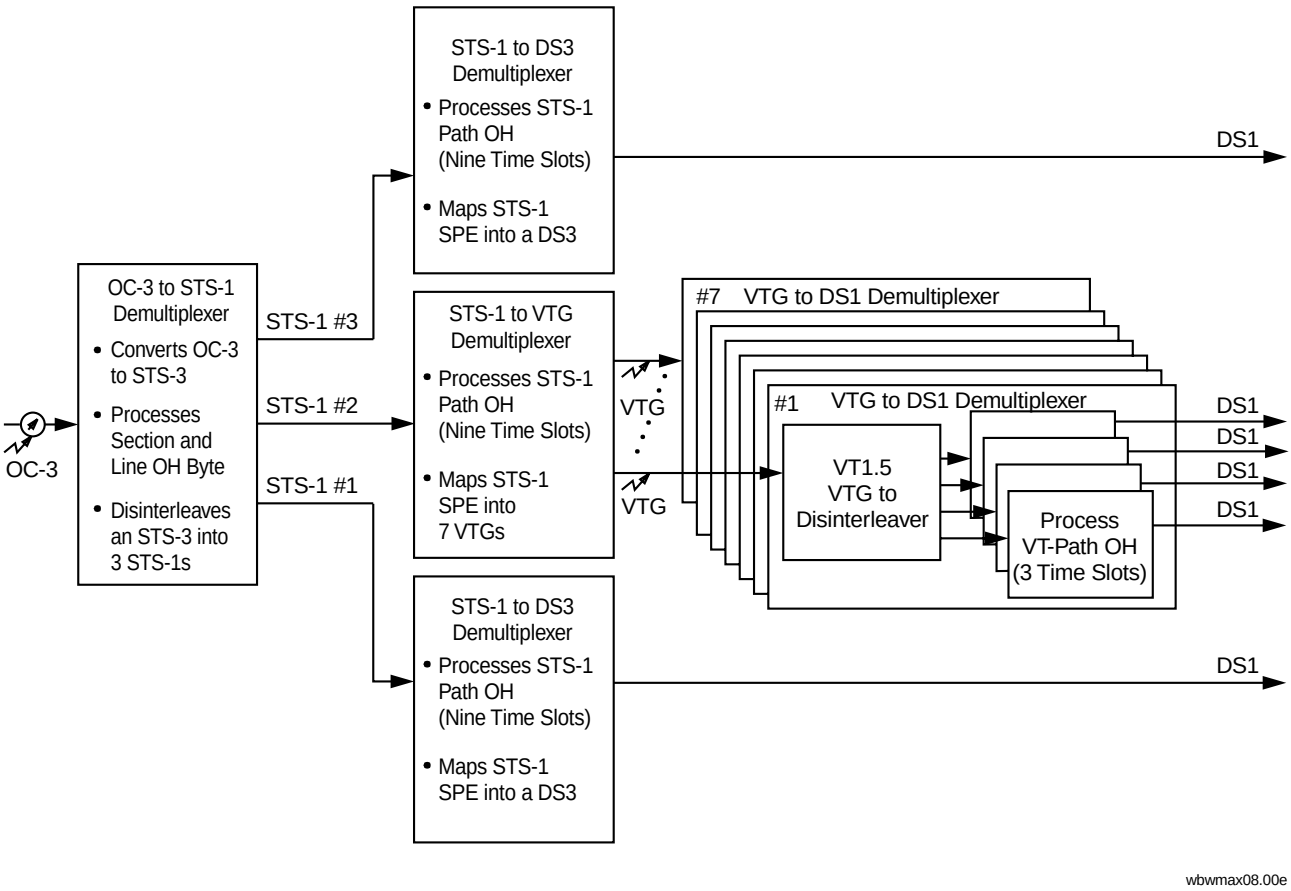
- The SONET frame is a fixed time (125 ms) and no bit-stuffing is used.
- The synchronous payload envelope (SPE) can *float* within the frame. This is to permit compensation for small variations in frequency between the clocks of the two systems that may occur if the systems are independently timed (plesiochronous timing). The SPE can also *drift* across the 125-ms frame boundary.

  Important! SONET STS pointers are used to locate the SPE relative to the transport overhead.

Figure

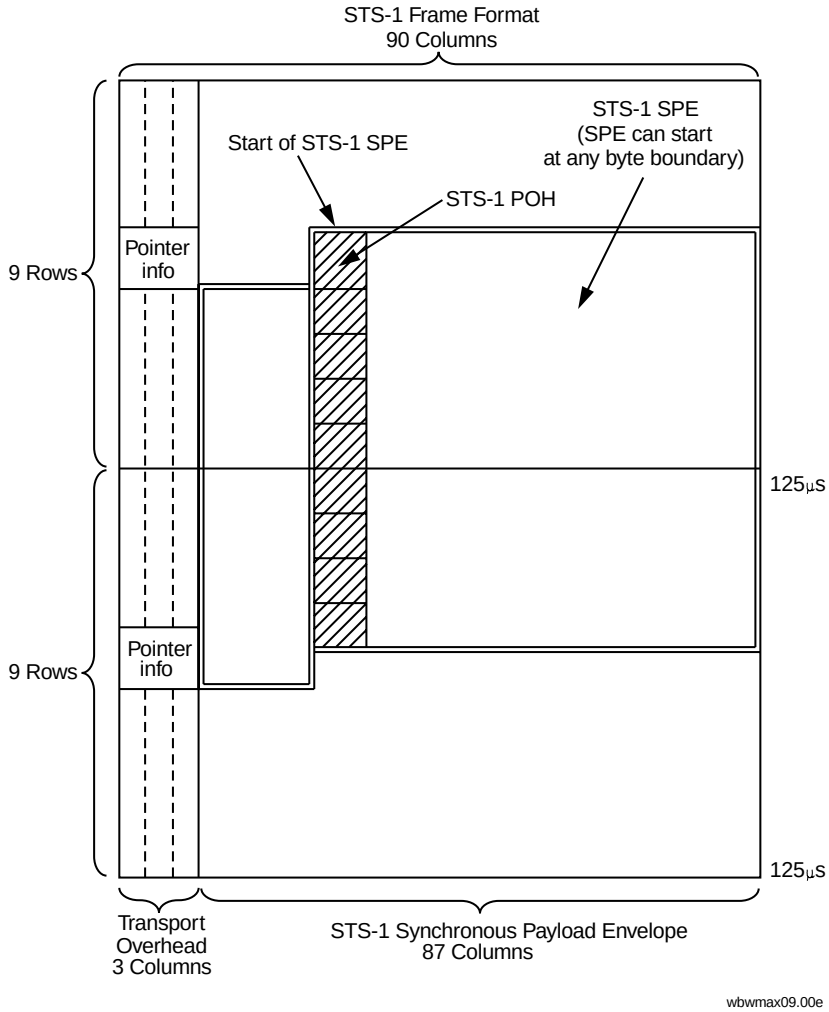
Figure D-7 illustrates the SONET demultiplexing process.

Figure D-7 SONET Demultiplexing Process



SPE figure Figure D-8 illustrates the SPE floating within an STS-1 frame.

Figure D-8 STS-1 SPE in Interior of STS-1 Frame



SONET Transport Rates

Overview

Higher rate SONET signals are created by byte-interleaving N STS-1s to form an N STS-1 signal.

Creating higher rate signals

The desired N STS-1s are created by:

- Adjusting all payload pointers and regenerating the section and line overhead bytes to be in phase with each other and the outgoing multiplexed signal
- Scrambling and converting the N STS-1 to an optical carrier – level N (OC-*N*) signal

SONET transport rates

The following table lists the SONET transport rates.

Table D-8 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-12	622.08	336 DS1s or 12 DS3s
OC-48	2488.32	1344 DS1s or 48 DS3s
OC-192	9953.28	5376 DS1s or 192 DS3s

Appendix E: Allowable Cross-Connections

Overview

Purpose This appendix provides detailed information about allowable cross-connections.

Contents This appendix provides the following information:.

Allowable VT1.5 Add/Drop Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS 1+1	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR, 1+1	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR, 1+1	2waypr	add-drop
{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR, 1+1	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR, 1+1	2waypr	add-drop
{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR w/ UNSWITCHED[1]	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR w/ UNSWITCHED[1]	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR w/ UNSWITCHED[1]	2waypr	add-drop
{a,b,c,d,g}-{1-2}-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS 1+1	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR, 1+1	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR, 1+1	2waypr	add-drop
{a,b,c,d,g}-{1-2}-{1-12}-{1-7,all}- {1-4,all}	OC-12 LS UPSR	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR, 1+1	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR, 1+1	2waypr	add-drop
{a,b,c,d,g}-{1-2}-{1-12}-{1-7,all}- {1-4,all}	OC-12 LS UPSR w/ UNSWITCHED[1]	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR w/ UNSWITCHED[1]	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR w/ UNSWITCHED[1]	2waypr	add-drop
(a,b,c,d,g}-{1-4}-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS 1+1	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR, 1+1	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR, 1+1	2waypr	add-drop
{a,b,c,d,g}-{1-4}-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR, 1+1	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR, 1+1	2waypr	add-drop

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-4}-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR w/ UNSWITCHED[1]	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR w/ UNSWITCHED[1]	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR w/ UNSWITCHED[1]	2waypr	add-drop
{a,b,c,d}-1-{1-7,all}-{1-4,all}	DS1	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR, 1+1	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR, 1+1	2waypr	add-drop
{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	EC1	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR, 1+1	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR, 1+1	2waypr	add-drop
{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	TMUX	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR, 1+1	2waypr	add-drop
		m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR, 1+1	2waypr	add-drop

Notes:

1 Beginning in release 3.0, the 0x1 LS port application is no longer supported. The unswitched (0x1) connectivity previously associated with cross-connections to these ports can now be achieved, on per cross-connection basis, for cross-connections to UPSR ports by setting chappl=UNSWITCHED in the ENT-CRS-rr command. chappl=UNSWITCHED is also applicable to HS UPSRs.

Allowable STS-1 Add/Drop Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] UPSR	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] UPSR w/ UNSWITCHED[2]	m-1-{1-192}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1-96}	OC-192 HS BLSR w/ NUT[3]	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1-24}	OC-48 HS BLSR w/ NUT[3]	2waypr	add-drop
{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR w/ NUT	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-1- {1-24}	OC-48 LS[1] BLSR w/ NUT[3]	m-1-{1-192}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS UPSR	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS UPSR w/ UNSWITCHED[2]	m-1-{1-192}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1-96}	OC-192 HS BLSR w/ NUT[3]	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1-24}	OC-48 HS BLSR w/ NUT[3]	2waypr	add-drop
{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS UPSR	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS UPSR w/ UNSWITCHED[2]	m-1-{1-192}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1-96}	OC-192 HS BLSR w/ NUT[3]	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1-24}	OC-48 HS BLSR w/ NUT[3]	2waypr	add-drop

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d}-1	DS1	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d}-{1-12}	DS3	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d}-{1-12}	EC1	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d}-{1-12,all}	TMUX	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR	2waypr	add-drop
		m-1-{1-48}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop

Notes:

1 A total of 24 STS-1 cross-connects are supported on OC-48 LS OLIUs in FN A, B or C, when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

2 Beginning in release 3.0, the 0x1 LS port application is no longer supported. The unswitched (0x1) connectivity previously associated with cross-connections to these ports can now be achieved, on per cross-connection basis, for cross-connections to UPSR ports by setting chappl=UNSWITCHED in the ENT-CRS-rr command. chappl=UNSWITCHED is also applicable to HS UPSRs.

3 Unswitched cross-connections to the BLSR require the that affected BSLR timeslots be provisioned as Not Protected or Temporarily Not Protected.

Allowable STS-3c Add/Drop Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-{1,4,7, 10,13,16,19,22,25,28,31, 34,37,40,43,46}	OC-48 LS[1] 1+1	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,4,7,...,88,91,94}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40, 43,46}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-1-{1,4,7, 10,13,16,19,22,25,28,31, 34,37,40,43,46}	OC-48 LS[1] UPSR	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,4,7,...,88,91,94}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40, 43,46}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-1-{1,4,7, 10,13,16,19,22,25,28,31, 34,37,40,43,46}	OC-48 LS[1] UPSR w/ UNSWITCHED[2]	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,4,7,...,88,91,94}	OC-192 HS BLSR w/ NUT[3]	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40, 43,46}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR w/ NUT[3]	2waypr	add-drop

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,4,7,...,88,91,94}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19,22}}	OC-48 LS[1] BLSR w/ NUT	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,4,7,...,88,91,94}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR w/ NUT[3]	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS 1+1	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,4,7,...,88,91,94}	OC-192 HS BLSR	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR	2waypr	add-drop
{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS UPSR	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,4,7,...,88,91,94}	OC-192 HS BLSR	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR	2waypr	add-drop

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS UPSR w/ UNSWITCHED[2]	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,4,7,...,88,91,94}	OC-192 HS (BLSR w/ NUT[3])	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR w/ NUT[3]	2waypr	add-drop
{a,b,c,d,g}-{1-4}-{1}	OC-3 LS 1+1	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,4,7,...,88,91,94}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-{1-4}-{1}	OC-3 LS UPSR	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,4,7,...,88,91,94}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-4}-{1}	OC-3 LS UPSR w/ UNSWITCHED[2]	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,4,7,...,88,91,94}	OC-192 HS BLSR w/ NUT[3]	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22,25,28,31,34, 37,40,43,46}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR w/ NUT[3]	2waypr	add-drop

Notes:

1 A total of 8 STS-3c cross-connects are supported on OC-48 LS OLIUs in FN A, B or C, when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

2 Beginning in release 3.0, the 0x1 LS port application is no longer supported. The unswitched (0x1) connectivity previously associated with cross-connections to these ports can now be achieved, on per cross-connection basis, for cross-connections to UPSR ports by setting chappl=UNSWITCHED in the ENT-CRS-rr command. chappl=UNSWITCHED is also applicable to HS UPSRs.

3 Unswitched cross-connections to the BLSR require the that affected BSLR timeslots be provisioned as Not Protected or Temporarily Not Protected.

Allowable STS-12c Add/Drop Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] 1+1	m-1-{1,13,25,...,157,169,181}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,13,25,...,61,73,85}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,13,25,37}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,13}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] UPSR	m-1-{1,13,25,...,157,169,181}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,13,25,...,61,73,85}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,13,25,37}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,13}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] UPSR w/ UNSWITCHED[2]	m-1-{1,13,25,...,157,169,181}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,13,25,...,61,73,85}	OC-192 HS BLSR w/ NUT[3]	2waypr	add-drop
		m-1-{1,13,25,37}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,13}	OC-48 HS BLSR w/ NUT[3]	2waypr	add-drop
{a,b,c,d,g}{1-2}-1-{1,13}	OC-48 LS[1] BLSR	m-1-{1,13,25,...,157,169,181}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,13,25,...,61,73,85}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,13,25,37}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,13}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}{1-2}-1-{1,13}	OC-48 LS[1] BLSR w/ NUT	m-1-{1,13,25,...,157,169,181}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,13,25,...,61,73,85}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,13,25,37}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,13}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-1-{1,13}	OC-48 LS[1] BLSR w/ NUT[3]	m-1-{1,13,25,...,157,169,181}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,13,25,37}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
{a,b,c,d,g}-{1-2}-1	OC-12 LS 1+1	m-1-{1,13,25,...,157,169,181}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,13,25,...,61,73,85}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,13,25,37}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,13}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop
{a,b,c,d,g}-{1-2}-1	OC-12 LS UPSR	m-1-{1,13,25,...,157,169,181}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,13,25,...,61,73,85}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-{1,13,25,37}	OC-48 HS UPSR, 1+1	2waypr	add-drop
		m{1-2}-1-{1,13}	OC-48 HS BLSR, BLSR w/ NUT	2waypr	add-drop

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-2}-1	OC-12 LS UPSR w/ UNSWITCHED[2]	m-1-{1,13,25,...,157,169,181}	OC-192 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,13,25,...,61,73,85}	OC-192 HS (BLSR w/ NUT[3])	2waypr	add-drop
		m-1-{1,13,25,37}	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,13}	OC-48 HS BLSR w/ NUT[3]	2waypr	add-drop

Notes:

1 A total of 2 STS-12c cross-connects are supported on OC-48 LS OLIUs in FN A, B or C, when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

2 Beginning in release 3.0, the 0x1 LS port application is no longer supported. The unswitched (0x1) connectivity previously associated with cross-connections to these ports can now be achieved, on per cross-connection basis, for cross-connections to UPSR ports by setting chappl=UNSWITCHED in the ENT-CRS-rr command. chappl=UNSWITCHED is also applicable to HS UPSRs.

3 Unswitched cross-connections to the BLSR require the that affected BSLR timeslots be provisioned as Not Protected or Temporarily Not Protected.

Allowable STS-48c Add/Drop Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-1	OC-48 LS[1] 1+1	m-1-{1,49,97,145}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,49}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-1	OC-48 HS UPSR, 1+1	2waypr	add-drop
{a,b,c,d,g}-1-1	OC-48 LS[1] UPSR	m-1-{1,49,97,145}	OC-192 HS UPSR	2waypr	add-drop
		m{1-2}-1-{1,49}	OC-192 HS BLSR, BLSR w/ NUT	2waypr	add-drop
		m-1-1	OC-48 HS UPSR, 1+1	2waypr	add-drop
{a,b,c,d,g}-1-1	OC-48 LS[1] UPSR w/ UNSWITCHED[2]	m-1-{1,49,97,145}	OC-192 HS UPSR UNSWITCHED[2]	2waypr	add-drop
		m-1-{1,49}	OC-192 HS BLSR w/ NUT[3]	2waypr	add-drop
		m-1-1	OC-48 HS UPSR w/ UNSWITCHED[2]	2waypr	add-drop

Notes:

1 STS-48c cross-connects are supported in Function Unit D and Growth, when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

2 Beginning in release 3.0, the 0x1 LS port application is no longer supported. The unswitched (0x1) connectivity previously associated with cross-connections to these ports can now be achieved, on per cross-connection basis, for cross-connections to UPSR ports by setting chappl=UNSWITCHED in the ENT-CRS-rr command. chappl=UNSWITCHED is also applicable to HS UPSRs.

3 Unswitched cross-connections to the BLSR require the that affected BSLR timeslots be provisioned as Not Protected or Temporarily Not Protected.

Allowable VT1.5 Hairpin Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS 1+1	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d}-{1}-{1-7,all}-{1-4,all}	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	TMUX	2waypr	inter-FN
{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR	2waypr	pass-through[1] inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d}-{1}-{1-7,all}-{1-4,all}	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	TMUX	2waypr	inter-FN
{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR w/ UNSWITCHED[2]	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR[2] UNSWITCHED	2waypr	pass-through[1] inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR w/ UNSWITCHED[2]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR w/ UNSWITCHED[2]	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-2}-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS 1+1	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d}-{1}-{1-7,all}-{1-4,all}	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	TMUX	2waypr	inter-FN
{a,b,c,d,g}-{1-2}-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR	2waypr	pass-through[1] inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d}-{1}-{1-7,all}-{1-4,all}	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	TMUX	2waypr	inter-FN
{a,b,c,d,g}-{1-2}-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR w/ UNSWITCHED[2]	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR w/ UNSWITCHED[2]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR w/ UNSWITCHED[2]	2waypr	pass-through[1] inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR w/ UNSWITCHED[2]	2waypr	inter-FN
(a,b,c,d,g}-{1-4}-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS 1+1	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d}-{1}-{1-7,all}-{1-4,all}	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	TMUX	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-4}-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS 1+1,UPSR	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR	2waypr	pass-through[1] inter-FN
		{a,b,c,d}-{1}-{1-7,all}-{1-4,all}	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	TMUX	2waypr	inter-FN
{a,b,c,d,g}-{1-4}-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR w/ UNSWITCHED[2]	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR w/ UNSWITCHED[2]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR w/ UNSWITCHED[2]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR w/ UNSWITCHED[2]	2waypr	pass-through[1] inter-FN
{a,b,c,d}-1-{1-7,all}-{1-4,all}	DS1	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR, 1+1	2waypr	inter-FN
{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	EC1	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	TMUX	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	TMUX	{a,b,c,d,g}-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}-{1-7,all}-{1-4,all}	OC-12 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}-{1-7,all}-{1-4,all}	OC-3 LS UPSR, 1+1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}-{1-4,all}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}-{1-7,all}- {1-4,all}	TMUX	2waypr	inter-FN

Notes:

1 2waypr pass-through cross-connections on UPSR interfaces use the same channel aid for both the src_aid and dest_aid of the ENT-CRS-rr command.

2 Beginning in release 3.0, the 0x1 LS port application is no longer supported. The unswitched (0x1) connectivity previously associated with cross-connections to these ports can now be achieved, on per cross-connection basis, for cross-connections to UPSR ports by setting chappl=UNSWITCHED in the ENT-CRS-rr command. chappl=UNSWITCHED is also applicable to HS UPSRs.

Allowable STS-1 Hairpin Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d}-1	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	DS3	2waypr	inter-FN
		{a,b,c,d}-{1-12}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	TMUX	2waypr	inter-FN
{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] UPSR	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] UPSR	2waypr	pass-through[2] inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d}-1	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	DS3	2waypr	inter-FN
		{a,b,c,d}-{1-12}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	TMUX	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	2waypr	pass-through[2] inter-FN
		{a,b,c,d,g}-1-{1-24}	OC-48 LS[1] BLSR w/ NUT[4]	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	pass-through[5]
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d}-1	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	DS3	2waypr	inter-FN
		{a,b,c,d}-{1-12}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	TMUX	2waypr	inter-FN
{a,b,c,d,g}{1-2}-1- {1-24}	OC-48 LS[1] BLSR w/ NUT	{a,b,c,d,g}-1-{1-48}	OC-48 LS 1+1, UPSR[1]	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	pass-through[5]
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d}-1	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	DS3	2waypr	inter-FN
		{a,b,c,d}-{1-12}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	TMUX	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1- {1-24}	OC-48 LS[1] BLSR w/ NUT[3]	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] UPSR w/ UNSWITCHED[2]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-12}	OC-12 LS UPSR w/ UNSWITCHED[2]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-3}	OC-3 LS UPSR w/ UNSWITCHED[2]	2waypr	inter-FN
{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1, UPSR	2waypr	inter-FN intra-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d}-1	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	DS3	2waypr	inter-FN
		{a,b,c,d}-{1-12}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	TMUX	2waypr	inter-FN
{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS UPSR	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1	2waypr	inter-FN intra-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS UPSR	2waypr	pass-through[2] inter-FN intra-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d}-1	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	DS3	2waypr	inter-FN
		{a,b,c,d}-{1-12}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	TMUX	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS UPSR w/ UNSWITCHED[3]	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-24}	OC-48 LS[1] BLSR w/ NUT[4]	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS UPSR w/ UNSWITCHED[3]	2waypr	pass-through[2] inter-FN intra-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1, UPSR	2waypr	inter-FN intra-FN
		{a,b,c,d}-1	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	DS3	2waypr	inter-FN
		{a,b,c,d}-{1-12}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	TMUX	2waypr	inter-FN
{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS UPSR	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12LS 1+1	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1	2waypr	inter-FN intra-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS UPSR	2waypr	pass-through[2] inter-FN intra-FN
		{a,b,c,d}-1	DS1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	DS3	2waypr	inter-FN
		{a,b,c,d}-{1-12}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	TMUX	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS UPSR w/ UNSWITCHED[3]	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] UPSR UNSWITCHED[3]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-24}	OC-48 LS[1] BLSR w/ NUT[4]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-2}-{1-12}	OC-12 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS UPSR UNSWITCHED[3]	2waypr	pass-through[2] inter-FN intra-FN
{a,b,c,d}-1	DS1	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1, UPSR	2waypr	inter-FN
{a,b,c,d}-{1-12}	DS3	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1, UPSR	2waypr	inter-FN
{a,b,c,d}-{1-12}	EC1	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d}-{1-12}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	TMUX	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d}-{1-12}	TMUX	{a,b,c,d,g}-1-{1-48}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1-12}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1-3}	OC-3 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d}-{1-12}	EC1	2waypr	inter-FN
		{a,b,c,d}-{1-12}	TMUX	2waypr	inter-FN

Notes:

1 A total of 24 STS-1 cross-connects are supported on OC-48 LS OLIUs in FN A, B or C, when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

2 2waypr pass-through cross-connections on UPSR interfaces use the same channel aid for both the src_aid and dest_aid of the ENT-CRS-rr command.

3 Beginning in release 3.0, the 0x1 LS port application is no longer supported. The unswitched (0x1) connectivity previously associated with cross-connections to these ports can now be achieved, on per cross-connection basis, for cross-connections to UPSR ports by setting chappl=UNSWITCHED in the ENT-CRS-rr command. chappl=UNSWITCHED is also applicable to HS UPSRs.

4 Unswitched cross-connections to the BLSR require the that affected BSLR timeslots be provisioned as Not Protected or Temporarily Not Protected.

5 2waypr pass-through cross-connections on BLSR interfaces use the west ring channel aid for the src_aid (dest_aid) and east ring channel aid for the dest_aid (src_aid) of the ENT-CRS-rr command.

Allowable STS-3c Hairpin Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] 1+1	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS 1+1, UPSR	2waypr	inter-FN
{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] UPSR	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] UPSR	2waypr	pass-through[2] inter-FN
		{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS 1+1, UPSR	2waypr	inter-FN
{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	2waypr	pass-through[2] inter-FN
		{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR w/ NUT[4]	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19, 22}	OC-48 LS[1] BLSR	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	pass-through[5]
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS 1+1, UPSR	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR w/ NUT	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	pass-through[5]
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS 1+1, UPSR	2waypr	inter-FN
{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR w/ NUT[4]	m-1-{1-48}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		m-1-{1-12}	OC-12 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		m-1-{1-3}	OC-3 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
{a,b,c,d,g}-{1-2}-{1.4.7.10}	OC-12 LS 1+1	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS 1+1, UPSR[1]	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS 1+1, UPSR	2waypr	inter-FN intra-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS 1+1, UPSR	2waypr	inter-FN
{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS UPSR	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16 19,22}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS 1+1	2waypr	inter-FN intra-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS UPSR	2waypr	pass-through[2] inter-FN intra-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS 1+1, UPSR	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS UPSR w/ UNSWITCHED[3]	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR w/ NUT[4]	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS UPSR w/ UNSWITCHED[3]	2waypr	pass-through[2] inter-FN intra-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
{a,b,c,d,g}-{1-4}-1	OC-3 LS 1+1	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS 1+1, UPSR	2waypr	inter-FN intra-FN
{a,b,c,d,g}-{1-4}-1	OC-3 LS UPSR	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS 1+1	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS 1+1	2waypr	inter-FN intra-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS UPSR	2waypr	pass-through[2] inter-FN intra-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-{1-4}-1	OC-3 LS UPSR w/ UNSWITCHED[3]	{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22,25, 28,31,34,37,40,43,46}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1,4,7,10,13,16,19,22}	OC-48 LS[1] BLSR w/ NUT[4]	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-1	OC-3 LS UPSR w/ UNSWITCHED[3]	2waypr	pass-through[2] inter-FN intra-FN

Notes:

1 A total of 8 STS-1 cross-connects are supported on OC-48 LS OLIUs in FN A, B or C, when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

2 2waypr pass-through cross-connections on UPSR interfaces use the same channel aid for both the src_aid and dest_aid of the ENT-CRS-rr command.

3 Beginning in release 3.0, the 0x1 LS port application is no longer supported. The unswitched (0x1) connectivity previously associated with cross-connections to these ports can now be achieved, on per cross-connection basis, for cross-connections to UPSR ports by setting chappl=UNSWITCHED in the ENT-CRS-rr command. chappl=UNSWITCHED is also applicable to HS UPSRs.

4 Unswitched cross-connections to the BLSR require the that affected BSLR timeslots be provisioned as Not Protected or Temporarily Not Protected.

5 2waypr pass-through cross-connections on BLSR interfaces use the west ring channel aid for the src_aid (dest_aid) and east ring channel aid for the dest_aid (src_aid) of the ENT-CRS-rr command.

Allowable STS-12c Hair Pin Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] 1+1	{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,13}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-1	OC-12 LS 1+1, UPSR	2waypr	inter-FN
{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] UPSR	{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] 1+1	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,13}	OC-48 LS[1] UPSR	2waypr	pass-through[2] inter-FN
		{a,b,c,d,g}-{1-2}-1	OC-48[1] LS BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1,4,7,10}	OC-12 LS 1+1, UPSR	2waypr	inter-FN
{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	2waypr	pass-through[2] inter-FN
		{a,b,c,d,g}-1-{1,13}	OC-48 LS[1] BLSR w/ NUT[4]	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-1	OC-12 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
{a,b,c,d,g}{1-2}-1-{1,13}	OC-48 LS[1] BLSR	{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,13}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	pass-through[5]
		{a,b,c,d,g}-{1-2}-1	OC-12 LS 1+1, UPSR	2waypr	inter-FN
{a,b,c,d,g}{1-2}-1-{1,13}	OC-48 LS[1] BLSR w/ NUT	{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,13}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	pass-through[5]
		{a,b,c,d,g}-{1-2}-1	OC-12 LS 1+1, UPSR	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-{1,13}	OC-48 LS[1] BLSR w/ NUT[4]	m-1-{1,13,25,37}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		m-1-1	OC-12 LS UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
{a,b,c,d,g}-{1-2}-1	OC-12 LS 1+1	{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,13}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-1	OC-12 LS 1+1, UPSR	2waypr	inter-FN intra-FN
{a,b,c,d,g}-{1-2}-1	OC-12 LS UPSR	{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS 1+1, UPSR[1]	2waypr	inter-FN
		{a,b,c,d,g}{1-2}-1-{1,13}	OC-48 LS[1] BLSR, BLSR w/ NUT	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-1	OC-12 LS 1+1	2waypr	inter-FN intra-FN
		{a,b,c,d,g}-{1-2}-1	OC-12 LS UPSR	2waypr	pass-through[2] inter-FN intra-FN
{a,b,c,d,g}-{1-2}-1	OC-12 LS UPSR w/ UNSWITCHED[3]	{a,b,c,d,g}-1-{1,13,25,37}	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	2waypr	inter-FN
		{a,b,c,d,g}-1-{1,13}	OC-48 LS[1] BLSR w/ NUT[4]	2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-1	OC-12 LS UPSR w/ UNSWITCHED[3]	2waypr	pass-through[2] inter-FN intra-FN

Notes:

1 A total of 2 STS-12c cross-connects are supported on OC-48 LS OLIUs in FN A, B or C, when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

2 2waypr pass-through cross-connections on UPSR interfaces use the same channel aid for both the src_aid and dest_aid of the ENT-CRS-rr command.

3 Beginning in release 3.0, the 0x1 LS port application is no longer supported. The unswitched (0x1) connectivity previously associated with cross-connections to these ports can now be achieved, on per cross-connection basis, for cross-connections to UPSR ports by setting chappl=UNSWITCHED in the ENT-CRS-rr command. chappl=UNSWITCHED is also applicable to HS UPSRs.

4 Unswitched cross-connections to the BLSR require the that affected BSLR timeslots be provisioned as Not Protected or Temporarily Not Protected.

5 2waypr pass-through cross-connections on BLSR interfaces use the west ring channel aid for the src_aid (dest_aid) and east ring channel aid for the dest_aid (src_aid) of the ENT-CRS-rr command.

Allowable STS-48c Hairpin Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-1-1	OC-48 LS[1] 1+1	{a,b,c,d,g}-1-1	OC-48 LS[1] 1+1, UPSR	2waypr	inter-FN
{a,b,c,d,g}-1-1	OC-48 LS[1] UPSR	{a,b,c,d,g}-1-1	OC-48 LS[1] 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-1	OC-48 LS[1] UPSR	2waypr	pass-through[2] inter-FN
{a,b,c,d,g}-1-1	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	{a,b,c,d,g}-1-1	OC-48 LS[1] UPSR w/ UNSWITCHED[3]	2waypr	pass-through[2] inter-FN

Notes:

1 STS-48c cross-connects are supported in Function Unit D and Growth, when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

2 2waypr pass-through cross-connections on UPSR interfaces use the same channel aid for both the src_aid and dest_aid of the ENT-CRS-rr command.

3 Beginning in release 3.0, the 0x1 LS port application is no longer supported. The unswitched (0x1) connectivity previously associated with cross-connections to these ports can now be achieved, on per cross-connection basis, for cross-connections to UPSR ports by setting chappl=UNSWITCHED in the ENT-CRS-rr command. chappl=UNSWITCHED is also applicable to HS UPSRs.

Allowable STS-VT1.5 Main Pass-Through Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR	m-1-{1-192}-{1-7,all}-{1-4,all}	OC-192 HS UPSR	2waypr	pass-through[1]
m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR	m-1-{1-48}-{1-7,all}-{1-4,all}	OC-48 HS UPSR	2waypr	pass-through[1]

Notes:

1 2waypr pass-through cross-connections on UPSR interfaces use the same channel aid for both the src_aid and dest_aid of the ENT-CRS-rr command.

Allowable STS-1 Main Pass-Through Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
m-1-{1-192}	OC-192 HS UPSR	m-1-{1-192}	OC-192 HS UPSR	2waypr	pass-through[1]
m-1-{1-48}	OC-48 HS UPSR	m-1-{1-48}	OC-48 HS UPSR	2waypr	pass-through[1]
m{1-2}-1-{1-24}	OC-48 HS BLSR	m-1-{1-24}	OC-48 HS BLSR	2waypr	pass-through[2]

Notes:

1 2waypr pass-through cross-connections on UPSR interfaces use the same channel aid for both the src_aid and dest_aid of the ENT-CRS-rr command.

2 2waypr pass-through cross-connections on BLSR interfaces use the west ring channel aid for the src_aid (dest_aid) and east ring channel aid for the dest_aid (src_aid) of the ENT-CRS-rr command.

Allowable STS-3c Main Pass-Through Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
m-1-{1,4,7,...,184,187, 190}	OC-192 HS UPSR	m-1-{1,4,7,...,184,187,190}	OC-192 HS UPSR	2waypr	pass-through[1]
m-1-{1,4,7,10,13,16,19,22,25,28,31,34,37,40,43,46}	OC-48 HS UPSR	m-1-{1,4,7,10,13,16,19,22,25,28,31,34, 37,40,43,46}	OC-48 HS UPSR	2waypr	pass-through[1]
m{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR	m{1-2}-1-{1,4,7,10,13,16,19,22}	OC-48 HS BLSR	2waypr	pass-through[2]

Notes:

1 2waypr pass-through cross-connections on UPSR interfaces use the same channel aid for both the src_aid and dest_aid of the ENT-CRS-rr command.

2 2waypr pass-through cross-connections on BLSR interfaces use the west ring channel aid for the src_aid (dest_aid) and east ring channel aid for the dest_aid (src_aid) of the ENT-CRS-rr command.

Allowable STS-12c Main Pass-Through Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
m-1-{1,13,25,...,157,169, 181}	OC-192 HS UPSR	m-1-{1,13,25,...,157,169,181}	OC-192 HS UPSR	2waypr	pass-through[1]
m-1-{1,13,25,37}	OC-48 HS UPSR	m-1-{1,13,25,37}	OC-48 HS UPSR	2waypr	pass-through[1]
m{1-2}-1-{1,13}	OC-48 HS BLSR	m{1-2}-1-{1,13}	OC-48 HS BLSR	2waypr	pass-through[2]

Notes:

1 2waypr pass-through cross-connections on UPSR interfaces use the same channel aid for both the src_aid and dest_aid of the ENT-CRS-rr command.

2 2waypr pass-through cross-connections on BLSR interfaces use the west ring channel aid for the src_aid (dest_aid) and east ring channel aid for the dest_aid (src_aid) of the ENT-CRS-rr command.

Allowable STS-48c Main Pass-Through Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
m-1-{1,49,97, 145}	OC-192 HS UPSR	m-1-{1,49,97, 145}	OC-192 HS UPSR	2waypr	pass-through[1]
m-1-1	OC-48 HS UPSR	m-1-1	OC-48 HS UPSR	2waypr	pass-through[1]

Notes:

1 2waypr pass-through cross-connections on UPSR interfaces use the same channel aid for both the src_aid and dest_aid of the ENT-CRS-rr command.

Allowable Ethernet STS-1 Add/Drop Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-v{1,3}-{1-21}	GbE[1]	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
				mltpt	add-drop
		m-1-{1-192}	OC-192 HS UPSR w/ UNSWITCHED	mltpt	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR	2waypr	add-drop
		m-1-{1-96}	OC-192 HS BLSR w/ NUT	mltpt	add-drop
		m-1-{1-48}	OC-48 HS UPSR	2waypr	add-drop
				mltpt	add-drop
		m-1-{1-48}	OC-48 HS UPSR w/ UNSWITCHED	mltpt	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR	2waypr	add-drop
		m-1-{1-24}	OC-48 HS BLSR w/ NUT	mltpt	add-drop
{a,b,c,d}-v1-{1-21}	FE	m-1-{1-192}	OC-192 HS UPSR	2waypr	add-drop
				mltpt	add-drop
		m-1-{1-192}	OC-192 HS UPSR w/ UNSWITCHED	mltpt	add-drop
		m{1-2}-1-{1-96}	OC-192 HS BLSR	2waypr	add-drop
		m-1-{1-96}	OC-192 HS BLSR w/ NUT	mltpt	add-drop
		m-1-{1-48}	OC-48 HS UPSR	2waypr	add-drop
				mltpt	add-drop
		m-1-{1-48}	OC-48 HS UPSR w/ UNSWITCHED	mltpt	add-drop
		m{1-2}-1-{1-24}	OC-48 HS BLSR	2waypr	add-drop
		m-1-{1-24}	OC-48 HS BLSR w/ NUT	mltpt	add-drop

Notes:

1 VCG3 is not supported on GbE packs in FN A, B when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

Allowable Ethernet STS-1 Hairpin Cross-Connections

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d,g}-v{1,3}-{1-21}	GbE[1]	{a,b,c,d,g}-1-{1-48}	OC-48 LS[2] 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-48}	OC-48 LS[2] UPSR	2waypr	inter-FN
				mltpt	inter-FN
		{a,b,c,d,g}-1-{1-48}	OC-48 LS[2] UPSR w/ UNSWITCHED	mltpt	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[2] BLSR	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-24}	OC-48 LS[2] BLSR w/ NUT	mltpt	inter-FN
		{a,b,c,d,g}-{1-2}-{1, 12}	OC-12 LS 1+1	2wapr	inter-FN
		{a,b,c,d,g}-{1-2}-{1, 12}	OC-12 LS UPSR	mltpt	inter-FN
				2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1, 12}	OC-12 LS UPSR w/ UNSWITCHED	mltpt	inter-FN
		{a,b,c,d,g}-{1-4}-{1, 3}	OC-3 LS 1+1	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1, 3}	OC-3 LS UPSR	mltpt	inter-FN
				2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1, 3}	OC-3 LS UPSR w/ UNSWITCHED	mltpt	inter-FN
		{a,b,c,d,g}-v{1,3}-{1-21}	GbE[1]	2waypr	inter-FN
		{a,b,c,d}-v1-{1-21}	FE	2waypr	inter-FN

From		To			
Address1	**Port Type Application**	**Address2**	**Port Type Application**	**CCT Value**	**Type**
{a,b,c,d}-v1-{1-21}	FE	{a,b,c,d,g}-1-{1-48}	OC-48 LS[2] 1+1	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-48}	OC-48 LS[2] UPSR	2waypr	inter-FN
				mltpt	inter-FN
		{a,b,c,d,g}-1-{1-48}	OC-48 LS[2] UPSR w/ UNSWITCHED	mltpt	inter-FN
		{a,b,c,d,g}{1-2}-1-{1-24}	OC-48 LS[2] BLSR	2waypr	inter-FN
		{a,b,c,d,g}-1-{1-24}	OC-48 LS[2] BLSR w/ NUT	mltpt	inter-FN
		{a,b,c,d,g}-{1-2}-{1, 12}	OC-12 LS 1+1	2wapr	inter-FN
		{a,b,c,d,g}-{1-2}-{1, 12}	OC-12 LS UPSR	mltpt	inter-FN
				2waypr	inter-FN
		{a,b,c,d,g}-{1-2}-{1, 12}	OC-12 LS UPSR w/ UNSWITCHED	mltpt	inter-FN
		{a,b,c,d,g}-{1-4}-{1, 3}	OC-3 LS 1+1	2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1, 3}	OC-3 LS UPSR	mltpt	inter-FN
				2waypr	inter-FN
		{a,b,c,d,g}-{1-4}-{1, 3}	OC-3 LS UPSR w/ UNSWITCHED	mltpt	inter-FN
		{a,b,c,d,g}-v{1,3}-{1-21}	GbE[1]	2waypr	inter-FN

Notes:

1 VCG3 is not supported on GbE packs in FN A, B when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

2 A total of 24 STS-1 cross-connects are supported on OC-48 LS OLIUs in FN A, B or C, when M1 and M2 are equipped with LNW26 type or LNW26B type OC-48 OLIUs.

Glossary

Abbreviations and Acronyms

A

ABN
Abnormal (status condition)

AC
Alternating Current

ADM
Add/Drop Multiplexer

ADR
Add/Drop Ring

AGNE
Alarm Gateway Network Element

AIS
Alarm Indication Signal

AMI
Alternate Mark Inversion

ANSI
American National Standards Institute

APD
Avalanche PhotoDiode

APS
Automatic Protection Switch

ASAP
Alarm Severity Assignment Profile

ASCII
American Standard Code for Information Interchange

ASN.1
Abstract Syntax Notation 1

ATM
Asynchronous Transfer Mode

Auto
Automatic

B

B3ZS
Bipolar 3-Zero Substitution

B8ZS
Bipolar 8-Zero Substitution

BDFB
Battery Distribution and Fuse Bay

BER
Bit Error Rate

BIP
Bit Interleaved Parity

BITS
Building Integrated Timing Supply

BLSR
Bidirectional line-switched ring

BPDU
Bridge protocol data unit

C

CC
Clear Channel

CCITT
Comité Consultatif International Télégrafique & Téléphonique

(International Telephone and Telegraph Consultative Committee)

CD-ROM
Compact Disk, Read-Only Memory

CIT
Craft Interface Terminal

CLEI
Common Language Equipment Identifier

CLK
Clock

CMISE
Common Management Information Service Element

CO
Central Office

CP
Circuit Pack

CPE
Customer Premises Equipment

CR
Critical (alarm status)

CTS
Customer Technical Support; now known as Technical Support Services (TSS)

CV
Coding Violation

CVFE
Coding Violation Far End

D

DACS
Digital Access Cross-Connect System

dB
Decibels

DC
Direct Current

DCC
Data Communications Channel

DCE
Data Communications Equipment

DEMUX
Demultiplexer

DLC
Digital Loop Carrier

DRI
Dual Ring Interworking

DS1
Digital Signal Level 1

DS3
Digital Signal Level 3

DSLAM
Digital Subscriber Line Access Multiplexer

DSNE
Directory Services Network Element

DSX
Digital Cross-Connect Panel

DTE
Data Terminating Equipment

DWDM
Dense Wavelength Division Multiplexing

E

EC-1
Electrical Carrier Level 1

ECI
Equipment Catalog Item

EEPROM
Electrically-Erasable Programmable Read-Only Memory

EIA
Electronic Industries Association

EMC
Electromagnetic Compatibility

EMI
Electromagnetic Interference

EOOF
Excessive Out of Frame

EPORT
Ethernet Port

EPROM
Erasable Programmable Read-Only Memory

EQ
Equipped (memory administrative state)

EQPT
Equipment

ES
Errored Seconds

ESD
Electrostatic Discharge

ESF
Extended Super Frame

EST
Environmental Stress Testing

F

FCC
Federal Communications Commission

FE
Far End

FE ACTY
Far End Activity

FEBE
Far End Block Error

FEC
Forward Error Correction

FEPROM
Flash EPROM

FIT
Failures in 10^{-9} hours of operation.

FTAM
File Transfer and Access Management

G

GB
Gigabytes

GbE
Gigabit Ethernet

Gb/s
Gigabits per second

GHz
Gigahertz

GNE
Gateway Network Element

GR-XXX
Telcordia Technologies (Bellcore) General Requirement-XXX

GUI
Graphical User Interface

H **HS**
High Speed

Hz
Hertz

I **IAO LAN**
Intraoffice Local Area Network

ID
Identifier

IEC
International Electrotechnical Commission

IEEE
Institute of Electrical and Electronics Engineers

IMF
Infant Mortality Factor

INC
Incoming Status

I/O
Input/Output

IP
Internet Protocol

IR
Intermediate Reach

IS
In Service

ISDN
Integrated Services Digital Network

ISO
International Standards Organization

ISP
Internet Service Provider

K **Kb/s**
Kilobits per second

L **LAN**
Local Area Network

LAPD
Link Access Procedure "D"

LBC
Laser Bias Current

LBO
Lightguide Build Out

LCN
Local Communications Network

LEC
Local Exchange Carrier

LED
Light-Emitting Diode

LGX
Lightguide Cross-Connect

LOF
Loss of Frame

LOP
Loss of Pointer

LOS
Loss of Signal

LPBK
Loopback

LR
Long Reach

LS
Low Speed

M

MB
Megabytes

Mb/s
Megabits per second

MJ
Major Alarm

MM
Multimode

MML
huMan-Machine Language

MN
Minor Alarm

MPEG
Moving Picture Experts Group

MTBF
Mean Time Between Failures

MTBMA
Mean Time Between Maintenance Activities

Mult
Multipling

MUX
Multiplex

N

NA
Not Applicable

NARTAC
North American Regional Technical Assistance Center

NE
Near End

NE
Network Element

NE ACTY
Near-End Activity

NEBS
Network Equipment-Building System

nm
Nanometer (10^{-9} meters)

NMA
Network Monitoring and Analysis

NMON
Not Monitored (provisioning state)

NRZ
Nonreturn to Zero

NSA
Not Service Affecting

NSAP Address
Network Service Access Point Address (used in the OSI network layer 3)

NTF
No Trouble Found

NTP
Network time protocol

NUT
Nonpreemptible unprotected traffic

NVM
Non-Volatile Memory

O

OAM&P
Operations, Administration, Maintenance, and Provisioning

OC-1
Optical Carrier, Level 1 Signal (51.84 Mb/s)

OC-3
Optical Carrier, Level 3 Signal (155.52 Mb/s)

OC-12
Optical Carrier, Level 12 Signal (622.08 Mb/s)

OC-48
Optical Carrier, Level 48 Signal (2488.32 Mb/s) (2.5 Gb/s)

OC-192
Optical Carrier, Level 192 Signal (9953.28 Mb/s) (10 Gb/s)

OLIU
Optical Line Interface Unit

OI
Operations Interworking

OOF
Out of Frame

OOL
Out of Lock

OOS
Out-of-Service

OPS/INE
Operations System/Intelligent Network Element

OS
Operations System

OSI
Open Systems Interconnection

OSMINE
Operations Systems Modifications for the Integration of Network Elements

OSP
Outside Plant

P

P-bit
Performance Bit

PC
Personal Computer

PCMCIA
Personal Computer Memory Card International Association

PID
Program Identification

PIR
Peak information rate

PJC
Pointer Justification Count

PLL
Phase-Locked Loop

PM
Performance Monitoring

POP
Points of Presence

POTS
Plain Old Telephone Service

PROTN
Protection

PWR
Power

R **RAM**
Random Access Memory

RDI
Remote Defect Indication

RTAC
Lucent Regional Technical Assistance Center (1-800-225-RTAC)

RTRV
Retrieve

RU
Rack Unit

RZ
Return to Zero

S **SA**
Service Affecting

SD
Signal Degrade

SEFS
Severely Errored Frame Seconds

SES
Severely Errored Seconds

SF
Super Frame (format for DS1 signal)

SID
System Identification

SM
Single Mode

SMC
SONET Minimum Clock

SNMP
Simple Network Management Protocol

SONET
Synchronous Optical NETwork

SPE
Synchronous Payload Envelope

SRD
Software Release Description

STS, STS-n
Synchronous Transport Signal

STS-1 SPE
STS-1 Synchronous Payload Envelope

STS-3c
Synchronous Transport Level 3 Concatenated Signal

STS-12c
Synchronous Transport Level 12 Concatenated Signal

STS-48c
Synchronous Transport Level 48 Concatenated Signal

STU
Synchronized - Traceability Unknown

SYSCTL
System Controller (circuit pack)

T

T1X1 and T1M1
The ANSI committees responsible for telecommunications standards

TA
Telcordia Technologies Technical Advisory

TARP
Target Identifiers Address Resolution Protocol

TBD
To Be Determined

TCA
Threshold-Crossing Alert

TCP/IP
Transmission Control Protocol/Internet Protocol

TDM
Time Division Multiplexing

THz
Terrahertz (1012 Hz)

TID
Target Identifier

TIRKS
Trunks Integrated Records Keeping System

TL1
Transaction Language 1

TR
Telcordia Technologies Technical Requirement

TSA
Time Slot Assignment

TSI
Time Slot Interchange

TSO
Technical Support Organization

U

UAS
Unavailable Seconds

UPD/INIT
Update/Intialize

UPSR
Unidirectional Path Switched Rings

V

VAC
Volts Alternating Current

VCG
Virtual Container Group

VDC
Volts Direct Current

VLAN
Virtual Local Area Network

VM
Violation Monitor

VMR
Violation Monitor and Removal

VoIP
Voice over Internet Protocol

VPN
Virtual Private Network

vslot
Virtual Slot

VT
Virtual Tributary

VT1.5
Virtual Tributary 1.5 (1.728 Mb/s)

W

WAN
Wide Area Network

WDCS
Wideband Digital Cross-Connect System

WDM
Wavelength Division Multiplexing

WRT
Wait to Restore Time

X **X.25**
An ITU standard defining the connection between a terminal and a public packet-switched network

Numerics

1+1

The 1+1 protection switching architecture protects against failures of the optical transmit/receive equipment and their connecting fiber facility. One bidirectional interface (two fibers plus associated OLIUs on each end) is designated "service," and the other is designated "protection." In each direction, identical signals are transmitted on the service and protection lines ("dual-fed"). The receiving equipment monitors the incoming service and protection lines independently, and selects traffic from one line (the "active" line) based on performance criteria and technician/OS control. In 1+1 both service and protection lines could be active at the same time (service in one direction, protection in the other).

1xN, 1x1

1xN protection switching pertains to circuit pack protection that provides a redundant signal path through the DMX 2.5G Multiplexer (it does not cover protection switching of an optical facility; se "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

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).

Adaptive Rate

See Pipe Mode.

Add/Drop Multiplexer (ADM)

The term for a synchronous network element capable of combining signals of different rates and having those signals added to or dropped from the stream.

Aging

The filtering database entries are automatically removed after an aging period (300 seconds).

Alarm

Visible or audible signal indicating that an equipment failure or significant event/condition has occurred.

Alarm Cut-Off (ACO)

A button on the SYSCTL used to silence audible alarms.

Alarm Gateway Network Element (AGNE)

A defined NE in an alarm group through which members of the alarm group exchange information.

Alarm Indication Signal (AIS)
A code transmitted downstream in a digital network that shows that an upstream failure has been detected and alarmed.

Alarm Severity Assignment Profile (ASAP)
A user provisioned mechanism to control an alarm level.

Alternate Mark Inversion (AMI)
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.

APS Channel
The signalling channel carried in the K1 and K2 bytes of the SONET overhead on the protection line. It is used to exchange requests and acknowledgments for protection switch actions.

American Standard Code for Information Interchange (ASCII)
A standard 7-bit code that represents letters, numbers, punctuation marks, and special characters in the interchange of data among computing and communications equipment.

Asynchronous Transfer Mode (ATM)
A high-speed transmission technology characterized by high bandwidth and low delay. It utilizes a packet switching and multiplexing technique which allocates bandwidth on demand.

Auto
One possible state of a DS1 or DS3 port. In this state, the port will automatically be put "in service" if a good signal is detected coming from the DSX panel.

Automatic Protection Switch
A 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.

Autonomous Message
A message transmitted from the controlled Network Element to the ITM-SC which was not a response to an ITM-SC originated command.

Avalanche Photodiode (APD)
A diode that increases its electrical conductivity by a multiplication effect when hit by light. APDs are used in lightwave receivers because the APDs have a greater sensitivity to weakened light signals (for example, those which have traveled long distances over fiber).

B Backbone Ring

A host ring.

Backup

The backup and restoration features provide the capability to recover from loss of NE data because of such factors as human error, power failure, NE design flaws, and software bugs.

Bandwidth

The difference in Hz between the highest and lowest frequencies in a transmission channel. The data rate that can be carried by a given communications circuit.

Baud Rate

Transmission rate of data (bits per second) on a network link.

Bidirectional Line

A transmission path consisting of two fibers that handle traffic in both the transmit and receive directions.

Bidirectional Line-Switched Ring (BLSR)

A bidirectional ring in which protection switching is accomplished by switching working traffic into protection time slots in the line going in the opposite direction around the ring.

Bidirectional Ring

A ring in which both directions of traffic between any two nodes travel through the same network elements (although in opposite directions).

Bidirectional Switch

Protection switching performed in both the transmit and receive directions.

Bipolar 8-Zero Substitution (B8ZS)

A line coding technique that replaces eight consecutive zeros with a bit sequence having special characteristics accomplishing two objectives: First, this bit sequence accommodates the density requirements of the ones for digital T1 carrier; Second, the sequence is recognizable at the destination (due to deliberate bipolar violations) and is removed to produce the original signal.

Bit

The smallest unit of information in a computer, with a value of either 0 or 1.

Bit Error Rate (BER)

The ratio of error bits received to the total number of bits transmitted.

Bit Error Rate Threshold

The point at which an alarm is issued for bit errors.

Bit Interleaved Parity-N(BIP-N)
A method of error monitoring over a specified number of bits (BIP-3 or BIP-8).

BITS clock
A BITS (Building Integrated Timing Source) clock is simply a clock within a central office that distributes timing to all the equipment in that central office. The BITS clock is tied to an external, stable timing source, such as a GPS (global positioning satellite).

Blocking
The state in which an ethernet port does not participate in frame relay. The forwarding process discards received frames.

Bridge Cross-Connection
The setting up of a cross-connection leg with the same input tributary as that of an existing cross-connection leg. Thus, forming a 1:2 bridge from an input tributary to two output tributaries.

Broadband
Any communications channel with greater bandwidth than a voice channel; sometimes used synonomously with wideband.

Byte
Refers to a group of eight consecutive binary digits.

C

C-Bit
A framing format used for DS3 signals produced by multiplexing 28 DS1s into a DS3. This format provides for enhanced performance monitoring of both near-end and far-end entities.

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).

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.

Circuit
A set of transmission channels through one or more network elements that provides transmission of signals

between two points, to support a single communications path.

Clear Channel (CC)
A provisionable mode for the DS3 output that causes parity violations not to be monitored or corrected before the DS3 signal is encoded.

Coding Violation (CV)
A performance monitoring parameter indicating that bipolar violations of the signal have occurred.

Collocated
System elements that are located in the same location.

Concatenation
A procedure whereby multiple virtual containers are associated one with each other resulting in a combined capacity that can be used as a single container across which bit sequence integrity is maintained.

Constituent Signals
List of received signals for an adaptive rate (pipe mode) optical port.

Cost
Cost is used to help determine the efficiency of any given path. Cost is provisioned for a port (depending on speed of transmission) and calculated automatically for a path (sum of the port costs for the path).

Craft Interface Terminal (CIT)
The user interface terminal used by craft personnel to communicate with a network element.

Critical (CR)
Alarm that indicates a severe, service-affecting condition.

Cross-Connect Capacity
The total bandwidth of cross-connections as measured by the bandwidth of input and output tributaries. A system with N STS-1 equivalent input tributaries and N STS-1 equivalent output tributaries (referred to as "NxN") provides a cross-connection capacity of N STS-1 equivalents. This system could provide N one-way point-to-point cross-connections or N^2 two-way point-to-point cross-connections at the equivalent rate of STS-1.

Cross-Connect Loopback
A cross-connection from an input tributary to the output of that same tributary via the cross-connect fabric.

Cross-Connect Rate
The attribute of a cross-connection that defines the constituent signal rate(s) it can carry. For a cross-connection with an STS-3 "pipe" cross-connection rate, the constituent signals carried by the cross-connection can be either an STS-3c signal or three STS-31 signals. Similarly, for a cross-connection with an STS-12 "pipe" cross-connection rate, the constituent signals carried by the cross-connection can be either

an STS-12c signal or an allowed mix of STS-12c signals and STS-3 signals.

Cut-Through
Refers to a simple ASCII interface to an NE. It enables the user to send TL1 messages directly to the NE with no interpretation or assistance provided by the WaveStar CIT.

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.

Data Communications Channel (DCC)
The embedded overhead communications channel in the synchronous line, used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between network elements in a synchronous network.

Data Communications Equipment (DCE)
The equipment that provides signal conversion and coding between the data terminating 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.

Data Terminating Equipment (DTE)
The equipment that originates data for transmission and accepts transmitted data.

DDM-2000
Lucent's current SONET 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.

Dense Wavelength Division Multiplexing (DWDM)
Transmitting two or more signals of different wavelengths simultaneously over a single fiber.

Digital Multiplexer
Equipment that combines time-division multiplexing several digital signals into a single composite digital signal.

Digital Signal Levels 0, 1, 3 (DS0, DS1, DS3)
An ANSI-defined signal or service level corresponding to the following: DS0 is 64 Kb/s, DS1 is 1.544 Mb/s (equivalent to T1), and DS3 is 44.736 Mb/s (equivalent to 28 T1 channels or T3).

Disable admin
An ethernet port that does not participate in the spanning tree. The port is disabled by management.

Disable failure
A port in this state does not participate in the spanning tree. The port is disabled due to a hardware or software failure.

DS3 Format
Specifies the line format of a DS3 interface port, such as M23 or C-bit parity.

Directory Services Network Element (DSNE)
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.

Digital Cross-Connect Panel (DSX)
A panel designed to interconnect to equipment that operates at a designated rate. For example, a DSX-3 interconnects equipment operating at the DS3 rate.

Dual Homing
A network topology in which two OC-3 or OC-12 shelves serve as hosts supporting up to 16 OC-3 rings or 4 OC-12 rings.

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).

Electromagnetic Compatibility (EMC)
A measure of equipment tolerance to external electromagnetic fields.

Electromagnetic Interference (EMI)
High-energy, electrically induced magnetic fields that cause data corruption in cables passing through the fields.

Electronic Industries Association (EIA)
A trade association of the electronic industry that establishes electrical and functional standards.

Electrostatic Discharge (ESD)
Static electrical energy potentially harmful to circuit packs and humans.

ECI - Equipment Catalog Item
The bar code number on the faceplate of each circuit pack used by some inventory systems.

Errored Seconds (ES)
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.

Establish
A user initiated command, at the WaveStar CIT, to create an entity and its associated attributes in the absence of certain hardware.

Event
A significant change. Events in controlled Network Elements include signal failures, equipment failures, signals exceeding thresholds, and protection switch activity. When an event occurs in a controlled Network Element, the controlled Network Element will generate an alarm or status message and send it to the management system.

Extended Superframe Format (ESF)
A T1 format that uses the framing bit for non-intrusive signaling and control. A T1 frame is sent 8,000 times a second, with each frame consisting of a payload of 192 bits, and with each frame preceeded by a framing bit. Because ESF only requires 2,000 framing bits for synchonization, the remaining 6,000 framing bits can be used for error detection.

Externally Timed
An operating condition of a clock in which it is locked to an external reference and is using time constants that are altered to quickly bring the local oscillator's frequency into approximate agreement with the synchronization reference frequency.

F

Facility
A one- or two-way circuit that carries a transmission signal.

Facility Loopback
A facility loopback is where an entire line is looped back.

Facility Roll
The disconnection of the circuit cross-connecting input tributary to an output tributary followed, within the

required completion time (≤2.5 ms), by a cross-connection of an input tributary to an output tributary.

Failures in Time (FIT)
Circuit pack failure rates per 109 hours as calculated using the method described in Reliability Prediction Procedure for Electronic Equipment, Telcordia Method I, Issue 5, September 1995.

Far End (FE)
Any other network element in a maintenance subnetwork other than the one the user is at or working on. Also called remote.

Far-End Receive Failure (FERF)
An indication returned to a transmitting Network Element that the receiving Network Element has detected an incoming section failure. Also known as RDI (Remote Detect Indication).

Fault
Term used when a circuit pack has a hard (not temporary) fault and cannot perform its normal function.

Fault Management
Collecting, processing, and forwarding of autonomous messages from network elements.

File Transfer and Access Management (FTAM)
FTAM is the Open Systems Interconnection (OSI) standard for file transfer, file access, and file management.

Filtering database
The filtering database maintains a dynamic list of paths to which packets should be routed based on the destination address. The database entries are created, updated, and removed by the learning process.

Flash EPROM
A technology that combines the nonvolatility of EPROM with the in-circuit reprogrammability of EEPROM (electrically-erasable PROM).

Forced
Term used when a circuit pack (either working or protection) has been locked into a service-providing state by user command.

Forced Switch to Protection
The WaveStar CIT command that forces the protection group to be the “Active Unit.” The clear command is required to remove the Forced Switch state. While in the Forced Switch state the system may not switch the active unit either automatically, by means of the WaveStar CIT Forced Switch, or Manual Switch command.

Forwarding
The state in which an ethernet port participates in frame relay.

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
Lucent's SONET OC-48 Lightwave System.

FTAM-FTP Gateway
In Release 3.0 and later releases, the Metropolis® DMX supports an FTAM-FTP gateway function. This is also referred to as file transfer translation device (FTTD). The FTTD translates FTAM over OSI presentation to FTP over TCP/IP.

Function Unit
Refers to any one of a number of different circuit packs that can reside in the A, B, C, or D function unit slots on the DMX 2.5G Multiplexer.

G Gateway Network Element (GNE)
A network element that passes information between other network elements and management systems through a data communication network.

H Hairpin Routing
A cross-connection between function units (inter-function unit). For example, function unit C to function untis A, B, or D. Also, a cross-connection within the same function unit (intra-function unit). Cross-connections go through Main, but no bandwidth or time slots are taken from the backbone ring. Eliminates need for another shelf.

Hashed FTP
In Release 3.0 and later releases, the hashed FTP (digital signature) capability prevents tampering with a downloadable software image.

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 Insert
To physically insert a circuit pack into a slot, thus causing a system-initiated restoral of an entity into service and/or creation of an entity and associated attributes.

In-Service (IS)
A memory administrative state for ports. IS refers to a port that is fully monitored and alarmed.

Intermediate Reach (IR)
A term used to describe distances of 15 to 40 km between optical transmitter and receiver without regeneration. See long reach.

J Jitter

Timing jitter is defined as short-term variations of the significant instants of a digital signal from their ideal positions in time.

Jumbo frame
In Release 3.0 and later releases, Metropolis® DMX supports jumbo ethernet frames with a capacity up to 9600 bytes. Jumbo frames increased network efficiency by reducing the number of frames to be processed.

L Lightguide Build-Out (LBO)

An attenuating (signal-reducing) element used to keep an optical output signal strength within desired limits.

Lightguide Cross-Connect (LGX)
A SONET device that contains ports for optical fiber connections to an optical network element (NE). An LGX is used to make and change connections to an NE without changing the cabling on the NE itself.

Light Emitting Diode (LED)
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
A transmission medium, together with the associated equipment, required to provide the means of transporting information between two consecutive network elements. One network element originates the line signal; the other terminates it.

Line Timing
The capability to directly derive clock timing from an incoming OC-N signal while providing theuser 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.

Listening
The state in which an ethernet port is preparing to participate in frame relay. In the listening state, frame relay is disabled. This is an interim state between blocking and learning.

Local
See Near-End.

Local Area Network (LAN)
A communications network that covers a limited geographic area, is privately owned and user administered, is mostly used for internal transfer of information within a business, is normally contained within a single building or adjacent group of buildings, and transmits data at a very rapid speed.

Long Reach (LR)
A term used to describe distances of 40 km or more between optical transmitter and reciever without regeneration. See Intermediate Reach.

Loopback
Type of diagnostic test used to compare an original transmitted signal with the resulting received signal. A loopback is established when the received optical or electrical external transmission signal is sent from a port or tributary input directly back toward the output.

Loss of Frame (LOF)
A failure to synchronize to an incoming signal.

Loss of Pointer (LOP)
A failure to extract good data from an STS-1 payload.

Loss of Signal (LOS)
The complete absence of an incoming signal.

M

M23-Format
A standard framing format used for DS3 signals produced by multiplexing 28 DS1s into a DS3 (sometimes referred to as M13-format, without C-bit parity).

Main
The two slots (M-1 and M-2) on a Metropolis® DMX shelf in which the OC-48 or OC-192 high speed OLIU circuit packs are installed.

Major
Indicates a service-affecting failure, main or unit controller failure, or power supply failure.

Maintenance Condition
An equipment state in which some normal service functions are suspended, either because of a problem or to perform special functions (copy memory) that can not be performed while normal service is being provided.

Minor (MN)
Indicates a non-service-affecting failure of equipment or facility.

Miscellaneous Discrete Interface
Allows an operations system to control and monitor equipment collocated within a set of input and output contact closures.

Multiplexer
A device (circuit pack) that combines two or more transmission signals into a combined signal on a shared medium.

Multiplexing
The process of combining multiple signals into a larger signal at the transmitter by a multiplexer. The large signal is then split into the original smaller signals at the receiver by a demultiplexer.

N

Network Element (NE)
A node in a telecommunication network that supports network transport services and is directly manageable by a management system.

Network Service Access Point (NSAP) Address
Network Service Access Point Address (used in the OSI network layer 3). An automatically assigned number that uniquely identifies a Network Element for the purposes of routing DCC messages.

Node
A network element in a ring or, more generally, in any type of network. In a network element supporting interfaces to more than one ring, node refers to an interface that is in a particular ring. Node is also defined as all equipment that is controlled by one system controller. A node is not always directly manageable by a management system.

Near End
The network element the user is at or working on. Also called local.

Network Element (NE)
The basic building block of a telecommunications equipment within a telecommunication network that meets SONET standards. Typical internal attributes of a network element include: onr or more high- and low-speed transmission ports, built-in intelligence, synchronization and timing capability, and access interfaces for use by technicians and/or operation systems. In addition, a network element may also include a time slot interchanger.

Network Time Protocol
Network time protocol is an easy, accurate, and automatic method to get and synchronize date/time.

Non-Revertive Switching
In non-revertive switching, an active and standby line exist on the network. When a protection switch occurs, the standby line is selected to support traffic, thereby becoming the active line. The original active line then becomes the standby line. This status remains in effect even when the fault clears. That is, there is no automatic switch back to the original status.

Non-Volatile Memory (NVM)
Memory that retains its stored data after power has been removed. An example of NVM would be a hard disk.

No Request State
This is the routine-operation quiet state in which no external command activities are occurring.

Not Monitored (NMON)
A provisioning state for equipment that is not monitored or alarmed.

O

OC, OC-n - Optical Carrier
The optical signal that results from an optical inversion of an STS signal; that is, OC-1 from STS-1 and OC-n from STS-n.

OC-1
Optical Carrier Level 1 Signal (51.844 Mb/s).

OC-3
Optical Carrier Level 3 Signal (155 Mb/s).

OC-12
Optical Carrier Level 12 Signal (622 Mb/s).

OC-48
Optical Carrier Level 48 Signal.

Open Systems Interconnection (OSI)
Referring to the OSI reference model, a logical structure for network operations standardized by the International Standards Organization (ISO).

Operations Interface
Any interface providing you with information on the system behavior or control. These include the equipment LEDs, SYSCTL faceplate, WaveStar CIT, office alarms, and all telemetry interfaces.

Operations Interworking (OI)
The capability to access, operate, provision, and administer remote systems through craft interface access from any site in a SONET/SDH network or from a centralized operations system.

Operations System (OS)
A central computer-based system used to provide operations, administration, and maintenance functions.

P

Pass Through
Paths that are cross-connected directly across an intermediate node in a ring network.

Path
A logical connection between the point at which a standard frame format for the signal at the given rate is assembled, and the point at which the standard frame format for the signal is disassembled.

Path Protection Group
The part of a cross-connection topology that is provisioned to provide path-level protection switching for all the constituent signals carried by the cross-connection. A path protection group can be identified as an entity by its logical output tributary and its cross-connection rate. A path protection group consists of one or more constituent path selectors.

Peak Rate Policer
Meters packet traffic leaving the internal packet switch and going toward the SONET network. If the packets exceed the provisioned peak information rate, the packets are dropped.

Performance Monitoring (PM)
Measures the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated).

Pipe Mode
In Release 3.0 and later releases, Metropolis® DMX supports cross-connections on adaptive rate OC-n ports (pipe mode). The signal rates adapt to the supported set of signal rates. Cross-connections may be provisioned at any cross-connection rate that is supported for the tributaries associated with the OC-n ports. A cross-connections can carry any set of constituent signals; however, the total of the constituent signal rates must not exceed the cross-connection rate.

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

Port (also called Line)
The physical interface, consisting of both an input and output, where an electrical or optical transmission

interface is connected to the system and may be used to carry traffic between network elements. The words "port" and "line" may often be used synonymously. "Port" emphasizes the physical interface, and "line" emphasizes the interconnection. Either may be used to identify the signal being carried.

Port Protection Group
A user provisioned association of protected optical interface ports. This association is used for line protection. The group of ports represent both a protection switching entity and also a set of lines that carry services to/from another network element. The port protection groups also determine the set of logical tributaries from and to which cross-connections can be provisioned.

Port State Provisioning
A feature that allows a user to supress 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*.

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
Extra capacity (channels, circuit packs) in transmission equipment that is not intended to be used for service, but rather to serve as backup against equipment failures.

Provisioning
The modification of certain programmable parameters that define how the node functions with various installed entities. These modifications are initiated locally or remotely by either a CIT or an OS. They may arrive at the node via the IAO LAN, CIT port, or any DCC channel. The provisioned data is maintained in NVM and/or hardware registers.

R Reactive Maintenance
Refers to decting defects/failures and clearing them.

Remote
See Far-End (FE).

Remote Defect Indication (RDI)
An indication returned to a transmitting terminal that the receiving terminal has detected an incoming section failure. [Previously called far-end-receive failure (FERF).]

Remote Network Element
Any Network Element that is connected to the referenced Network Element through either an electrical or optical link. It may be the adjacent node on a ring, or N nodes away from the reference. It also may be at the

same physical location but is usually at another (remote) site.

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 the clearing of any failure conditions that caused a protection switch to occur or after any external switch commands are reset. *See Non-Revertive*.

Ring
A configuration of nodes comprised of network elements connected in a circular fashion. Under normal conditions, each node is interconnected with its neighbor and includes capacity for transmission in either direction between adjacent nodes. Path switched rings use a head-end bridge and tail-end switch. Line switched rings actively reroute traffic over a protection line.

Ring (0x1) Low-Speed Interface
Formerly referred to as dual 0x1 or single 0x1. In ring applications, the DMX 2.5G Multiplexer may 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 other for protection. *See 1+1*.

Root node
The node from which path cost to any other node is measured.

Root port
In a bridge, the port that connects to the root (the port on the root side of the bridge.

S

Stratum 3 Timing Generator
The timing generator circuit pack, located in the OC-48 r OC-192 high-speed OLIU circuit pack, generates clock signals for distribution to the transmit circuits. It operates in the free-running, loop-timing, phase-lock, and holdover modes.

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.

Service
The operational mode of a physical entity that indicates that the entity is providing service. This designation will change with each switch action.

Severely Errored Seconds (SES)
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) occur.

Shelf ID
A switch-settable parameter with values from 1 to 8. Used to log into a selected shelf in a by using the CIT.

Shelf View
A graphical depiction of one shelf. Selectable objects in this view are the shelf, the slots/circuit packs, and the ports.

Single Homing
A network topoly in which a single DDM-2000 FiberReach, OC-3 Multiplexer, or OC-12 Multiplexer serves as a DMX 2.5G Multiplexer host supporting up to six OC-3 or OC-12 rings.

Site ID
A switch-settable parameter with values from 1 to 8. Displayed on the SYSCTL circuit pack to indicate to which site the faceplate alarms and LEDs apply.

Slot
A physical position in a shelf for holding a circuit pack and connecting it to the backplane. This term is also used loosely to refer to the collection of ports or tributaries connected to a physical circuit pack placed in a slot.

Software Backup
The process of saving an image of the current network element's databases, which are contained in its NVM, to a remote location. The remote location could be the WaveStar CIT or an OS.

Software Download
The process of transferring a generic (full or partial) or provisioned database from a remote entity to the target network element's memory. The remote entity may be the WaveStar CIT or an OS. The download procedure uses bulk transfer to move an uninterpreted binary file into the network element.

Spanning Tree Group
Nodes can be provisioned to belong to a spanning tree group. Only the nodes within that group participate in the spanning tree for the group.

Squelch Map
This map contains information for each cross-connection in a ring and indicates the source and destination nodes for the low-speed circuit that is part of the cross-connection. This information is used to prevent traffic misconnection in rings with isolated nodes or segments.

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 1x1 or 1xN protected circuit pack that is not currently carrying service. *See Active*.

Status
The indication of a short-term change in the system.

STS, STS-n - Synchronous Transport Signal
The basic 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
A group of interconnected/interrelated Network Elements. The most common connotation is a synchronous network in which the Network Elements have data communications channel (DCC) connectivity.

Superframe Format (SF)
A DS1 framing format in which 24 DS0 timeslots plus a coded framing bit are are organized into a frame which is repeated 12 times to form the superframe.

Synchronization Messaging
SONET synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork.

Synchronous Network
The synchronization of transmission systems with synchronous payloads to a master (network) clock that can be traced to a reference clock.

Synchronous Optical Network (SONET)
The North American standard for the rates and formats that defines optical signals and their constituents.

Synchronous Payload
Payloads that can be derived from a network transmission signal by removing integral numbers of bits from every frame. Therefore, no variable bit-stuffing rate adjustments are required to fit the payload in the transmission signal.

Synchronous Payload Envelope (SPE)
The combined payload and path overhead of an STS-1, STS-3c, STS-12c or STS-48c signal.

SYSCTL - System Controller
The system controller circuit pack that provides overall administrative control of the terminal.

System View
A graphical depiction of the entire Network Element. Selectable objects in this view are the bays and shelves.

T

T1
A carrier system that transmits at the rate of 1.544 Mb/s (a DS1 signal).

T2
A carrier system that transmits at the rate of 6.312 Mbps (a DS2 signal).

T3
A carrier system that transmits at the rate of 44.736 Mbps (a DS3 signal).

Target Identifier (TID)
A provisionable parameter that is used to identify a particular Network Element within a network. It is a character string of up to 20 characters where the characters are letters, digits, or hyphens (-).

Telcordia Technologies
Telcordia Technologies (formerly Bellcore) is a well-recognized telecommunications' standards organization.

Test Access
A set of cross-connection topologies used in conjunction with a testing system to monitor and "split" signal paths for purposes of fault isolation.

Through (or Continue) Cross-Connection
A cross-connection within a ring, where the input and output tributaries have the same tributary number but are in lines opposite each other.

Threshold-Crossing Alert (TCA)
A message type sent from a Network Element that indicates that a certain performance monitoring parameter has exceeded a specified threshold.

Through Timing
Refers to a network element that derives its transmit timing in the east direction from a received line signal in the east direction and its transmit timing in the west direction from a received line signal in the west direction.

Time Division Multiplexing (TDM)
A technique for transmitting a number of separate data, voice, and/or video signals simultaneously over one communications medium by interleaving a portion of each signal one after another.

Time Slot Assignment (TSA)
A capability that allows any tributary in a ring to be cross-connected to any tributary in any lower-rate, non-ring interface or to the same-numbered tributary in the opposite side of the ring.

Time Slot Interchange (TSI)
The ability of the user to assign cross-connections between any tributaries of any lines within a Network Element. Three types of TSI can be defined: Hairpin TSI, Interring TSI (between rings), and Intraring TSI (within rings).

Transaction Language One (TL1)
A machine-to-machine communications language that is a subset of ITU's human-machine language.

Tributary
A path-level unit of bandwidth within a port, or the constituent signal(s) being carried in this unit of bandwidth, for example, an STS-1 tributary within an OC-N port.

U

Unavailable Seconds (UAS)
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 Path-Switched Ring (UPSR)
Path-Switched rings employ redundant fiber optic transmission facilities in a pair configuration, with one fiber transmitting in one direction (for example, East) and the backup fiber transmitting in the other direction (for example, West). If the primary ring fails, then the protection ring takes over.

UPD/INIT
A push-button on the SYSCTL faceplate.

User Privilege
Permits a user must perform on the computer system on which the system software runs.

V

Virtual Tributary (VT)
A structure designed for transport and switching of sub-STS-1 payloads. There are currently four sizes: VT1.5 (1.728 Mb/s), VT2 (2.304 Mb/s), VT3 (3.456 Mb/s), and VT6 (6.912 Mb/s).

VT1.5 Tributary
A SONET logical signal with a data rate of 1.728 Mbps. In the 9-row structure of the STS-1 SPE, a VT1.5 occupies three columns. VT-structured STS-1 SPEs are divided into seven VT groups. Each VT group occupies twelve columns of the 9-row structure and, for VT1.5s, contains four VTs per group.

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

Wait-to-Restore (WTR)

Applies to revertive switching operation. The protection group enters the WTR state when all Equipment Fail (EF) conditions are cleared, but the system has not yet reverted back to its working line. The protection group remains in the WTR state until the Wait-to-Restore timer completes the WTR time interval.

Wait to Restore Time (WRT)

Corresponds to the time to wait before switching back after a failure has cleared (in a revertive protection scheme). The WRT can be between 0 and 15 minutes, in increments of one minute.

Wavelength Division Multiplexing (WDM)

A means of increasing the information-carrying capacity of an optical fiber by simultaneously transmitting signals at different wavelengths.

Wide Area Network (WAN)

A communication network that uses common-carrier provided lines and covers an extended geographical area.

Wizard

A form of user assistance that automates a task through a dialog with the user.

X **X.25 Interface/Protocol**

The ITU packet-switched interface standard for terminal access that specifies three protocol layers: physical, link, and packet for connection to a packet-switched data 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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