Lucent Technologies
Bell Labs Innovations

# *LambdaXtreme*™ Transport

## User Operations Guide

Release 1.1

365-575-781R1.1
Issue 1
June 2002

Product Development Manager 1-888-LUCENT8

### Notice

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

### Mandatory customer information

### Interference Information: Part 15 of FCC Rules

NOTE: 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.

### Security statement

In rare instances, unauthorized individuals make connections to the telecommunications network. In such an event, applicable tariffs require that the customer pay all network charges for traffic. Lucent Technologies and its predecessors cannot be responsible for such charges and will not make any allowance or give any credit for charges that result from unauthorized access.

### Trademarks

LambdaXtreme™ Transport is a trademark of Lucent Technologies.

Navis™ is a trademark of Lucent Technologies.

### Limited Warranty

For terms and conditions of sale, contact your Lucent Technologies Account Team.

### Ordering information

The ordering number for this information product is 365-575-781R1.1. For ordering information, refer to the “About this information product” chapter.

### Support

### Technical support

The Lucent Technologies Customer Technical Assistance Management (CTAM) provides a technical assistance telephone number that is monitored 24 hours a day. For technical assistance in the continental U.S., call 1-866-LUCENT8 (1-866-582-3688) and select the appropriate prompt. Outside the continental U.S., please call 1-630-224-4672.

### Information product support

Lucent Technologies provides a referral telephone number for support. Use this number to report errors or to ask questions about the information product. This is a non-technical number. The telephone number is 1-888-LUCENT8.

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# About this information product

**Purpose** This User Operations Guide provides information a user needs to operate LambdaXtreme™ Transport including provisioning equipment, establishing optical channel connections, and using the LambdaXtreme™ Transport Craft Interface Terminal (CIT).

**Reason for reissue** This document addresses LambdaXtreme™ Transport Release 1.1.

**Safety labels** The following safety labels are used in this document:

**DANGER**

*This admonishment shows the presence of a hazard that will cause death or severe personal injury if the hazard is not avoided.*

**WARNING**

*This admonishment shows the presence of a hazard that can cause death or severe personal injury if the hazard is not avoided.*

**CAUTION**

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

### Intended audience

This manual is intended primarily for individuals in the field of telecommunications and for communications network providers.

Descriptive material in this document may be used by anyone desiring specific information or knowledge on the operational functions and features of LambdaXtreme™ Transport.

Procedural tasks in this document are written primarily for personnel responsible for the operation and maintenance of LambdaXtreme™ Transport.

### How to use this information product

The chapters in this document provide the following information:

Chapter 1, "Introduction", presents a summary description of LambdaXtreme™ Transport.

Chapter 2, "Operations", describes the interfaces and software support of operations for LambdaXtreme™ Transport.

Chapter 3, "Security Administration", details the security administration features in LambdaXtreme™ Transport

Chapter 4, "Equipment Provisioning", provides information for provisioning LambdaXtreme™ Transport equipment.

Chapter 5, "Establishing Optical Channel Connections", describes the autodiscovery and autoprovisioning features of LambdaXtreme™

Transport and provides information for provisioning optical channel connections.

Chapter 6, "System Maintenance", provides detailed "how to" instructions for performing basic maintenance activities and test procedures on LambdaXtreme™ Transport.

Chapter 7, "Craft Interface Terminal", presents a description of the LambdaXtreme™ Transport Craft Interface Terminal (CIT).

Appendix A, "Using the CIT", describes step-by-step procedures for performing tasks using the LambdaXtreme™ Transport CIT.

The "Glossary" provides a list of common terms and acronyms.

The "Index" provides page numbers for key words and subject names.

**Conventions used**

The following typographical conventions are used throughout this document:

- **Bold face** type is used to identify CIT menu selections and button selections.

**Related documentation**

The *LambdaXtreme™ Transport User Operations Guide* is part of a set of documents that support the LambdaXtreme™ Transport System. The following items are included in the set:

| Document Number | Document Title |
|---|---|
| 365–575–780R1.1 | LambdaXtreme™ Transport Applications and Planning Guide, Release 1.1 |
| 365–575–781R1.1 | LambdaXtreme™ Transport User Operations Guide, Release 1.1 |
| 365–575–783R1.1 | LambdaXtreme™ Transport Alarms, Messages, and Trouble Clearing Guide, Release 1.1 |
| 365-575-782R1.1 | LambdaXtreme™ Transport Installation Manual and System Turn-up Services, Release 1.1 |
| Comcode 109163642 | LambdaXtreme™ Transport Software Release Description, Release 1.1 |
| 365–575–797 | LambdaXtreme™ Transport Software Ordering Guide |

## Related training

The Lucent Learning (LL) Organization provides management courses for system planning, engineering, and ordering, as well as courses to train telecommunications technicians in installation, operations, and maintenance. To enroll in training classes, call the Lucent Learning Organization at 1-888-LUCENT8 (1-888-582-3688) Prompt 2 - Prompt 2, or fax to 1-407-767-2677. The International registration number is 1-407-767-2798. Suitcasing of these courses is also available. To arrange suitcase sessions (within USA), call the Product Training Manager at 1-888-582-3688, Prompt 2 - Prompt 1.

The available LambdaXtreme™ Transport courses are listed in the following table.

| Course Number | Course Title |
|---|---|
| LW2471 | LambdaXtreme™ Transport Installation & Testing |
| LW2271 | LambdaXtreme™ Transport Applications and Planning |
| LW2671 | LambdaXtreme™ Transport Operations and Maintenance |

### Schedule and Registration

For more information or to register for any of these courses, call:

1-888-LUCENT8 and select option 2

Fax: 1-407-767-2677

Or write to:

Lucent Technologies

Lucent Learning

240 E. Central Parkway

Altamonte Springs, FL 32701

## Technical Support Telephone Number

The Lucent Technologies Global TSS Contact Center provides a technical assistance telephone number that is monitored 24 hours a day. For technical assistance, call 1-866-LUCENT8 (1-866-582-3688) and select the appropriate prompt. Outside the continental United States, call 1-630-224-4672.

## Lightwave Safety Guidelines

The following precautions should be observed.

### General Laser Information

The LambdaXtreme™ Transport and associated optical test sets use semiconductor laser transmitters that emit 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-infrared wavelengths is officially designated invisible, some people can see the shorter wavelength energy even at power levels several orders of magnitude below any that have been shown to cause injury to the eye.

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

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

### Lasers and Eye Damage

Light energy emitted by laser and high-radiance light-emitting diodes (LEDs) in the 400 to 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, magnifying the irradiance. The irradiance of the energy that reaches the retina is approximately $10^5$ or 100,000 times that at the cornea, and if sufficiently intense, may cause a retinal burn.

The damage mechanism at the wavelengths used in telecommunications is thermal in origin, 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 is not instantaneous. It occurs only when one looks at the light sufficiently long enough that the product of the retinal irradiance and the viewing time exceeds the damage threshold. Light energies above 1400 nm would cause surface and skin burns and do not affect the retina. The thresholds for injury at wavelengths greater than 1400 nm are significantly higher than 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 seven major Classes 1, 1M, 2, 2M, 3R, 3B, and 4. The International Electro-technical Commission (IEC) is an international standards body that writes laser safety standards under IEC-60825. Classification schemes are similar with Classes divided into Classes 1, 1M, 3R, 3B, and 4. Lasers are classified according to the accessible emission limits and their potential for causing injury. Lightwave systems are generally classified as Class 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, covers are in place over the circuit pack shelves. The circuit packs themselves, however, may be FDA/CDRH Class 1 or 3B, or IEC Class 1, 3R, or 3B.

### Lightwave Safety Precautions

Under normal operating conditions, the LambdaXtreme™ Transport System is totally enclosed and presents no risk of eye injury. It is a Class 1M system under the FDA/CDRH scheme.

The lightguide cables that interconnect various components of a lightwave system can disconnect or break and may expose people to lightwave emission. Also, certain measures and maintenance procedures may expose the technician to emission from the semiconductor laser during installation and servicing. Unlike more familiar laser devices, such as solid-state and gas lasers, the emission pattern of a semiconductor laser results in a highly divergent beam. In a divergent beam, the irradiance (power 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 shorter wavelengths and higher at the longer wavelengths. However, damage may occur if an optical instrument such as a microscope, magnifying glass, or eye loupe is used to stare at the energized fiber end.

**WARNING**

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

### Safety Precautions for Enclosed Systems

Under normal operating conditions, the LambdaXtreme™ Transport System is completely enclosed; nonetheless, the following precautions should be observed:

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

### Safety Precautions for Unenclosed Systems

The Automatic Power Reduction (APR) feature brings the optical amplifier output power and Raman pump output power to safe levels in the event of a fiber cut, removed connector or equipment failure. The main concerns with respect to time to reduce power are human safety and prevention of optical surges. Once the system has been repaired or links have been re-established, the feature also ensures restoration to normal operation.

## DANGER

*Automatic Power Reduction (APR) is not available during maintenance or other applicable scenarios. This includes system or circuit pack resets. For example, when the SCTL fails, APR is unavailable until the pack is replaced and the system rebooted.*

During service, maintenance, or restoration, the LambdaXtreme™ Transport System is considered unenclosed. During service, maintenance, or restoration, observe the following precautions:

- Only authorized, trained personnel should 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 APR are engineering controls that are also used to limit the emissions. However, technicians removing or replacing regenerators should not stare or look directly into the vacant regenerator slot with optical instruments or magnifying lenses. (Normal eyewear or indirect viewing instruments, such as Find-R-Scope's infrared optical viewers, are not considered magnifying lenses or optical instruments.)
- Only authorized, trained personnel should use the lightwave test equipment during installation or servicing, since this equipment contains semiconductor lasers. [Some examples of lightguide test equipment are Optical Time Domain Reflectometers (OTDRs), Hand-Held Loss Test Sets, and Feature Finders.]
- Under no circumstances should any personnel scan a fiber with an optical test set without verifying that all lightwave sources on the fiber are turned off.
- All unauthorized personnel should be excluded from the immediate area of lightwave transmission systems during installation and service.

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

## Laser Safety and Lucent Products

Lucent is committed to designing optical fiber transmission equipment that minimizes operator and service personnel exposure to potentially hazardous levels of optical energy during service and operation. However, the continued safe use of optical transmission, optical cables and passive optical connection equipment requires partnership with customers to assure that these systems are deployed and maintained in a safe manner. While automatic laser power reduction systems in Lucent's higher power transmission equipment respond quickly to reduce laser emissions to safe levels in the event of fiber disconnection or break, network operators must take proper action in the event of an alarm.

In a typical network, our optical cables and passive optical connection equipment can carry signals from various vendor sources that may have different degrees of safety controls. We urge our customers to properly assess the power of these sources to ensure that their safety controls are adequate.

To strengthen our partnership and to assure the continued safe deployment and use of optical networks, we urge you to use the following standards as your guides for laser safety for your customers and employees:

In the U.S.:

- ***ANSI Z136.1 – American National Standard for Safe Use of Lasers.***
- ***ANSI Z136.2 – American National Standard for Safe Use of Optical Fiber Communication Systems Utilizing Laser Diode and LED Sources.***

Elsewhere:

- ***IEC 60825 Safety of Laser Products Part 1: Equipment classification, requirements and user's guide.***
- ***IEC 60825 Safety of Laser Products Part 2: Safety of optical fibre communication systems.***

It should be noted that recent studies in Europe[1] have suggested that power as low as 50 mW can ignite certain hazardous (classified) gaseous/vapor/mist/dust environments under worst case, dusty conditions. Standards are being written, both in the US and the International Electrotechnical Commission (IEC), to address optical installations in hazardous (classified) environments. If you must deploy high power systems in such environments, you should assess the impact.

[1] Carleton, F.B., Bothe, H., Proust, Ch., Hawksworth, S., Prenormative research on the use of optics in potentially explosive atmospheres – PROPEX - EUR 19617 EN. European Commission, 2000 (Brussels, Belgium), November 1999.

## Warning and Compliance Labels

### Warning Label

A warning label is provided on the inside front cover of each shelf assembly. The warning label shows the word "DANGER" in white lettering on a safety red background, and the text of the warning label in black lettering on a white background. See the figure below.


The label states:

***DANGER***

***INVISIBLE LASER RADIATION WHEN OPEN***

***AND FIBER DISCONNECTED***

***Avoid direct exposure to beam.***

***Do not view beam with optical instruments.***

### IEC Caution Label

An IEC “CAUTION” label is provided on the inside front cover of each shelf assembly. See the figure below.


This label uses black lettering on a safety yellow background, and states in both English and French:

***CAUTION***

***INVISIBLE CLASS 1M LASER RADIATION***

***WHEN OPEN AND FIBER DISCONNECTED***

***Do not view directly with optical instruments.***

### IEC Hazard Level Label

An IEC “HAZARD LEVEL” label is provided on the faceplate of all circuit packs with optical connectors which could permit access to IEC 1M emissions. This includes all OA, RP, RPG, and OD Circuit Packs. See the figure below.


For additional information on laser output power measurements, see the *LambdaXtreme™ Transport Applications and Planning Guide, Release 1.1.*

### Rear Cover Warning Label

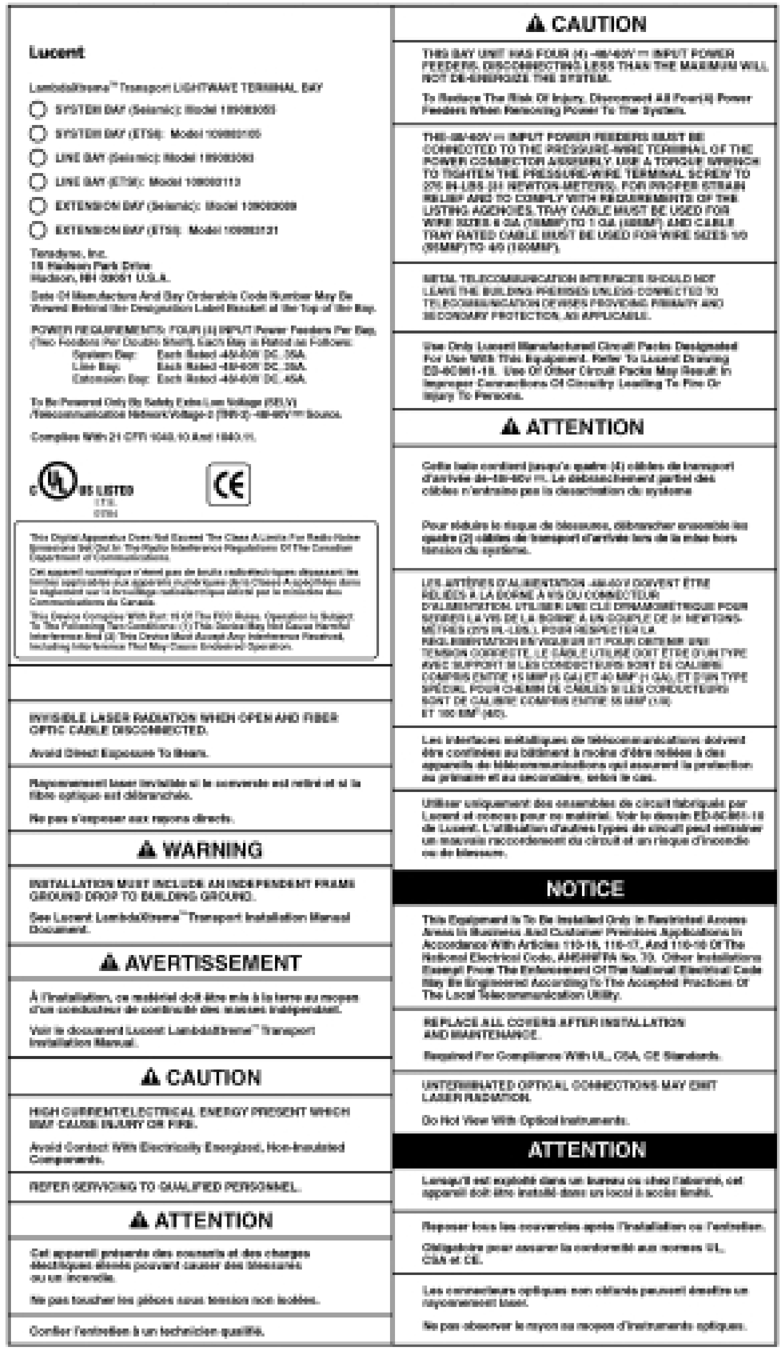
A warning label is provided on the rear cover of each equipment bay, cabinet, and miscellaneously mounted shelf that states:

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

### System Compliance Label

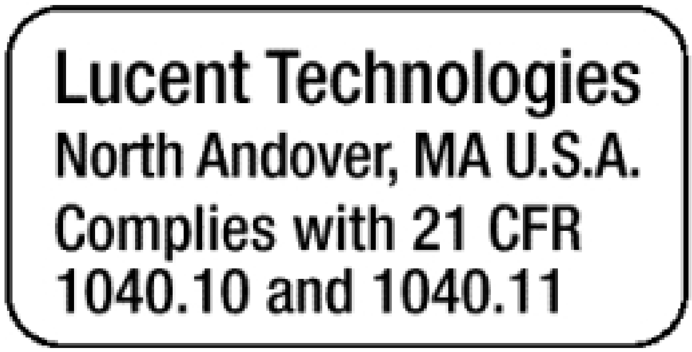
A compliance label stating that the system has been certified, along with the manufacturer's name and place of manufacture, is attached to the rear of each equipment bay, cabinet, and miscellaneously mounted shelf. The following figure shows an example of a compliance label.

The compliance label is located on the rear of the equipment cabinet (at eye level) and miscellaneously mounted shelves.



### Laser Diode Compliance Label

A Laser Diode Compliance Label is attached to the non-component side of each circuit pack containing a laser diode. This includes all OA, OT, RP, RPG, and SUPVY circuit packs. See the figure below.




## Electrostatic Discharge (ESD)

### Introduction

The following information must be considered whenever working on the LambdaXtreme™ Transport System, or one of its components.

**CAUTION**

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

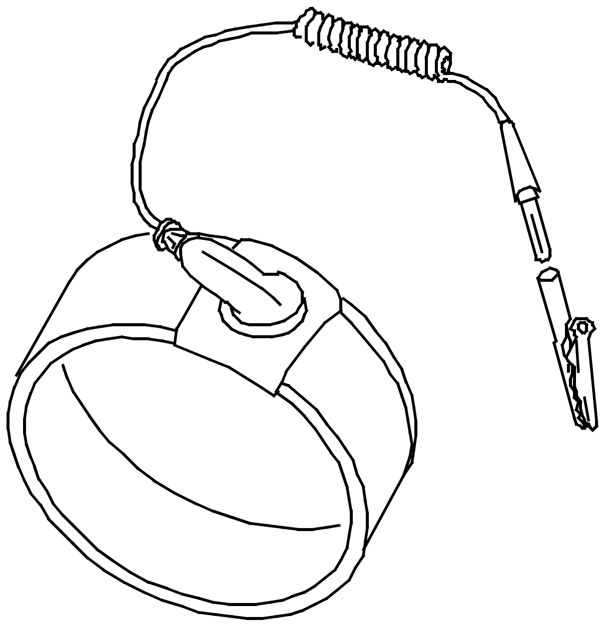
### Precautions

The following precautions must be observed 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 electrostatic discharge (ESD).
- When handling circuit packs/units (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/units 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/units from antistatic packaging until ready to insert them into slots.
- If possible, open all circuit packs/units at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats.
- Always store and transport circuit packs/units 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/units. When removing circuit packs/units from a cabinet, immediately place the circuit packs/units in static-safe packages.
- Whenever possible, maintain relative humidity above 20 percent.
- Always keep the front covers on the shelves except during an upgrade or maintenance procedure. Be sure to put blanks in slots that are not used. Once a circuit pack/unit is replaced in the shelf, immediately close the front cover.

### Grounding Wrist Straps

Any connectors on the shelf interconnection panel that are not cabled should be fitted with a plastic dust cap to provide ESD protection. To reduce the possibility of ESD damage, shelves are equipped with grounding jacks to enable personnel to ground themselves using wrist straps while handling circuit packs/units or working on a shelf. See the figure below. The wrist straps should be checked periodically with a wrist strap tester to ensure that they are working properly.



**Important!** The grounding jacks for connection of wrist straps are located at the front of the bay on the right side, just below the hinge for each shelf cover.

## Safety Instructions

### Save These Instructions

***READ AND UNDERSTAND ALL INSTRUCTIONS***

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

- Follow all warnings and instructions marked on the product.
- Slots and openings in this product at the front and top are provided for ventilation. To protect it from overheating, these openings must not be blocked or covered.
- Opening or removing rear covers or sheet-metal parts may present exposure to high current or electrical energy levels, or to other risks.

- 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 liquid of any kind on the product.
- Refer servicing to qualified service personnel.
- Use caution when installing and modifying telecommunications lines.
- Never install telecommunication wiring during a lightning storm.
- Never install telecommunication jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telecommunication wires or terminals unless the telecommunication line has been disconnected at the network interface.
- Installation must include an independent frame ground conductor to building ground. Grounding/bonding circuit continuity is vital for safe operation of this equipment. Never operate with grounding/bonding conductor disconnected.
- This product has four -48Vdc input power feeders per bay. Disconnecting one power feeder will not de-energize the product. To reduce the risk of injury, disconnect the four power supply cables when removing power from the system.
- Metallic telecommunication interfaces should not leave the building premises unless connected to telecommunication devices providing primary and secondary protection, as applicable.
- For continued protection against risk of fire, replace only with same type and rating of fuse.
- Use only Lucent Technologies manufactured, recognized circuit packs/units/modules. Refer to the *LambdaXtreme™ Transport Applications and Planning Guide, Release 1.1*.
- This equipment is intended for installation in Restricted Access Locations where access is controlled or where access can only be gained by service personnel with a key or tool. Access to this equipment is restricted to qualified service personnel only.

- Power the unit only from -48Vdc (-60Vdc for ETSI and similar applications) sources providing Safety Extra Low Voltage (SELV) outputs.
- This equipment must be provided with a readily accessible input power disconnect device as part of the building installation (such as a main power disconnect switch or external circuit breaker).

***SAVE THESE INSTRUCTIONS.***

**How to comment**

To comment on this information product online, go to *http://www.lucent-info.com/comments* or email your comments to ctiphotline@lucent.com (mailto:ctiphotline@lucent.com).

**How to order**

The LambdaXtreme™ Transport customer documents can be ordered as individual paper copies or as a set on a CD-ROM (Comcode #109163683). One-time orders include a binder (if applicable) and the document contents for the current issue in effect at the time of the order. Also, placement on the standing order list for all later reissues of the document may be requested. The standing order list for each document provides automatic distribution of all reissues of the document.

***Note:*** For commercial customers, a credit card is required for orders totaling $1000 or less. Visa, Mastercard, and American Express are accepted. Prepayment by check is also acceptable. Orders totaling over $1000 may be paid for using credit card, check, or invoice upon receipt of a purchase order. Orders placed by Lucent Associates are billed using the cost center.

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

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2855 N. Franklin Road

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Fax: 1-800-566-9568

***Phone/E-mail outside USA for Canada, North American Region:***

Phone: 1-317-322-6615

E-mail: intlnaorders@lucent.com

***Phone/E-mail outside USA for Europe, the Middle East, and Africa (EMEA); Asia, Pacific Region, and China; Caribbean, Latin America (CALA):***

Phone: 1-317-322-6416

E-mail: intlorders@lucent.com

***Worldwide Fax:*** 1-317-322-6699

***Internet for Commercial Customers:***

http://www.lucentdocs.com

or

http://www.lucent8.com

***Internet for Lucent Associates:***

http://www.cic.lucent.com

# 1 Introduction

## Overview

**Purpose**

This chapter provides a brief description of Lucent Technologies LambdaXtreme™ Transport optical networking product.

**Contents**

# System Overview

**Introduction**

LambdaXtreme™ Transport is Lucent Technologies next generation Dense Wavelength Division Multiplexing (DWDM) optical networking solution that uniquely offers one common platform for both ultra high capacity (up to 2.56 Tbps) and ultra long reach (up to 4000 km without electrical regeneration).

In combination with Lucent's LambdaUnite™ MultiService Switch (MSS) and LambdaRouter™ All Optical Switch (AOS) products, LambdaXtreme™ Transport provides a comprehensive set of wavelength-level control and management solutions that provides customers with unprecedented flexibility in their network.

LambdaXtreme™ Transport uses a platform of common amplifiers, common element and network management systems, common controller packs, and common physical design for LambdaXtreme™ Transport Long Haul (LH), LambdaXtreme™ Transport Ultra Long Haul (ULH), and LambdaXtreme™ Transport Ultra High Capacity (UHC) applications. Using a single platform across multiple applications means lower operational cost and faster time-to-market for service providers.

LambdaXtreme™ Transport operates in a single band of the optical spectrum. Since no bandsplitters/combiners are employed, the system features a smaller footprint, enhanced system margins, simpler system growth, and easier operations management, all of which lead to lower overall system costs.

The LambdaXtreme™ Transport 10G (LH/ULH) system supports transmission of up to 1.28 Tbps as 128 OC-192 (10 Gbps) extended L Band channels with WaveWrapper Forward Error Correction (FEC). OC-48 (2.5 Gbps) signals are handled by a 4:1 multiplexing WaveWrapper Optical Translator (OT). This system can yield up to 4000 km reach.

The LambdaXtreme™ Transport 40G (UHC) system supports transmission of 64 channels for a capacity of 2.56 Tbps. Payload (per channel) is four OC-192 (10 Gbps) signals handled by a 4:1 multiplexing WaveWrapper OT. This can yield up to 1000 km reach.

## Application Architectures

LambdaXtreme™ Transport is suited to the following service environments:

- Point-to-Point systems
- Linear Add-Drop chains
- Mesh systems

Benefits that LambdaXtreme™ Transport brings to these service environments include increased component density and reduced footprint (compared to previous Lucent products and competitor products).

For a complete detailed product overview including system components and specifications, see the *LambdaXtreme™ Transport Applications and Planning Guide, Release 1.1*.

# 2 Operations

## Overview

**Purpose**

This chapter explains the external physical interfaces, external NE communication links, link protocols and link establishment mechanisms that are utilized to support LambdaXtreme™ Transport operations. It also provides an overview of Fault and Performance Management. Finally, it describes the software support of operations including the functionality that is provided and the data that is processed.

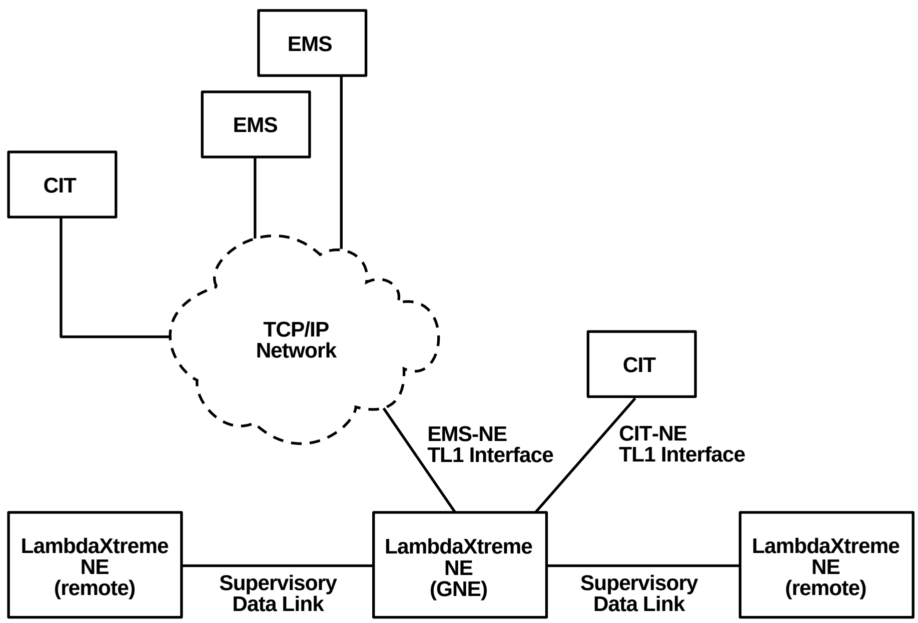
**Contents**

# Introduction

**Overview**

As illustrated below, the LambdaXtreme™ Transport NE external communications are the EMS-NE TL1 interface and the CIT-NE TL1 interface. The Supervisory Data Link is used as a data communication channel from a gateway NE to a remote NE.

**Figure 2-1 LambdaXtreme™ Transport External Communication Links**

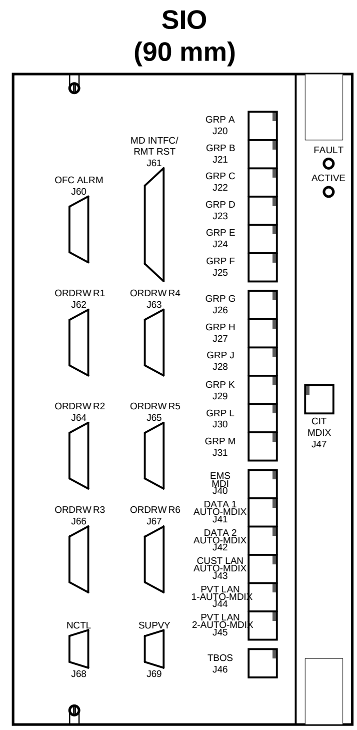



The Element Management System (EMS) interface and the Craft Interface Terminal (CIT) interface are both used for NE management. The NE supports system/security administration functions over both these interfaces via TL1 messages carried over TCP/IP connections. Users perform their maintenance functions using an Element Management System such as Lucent Technologies Navis™ Optical Element Management System (EMS).

The System Input/Output Panel (SIO) circuit pack is the main user interface to LambdaXtreme™ Transport. The SIO faceplate includes various ports including one for an EMS connection and one for the CIT (see Figure 2-2, "SIO Panel" (2-3)). For more information on the

SIO circuit pack see the *LambdaXtreme™ Transport Applications and Planning Guide, Release 1.1.*

**Figure 2-2 SIO Panel**




## Maintenance Subnetwork

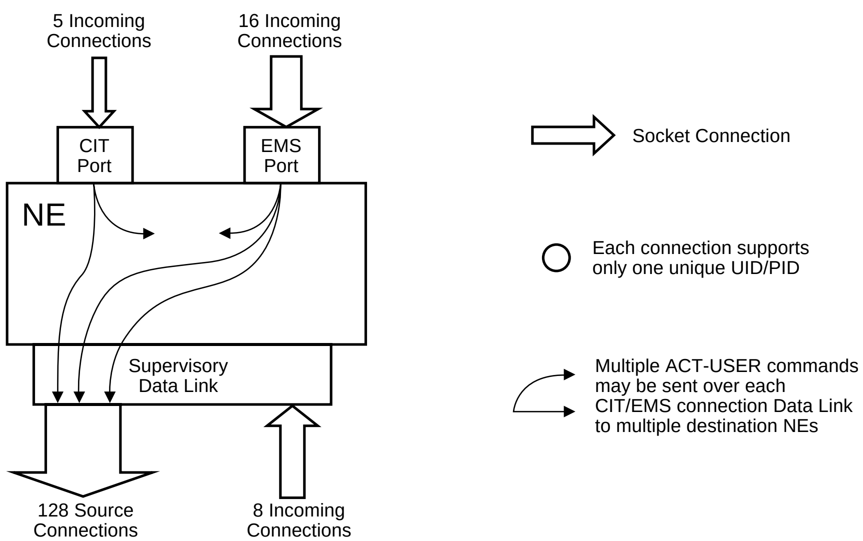
A maintenance subnetwork consists of all of the NEs that can communicate via the Data Communications Network (DCN). Connectivity for all CIT/EMS messages between NEs is through the DCN. The following applies:

- All LambdaXtreme™ Transport NEs within a maintenance subnetwork are accessible from any EMS/CIT (EMS-NE/CIT-NE) interface within the subnetwork. This enables all operations, administration, maintenance, and provisioning (OAM&P) functions to be performed on any NE within a maintenance subnetwork from any NE within the same subnetwork.
- The EMS/CIT NE interface behaves as an End System (ES) in an IP network. There is no routing performed at those ports.

### Gateway Network Element

A Gateway Network Element (GNE) is defined to be an NE that provides user access to all NEs within the maintenance subnetwork. The GNE routes the messages between members of the maintenance subnetwork. All NEs are capable of being GNEs. The following figure illustrates LambdaXtreme™ Transport GNE connectivity/login capabilities.

**Figure 2-3 GNE Connectivity/Login Capabilities**




### Remote Maintenance

LambdaXtreme™ Transport includes remote maintenance capabilities which allow the CIT/EMS to access all NEs in a maintenance subnetwork. NE communication is performed over the Supervisory Data Link.

□

# EMS-NE Interface

## Overview

The EMS-NE TL1 interface provides a link between the LambdaXtreme™ Transport NE and an EMS such as Lucent Technologies' Navis™ Optical Element Management System (EMS). The application data exchangeable over this interface is the set of LambdaXtreme™ Transport TL1 messages which are transported over a TCP/IP network. These messages include both input commands and responses, and autonomous outputs (alarms and events).

### *Navis*™ Optical Element Management System (EMS)

Navis™ Optical EMS, a separate Lucent Technologies product, can be used as an end user management system. When used as such, Navis™ Optical EMS provides a Graphical User Interface (GUI) for users to access and manage LambdaXtreme™ Transport with visibility down to the circuit pack, port, and tributary levels. As an end user system, Navis™ Optical EMS provides a complete suite of element management functionality including fault, configuration, and security management. For more information, see the *Navis™ Optical Element Management System (EMS) Applications and Planning Guide, Release 8.0 (190-224-160R8.0).*

## EMS Link Establishment

The EMS interface connection on the SIO provides a link to the connected NE (GNE). An EMS accesses a GNE and all remote NEs by using the IP Address of the GNE EMS port. While it is true that provisioning of a GNE is not required, the user must provision the IP address of the EMS port of an NE that is going to be used as a GNE. Specific step-by-step instructions for creating a Gateway Node are covered in Appendix A, "Using the CIT".

The following capabilities apply to TL1 application sessions over an EMS-NE link (see Figure 2-3, "GNE Connectivity/Login Capabilities" (2-4)):

- Can establish up to 16 EMS-NE data links to the GNE.
- Can establish and administer more than one functional data channel between an EMS and any particular NE. Specifically an EMS may login to a maximum of 128 remote NEs through a GNE.

- The functional data channels to any NE allow for command and response, autonomous output, and maintenance (a combination of the two).
- There can be more than one EMS-NE TL1 link to a given LambdaXtreme™ Transport NE meaning there can be application sessions between the NE and more than one EMS.

**Session Administration**

For an EMS login session, it is possible to suppress/allow NE autonomous outputs (notification messages are enabled by default).

The date format for all solicited and autonomous outputs depends on the provisionable parameter that distinguishes between the SONET and SDH environments and whether the year format for the login session is provisioned as a two or four digit number.

Thus the date format for solicited and autonomous outputs is shown in the following table:

**Table 2-1 Date Formats for Autonomous and Solicited Outputs**

| State of Provisionable Parameter | Date Format |
|---|---|
| SONET | YY-MM-DD (year-month-day) or YYYY-MM-DD (year-month-day) |
| SDH | DD-MM-YY (day-month-year) or DD-MM-YYYY (day-month-year) |

**Trouble Reporting Mechanisms**

A LambdaXtreme™ Transport NE displays fault conditions (EMS Link Failure) for an EMS interface that experiences equipment/signal failures. The EMS Link Failure will only be alarmed if the EMS port state has been provisioned to MON (monitor) using the ENT-SYS command.

The RJ45 connector on the SIO circuit pack that terminates the EMS interface has a green Link Integrity LED. When an attached link is operating normally, the green LED is lit. If the attached link is not operating normally the green LED is turned off. The green LED is also not lit if there is no attached link. When an EMS-NE link external fault has been detected , NE software declares an EMS Link Failure alarmed condition (severity MJ).

An EMS Link Failure alarmed condition results in an autonomous TL1 output message, and blinking of the red FAULT LED on the SIO circuit pack.

For a complete description of LambdaXtreme™ Transport fault conditions, see the *LambdaXtreme™ Transport Alarms, Messages, and Trouble Clearing Guide, Release 1.1*.

□

# CIT-NE Interface

**Overview**

The LambdaXtreme™ Transport Craft Interface Terminal (CIT) is a desktop or laptop computer that contains the LambdaXtreme™ Transport CIT software. The CIT (as well as the Navis™ Optical EMS) provides a user-friendly GUI that allows customers to interact with LambdaXtreme™ Transport NEs locally through a physical connection, or to remotely located network elements that are appropriately connected to the NE that has a physical connection to the CIT. The CIT provides a fully functional GUI with pull-down menus and context-sensitive, on-line help. The CIT gives craftspeople a unified set of features for provisioning, testing, and reporting.

User input-output capabilities on the CIT-NE interface are identical to those of the EMS-NE interface and all TL1 commands and autonomous messages are applicable over both interfaces.

Note: The CIT-NE connection is intended for a direct connection from a PC to the NE using a straight wired RJ-45 cable and not for a network connection. For a CIT network type connection, the CIT should be connected via a network that terminates to the EMS-NE interface.

**CIT Link Establishment**

The CIT-NE Link connects to a port on the SIO circuit pack via an RJ-45 jack. This jack has a green Link Integrity LED that is lit when the connected link is good (see Figure 2-2, “SIO Panel” (2-3)).

The CIT-NE interface is a 10/100 BaseT LAN interface running TCP/IP. Its IP address is dynamically determined via a CIT-resident non-standard DHCP server, meaning that no provisioning is required to connect to the CIT interface.

Note: The PC NIC parameters must be properly provisioned as this is independent of the CIT software.

The following capabilities apply to TL1 application sessions over a CIT-NE link (see Figure 2-3, “GNE Connectivity/Login Capabilities” (2-4)):

- Can establish up to 5 CIT-NE data links to the GNE.
- Can establish and administer more than one functional data channel between a CIT and any particular NE. Specifically a CIT may login to a maximum of 128 remote NEs through a GNE.

- The functional data channels to any NE allow for command and response, autonomous output, and maintenance (a combination of the two).
- There can be more than one CIT-NE TL1 link to a given LambdaXtreme™ Transport NE meaning there can be application sessions between the CIT and more than one NE.

### DHCP Server

When a CIT user directly connects the CIT PC (via the CIT port) to the NE, the CIT-resident DHCP server and the NE will communicate to configure the NE's CIT port IP address to be a part of the CIT PC's subnet. The CIT user will not have to provide any CIT port IP administration.

## Session Administration

A CIT user can establish a CIT-NE application session with the "local" NE (the NE to which the CIT is physically connected) or with a remote NE. Communication between the local/gateway NE and the remote NE is over the LambdaXtreme™ Transport Inter-Node DCN. In GUI mode, CIT users can maintain up to four CIT-NE application sessions (logins) with several different NEs. In CIT cut-through mode, a user can login to 128 simultaneous sessions.

## Trouble Reporting Mechanisms

The CIT-NE Interface Link Integrity LED located on the SIO circuit pack is used to determine if there is a signal failure.

□

# Orderwire

**Description**

The Orderwire channel is used to establish voice communication between LambdaXtreme™ Transport nodes. The Orderwire channels are derived from the supervisory signal traversing between the LambdaXtreme™ Transport nodes.

Each orderwire interface consists of clock, sync, and data signals in the transmit direction (external orderwire equipment to Optical Supervisory Channel (OSC)) and clock, sync, and data signals in the receive direction (OSC to external orderwire equipment). The clock and sync signals are outputs of the SUPVY for both transmit and receive. The transmit data signal is an input of the SUPVY (see "Supervisory Channel Provisioning" (4-14)).

LambdaXtreme™ Transport uses a packetized orderwire transmission scheme that automatically adjusts the play-out data rate at the receiving end of an orderwire connection to the transmission data rate at the transmitting end. The benefits of this are:

- The customer does not need to provision the timing mode for basic orderwire to work. (There may be customer applications such as digital bridging between orderwire ports, that may require clock synchronization of the NEs).
- Greater flexibility is possible in the orderwire connections. Instead of only local or express orderwire options, it is possible for any of the six orderwire interfaces in an NE to connect to orderwire interfaces at any other NE.

**Orderwire Implementation**

There are six DB15S connectors located on the SIO panel for Orderwire interfaces. The drivers, receivers, and terminations are on the SUPVY pack. The SUPVY supports three orderwire circuits from each direction. Three orderwire channels are carried in the East OSC and three in the West OSC. The three channels can be independently provisioned by the user as either local (dropped to the orderwire connectors on the SIO) or express. The default is local.

□

# History Logs

**Overview**

To help users track their command activities and the events autonomously output by the system, each LambdaXtreme™ Transport NE keeps and maintains the following logs:

- Event History Log
- History Detail Event Log (Autonomous Output Log)

**Event History Log**

LambdaXtreme™ Transport uses a single log to store and retrieve events. This log provides a complete history of the 500 most recent events that have occurred in the system. Events include the start and end of alarm and status conditions, and all input activities that affect or would affect the state on the NE, successfully completed or denied. These events are listed in order of occurrence. This log is available via the CIT, TL1 cut-through interface (RTRV-LOG command), or EMS.

The following events are displayed:

- User transactions that affect or would affect the state of the network element.
- Events identifying the start and end of alarm and status conditions.
- Transient events.

Specific step-by-step instructions for viewing the Event History Log are covered in Appendix A, "Using the CIT".

**History Detail Event Log (Autonomous Output Log)**

Each NE keeps a log of the 4000 most recent autonomous outputs. Users are able to retrieve this log and to filter the messages that are displayed. The log exists not only for user convenience, but because events will show up here even if they do not show up elsewhere (possible reasons being EMS-NE link or network failure or user inhibiting of autonomous TL1 message reporting).

The History Detail Event Log is retrievable via the RTRV-AO TL1 command. It is not available through the CIT.

□

# Office Alarm Display

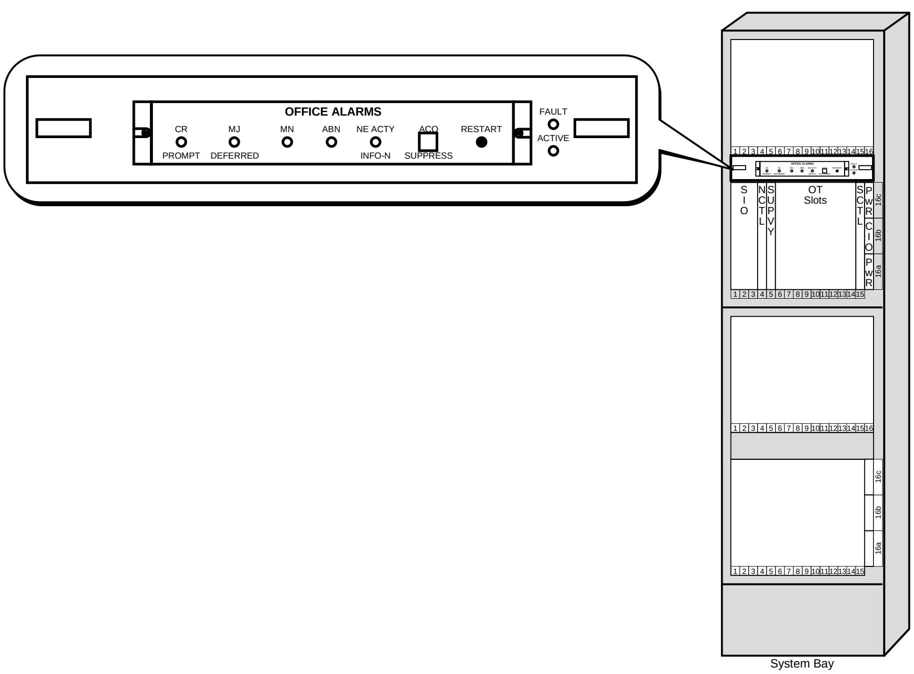
**Description**

The Office Alarm Display has two control buttons/switches, three alarm indicators, and three status indicators. One control button turns off local audible office alarms and the other restarts the system software. Alarm indicators display the highest severity level of the current alarm conditions. Status indicators display the status of the Alarm Cut-Off (ACO), the presence of abnormal conditions on the NE, and the presence of any alarm or status conditions on the NE.

The reset switch (labeled RESTART) restarts system software using the provisionable parameter values that were defined prior to the reset. Pushing this button effects a power cycle of the Network Element Controller (NCTL). The result is a “hard reset” of the NCTL and a “soft reset” of the rest of the circuit packs (transmission is not interrupted).

The following figure shows the Office Alarm Display and its location in the System Bay.

**Figure 2-4 Office Alarm Display**



# Fault Management

## Overview

The main focus in Fault Management is to present the user with the current alarms of a LambdaXtreme™ Transport NE in summaries and different views, so that the user gets a quick overview of what is going on with the NE. These views also support the user in analyzing fault conditions and quickly finding a solution for the problem.

An alarm is a notification of a failure and also an external visible indication of a failure by enabling the contact closure on the alarm grid. An autonomous message is generated to report the alarm and the Fault Light-emitting diode (LED) on the circuit pack or user panel may be turned on or blinking depending on the severity and type of alarm.

When multiple conditions with two or more different alarm attributes are active, only the highest level alarm will be active (both audible and visual). When the highest severity alarm has been cleared, the next highest alarm, if any, will be activated (both audible and visual).

Note: For detailed procedures on clearing alarms, see the *LambdaXtreme™ Transport Alarms, Messages, and Trouble Clearing Guide, Release 1.1.*

## Active Condition/Alarm Log

The NE keeps a log of active (outstanding) conditions which are the result of both alarmed and non-alarmed events. Users can retrieve an Alarm List Report that displays all active alarms. This alarm log summarizes the total number of alarms retrieved as well as the informational messages.

Each alarm is represented as a line in a table. The following six columns comprise the table:

- Level - This indicates the highest severity alarm present in the system at the time the alarm was generated (not the severity of the alarm itself). The possible values are Critical, Major, and Minor for the SONET environment, and Prompt or Deferred for the SDH environment.
- AID - This indicates the access identifier (AID) of the equipment on which the alarm occurred.
- Occurred - This indicates the date and time at which the reported alarm began.

- Description - This contains the text description of the reported condition.
- Service - This indicates the effect the reported alarm has on service. Possible values are Service affecting (SA) or Non-Service affecting (NSA).

Specific step-by-step instructions for viewing the Alarm List Report are covered in Appendix A, “Using the CIT”.

### Alarm Definitions

The provisionable parameter called STD (standard) determines the set of supported alarm severities. The value of this parameter can be set to “SONET” or “SDH”.

The mapping and the set of supported alarm severities for the SONET and SDH environments are shown in the following table:

| SONET | SDH |
|---|---|
| CRITICAL (CR) | PROMPT |
| MAJOR (MJ) | |
| MINOR (MN) | DEFERRED |
| NOT ALARMED (NA) | NO ALARM |
| NOT REPORTED (NR) | NO REPORT |

### Alarm Severity Levels

In order to tailor a customer’s operations plans to specific operations environments, LambdaXtreme™ Transport allows customers to provision (customize) alarm levels and the inhibiting of the generation/reporting of specific alarms.

An Alarm Severity Assignment (ASA) associates a set of alarm severities with one or more Alarm Identifiers. The basic outline of the feature is as follows:

- The NE’s alarms are uniquely categorized into groups - with each alarm residing in one and only one group.
- A default (original value) of alarm severity is given to each alarm in each group. There is thus a default set of Alarm Group severities.

- The user has the capability to change any individual alarm severity.
- Changes of alarm severities do not affect outstanding (current) alarms.

Alarm severity levels can be set via the CIT, TL1 cut-through (ED-SEV command), or the EMS. Specific step-by-step instructions for setting alarm severity levels via the CIT are covered in Appendix A, "Using the CIT". For provisioning procedures via the EMS, see the *Navis™ Optical Element Management System (EMS) Maintenance Guide, Release 8.0 (190-224-157R8.0).*

### Alarm Groups

The LambdaXtreme™ Transport Alarm Groups are as follows:

- Slot – Slot, Circuit Pack and Equipment alarms
- PortOT – Signal alarms detected at OT ports
- PortOther – Signal alarms detected at SUPVY or OMON circuit pack ports
- OCHAN – OCHAN AIDs
- PortOA_RP– Signal alarms detected at OA or Raman Pump circuit pack ports
- PortOM_OD – Signal alarms detected at Optical Multiplexor or Demultiplexor ports
- Line
- Shelf
- Fan – Fan Assembly alarms
- System

## Alarm Displays and Status Indicators

The Office Alarms interface is a set of discrete relays that control audible and visual office alarms that includes the following:

- Equipment LEDs
- NE Level Alarm LEDs
- Power-On LED
- Abnormal Condition LED
- Activity-Near End/Info-N LED

### Equipment LEDs

There are two LEDs on each circuit pack. The FAULT LED is red and is illuminated steadily when there is a failure of the circuit pack or when the circuit pack is booting. This red LED flashes (at a rate of one second on and one second off) to indicate the failure of an input to the circuit pack.

The ACTIVE LED is green and is illuminated steadily when the circuit pack is booted and flashes when the circuit is booting. The LEDs are off when the pack is not powered up.

### NE Level Alarm LEDs

NE Level Alarms are displayed on the Fan Assembly User Panel (for details of the Fan Assembly, see the LambdaXtreme™ Transport Applications and Planning Guide, Release 1.1). Separate LEDs display the severity level of the received alarm as follows:

- The alarm indicator for alarm conditions that are consistent with the definitions for Critical (SONET environment) or Prompt (SDH environment) is Critical/Prompt. The indicator is labeled CR/Prompt and is a red LED.
- The alarm indicator for alarm conditions that are consistent with the definitions for Major (SONET environment) or Deferred (SDH environment) is Major/Deferred. The indicator is labeled MJ/Deferred and is a red LED.
- The alarm indicator for alarm conditions that are consistent with the definition for Minor (SONET environment) is Minor. The indicator is labeled MN and is a yellow LED.

Both audible and visual alarms are activated during an alarm condition. User provisioning and control of setting (changing) severities of individual alarm events is possible with LambdaXtreme™ Transport making it adaptable to various operations environments. Step-by-step instructions for alarm provisioning via the CIT are covered in Appendix A, "Using the CIT". For provisioning procedures via the EMS, see the *Navis™ Optical Element Management System (EMS) Maintenance Guide, Release 8.0 (190-224-157R8.0).*

### Power-On LED

A green LED labeled PWR OUTPUT is associated with and located on each power filter on each shelf within an NE. The LED is illuminated when the filter is powered, and is extinguished when the filter is not powered. The PWR OUTPUT LED is extinguished if the low-voltage shutdown feature located on the power filter is activated.

### Abnormal Condition LED

This LED labeled ABN/Abnormal is not utilized for the current release.

### Activity-Near End/Info-N LED

A yellow LED on the Fan Assembly User Panel is labeled NE-ACTY/ INFO-N and is illuminated whenever there is an alarm or status condition active on the local NE. This includes any condition identified regardless of the alarm level. An alarm condition is one with a severity attribute of Critical (CR), Major (MJ), Minor (MN), Prompt, or Deferred. A status condition is one with an alarm attribute of NA, NR, NO, or No_Alarm. The NE-ACTY/ INFO-N LED is illuminated for both types of conditions.

## Alarm Cut-Off and Alarm Cut-Off Clearing Capabilities

The Alarm Cut-Off (ACO/Suppress) button located on the Office Alarm Display turns off any local audible office alarms. Once the ACO/Suppress button has been pressed, any subsequent alarmable conditions will activate the audible alarm again.

The NE sends an autonomous message over both the CIT-NE and EMS-NE interfaces whenever the ACO condition is raised (audible alarms silenced) or cleared (audible alarms activated again).

## LED Functional Testing

LambdaXtreme™ Transport software supports the testing of circuit pack LEDs (single or multiple) or user panel LEDs simultaneously. The testing of circuit pack and user panel LED functionality does not have any impact on LambdaXtreme™ Transport office alarms.

## LED and Alarm Behavior During Circuit Pack Reboots and System Restart

This subsection describes LED and Alarm behavior during circuit pack reboots and system restarts.

### Circuit Pack Reboots

During a circuit pack reboot the following applies:

- There is an alarm condition: “XXX booting in progress” where “XXX” represents a particular circuit pack type. The values for “XXX” are the full set of LambdaXtreme™ Transport circuit pack types that have a FAULT LED and an ACTIVE LED with the exception of the SIO and Fan Assembly.

Note: This applies only to an individual circuit pack reboot. During a system reboot, there is no “XXX booting in progress” for every circuit pack in the NE.

- The circuit pack LEDs are illuminated as follows: FAULT (red) LED lit continuously; ACTIVE (green LED) flashing.

When the boot cycle is completed:

- There is an appropriate “Clear” of the “XXX booting in progress” alarm.
- The ACTIVE (green) LED ceases flashing and remains lit.
- If the circuit pack is determined to be good, the FAULT (red) LED is extinguished.
- If the Fault software determines that the circuit pack failed, the FAULT (red) LED remains lit and an appropriate FAILED condition for the circuit pack is declared.
- If the Fault software determines that the circuit pack is of an unexpected type, the FAULT (red) LED remains lit and an “Unexpected circuit pack type” alarm condition is declared.
- If the Fault software determines that a transmission circuit pack is good but has an incoming signal fault, the FAULT (red) LED begins to flash and the appropriate alarm condition is declared.

### System Restart

During system restart the following applies:

- On the NCTL circuit pack, on each SCTL circuit pack and on each of the remaining circuit packs (in sequence) the following occurs:
  - The FAULT (red) LED turns on following pack reset.
  - The ACTIVE (green) LED begins to flash following pack reset. It remains flashing until the network element completes booting.
- The FAULT (red) LED on each circuit pack remains on while the NE software is being loaded; it is extinguished when the system software determines that the circuit pack is good.
- If the system software determines that the circuit pack failed, the FAULT (red) LED remains lit and an appropriate FAILED condition for the circuit pack is declared.

When the NE completes booting the following applies:

- The “Reset in Progress” condition clears.
- The ACTIVE (green) LEDs on all the circuit packs cease flashing and remain lit.
- The ACTIVE (green) LEDs remain lit until the NE software starts again, or until the double shelf loses power.
- Circuit pack fault conditions are handled on an individual circuit pack basis.

□

# Miscellaneous Discretes Management

## Description

Miscellaneous Discretes are provided as a mechanism for controlling and monitoring NEs via remotely activated relay closures. The electronics are located within the NCTL circuit pack. LambdaXtreme™ Transport NEs contain Miscellaneous Discrete Interfaces (MDIs) for provisioning two types of miscellaneous discretes – Environmental points (inputs) and control points (outputs). For LambdaXtreme™ Transport there are sixteen environmental points in each NE and four control points.

Environmental points provide a way to monitor the environment around the bay; there are 16 discrete points that can be provisioned to send a message to the CIT, (e.g., alarms for smoke, intruders, flood, or fire).

Control points provide a way to activate/deactivate various equipment external to the NE through the use of NE control relays that are commanded via NE messages.

## Environmental and Control Points Functionality

Environmental Points allow the user to define the alarm severity and alarm message for the miscellaneous discrete alarms. Control Points allow the user to define (describe) the condition name for the controls. These descriptions are used for information purposes when a user seeks to operate or release external miscellaneous discrete controls. For example, the user may want to verify that aid=CONT-1 is associated with a fan (and not a sprinkler) before operating it. The following applies to internal and external environmental and control points:

- LambdaXtreme™ Transport provides 16 internal miscellaneous discrete environmental input points and 4 internal miscellaneous discrete control output points.
- Each LambdaXtreme™ Transport NE is capable of sensing any individual contact closure for the environmental input points and generating an appropriate autonomous message over the EMS-NE and CIT-NE interfaces.
- Each point can be uniquely labeled for EMS/CIT requests, responses, and notifications.

- The EMS/CIT is capable of activating/releasing any control output point.
- Users can test any discrete interface output (control) point. It is possible to test all the control points on an NE or just on a per output basis.

### Environmental Points Parameters

The Environmental Points provisioning window in the CIT contains the following fields:

- AID – This identifies the miscellaneous discrete environmental point.
- Alarm Message – This is the condition description to be associated with the environmental point. The description may be a string of up to 26 characters consisting of upper and lower case alphanumeric, spaces and periods.
- Alarm Severity – This parameter defines the level of the alarm to be associated with the environmental point if a failure occurs.

### Control Points Parameters

The Control Points provisioning window in the CIT contains the following fields:

- AID – This identifies the miscellaneous discrete control point.
- Control Point Name – This is a text string associated with the selected miscellaneous discrete control. It is an alphanumeric string, upper and lower case, spaces and periods allowed, up to 26 characters long. It is case sensitive. A Control Point Name entry is required.
- Status – Displays the current status of the control point. Possible values are Open or Closed.
- Action – This field allows you to operate the control point. If the current status is Open, then possible values are Close, Pulse, and None. If the current status is Closed, then possible values are Open and None.

□

# Performance Management

**Description**

Performance Management (PM) refers to the in-service, non-intrusive monitoring of transmission quality and equipment health. LambdaXtreme™ Transport systematically tracks the signal quality and equipment health through continuous collection and analysis of performance data. The user can retrieve current and past values of the system and through this, get an overview of the health of the system. Performance Management capability exists for optical lines, channels (both data traffic and supervisory) and for equipment monitoring. Users have the ability to provision threshold parameters to levels that might be indicative of impending performance degradation.

Responding to a performance degradation before there is a failure and system alarms are raised, is termed proactive maintenance. Responding to system alarms is termed reactive maintenance. Crossing of a performance parameter threshold indicates a potential network quality or performance degradation while the services being transported have not been impacted. If a condition continues to deteriorate, then alarms are raised and immediate attention may be required to resolve or repair the problem.

Step-by-step instructions for performance management provisioning via the CIT can be found in Appendix A, "Using the CIT". For provisioning procedures via the EMS, see the *Navis™ Optical Element Management System (EMS) Maintenance Guide, Release 8.0 (190-224-157R8.0).*

**Thresholds**

A threshold is the mechanism for generating a defined notification resulting from changes in PM parameter values. LambdaXtreme™ Transport allows provisioning of performance parameter thresholds which can be set by the user to show degraded performance.

**PM Event Reporting**

By definition, a Threshold Crossing Alert (TCA) or Quality of Service (QOS) event means that a threshold associated with a performance parameter has been exceeded. The QOS notification message is reported to the TL1 interface where threshold crossings associated with a particular path can be correlated, and the likely source of the degradation can be identified. The EMS receiving the QOS message should interpret the QOS as an early warning regarding the health of the signal.

The TCA/QOS notification flag is used to turn on or off the TCA/QOS autonomous message notification of any parameter. All TCAs are retrievable either locally or remotely via the CIT/EMS and can be provisioned to send autonomous messages.

□

# Software and Database Administration

**Overview**

This section describes the software management features of LambdaXtreme™ Transport. Software management involves copying and moving executable code and provisioned data between volatile and non-volatile memory within the NE and between the NE and CIT or EMS. These activities are done upon initial installation, when power is restored to an NE, when circuit packs are inserted, and in response to user commands from the EMS or CIT.

LambdaXtreme™ Transport supports the following user capabilities:

- Installing initial NE software generic
- Downloading software
- Copying NE software to remote NEs
- Database Backup and Restore
- Rebooting the System

Step-by-step instructions for software administration via the CIT are covered in Appendix A, "Using the CIT". For software administration procedures via the EMS, see the *Navis™ Optical Element Management System (EMS) Provisioning Guide, Release 8.0 (190-224-156R8.0).*

**Installing Initial NE Software Generic**

The NCTL has a removable PCMCIA FlashDisk Memory Module (FMM) for non-volatile memory storage of executable code and provisioned data. The CIT PC contains a PCMCIA Type II card slot in which to insert the FMM to copy the NE software from the PC hard drive to the FMM. The FMM contains two directories (Active and Inactive) for storing the active and inactive NE software. During an initial installation startup, a copy of the software to be run on the NE is stored in the active directory of the FMM.

The process for installing the initial software generic on an NE includes the following steps:

- Insert the FMM into the PCMCIA FMM slot on the CIT PC.
- Install the NE software on the FMM (see Appendix A, "Using the CIT".)
- Remove the FMM from the CIT.
- Insert the FMM into the slot on the NCTL and the software will automatically be used on the NE.

Note: An NCTL or FMM should never be removed without first pressing the FMM LED button and waiting for it to flash. If an NCTL or FMM is removed without following this procedure, there is a risk of FMM file corruption. When an FMM is removed and then reinserted, DBBACKUPTIME is reset to the default date and time.

An FMM can be placed into a powered or unpowered NCTL. The NCTL will not boot without an FMM (PCMCIA card) present. If the NCTL circuit pack attempts to boot without an FMM, the boot process is halted, the FAULT LED is turned on, and the MJ audible and visual Office Alarms are activated. If a valid FMM is inserted at a later time, the NCTL will automatically start booting with the new FMM and will not have to be reset.

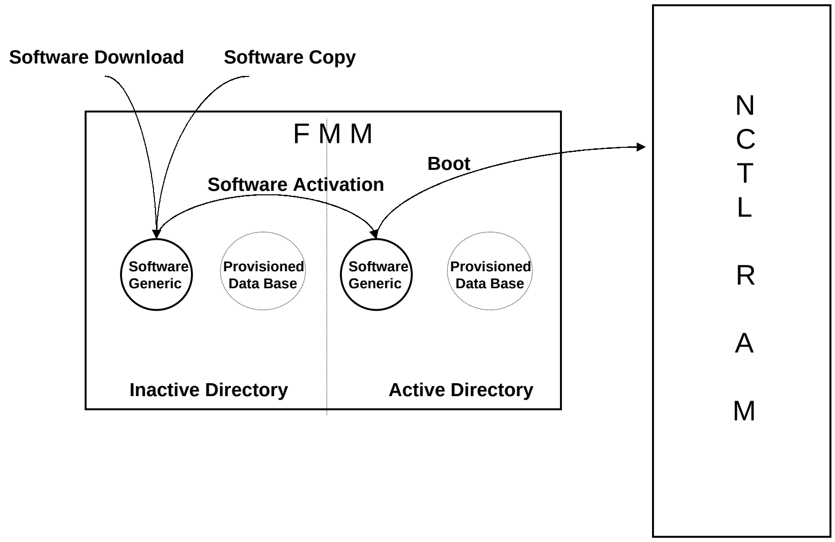
**Important!** Do not press the FMM LED button twice (a second time) and then remove the FMM. Pressing the button a second time cancels the request to remove the FMM. If removed at this point, the database will become out of sync and damage to the FMM can occur.

### Downloading Software

LambdaXtreme™ Transport supports the capability to download NE generic software from the CIT or EMS to the backup (inactive) directory of the GNE NE's FMM. Also supported are software downloads to the GNE, remote copies from the GNE, and backup/restores through the GNE. The download is done via the FTP protocol.

The following figure shows the respective software generic used for download/copy operations.

**Figure 2-5 Software Download/Copy from FMM**




**Important!** In order to perform a software download, the user must first create the proper directory structure on the CIT-PC and launch an FTP server task. The DWNLD-SW command can only be issued on the physical port on which the participating FTP server IP address, provided in this command, is reachable.

## Copying NE Software to Remote NEs

LambdaXtreme™ Transport supports the capability to copy NE software from the NE to which the user is logged into, to the inactive directory of the FMM of an NE anywhere within the maintenance subnetwork. The software copy (from one network element to another) occurs in the background. Once the software transfer is initiated, there is no mechanism to cancel the operation. The command completion and various events/conditions during the copy are reported on the TL1 interface.

Note: The software copy operation cannot be executed at a source NE while a backup, restore, or download operation is occurring at the same NE, as each of these operations locks the FMM.

### New Software Activation

The user can issue a command that swaps the active and inactive software on the FMM and then reboots the system. This capability allows users to reboot the NE and also provides the option of swapping the NE software between the FMM active and inactive directories and/or swapping the active and inactive versions of the database.

**Important!** Before executing this command, be aware of the following:

- Execution of this command may affect service.
- Execution of this command at any NE will affect EMS communication with that NE; all EMS users logged into that NE will be logged out.
- Rebooting the NE will wipe out the History Log.

#### Viewing Software Release Information

The user can view software release information about the various copies and releases of the NE software as it resides in the NE. When the user requests software release information, the user will see the following for the NE:

- Software release version for the active and inactive directory of the FMM
- The current status of the software release in the active and inactive directory.

### OLS Software Upgrade

Customers should upgrade all network elements in an OLS as quickly as possible when upgrading to a different software release. Having different software releases running on different nodes at the same time, may cause supervisory communications to fail which may impact functionality including (but not limited to):

- APR recovery
- Transient response
- Remote commands

The upgrade should be done such that the new software is copied to all the nodes. Then, the farthest away nodes should be reset before the closer nodes. This is necessary because if the local node gets upgraded first, it may no longer be able to communicate with the farther away nodes.

Note: The terms farthest and closest refer to network topology and not actual distance from the local node.

The process for performing a software upgrade includes the following steps:

- Download the software to the GNE. See "Downloading Software" (2-25).
- Copy the software from the GNE to all other nodes. See "Copying NE Software to Remote NEs" (2-26).
- Activate the new software – one node at a time starting from the farthest End Terminal. See "New Software Activation" (2-27).

**Important!** After a software upgrade, the provisioned database in the inactive directory (used for backup) is wiped out and replaced with the new generic database. Therefore, in order to perform a rollback using a previously provisioned database, the user must first execute the RESTORE-DB command.

## Database Backup and Restore

**Important!** In order to perform database backup and restore, the user must first create the proper directory structure on the CIT-PC and launch an FTP server task. A BACKUP-DB or RESTORE-DB command can only be issued on the physical port on which the participating FTP server IP address, provided in the command, is reachable. For example, a RESTORE-DB command cannot be issued via the CIT-NE interface to perform a database restore to a server reachable via the EMS-NE interface.

The Backup/Restore feature allows a user to either backup or restore NE database files which contain provisioning data. LambdaXtreme™ Transport supports an FTP protocol for the purpose of NE database Backup to and Restoral from a remote system.

The Backup command causes a transfer of an NE's FMM mirror database to the backup database and to a specified remote system (e.g., EMS or CIT). The Restore command causes a transfer of a copy of a LambdaXtreme™ Transport database from a remote system to a specified NE with the intention of having the NE restart using the values in the transferred database as the working database.

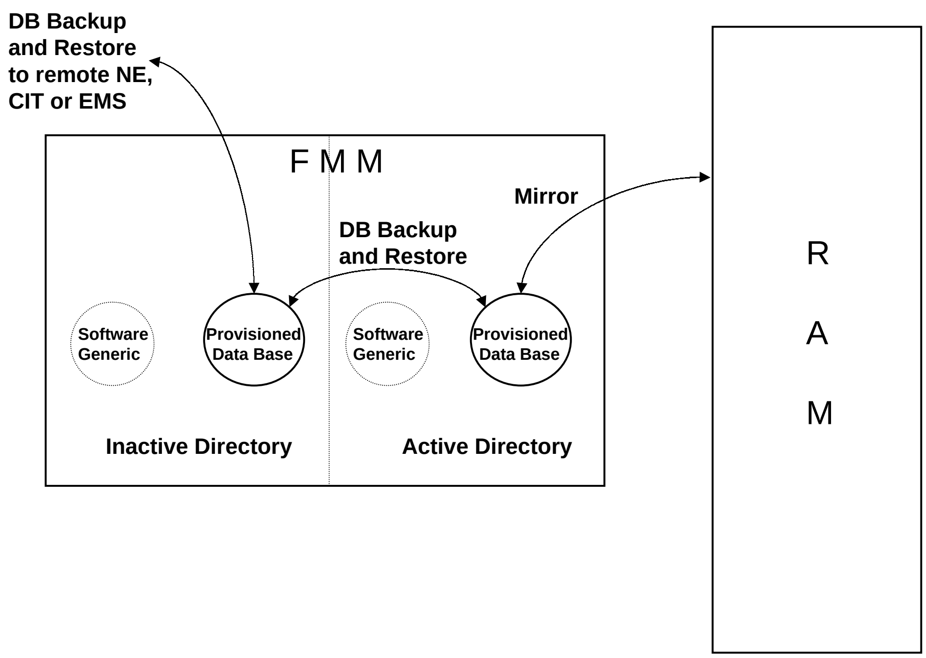
Note: If the NE is in the middle of an operation where a reboot would cause the NE software or database to be corrupted, the reboot is denied and an error message is returned.

The following applies to the provisioned database:

- There is one copy in RAM that is the “working copy” with the most up-to-date information.
- One copy is stored in the Active Directory of the FMM. The mirror is kept in sync with the working copy and is used during a reboot.
- One copy is stored in the Inactive Directory of the FMM to be used when a backup is performed.

The following figure shows the respective database used for backup/restore operations.

**Figure 2-6 Database Backup/Restore from FMM**




The database backup and restore features are not available from the CIT PC GUI. This functionality is available only through the TL1 cut-through interface commands BACKUP-DB and RESTORE-DB. The backup/restore commands are executed at the GNE. The target NE for the backup/restore is specified as a command parameter. Only one backup or restore may take place on a node at any given time.

For details of the TL1 cut-through interface, see Chapter 7, "Craft Interface Terminal" and "Execute Commands Interactively via TL1 Cut Through" (A-28). For backup/restore functionality via Navis Optical EMS, see the *Navis Optical Element Management System (EMS) Administration Guide, Release 8.0 (190-224-158R8.0).*

### Database Backup

The following principles apply during an NE database Backup:

- Upon receipt of a Backup request from an EMS user that includes a server address, user id, password, TID and a pathname, the NE initiates an FTP session with the remote system for the purposes of making a backup copy of the database.
- The NE makes a snapshot copy of the memory database and stores it in the backup FMM database.
- After successful initiation of the FTP session, the NE issues FTP write request(s) to copy all of the backup FMM database file(s) to the supplied remote system and pathname.
- In the case of a Backup from a remote NE, the database file(s) to be backed up are remotely copied from the remote NE through the GNE to the CIT/EMS.
- The NE notifies the command initiator, EMS or CIT, via an autonomous message of the outcome (success or failure) of every invocation of the Backup function. This notification is generated at both the GNE and the destination NE.

Note: An NE Backup is uninterruptible (i.e., user-initiated actions will be delayed until the backup is completed).

### Database Restore

The following principles apply during an NE database Restore:

- Upon receipt of a Restore request from a user via the remote system that includes a server address, user id, password, TID and a pathname, the NE initiates an FTP session with the supplied address for the purposes of restoring the database from a remote system.
- After successful initiation of the FTP session, the NE issues a read request to get a listing of all of the file(s) in the remote system directory pointed to by the supplied pathname.

- Using this directory listing, the NE copies all of the database file(s) to the backup FMM copy of the database.
- In the case of a restore to a remote NE, the backup database file(s) are remotely copied from the CIT/EMS through the GNE to the remote NE.
- Database Restore is a two step process: RESTORE-DB is used to get the database into the backup area; an INIT-SYS is used to verify, swap, and reset.
- The NE notifies the remote system user of the outcome (success or failure) of every invocation of the Restore function.
- An autonomous notification is issued before the system executes any Reset function.

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Lucent Technologies
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# 3 Security Administration

## Overview

**Purpose**

This chapter provides information on security administration for LambdaXtreme™ Transport. The LambdaXtreme™ Transport NE security functions handle NE access and control capabilities that occur over the CIT-NE and EMS-NE TL1 interfaces.

Step by step instructions for security administration provisioning via the CIT are covered in Appendix A, "Using the CIT". For provisioning procedures via the EMS, see the *Navis Optical Element Management System (EMS) Administration Guide, Release 8.0 (190-224-158R8.0).*

**Contents**

# Security Levels/Functions

**Description**

The purpose of security administration is to manage user accounts (logins, passwords, authorization levels, external links) and to monitor system security so that only valid users can perform permitted actions and receive authorized information from the system.

The CIT GUI provides the user the capability of security administration for the NE(s). The NE does not provide an “unsecure” user external port. That is, all user external LambdaXtreme™ Transport ports require a login/password in order to gain access.

The NE provides security administration mechanisms that allow an administrator to control the usage and management of user logins, security features, and database of the NE, and to generate security audit trails when necessary via the corresponding network management interfaces. The following security administration functions are offered:

- Administration of NE user logins that are used on both the EMS-NE and CIT-NE interfaces.
- Administration of the NE command permissions (User Access Privileges) for each NE user login.
- Administration of NE-wide security characteristics such as login aging, password aging, user ID lockout thresholds, and inactivity time-out periods (on a per port basis with the ports being the EMS-NE and CIT-NE interfaces).

The following material explains the basis of the LambdaXtreme™ Transport command permissions structure including Functional Categories, Authorization Levels, User Privilege Codes, and User Access Privilege Assignments.

**Functional Categories**

All LambdaXtreme™ Transport TL1 commands supported by NEs are grouped into the following five functional categories (FCs):

- Security Administration (S)
- Provisioning (P)
- Performance Monitoring (PM)
- Maintenance (M)
- Test Access (T)

### Authorization Levels

Authorization Levels (AL) are used to add a measure of fine granularity to access control within each functional category by tailoring a user's access to commands within the functional category.

LambdaXtreme™ Transport supports six command authorization levels. These are listed below in order of descending privilege

- Level 5 (Super User) – Full authorization access (controls user security functions)
- Level 4 (Privileged User) – Authorized for service affecting actions
- Level 3 (General User) – Authorized for potentially service affecting actions
- Level 2 (Maintenance) – Basic authorization
- Level 1 (Reports Only) – No access to user login security information (Default)
- Level 0 – No command access or authorization

### User Privilege Code

User Privilege Codes (UPC) determine the tasks a user is permitted to perform. The UPC is the mechanism whereby a user's NE TL1 command permissions profile is tailored. Each NE supports the use of a UPC determining the set of commands that any given user is authorized to execute.

The UPC is a composite of two attributes: the Functional Category plus the Authorization Level as described above. The UPC is a one/two-letter and one-digit number associated with functional job categories. The letters represent the functional job category. The one-digit number represents the user's authorization level. The UPC is assigned when a login is created or modified.

### User Access Privilege

The User Access Privilege (UAP) is a collection of UPCs that are assigned to a user based on the user's work/functional responsibility. A UAP is specified for each newly created user ID. A user with Security Administration privileges (UPC of S5) has the ability to assign a UAP to each new user ID added to the NEs local database according to the TL1 commands the new user is authorized to execute. A minimum UAP level of S1 must be assigned to each user login so that the user can log into the NE.

A non-super-user has the following assigned authorization levels in each of the following categories:

- S[1, 4, 5] – For System Administration, Authorization Level 1, 4, 5.
- T[0, 4] – For Test Access, Authorization Level 0, 4.
- PM[0, 1, 3] – For Performance Monitoring, Authorization Level 0, 1, 3.
- P[0, 1, 3] – For Provisioning, Authorization Level 0, 1, 3.
- M[0, 1, 3] – For Maintenance, Authorization Level 0, 1, 3.

An authorization level of “0”, indicates that the user has no privileges in the functional category.

Super-users have an authorization level of “5” in all of the categories; non-super-users will not be allowed to have an authorization level of “5” in any of the areas.

If the user has some other authorization level other than those listed here, because it was provisioned by some mechanism other than the CIT GUI (e.g., an NE provisioned by an EMS and then linked to the maintenance subnetwork) then the next most restrictive authorization level is assigned (e.g., T3 becomes T0, and S3 becomes S1).

Because many CIT screens require at least retrieve privileges (i.e., authorization level of 1) in several functional categories, setting an authorization level to “No Authorization” for a functional category may restrict a user’s access to screens for which they would need to have authorization. Thus, if the privilege level is set to “No Authorization” in the Maintenance, Provisioning or Performance Management categories, a warning message is displayed indicating “No Authorization” when the user attempts to access the screen.

### UAP Provisioning Example

A user ID that requires a high provisioning privilege can be provisioned via the CIT as follows where each functional category is assigned the following Authorization Level:

- Provisioning – Level 3
- Test Access – Level 4
- Performance Monitoring – Level 1
- System Administration – Level 1
- Maintenance – Level 0 (no authorization)

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# Logins

## Introduction

Login security controls access to the NE(s) by individual users. User identity is specified using a user ID which is a unique identifier used by an NE for security management. The user ID consists of a string of case-sensitive alphabetic and/or numeric characters containing a minimum of three characters and a maximum of ten characters from the defined character set (see Tables 3-1, 3-2, and 3-3). The NE authenticates the user ID against the NE's local security database. Based on this, the NE either accepts or denies login access to the NE.

At the heart of security administration is the ability to deny a user access to the NE. Access may be denied during one of the following points in time:

- When the user first attempts to login and the login attempt is denied.
- During an active session and the user is disconnected by the NE.

Once the user logs into an NE with a valid user ID (and Password), user functions can then be performed based on the assigned User Access Privilege (UAP).

Table 3-1 shows the set of symbolic characters for use in User Login ID and Password applications.

**Table 3-1 Symbolic Character Set**

<table>
<tr><td>!</td><td>*</td><td>/</td><td>[</td><td>]</td><td>|</td><td>’</td><td>+</td><td><</td><td>></td></tr>
<tr><td>^</td><td>(</td><td>)</td><td>-</td><td>{</td><td>}</td><td>~</td><td>.</td><td>_</td><td>′</td></tr>
</table>

Table 3-2 shows the set of numeric characters for use in User Login ID and Password applications.

**Table 3-2 Numeric Character Set**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Table 3-3 shows the set of alphabetic characters for use in User Login ID and Password applications.

**Table 3-3 Alphabetic Character Set**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | B | C | D | E | F | G | H | I | J | K | L | M |
| N | O | P | Q | R | S | T | U | V | W | X | Y | Z |

**Table 3-3 Alphabetic Character Set (continued)**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| a | b | c | d | e | f | g | h | i | j | k | l | m |
| n | o | p | q | r | s | t | u | v | w | x | y | z |

### Super User Logins

The LambdaXtreme™ Transport NE supports three Super User logins. When shipped from the factory, the three original Super User IDs are:

- "LUC01" (lucent-zero-one)
- "LUC02" (lucent-zero-two)
- "LUC03" (lucent-zero-three)

The Super User login IDs cannot be removed and no additional Super User logins can be created. The Super User logins have full privileges (UAP of M5, P5, PM5, S5, T5) in all functional categories including those affecting security, access to the NE, system initialization, NE testing, software installation, and database and software management. It is not possible to modify a Super User's access or permissions capabilities.

The three default Super User logins are supported over the CIT-NE, EMS-NE, and DCN remote login interfaces. The NE allows any Super User to be simultaneously logged in via the CIT-NE and EMS-NE TL1 interfaces (i.e., multiple Super User login sessions are permitted). The NE manages each login session independently and allows the user to obtain information regarding who is currently active on which channel for each of the NE's interfaces.

### Non-Super User Logins

The LambdaXtreme™ Transport NE supports up to 100 Non-Super User logins. A Non-Super User is able to have only one login session to a given NE at any given instance (i.e., multiple Non-Super User login sessions are not permitted). If a Non-Super User is logged into the NE over the EMS-NE, CIT-NE, or DCN interface, and then attempts to log in over any of the other interfaces, the login attempt will be rejected. An error message will be shown stating that a Non-Super User cannot be simultaneously logged into the NE over more than one external interface.

### Temporary (Visitor) Logins

The NE allows a user with Security Administration privileges to create temporary logins with expiration dates that can be provisioned. These temporary logins are automatically deleted on the specified date regardless of the frequency of use of the login.

A login can be changed from “regular” (Non-Super User) into “temporary”. There is no way to change a temporary login to a regular login, although a temporary login can be deleted and the same login ID used to create a regular login.

### User Login Aging

The NE allows a user with appropriate security administration privileges (UPC of S4 or higher) to globally set a login lifetime (aging) parameter. As long as a Non-Super User logs in more frequently than the login lifetime parameter, the user’s login is retained. If a user does not login to the NE within the specified period, the login is deleted and the condition recorded in the NE history log. Login aging applies only to Non-Super User logins. Super User logins never expire and cannot be deleted.

The login lifetime parameter can be globally set within the range of 7 to 999 days. The default is 60 days.

### Non-Super User/Temporary Login Expiration

User logins are checked for expiration every hour on the hour. Therefore, a user login will be deleted within one hour of its expiry. If the login has expired but has not yet been deleted and the user attempts to login, the login will not be permitted. Once a user login has expired, it is not possible to create a new login with the same user ID until the old login has been deleted.

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# Passwords

**Introduction**

All external LambdaXtreme™ Transport ports require a password in addition to a user ID in order to gain access. Passwords are used along with user IDs to verify the identity of users. A password consists of a string of alphanumeric and symbolic characters (minimum of six and maximum of ten). Each password contains at least one alphabetic character, one numeric character, and one symbolic character. Passwords are case-sensitive.

Passwords are stored or retained in encrypted form using strong industry standard encryption although they are not encrypted when transmitted from the CIT or EMS to the NEs. Passwords are never transmitted from the NE to the CIT or EMS.

For security purposes, when a password is entered, the actual password is not displayed on the GUI interface. Instead, an asterisk (*) appears as the user enters each character of the password.

**Super User Passwords**

The original Super User default passwords as shipped from the factory are:

- "LUONG+01"
- "LUONG+02"
- "LUONG+03"

Each Super User has the capability to change their own password or the password of any of the other Super Users. It is highly recommended that passwords be changed after the first use.

**Important!** Do not forget your password. Make sure to backup your database.

**Password Administration**

The NE provides each user the ability to change their own password on demand or based on password aging requirements. Passwords may be changed via either the CIT or EMS interface. The NE keeps track of the date when each user password was last changed. When a user logs in, this date is compared with the current date. If the current date is more than the provisioned number of days after the last changed date, then the NE considers the password as expired.

A Non-Super User's password is also considered expired the very first time the user logs in successfully. This feature is intended to force users to select a password different from the original password provided by the security administrator. This does not apply to Super Users.

To change a password, the user must enter the current password, the new password, and the confirmed new password. The LambdaXtreme™ Transport NE checks the password for proper length and syntax in accordance with established password requirements. Before updating the NE's database, the NE ensures that the current password is different from the new password and that the new password and confirmed new password are the same. An error message is generated to notify the user if any of the password requirements is not met.

### Password Aging

The NE maintains a provisionable Password Aging interval that is applicable system-wide to all Non-Super User login IDs. This parameter can be globally set by a user possessing the appropriate system administration privilege (UPC of S4). With the Password Aging feature, a user's password expires if it is not changed within the provisioned period of time. Once the password expires, the user cannot login until the password is changed.

The range of allowed values for the Password Aging interval is 7 to 999 days. The default is 30 days.

When Password Aging is enabled, a user is not able to change their password again until at least seven (7) calendar days have passed since the last time the password was successfully changed. If fewer than seven calendar days have passed, any attempt to change the password will be denied. If the Password Aging feature is disabled, passwords may be changed without any elapsed time restrictions.

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# Login Sessions

**Introduction**

The NE supports the simultaneous existence of 29 login sessions which can be any combination of Super-User and Non-Super User login IDs.

A login session (channel) can be in one of the following three possible channel states:

- Login Active
- Login Inactive
- Password Expired

**Login Active State**

A channel enters the Login Active state when a valid login command without an expired password is received by the NE. Only one login session is allowed per channel. A login request received on a channel that is already in the Login Active state will be denied with explanatory text. A user who attempts to login to a channel that they are already logged into, will receive an appropriate message.

A channel exits the Login Active state (reverts to Login Inactive state) when any one of the following occurs:

- A valid logoff command is received by the NE on that channel
- A condition occurs in the NE or local NE that requires a cancellation of a login session
- The TCP/IP connection is lost

**Login Inactive State**

All channels are, by default, in the Login Inactive state. A channel transitions out of this state only when a valid login command is received by the NE. When a channel is in the Login Inactive state, the NE does not respond to any requests other than valid login requests. In addition, no notification messages appear on a channel in the Login Inactive state. A login session transitions to the Login Inactive state when a user logs off and terminates a login session.

**Password Expired State**

A login session enters the Password Expired state when the NE receives a valid login command on a channel that is in the Login Inactive state, but the password for the user ID has expired. The NE rejects the login command and displays text explaining that the user's password has expired.

In this state, the NE only accepts a valid login command (using a different user ID), or a ***Modify Password*** command to change the expired password for the user ID. Using either of these options, the login proceeds normally with the channel entering the Login Active state. Otherwise, the login session returns to the Login Inactive state.

**Login Procedure**

A login attempt is considered successful if the following conditions are met:

- A provisioned user ID and correct password is entered and
- The user login and NE login security is enabled (i.e., Non-Super Users are permitted to log onto the NE) and
- The user ID lockout threshold has not been exceeded

If the login attempt is successful, it is recorded in the history log.

If any of the above conditions are not met, the security feature denies access to a user attempting to log in, or may disconnect a user during an active session.

When a login attempt fails due to user ID lockout threshold, the following occurs:

- The login is denied until the lockout period has expired.
- Each unsuccessful login attempt is recorded in the NE history log.
- The login ID entered on the last attempt and reasons why the login failed are recorded in the history log.
- Error return text to the user reads ***Login Failed*** but reasons why the login failed are not reported.

If the user login attempt is unsuccessful because the user ID has been disabled, the following occurs:

- Each unsuccessful login attempt is recorded in the NE history log.
- A ***logout:user-id-forced disconnect*** message is recorded in the NE history log.
- Error return text to the user reads ***Login Disabled.***

## Login Session Disconnect

If a login session is active on a particular channel and the NE or remote NE must disconnect the session for some reason, the following occurs:

- Any commands that originated on the channel currently executing on the NE are dropped.
- A ***logout:user-id*** message is recorded in the local NE's history log.
- Before disconnecting the session, the NE sends notification of the impending disconnect to the appropriate EMS or CIT.

## Login Session Denied

A login session is denied for any one of the following reasons:

- The user fails to enter a valid ID and password.
- The login ID of the individual user has been administratively disabled.
- Another user is already logged into the same NE using the same EMS-NE or CIT-NE data link.
- A Non-Super User is already logged in over a different CIT-NE, EMS-NE, or DCN data link.
- NE logins are disabled (Non-Super Users).
- Login attempts exceed the user ID lockout threshold.
- The user ID lockout period is not over.

When a login attempt on a channel is denied, the following occurs:

- A ***login:user-id-DENY*** message is recorded in the history log.
- A login denied message is sent on the channel associated with the login attempt.

## User ID Lockout

The NE allows a user possessing the appropriate system administration privilege (UPC of S4 or higher) to provision the following user ID lockout parameters:

- User ID Lockout Threshold – the number of sequential invalid login attempts permitted after which the user ID is locked out and an Intruder Alert Alarm is raised and recorded in the NE history log. The range of values is 2 to 99. The default value is 5.
- User ID Lockout Period – the number of minutes that a user is locked out once the User ID Lockout Threshold is reached. The range of values is 1 to 99.

**Important!** The user will automatically be re-enabled once the elapsed time since lockout exceeds the provisioned value of the User ID Lockout Period. The user cannot be manually re-enabled by anyone during this waiting period. Once re-enabled, the NE resets the User ID Lockout Threshold and the User ID Lockout Period to the default values.

### Inhibiting Individual User IDs

The NE allows a user with the appropriate privilege (UPC of S5) to disable an existing Non-Super User ID. Disabling a user ID prevents the user from establishing a session. If the user ID is actively logged into a session, the login session is automatically terminated and any attempt by the user to log back into the NE is denied.

### Globally Inhibiting User Login Activity

The NE allows a user with the appropriate privilege (UPC of S5) to control login access on a per network element basis by temporarily inhibiting all Non-Super Users from logging into the NE. This capability might be used during routine maintenance or upgrade activities. The three Super Users are not affected by this security measure and are always allowed to log in.

When the command is issued to disable logins, all Non-Super Users currently logged in are disconnected, and any attempt to log into the NE is denied. A “Logins Inhibited” condition is raised by the NE and recorded in the NE history log. The NE-ACTY user panel LED is activated when logins are inhibited.

When logins are once again enabled, the “Logins Inhibited” condition is cleared and recorded in the NE history log. The NE-ACTY user panel LED is deactivated (turned off) when logins are enabled.

### Inactivity Time-out

For each NE, an inactivity time-out period can be globally provisioned for all user sessions (logins) on a per-port and per-channel basis (the GNE enforces the time-out). All the user sessions associated with an NE’s particular point of attachment port and channel combination have the same Inactivity Time-out period (whatever is provisioned for the port). If a user does not interact with an NE during the provisioned period of time over the given port and channel combination, the user is automatically logged off from ALL login sessions to NEs maintained over the given port and channel combination and a ***Logout:user-id-timeout*** message is recorded in the history log.

The Inactivity Time-out Period range is 1 to 999 minutes. The default is 30 minutes. If the Inactivity Timer is enabled, it applies to all user sessions (logins) maintained on the given port and channel combination. There is a separate timer maintained for each channel on a given port.

The Inactivity Timer is active only when there is an active login session on the channel and the NE is expecting the user to input data. If the NE is busy processing a request, the inactivity timer is disabled. It is activated when, at the completion of a user-generated command, there is no pending message being processed by the NE.

**Security Notification Management**

The NE sends appropriate notification whenever any of the following attributes change for an existing login in the NE database:

- User ID
- User Access Privilege
- User ID Lockout Threshold
- User ID Lockout Period
- Temporary Login Aging
- User Login Aging
- Password Aging
- Inactivity Time-out Period
- Last User ID Disabled Time

The NE sends a notification whenever the following security events occur:

- Login Creation
- Login Modification
- Login Deletion
- Login
- Logout
- Logout – Remote Link Down
- Intrusion Alert
- Logins Inhibited
- Logins Inhibited Cleared

**Security Data Storage**

All security data related to the NE or individual user logins is stored in non-volatile memory (NVM). This ensures that data is retained in the event of a system failure or shutdown. All security information, except passwords, can be printed, viewed, and accessed as read only by users possessing the appropriate system administration privilege.

**Audit Trail Record**

The NE maintains a record in the NE history log of all login attempts, user logouts, and provisioning commands. The following information is logged for all commands, except retrieve (RTRV) and test (TST) commands:

- User ID
- Time Stamp (start and end for each event occurrence)
- User login attempts (success and failure)
- Reason for denial (invalid user ID and/or password, association or communication link failures)

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# 4 Equipment Provisioning

## Overview

**Purpose**

This chapter provides information for provisioning the LambdaXtreme™ Transport equipment.

**Contents**

# Introduction

**Description**

Provisioning is the process of assigning values to parameters which determine the operating characteristics of the system. The values of the provisioned parameters determine how you interface with an NE and how the NE functions with various installed entities. Each provisionable parameter has a factory supplied original value when software is first loaded into an NE. These values become the current value upon launching the software and are the values used by the system. All provisioned parameters and values are preserved in the system's nonvolatile memory and are protected and retrievable on demand in the event of a power failure. Copies of these parameter settings can also be used by other identical NEs.

All externally user provisionable parameters can be set using either the CIT, TL1 cut-through, or EMS (for remote provisioning). For detailed equipment provisioning procedures via the CIT, see Appendix A, "Using the CIT". To provision via the TL1 cut-through, see Chapter 7, "Craft Interface Terminal". For provisioning procedures via the EMS, see the *Navis™ Optical Element Management System (EMS) Provisioning Guide, Release 8.0 (190-224-156R8.0).*

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# Provisioning System Level Attributes for the NE

**Overview**

The system administration capabilities of LambdaXtreme™ Transport enable the user to retrieve and provision system level NE attributes. Changing some system level attributes cause the NE to reboot, while changing other system level attributes cause the SUPVY circuit to reboot. Changing still other system level parameters do not cause any reboot.

In the following sections, all the parameters which cause a reboot of the system are set from within a single CIT screen. The CIT warns the user to finish setting all system parameters that cause a reboot of the NE before executing the change for any of these parameters.

The NE resets (reboots while powered) if a user changes the value of one or more of the following parameters:

- NE Type
- NE Number
- Optical Interface Standard
- Channel Rate
- the KEEP_PUMPS_ON flag

Note: The user is able to change an NE's TID and not cause an NE reset.

**NE Node Type (NETYPE)**

There are three LambdaXtreme™ Transport 2-fiber NE terminal configurations (NETYPEs): End Terminal (ET), Repeater Shelf (RPT), and Optical Add-Drop Multiplexor (OADM). The ET provides add/drop access to 100% of the channels and two collocated ETs may be arranged in a back-to-back fashion to provide ring-like terminal transmission. The OADM allows add/drop access to 64 of the 128 available channels. The RPT has no add/drop capability.

The NE allows the user to provision one of the following NE node types for the NE:

**Table 4-1 NE Node Types**

| NE Node Types | Node Type Identifier |
|---|---|
| 2 Fiber End Terminal | 2F_ET |
| 2 Fiber Repeater | 2F_RPT |

**Table 4-1 NE Node Types (continued)**

| NE Node Types | Node Type Identifier |
|---|---|
| 2 Fiber OADM | 2F_OADM |

When a node is installed it will have an original (default) Node Type value of 2F_RPT. If the node is in fact not of the default type, various “Unexpected Circuit Pack” and “Circuit Pack Removed” alarm conditions will occur when the node is first booted. The user must then provision the correct NETYPE. The node will automatically reboot when the NETYPE is changed and all existing connections are deleted. Also, when the NETYPE is changed, any data provisioned by the ENT-OTPS, SET-TH-OTPS, ENT-OCHTRC, or ENT-SECTRC TL1 commands will be set back to the original values.

**NE Number (NENUM)**

The user is required to provision an NE Number which is used to generate a set of unique internal NE-specific IP addresses for each NE in the control network. The range for this parameter is 1 to 800. Changing this parameter causes the NE to reboot.

Note: It is strongly recommended that NENUM not be provisioned with a value of 1 (which is the original value for NENUM) as this may cause a duplicate NENUM condition to occur. When provisioning an NE Number, if a new NE Number is entered and the NE knows that the NE Number is not unique (already exists), the command fails.

**Optical Interface Standard**

The Optical Interface Standard is the standard environment in which the NE is provisioned to operate. The NE allows the user to provision the NE’s synchronous signal format and reporting standard to be either SONET or SDH. The original value is SONET. Changing this parameter causes the NE to reboot.

The reporting standard specifies whether SONET or SDH alarm severity notification codes, Performance Monitoring parameter data formats, and date formats are used.

**Channel Rate**

The optical channel rate is an NE-wide parameter that specifies the rate for all optical channels on all optical lines with which the NE interfaces. The NE requires the user to provision the optical channel rate for the NE. Allowed values for the optical channel rate are 10 Gbps and 40 Gbps. The NE automatically reboots if the optical channel rate value is changed and all existing connections are deleted. All port states are reset to Automatic (OOS-MA-AS).

The original value for optical channel rate is 10 Gbps. The NE validates and only allows booting of OTs which transmit at the provisioned optical channel rate.

**Maintain Transmission Upon Raman Pump Failure**

This determines whether transmission should be maintained in the event of a single Raman Pump failure. A provisionable field in the CIT displays Yes or No according to the retrieved value for the KEEP_PUMPS_ON parameter. The original value is Yes. Changing this parameter will cause the NE to reboot.

**NE Target Identifier (TID)**

The TID is the unique NE identifier that is used to address the NE. It is the highest level “object” of the TL1 command. The user is required to provision a unique TID for each NE in the LambdaXtreme™ Transport control network. The user must ensure the TID is unique across the maintenance subnetwork. For a new NE, the default is *TID=LT_XTREME*. Changing the TID will terminate the NE session.

The TID must adhere to the following specifications:

- The TID is a string of 20 or fewer characters from the set: [A-Z][a-z][0-9].+-%#/
- The first character of the TID need not be alphabetic
- The NE is insensitive to the case of a TID (upper case and lower case letters are treated the same)

When provisioning a TID, the following applies:

- If a new TID is entered and the NE knows that the TID already exists, the command fails.
- If the NE doesn’t know that the TID already exists and then later learns that there is a duplicate TID (because nodes get hooked together), then the NE yields an alarmed output that describes the attempt to provision a TID that is not unique to the control network.

**EMS Port IP Address; EMS Default Router IP Address; Subnet Mask**

The EMS-NE data link communications protocol stack is a TCP/IP stack. The NE's EMS-NE data link IP address is initially provisionable via the CIT and subsequently through EMS.

Every NE can be a Gateway Network Element (GNE). The only NEs that should be provisioned with EMS IP parameters are those that may serve as EMS Gateway NEs. Potential Gateway NEs are defined by the overlay management network topology.

An EMS accesses a GNE and all remote NEs by using the IP Address of the GNE EMS Port. While it is true that provisioning of a GNE is not required, the user must provision the IP address of the EMS port of an NE that is going to be used as a GNE.

Provisioning these parameters will not cause a reboot, but will bring the EMS-NE link down. If the user is connected to the NE via the EMS port of the NE, and the user attempts to modify these parameters, the CIT displays the following message to the user:

```
Modifying these parameters will result in losing the
EMS-NE link. Therefore this login session will terminate
and you will be required to login again.
```

If the user is connected to this NE via the CIT port or supervisory channel of the NE, and the user attempts to modify the EMS Port IP Address, the CIT displays the following message to the user:

```
Modifying these parameters will result in losing the
EMS-NE link. Any communications via EMS link of this NE
will be lost.
```

After the appropriate message is displayed, the user can confirm the change of the parameter values or cancel.

**Date/Time**

LambdaXtreme™ Transport maintains a Date and Time of Day clock. The clock is used to time stamp events such as reporting and clearing of alarm conditions and interactions with the operations system. The NE Date and Time can be set via the CIT, TL1 cut-through, or EMS interfaces.

**Optical Amplifier (OA)-Pack in Repeater Nodes**

This feature allows the user to provision the presence or non-presence of an OA (DGEF) circuit pack on the optical line. There is one parameter for optical line 1W and a separate one for optical line 1E. This feature is only present in the CIT for Repeater nodes. The allowable values are Yes or No.

"Yes" indicates that an OA (DGEF) circuit pack is installed on the optical line. "No" indicates that the OA installed on the optical line is either an OA (Raman) circuit pack, or an OA (Raman, EDFA) circuit pack.

Changing either of these values causes the Repeater's SCTL circuit pack to reboot, (i.e., the shelf will reboot).

□

# Port Provisioning

**Overview**

This subsection describes the requirements for setting Optical Translator (OT) port states as they relate to channel connections. OT ports can be provisioned via the CIT, the TL1 cut-through (ENT-OTPS command), or via EMS. For detailed port provisioning procedures via the CIT see Appendix A, "Using the CIT". For provisioning via the TL1 cut-through, see Chapter 7, "Craft Interface Terminal". For provisioning procedures via the EMS, see the *Navis*™ *Optical Element Management System (EMS) Provisioning Guide, Release 8.0 (190-224-156R8.0).*

**Methods of Provisioning**

There are two distinguishable methods of port provisioning – autoprovisioning and manual provisioning. Whenever possible, the LambdaXtreme™ Transport NE will discover and provision optical channel connections without the user having to enter any provisioning commands. When the NE discovers a newly added optical channel frequency with no command input from the user, this is referred to as autodiscovery of an optical channel. When the NE automatically provisions the autodiscovered optical channel (without command input from user), this is referred to as autoprovisioning. The autodiscovery and autoprovisioning features are implemented together to enable the automatic discovery and provisioning of optical connections by the NE.

### Autoprovisioning

To enable autodiscovery and autoprovisioning for new optical connections in the LambdaXtreme™ Transport NE, the user installs the appropriate circuit packs and physically connects ports between the packs (such as an OT port to an OM port). Then, given a valid signal to the client side of an add/drop OT, the NE software automatically discovers and provisions the corresponding optical connections made by the user. The NE software will provision the discovered connections in its database.

Autoprovisioning is enabled only when the client side port is in the Automatic state (see Figure 4-1, "OT Port State Diagram" (4-9)).

### Manual Provisioning

Autodiscovery and autoprovisioning do not apply to all optical channel connections. For these exceptions the user provisions the NE optical channel connections using the CIT, TL1 commands, or the EMS. Manual provisioning is the process by which system parameters are set (provisioned) using a series of user-entered commands via the CIT, TL1 cut-through, or EMS.

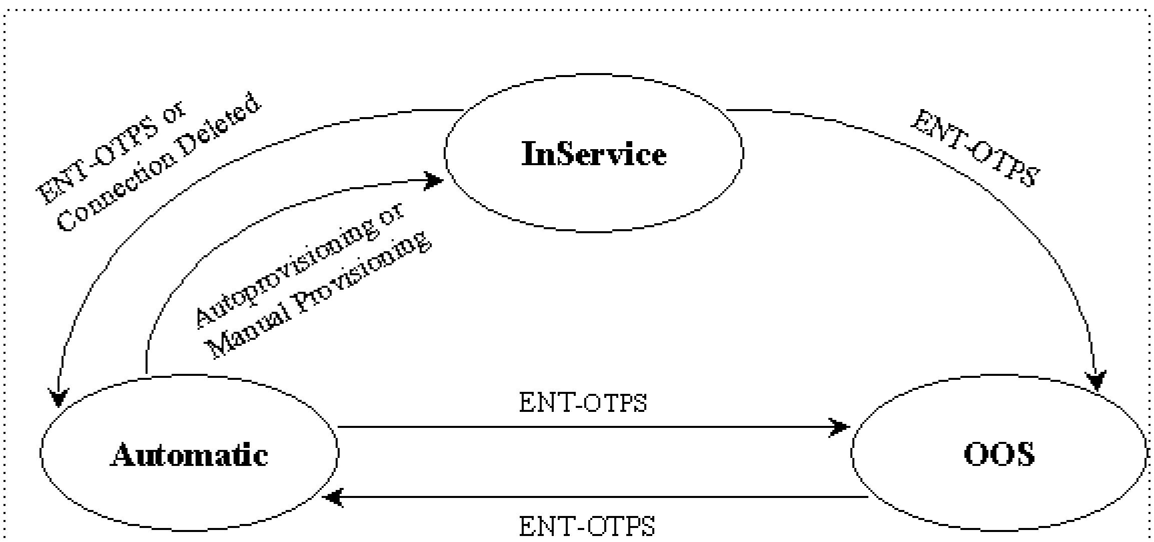
Compatible optics channels must be manually provisioned by the user. For these connections, the client side signal connects directly to OM and OD ports bypassing OT circuit packs. These connections must be provisioned by the user as external connection types.

All TL1 port provisioning commands, parameters, original values, and allowed values can be viewed via the CIT TL1 cut-through (see Chapter 7, "Craft Interface Terminal".

## Provisioning Port State

This section describes the requirements for setting Optical Translator (OT) port states as they relate to channel connections. The following figure shows the port states that are supported and the transitions between these states.

**Figure 4-1 OT Port State Diagram**



For any OT type (except Through OTs), the user can provision the following OT Port parameters:

- Port Mode – This field displays the current port mode setting and allows the user to specify the port mode of the OT Client In Port. The LambdaXtreme™ Transport NE supports the following states for the OT client side input port:
  - Automatic (OOS-MA-AS) - At installation time, the default state (original value) that the OT port assumes is Automatic and the OT laser is off.
  - Monitored (IS) - This is the state that the OT port assumes for monitoring. The user is not able to set the OT port state to In Service.
  - Not Monitored (OOS) - This is the state that can be set in case the fault monitoring on this port needs to stop.

Once the parameter value has been chosen, the user then has the option of applying the settings to just the Client In Port being provisioned, all Client In Ports on this Pack, all Client In Ports on this Shelf, all Client In Ports on this Bay, or all Client In Ports on this Bay and Selected Bays. The TL1 command to provision this parameter is ENT-OTPS. To provision the port mode via the CIT, see "Provision Mode for OT Client Side Input Port" (A-44).

- Error Response – These fields allow the user to provision various OT Line In Error Response parameters related to OT ports.
  - Optical Channel Signal Defect Response - This field determines how an OT which is sending its output to external equipment will respond when there is a defect in the received WaveWrapper signal. Two possible responses can be provisioned - "Shut Off Client Side OT Laser" or "Insert Unframed AIS to Client Signal".
  - Optical Channel Path Trace Mismatch Response - This field indicates whether the OT will take action when Optical Channel Path Trace Mismatch is detected. The allowed values are: "Apply Optical Channel Signal Defect Response" or "Pass Signal to Client Side".
  - Optical Channel Payload Type Mismatch Response - This field indicates whether the OT will take action when Optical Channel Payload Type Mismatch is detected. The allowed values are: "Apply Optical Channel Signal Defect Response" or "Pass Signal to Client Side".

  Once the parameter values have been chosen, the user then has the option of applying the settings to just the Line In Port being provisioned, all Line In Ports on this Pack, all Line In Ports on this Shelf, all Line In Ports on this Bay, or all Line In Ports on the NE. The TL1 command to provision these parameters is ENT-OTPS.

□

# Optical Line Provisioning

**Overview**

Optical Line Provisioning allows the user to provision all parameters associated with an optical line. The user is required to provision the outside plant fiber type for each line AID with which an NE interfaces. This information is used to optimize performance. Optical lines can be provisioned via the CIT, the TL1 cut-through (ENT-OLPP command), or via EMS.

**Provisioning Optical Lines**

Line AIDs are selected as follows:

- On Repeater and OADM nodes the allowable choices for line AID are 1E and 1W.
- On End Terminals the only allowable choice for line AID is 1E.

The user selects an optical line AID and then provisions the following Optical Line parameters:

- Optical Line Fiber Type – This parameter denotes the optical fiber type in this span (both directions of transmission). Possible values are:
  - Standard Single-Mode
  - Lucent TrueWave-Classic
  - Lucent TrueWave-Plus
  - Lucent TrueWave Reduced Slope
  - Corning LEAF
- Tx Outside Plant Span Loss – In this field the user can set the value for SPAN_LOSS. The allowable values are floating point values in tenths of dBs between 0.0 and 75.0 dB.
  Note: This is the “S-NE to R-NE” loss and therefore includes all office patch panels, office connections, and the office to outside plant splice losses as well as the actual outside plant loss.
- Tx Outside Plant Connector – In this field the user can set the value for the type of connector that terminates the outside plant (OSP) transmit fiber at the NE. The allowed values are “ST” (Straight Tip) or “Not ST”.

- Line Compensation DCM Type – In this field the user can select the type of Dispersion Compensation Module (DCM) associated with the transmit amplifier. Allowed values are:
  - Standard Single-Mode
  - Lucent TrueWave-Classic
  - Lucent TrueWave Reduced Slope
  - Corning LEAF

  Note: Each possible value consists of fiber type and span length for which DCM is being applied.
- Soliton OT Pulse Width Vector – In this field the user can select one of eight Soliton OT pulse width profiles pre-set in the NE. Each profile specifies the Soliton OT pulse widths for every channel in this optical line.
- Comment – This field displays a comment field of up to 128 characters. The user has the option to populate this field with a description of line characteristics.

□

# Supervisory Channel Provisioning

**Overview**

The Supervisory Circuit Pack (SUPVY) is a low-speed transmission pack that facilitates communication between LambdaXtreme™ Transport NEs. The SUPVY is the termination point of the supervisory channels. In node-to-node communication, the controller core in the SUPVY pack communicates with the SUPVY controller core in other NEs via the Optical Supervisory Channel (OSC). All such internode communication flows through the SUPVY controller core before transmission on the OSC. SUPVY packs allow the user to provide remote system operations such as performance maintenance and provisioning via the CIT and EMS.

The Supervisory Channel can be provisioned via the CIT, the TL1 cut-through (ENT-SUPR command), or via EMS.

**Orderwire**

In Orderwire communication, connections are established across NEs using external Orderwire equipment. The Orderwire channels which are used to establish voice communication between LambdaXtreme™ Transport nodes, are derived from the supervisory signal traversing between the LambdaXtreme™ Transport nodes. The user is able to provision up to 3 Orderwire links at each SUPVY interface of the LambdaXtreme™ Transport node.

The orderwire interface has the following characteristics:

- Each Orderwire interface consists of clock, sync, and data signals in the transmit direction and in the receive direction. The clock and sync signals are outputs of the SUPVY for both transmit and receive. The transmit data signal is an input and the receive data signal is an output of the SUPVY.
- Orderwire signals are RS-485. The drivers, receivers, and terminations are on the SUPVY pack.
- One DB15S connector is used per orderwire interface. The connectors are on the SIO panel.
- The transmit clock is derived from the local SUPVY common clock. The receive clock automatically tracks the local SUPVY common clock of the transmitting NE.

For additional details of the SUPVY pack and Orderwire interface, see the *LambdaXtreme™ Transport Applications and Planning Guide, Release 1.1*.

### Provisioning Orderwire Channels

Each Orderwire channel is provisioned by the user to be local (terminating on the node) or express (non-terminating on the node). It is also important that the timing source at each node be provisioned such that synchronous operation is attained, otherwise slips will occur. While slips have no apparent adverse effect on the node-to-node transmission, slips do cause clipping of speech or data errors on the Orderwire channels.

### Provisioning Port Monitoring

Note: This feature is not supported in the current release but will be available in the future.

These fields allow the user to provision the monitoring status of various ports. The user selects one of the values presented (“Monitored” or “Not Monitored”). For the SIO pack ports, “Monitored” indicates monitoring for LAN failure (Link integrity failure). The TL1 command to provision this is ENT-SUPR. The monitoring status of the following ports can be provisioned:

- Data Port 1 – In this field the user can set the state of PORT-DATA_1. This port is located on the SIO pack.
- Data Port 2 – In this field the user can set the state of PORT-DATA_2. This port is located on the SIO pack.
- Customer LAN Port – In this field the user can set the state of PORT-CUSTLAN. This port is located on the SIO pack.
- Private LAN Port 1 – In this field the user can set the state of PORT-PVTLAN_1. This port is located on the SIO pack.
- Private LAN Port 2 – In this field the user can set the state of PORT-PVTLAN_2. This port is located on the SIO pack.

□

# Miscellaneous Discretes Provisioning

## Overview

This feature allows the user to provision miscellaneous discrete alarms (inputs) and controls (outputs). The user defines the alarm severity and alarm message for the miscellaneous discrete alarms and also defines the condition name for the controls. The user can specify the desired control action to produce a continuous output to an external device or just produce output momentarily to test the control points.

Miscellaneous Discretes can be provisioned via the CIT, the TL1 cut-through (SET-ATTR command), or via EMS.

## Provisioning Environmental and Control Points

The alarm severity level for each of the miscellaneous discrete environmental points is provisionable via the CIT/EMS. The following capabilities are available:

- The state of the environmental points is available as message-based EMS messages and are reported on demand at the CIT and EMS interfaces.
- Users can operate and release the control points via either the CIT or EMS interface.
- If the network element experiences a RESET, the states of the environmental and control points remain unaffected.
- All discretes are provisioned with their values upon initialization. Alarms are given an original value of MN.

To define the miscellaneous discrete alarms and controls, the CIT user defines the alarm severity and alarm message for the miscellaneous discrete alarms and defines the condition name for the controls. For control points, the user can opt to produce a continuous output to an external device or just produce output momentarily to test the control points.

The following fields are displayed to the user on the CIT Miscellaneous Discrete Alarms Provisioning screen.

- Environmental Alarm AID
  This field displays the selected Environmental Alarm AID. This is ENV-(1-16) for the internal Environmental Alarms and ENV-(17-144) for the external Environmental Alarms. The CIT displays the value that is currently stored in the NE for this field.
- Environmental Alarm Message

In this field, the user enters the alarm message (up to 26 characters) for this AID.

- Environmental Alarm Severity
  In this field, the user enters the alarm severity for this AID. The user can modify this field with values that are based on the operations standard (SONET or SDH) provisioned on the NE. If the NE is provisioned for the SONET standard, then the allowed values for this field are: Critical (CR), Major (MJ), Minor (MN), Not Alarmed (NA), Not Reported (NR), NO (Ignored). If the NE is provisioned for the SDH standard then the allowed values are: Prompt, Deferred, No Alarm, No Report, Not Indicated.
- Control Point AID
  This field displays the selected Control Point AID. This is CONT (1-4) for internal Miscellaneous Discrete Controls and CONT (5-36) for external Miscellaneous Discrete Controls.
- Control Point Name
  In this field, the user enters the name of the Control Point (up to 26 characters) for this AID.
- Control Point Status
  This field displays the current status of the control point (“Open” or “Closed”).
- Control Point Action
  This is selectable by the user to produce a continuous output to an external device or just produce output momentarily to test the control points. The possible values are: None, Pulse, Closed, or Open (depending upon the current Control Point Status).

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# 5 Establishing Optical Channel Connections

## Overview

**Purpose**

This chapter describes the autoprovisioning/autodiscovery features for establishing LambdaXtreme™ Transport optical channel connections. Step-by-step instructions for provisioning of compatible optics connections via the CIT are covered in Appendix A, "Using the CIT". Provisioning of optical channel connections can also be done via the TL1 ENT-CONN command (see Chapter 7, "Craft Interface Terminal". For EMS provisioning procedures, see the *Navis™ Optical Element Management System (EMS) Provisioning Guide, Release 8.0 (190-224-156R8.0).*

**Contents**

# Introduction

**Overview**

For LambdaXtreme™ Transport an optical channel connection is defined as two connectivity paths within a LambdaXtreme™ Transport NE traveling in opposite directions. These two paths are the input and output of the same customer signal and have the same grid frequency. The connection begins from the customer source point, through the NE, to the appropriate ports at the exit point of the NE. An optical channel connection may consist of multiple point to point connections within an NE which are used to add, drop, or pass through an optical channel.

The approach taken with LambdaXtreme™ Transport is to eliminate having to provision channel connections. Whenever possible, the LambdaXtreme™ Transport NE discovers and provisions optical channel connections without the user having to enter any provisioning commands. When a valid client signal is applied to an OT, the NE senses the presence of the valid signal and turns on the OT line side signal, thus allowing transmission over this channel. Successful discovery of the new connection leads to creation of the connection record in the database that triggers Fault and Performance Monitoring of the newly created channel. For LambdaXtreme™ Transport, autodiscovery of optical channel connections is supported for End Terminals and OADM nodes where OTs are used. It is not applicable for Repeater nodes.

Compatible optics connections (also known as external connections) do not require the use of OTs and are the only type of connections that cannot be autodiscovered and autoprovisioned by the NE. The user provisions connections for compatible optics using the CIT, TL1 commands, or the EMS.

**Autodiscovery and Autoprovisioning of Optical Channel Connections**

To autoprovision an optical connection, the user first installs the appropriate OT pack and makes all the necessary fiber connections to the OM/OD. The final step is to connect externally to the operating customer equipment and apply a valid signal to this OT for the first time. When all the necessary connectivity information is discovered by the NE, the software provisions the connection in the database.

Note: For a valid channel connection, the user has to drop the customer signal on the same OT as the add side of the same signal or else the software cannot automatically discover the connection correctly. Also, the connection will not be autoprovisioned if any of the involved circuit packs are in alarm (e.g., OT boot in progress or OT warming).

After a new connection has been provisioned in the NE database via autoprovisioning, the NE sends an autonomous message to the user that a connection has been successfully provisioned and the following connection information is recorded in the database:

- All necessary point to point connections within the NE that make up the 2-way connection within the NE. This includes the applicable point to point connections within the NE (add, drop, or pass-through connections) with the corresponding OT, OM and OD AID's.
- Grid frequency of the channel.
- Line AID (1E, 1W).
- Connection Type.
- Tributary Identifier (if applicable)

LambdaXtreme™ Transport will reject the provisioning of optical channel connections which attempt to place a new connection on a line having a grid frequency with the same value as one provisioned previously on that line.

Note: Autodiscovery/autoprovisioning of a connection may take a few minutes (typically less than 2 minutes) to provision a single optical connection. The LambdaXtreme™ Transport will provision connection autodiscovery requests one at a time. Users may connect many OTs and initiate multiple autodiscovery requests at the same time, but they will be provisioned sequentially.

## Optical Channel Connection Types

LambdaXtreme™ Transport supports the following types of optical channel connections. These connections are two-way and include an add and corresponding drop within an NE.

- 10G connection
- 2.5G Trib connection
- 10G Trib connection
- 40G Through connection for back-to-back End Terminals
- External connection for compatible optics

□

# 10G Connections

### 10G Optical Connections

10G optical channel connections are supported on the 10G End Terminals and OADM Terminals. These connections include the following types of OTs:

- 10G:WW10G Add/Drop, I-64.1, LH, 30mm wide, 1310 nm client signal
- 10G:WW10G Add/Drop, S-64.2b, LH, 30mm wide, 1550 nm client signal
- 10G:WW10G Add/Drop, I-64.1, ULH, 60mm wide, 1310 nm client signal
- 10G:WW10G Add/Drop, S-64.2b, ULH, 60mm wide, 1550 nm client signal.

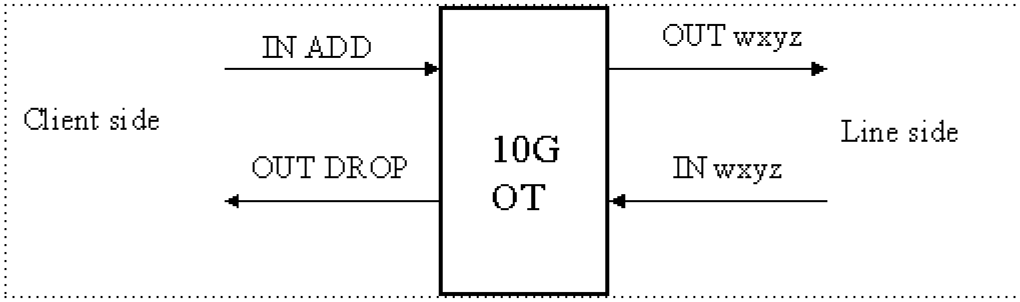
OTs can be interchanged by users for existing connections as follows:

- A 10G:WW10G Add/Drop OT with I-64.1, 1310 nm client signal can be interchanged with another OT with the same frequency of type 10G:WW10G Add/Drop OT with S-64.2b, 1550 nm client signal.
- A 10G:WW10G Add/Drop ULH OT with I-64.1, 1310 nm client signal can be interchanged with another OT with the same frequency of type 10G:WW10G Add/Drop ULH OT with S-64.2b, 1550 nm client signal.

The user can replace an OT pack with a 10G OT pack with different client side characteristics without having to delete the connection and recreate it. If an incompatible type of OT is plugged into the slot then an alarm will be raised for an “Unexpected CP type”. To replace the OT in this case, the user will need to delete the existing OT connection first and then install the new OT with a valid customer signal. This event would cause autoprovisioning of the connection with the new OT type.

Each LambdaXtreme™ Transport 10G OT supports a bidirectional channel via client side ports (IN ADD, OUT DROP) and line side ports (IN wxyz, OUT wxyz). The 10G OT ports are shown in the following figure:

**Figure 5-1 10G OT Ports**




□

# 2.5G/10G Trib Connections

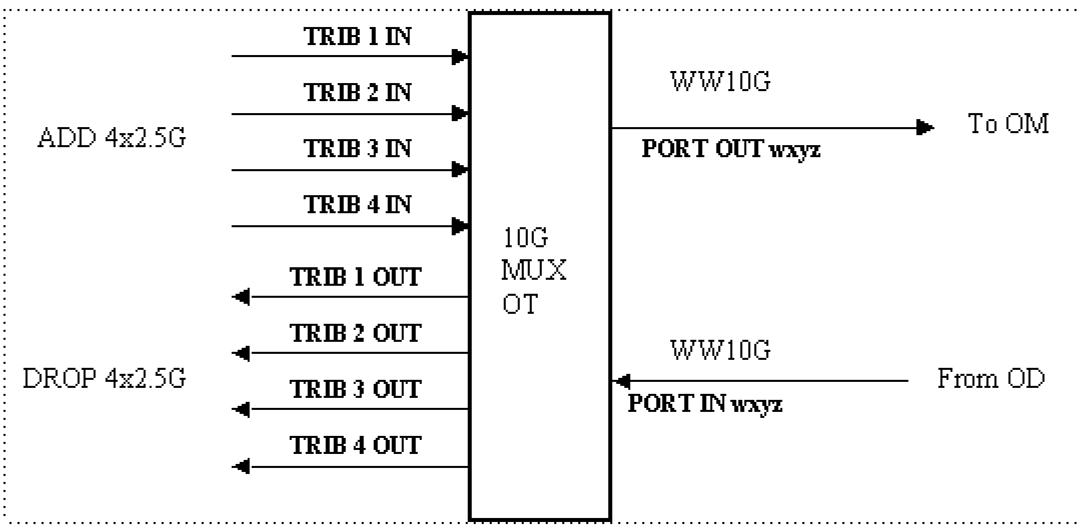
## 2.5G Trib Optical Connections

2.5G Trib optical channel connections are supported on 10G End Terminals and OADM Terminals. These connections are supported by a 10G Mux OT and include the following:

- Four 2.5G bidirectional channels connected to four customer signals (ports TRIB 1 IN & OUT, TRIB 2 IN & OUT, TRIB 3 IN & OUT, TRIB 4 IN & OUT)
- One line side WW10G signal input connected to the OD (port IN wxyz)
- One line side WW10G signal output connected to the OM (port OUT wxyz)

The 2.5G Trib connection is shown in the following figure:

**Figure 5-2 2.5G Trib Connection**



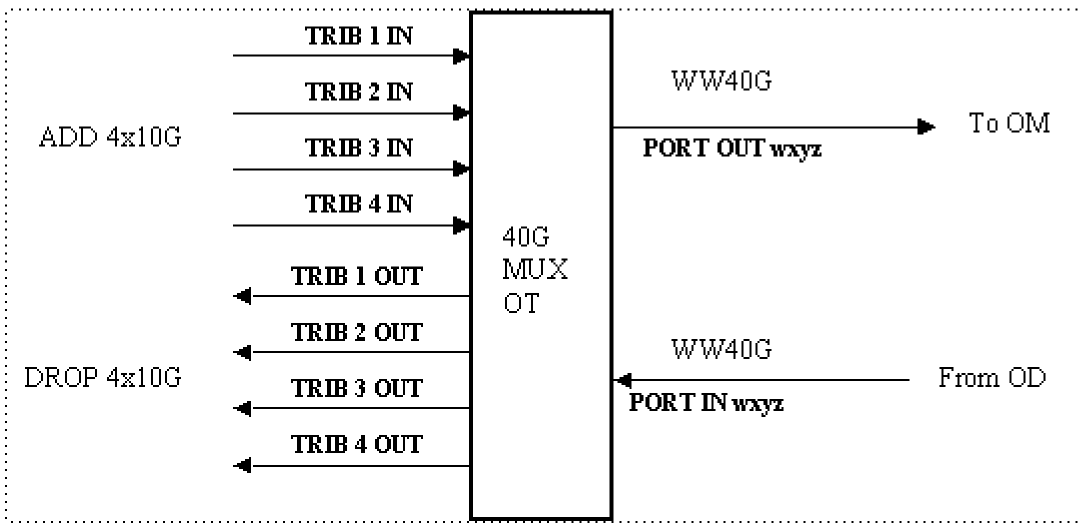
**10G Trib Optical Connections**

10G Trib optical channel connections are supported on 40G End Terminals. These connections are supported by a 40G Mux OT and include the following:

- Four 10G bidirectional channels connected to four customer signals (ports TRIB 1 IN & OUT, TRIB 2 IN & OUT, TRIB 3 IN & OUT, TRIB 4 IN & OUT)
- One line side WW40G signal input connected to the OD (port IN wxyz)
- One line side WW40G signal output connected to the OM (port OUT wxyz)

The 10G Trib connection is shown in the following figure:

**Figure 5-3 10G Trib Connection**



### Autoprovisioning of 2.5/10G Trib Optical Connections

When a new 10G/40G Mux OT pack is properly connected by the user and one to four 2.5G/10G valid signals are sent to the client side ports of the OT the following occurs:

- the LambdaXtreme™ Transport NE establishes a 10G/40G channel on the line side. On the customer side there may be up to four 2.5G/10G customer channels.
- the LambdaXtreme™ Transport NE automatically discovers the underlying connections and automatically provisions the corresponding two-way channels for a 2.5G/10G Trib connection. These channels are bidirectional and include both the adds and the corresponding drops.
- the LambdaXtreme™ Transport NE provisions one connection per 2.5G/10G Trib customer input. Since there may be one through four 2.5G/10G customer inputs, there may be one through four 2.5G/10G Trib connections provisioned.
  Note: The four 2.5G/10G Trib connections may be connected to the Mux OT at different times.

When provisioned, the parameters for these types of connection are stored as follows:

- The connection type parameter has the value of “2.5G Trib” or “10G Trib”.
- The tributary identifier has the value of the tributary being used in this connection. The values are: Trib1, Trib2, Trib3, or Trib4.

□

# OADM Connections

**Overview**

OADM nodes support autodiscovery and autoprovisioning of connections where OTs are used. As with End Terminals, the compatible optics connections are provisioned by the user as External connections.

OADM NEs autoprovision optical connections in the same manner as End Terminals. When a new OT is installed, and a valid signal is applied, autodiscovery of the connection is triggered. The OADM NE supports 10G systems and has the capability to add/drop 50% of the total channels supported on the node. The odd channels (referring to the frequency grid) are always express (i.e., travel through the node); the even channels can be set to through or configured to Add/Drop. For each even channel, the OADM NE has two through channels, one for each direction of transmission. By default, all channels are set to through.

OADM NE types differ from other LambdaXtreme™ Transport node types in the manner connections are provisioned because for OADM nodes the user has the capability to reconfigure connections via the CIT, TL1 commands, or the EMS. A through connection may be reconfigured to add/drop connections and vice-versa.

For the very first reboot of the OM and OD packs, the software sets the through channels for all frequencies to the through position and the add side channels to blocked position. This sets the channels to through by default. For any subsequent reboots of the OM or OD packs the channels assume their previous position.

### Adding OADM Connections

An OADM connection is added by first setting the through channels for a specific frequency to the Add/Drop position. By this operation, the frequency is blocked from being a through channel and then can be added/dropped.

Note: This type of connection can be provisioned either via the CIT, the TL1 cut-through (ENT-OADM-CONFIG command), or the EMS. See Appendix A, “Using the CIT” for provisioning via the CIT. See Chapter 7, “Craft Interface Terminal” for provisioning using TL1 commands. See the *Navis™ Optical Element Management System (EMS) Provisioning Guide, Release 8.0 (190-224-156R8.0),* for provisioning via the EMS.

The following parameters must be specified when configuring the OADM:

- the frequency to be added/dropped
  Note: In an OADM NE, the NE only validates and allows booting of OTs which have frequencies that can be added/dropped. In the R1.1 OADM NE, only OTs that have frequencies that end in 0 (as opposed to 5) can be used to add/drop channels. The express channels (frequencies that end in 5) cannot be added/dropped.
  Note: The RTRV-TH-OCHAN command is not applicable to express channels on the OADM. A request for this data will be denied by the network element.
- the add/drop position for the OADM through channels

To add an optical connection on the OADM the following events must take place (in any order).

1. Configure through channel to add/drop position.
2. Connect OT and turn valid client signal on.

When a valid signal is applied to an OT on an OADM the following occurs:

- The software retrieves the position of the OADM through channels. If the through channels are set to add/drop for this frequency, the NE proceeds to provision the connection. If the OADM through channels are positioned to through for this frequency, the NE produces an autonomous error message.
- If the through channels are set to add/drop for this frequency, the software sets the corresponding add channel to pass. This allows autodiscovery and autoprovisioning of the new connection to take place.
- When the autoprovisioning of the new connection is completed and the corresponding line AID is identified, the software ensures that the add channel for the frequency on the other line is at the block position if there is no connection. The add channel is set to pass only if there is a corresponding valid connection.

The OADM may be configured at any point in time.

- A channel may be configured from through to add/drop which will create the connection in the NE database if the client signal is present.
- A channel may be configured from add/drop to through which will delete the connection(s) if any are present for this channel.

Note: The through channels are not provisioned as connections. Only the add/drop channels are provisioned.

When adding a compatible optics connection on an OADM, this operation must be performed after the through channels have been configured to the add/drop position. Provisioning a connection (automatically or manually) will occur only when the corresponding through channels are configured to add/drop position.

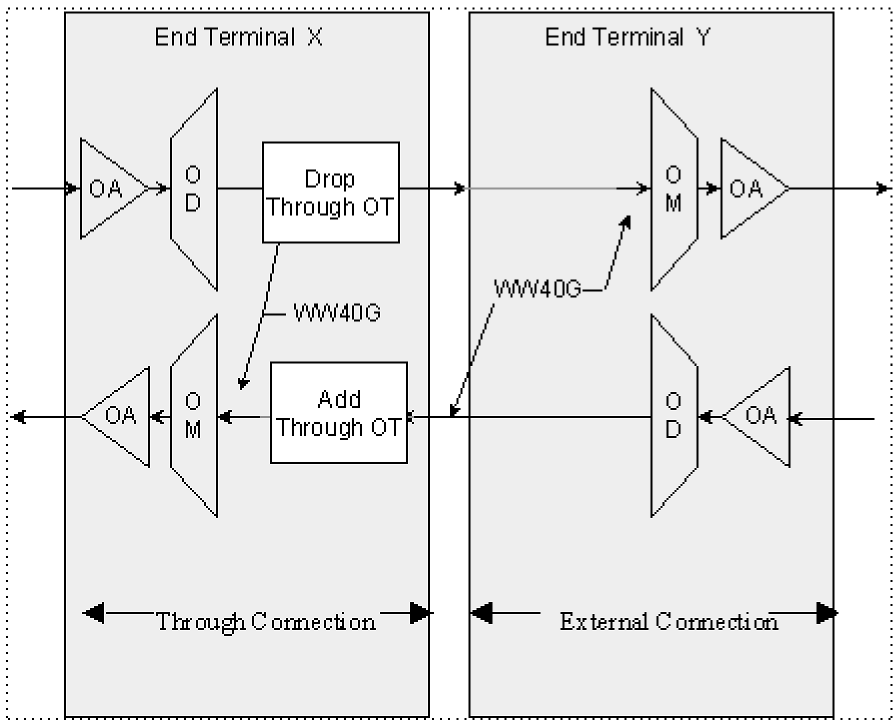
□

# 40G Through Connections for Back-To-Back End Terminals

**Overview**

40G through connections are only supported on 40G End Terminals. The through connections are supported by through OTs. The through OTs are unidirectional and only have one input and one output. The through connections for back-to-back End Terminals are autodiscovered and autoprovisioned by LambdaXtreme™ Transport when valid signals are applied to the OTs. A 40G through connection for back-to-back End Terminals is shown in the following figure:

**Figure 5-4 40G Through Connection for Back-to-Back End Terminals**



The following conditions must exist for a valid through connection for back-to-back End Terminals:

- The two through OTs must be configured in the same End Terminal. The other End Terminal must be configured for a compatible optics connection.
- The same grid frequency must be used as input and output from the through OTs.
- The output grid frequency of the through OTs will be the same as the input (no frequency conversion).

In Figure 5-4, "40G Through Connection for Back-to-Back End Terminals" (5-12), the 40G through connection will get autodiscovered/autoprovisioned in End Terminal X. For the other End Terminal (End Terminal Y), the user must manually enter an external connection for compatible optics.

### Autoprovisioning of 40G Through Optical Connections

Before provisioning the 40G through connection in the database, the NE will verify that a second 40G through OT with the same frequency is installed on the same system. This second OT may or may not have a valid input signal at the time the first through OT gets discovered.

If a second through OT does not exist, the NE generates an alarmed condition for an invalid 40G through connection. In this case, the 40G through connection will not be provisioned until both through OTs are installed.

Autodiscovery of a 40G through optical channel begins when a valid signal is applied to the add side of any one of the two through OTs. Given the back to back End Terminal configuration shown in End Terminal X in Figure 5-4, "40G Through Connection for Back-to-Back End Terminals" (5-12), (both through OTs are in the same End Terminal) the LambdaXtreme™ Transport software will autodiscover and autoprovision 1 two-way channel for a through connection for back-to-back End Terminals. This connection is bi-directional and includes both through OTs corresponding to the add and drop sides of this channel.

The connections are provisioned separately in End Terminal X and End Terminal Y. (Every connection is provisioned independent of the channel in the downstream or upstream back-to-back End Terminal).

Autodiscovery and autoprovisioning applies to the connection in End Terminal X. The connection in End Terminal Y must be provisioned by the user as an external connection for compatible optics.

□

# External Connections for Compatible Optics

**Overview**

A compatible optics signal for LambdaXtreme™ Transport is defined as a wave wrapped optical signal which is an equivalent signal to that produced or accepted by the LambdaXtreme™ Transport OT line side. Compatible optics connections are supported on End Terminals and OADM Terminals. These connections bypass the use of OTs. The OT function is moved out of the LambdaXtreme™ Transport NE to an external NE. This external NE must be able to accept standard output from an OD and produce standard input to an OM on the LambdaXtreme™ Transport NE.

Compatible optics signals have grid frequencies, wave wrapped optical signals, and transmit power levels the same as LambdaXtreme™ Transport. The compatible optics signals to a LambdaXtreme™ Transport NE may originate from another LambdaXtreme™ Transport NE (e.g., back-to-back terminals with through OTs) or from other Lucent optical products with compatible DWDM signals (e.g., Lucent Technologies LambdaUnite™ MultiService Switch (MSS)).

**Provisioning External Connections for Compatible Optics**

The LambdaXtreme™ Transport NE can not autodiscover compatible optics connections because the OT, which would sense the input signal, gets bypassed and therefore the NE does not know when the external connection is turned on. Connections for compatible optics must be manually provisioned. This can be done via the CIT, TL1 cut-through (ENT-CONN command), or the EMS.

The following parameters must be specified for a compatible optics connection:

- "EXT" (external) for type of connection
- connection grid frequency
- line AID

Note: When adding a compatible optics connection to a LambdaXtreme™ Transport NE, it is recommended that the user first provision an external (EXT) type connection (see "Add Compatible Optics Connection" (A-129)) before applying the input signal from the external source to the LambdaXtreme™ Transport NE. Users must ensure that the external source is transmitting a stable signal (non-fluctuating) before applying it to the LambdaXtreme™ Transport

NE in order to preserve stable transmission and not cause a power transient.

□

# 6 System Maintenance

## Overview

**Purpose**

This chapter provides detailed "how to" instructions for performing basic maintenance activities and test procedures on the LambdaXtreme™ Transport Transport optical networking product.

**Contents**

# Remove Front Cover

**Purpose**

This procedure describes how to remove a front cover which allows access to the air filter.

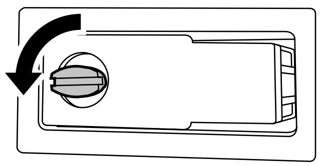
**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a LambdaXtreme™ Transport System network element to prevent electrostatic discharge damage to sensitive components.*

**Procedure**

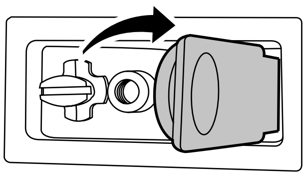
**1** Each front cover is secured by a pair of latches located in the top-right and top-left corners of the front cover. Rotate the locking screws 90 degrees counter-clockwise to release the latch handles (see Figure 6-1, "Front Cover Latch - Rotate" (6-2)).

**Figure 6-1 Front Cover Latch - Rotate**



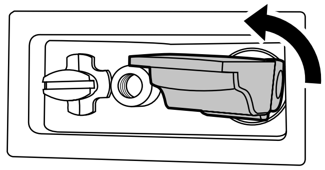
**2** Push on the outside edge of each latch handle so that the inside edge lifts up (see Figure 6-2, "Front Cover Latch - Up" (6-2)).

**Figure 6-2 Front Cover Latch - Up**



**3** Rotate the open handles 90 degrees counter-clockwise to release the latches (see Figure 6-3, “ Front Cover Latch - Release” (6-3)).

**Figure 6-3 Front Cover Latch - Release**



**4** Pull the top of the cover several inches toward you, while supporting it so that it does not fall.

**5** Remove the front cover by lifting it straight up to free it from the two hinge brackets located at the bottom of the shelf.

END OF STEPS

□

# Inspect/Replace Air Filter

**Purpose**

This procedure is used to remove the air filter in the bay for inspection, and when necessary, to replace the air filter.

Note: An appropriate screwdriver is needed for this procedure.

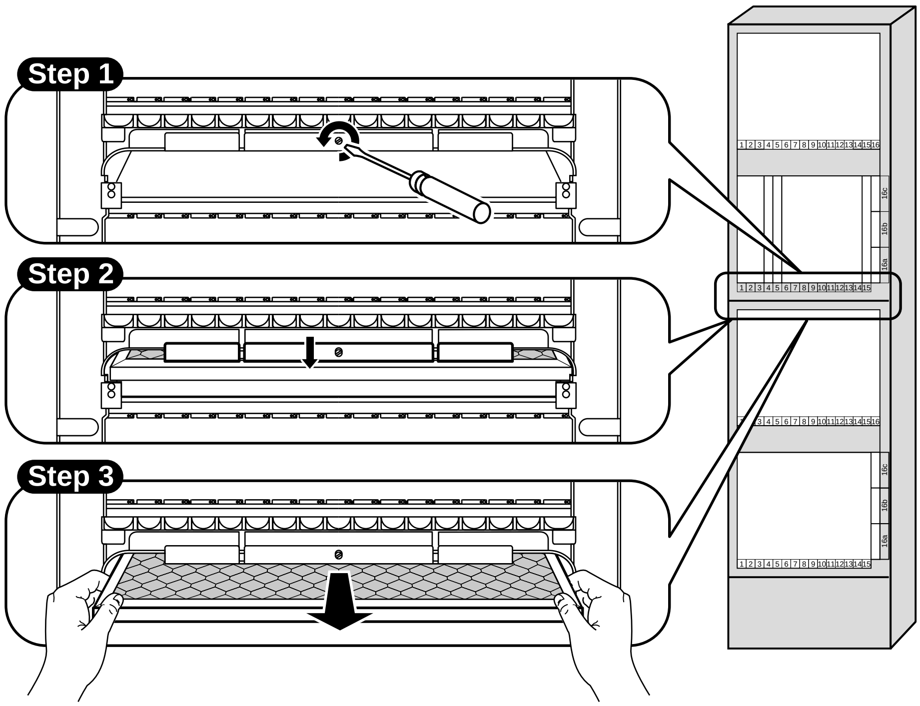
**Important!** A dirty filter causes a substantial reduction in the amount of available cooling air to the bay. The air filter should be inspected periodically and changed every six months.

## Procedure

1. Identify the location of the plastic cover on the shelf in the bay that contains the air filter. See Figure 6-4, "Air filter removal process" (6-5).

**2** Remove the front cover (see "Remove Front Cover" (6-2)) to expose the air filter slide holder assembly. The following figure shows the steps to remove the air filter.

**Figure 6-4 Air filter removal process**



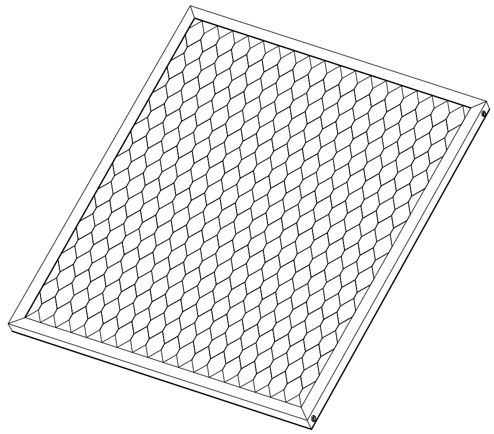

**3** Turn the screw (counterclockwise) on the air filter slide holder to free it and then pull it toward you.

**Result:**

The air filter which was held in place by the slide holder is released.

**4** Remove the air filter and inspect it for any dirt or dust accumulation that may clog it. The following figure shows the air filter.

**Figure 6-5 Air Filter**



**5** The filter can be reused if in good condition, but must be replaced if dirt or dust has accumulated.

**6** Insert a filter back into the shelf. While holding it up into position, push the air filter slide holder back into position (make sure the back lip of the assembly slides under the filter to secure it).

**Important!** When inserting a filter into the shelf, make sure the air flow arrows (located on the filter's edge) are pointing up.

**7** Turn the screw (clockwise) on the air filter slide holder to secure it.

**8** Replace the front cover (see "Install Front Cover" (6-7)).

END OF STEPS

☐

# Install Front Cover

**Purpose** This procedure describes how to re-install a front cover.

**Procedure**

1. Replace the front cover, inserting the bottom corners of the cover into the two hinge brackets located at the bottom of the shelf, and pressing the top of the front cover into place, flush with the shelf.

2. Rotate the open latch handles 90 degrees clockwise to close the latches.

3. Push on the raised edge of each latch handle to close it, so it is flush with the latch mechanism.

4. Rotate the locking screws 90 degrees clockwise to secure the latch handles.

END OF STEPS

# 7 Craft Interface Terminal

## Overview

**Purpose**

This chapter provides a description of the LambdaXtreme™ Transport Craft Interface Terminal (CIT).

Note: Specific task-oriented procedures performed via the CIT are covered in Appendix A, "Using the CIT".

**Contents**

# CIT Functionality

**Description**

The CIT provides a GUI that allows users to interact with LambdaXtreme™ Transport NEs from a PC via a 10/100BaseT physical connection. The CIT may be connected to the NE either locally through a physical connection to the CIT port located on the SIO, or remotely via a Data Communications Network (DCN) connection or dial-up connection to the NE's EMS port.

The LambdaXtreme™ Transport CIT GUI is a common interface to all LambdaXtreme™ Transport NEs regardless of type, and provides a powerful, flexible, and user friendly interface to execute the most frequently used actions. The GUI also supports numerous customization options so that users may tailor the displays in accordance with their own preferences. The CIT operates as an enhanced graphical tool and as a general provisioning aid. It is designed to take advantage of the capabilities of the LambdaXtreme™ Transport NEs, and optimize the role of the NEs in management functions to create an intelligent operations environment. The CIT provides the user with access to command functions that are required to install and operate LambdaXtreme™ Transport NEs and to maintain the LambdaXtreme™ Transport Optical Line System (OLS).

Note: Typically, for an established OLS system, the users perform their maintenance functions by using an Element Management System such as Lucent Technologies *Navis*™ *Optical Element Management System (EMS)* to operate the NE on an ongoing basis.

The CIT user interface is divided into three primary windows:

- OLS Manager – This window first appears when the user starts the CIT. The OLS Manager displays OLS (End Terminal-End Terminal) topology and provides the user with the facilities to launch login connections to any accessible network element.
- Node Manager – This window appears when the user connects to a network element from the OLS Manager. It provides the functions necessary to work with the network element across a variety of command functional areas such as Provision/Info, Performance, Test/Analysis, and Fault.
- Cut-Through Interface – This window appears when the user connects to a network element from the OLS Manager by selecting the cut-through option. It is a command line driven interface to the network element and requires specific knowledge of the commands in their TL1 form. One powerful feature of the cut-through interface is the scripting capability. Here the user can sequence any number of TL1 commands in a single file and have the CIT batch execute them one after the other. This is useful for provisioning large numbers of parameters at one time.

**Important!** For details on installing and setting up the CIT software and associated documentation, see *LambdaXtreme™ Transport Installation Manual and System Turn-up Services, Release 1.1.*

□

# OLS Manager

## Introduction

Once the CIT application is launched, the OLS Manager window appears. After NEs and/or OLSs have been identified on the CIT, the OLS Manager becomes the launching point for providing the CIT user the ability to interact with NEs. The OLS manager allows the user to specify which types of NEs to display.

Step-by-step instructions for using the OLS Manager via the CIT are covered in Appendix A, “Using the CIT”.

After a user has identified at least one network element, the user can perform actions on it. These include:

- Displaying the network map for the OLS to which the NE belongs.
- Logging into an NE within the maintenance subnetwork and using the CIT Node Manager to invoke CIT user functions on the NE.
- Logging into an NE within the maintenance subnetwork and issuing the appropriate TL1 command directly to the NE without use of the CIT GUI. This is called the cut-through option.

## OLS Manager Features

During a CIT session the user is able to perform the following OLS Manager functions by accessing these functions from one of the OLS Manager menus:

- Retrieve information about NEs and their associated OLSs
- Display the network map for the OLS to which the NE belongs
- Login to an NE
- Access Cut-Through option to issue TL1 commands
- Establish communications to NEs
- Search for a node.

## OLS Manager Display

The OLS Manager contains the following sections:

- Title Bar – Displays the title of the software. Also contains the window controls to minimize, maximize or close the window.
- Menu Bar – Provides access to the OLS manager functions. These menus are also accessible via keyboard shortcuts.

- Toolbar – Provides the ability to choose which OLS Map to display, filter the NEs via the Show drop down list, login to an NE, and retrieve an OLS Map.
- OLS Network Map – Displays the NEs defined for this system.
- Status Bar – Displays messages from the OLS Manager.
- Node Monitor Toolbar – Displays which NEs you are currently connected to. Provides ability to restore or disconnect a Node Manager or display the properties of the node.

## OLS Network Map

The intent of the network map that is displayed in the OLS Manager window is to give the CIT user information that is needed to help expedite the process of connecting to an NE. To find out more detailed information about an NE, the user must first log into the NE and invoke the desired function from the Node Manager menu.

The CIT OLS network map displays the following information:

- All NEs in the selected OLS. Network map information is provided for all network map icons including NE type, NE TID or alias, and any NEs that are part of the OLS map but may not be currently reachable.
- The connections between the NEs.
- Any LAN/WAN accessible gateway NEs.

□

# Node Manager

**Introduction**

The Node Manager appears once you log into a network element from the OLS Manager. From this window the user performs network management functions on the NE such as performance, fault management, provisioning, channel connection management and administration.

Step-by-step instructions for using the Node Manager via the CIT are covered in Appendix A, "Using the CIT".

The Node Manager window remains on the screen as long as the user is logged into the NE. The Node Manager screen closes when the NE login session is terminated via one of the following:

- the user disconnects from the NE
- the user manually closes the Node Manager window
- the connection with the NE is terminated due to network problems, NE reboot, logout due to session inactivity, etc.

**Node Manager Display**

The Node Manager contains the following sections:

- Title Bar – This displays the title of the software and displays the TID of the NE to which you are connected. Also contains the window controls to minimize, maximize, or close the window.
- Menu Bar – Provides access to the Node Manager functions (also available via the keyboard shortcuts). From this, the user can manage the NE and perform any of the available functions.
- Alarm Toolbar – Displays a summary of the current alarms in the system by severity including the counts for each occurrence. The user can click on this display to view more details for each alarm severity. Also displayed in the Alarm Toolbar is the date and time of the latest alarm that contributed to the alarm summary (Alarms Last Updated). This toolbar is undockable (can be separated from the Node Manager window). This is useful if more than one NE is being monitored at a time and the user would like to minimize some Node Managers while retaining the ability to monitor alarms.

- View Toolbar – Displays the buttons to access the five different views that correspond to the Node Manager functions (i.e., Equipment, Provision/Info, Performance, Test/Analysis, and Fault). The icons associated with each different view are automatically dimmed if they are not applicable for the equipment chosen in the NE Equipment Tree.
- NE Equipment Tree – This is similar to a windows explorer tree. This hierarchical display allows the user to select equipment that is part of the NE. A piece of equipment is selected by clicking on it. The alarm icon in the tree automatically becomes dimmed if the View chosen in the View Toolbar is not applicable to the associated equipment.
- Display Panel – Displays the appropriate information based on the highlighted equipment and the view. This area may display graphics, static information, or allow the user to enter data. When existing data is modified, a change gliff symbol appears next to the field that has been modified and also in the display panel tab. This indicates a change is pending but has not yet been applied.
- Status Bar – The status bar is located across the bottom of the Node Manager window and is divided into three sections. The left side of the status bar displays any messages or instructions from the Node Manager. The middle section displays the AID of the equipment selected in the tree. The right side displays the currently active view from the View Toolbar.

### NE Equipment Tree

The NE Equipment Tree allows the user to navigate through the NE equipment in a hierarchical fashion from the system level down to the port level and select a single entity from the hierarchy. The NE Equipment Tree is always displayed on the Node Manager and provides the equipment selection mechanism for all the NE management functions supported within the Node Manager window. The selection on the NE Equipment Tree is always in sync with the information displayed in the Display Panel.

When navigating the equipment tree, the following applies:

- Click on the plus sign (+) in front of the piece of equipment to expand the tree (or double-click the piece of equipment when closed).
- Click on the minus sign (-) in front of a piece of equipment to collapse the tree (or double-click the piece of equipment when open).
- Click on a piece of equipment to select it.

### Equipment Tree Hierarchy

The Equipment Tree hierarchy is as follows:

- System (Level 1) – This is the highest level on the NE Equipment Tree.
- Miscellaneous Discretes (Level 2)
- Optical Lines 1E and 1W (Level 2)
- Bay (Level 2)
- Shelf (Level 3)
- Slot (Level 4)
- Port (Level 5)

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# TL1 Cut-Through Interface

**Overview**

The CIT cut-through interface is a command line interface for issuing TL1 commands directly to the NE. This interface requires specific knowledge of TL1 commands. Step-by-step instructions for using the TL1 cut-through interface via the CIT are covered in Appendix A, "Using the CIT". For information regarding TL1 command usage via EMS, see the *Navis™ Optical Element Management System (EMS) Provisioning Guide, Release 8.0 (190-224-156R8.0).*

Note: The set of supported TL1 commands for LambdaXtreme™ Transport can be accessed by clicking on the Documentation Library icon which appears on the PC desktop once the documentation CD is installed. A link to the TL1 command library is available from the HTML page which is launched from this desktop icon. When connected to an NE, the supported TL1 commands can be viewed in the TL1 command list displayed in the TL1 cut-through interface.

The CIT user has the ability to see TL1 messages sent to the NE and the responses received from the NE. The following modes can be selected:

- Sent/Reply – Display only those commands sent to the NE and the responses received from the NE.
- Autonomous – Display only the autonomous messages received from the NE.
- All – Display all commands (includes both of the above).

**Features**

Once the CIT user invokes the cut-through function, the user has the following capabilities:

- Send commands to the NE.
- Display the TL1 response.
- Toggle logging on or off (user can specify a file name for the log).
- Start/stop the FTP server.
- Execute a script containing a sequence of commands.

Note: When using cut-through, the semi-colon character is not supported as data since it has special meaning to the TL1 commands. Therefore, semi-colons cannot be sent via the cut-through interface in any command.

## TL1 Cut-Through Functionality

The cut-through interface provides two basic modes to issue commands - interactive and scripting. Interactive mode allows the user to issue TL1 commands one at a time. Scripting mode allows the user to issue a group of TL1 commands to the NE. This is useful for provisioning large numbers of parameters at one time. The user can script any number of TL1 commands in a single file and have the CIT batch execute them one after the other.

The cut-through window is divided into the following five sections:

- TL1 Command List (Interactive mode only) – This lists the TL1 commands available for the current release of the software. The user can choose to view all the commands in an alphabetical list or a list organized by functionality. There are tabs on the command list that allow the user to choose which to display.
- OLS/TID Selection (Interactive mode only) – There are two drop down lists that allow the user to select an OLS and the TID to which the TL1 command(s) are to be sent. The TL1 command will have the TID field pre-populated with this value.
- Interactive Command Line (Interactive mode only) – This section displays a template of the TL1 command that was highlighted in the TL1 command list. The user has the opportunity to edit the parameters and add any optional parameters that are desired before pressing the Send button to send the command to the NE. The Command Line also functions as a drop down to view and select previously sent commands.
- Message Monitor – This area displays the TL1 command sent to the NE and the response from the NE. The user can choose to display only those commands sent to and the responses from the NE (Interactive tab), the autonomous messages received from the NE (Autonomous tab), or all the commands (All tab).
- Logging – This section allows the user to specify whether they want to log the communications between the CIT and the NE. It provides the user with the ability to specify which file to log the commands to and also the ability to view the log file.

## TL1 Logging

The CIT provides the ability to turn on/off a logging function that logs communications between the CIT and the NE. The CIT user has the ability to perform the following TL1 logging functions:

- Activate a TL1 message logging function.
- Choose the TL1 log file.

- View the TL1 log file.
- Toggle the TL1 logging function on/off. At the beginning of a cut-through session, the TL1 logging function is initially be set to “Off” and the TL1 log file name is set to a default.

**FTP Server**

Starting and stopping the FTP server can be performed via the CIT cut-through interface. This feature provides the user with a convenient method of launching an FTP server task which must be done prior to performing backup and restore operations or downloading software.

□

# Data Tables and Lists

**Overview** This section includes general information regarding data tables and lists available with LambdaXtreme™ Transport.

Following is an overview of the features available in the CIT data tables and lists:

- All data tables and lists in the CIT GUI contain the TID and the System Date/Time of the NE to which the information applies. All dates and times are in the format designated on the NE (SONET or SDH).
- A Report button lets the user send data to the PC browser and the user can then save the data to a file and/or print it. When the Report button is clicked, the PC's default browser is launched. For this functionality, there must be an HTML browser properly installed on the PC.
- Data tables and lists support column resizing and rearranging. The user can resize columns by placing the cursor between column headings and dragging horizontally. The user can move entire columns by dragging on the column heading.
- Data tables and lists support sorting (ascending and descending) of rows based on the values in one of the columns. The user clicks on the header of the column whose values are to be used for the sort.

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# Appendix A: Using the CIT

## Overview

**Purpose**

This section illustrates through procedural exercises, the features and capabilities of Lucent Technologies LambdaXtreme™ Transport CIT application software. The CIT provides the user with access to the command functions that are necessary to operate a newly installed NE and maintain the LambdaXtreme™ Transport OLS. The procedures in this section should prove useful when training new personnel regarding user operations on the CIT. It is strongly recommended that such training only be run with a LambdaXtreme™ Transport network/subnetwork that is out of service.

**Contents**

# Launch CIT Application

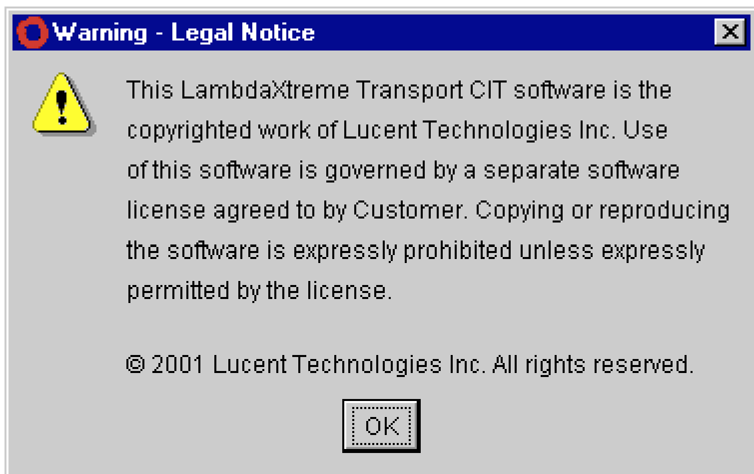
**Purpose** Bring up the LambdaXtreme™ Transport CIT application on the PC.

**Procedure**

**1** At the Windows desktop, double-click on the LambdaXtreme™ Transport CIT icon that was created when the LambdaXtreme™ Transport CIT applications software was installed.

**Result:**

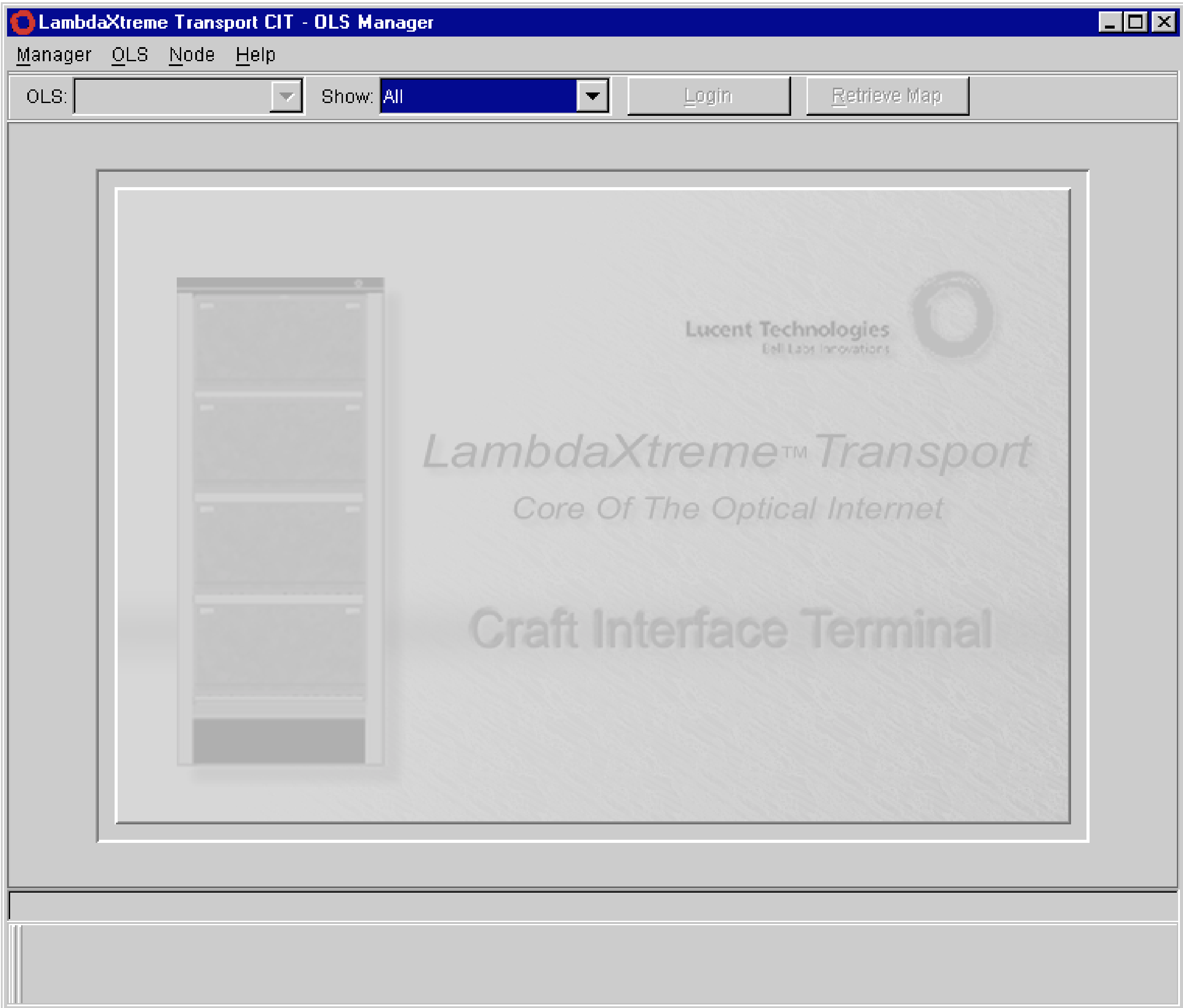
The following legal notice appears:




**2** Read the Legal Notice and click **OK.**

**Result:**

The OLS Manager window appears:




END OF STEPS

# Identify CIT Software Version

**Purpose** To determine the version of the LambdaXtreme™ Transport CIT software currently being used.

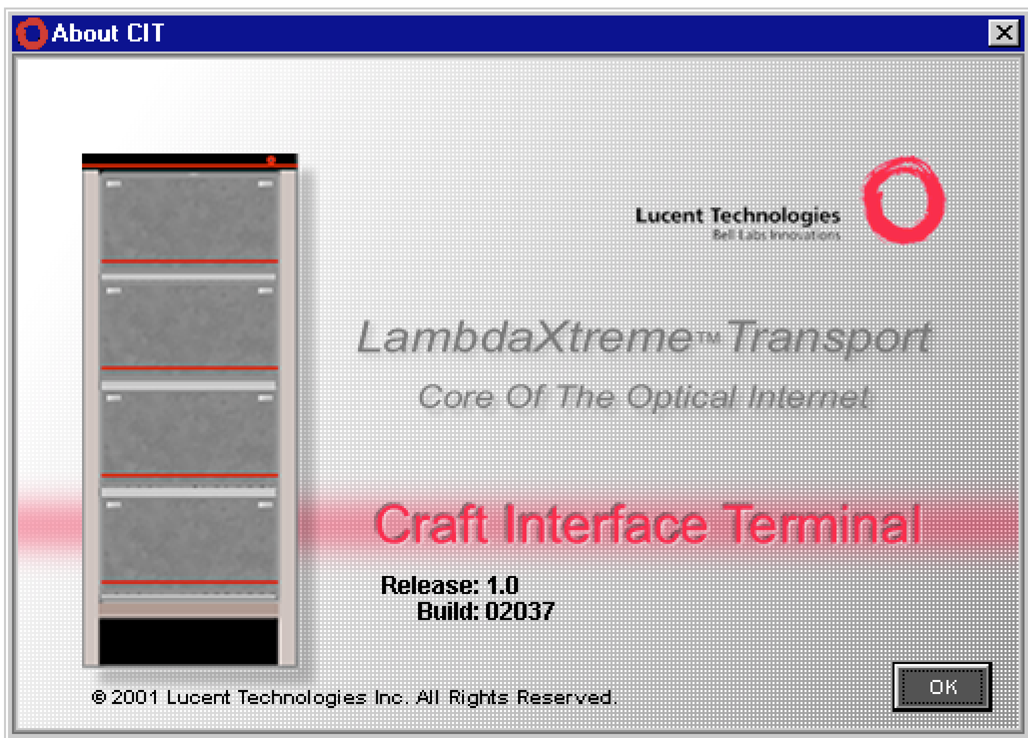
**Procedure**

1. From the OLS Manager menu, select **Help > About LambdaXtreme Transport CIT.**

   Note: When logged into an NE, this procedure can also be performed from the Node Manager menu.

   **Result:**

   The following window is displayed with the CIT software Release and Build information:




2. Click **OK** to close the window.

END OF STEPS

# Install Initial NE Software

**Purpose** Copy the NE software generic (executable code and data) from the CIT-PC to the FMM for use by the NE.

**Procedure**

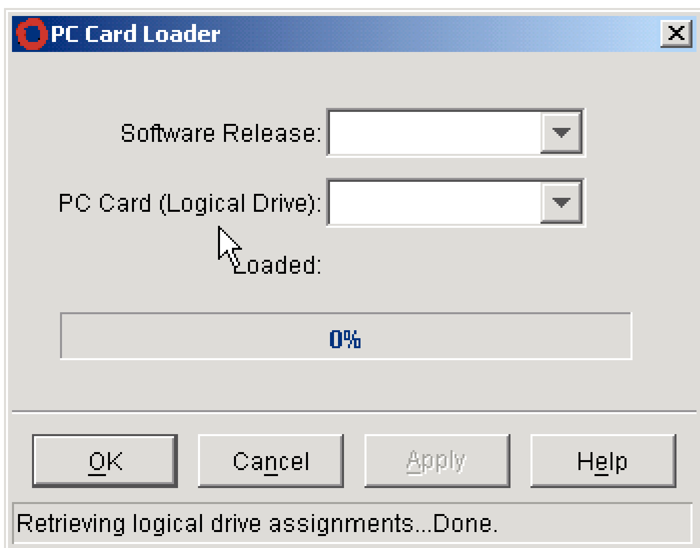
**1** Insert the FMM into the PCMCIA slot on the CIT PC.

Note: See the LambdaXtreme™ Transport Software Release Description, Release 1.0 (C109163642) for formatting information.

**2** From the OLS Manager menu, select **Manager > PC-Card Loader...**

**Result:**

The PC Card Loader window appears:



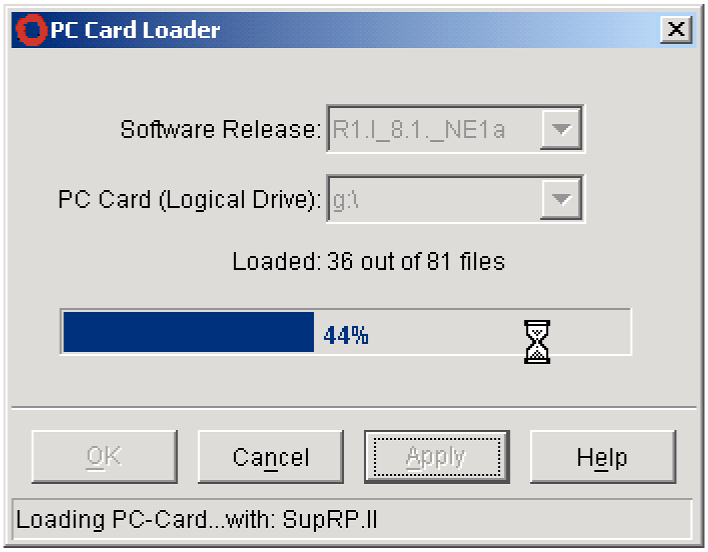

**3** Make the appropriate selections for Software Release and Logical Drive.

**Result:**

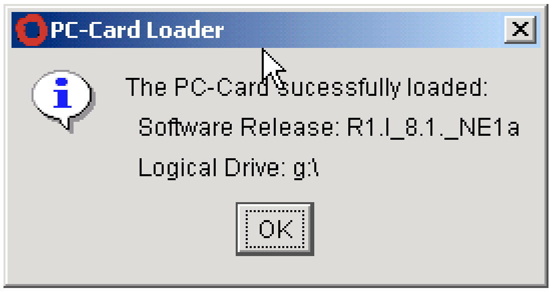
**4** Click **OK** or **Apply.**

**Result:**

The progress bar displays the progress of the Copy operation.




When finished, the following window appears:




**5** Click **OK.**

**6** Remove the FMM from the CIT. Insert the FMM into the slot on the NCTL and the software will automatically be used on the NE.

END OF STEPS

# Access Node

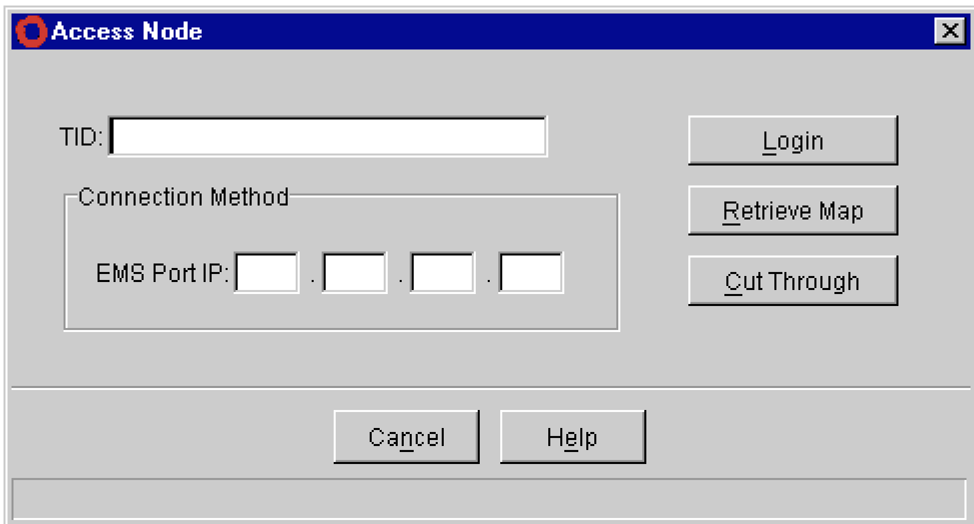
**Purpose** Define access to a node. (Necessary only if accessing the NE via the LAN/WAN).

**Procedure**

**1** From the OLS Manager menu, select **OLS > Access Node...**

**Result:**

The Access Node window appears:




**2** Enter the appropriate information in this window.

**3** Click **Login** to connect to the node (see “Log Into Node” (A-34)), or click **Retrieve Map** to update the graphical map of the OLS that contains the node (see “Retrieve OLS Map” (A-14)), or click **Cut Through** to start a Cut Through interface to the node (see “Execute Commands Interactively via TL1 Cut Through” (A-28)).

END OF STEPS

# Disconnect Node

**Purpose** Disconnects from selected node(s) that the user is currently logged into.

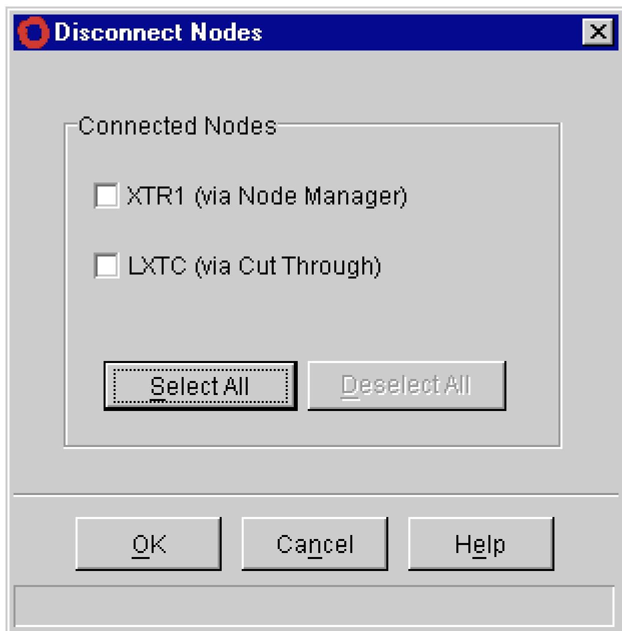
Note: You can also disconnect from a node by right-clicking the NE in the Node Monitor, or by selecting **File > Disconnect** from the Node Manager menu.

**Procedure**

**1** From the OLS Manager menu, select **Node > Disconnect...**

**Result:**

The Disconnect Nodes window appears:




**2** Select the node(s) to be disconnected. Click **OK.**

**Result:**

The node is disconnected and the user is returned to the OLS Manager.

END OF STEPS

# Assign/Unassign Gateway Nodes

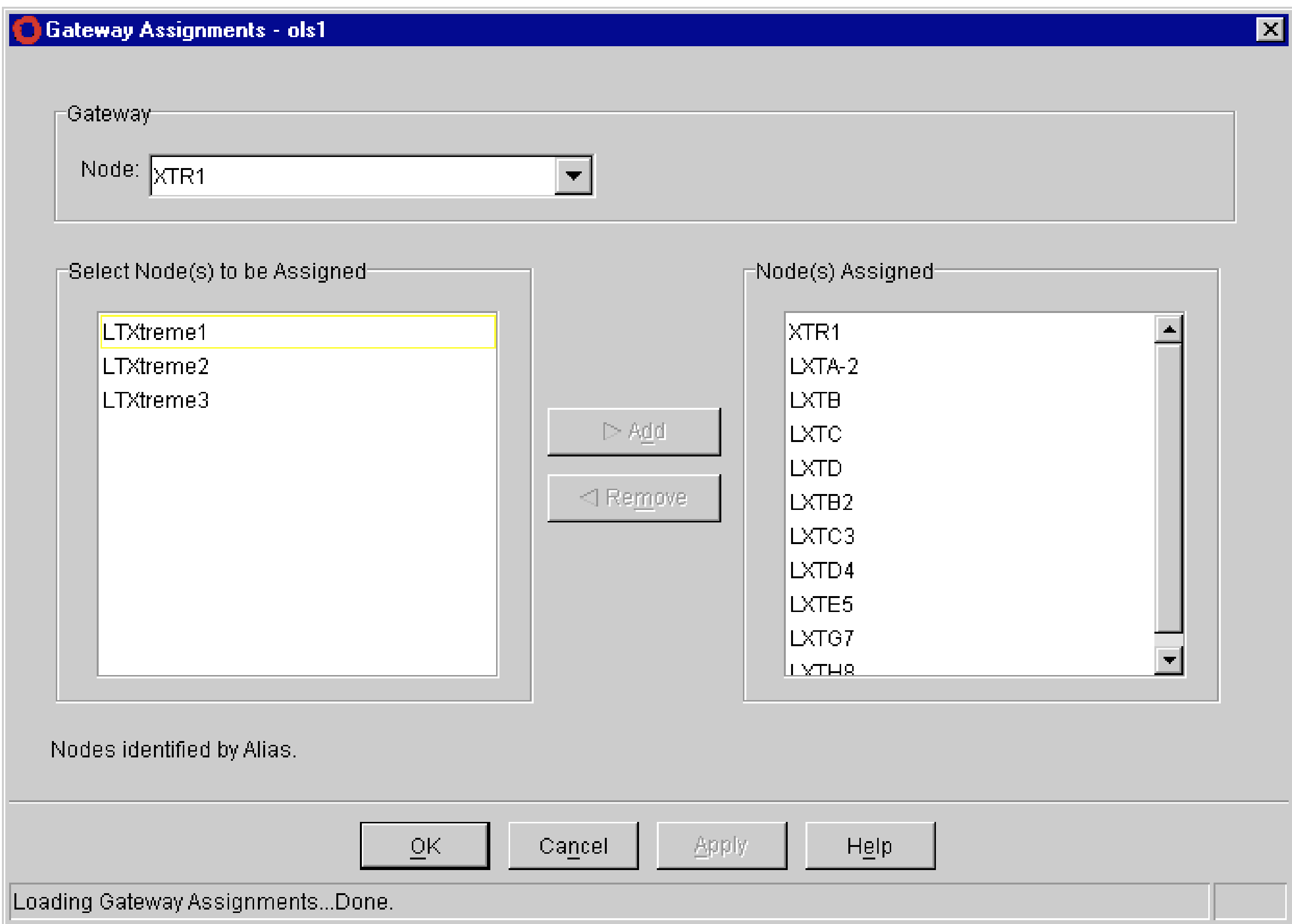
**Purpose** To define access to nodes that do not have an IP address and to which you are not currently connected. These nodes can only be accessed through a Gateway node.

**Procedure**

**1** From the OLS Manager menu select **OLS > Gateway Assignments**

**Result:**

The Gateway Assignments window appears:




**2** Select the gateway by clicking the down arrow next to the Node field and clicking on the appropriate selection from the drop down list.

**3** Select the Node(s) to be assigned to the selected gateway by clicking on the TID (or Alias) in the list. The **Ctrl** key and **Shift** key can be used along with the mouse in order to make multiple selections.

**4** Click on the **Add** button to move the selected Node(s) over to the Assigned list.

**Result:**

The selected Node(s) appear in the Assigned list and the **Apply** button is enabled.

**5** Click **OK** or **Apply** to have the assignments take effect.

**6** To unassign a Node(s), select the TID (or Alias) from the assigned list and click on the **Remove** button. Then click on the **OK** or **Apply** button.

Note: Nodes will be displayed by their TIDs or aliases based on the Preferences settings (see "Set OLS Manager Preferences" (A-18).

END OF STEPS

# Retrieve OLS Map

**Purpose** Display all NEs in the OLS map that contains the NE where the command is issued.

**Procedure**

**1** In the OLS Manager, select the desired node by clicking on its icon.

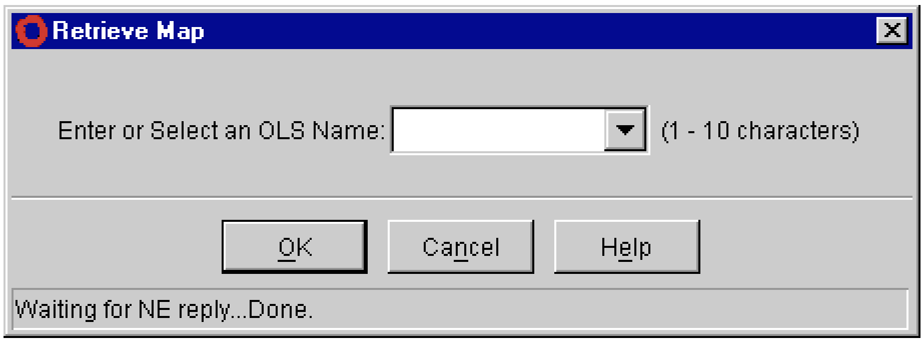
**Result:**

The **Login** and **Retrieve Map** buttons become enabled (only if access is defined - see "Assign/Unassign Gateway Nodes" (A-12).

**2** Click on the **Retrieve Map** button. You can also perform this by selecting **Node > Retrieve Map** from the OLS Manager menu.

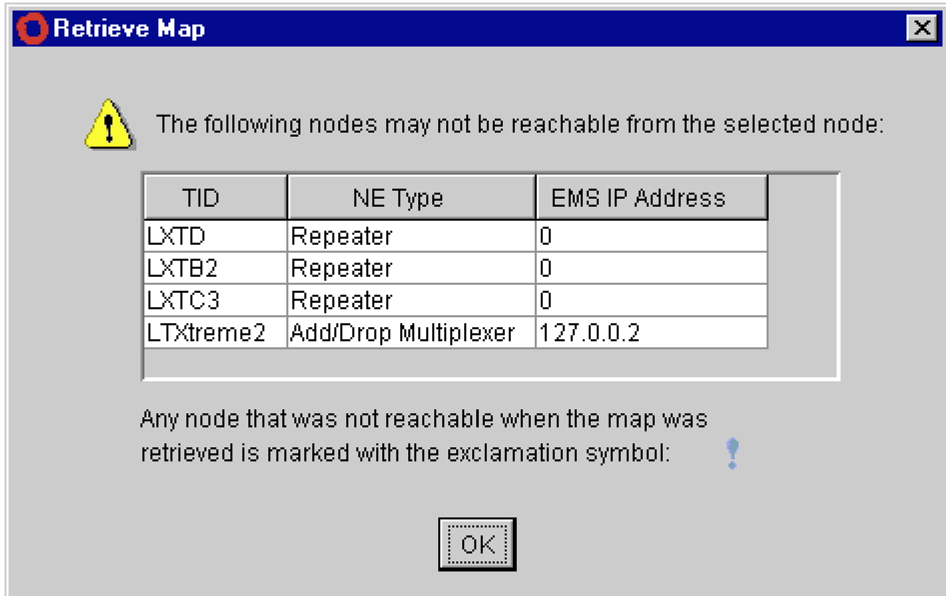
**Result:**

The Retrieve Map window appears:




**3** Enter an OLS name or select one from the drop down list. Click on **OK.**

If certain nodes are not reachable from the selected node, the following window will appear:

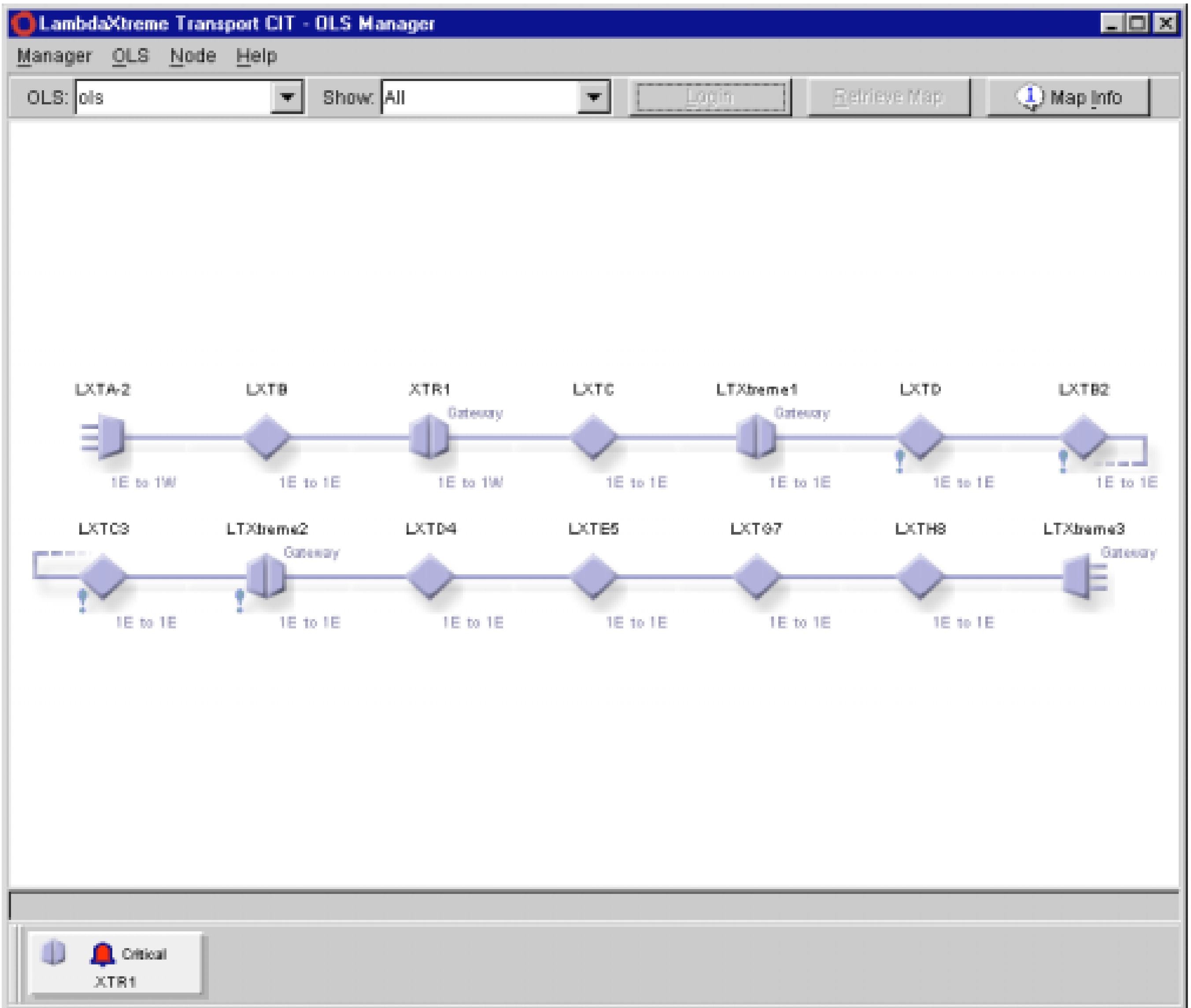



Click **OK.**

**Result:**

The Retrieve Map process is complete and you are returned to the OLS Manager window which displays the newly retrieved

OLS map. The OLS selection will be set to the value specified in the Retrieve Map dialog.

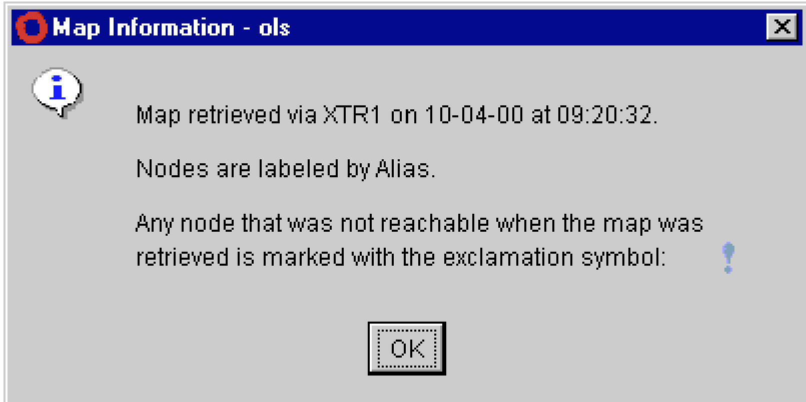



Note: The OLS Manager allows you to specify which type(s) of NEs are displayed in the OLS map. To filter the NE display, select the desired NE type from the **Show:** drop down list.

**4** To view map information click the Map Info button.

**Result:**

The following Map Information window appears:




END OF STEPS

# Set OLS Manager Preferences

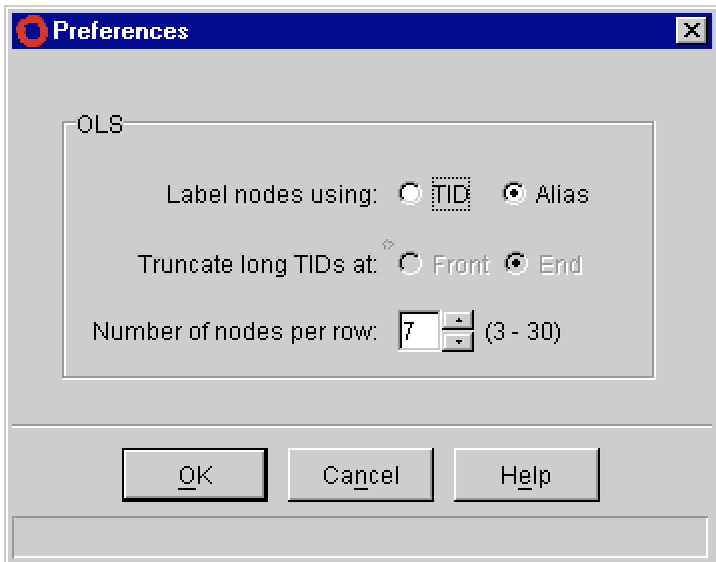
**Purpose** Use this procedure to specify how the CIT displays the OLS Map in the OLS Manager.

**Procedure**

**1** From the OLS Manager menu, select **Manager > Preferences...**

**Result:**

The Preferences window appears:




Note: To define Aliases, see "View/Edit Node Properties" (A-27)
.

**2** Specify the OLS Manager preferences to be used.

**3** Click **OK.**

END OF STEPS

# View OLS Details

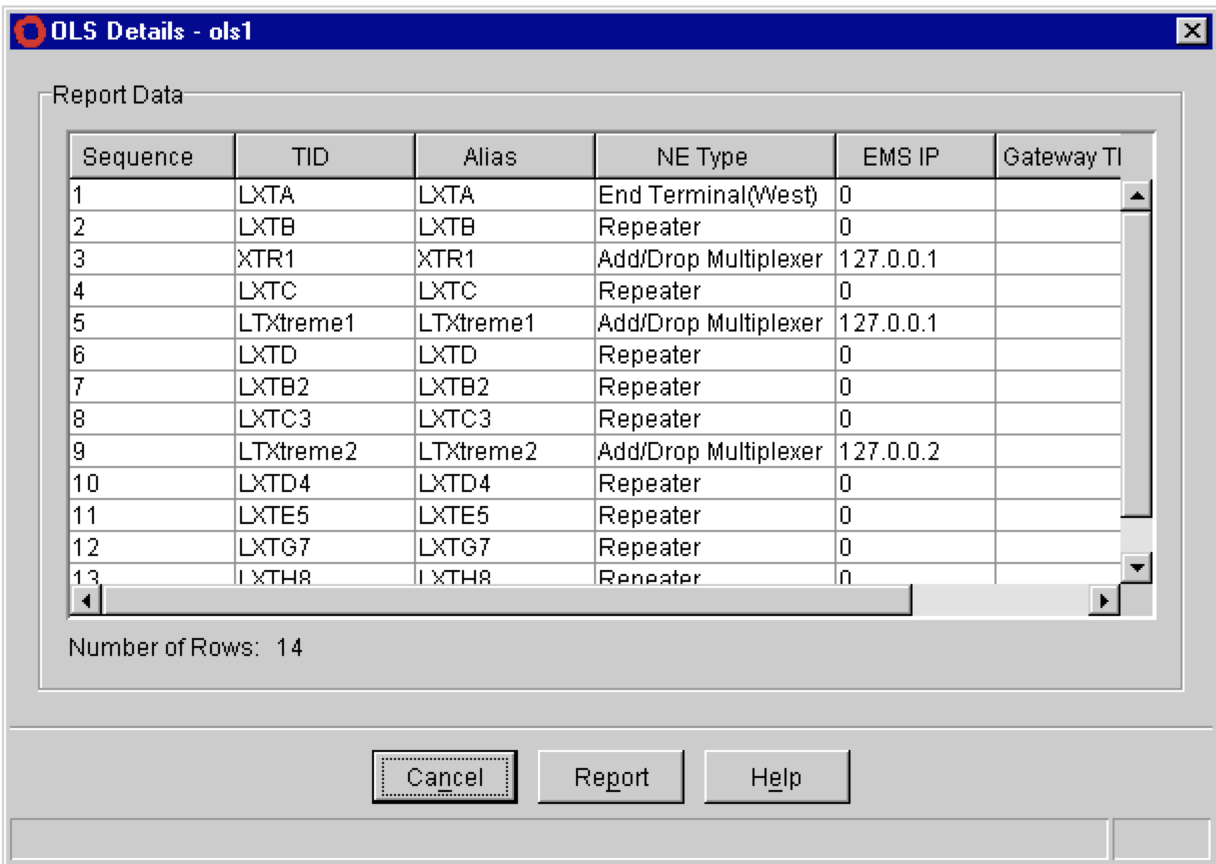
**Purpose** Display a report listing all NEs in the OLS currently selected in OLS Manager.

**Procedure**

**1** From the OLS Manager menu, select **OLS > Details.**

**Result:**

The OLS Details window appears.




**2** To close the OLS Report window, click on **Cancel** or **X.**

END OF STEPS

# Rename OLS

**Purpose** Change the OLS name for an existing OLS map.

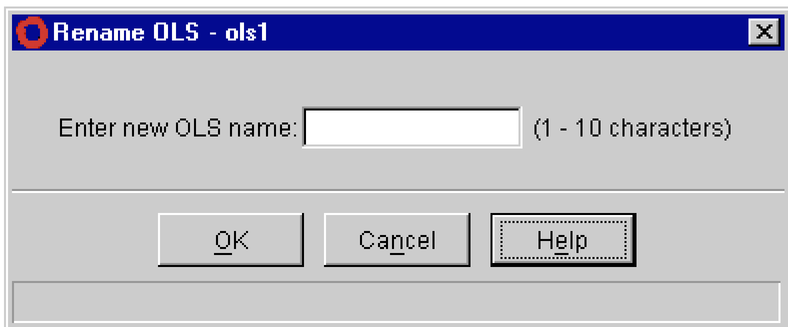
**Procedure**

**1** Select the OLS to be renamed from the **OLS** field drop down list.

**2** From the OLS Manager menu, select **OLS > Rename...**

**Result:**

The Rename OLS window appears:




**3** Enter the new OLS name.

**4** Click **OK.**

**Result:**

The specified OLS is renamed and the OLS selection is set to the new value.

END OF STEPS

# Delete OLS

**Purpose** Delete an existing OLS map that is no longer needed/applicable.

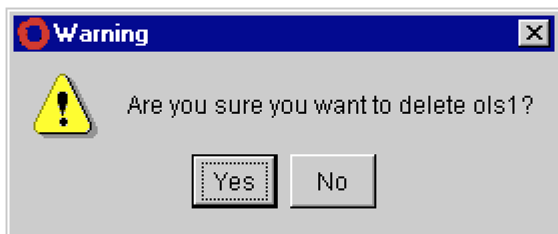
**Procedure**

**1** Select the OLS to be deleted from the **OLS** field drop down list.

**2** From the OLS Manager menu, select **OLS > Delete.**

**Result:**

The following warning appears:




**3** Click **Yes.**

**Result:**

The specified OLS is deleted and the user is returned to the OLS Manager.

END OF STEPS

# Export OLS Map Information

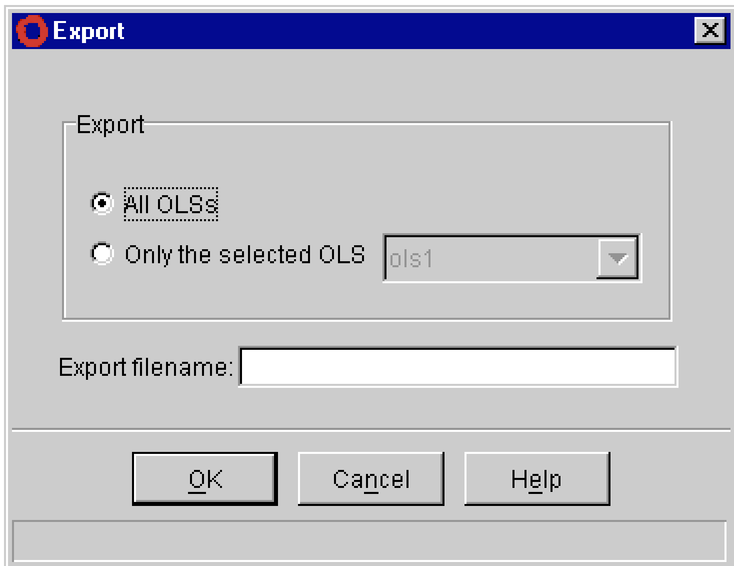
**Purpose** Save OLS network map information that can then be read in using the "Import OLS Map Information" (A-23) function.

**Procedure**

**1** From the OLS Manager menu, select **Manager > Export...**

**Result:**

The Export window appears:




**2** Select the OLS(s) to be exported and specify the **Export filename** to be used.

**3** Click **OK.**

**Result:**

The file is saved to a predetermined directory (*lx_xportcit/workspace* on the same drive where the CIT is installed) using the specified filename. The information can then be read in using the "Import OLS Map Information" (A-23) function. The file may be transferred to other CIT PCs as needed.

END OF STEPS

# Import OLS Map Information

**Purpose**

Import a file containing OLS network map information. The file must have been created previously using the "Export OLS Map Information" (A-22) function.

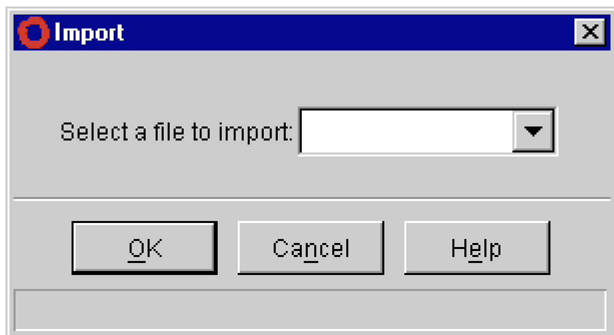
Note: The execution of the Import function may cause existing OLS information to be replaced.

**Procedure**

**1** From the OLS Manager menu, select **Manager > Import...**

**Result:**

The Import window appears:




**2** Select an existing file from the drop down list and click **OK.**

END OF STEPS

# Node Search

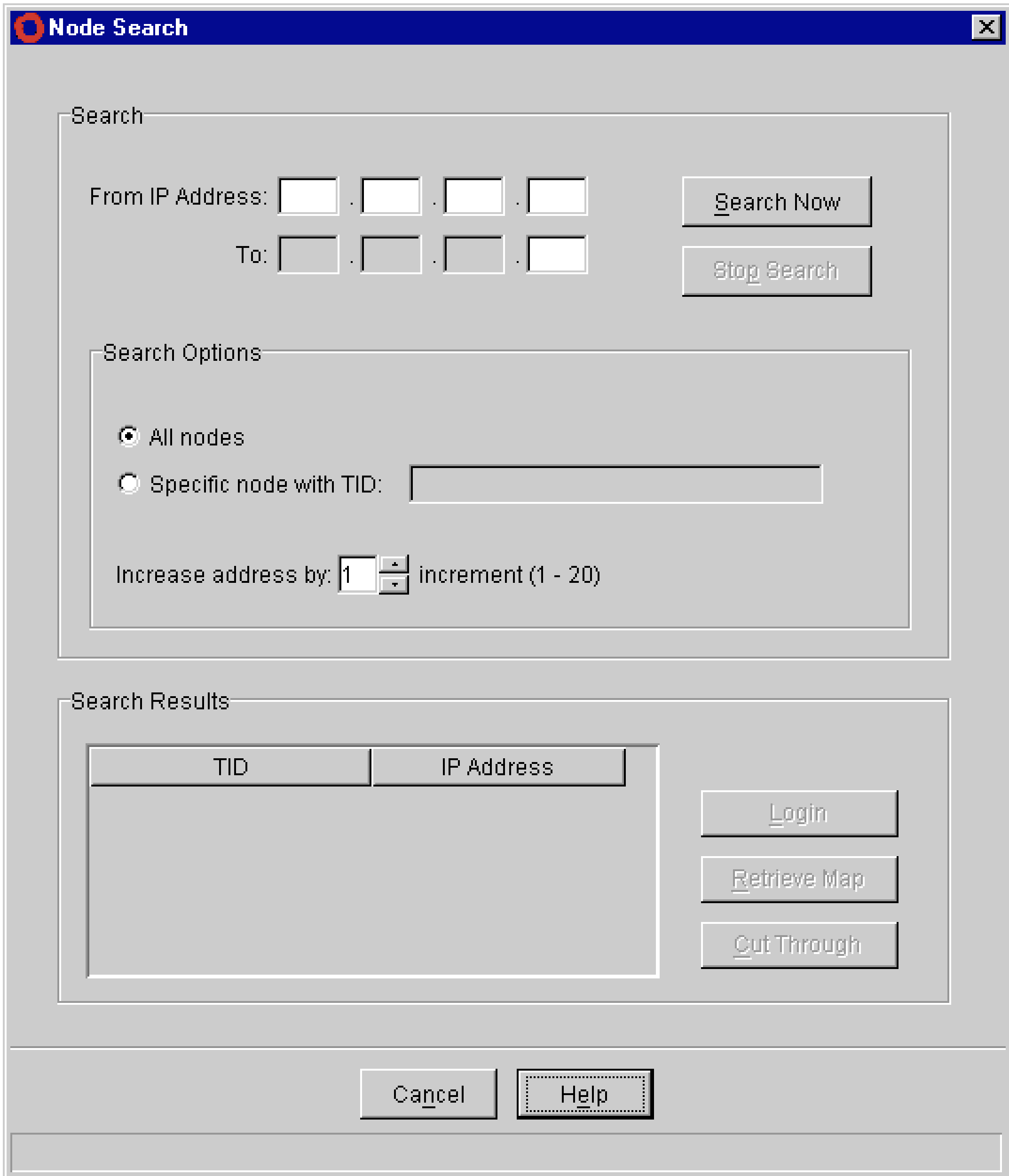
**Purpose** Search for a node(s) on all LANs that the CIT PC has access to.

**Procedure**

**1** From the OLS Manager menu, select **Node > Search...**

**Result:**

The Node Search window appears:




**2** Enter the IP Address Range and Search Criteria. Click **Search Now.**

**Result:**

The search results appear.

**3** Click on the desired node in the Search Results list. Then click **Login** to connect to the node (see "Log Into Node" (A-34)), or click **Retrieve Map** to update the graphical map of the OLS that contains the node (see "Retrieve OLS Map" (A-14)), or click **Cut Through** to start a Cut Through interface to the node (see "Execute Commands Interactively via TL1 Cut Through" (A-28)).

END OF STEPS

# View/Edit Node Properties

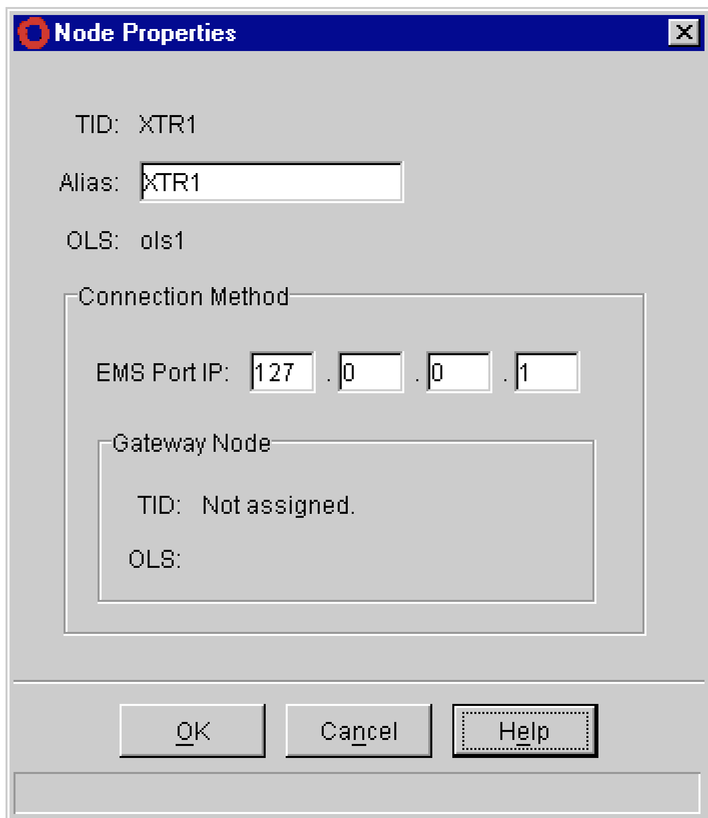
**Purpose** To view/edit properties of existing nodes and to define new gateway nodes by specifying the values used to connect to the node (the connection method).

**Procedure**

**1** From the OLS Manager, click on the desired node to select it. From the OLS Manager menu select **Node > Properties...** or right-click on the desired node and select **Properties...**

**Result:**

The Node Properties window appears:




**2** After information has been entered or viewed, click on **OK** to apply changes and return to the OLS Manager.

END OF STEPS

# Execute Commands Interactively via TL1 Cut Through

**Purpose**

To execute a TL1 command on an interactive basis directly to the NE.

Note: The set of supported TL1 commands for LambdaXtreme™ Transport can be accessed by clicking on the Documentation Library icon which appears on the PC desktop once the documentation CD is installed. A link to the TL1 command library is available from the HTML page which is launched from this desktop icon.

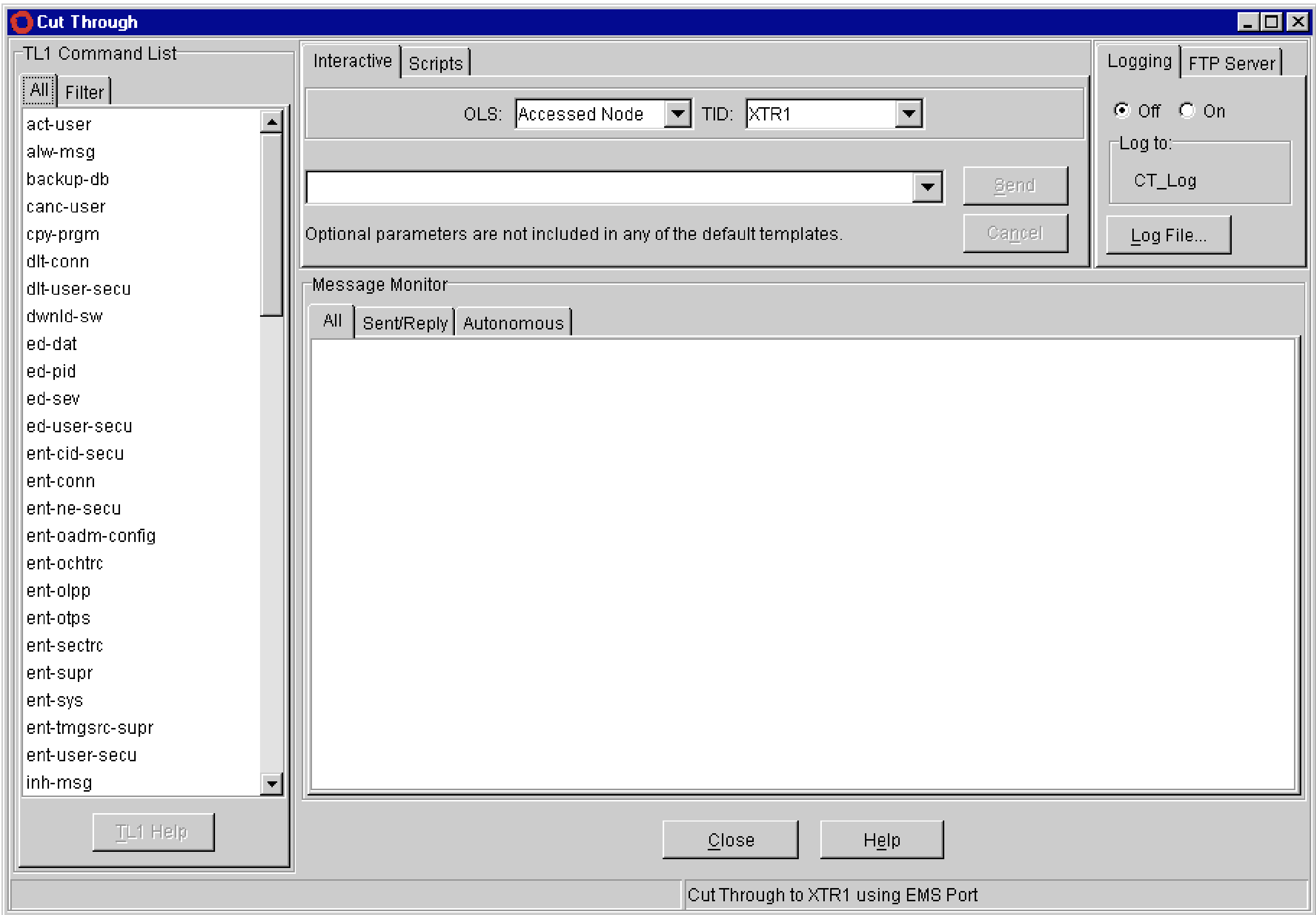
**Important!** When using cut-through, the semi-colon character is not supported as data since it has special meaning to the TL1 commands. Therefore, semi-colons cannot be sent via the cut-through interface in any command.

**Procedure**

1. In the OLS Manager, click the desired node to select it. From the menu select **Node > Cut Through...** or right-click on the node icon and select **Cut Through...**

**Result:**

The Cut Through window is displayed:




**2** From the Cut Through window, select the desired **OLS** and **TID** from the drop down list(s) and click (highlight) the appropriate selections. Be sure that the **Interactive** tab (not the Scripts tab) is selected.

**3** Click on the desired command from the TL1 Command List.

**Result:**

The TL1 template for the selected command is displayed. Insert your desired parameters into the template. TL1 syntax and guidance is obtained by clicking **TL1 Help.**

The two button tabs (All, Filter) located at the top af the TL1 Command List panel can be used to modify the list. The purpose of these are as follows:

- **All –** This shows all of the TL1 commands available for selection.
- **Filter** – This allows the user to filter the list by checking or unchecking the desired boxes. The Filter field can also be used to enter a command or part of a command to filter the list.

**4** Click on the **Send** button.

**Result:**

When the command is executed, the command information is displayed in the Message Monitor.

Other available features in this window include:

- Information can be recorded in a Log File by clicking the “On” box under Logging. The Log File is set or viewed by clicking the **Log File...** button.
- The FTP server can be started/stopped by clicking the **FTP Server** tab and then clicking **Start** or **Stop.** Server information can be viewed by clicking **Info.**
- **Sent/Reply, Autonomous, or All** messages can be selected for display in the Message Monitor by clicking the desired tab above the Message Monitor.

**5** To close the Cut Through window, click on **Close.**

END OF STEPS

# Run Scripts via TL1 Cut Through

**Purpose** To script any number of TL1 commands in a single file and batch execute them all one after the other. This is useful for provisioning large numbers of parameters at one time.

**Procedure**

1 In the OLS Manager, click the desired node to select it. From the menu select **Node > Cut Through...** or right-click on the node icon and select **Cut Through...**

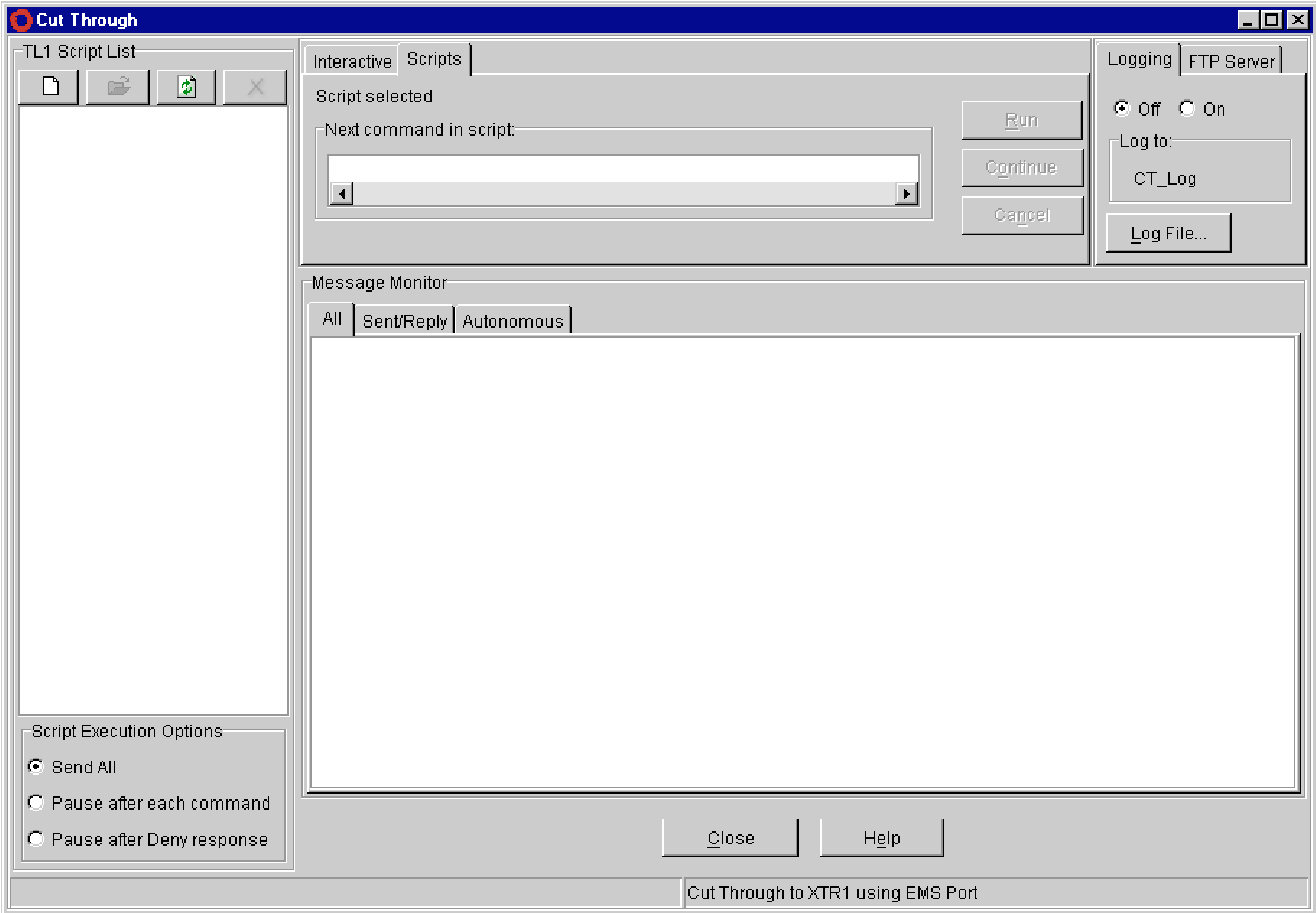
**Result:**

The Cut Through window is displayed.

2 Click on the **Scripts** tab.

**Result:**

The Cut Through window is displayed in scripting mode:




**3** Create a new script which can then be executed, or select the desired script from the TL1 script list.

**4** Click the **Run** button.

**Result:**

The execution of the commands is displayed in the Message Monitor as the script is run.

The four icons located at the top af the TL1 Script List panel are used as follows:

- **Left icon (New)** – Click this to create a new script (a Notepad window opens).
- **Second to left icon (Open)** – Click this to open the selected (highlighted) script from the list (a Notepad window opens).
- **Second to right icon (Refresh)** – Click this to refresh the list after a new script has been created.
- **Right icon (Delete)** – Click this to remove selected (highlighted) script files that are not needed.

The user has the ability to select **Send All, Pause after each command, or Pause after Deny response** during command execution.

**5** To close the Cut Through window, click on **Close.**

END OF STEPS

# Log Into Node

**Purpose** Log into a node to perform network management functions on the NE.

**Procedure**

1 First make sure an access method is defined (see "Assign/Unassign Gateway Nodes" (A-12)). In the OLS Manager, select the desired node by clicking on its icon. Click on the **Login** button. You can also login by selecting **Node > Login...** from the OLS Manager menu, or by double-clicking or right-clicking on the node icon.

**Result:**

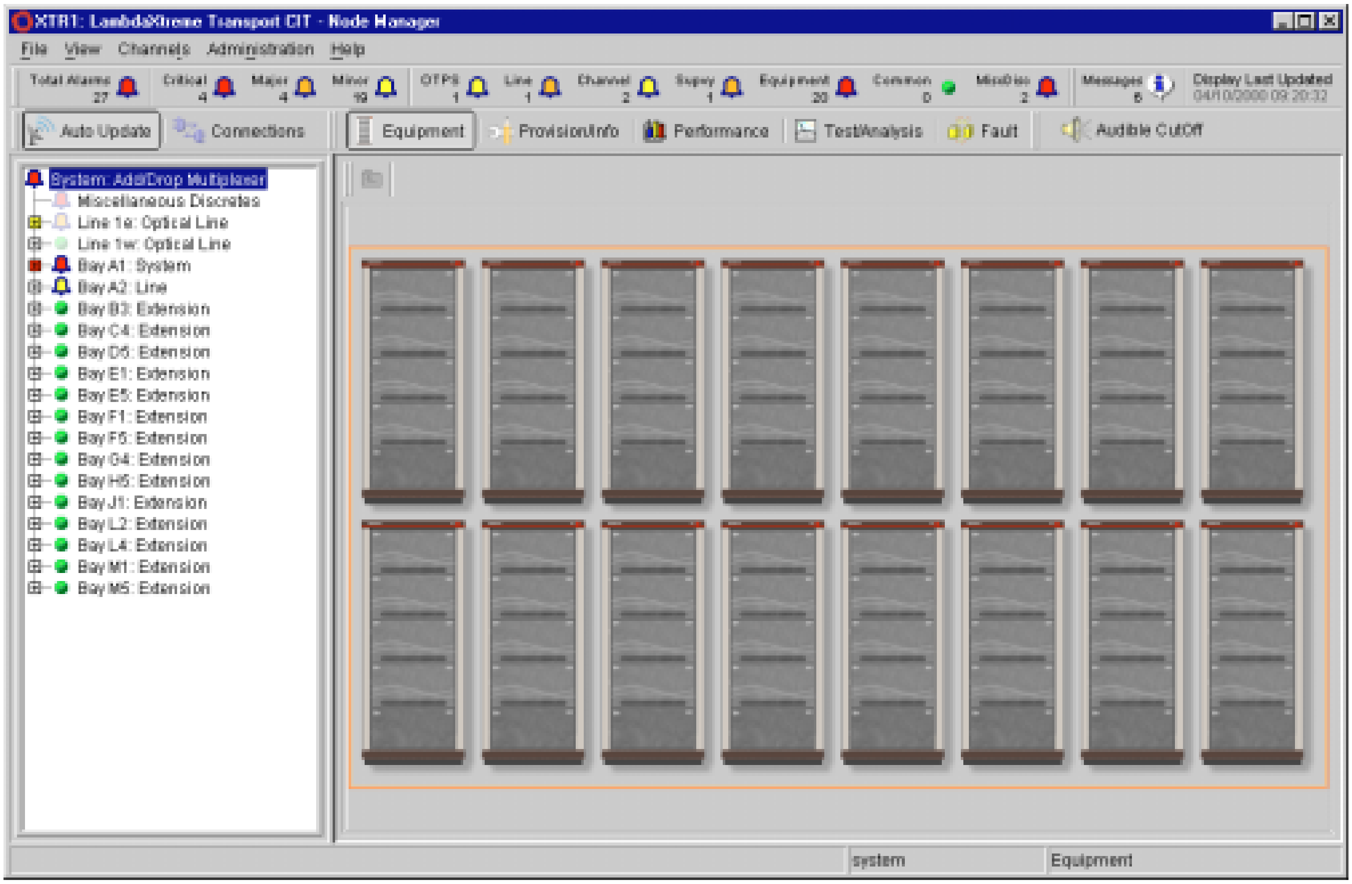
The Login window is displayed.


2 Enter **User ID** and **Password** information (this is case sensitive). Click on **OK.**

Note: If **Save User ID and Password** is checked, the User ID and Password are retained (only during this session of the OLS Manager) for subsequent NE logins.

**Result:**

The Node Manager window appears:




E N D  O F  S T E P S

☐

# Access the Equipment View in Node Manager

**Purpose** Display a graphical representation of the equipment selected in the Equipment Tree.

**Procedure**

**1** Click the **Equipment** button on the View Toolbar in the Node Manager. This can also be accessed from the Node Manager menu by selecting **View > Equipment.**

Note: The Equipment View is the default view that appears when you log into a node.

**Result:**

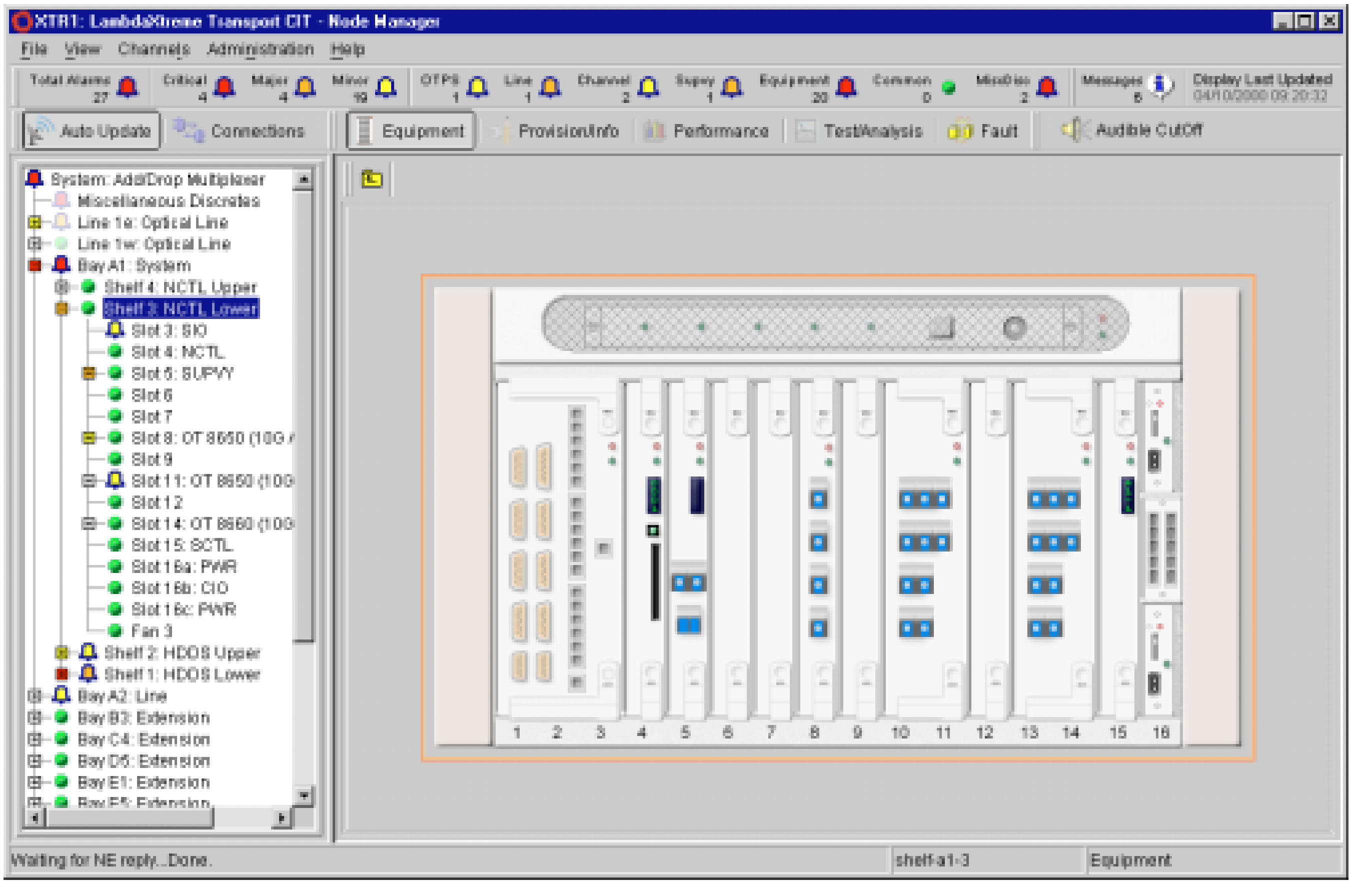
The Equipment View appears in the display panel of the Node Manager.

**2** When equipment is selected in the Equipment Tree, the Equipment View displays a graphical representation (when available) of the selected equipment.

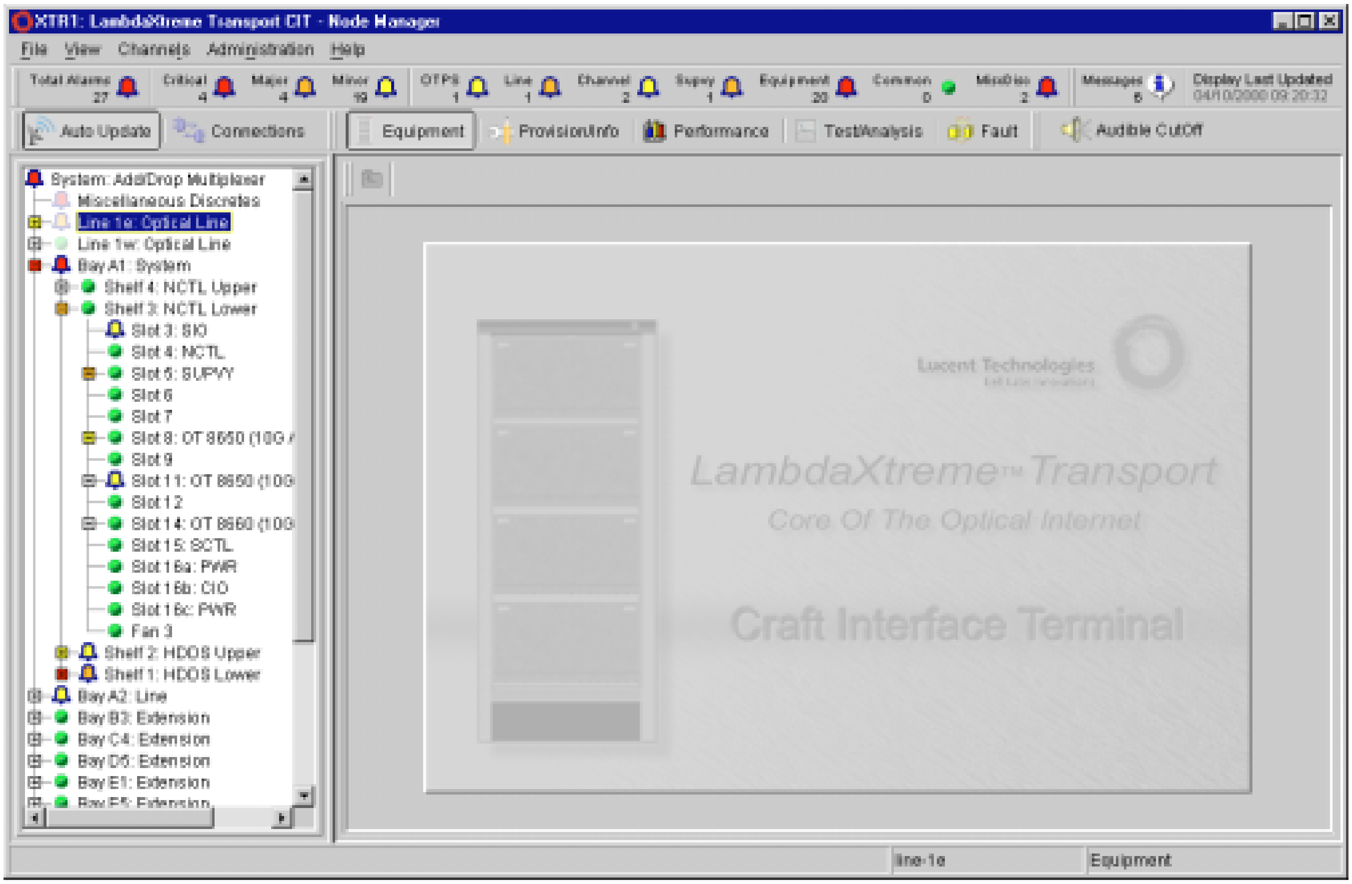
Note: When System or Bay level equipment (see "NE Equipment Tree" (7-7)) is graphically displayed, the user can click on specific equipment in the graphic to display it. If the selected equipment is open (expanded) in the Equipment Tree, it is displayed with a single click. If it is not open in the Equipment Tree, double-clicking displays it. As more detailed equipment is selected in the Equipment Tree hierarchy, the piece of equipment becomes outlined in the display in order to identify it.

**Result:**

The following is an example:



The following shows the display for equipment selection that has no graphical representation.




END OF STEPS

☐

# Access the Provision/Info View in Node Manager

**Purpose** Set or view provisioning parameters for the NE or for the piece of equipment selected in the Equipment Tree.

**Procedure**

**1** Click the **Provision/Info** button on the View Toolbar in the Node Manager. This can also be accessed from the Node Manager menu by selecting **View > Provision/Info.**

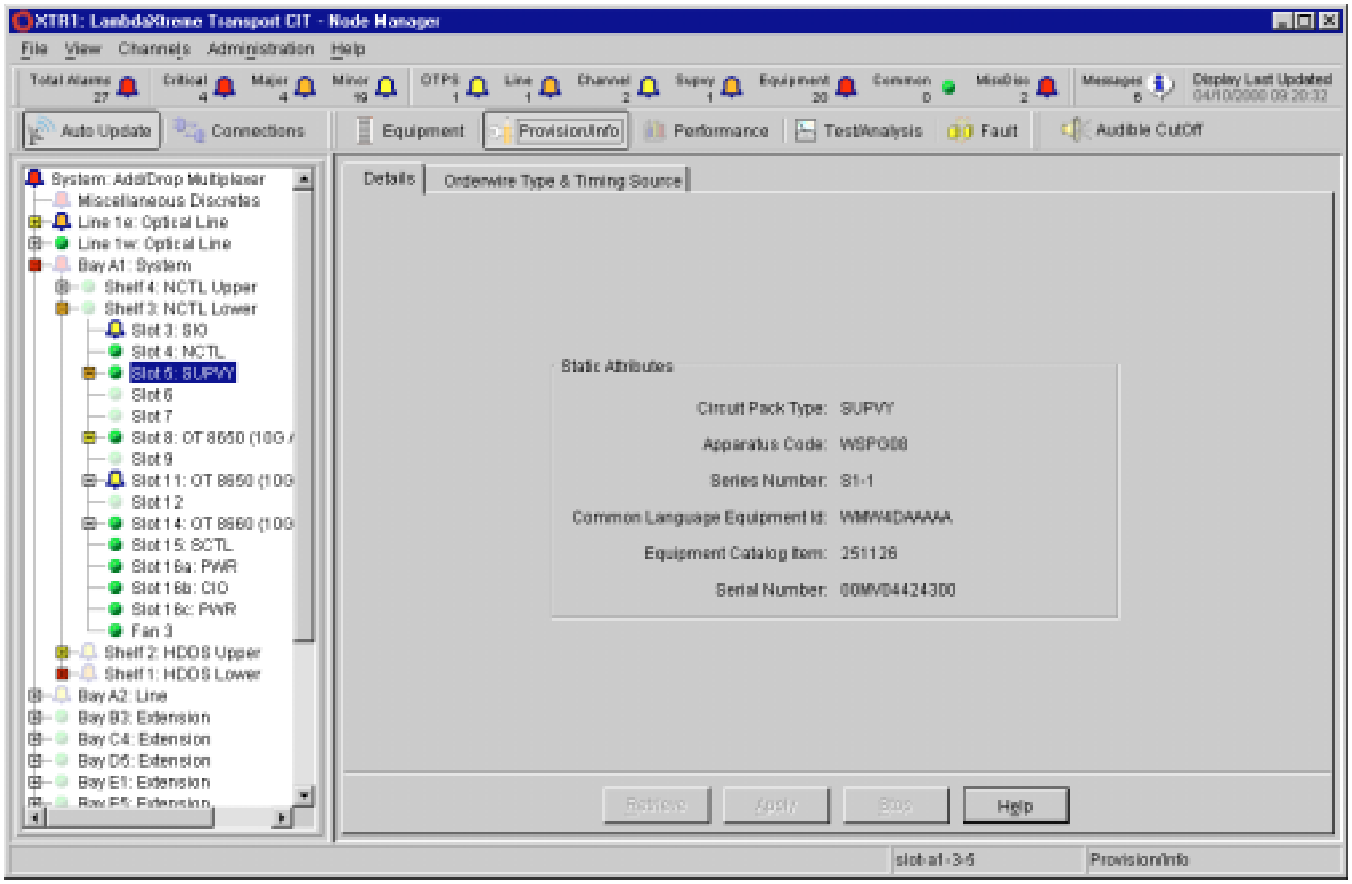
**Result:**

The Provision/Info View appears in the display panel of the Node Manager.

**2** As equipment is selected in the Equipment Tree, the Provision/Info View offers details and/or other Provision/Info options (when available) for the selected equipment.

**Result:**

The following is an example:

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**3** The available option(s) for the selected equipment are chosen from the tab(s) at the top of the display panel.

END OF STEPS

---

# View System Details

**Purpose** Display the provisioned information for the NE.

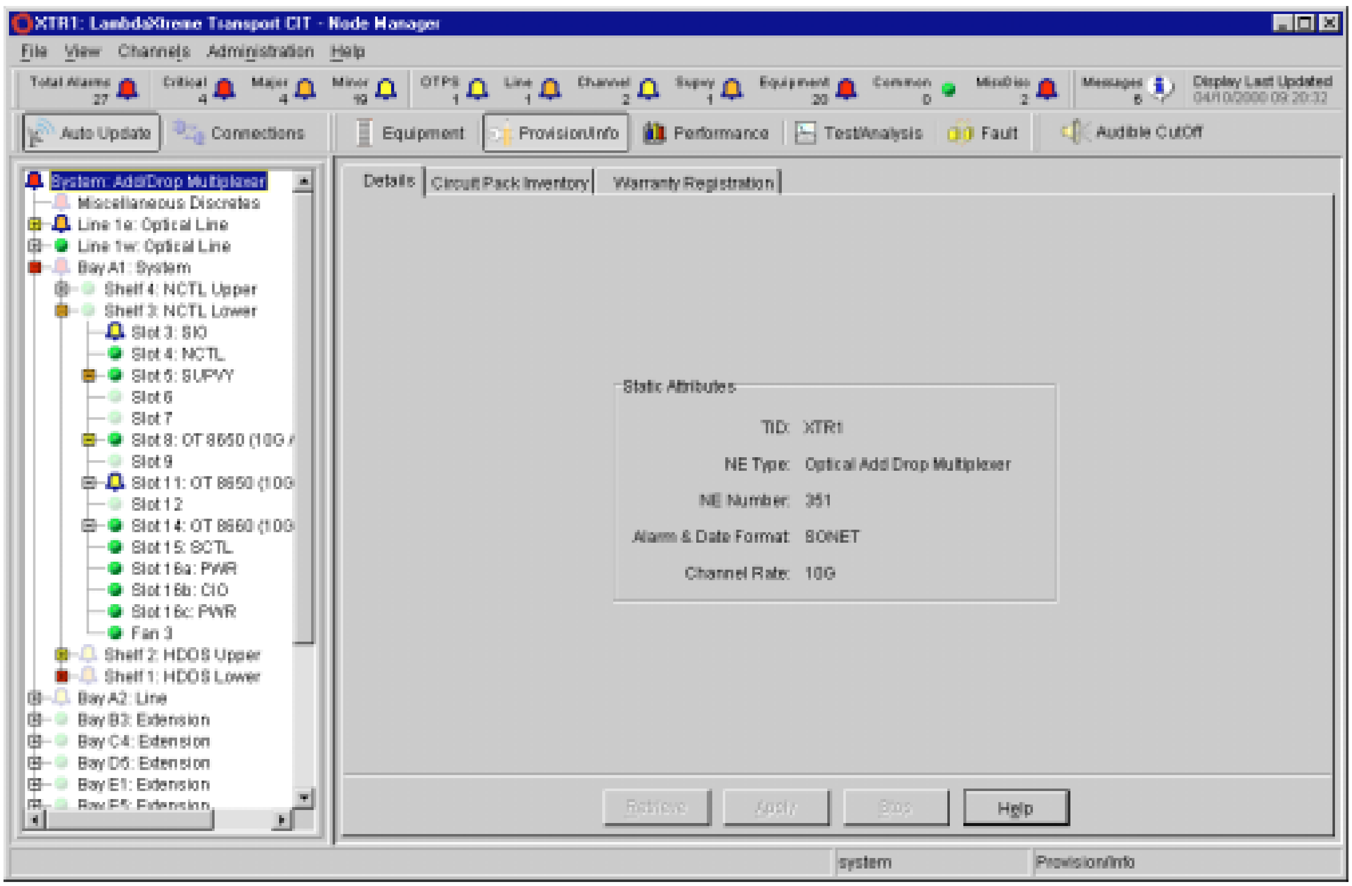
**Procedure**

**1** "Access the Provision/Info View in Node Manager" (A-39).

**2** Select the System (highest level) in the Equipment Tree. Click on the **Details** tab in the display panel.

**Result:**

The System Details window appears:




END OF STEPS

# Provision Optical Line Settings

**Purpose** Provision parameters associated with an optical line.

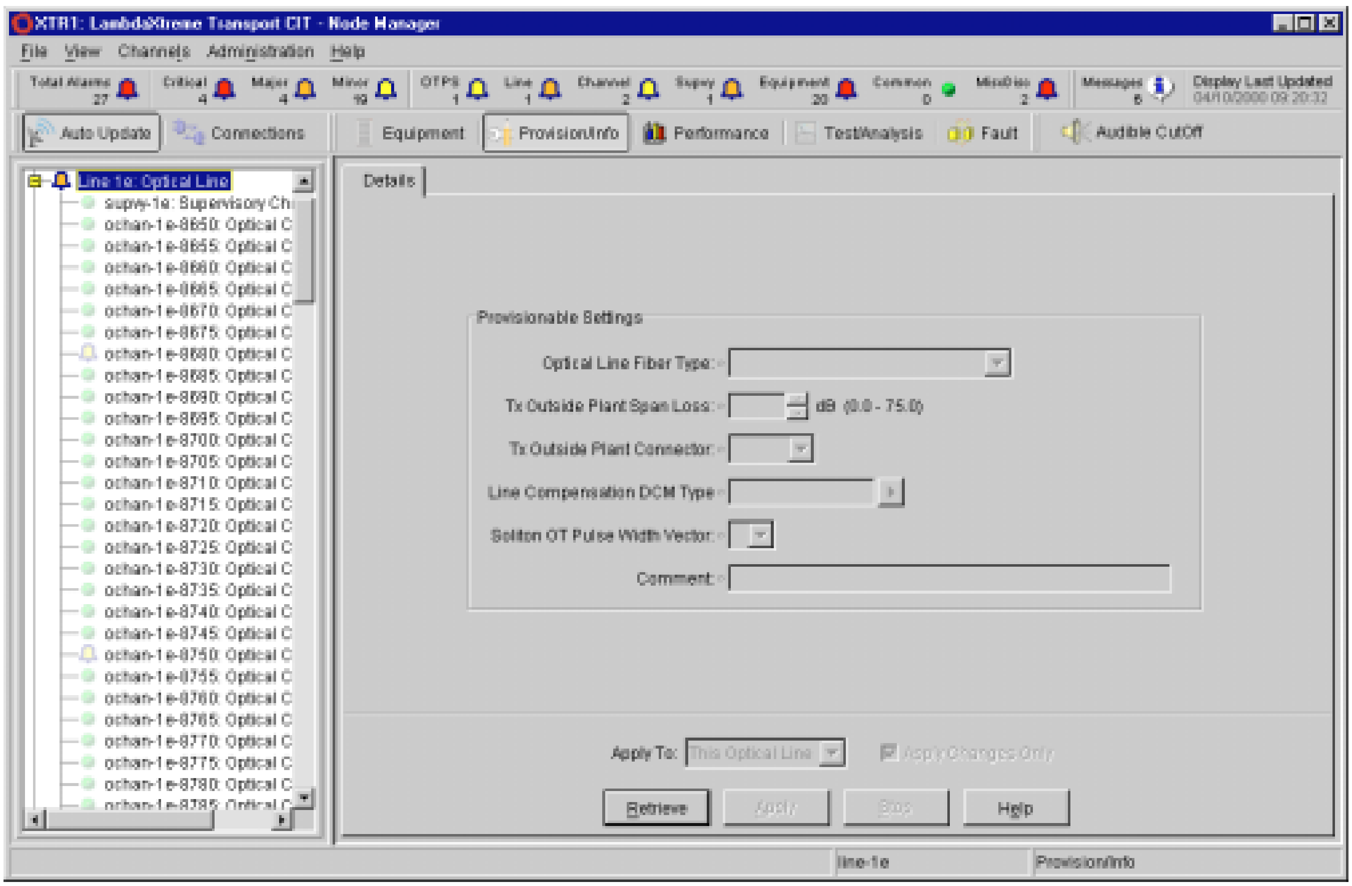
**Procedure**

**1** [“Access the Provision/Info View in Node Manager” (A-39)](#).

**2** From the Equipment Tree, select the Optical Line to be provisioned. Click on the **Details** tab in the display panel.

**Result:**

The Optical Line Details window appears:




**3** Click the **Retrieve** button to display the currently provisioned data. Make the appropriate selections and click **Apply.**

E N D O F S T E P S

# View Circuit Pack Details

**Purpose** Display the equipage information for a circuit pack.

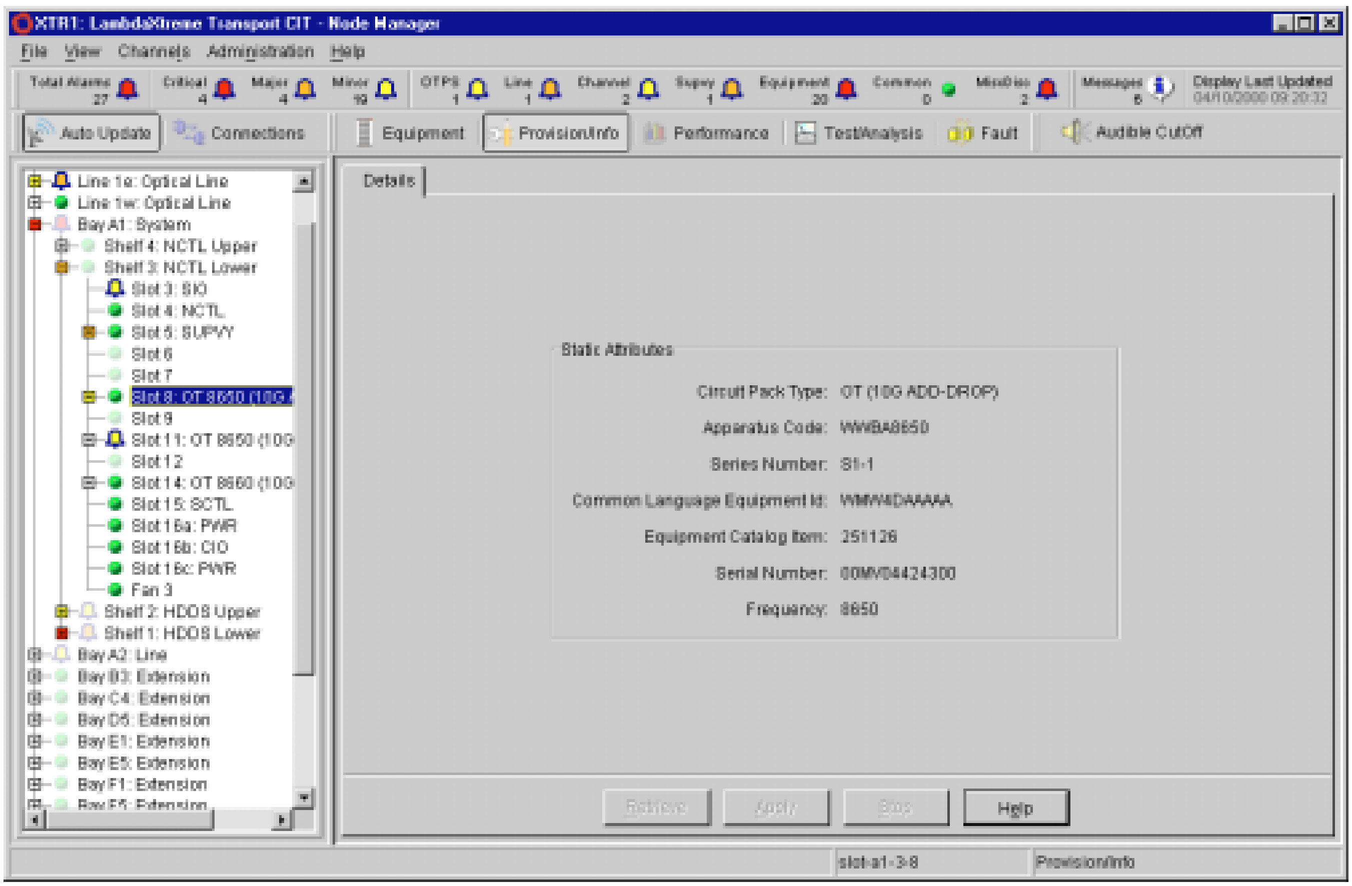
**Procedure**

**1** “Access the Provision/Info View in Node Manager” (A-39).

**2** Select the appropriate circuit pack slot in the Equipment Tree. Click on the **Details** tab in the display panel.

**Result:**

The Circuit Pack Details window appears:




END OF STEPS

# Provision Mode for OT Client Side Input Port

**Purpose** Set the OT port state as it relates to channel connections.

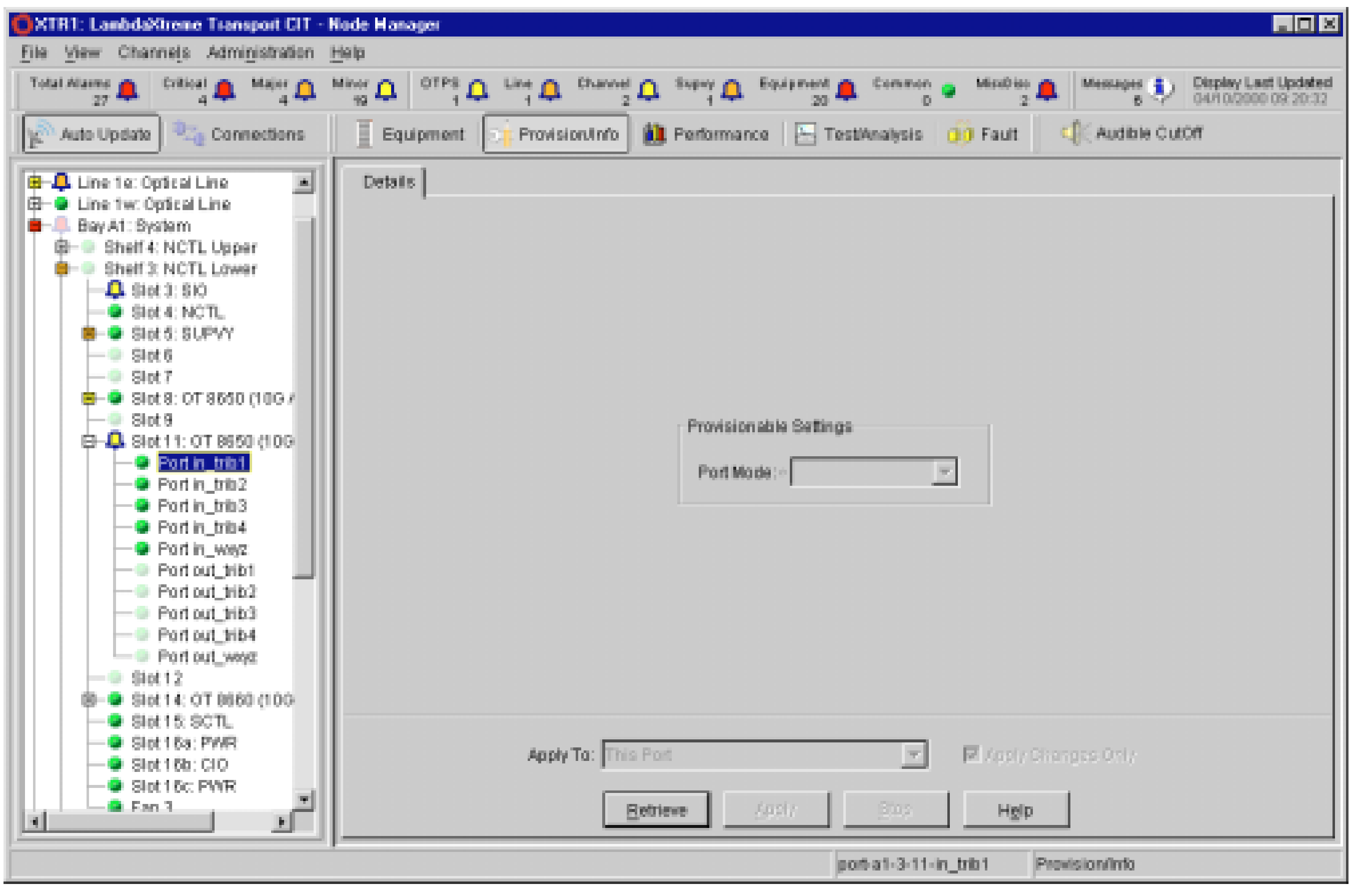
**Procedure**

**1** "Access the Provision/Info View in Node Manager" (A-39).

**2** From the Equipment Tree, select the OT Client In Port to be provisioned. Click on the **Details** tab in the display panel.

**Result:**

The OT Client In Port Details window appears:

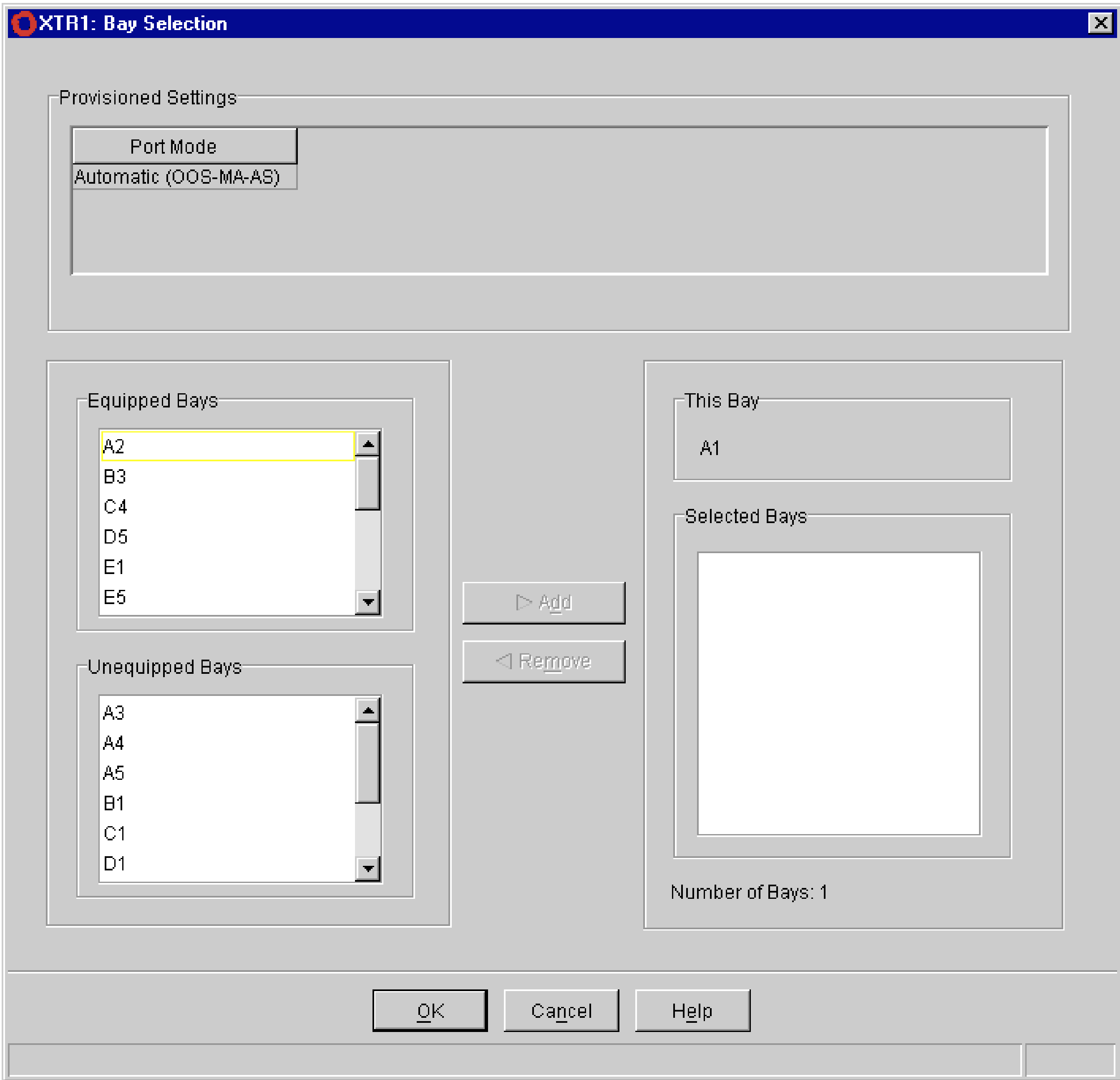



**3** Click **Retrieve** and the currently provisioned data is displayed.

4 Select the **Port Mode** from the drop down list.

5 Make the appropriate selection from the **Apply to:** drop down menu and click **Apply.**

Note: If **All Ports, This & Selected Bays** is chosen, the following Bay Selection window appears:




**6** Select the appropriate Equipped/Unequipped Bay(s) to which the settings are to be applied. Use the **Add** button to move the selected bay(s) to the **Selected Bays** area. To remove a bay(s) from this area, select the bay(s) and click **Remove.**

**7** Click **OK** to apply the settings. A completion indicator (checkmark) is displayed beside each selected bay as the respective operation is completed.

END OF STEPS

# Generate a Circuit Pack Inventory Report

**Purpose** Generate a report that contains circuit pack inventory information from the NE(s).

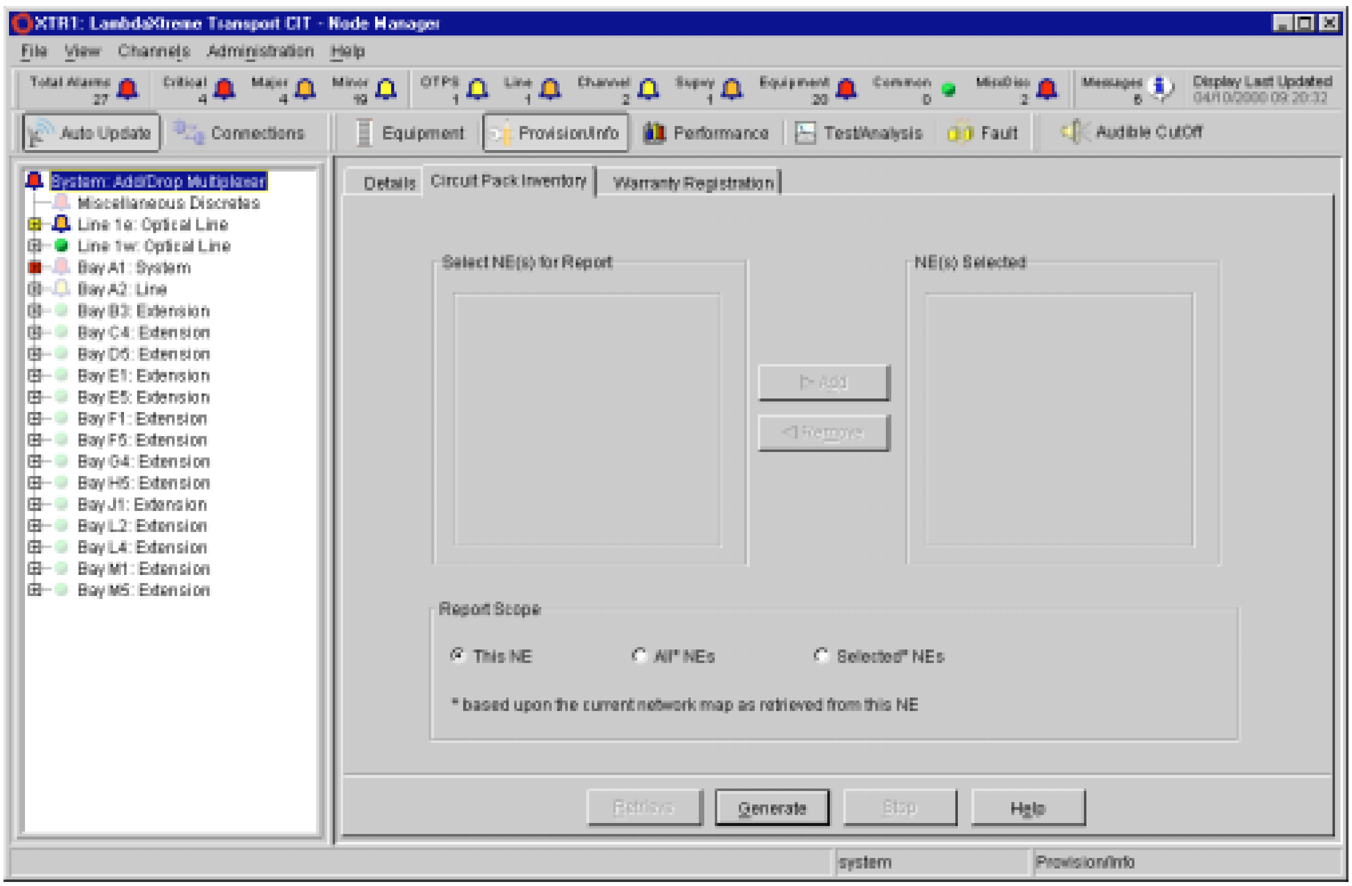
**Procedure**

1 "Access the Provision/Info View in Node Manager" (A-39).

2 Select the System level (highest level) in the NE Equipment Tree. Click on the **Circuit Pack Inventory** tab in the display panel.

**Result:**

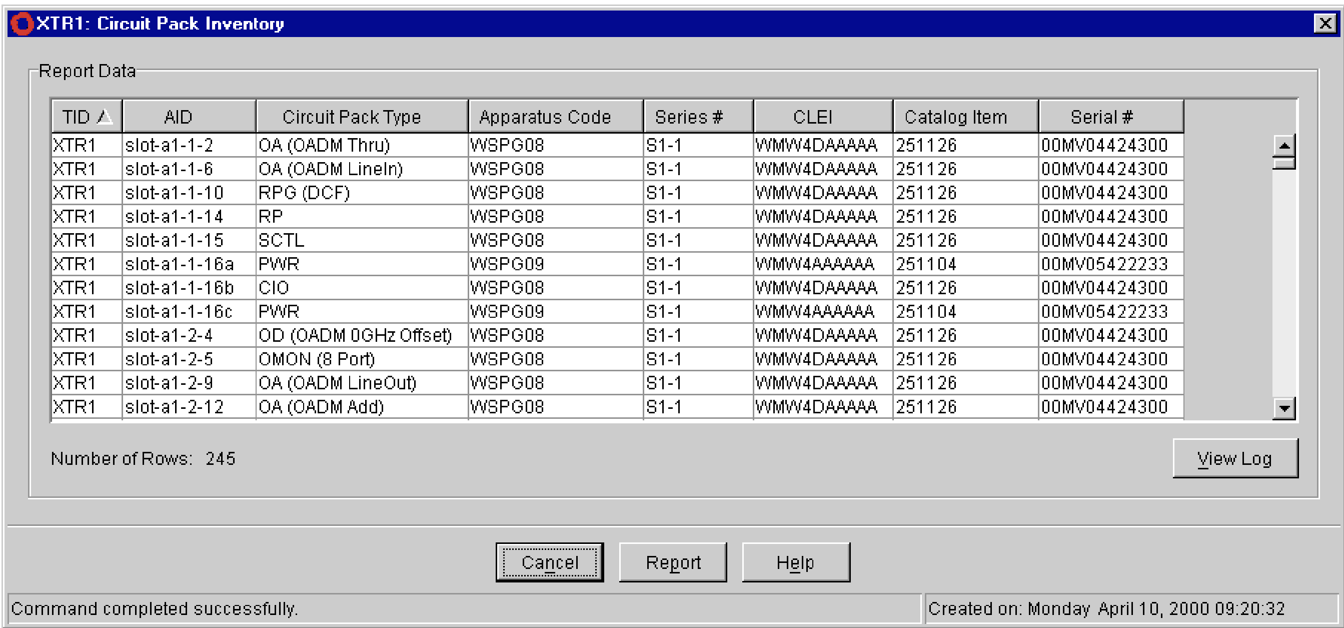
The following window is displayed:



**3** Make appropriate selections and click **Generate** to view the Circuit Pack Inventory Report.

**Result:**

The Circuit Pack Inventory window appears:




| TID | AID | Circuit Pack Type | Apparatus Code | Series # | CLEI | Catalog Item | Serial # |
|---|---|---|---|---|---|---|---|
| XTR1 | slot-a1-1-2 | OA (OADM Thru) | WSPG08 | S1-1 | WMW4DAAAAA | 251126 | 00MV04424300 |
| XTR1 | slot-a1-1-6 | OA (OADM LineIn) | WSPG08 | S1-1 | WMW4DAAAAA | 251126 | 00MV04424300 |
| XTR1 | slot-a1-1-10 | RPG (DCF) | WSPG08 | S1-1 | WMW4DAAAAA | 251126 | 00MV04424300 |
| XTR1 | slot-a1-1-14 | RP | WSPG08 | S1-1 | WMW4DAAAAA | 251126 | 00MV04424300 |
| XTR1 | slot-a1-1-15 | SCTL | WSPG08 | S1-1 | WMW4DAAAAA | 251126 | 00MV04424300 |
| XTR1 | slot-a1-1-16a | PWR | WSPG09 | S1-1 | WMW4AAAAAA | 251104 | 00MV05422233 |
| XTR1 | slot-a1-1-16b | CIO | WSPG08 | S1-1 | WMW4DAAAAA | 251126 | 00MV04424300 |
| XTR1 | slot-a1-1-16c | PWR | WSPG09 | S1-1 | WMW4AAAAAA | 251104 | 00MV05422233 |
| XTR1 | slot-a1-2-4 | OD (OADM 0GHz Offset) | WSPG08 | S1-1 | WMW4DAAAAA | 251126 | 00MV04424300 |
| XTR1 | slot-a1-2-5 | OMON (8 Port) | WSPG08 | S1-1 | WMW4DAAAAA | 251126 | 00MV04424300 |
| XTR1 | slot-a1-2-9 | OA (OADM LineOut) | WSPG08 | S1-1 | WMW4DAAAAA | 251126 | 00MV04424300 |
| XTR1 | slot-a1-2-12 | OA (OADM Add) | WSPG08 | S1-1 | WMW4DAAAAA | 251126 | 00MV04424300 |

E N D O F S T E P S

# Provision Monitoring Status of SIO Ports

**Purpose** Select SIO port(s) to be monitored for LAN failure (link integrity failure).

Note: This procedure is not supported in the current release but will be available in the future.

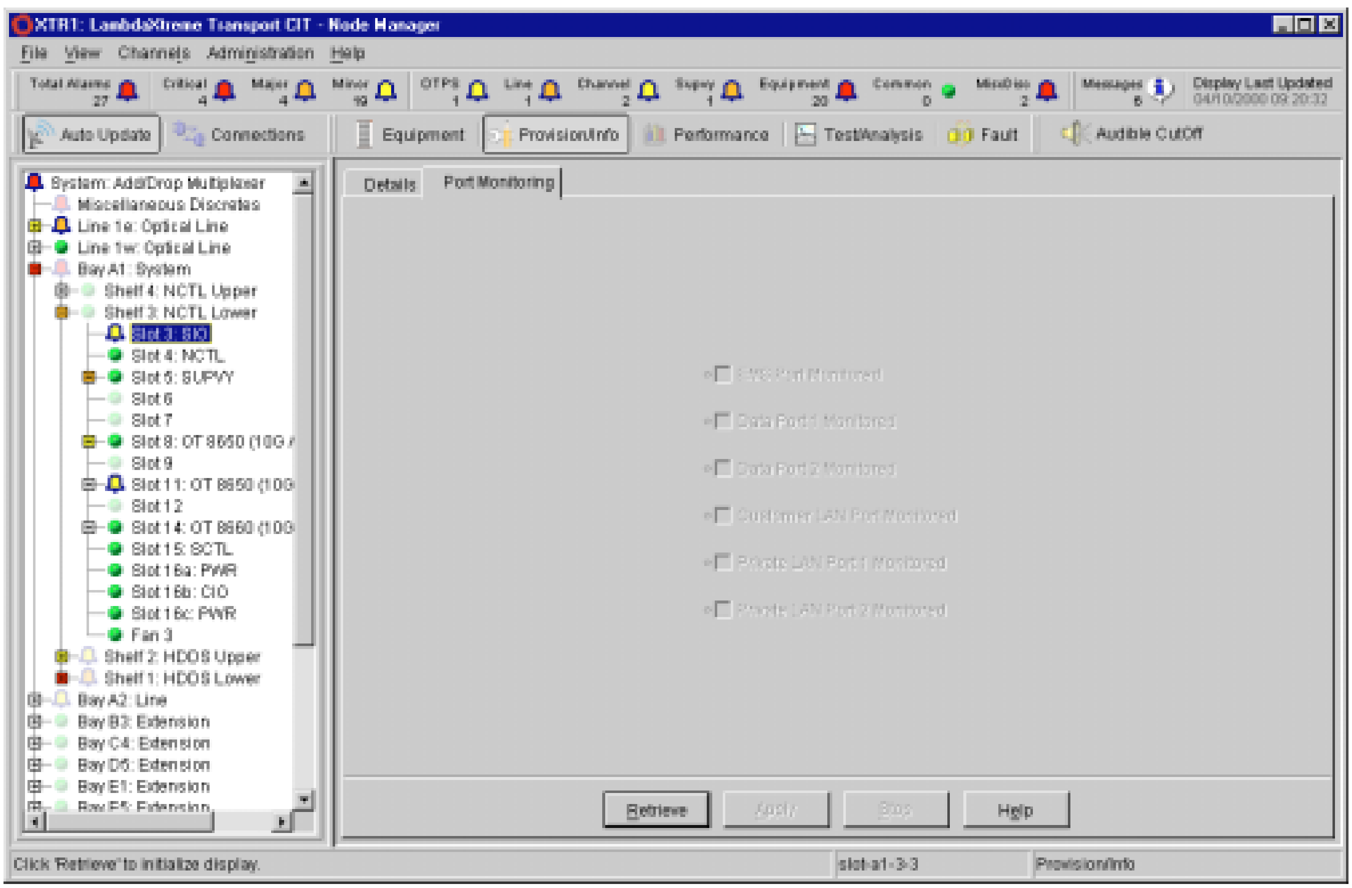
**Procedure**

**1** [“Access the Provision/Info View in Node Manager” (A-39)](#).

**2** From the Equipment Tree, select the slot containing the SIO Pack to be provisioned. Click on the **Port Monitoring** tab in the display panel.

**Result:**

The SIO Pack Port Monitoring window appears:



**3** Click the **Retrieve** button to display the currently provisioned data. Make the appropriate selections and click **Apply.**

END OF STEPS

# Provision Orderwire Type and Timing Source

**Purpose** Set parameters used for voice communication between LambdaXtreme™ Transport NEs.

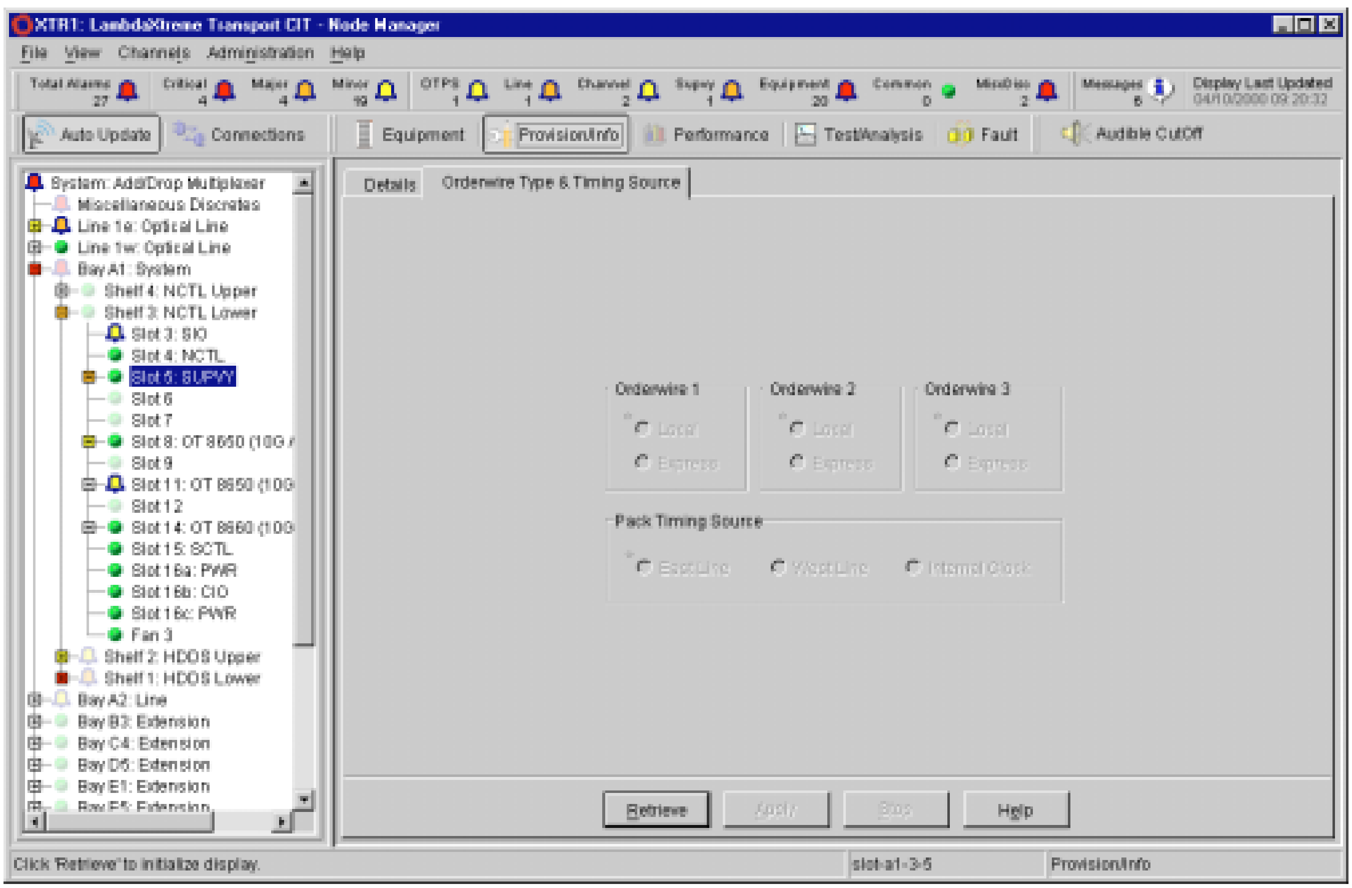
**Procedure**

**1** "Access the Provision/Info View in Node Manager" (A-39).

**2** From the Equipment Tree, select the slot containing the SUPVY Pack to be provisioned. Click on the **Orderwire Type & Timing Source** tab in the display panel.

**Result:**

The Orderwire window appears.



**3** Click the **Retrieve** button to display the currently provisioned data. Make the appropriate selections and click **Apply.**

END OF STEPS

# Provision OT Line In Error Response

**Purpose** Determine how an OT responds when various signal errors are detected.

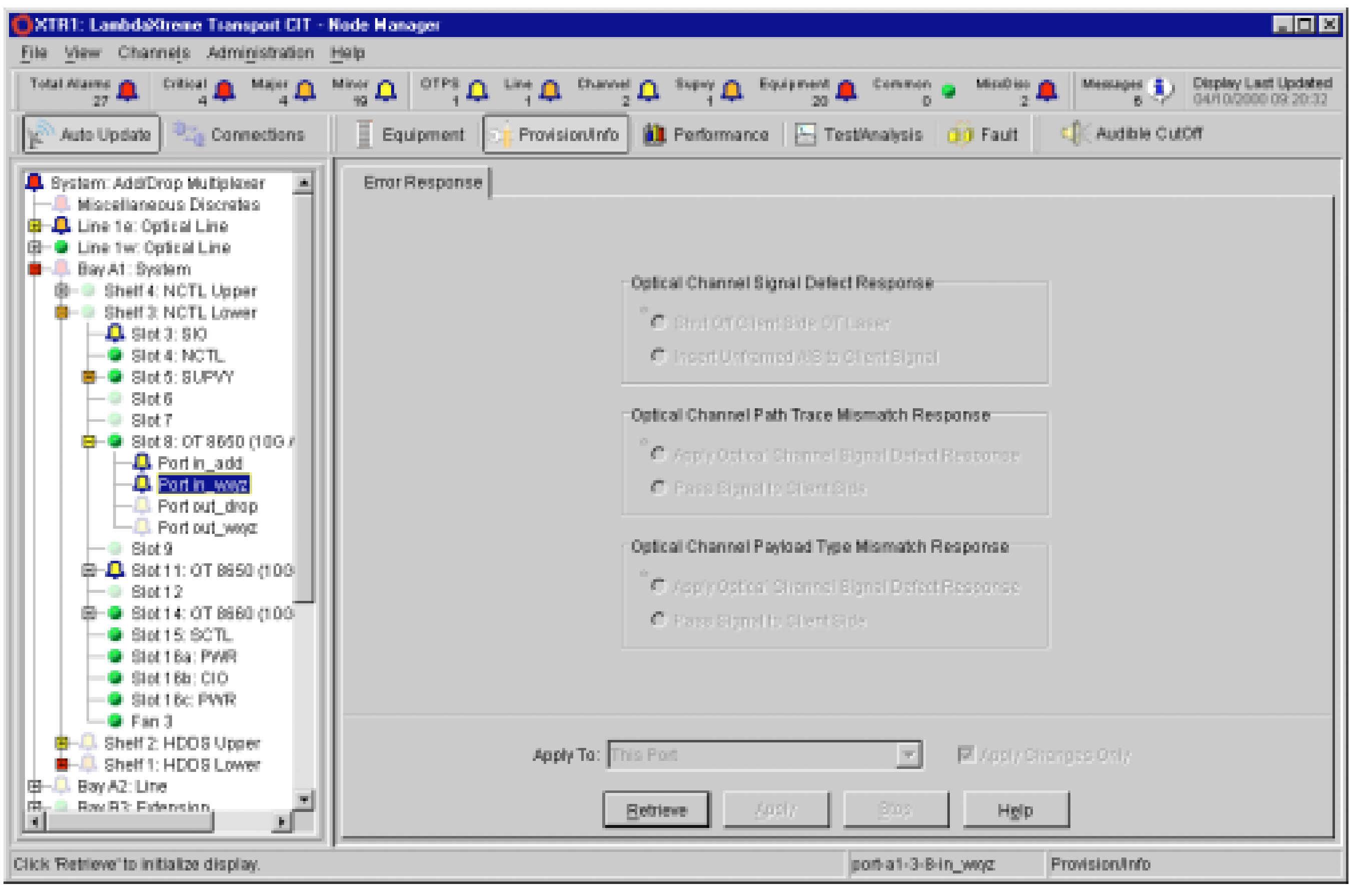
**Procedure**

**1** "Access the Provision/Info View in Node Manager" (A-39).

**2** From the Equipment Tree, select the Port to be provisioned (***Port in_wxyz*** selected below). Click on the **Error Response** tab in the display panel.

**Result:**

The OT Line In Error Response window appears:



**3** Click the **Retrieve** button to display the currently provisioned data. Make the appropriate selections and click **Apply.**

END OF STEPS

# Access the Performance View in Node Manager

**Purpose** Execute performance management functions to monitor transmission quality and equipment health.

**Procedure**

**1** Click the **Performance** button on the View Toolbar in the Node Manager. This can also be accessed from the Node Manager menu by selecting **View > Performance.**

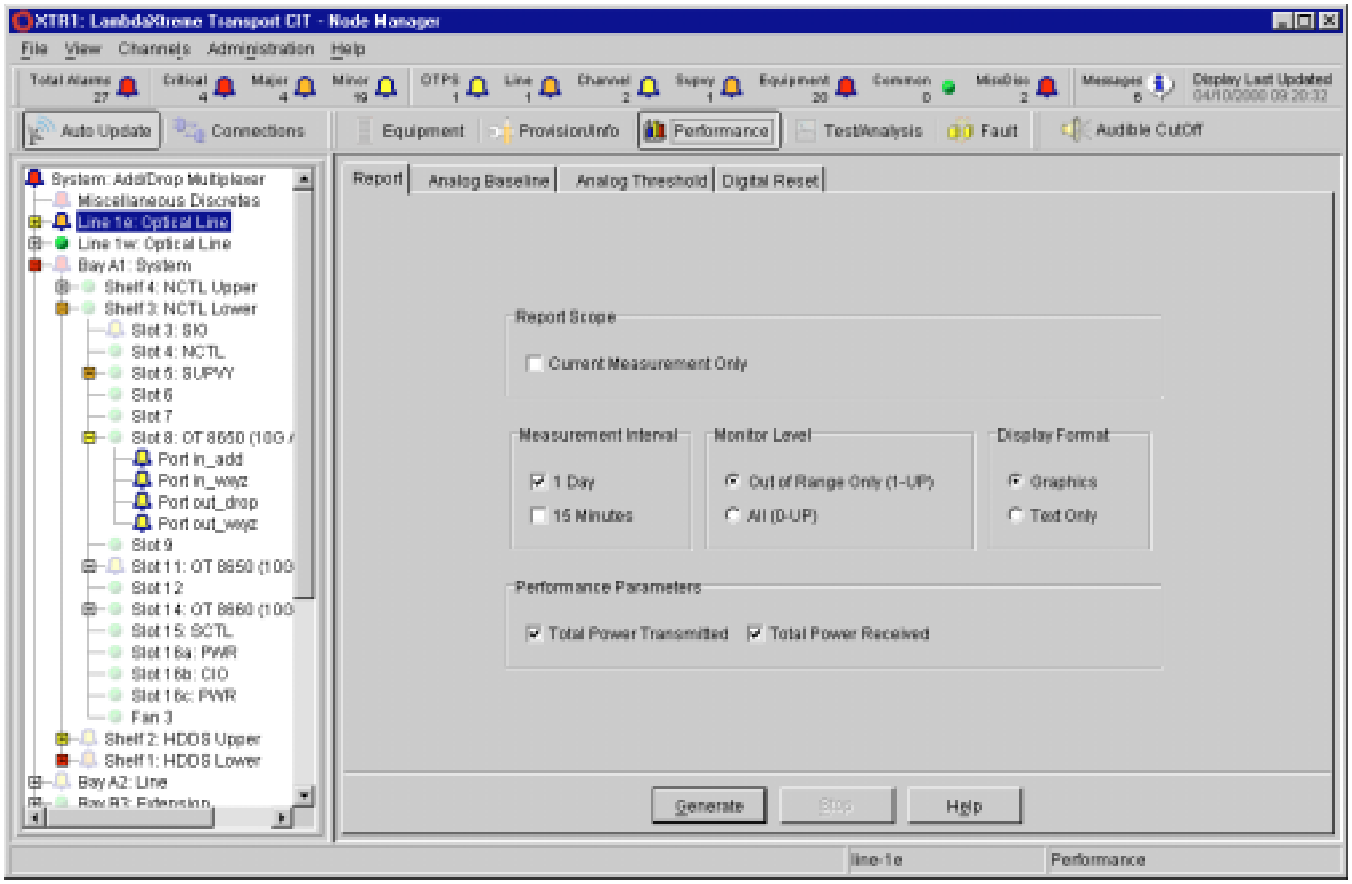
**Result:**

The Performance View appears in the display panel of the Node Manager.

**2** When equipment is selected in the Equipment Tree, the Performance View displays available Performance Management options (if any) for the selected equipment..

**Result:**

The following is an example:




**3** The available option(s) for the selected equipment are chosen from the tab(s) at the top of the display panel.

END OF STEPS

# Set Start Time for Performance Monitoring

**Purpose** Select or view the start time for the measurement of performance monitoring.

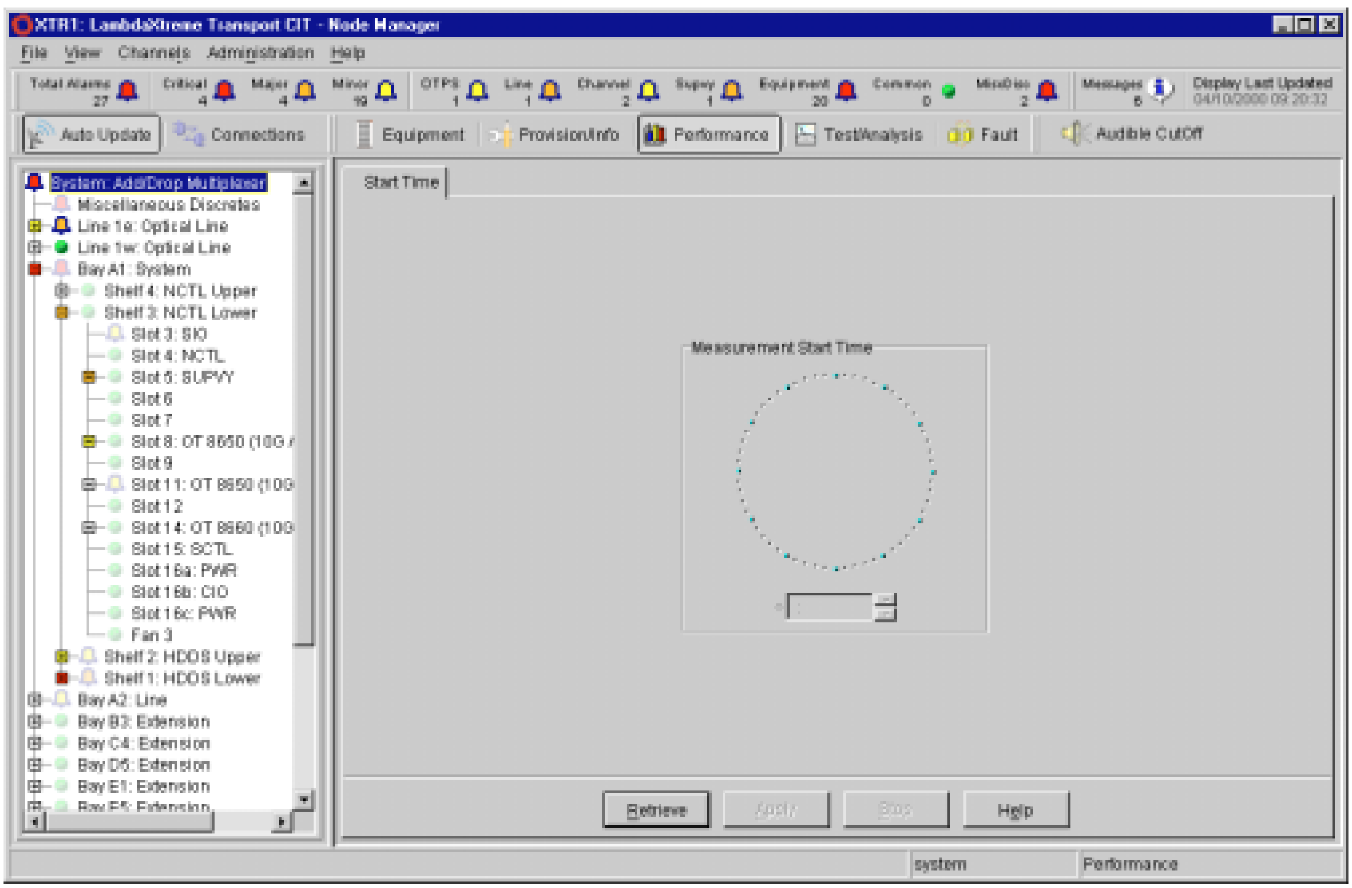
**Procedure**

**1** "Access the Performance View in Node Manager" (A-56).

**2** Select the System (highest level) in the Equipment Tree. Click on the **Start Time** tab in the display panel.

**Result:**

The Start Time window appears:



**3** Click the **Retrieve** button to display the currently provisioned data. Make the appropriate selections and click **Apply.**

END OF STEPS

# Generate Performance Monitoring Data

**Purpose** Request current and historical PM data for optical line, supervisory channel, optical channel, or OT port.

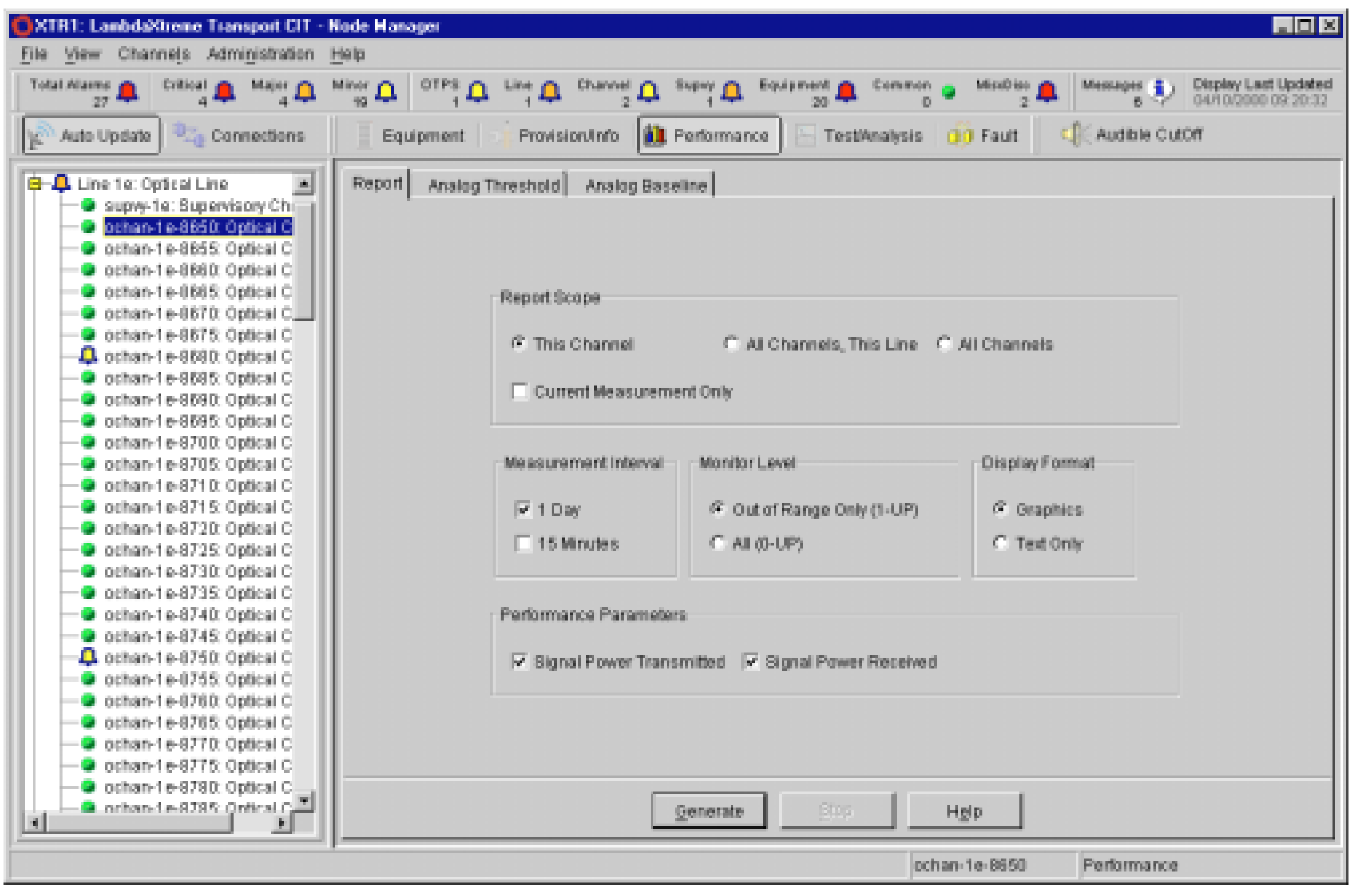
**Procedure**

1. "Access the Performance View in Node Manager" (A-56).

2. From the Equipment Tree, select the optical line, supervisory channel, optical channel, or OT port for which the report is to generated. Click on the **Report** tab in the display panel.

   **Result:**

   Depending upon which piece of equipment is selected in the Equipment Tree, a Report Parameters window such as the following appears:



**3** Specify all appropriate parameters and click on **Generate** to launch your browser and display the report.

Note: In a 15 minute PM report, the first bin of data will usually not contain a full 15 minutes of data. This is because the request will probably not be made exactly at a 15 minute time boundary.

END OF STEPS

# Establish Baseline Values for Signal/Total Power

**Purpose** Set baseline values for power transmitted/received in order to provide a basis from which to measure deviation from nominal.

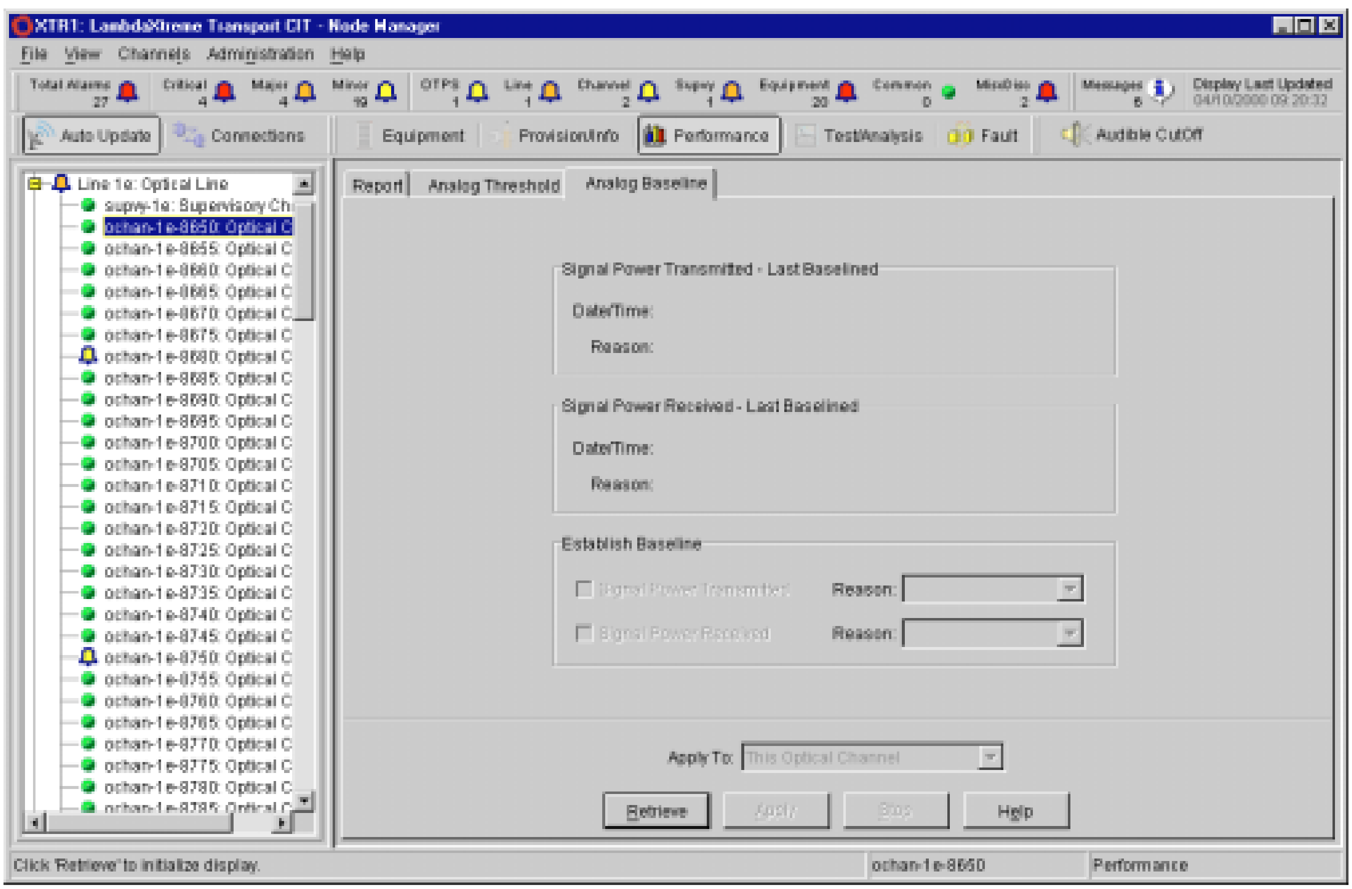
**Procedure**

**1** "Access the Performance View in Node Manager" (A-56).

**2** From the Equipment Tree, select the optical line, supervisory channel, or optical channel to be baselined. Click on the **Analog Baseline** tab in the display panel.

**Result:**

Depending upon which piece of equipment is selected in the Equipment Tree, an Analog Baseline window such as the following appears:



3 Click the **Retrieve** button to display the currently provisioned data. Select appropriate settings and click **Apply.**

END OF STEPS

# Provision Analog Threshold Levels and Message Notification

**Purpose** Set analog threshold level/crossing alert parameters to monitor transmission quality and equipment health.

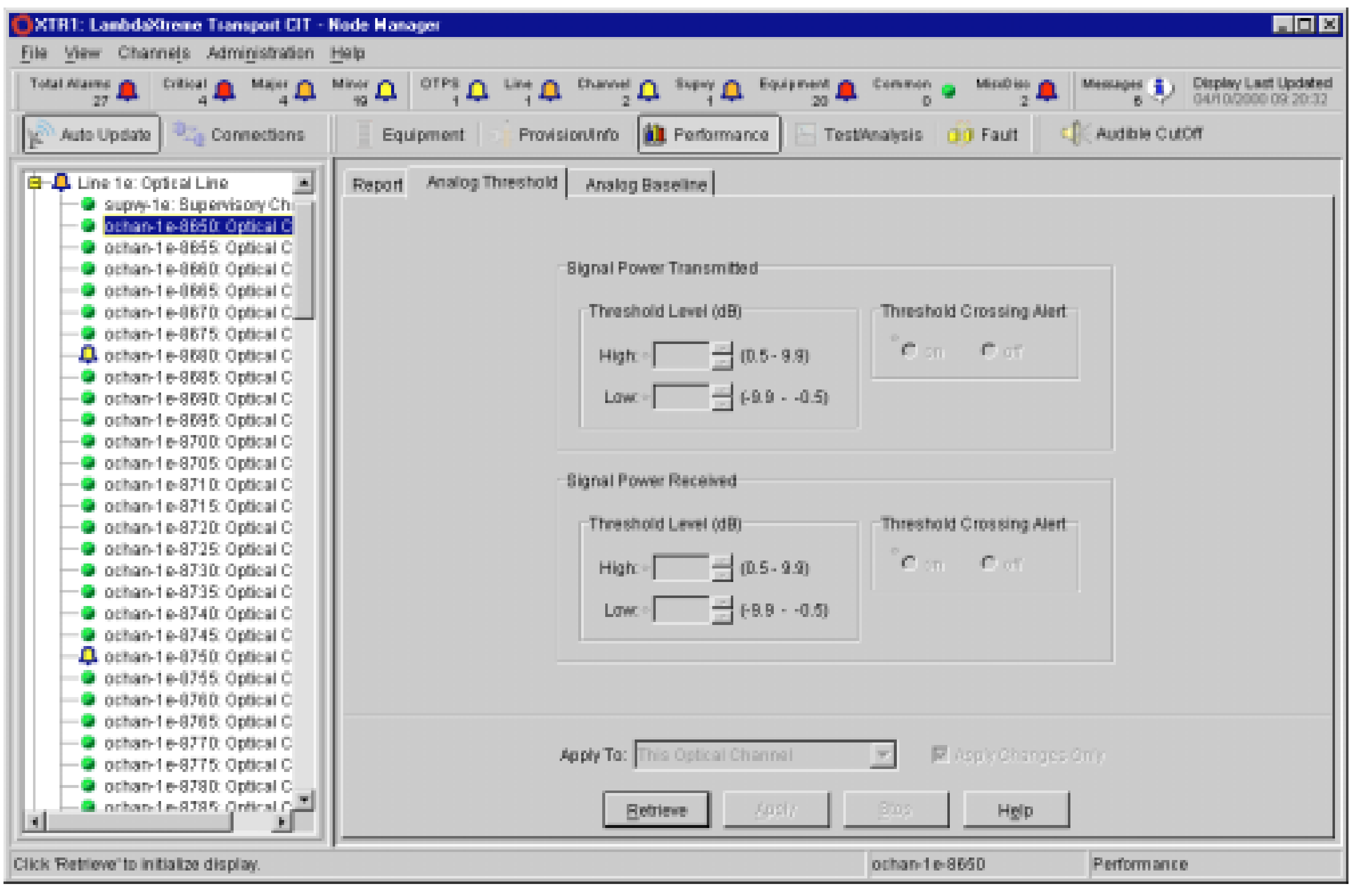
**Procedure**

**1** "Access the Performance View in Node Manager" (A-56).

**2** From the Equipment Tree, select the optical line, supervisory channel, or optical channel to be provisioned. Click on the **Analog Threshold** tab in the display panel.

**Result:**

Depending upon which piece of equipment is selected in the Equipment Tree, an Analog Threshold window such as the following appears:



**3** Click the **Retrieve** button to display the currently provisioned data. Enter appropriate values and click **Apply.**

END OF STEPS

# Provision Digital Threshold Levels and Message Notification

**Purpose** Set digital threshold level/crossing alert parameters to monitor transmission quality and equipment health.

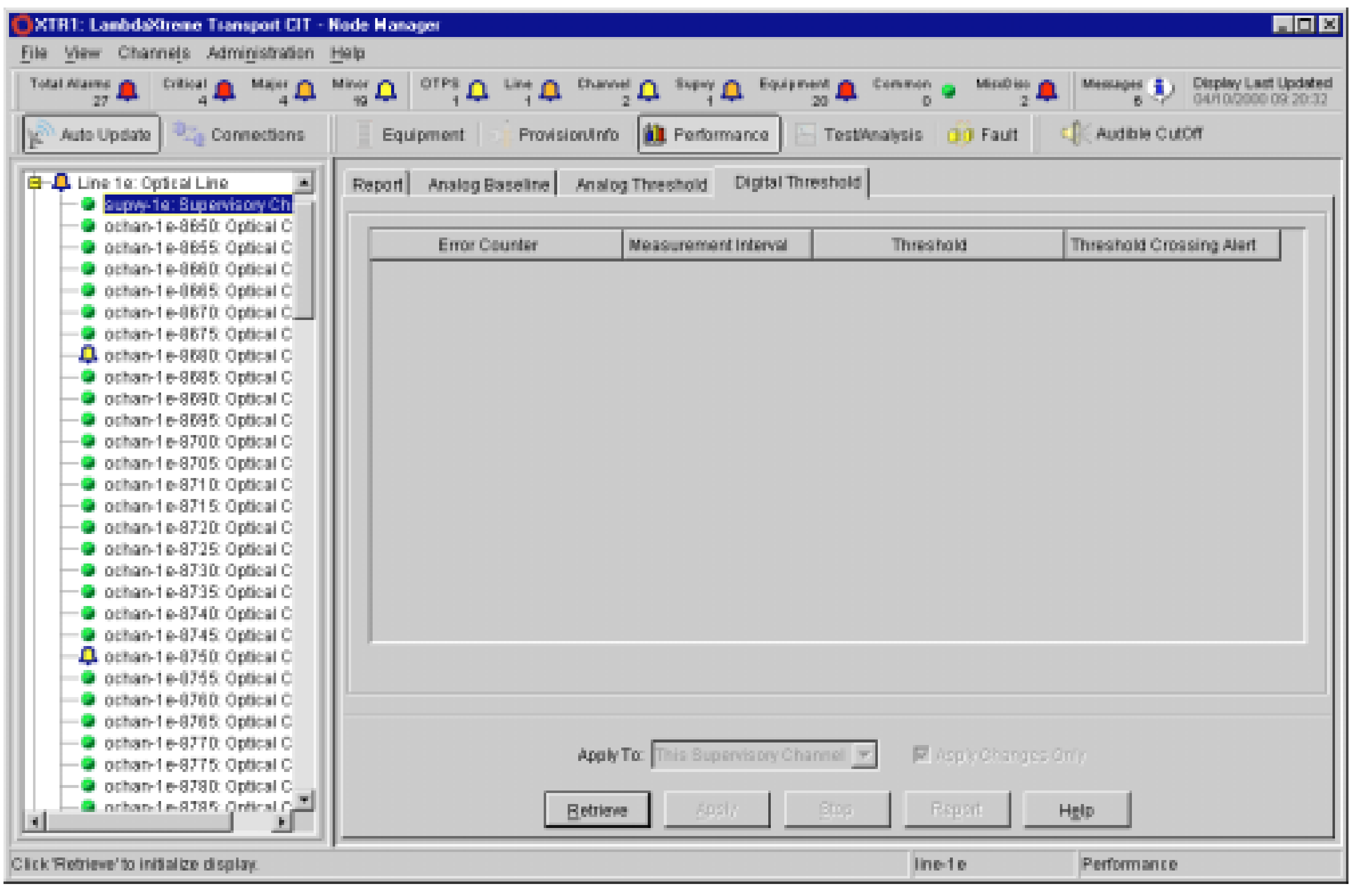
**Procedure**

**1** "Access the Performance View in Node Manager" (A-56).

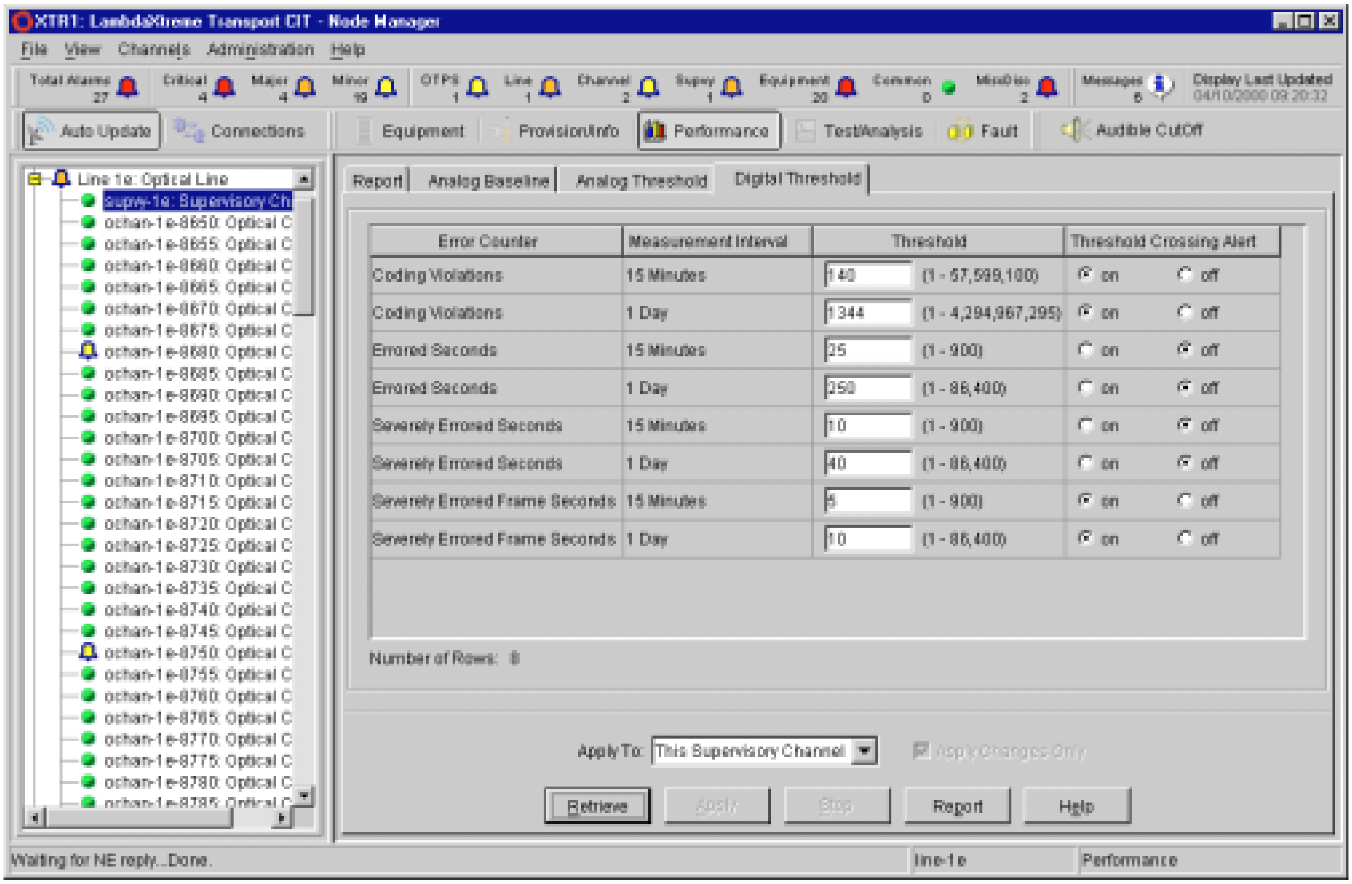
**2** From the Equipment Tree, select the supervisory channel, or OT port to be provisioned. Click on the **Digital Threshold** tab in the display panel.

**Result:**

Depending upon which piece of equipment is selected in the Equipment Tree, a Digital Threshold window such as the following appears:



**3** Click **Retrieve** and the currently provisioned data is displayed.




**4** Enter appropriate values and click **Apply.**

END OF STEPS

# Reset Digital Performance Monitoring Storage Registers

**Purpose** Initialize (reset) the error counts for all current day and/or all current 15-minute PM storage registers.

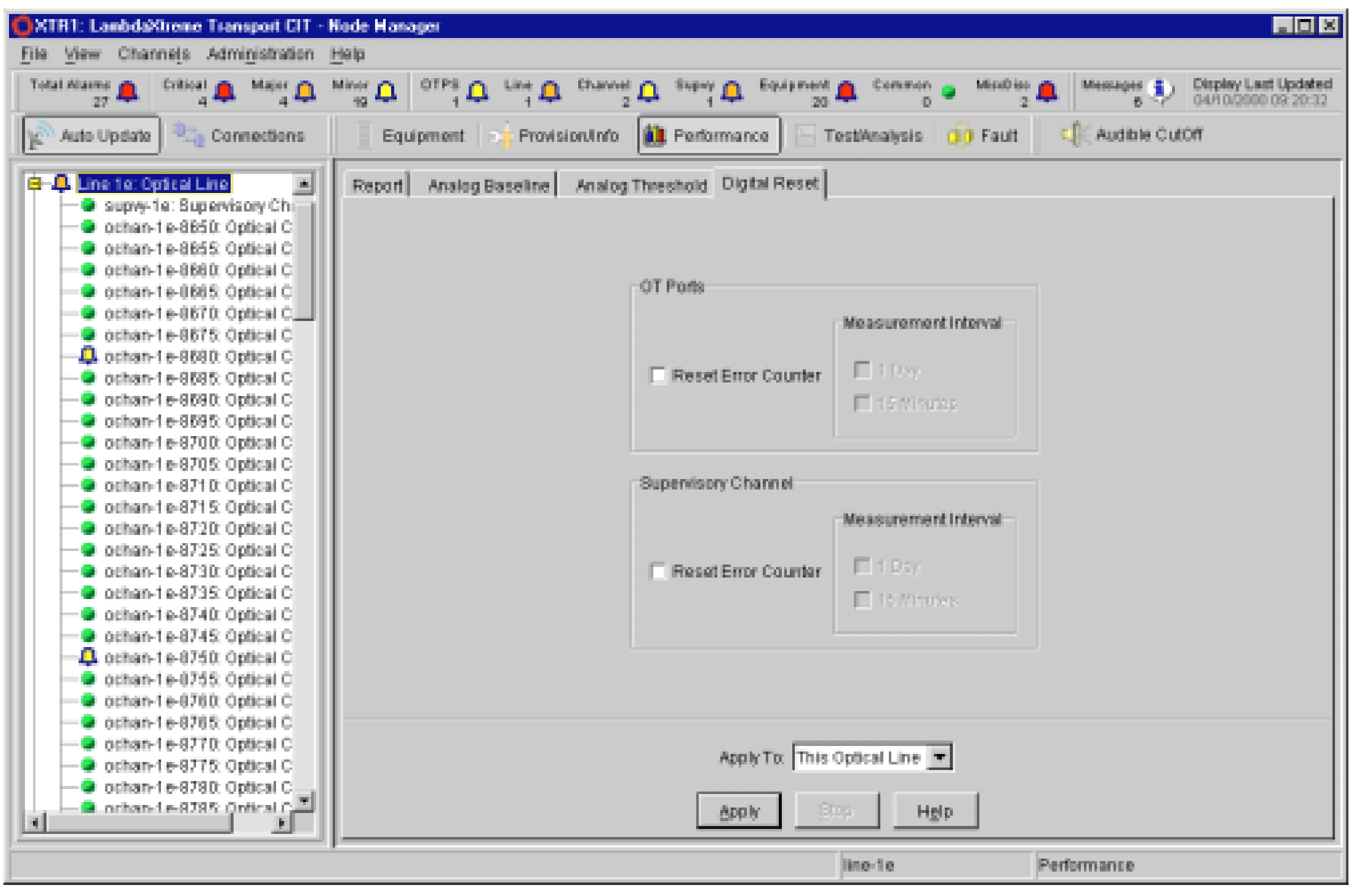
**Procedure**

**1** "Access the Performance View in Node Manager" (A-56).

**2** From the Equipment Tree, select an optical line or OT port to be reset. Click on the **Digital Reset** tab in the display panel.

**Result:**

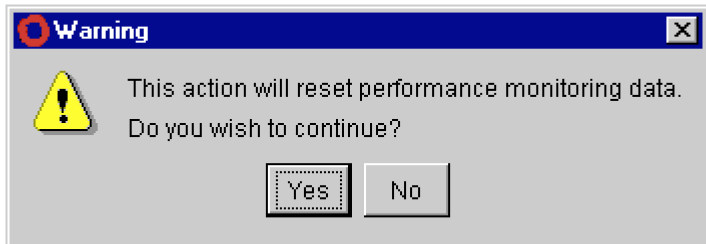
Depending upon which piece of equipment is selected in the Equipment Tree, a Digital Reset window such as the following appears:



**3** Make the appropriate selections and click **Apply.**

**Result:**

The following window appears:




Click **Yes.**

END OF STEPS

# Access the Test/Analysis View in Node Manager

**Purpose** Perform test and analysis procedures on equipment/signals.

**Procedure**

1. Click the **Test/Analysis** button on the View Toolbar in the Node Manager. This can also be accessed from the Node Manager menu by selecting **View > Test/Analysis.**

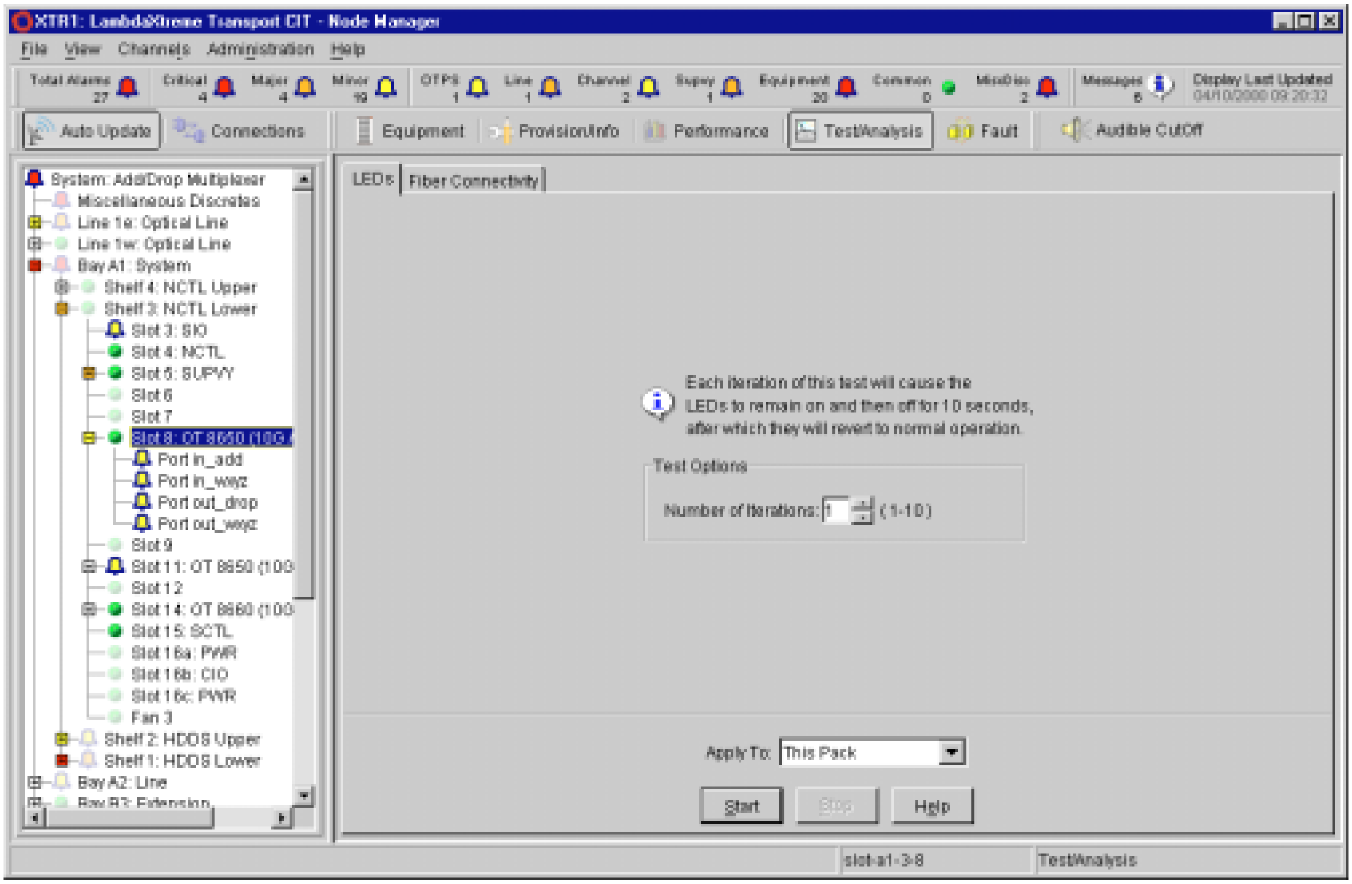
   **Result:**

   The Test/Analysis View appears in the display panel of the Node Manager.

2. When equipment is selected in the Equipment Tree, the Test/Analysis View displays available Test/Analysis options (if any) for the selected equipment.

**Result:**

The following is an example:

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**3** The available option(s) for the selected equipment are chosen from the tab(s) at the top of the display panel.

END OF STEPS

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# Test System Office Alarms

**Purpose** To insure the integrity of the audible and visible office alarms and status indicators.

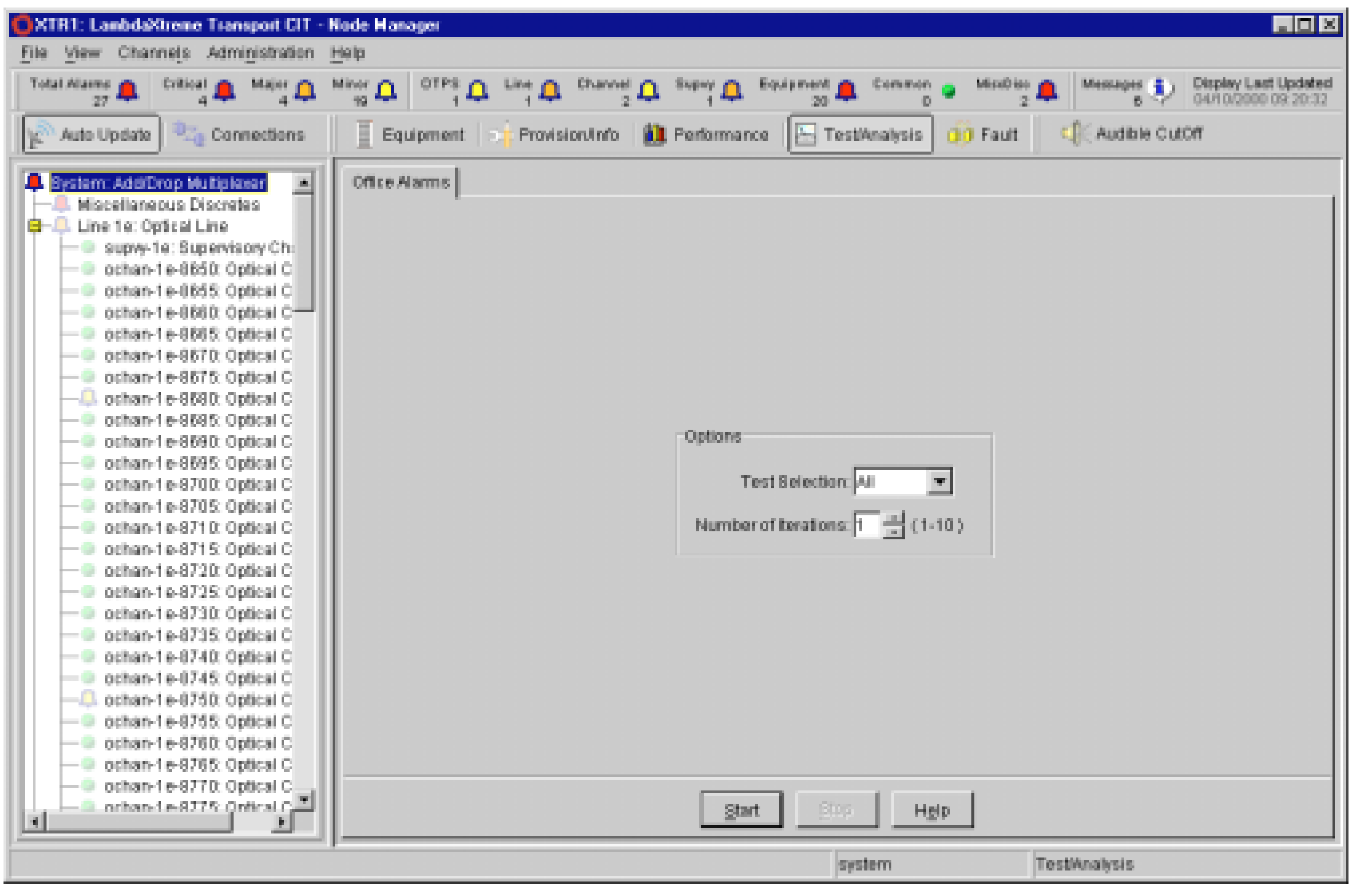
**Procedure**

**1** “Access the Test/Analysis View in Node Manager” (A-70).

**2** Select the System (highest level) in the Equipment Tree. Click on the **Office Alarms** tab in the display panel.

**Result:**

The Office Alarms window appears:




**3** Make the appropriate selections and click **Start.**

**Result:**

The LED alarm indications on the NE light and the alarm relays on the NE operate causing local office audible and visual alarms to activate. The corresponding User Panel LEDs are illuminated simultaneously with each office alarm and status indicator.

END OF STEPS

# Test Circuit Pack LEDs

**Purpose** Visually inspect the circuit pack LEDs during installation or regular maintenance.

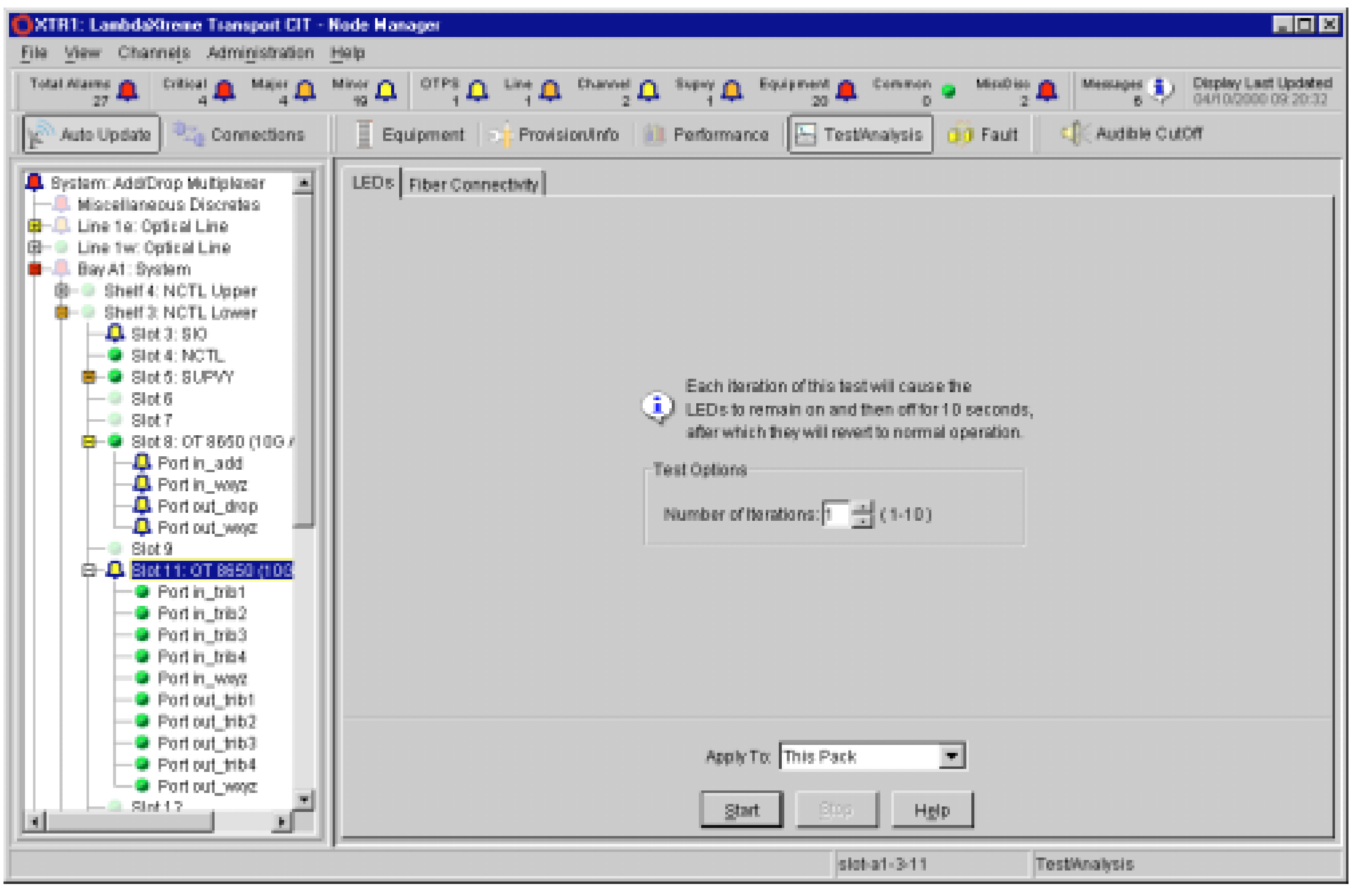
**Procedure**

**1** "Access the Test/Analysis View in Node Manager" (A-70).

**2** From the Equipment Tree, select the desired slot to be tested. Click on the **LEDs** tab in the display panel.

**Result:**

The Test Equipment LED window appears:




**3** Make the appropriate selections and click **Start.**

**Result:**

The LED(s) under test is turned on and off for ten seconds, after which it reverts to normal operation.

END OF STEPS

# Verify Fiber Connectivity

**Purpose** Test the add-side fiber connectivity between an OT and OM after installing growth OTs in the in-service NE.

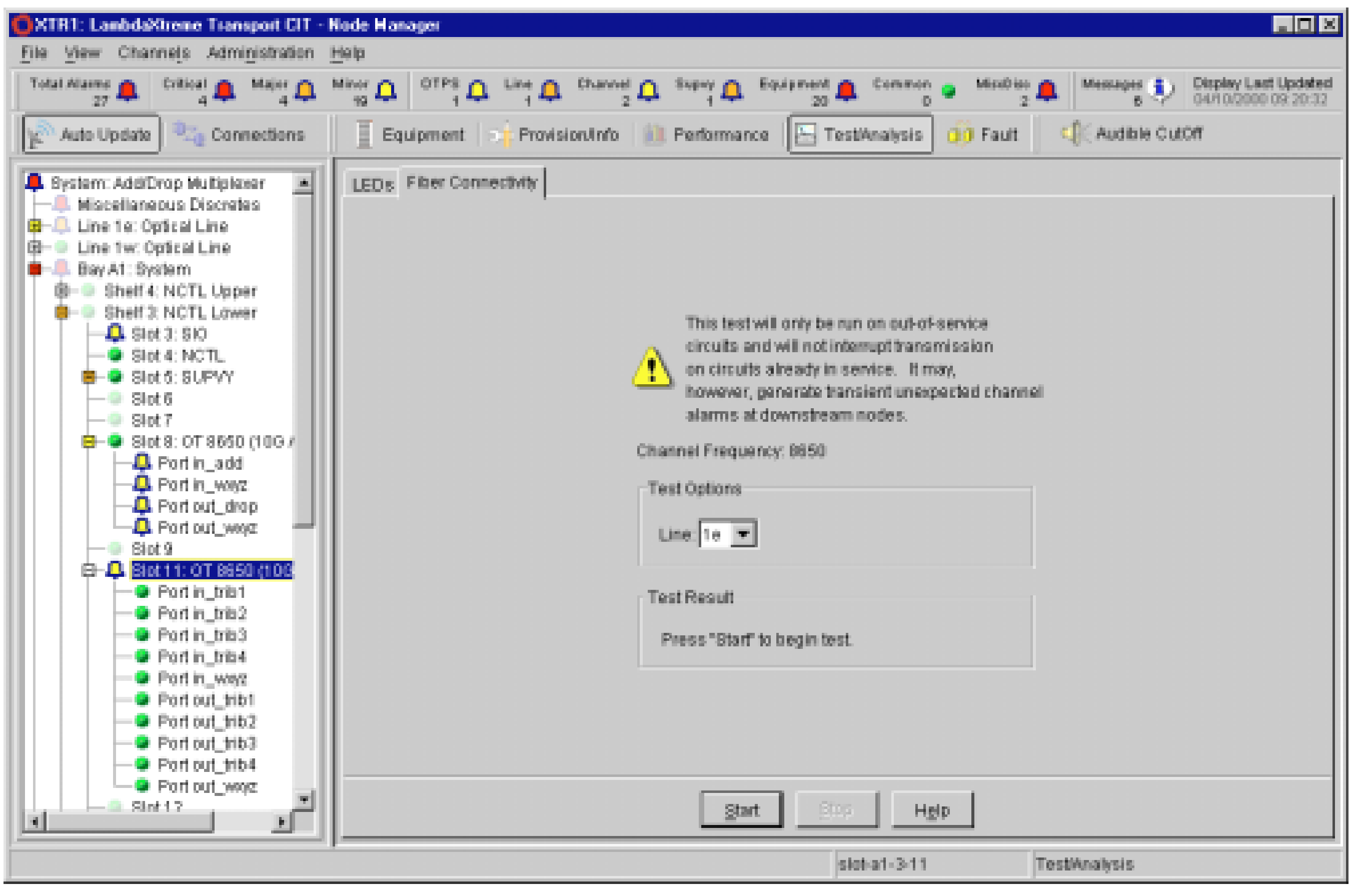
**Procedure**

1. "Access the Test/Analysis View in Node Manager" (A-70).

2. From the Equipment Tree, select the desired OT slot to be tested. Click on the **Fiber Connectivity** tab in the display panel.

   **Result:**

   The Fiber Connectivity window appears.




3. Select the line to be tested and click **Start.**

END OF STEPS

# Obtain OT Section Trace

**Purpose** Compare the expected incoming section trace byte (J0) identifier with the received incoming section trace to verify the integrity of the signal/connection.

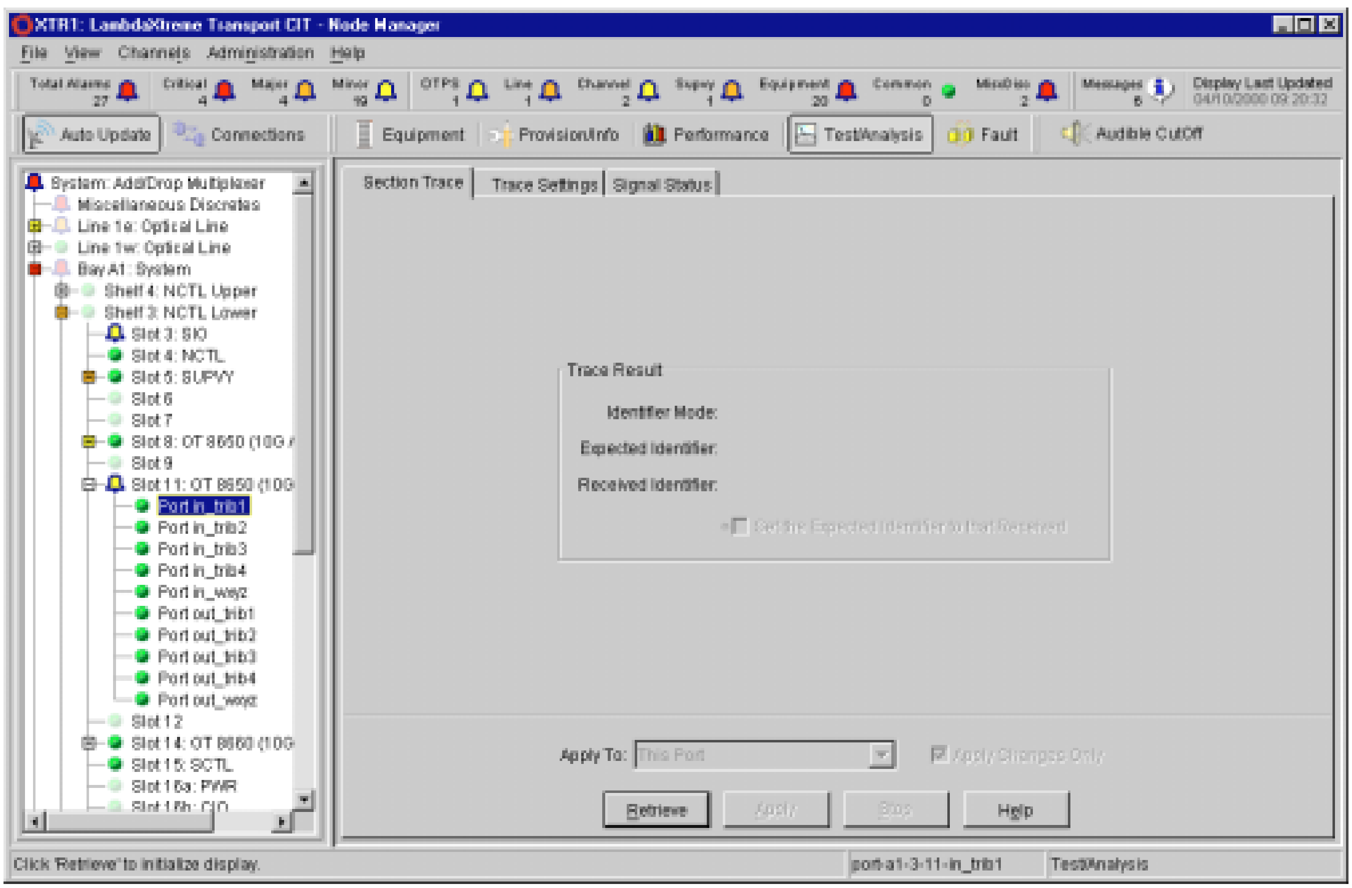
**Procedure**

**1** "Access the Test/Analysis View in Node Manager" (A-70).

**2** From the Equipment Tree, select the appropriate port. Click on the **Section Trace** tab in the display panel.

**Result:**

The OT Section Trace window appears:



**3** Click **Retrieve** and the currently provisioned data is displayed.

**4** To set the value of the expected identifier to that received, check the box.

**5** Make the appropriate selection from the **Apply to:** drop down menu and click **Apply.**

END OF STEPS

# Specify OT Section Trace Settings

**Purpose** Set the mode (length of the received and expected incoming messages) and specify the expected trace identifier.

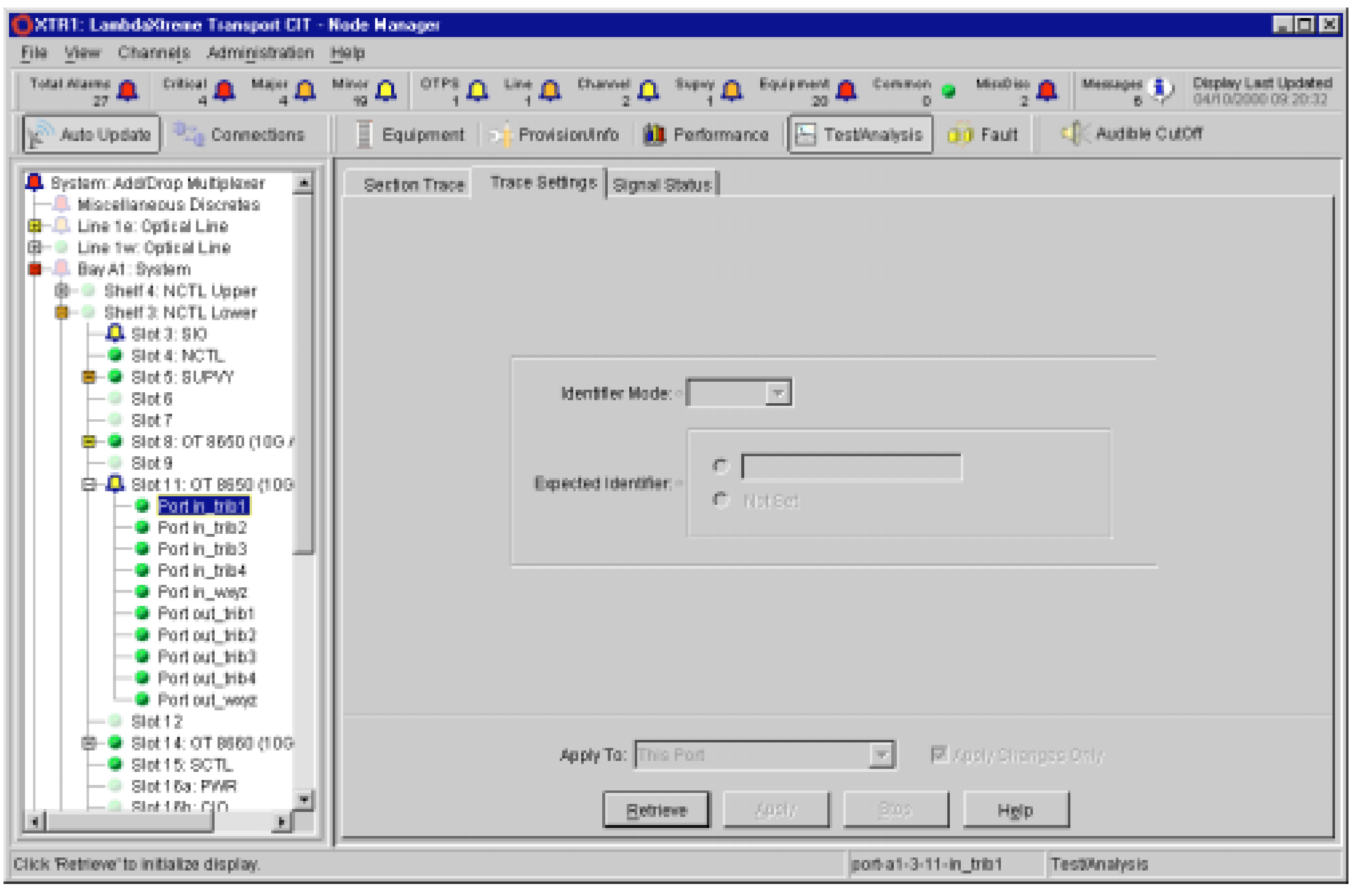
**Procedure**

**1** [“Access the Test/Analysis View in Node Manager” (A-70)](#).

**2** From the Equipment Tree, select the desired port. Click on the **Trace Settings** tab in the display panel.

**Result:**

The OT Trace Settings window appears:




**3** Click **Retrieve** and the currently provisioned data is displayed.

**4** Select/enter the appropriate values.

**5** Make the appropriate selection from the **Apply to:** drop down menu and click **Apply.**

END OF STEPS

# View Signal Status of OT Port

**Purpose** Retrieve incoming signal status of any OT input port to isolate signal defect conditions during installation of NEs.

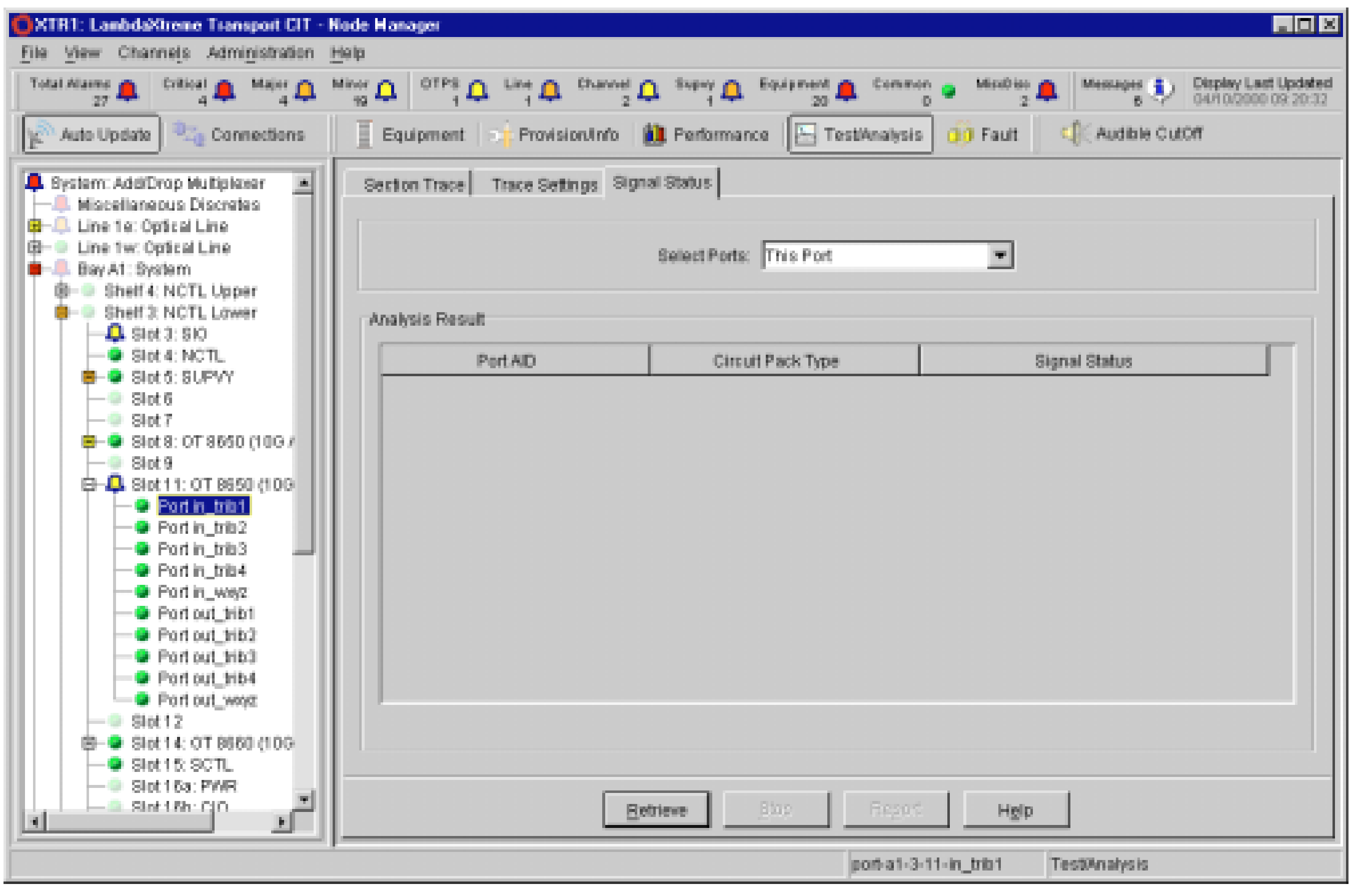
**Procedure**

**1** [“Access the Test/Analysis View in Node Manager” (A-70)](#).

**2** From the Equipment Tree, select the desired input port. Click on the **Signal Status** tab in the display panel.

**Result:**

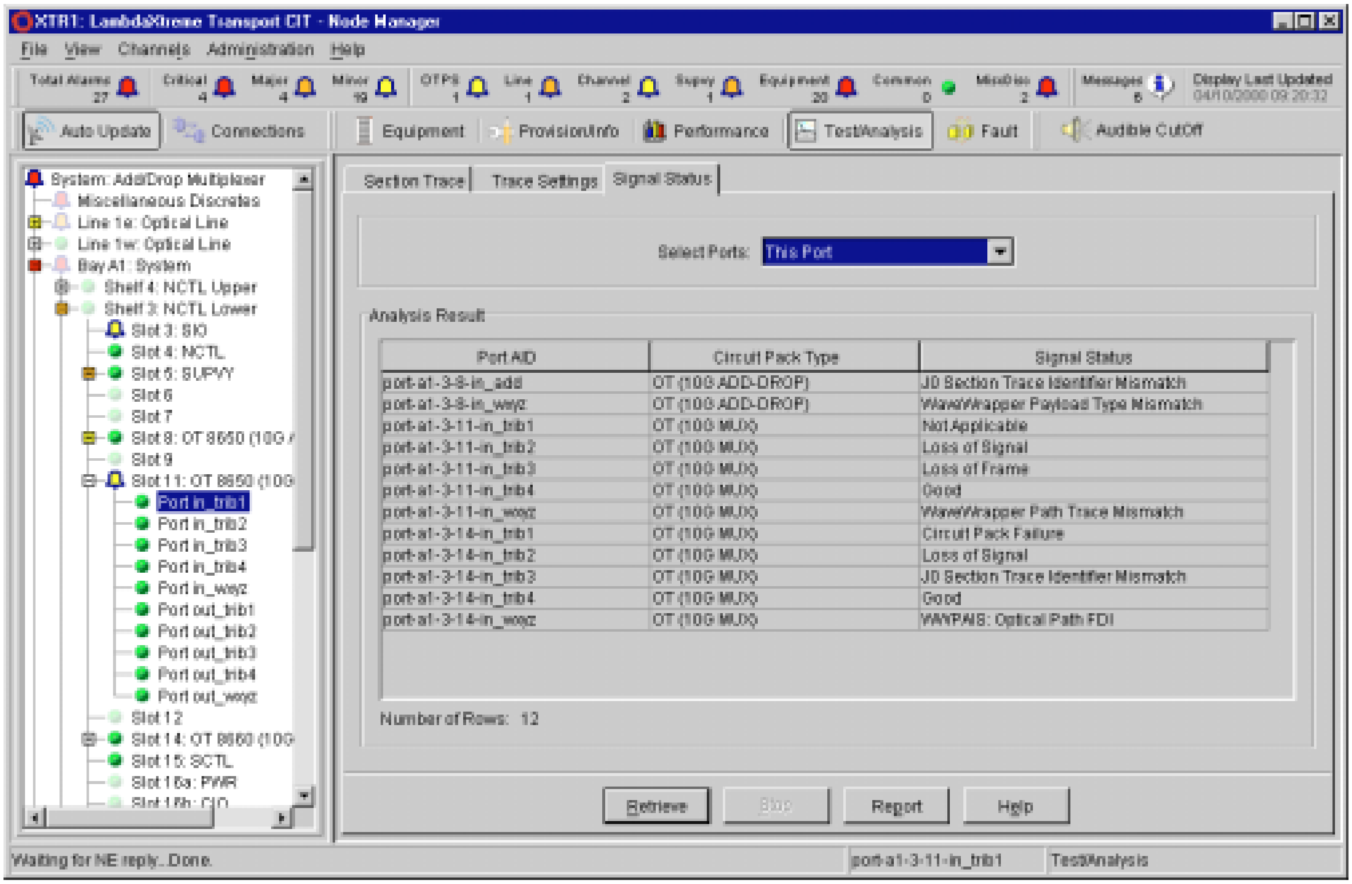
The OT Signal Status window appears:



**3** Select the appropriate port(s) from the drop down list and click **Retrieve.**

**Result:**

The signal status is displayed for the port(s) selected.




END OF STEPS

# Obtain Optical Channel Path Trace

**Purpose** Compare the expected identifier with the received identifier at the drop side of an Add/Drop OT.

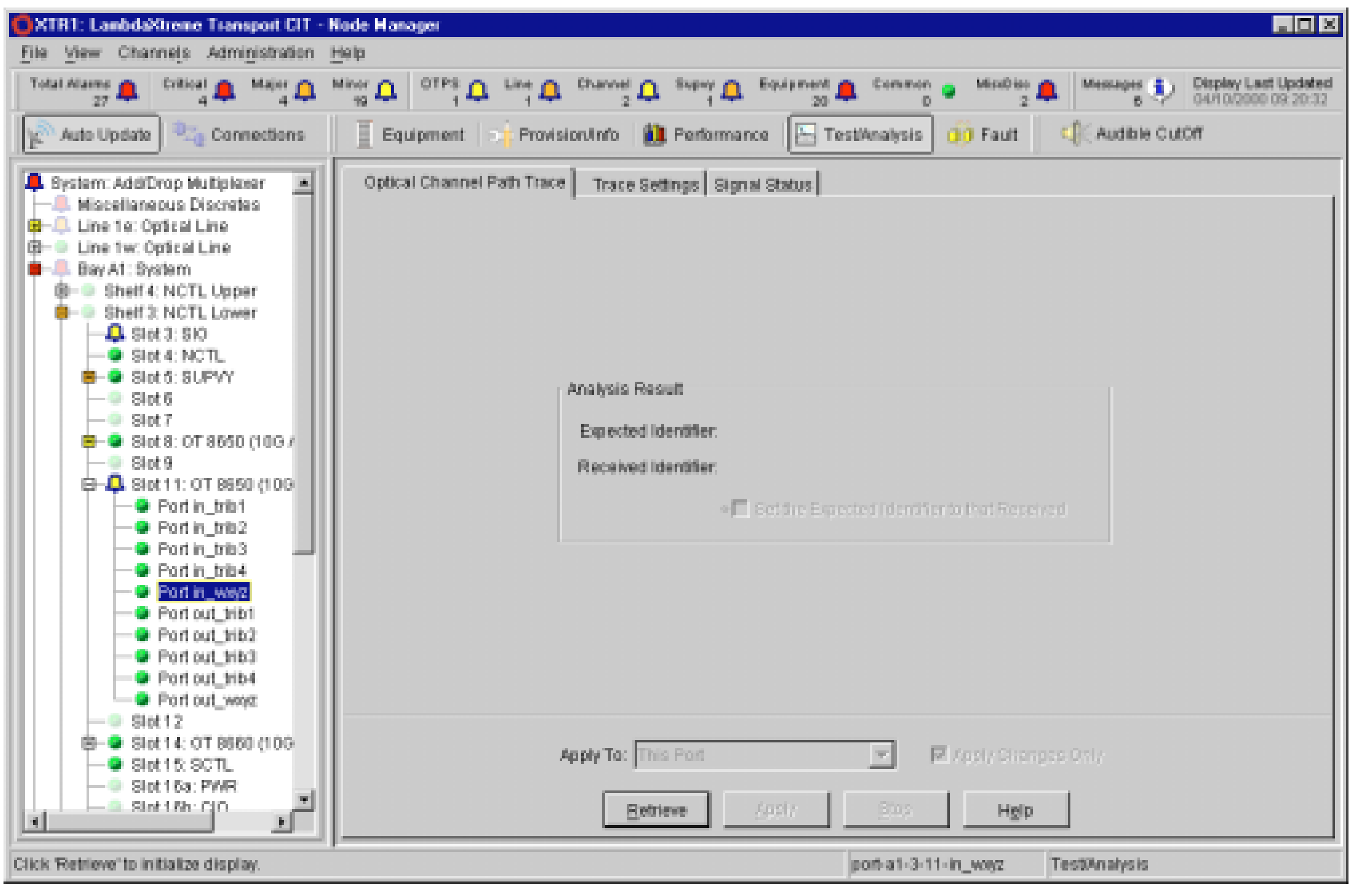
**Procedure**

1. “Access the Test/Analysis View in Node Manager” (A-70).

2. From the Equipment Tree, select the drop side line port of the Add/Drop OT. Click on the **Optical Channel Path Trace** tab in the display panel.

   **Result:**

   The Optical Channel Path Trace window appears:



**3** Click **Retrieve** to obtain the results of the path trace.

**4** To set the value of the expected identifier to that received, check the box.

**5** Make the appropriate selection from the **Apply to:** drop down menu and click **Apply.**

END OF STEPS

# Specify Optical Channel Path Trace Settings

**Purpose** Set the expected/transmitted identifiers for the optical channel path trace to verify connectivity between path terminating NEs.

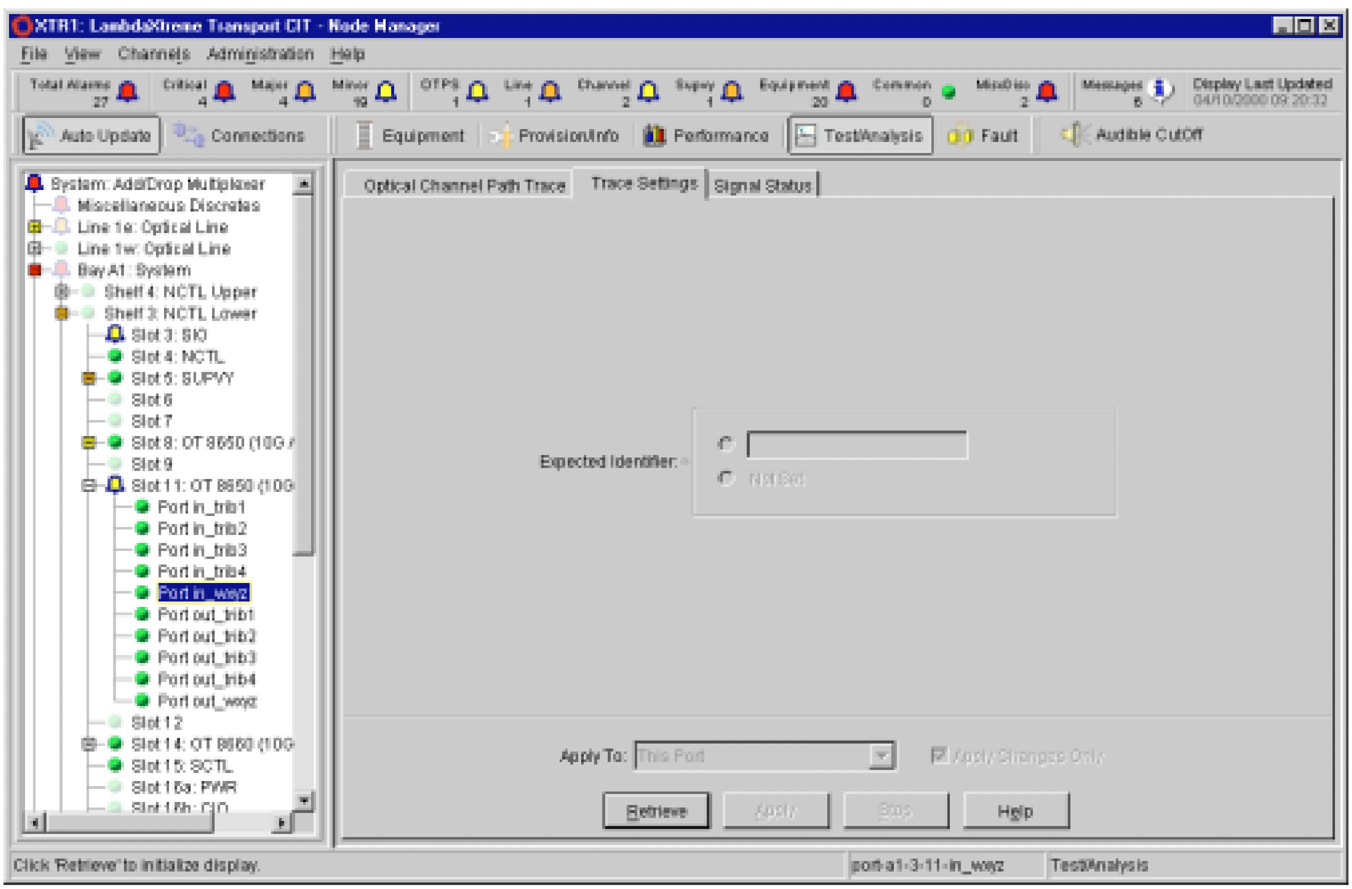
**Procedure**

**1** "Access the Test/Analysis View in Node Manager" (A-70).

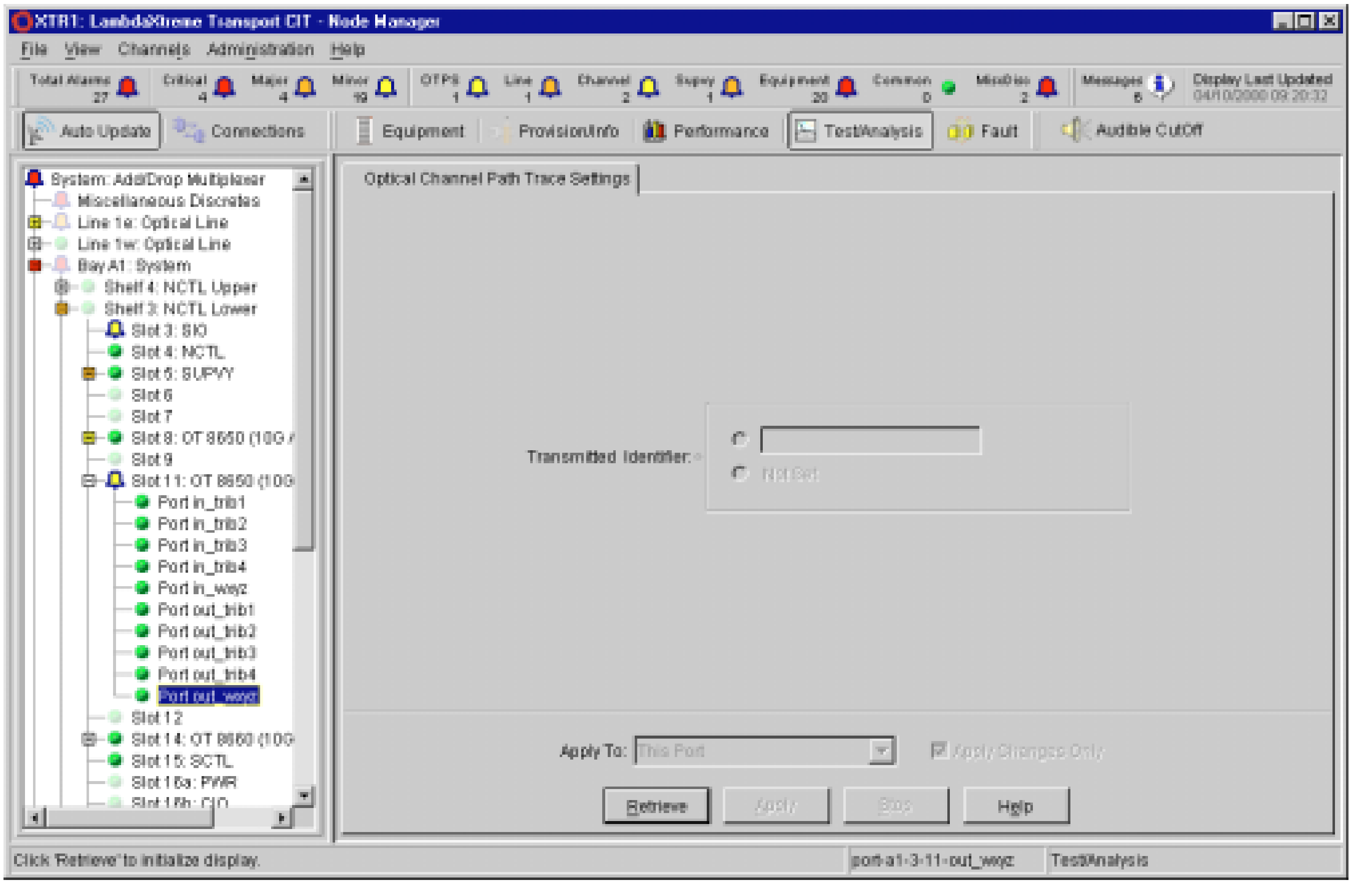
**2** From the Equipment Tree, select the appropriate drop/add port. Depending on the port selected, click the **Trace Settings** tab or the **Optical Channel Path Trace Settings** tab in the display panel.

**Result:**

For the drop side port, the following Optical Channel Path Trace Settings window appears:



For the add side port, the following Optical Channel Path Trace Settings window appears:




---

**3** Click **Retrieve** and the currently provisioned data is displayed.

---

**4** Select/enter the appropriate values.

---

**5** Make the appropriate selection from the **Apply to:** drop down menu and click **Apply.**

END OF STEPS

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□

# Access the Fault View in Node Manager

**Purpose** Provision parameters related to system alarm options and settings, and generate alarm lists.

**Procedure**

1. Click the **Fault** button on the View Toolbar in the Node Manager. This can also be accessed from the Node Manager menu by selecting **View > Fault.**

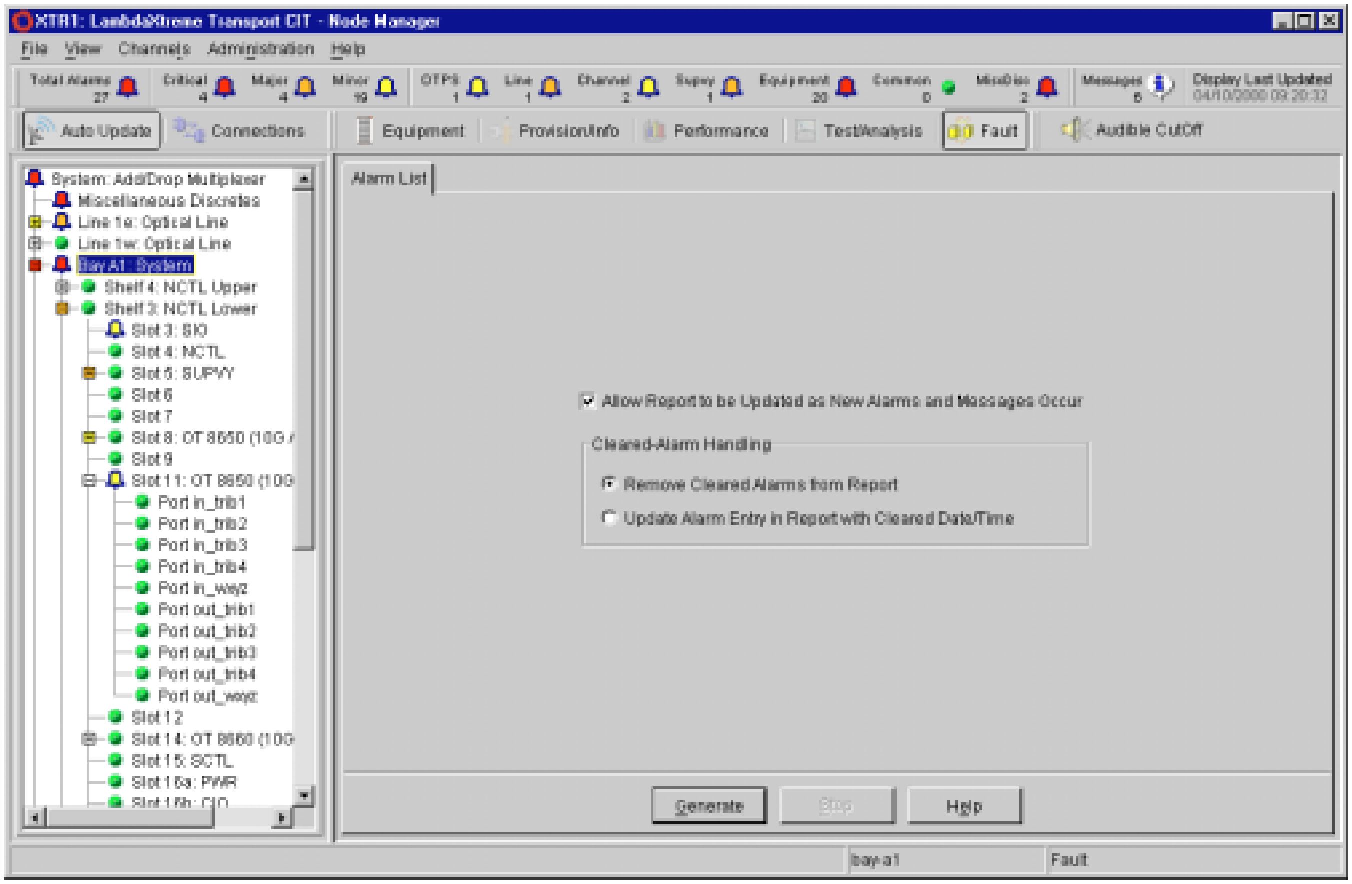
   **Result:**

   The Fault View appears in the display panel of the Node Manager.

2. When equipment is selected in the Equipment Tree, the Fault View displays available Fault options for the selected equipment.

**Result:**

The following is an example:




**3** The available option(s) for the selected equipment are chosen from the tab(s) at the top of the display panel.

END OF STEPS

# Set Options and Generate Alarm List for Selected Equipment

**Purpose** Set options to be used when generating an Alarm List for selected equipment.

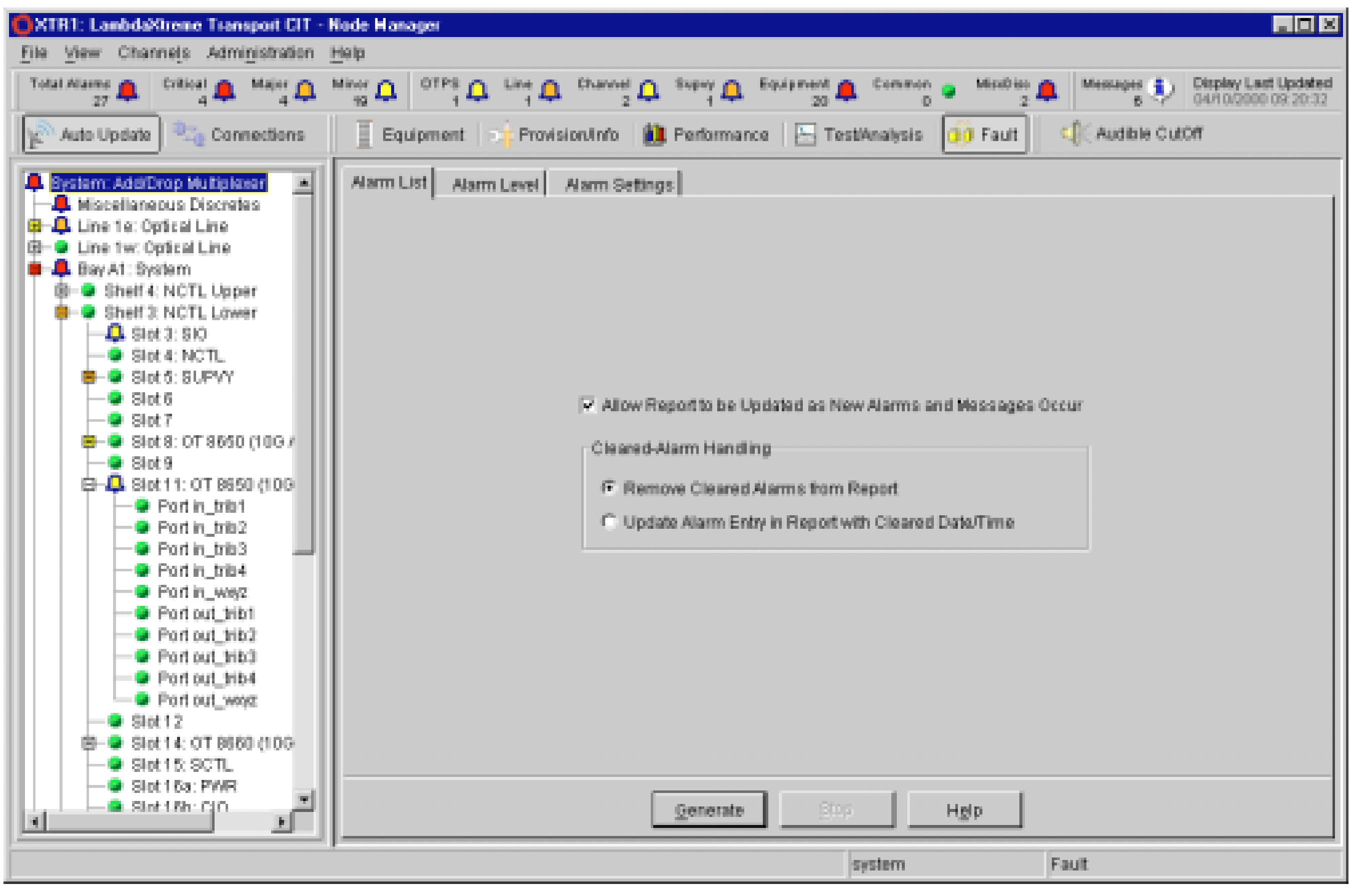
**Procedure**

**1** [“Access the Fault View in Node Manager” (A-87)](#).

**2** From the Equipment Tree, select the piece of equipment for which an Alarm List is to be generated. Click on the **Alarm List** tab in the display panel.

**Result:**

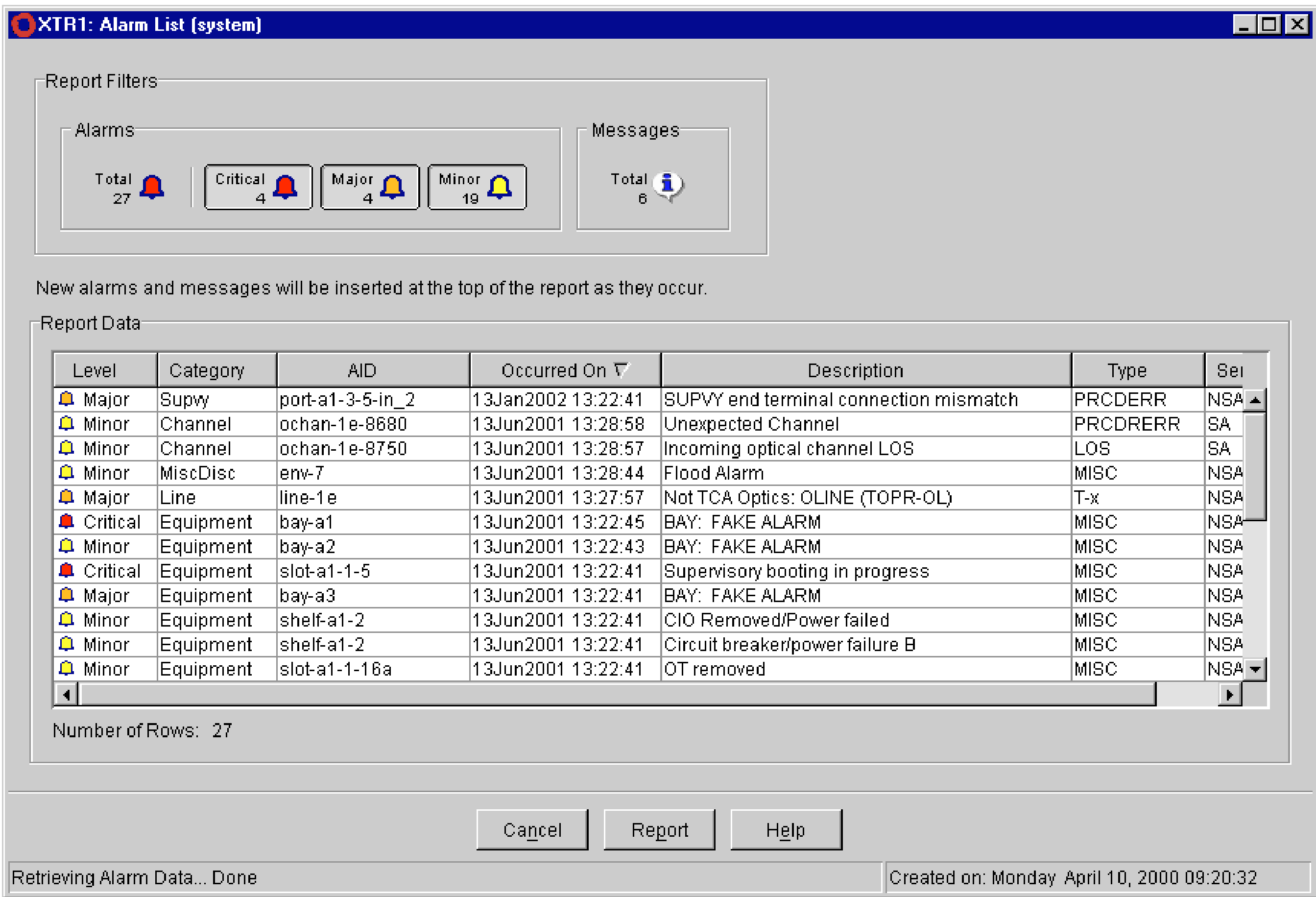
The Fault Equipment Report window appears:



**3** Select the settings to be applied to the Alarm List. Click **Generate** to create the Alarm List for the selected equipment.

**Result:**

The Alarm List is displayed for the selected equipment.




END OF STEPS

# Provision Alarm Severity Levels

**Purpose** Customize individual alarm severities to tailor operations plans to specific operations environments.

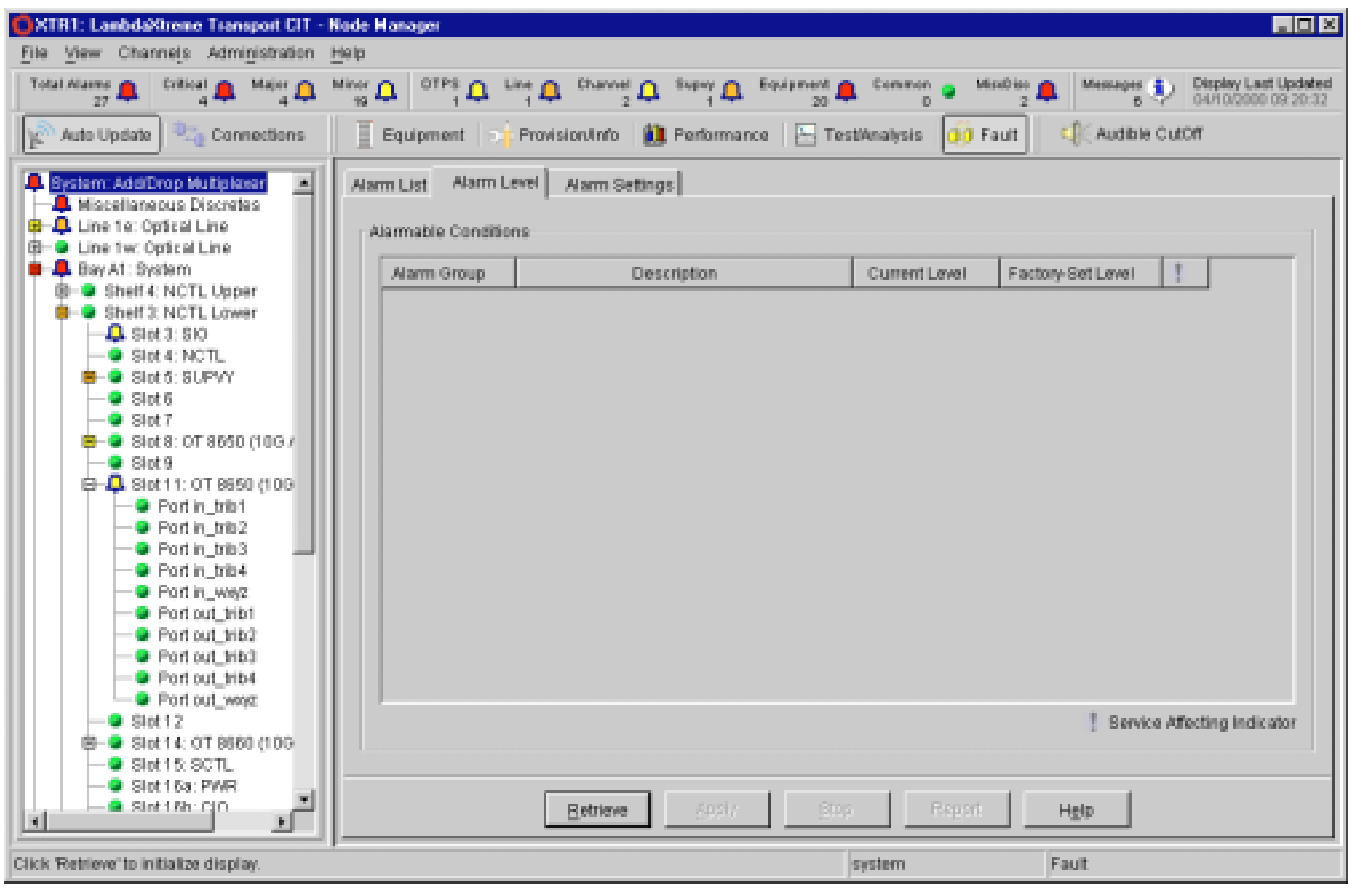
**Procedure**

1. "Access the Fault View in Node Manager" (A-87).

2. Select the System (highest level) in the Equipment Tree. Click on the **Alarm Level** tab in the display panel.

   **Result:**

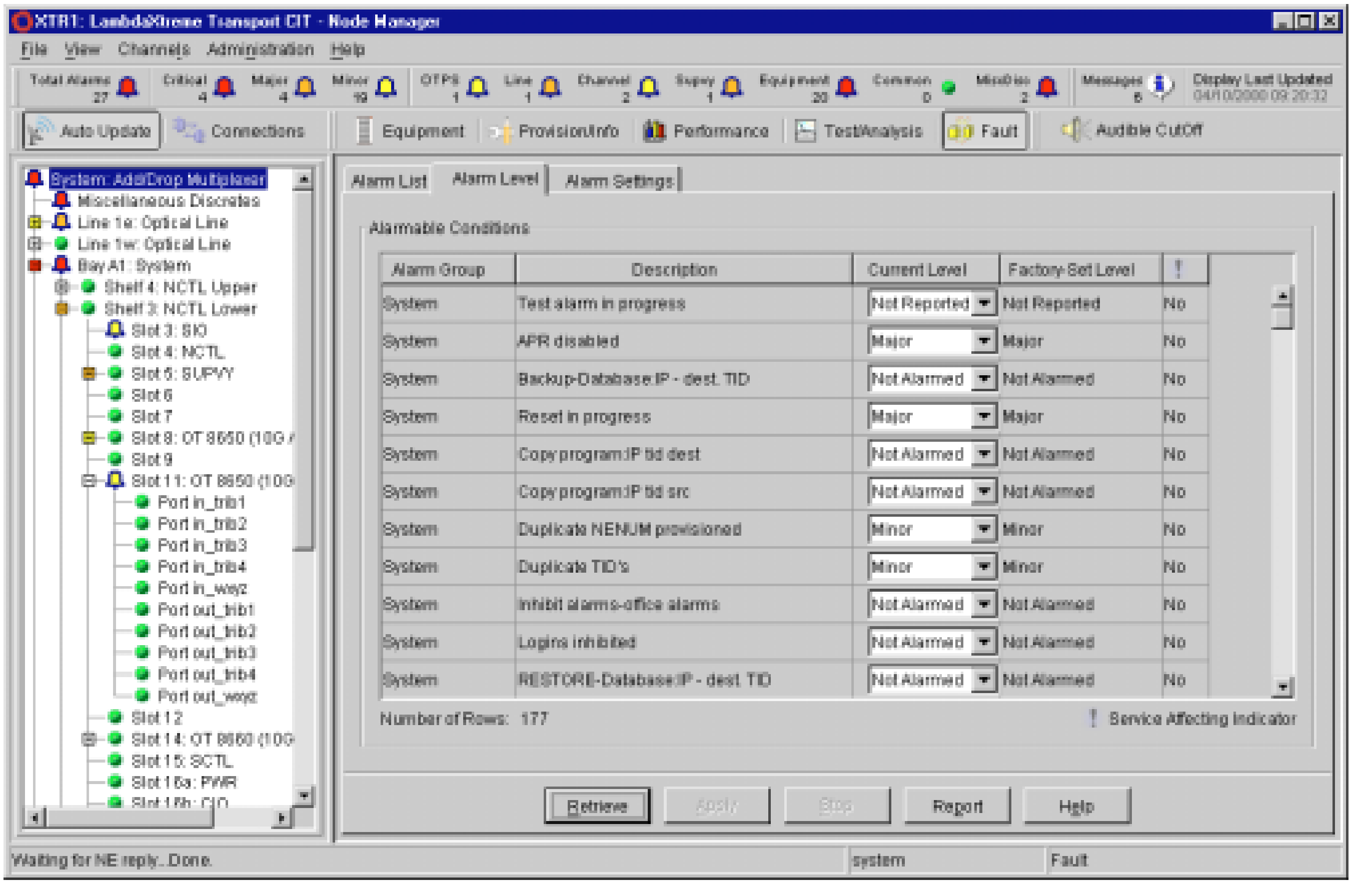
   The System Alarm Level window appears:




3. Click **Retrieve** to display the currently provisioned data.

**Result:**

The System Alarm Level window appears displaying the alarmable conditions.




**4** From the drop down lists, select the appropriate alarm level for any alarm condition being modified. Click **Apply.**

END OF STEPS

# Provision System Alarm Settings

**Purpose** Configure the parameters that control the Office Alarms behavior.

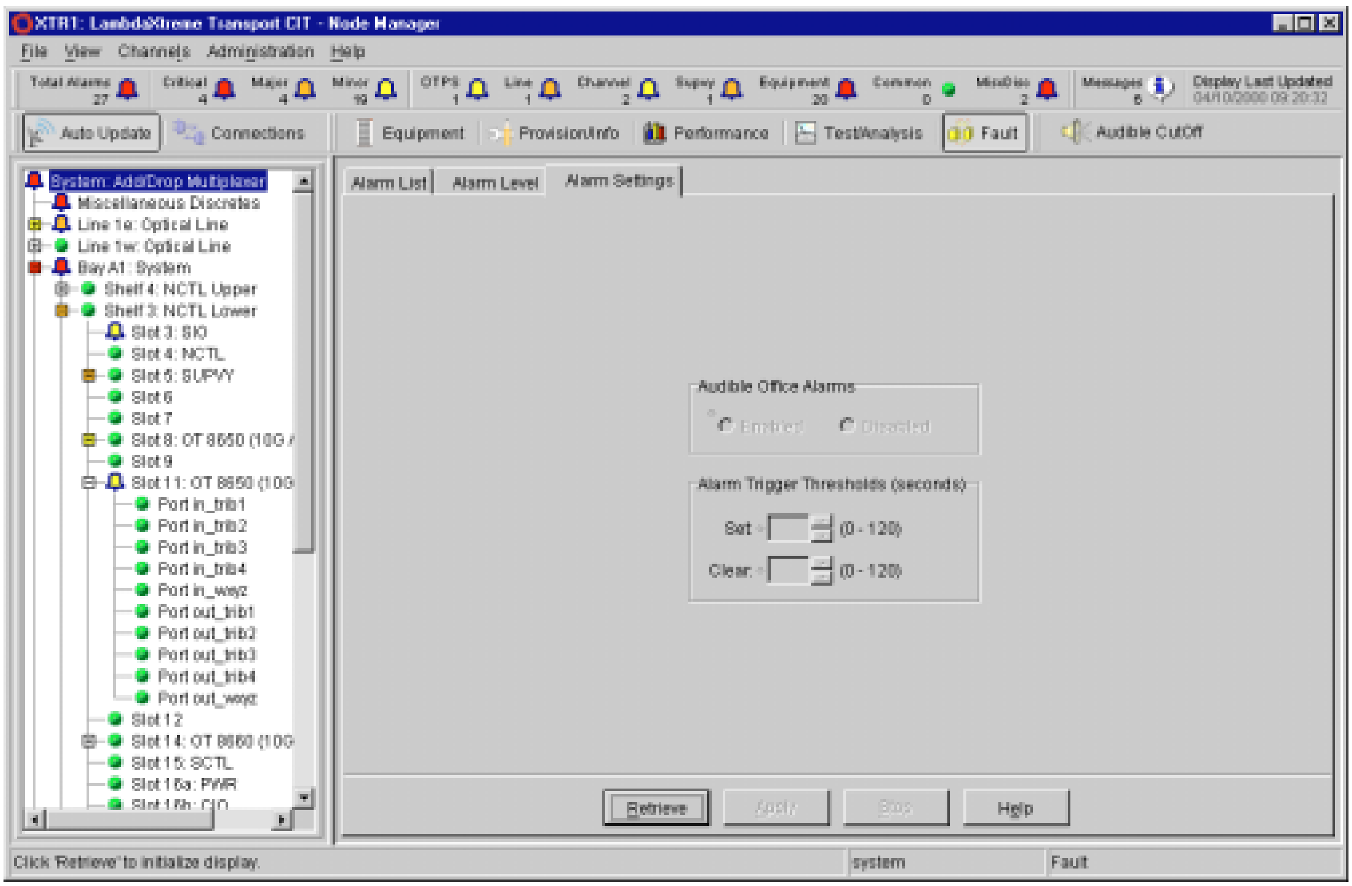
**Procedure**

**1** [“Access the Fault View in Node Manager” (A-87)](#).

**2** Select the System (highest level) in the Equipment Tree. Click on the **Alarm Settings** tab in the display panel.

**Result:**

The System Alarm Settings window appears:




**3** Click **Retrieve** to display the currently provisioned data.

4 Select the appropriate values and click **Apply.**

END OF STEPS

# Provision Miscellaneous Discretes Environmental Points

**Purpose** Define the alarm severities and the alarm messages for miscellaneous discrete alarms in order to monitor the environment around the bay.

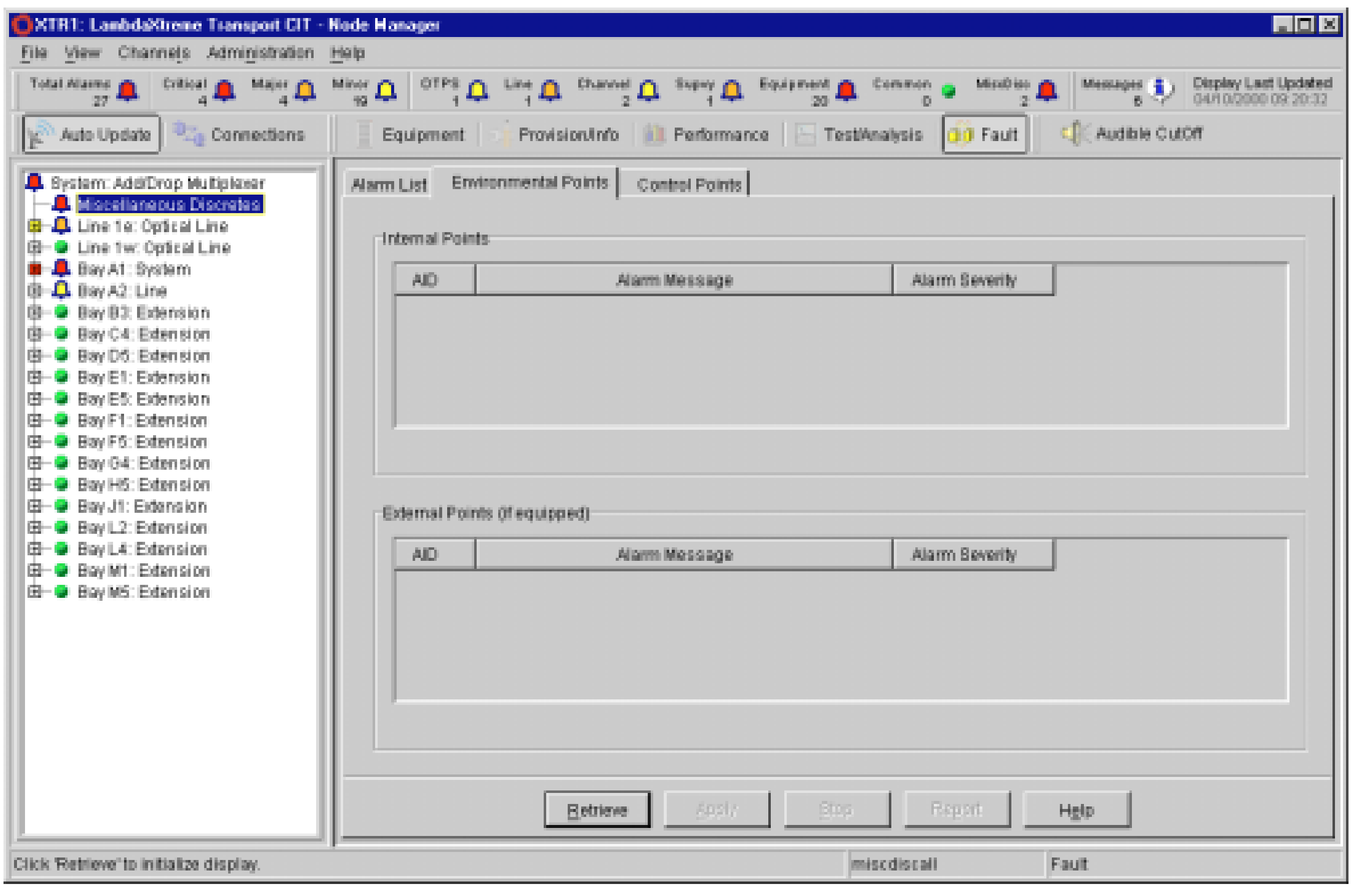
**Procedure**

**1** [“Access the Fault View in Node Manager” (A-87)](#).

**2** From the Equipment Tree, select Miscellaneous Discretes. Click on the **Environmental Points** tab in the display panel.

**Result:**

The Environmental Points Provisioning window appears:




**3** Click **Retrieve** to display the currently provisioned data.

**4** Enter/select the appropriate values and click **Apply.**

END OF STEPS

# Provision/Operate Miscellaneous Discretes Control Points

**Purpose** Define the condition names for the miscellaneous discrete controls and activate/release control points.

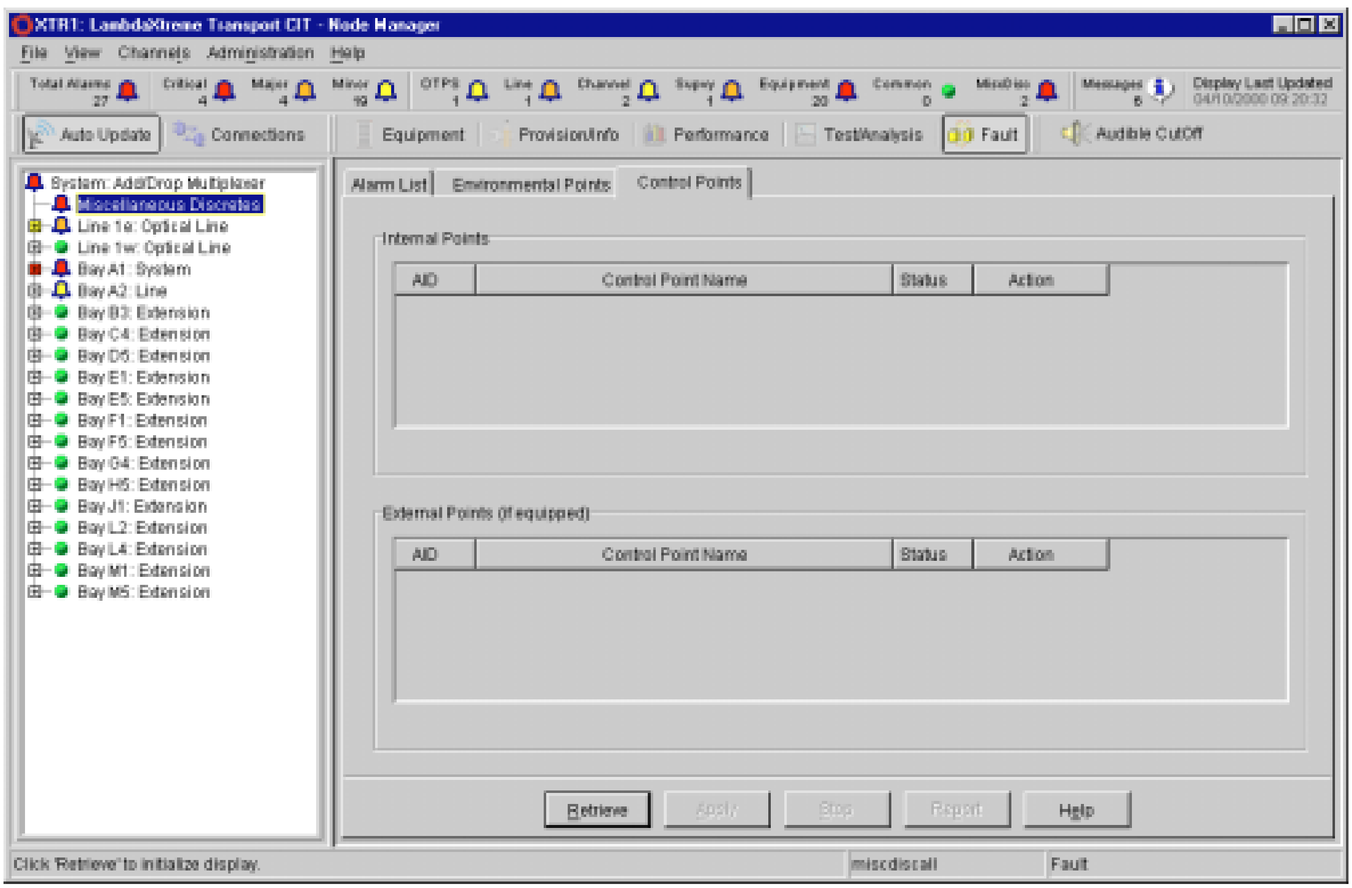
**Procedure**

**1** "Access the Fault View in Node Manager" (A-87).

**2** From the Equipment Tree, select Miscellaneous Discretes. Click on the **Control Points** tab in the display panel.

**Result:**

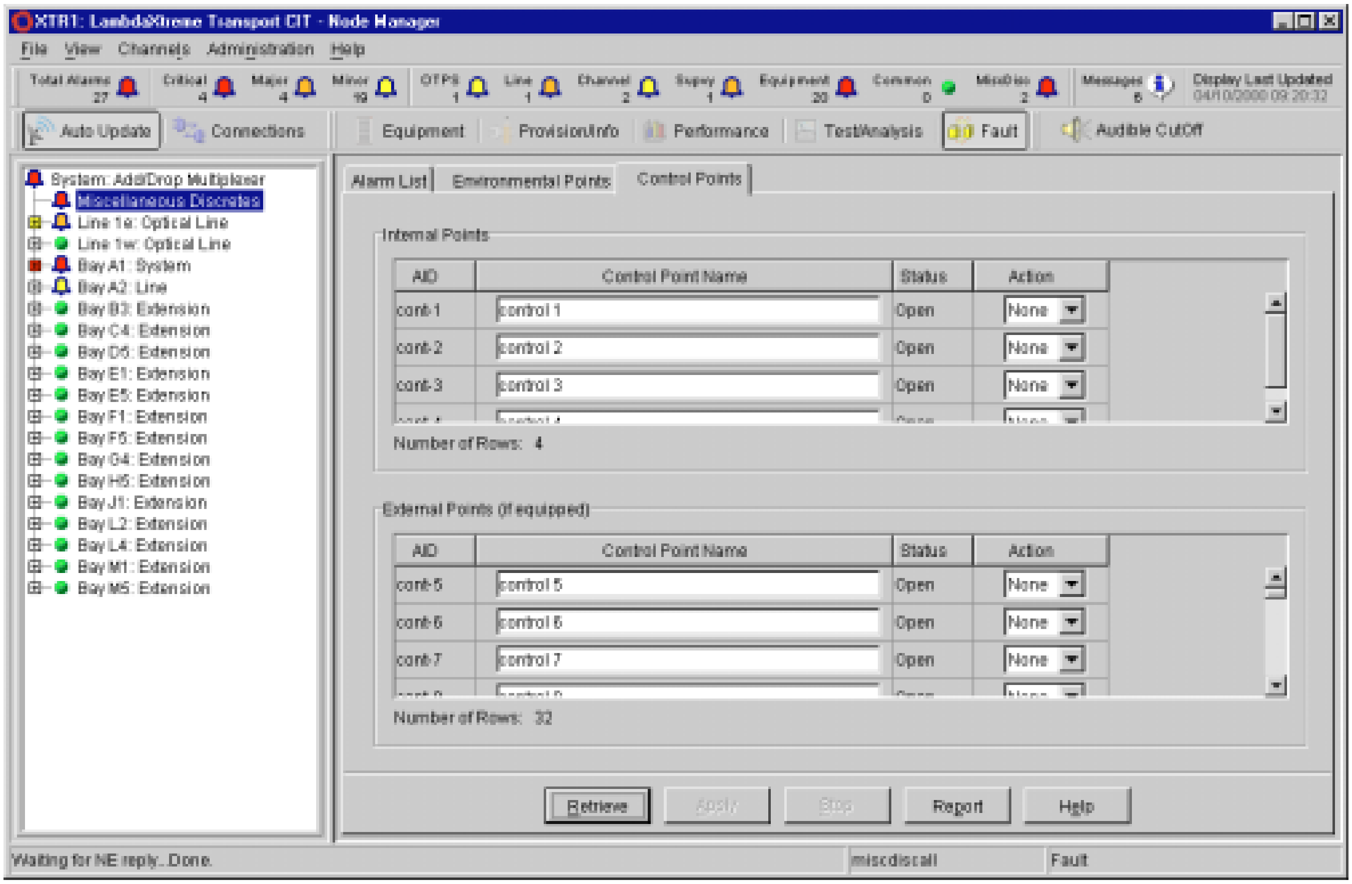
The Control Points Provisioning window appears:




**3** Click **Retrieve** to display the currently provisioned data.

**Result:**

The window is populated with the currently provisioned data:




4 The following applies:

- **Status** shows the current status of the control point (Open or Closed).
- **Action** allows you to operate the control point. If the current status is Open, then it possible to Close or Pulse (close momentarily) the control point. If the current status is Closed, then it is possible to Open it.

Enter/select the appropriate values and click **Apply.**

E N D O F S T E P S

# Provision System Level Attributes for the NE

**Purpose** Provision the system level attributes for the NE including parameters for Configuration, TID, EMS Port, Date/Time, and OA Pack.

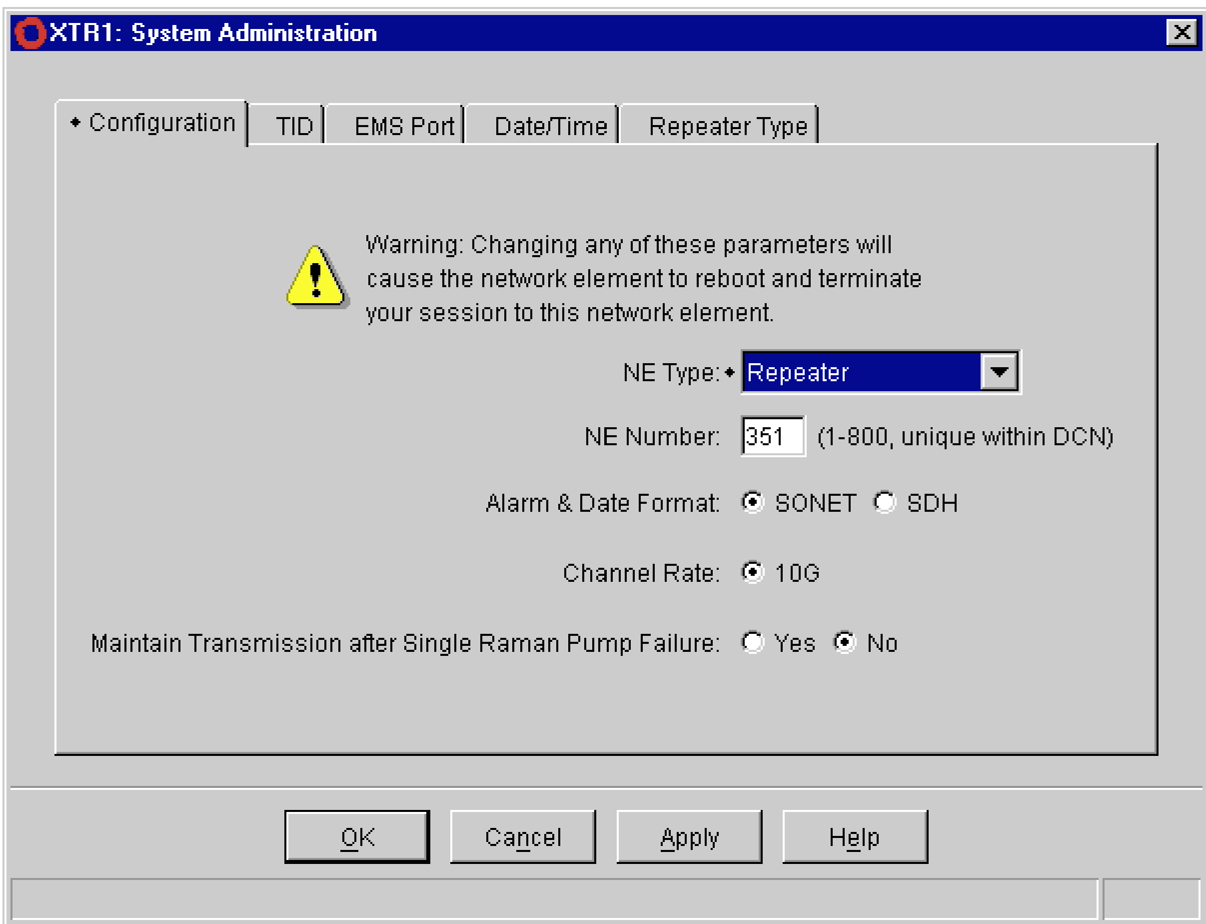
**Procedure**

**1** From the Node Manager menu, select **Administration > System...**

**Result:**

The following System Administration window is displayed.

Note: The tab titled **Repeater Type** is only visible when connected to a Repeater NE.




**2** Select the appropriate tab(s) at the top of this window to enter any system parameter changes needed.

3 Click on **OK** or **Apply** to execute changes.

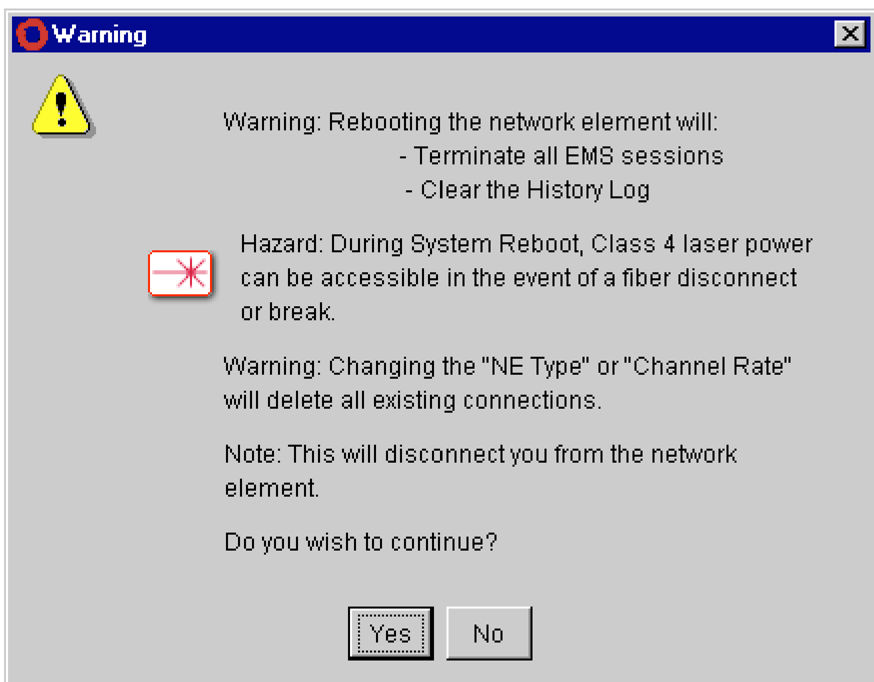
**Important!** All the parameters which cause a reboot of the system are set from within the Configuration tab in order to avoid repetitive reboots. The user should finish setting all system parameters that cause a reboot of the NE before executing the change for any of these parameters.

4 For any further changes needed to the system level parameters, select the **TID, EMS Port, Date/Time, or OA Pack** tabs at the top of the window and enter relevant information.

5 Click **OK** or **Apply** to provision all changes.

**Result:**

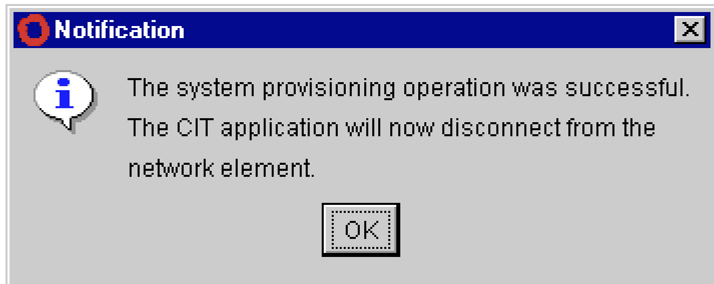
The following warning is displayed. The included message(s) are generated based upon which parameters are changed:




6 Click **Yes.**

**Result:**

The following notification is displayed prior to disconnecting the Node Manager session if caused by this provisioning:




**7** Click **OK.**

**Result:**

The system provisioning operation is complete and the user is disconnected from the NE if necessitated by the provisioning.

END OF STEPS

# Auto Update Messages

**Purpose** Allow/disallow the reporting of autonomous messages.

Note: The setting is on a per login basis and works as a toggle.

**Procedure**

1. The system default allows the reporting of autonomous messages. To disallow reporting of these messages, click once on the **Auto Update** button located in the View Toolbar. Selecting it again will allow reporting of autonomous messages.

   Note: This option can also be toggled from the Node Manager menu by selecting **File > Auto Update.** When reporting of autonomous messages is allowed, the icon next to the menu item is highlighted.

   Note: Every time the user logs into the Node Manager, Autonomous Messages are automatically set to Allow.

END OF STEPS

# View Alarm List Report

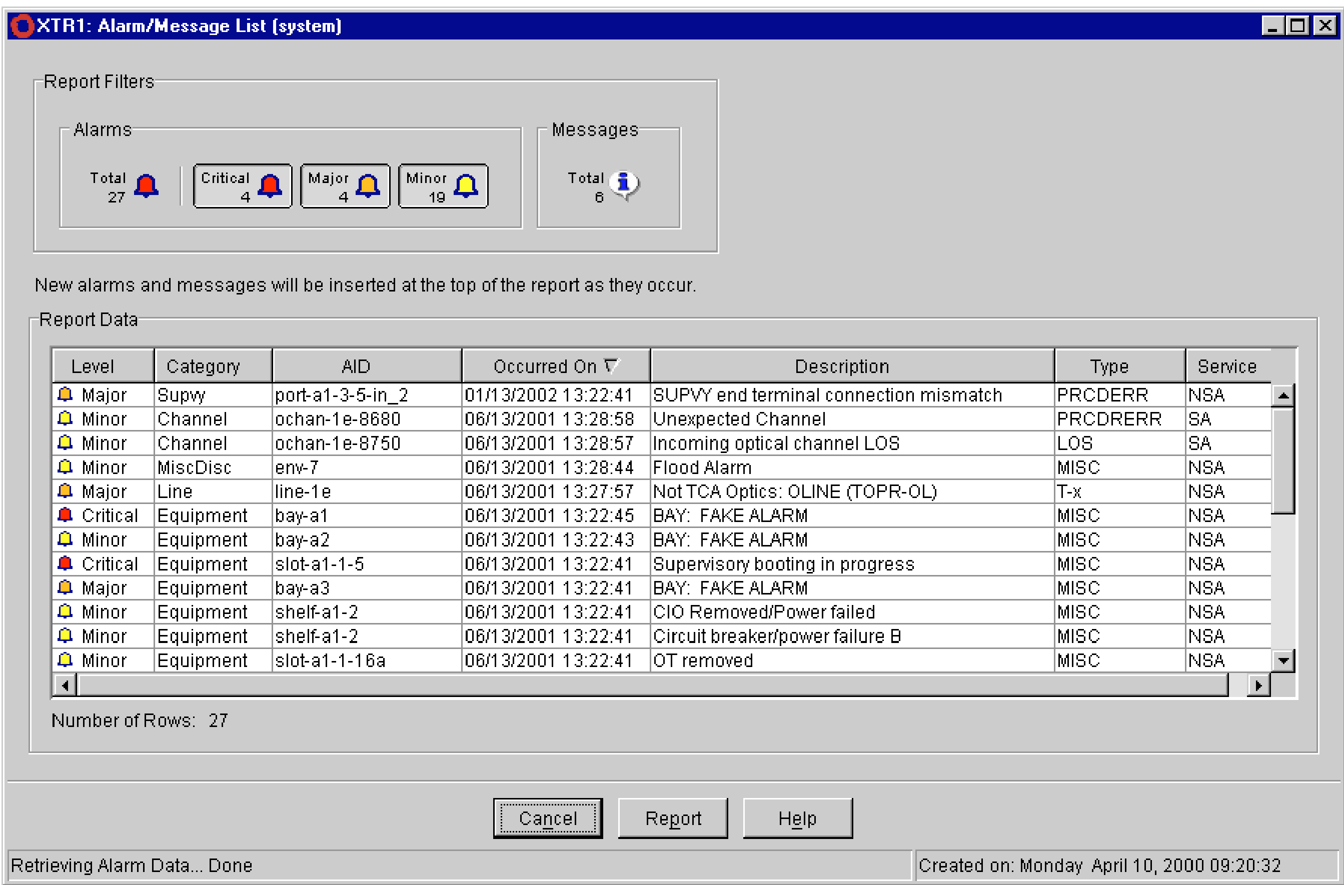
**Purpose** Display a report listing the active alarms retrieved from the NE.

**Procedure**

**1** From the Node Manager, click on the desired icon in the Alarm Toolbar. You can also view an alarm list via the Node Manager menu by clicking on **View > Alarm/Message List > [Selection].**

**Result:**

The Alarm List window displays information for the selected category.




**2** The Report Filters section of the window summarizes the total number of alarms retrieved and the total number of informational messages. Each report is launched with a default set of filters. The filters may be changed by clicking on the appropriate filter button **(Critical, Major, Minor).** To display the informational messages, click on the **Messages** icon.

END OF STEPS

# Cut Off Audible Alarms

**Purpose** Turn off (silence) existing alarm sounds.

**Procedure**

1 From the Node Manager, click on the Audible CutOff icon to the right of the View Toolbar. You can also select Audible CutOff from the Node Manager menu by clicking on **Administration >Audible CutOff.**

**Result:**

Existing audible alarms are silenced.

END OF STEPS

# View Neighbors Report

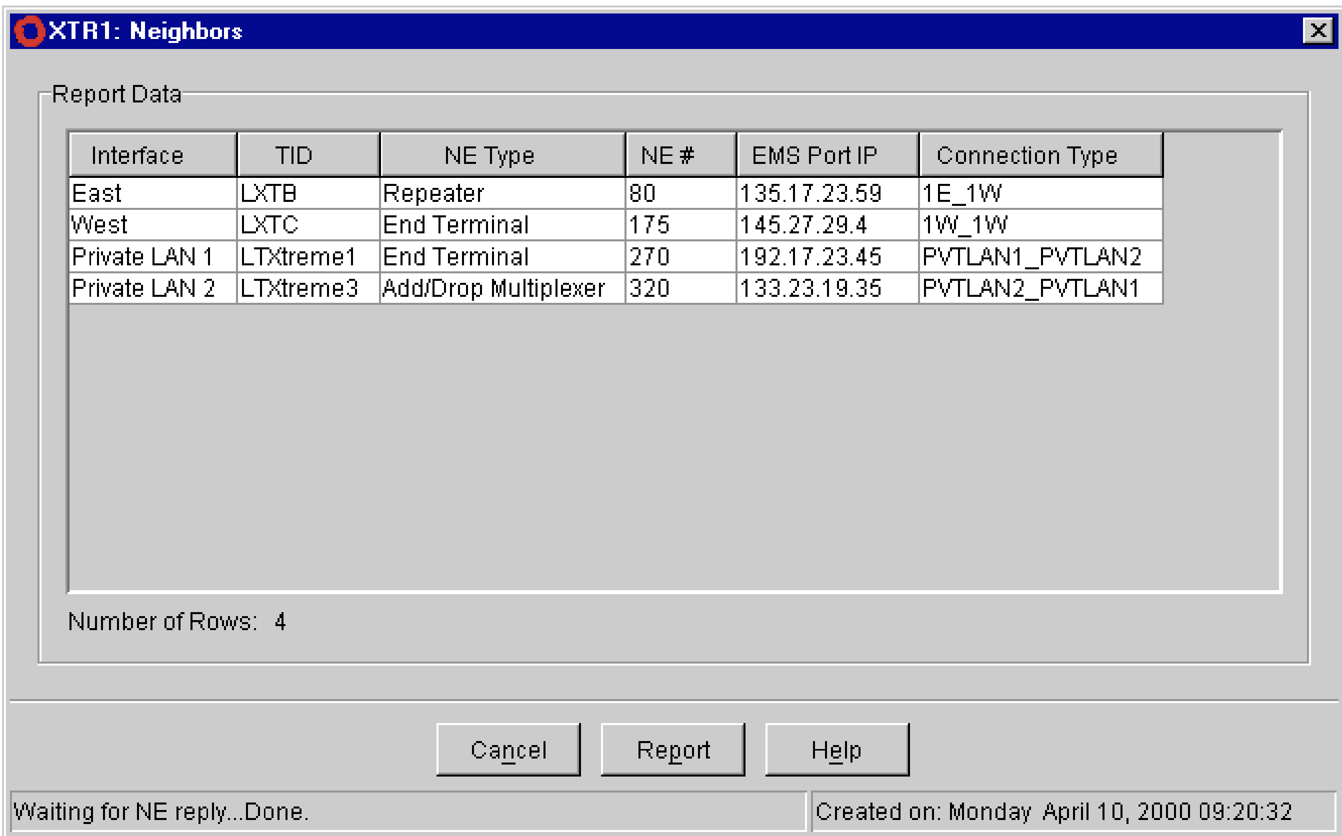
**Purpose** Display a report listing all neighboring NEs that are connected to this NE.

**Procedure**

**1** From the Node Manager menu, select **View > Neighbors.**

**Result:**

The Neighbors window appears:




END OF STEPS

# View Event History Log

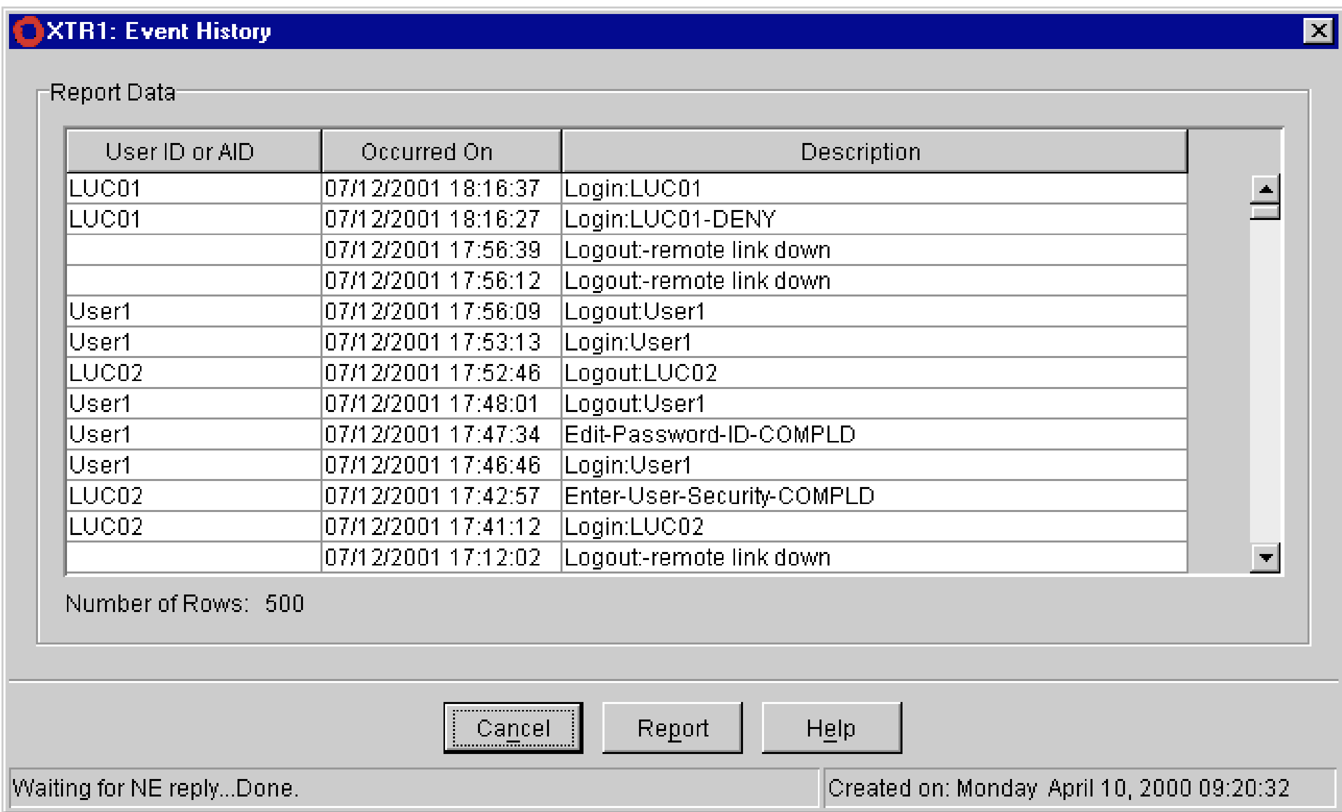
**Purpose** Display the contents of an Event History log for the NE.

**Procedure**

**1** From the Node Manager menu, select **View > Event History.**

**Result:**

The Event History window appears:




E N D  O F  S T E P S

# View Channel Map Report

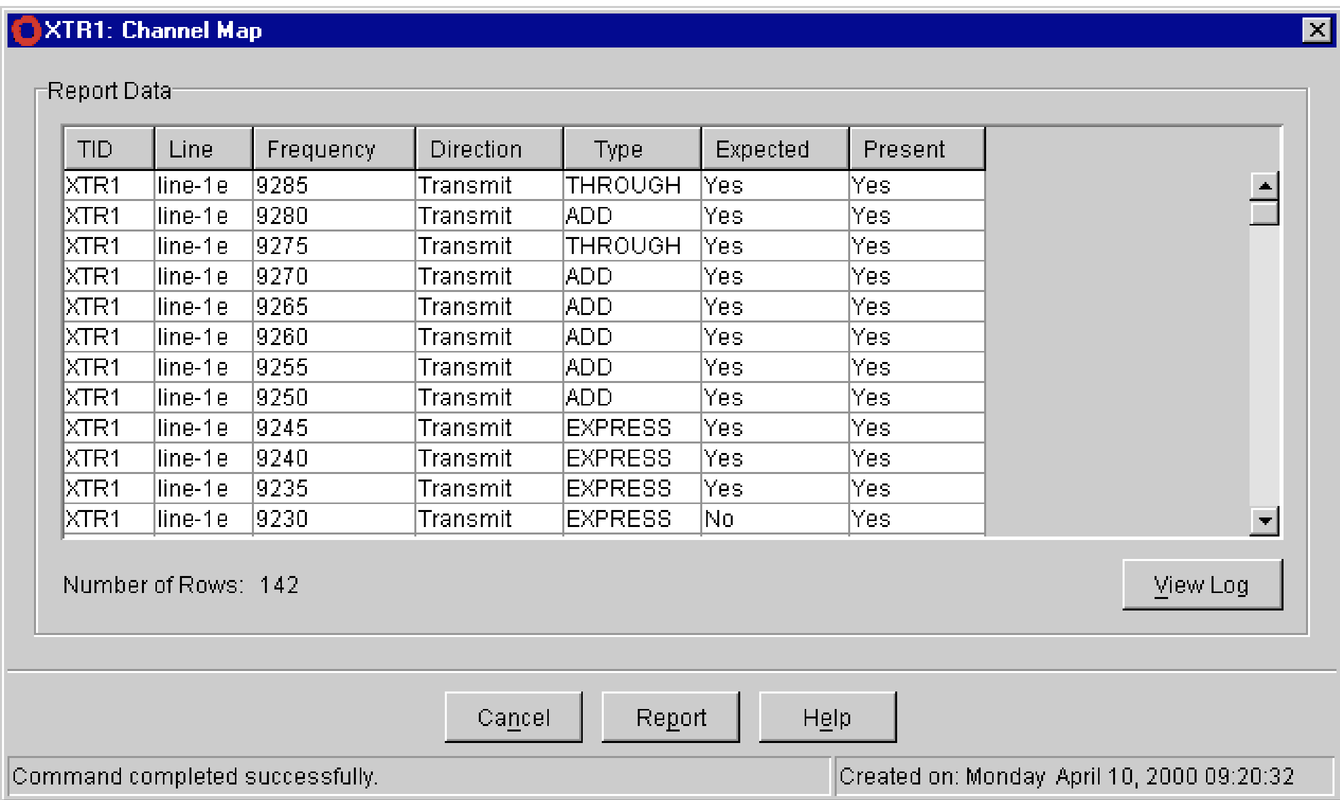
**Purpose** Display a report listing all optical channels that are being used at the current NE or all NEs in the OLS.

**Procedure**

**1** From the Node Manager menu, select **View > Channel Map > This NE** or **All NEs.**

**Result:**

The Channel Map window appears.

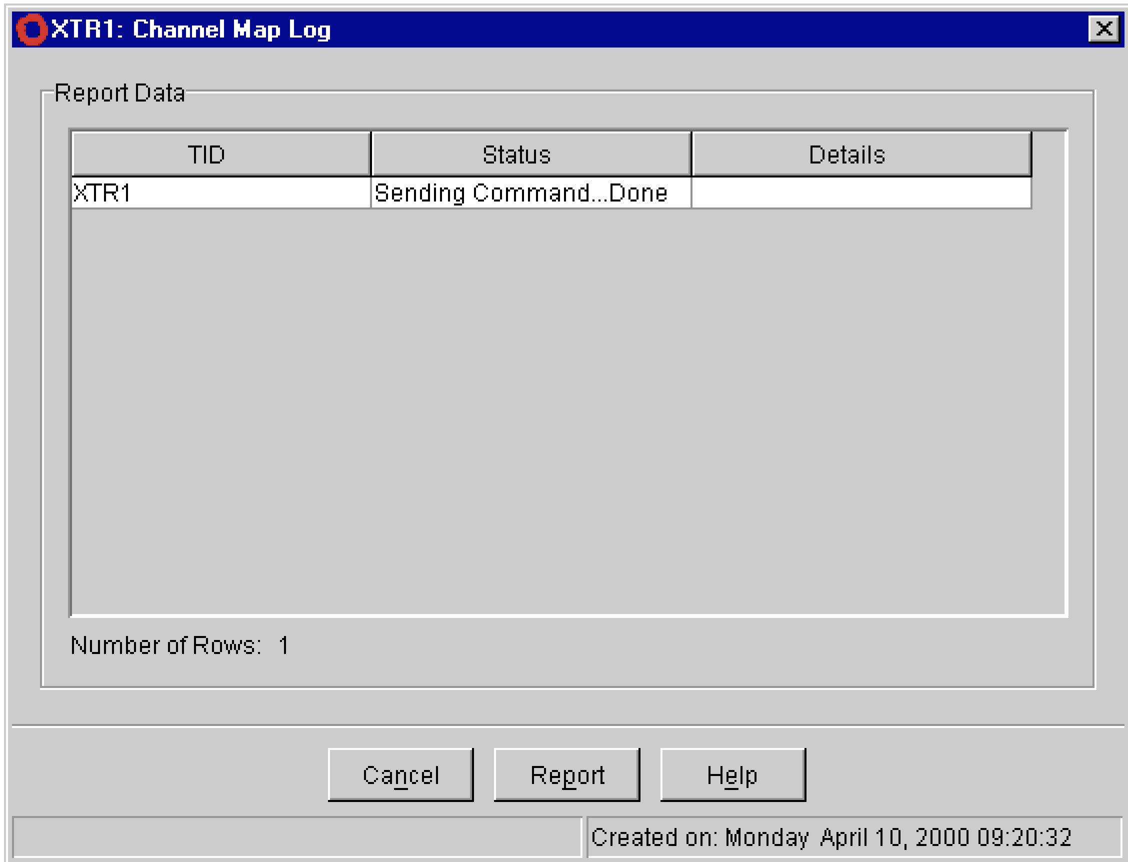



| TID | Line | Frequency | Direction | Type | Expected | Present |
|---|---|---|---|---|---|---|
| XTR1 | line-1e | 9285 | Transmit | THROUGH | Yes | Yes |
| XTR1 | line-1e | 9280 | Transmit | ADD | Yes | Yes |
| XTR1 | line-1e | 9275 | Transmit | THROUGH | Yes | Yes |
| XTR1 | line-1e | 9270 | Transmit | ADD | Yes | Yes |
| XTR1 | line-1e | 9265 | Transmit | ADD | Yes | Yes |
| XTR1 | line-1e | 9260 | Transmit | ADD | Yes | Yes |
| XTR1 | line-1e | 9255 | Transmit | ADD | Yes | Yes |
| XTR1 | line-1e | 9250 | Transmit | ADD | Yes | Yes |
| XTR1 | line-1e | 9245 | Transmit | EXPRESS | Yes | Yes |
| XTR1 | line-1e | 9240 | Transmit | EXPRESS | Yes | Yes |
| XTR1 | line-1e | 9235 | Transmit | EXPRESS | Yes | Yes |
| XTR1 | line-1e | 9230 | Transmit | EXPRESS | No | Yes |

**2** To view any possible errors encountered during data collection, you can click the **View Log** button.

**Result:**

The Channel Map Log appears:




END OF STEPS

# View OLS Configuration Report

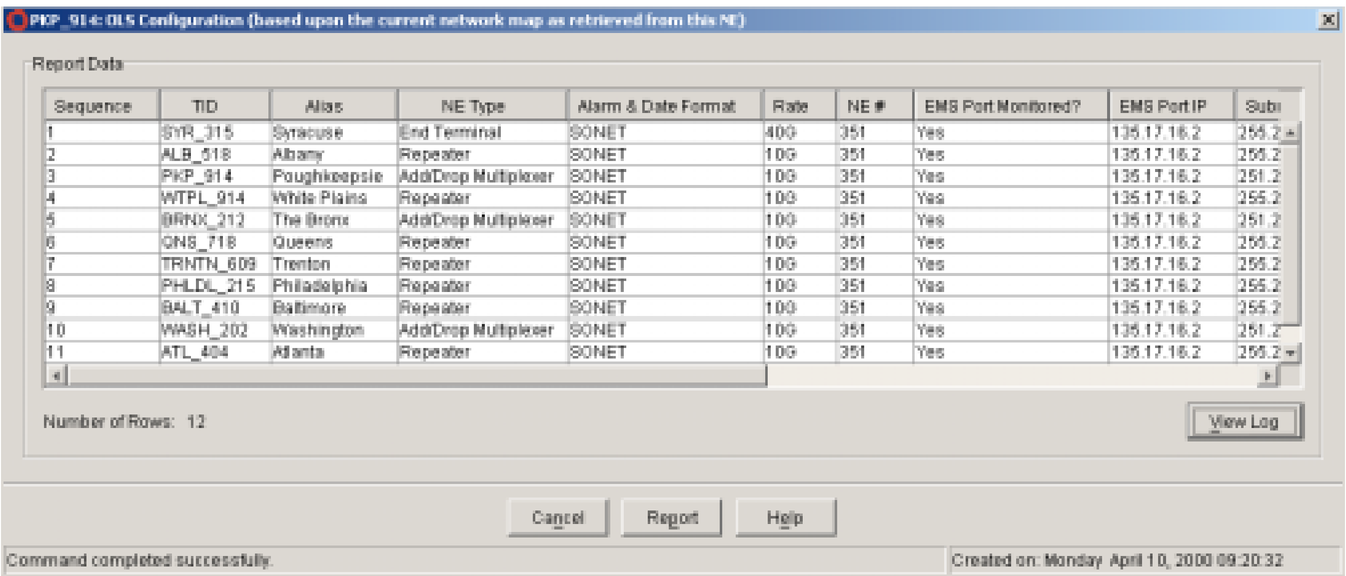
**Purpose** Display a report listing all NEs in the OLS.

**Procedure**

**1** From the Node Manager menu, select **View > OLS Configuration.**

**Result:**

The OLS Configuration window appears:




| Sequence | TID | Alias | NE Type | Alarm & Date Format | Rate | NE # | EMS Port Monitored? | EMS Port IP | Subi |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SYR_315 | Syracuse | End Terminal | SONET | 40G | 351 | Yes | 135.17.16.2 | 255.2 |
| 2 | ALB_518 | Albany | Repeater | SONET | 10G | 351 | Yes | 135.17.16.2 | 255.2 |
| 3 | PKP_914 | Poughkeepsie | Add/Drop Multiplexer | SONET | 10G | 351 | Yes | 135.17.16.2 | 251.2 |
| 4 | WTPL_914 | White Plains | Repeater | SONET | 10G | 351 | Yes | 135.17.16.2 | 255.2 |
| 5 | BRNX_212 | The Bronx | Add/Drop Multiplexer | SONET | 10G | 351 | Yes | 135.17.16.2 | 251.2 |
| 6 | QNS_718 | Queens | Repeater | SONET | 10G | 351 | Yes | 135.17.16.2 | 255.2 |
| 7 | TRNTN_609 | Trenton | Repeater | SONET | 10G | 351 | Yes | 135.17.16.2 | 255.2 |
| 8 | PHLDL_215 | Philadelphia | Repeater | SONET | 10G | 351 | Yes | 135.17.16.2 | 255.2 |
| 9 | BALT_410 | Baltimore | Repeater | SONET | 10G | 351 | Yes | 135.17.16.2 | 255.2 |
| 10 | WASH_202 | Washington | Add/Drop Multiplexer | SONET | 10G | 351 | Yes | 135.17.16.2 | 251.2 |
| 11 | ATL_404 | Atlanta | Repeater | SONET | 10G | 351 | Yes | 135.17.16.2 | 255.2 |

**2** To view any possible errors encountered during data collection, you can click the **View Log** button.

END OF STEPS

# View OLS Software/Database Report

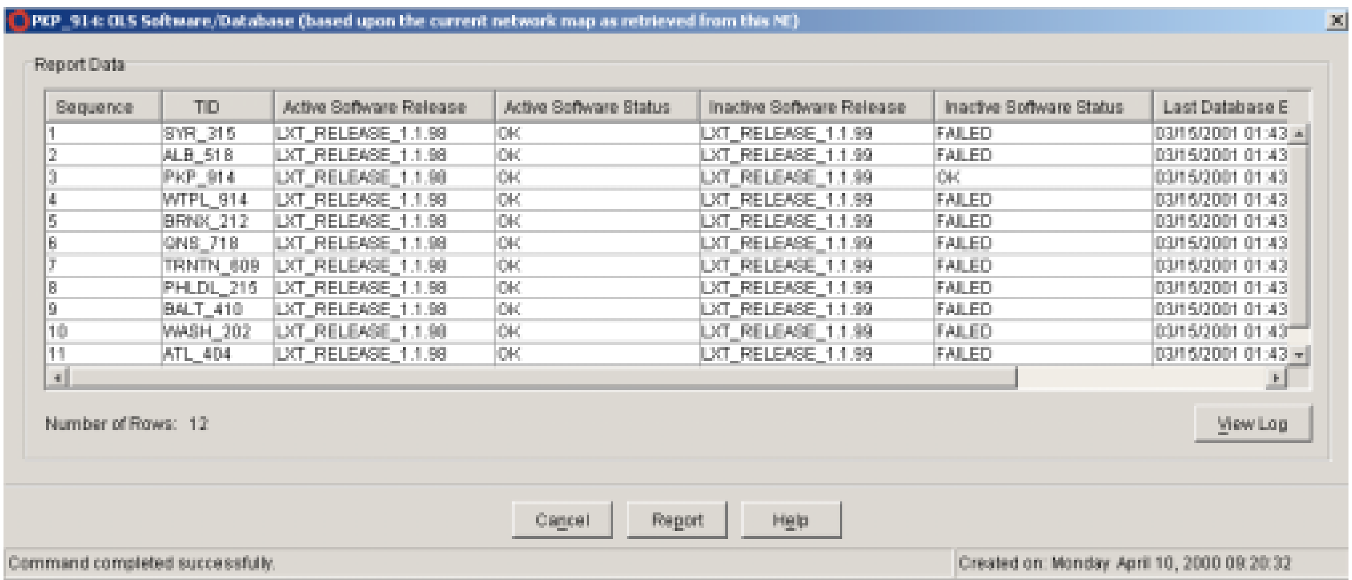
**Purpose** Display a report listing current software and database information on all NEs in the OLS.

**Procedure**

**1** From the Node Manager menu, select **View >OLS Software/Database.**

**Result:**

The OLS Software/Database window appears:




| Sequence | TID | Active Software Release | Active Software Status | Inactive Software Release | Inactive Software Status | Last Database E |
|---|---|---|---|---|---|---|
| 1 | SYR_315 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | FAILED | 03/15/2001 01:43 |
| 2 | ALB_518 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | FAILED | 03/15/2001 01:43 |
| 3 | PKP_914 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | OK | 03/15/2001 01:43 |
| 4 | WTPL_914 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | FAILED | 03/15/2001 01:43 |
| 5 | BRNX_212 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | FAILED | 03/15/2001 01:43 |
| 6 | QNS_718 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | FAILED | 03/15/2001 01:43 |
| 7 | TRNTN_609 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | FAILED | 03/15/2001 01:43 |
| 8 | PHLDL_215 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | FAILED | 03/15/2001 01:43 |
| 9 | BALT_410 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | FAILED | 03/15/2001 01:43 |
| 10 | WASH_202 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | FAILED | 03/15/2001 01:43 |
| 11 | ATL_404 | LXT_RELEASE_1.1.98 | OK | LXT_RELEASE_1.1.99 | FAILED | 03/15/2001 01:43 |

**2** To view any possible errors encountered during data collection, you can click the **View Log** button.

END OF STEPS

# Refresh Alarms

**Purpose**

Update the Node Manager Alarm Toolbar.

Note: This function is not necessary when Autonomous Messages are Allowed (see "Auto Update Messages" (A-102)).

**Procedure**

**1** From the Node Manager menu, select **View > Refresh > Alarms.**

**Result:**

The alarm toolbar is reinitialized.

END OF STEPS

# Refresh Equipment

**Purpose**

Update the Node Manager Equipment Tree.

Note: The Equipment Tree is never updated automatically when NE equipment changes. The user must operate this function to refresh the tree manually.

**Procedure**

1. From the Node Manager menu, select **View > Refresh > Equipment.**

   **Result:**

   The equipment tree is updated and any new equipment is added.

END OF STEPS

# Security Administration - Add a User

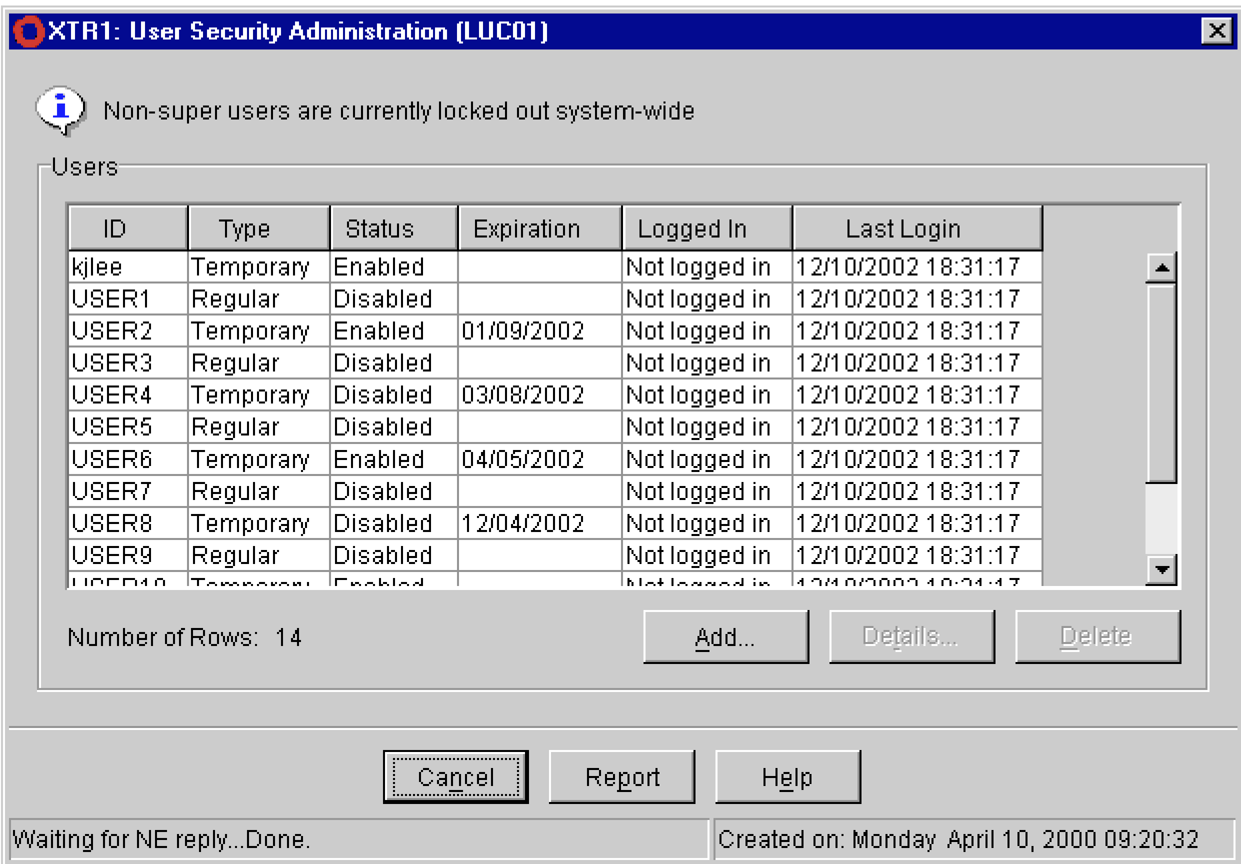
**Purpose** Add a new user to the system.

**Procedure**

**1** From the Node Manager menu, select **Administration > Security > Users...**

**Result:**

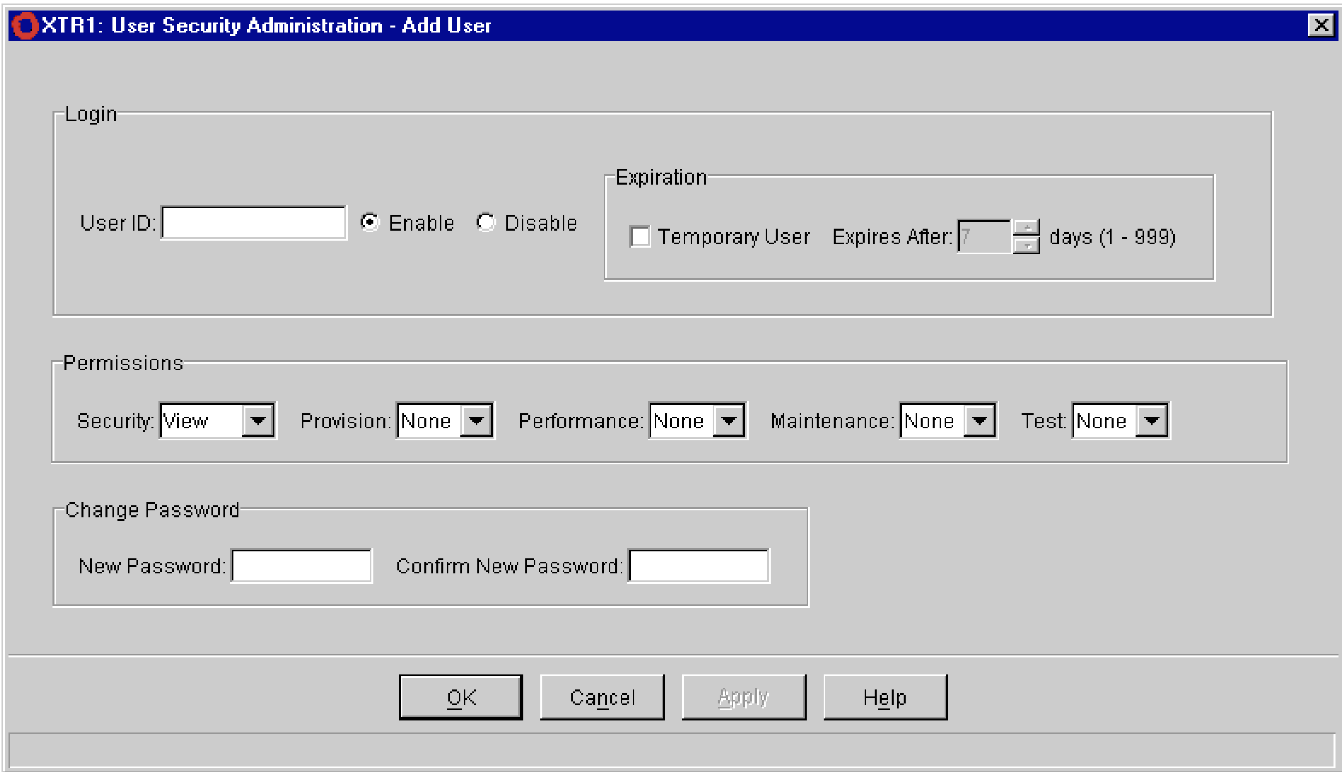
The User Security Administration window is displayed:




**2** Click the **Add...** button.

**Result:**

The Add User window is displayed.




**3** Enter all pertinent information for the new user.

**4** Click **OK** or **Apply.**

END OF STEPS

# Security Administration - View/Change User Security Settings

**Purpose** View or change security settings for an existing user.

**Procedure**

**1** From the Node Manager menu, select **Administration > Security > Users...**

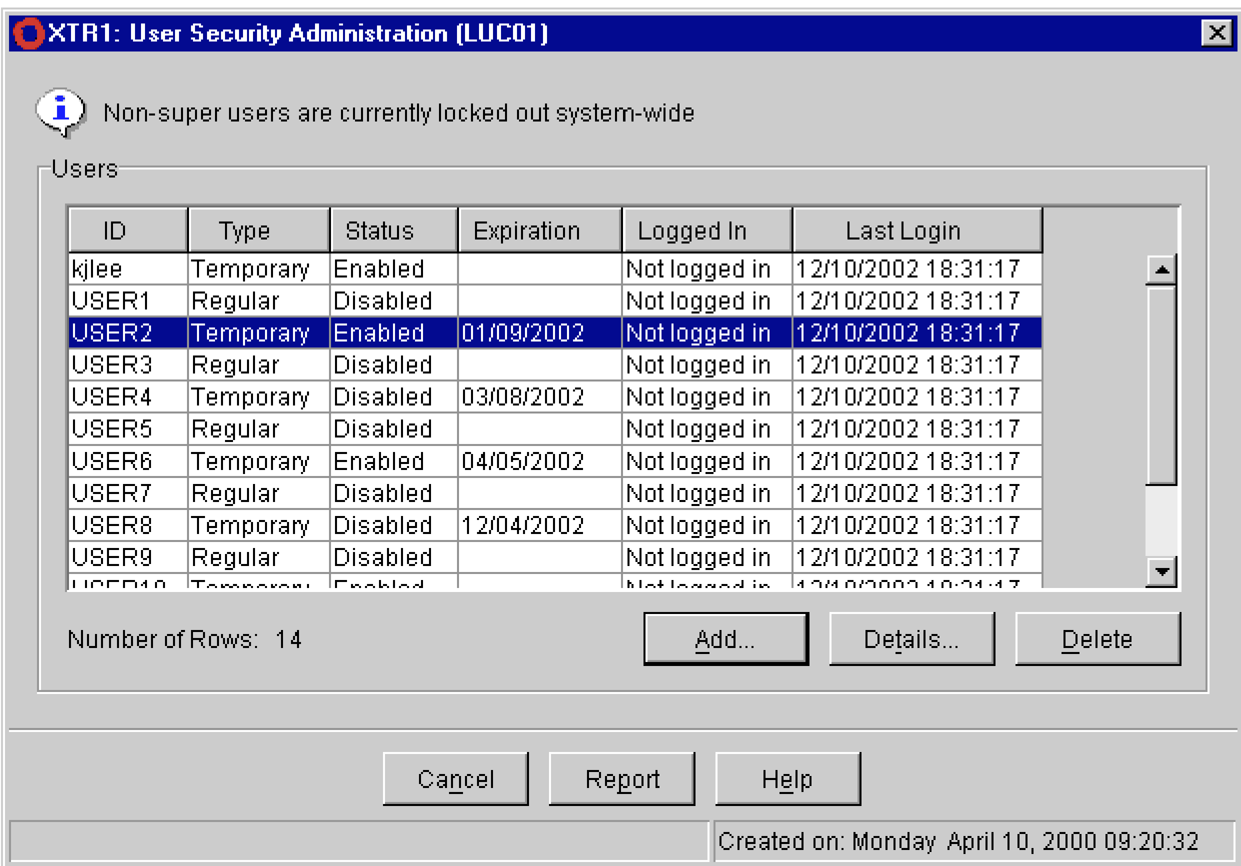
**Result:**

The User Security Administration window is displayed.

**2** Select the user whose security settings are to be viewed/changed.

**Result:**

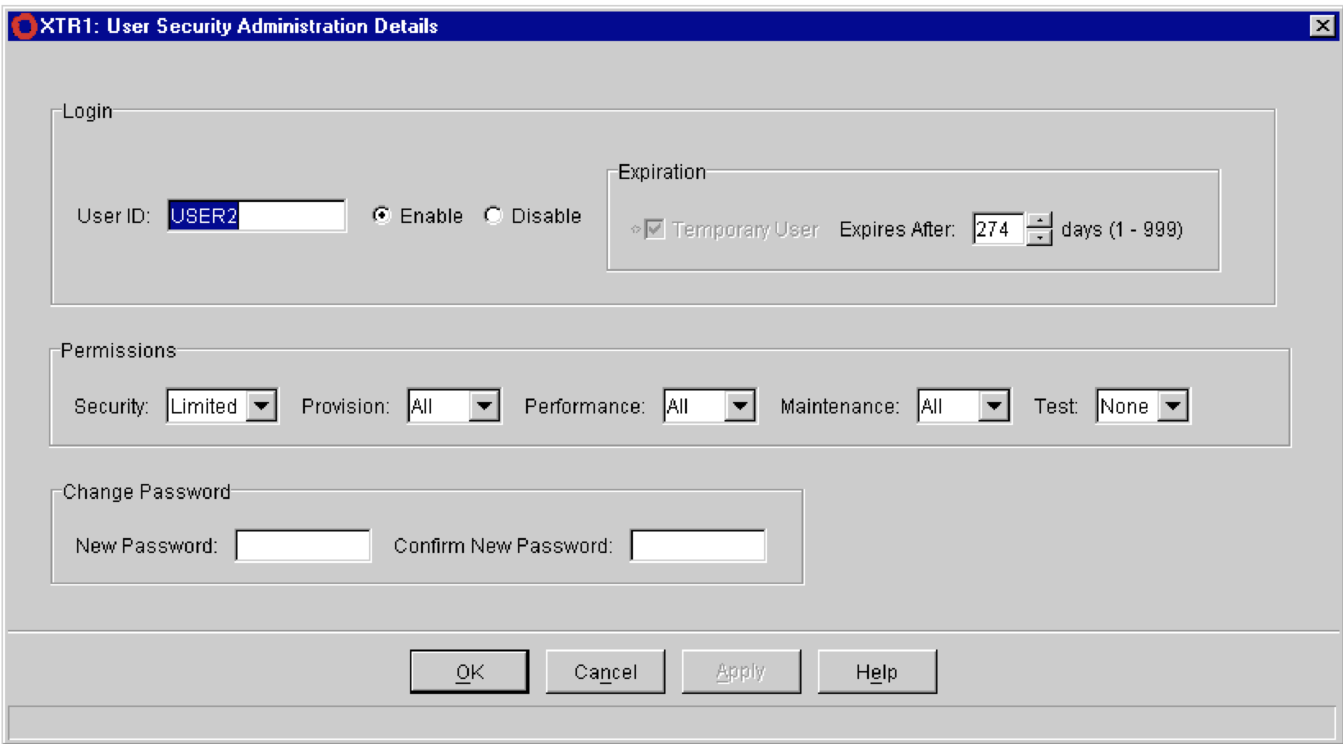
The **Details...** button becomes enabled as shown.



**3** Click on **Details...**

**Result:**

The following User Security Administration Details window is displayed:




**4** View or change all pertinent information for the specified user.

**5** Click **OK** or **Apply** to process any new settings.

END OF STEPS

# Security Administration - Delete a User

**Purpose** Delete an existing user from the system.

**Procedure**

**1** From the Node Manager menu, select **Administration > Security > Users...**

**Result:**

The User Security Administration window is displayed.

**2** Highlight the user to be deleted.

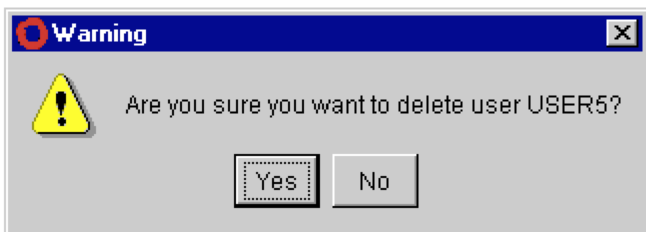
**Result:**

The **Delete** button becomes enabled.

**3** Click on **Delete.**

**Result:**

The following warning is displayed:




**4** Click on **Yes** to delete the specified user.

END OF STEPS

# Security Administration - Set System Security Parameters

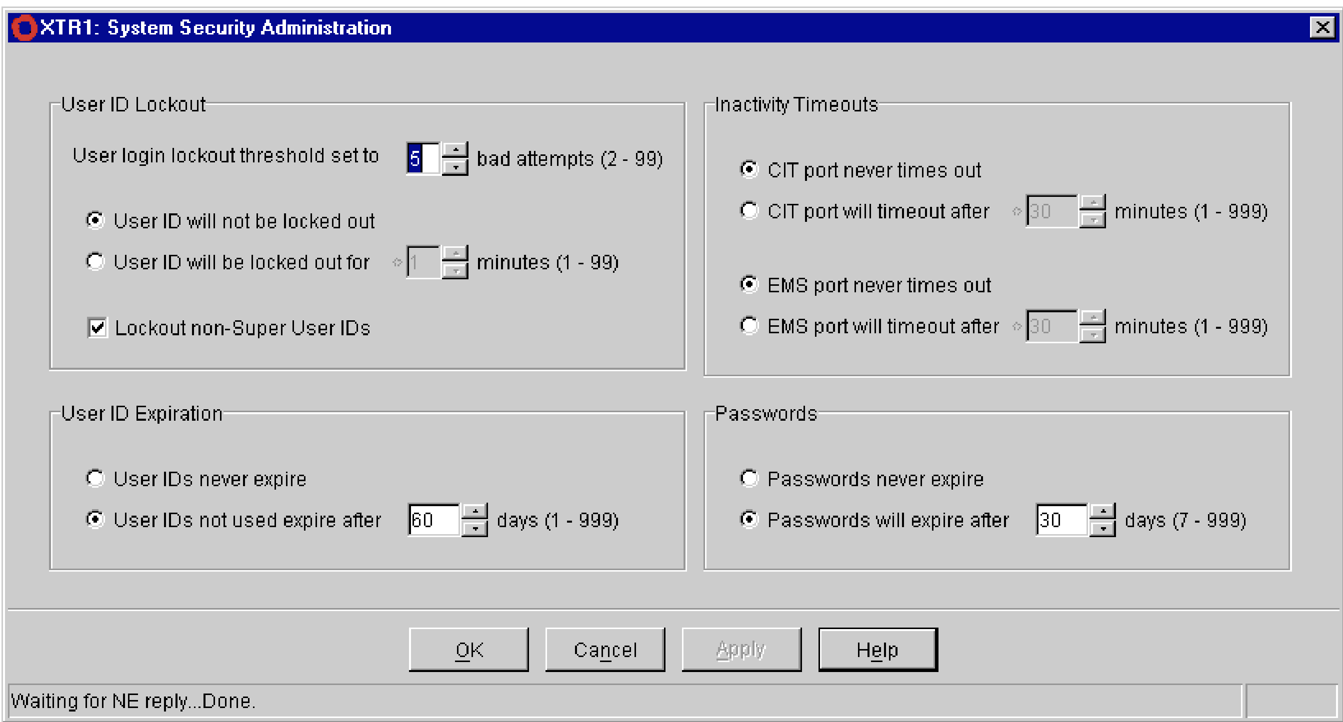
**Purpose** Set security parameters on the network element.

**Procedure**

**1** From the Node Manager menu, select **Administration > Security > System...**

**Result:**

The System Security Administration window is displayed:




**2** View or change appropriate information for the following as necessary:

- User ID Lockout
- Inactivity Timeouts
- User ID Expiration
- Passwords

3 Click **OK** or **Apply** to process new settings.

END OF STEPS

# Security Administration - Change Password

**Purpose**

Change your current password.

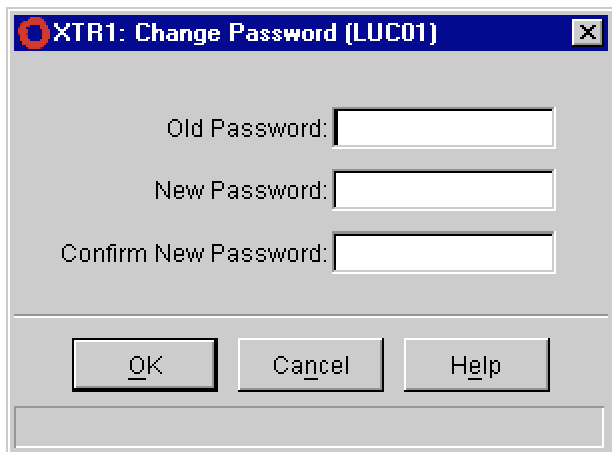
Note: From this screen, the only password that can be changed is the password of the user who is currently logged in.

**Procedure**

**1** From the Node Manager menu, select **Administration > Security > Change Password...**

**Result:**

The Change Password window is displayed:




**2** Enter the required information in the appropriate fields.

**3** Click **OK** to change the password.

END OF STEPS

# View Software Release Information

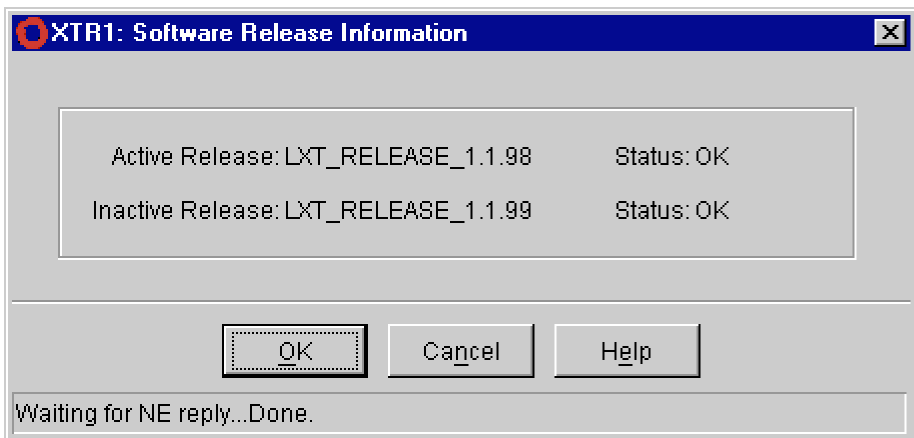
**Purpose** Display the current software information for the active and inactive areas of the FlashDisk Memory Module (FMM).

**Procedure**

**1** From the Node Manager menu, select **Administration > Software > Release Information...**

**Result:**

The Software Release Information window is displayed:




**2** Click **OK** to close the window.

END OF STEPS

# Download Software

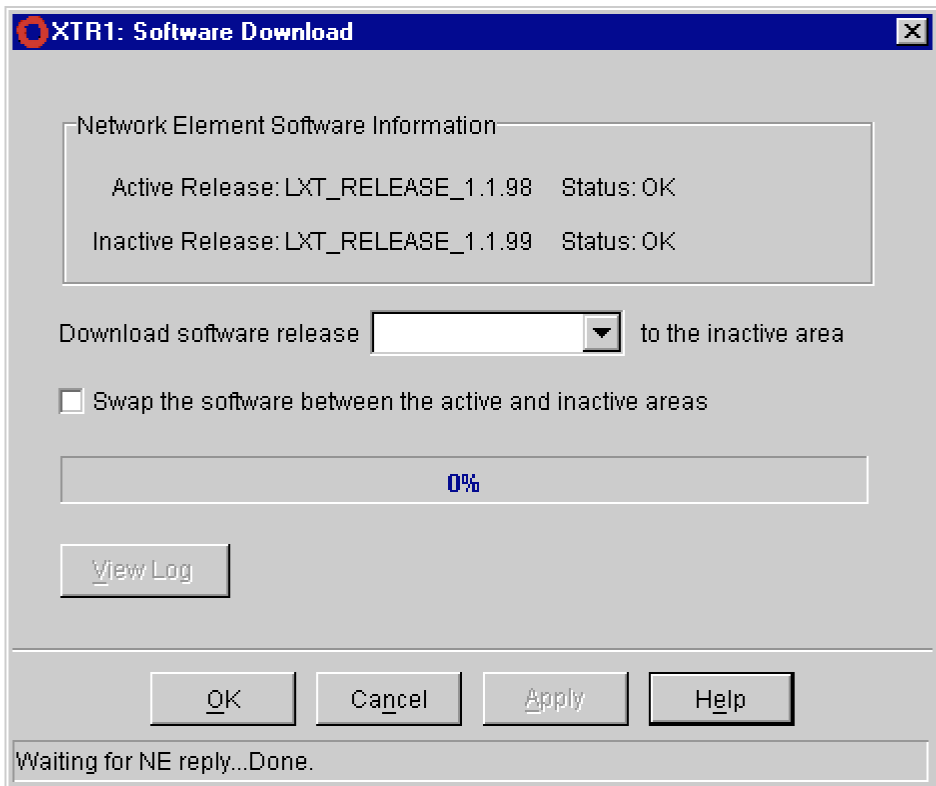
**Purpose** Download a software generic to the inactive partition of the NE Controller (NCTL) circuit pack FlashDisk Memory Module (FMM).

**Procedure**

**1** From the Node Manager menu, select **Administration > Software > Download...**

**Result:**

The Software Download window is displayed:

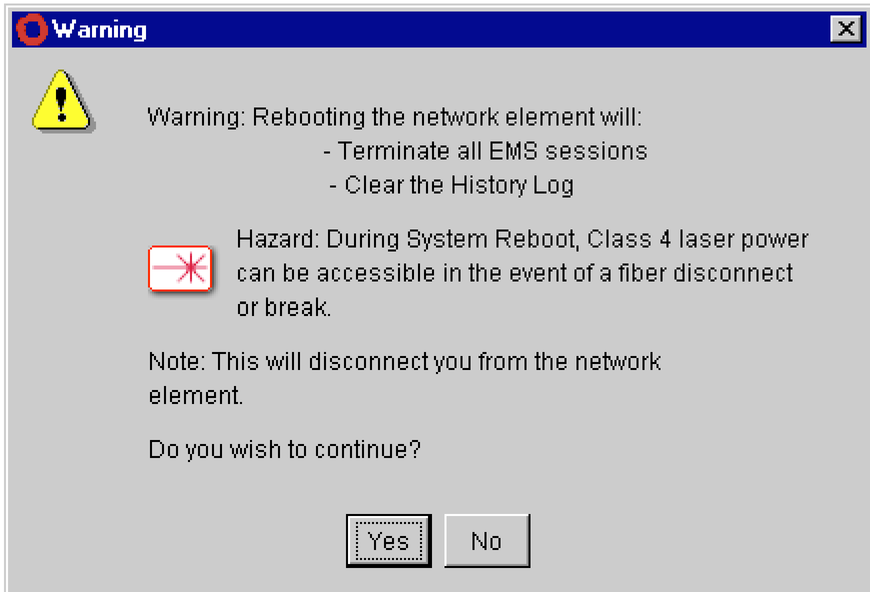



**2** Network Element Software Information is displayed for the active and inactive partition of the FlashDisk Memory Module (FMM). From the drop down list, select the NE software release to be downloaded. Click **OK** or **Apply.**

**Result:**

The software is downloaded and the **View Log** button is enabled.

Note: If the box is checked to swap the software between the active and inactive areas which requires a reboot, the following warning appears:




**3** To view a File Transfer Log of this operation, click **View Log.**

END OF STEPS

# Copy Software

**Purpose**

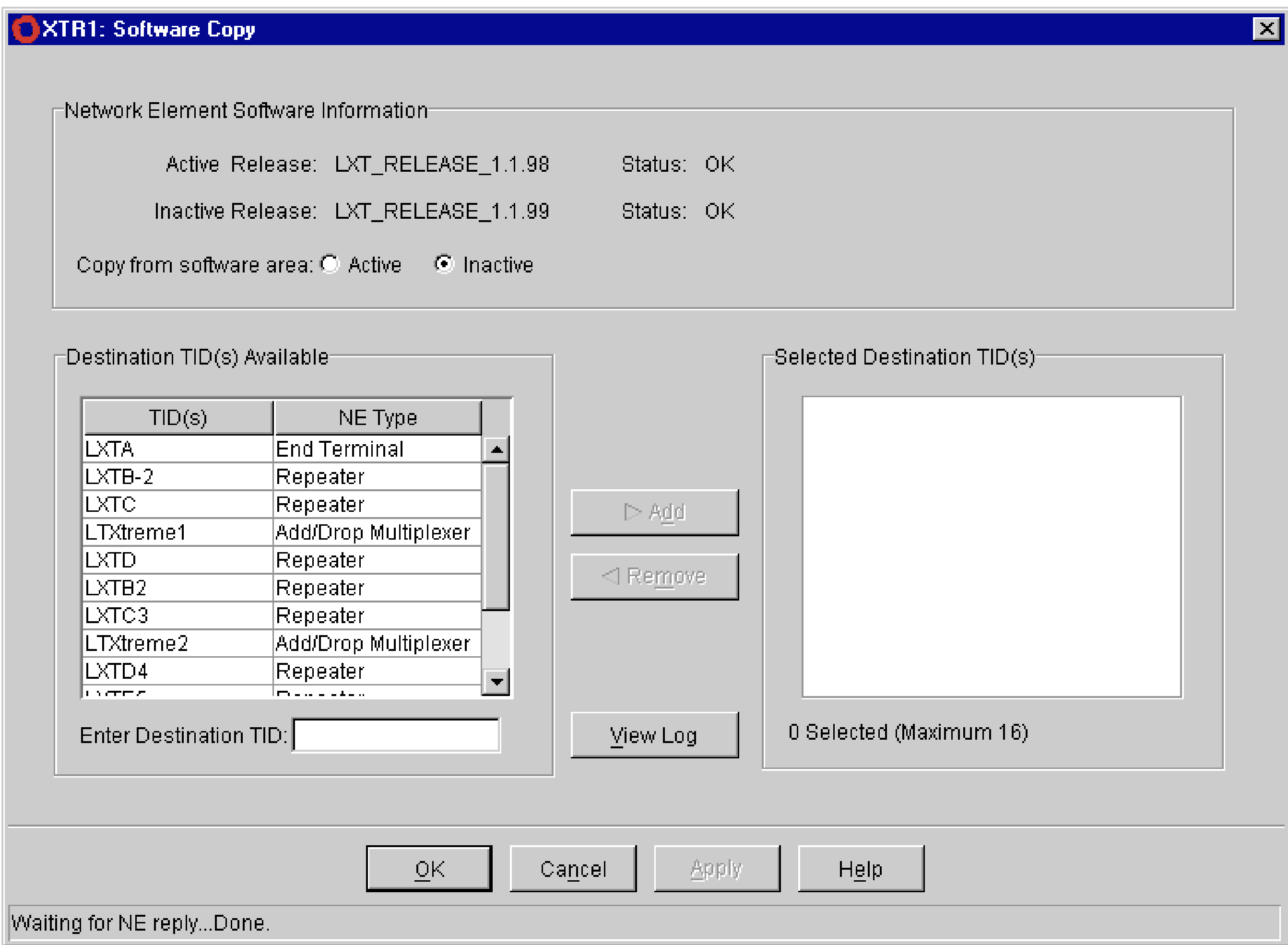
Copy the software generic contained in the active or the inactive memory partition of the network element currently connected (the source) to the inactive memory partition of another network element (the destination).

**Procedure**

**1** From the Node Manager menu, select **Administration > Software > Copy...**

**Result:**

The Software Copy window is displayed:



**2** Network Element Software Information is displayed for the active and inactive releases. For **Copy from software area** select **Active** or **Inactive** to specify the software source to be copied.

**3** Select the copy destination from **Destination TID(s) Available** or enter the TID in the **Enter Destination TID** field.

**4** Use the **Add** button to move the selected TID(s) to the **Selected Destination TID(s)** area (maximum of 16 destination nodes). To remove a TID(s) from this area, select the TID(s) and click on the **Remove** button.

**5** Click **OK** or **Apply** to copy the software to the TID(s) in the destination area.

**6** To view a Software Copy Log of this operation, click **View Log.**

END OF STEPS

# Reboot System

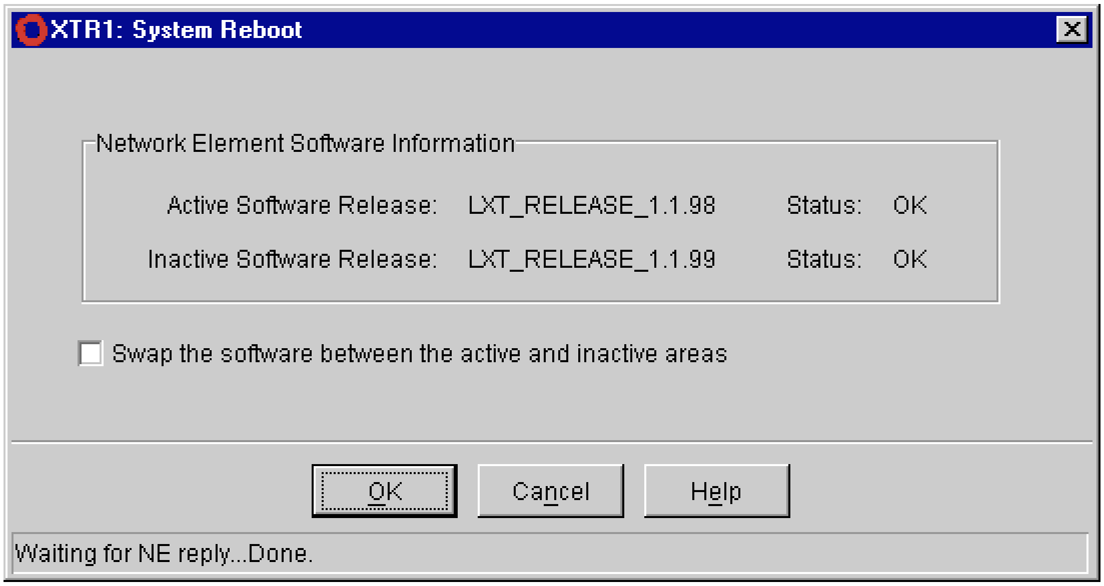
**Purpose** Reboots the NE and swaps NE software between the active and inactive areas if so desired.

**Procedure**

**1** From the Node Manager menu, select **Administration > System Reboot...**

**Result:**

The System Reboot window is displayed:

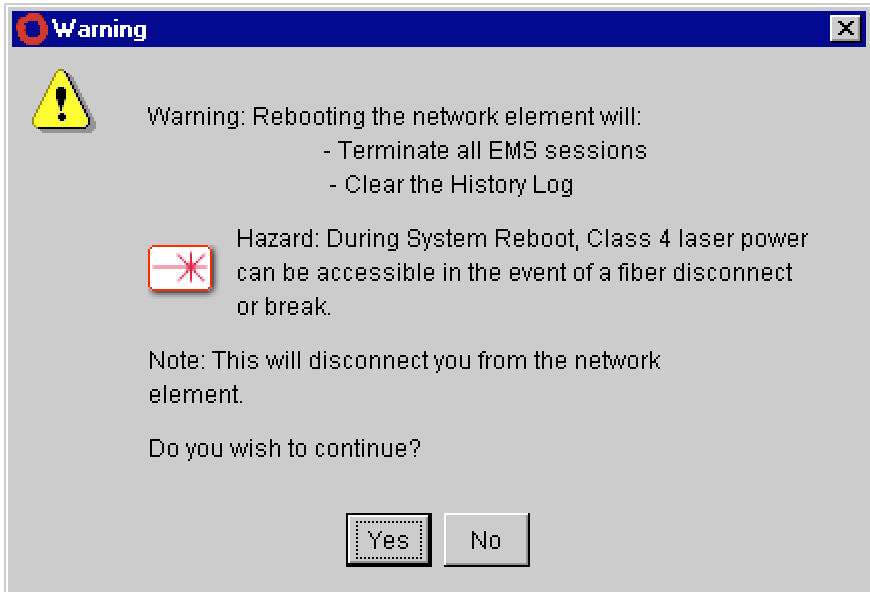



**2** Network Element Software Information is displayed for the active and inactive software releases. To **Swap the software between the active and inactive areas,** click this box.

**3** Click **OK.**

**Result:**

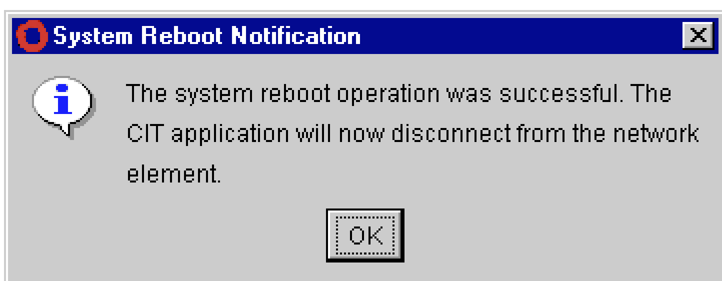
The following warning is displayed:




4 Click **Yes.**

**Result:**

The following message is displayed:




5 Click **OK.**

**Result:**

The Node Manager is disconnected.

END OF STEPS

# Add Compatible Optics Connection

**Purpose**

Add an external (EXT) connection which bypasses the use of OT equipment and therefore cannot be autodiscovered/autoprovisioned.

Note: This procedure does not apply to Repeaters.

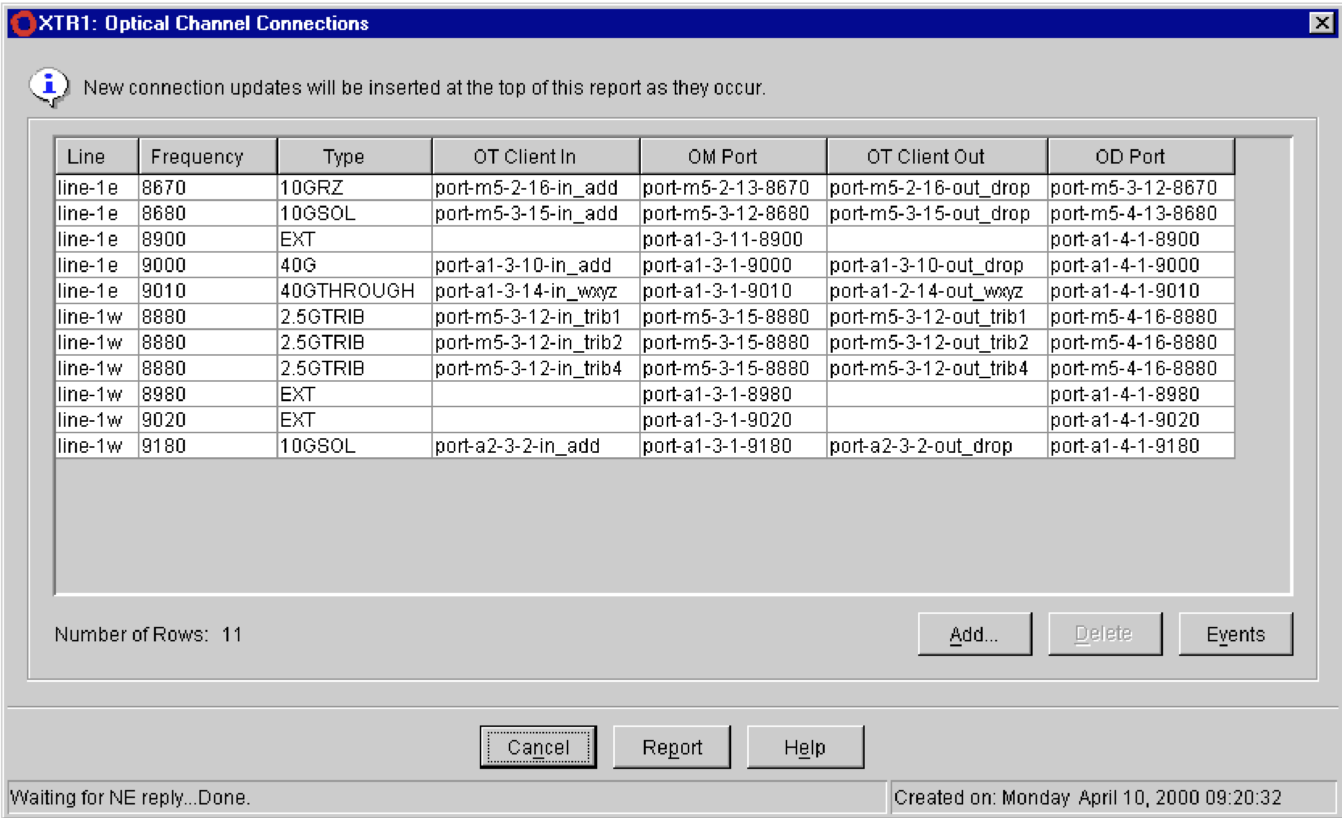
**Important!** When adding a compatible optics connection to a LambdaXtreme™ Transport NE, it is recommended that the user first provision an external (EXT) type connection before applying the input signal from the external source to the LambdaXtreme™ Transport NE. Users must ensure that the external source is transmitting a stable signal (non-fluctuating) before applying it to the LambdaXtreme™ Transport NE in order to preserve stable transmission and not cause a power transient.

**Procedure**

1. From the Node Manager menu, select **Channels > Optical Connections...** or click on the **Connections** button located in the View Toolbar.

**Result:**

The Optical Channel Connections window is displayed:

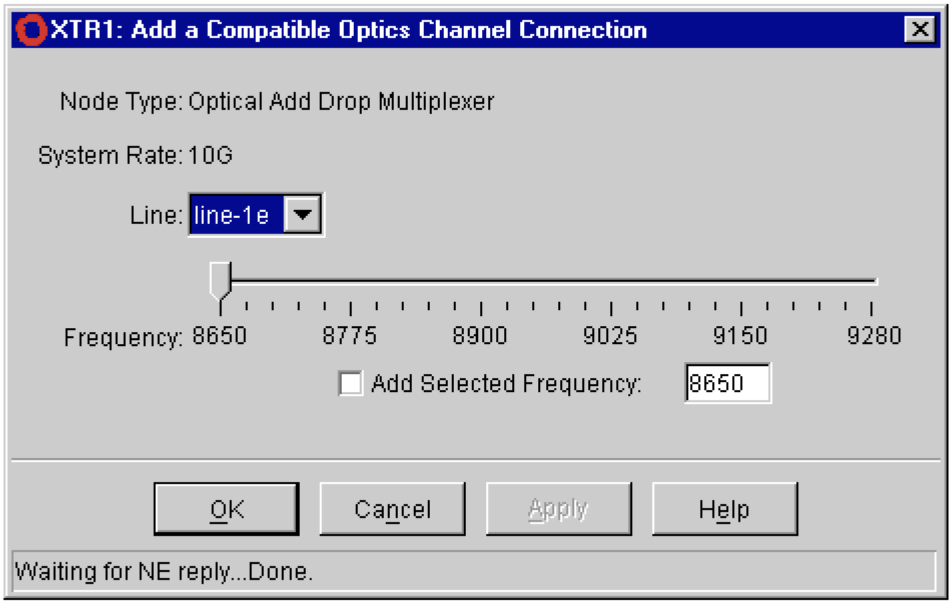



| Line | Frequency | Type | OT Client In | OM Port | OT Client Out | OD Port |
|---|---|---|---|---|---|---|
| line-1e | 8670 | 10GRZ | port-m5-2-16-in_add | port-m5-2-13-8670 | port-m5-2-16-out_drop | port-m5-3-12-8670 |
| line-1e | 8680 | 10GSOL | port-m5-3-15-in_add | port-m5-3-12-8680 | port-m5-3-15-out_drop | port-m5-4-13-8680 |
| line-1e | 8900 | EXT | | port-a1-3-11-8900 | | port-a1-4-1-8900 |
| line-1e | 9000 | 40G | port-a1-3-10-in_add | port-a1-3-1-9000 | port-a1-3-10-out_drop | port-a1-4-1-9000 |
| line-1e | 9010 | 40GTHROUGH | port-a1-3-14-in_wxyz | port-a1-3-1-9010 | port-a1-2-14-out_wxyz | port-a1-4-1-9010 |
| line-1w | 8880 | 2.5GTRIB | port-m5-3-12-in_trib1 | port-m5-3-15-8880 | port-m5-3-12-out_trib1 | port-m5-4-16-8880 |
| line-1w | 8880 | 2.5GTRIB | port-m5-3-12-in_trib2 | port-m5-3-15-8880 | port-m5-3-12-out_trib2 | port-m5-4-16-8880 |
| line-1w | 8880 | 2.5GTRIB | port-m5-3-12-in_trib4 | port-m5-3-15-8880 | port-m5-3-12-out_trib4 | port-m5-4-16-8880 |
| line-1w | 8980 | EXT | | port-a1-3-1-8980 | | port-a1-4-1-8980 |
| line-1w | 9020 | EXT | | port-a1-3-1-9020 | | port-a1-4-1-9020 |
| line-1w | 9180 | 10GSOL | port-a2-3-2-in_add | port-a1-3-1-9180 | port-a2-3-2-out_drop | port-a1-4-1-9180 |

**2** To add a compatible Optics Channel Connection, click on the **Add...** button.

**Result:**

The Add a Compatible Optics Channel Connection window is displayed:




**3** Select the appropriate **Line** value from the drop down list (if node type is OADM). Next, select the channel frequency by moving the slider or typing the value directly into the field.

All valid and available channel frequencies are selectable. These values are based on node type. For End Terminals, all channel frequencies that are available (not in use by other connections) are selectable. For OADM, only the available frequencies configured to Add/Drop are selectable.

Note: To provision connections on an OADM node, the OADM frequency must first be configured to Add/Drop (see "OADM Configuration" (A-135)). In an OADM NE, the NE only validates and allows booting of OTs which have frequencies that can be added/dropped. In the OADM NE, only OTs that have frequencies that end in 0 (as opposed to 5) can be used to add/drop channels. The express channels (frequencies that end in 5) cannot be added/dropped.

**4** Once the channel frequency has been chosen, click the **Add Selected Frequency** check box.

**5** Click on **OK** or **Apply** to add the Optical Channel Connection.

**6** To view autoprovisioned connection events received during this session, click **Events.**

END OF STEPS

# Delete Optical Connection

**Purpose** Delete an Optical Channel Connection that is no longer needed or cannot be accessed.

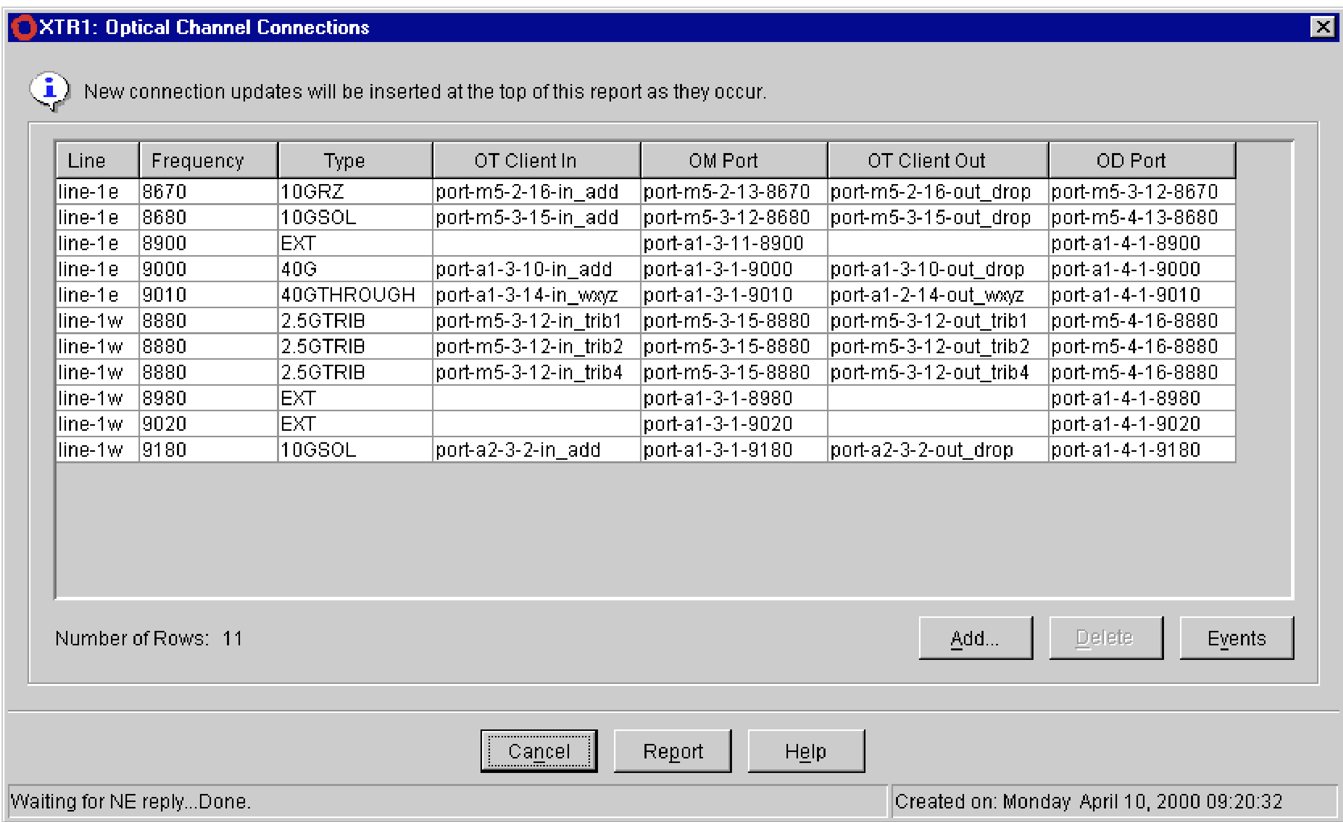
Note: This procedure does not apply to Repeaters.

**Procedure**

**1** From the Node Manager menu, select **Channels > Optical Connections...** or click on the **Connections** button located in the View Toolbar.

**Result:**

The Optical Channel Connections window is displayed.




**2** Select the connection to be deleted.

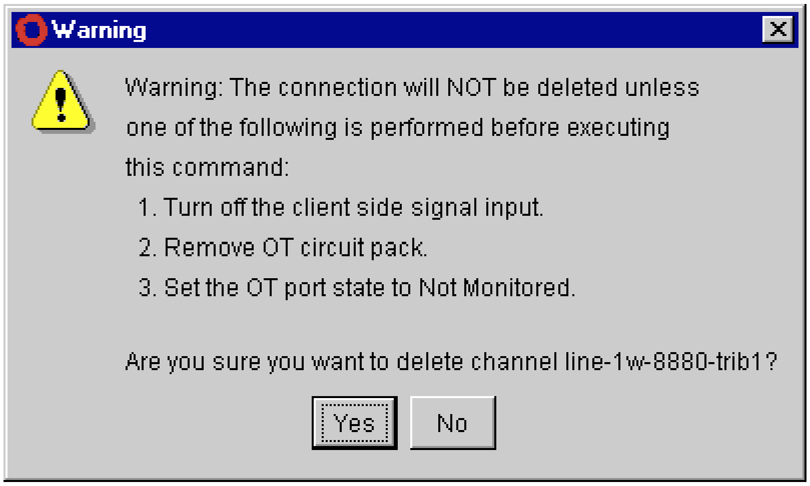
**Result:**

The **Delete** button becomes enabled.

**3** Click **Delete.**

**Result:**

For connections that are not external (Type not equal to EXT), the following warning is displayed:




For external connections (Type=EXT), the following warning is displayed:


**4** Click **Yes** to delete the connection.

END OF STEPS

# OADM Configuration

**Purpose**

Configure OADM frequencies to Add/Drop (so a channel can be added/dropped) or Through.

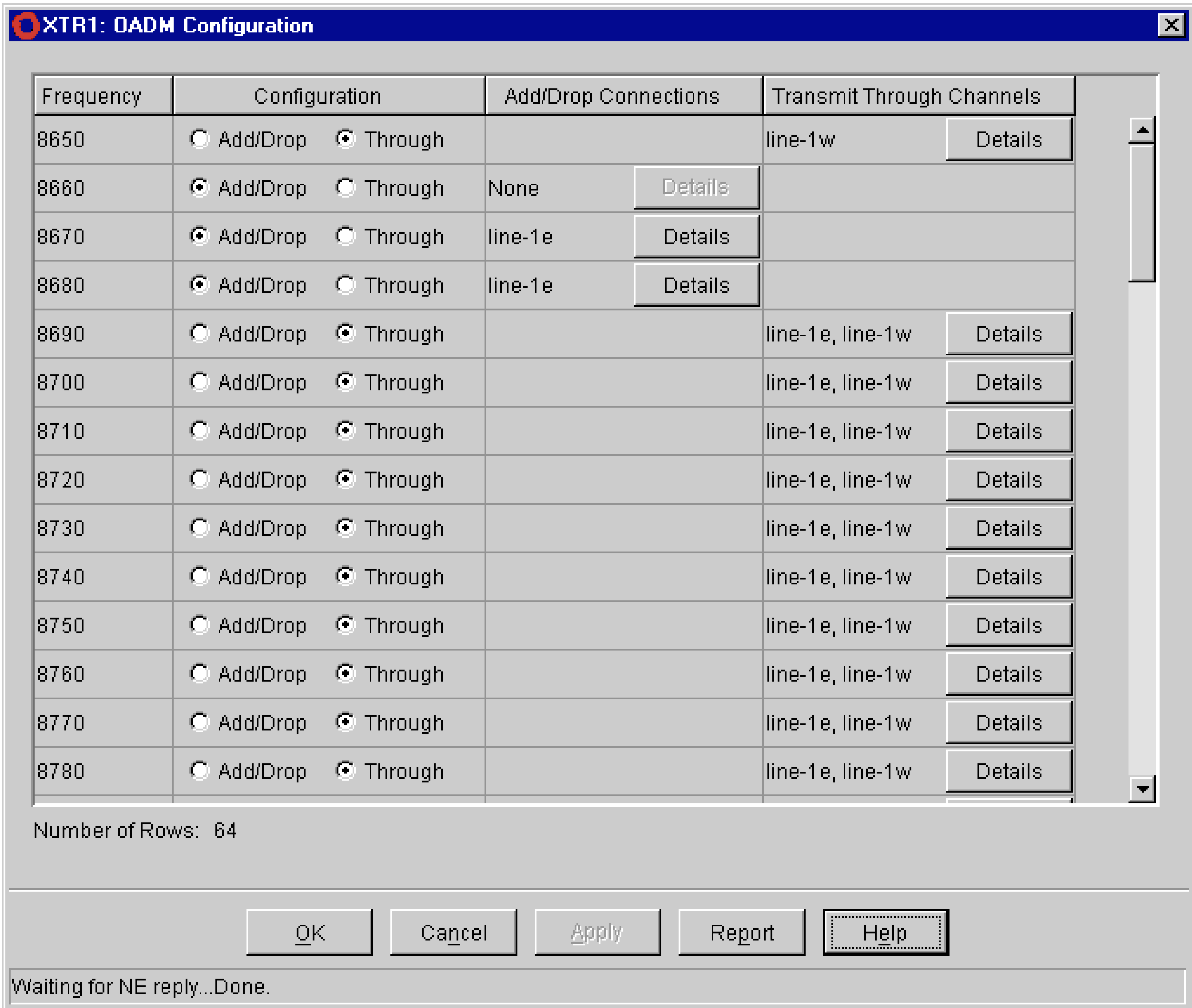
Note: This procedure applies only to OADM NEs.

**Procedure**

**1** From the Node Manager menu, select **Channels > OADM Configuration**

**Result:**

The OADM Configuration window is displayed:

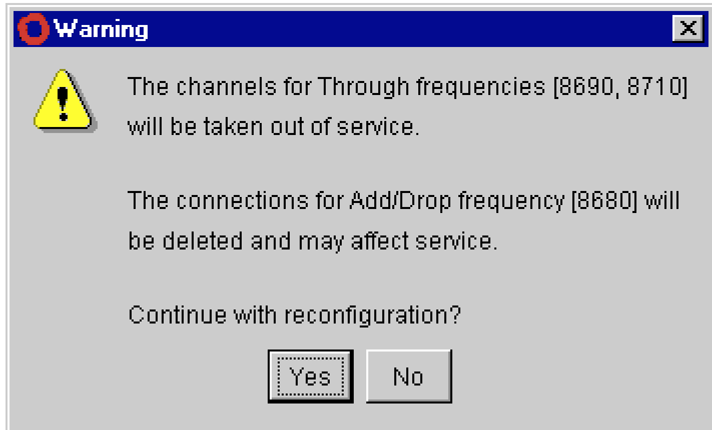



**2** Specify the configuration for the desired frequency by clicking on the appropriate box (Add/Drop or Through). More than one frequency can be configured.

**3** Click on **Apply.**

**Result:**

Depending on the reconfiguration being applied, a warning such as the following may appear:




4 Click on **Yes** to reconfigure.

END OF STEPS

☐

# Access the Help Viewer

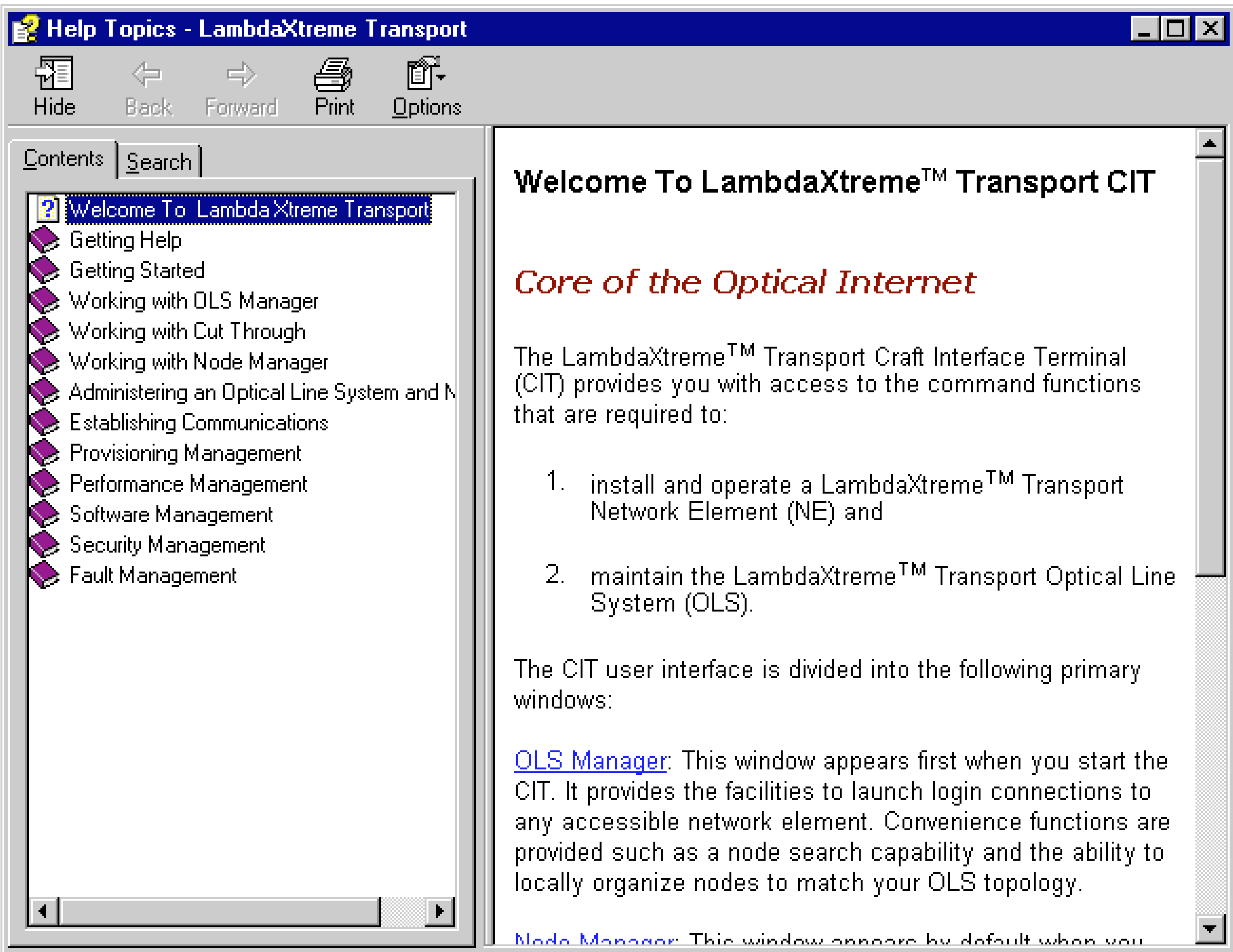
**Purpose** View or search for help topics.

**Procedure**

**1** From the OLS Manager menu or Node Manager menu, select **Help > Help Contents & Find.**

**Result:**

The Help Viewer is displayed:



**2** To find a help topic, click one of the following tabs:

- **Contents** - To browse through the table of contents, click the Contents tab. The table of contents is an expandable list of available topics.
- **Search** - To locate every occurrence of a word or phrase that is contained in any help file, click the Search tab, and then type the word followed by the Enter key.

**3** Click the Contents entry, or Search Results entry to display the corresponding topic.

END OF STEPS

# Glossary

## NUMERICS

**3R (Reshaping, Reamplification, Retiming) Functionality**
When a signal is converted from optical to electrical, optical translators reshape, reamplify, and retime the electrical signal.

**10/100 BASE-T**
A twisted-pair cable version of an IEEE 802.3 network.

**100BASE-TX**
A 100-Mbps Ethernet implementation over Category 5 twisted-pair cabling. In other words, this is a 100 megabit-per-second local area network known by the generic name of Fast Ethernet operating over twisted copper cable. This technology is becoming very popular and cost-effective. It is designed to integrate with existing networks with minimal disruption.

## A

**ACO (Alarm Cut-Off)**
A push-button switch on the indicator strip that can be used to retire an audible office alarm.

**AID (Access Identifier )**
AIDs identify an entity or a range of entities within a NE in a TL1 message (for example, a port or list of ports). See also TL1. This field is optional.

**AIM (Alarm Indication Message)**
A message sent from a one NE to another NE to indicate that it has received a signal so degraded that it raised an alarm.

**AIS (Alarm Indication Signal )**
A signal sent downstream by a NE to indicate that its incoming signal has failed.

**Alarm**
External notification or display of a failure condition. The indication of a failure towards an external system interface or via audible or visible indicators.

**Alarm List**
A status report that lists active alarms on the NE.

**Alarm Log**
A history of the setting and clearing of system alarms on the NE.

**Alarm Severity**
An attribute defining the priority of the alarm message. The way alarms are processed depends on the severity.

**Alarm Suppression**
Selective removal of alarm messages from being forwarded to the GUI or to network management layer OSs.

**Angular Misalignment**
Loss at a connector due to misaligned fiber end face angles.

**Anomaly**
Any deviation from normal behavior. Anomalies do not result in any consequent actions, but are contributors to defects and performance monitoring counts.

**ANSI (American National Standards Institute)**
A United States standards body that accredits standards for programming languages, communications and networking; it is the U.S. representative in the International Organization for Standardization (ISO).

**APC (Angle Polished Connector)**
An 5″-15″ angle on the connector tip for the minimum possible back reflection.

**Apparatus Code**
ASCII name assigned by the manufacturer to identify a particular circuit pack by pack type and number.

**APR (Automatic Power Reduction)**
The lowering of the laser power to a limit that fits into class 1 category for handling fiber cables. APR replaces the full power off feature known as ALS (automatic laser shutdown) or APSD (automatic power shutdown).

**AR (Antireflection coating)**
A thin, dielectric or metallic film applied to an optical surface to reduce its reflection and thereby, increase its transmission.

**ASE (Amplified Spontaneous Emission)**
An optical noise generated in an erbium-doped fiber amplifier (EDFA) with and without signal input power.

**ASTM (American Society for Testing and Materials)**
A non-profit industry wide organization that publishes standards, methods of test, recommended practices, definitions and other related material.

**Asynchronous**
Data that is transmitted without an associated clock signal.

**ATAG (Autonomously generated correlation TAG)**
An autonomous TL1 message (event) counter used to detect lost events.

**ATM (Asynchronous Transfer Mode )**
A digital transmission switching format, containing 5 bytes of header information followed by 48 data bytes. Part of the B-ISDN standard.

**Attenuation**
The decrease in signal strength along a fiber optic waveguide caused by absorption and scattering. Attenuation is usually expressed in dB/km.

**Attenuator**
In optical systems, a passive device that reduces the amplitude of a signal without distorting the waveform.

**Auto-Provisioning**
Configuration of system parts without pre-provisioning. When a part is plugged into the system it is accepted with its default configuration.

**Automatic Protection Switch**
A protection switch that occurs automatically in response to an automatically detected fault condition.

**Autonomous Messages**
Messages sent to the CIT to notify it of state changes in the system. These messages are initiated by the system. They are not responses to a CIT-initiated command.
Examples of Autonomous Messages include alarms, events (non-alarmed condition), notification of connections that are added or deleted, and changes in the node database.

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## B

**Backscattering**
The return of a portion of scattered light to the input end of a fiber; the scattering of light in the direction opposite to its original propagation.

**Bay**
A mechanical facility to mount shelves and other equipment for system configurations. Bays can be accessed from the front side or front and rear side. It is made of aluminum or steel and is attached to the wall or ceiling. Equipment cabling is laid in or attached to the Bay. Also known

as rack.

**BCM (Board Controller Module)**
A small module (printed wiring board plus components) that plugs into almost every circuit pack (other than the NCTL, SCTL, and SUPVY) to supply the processor, memory and intra-NE communications capabilities needed to operate the pack in the system.

**Beamsplitter**
An optical device, such as a partially reflecting mirror, that splits a beam of light into two or more beams. Used in fiber optics for directional couplers.

**Bend Radius**
The smallest radius an optical fiber or fiber cable can bend before increased attenuation or breakage occurs.

**Bending Loss**
Attenuation caused by high-order modes radiating from the outside of a fiber optic waveguide, which occur when the fiber is bent around a small radius. See also macrobending, microbending.

**BER (Bit Error Rate)**
BER measures how accurately a bit stream is transmitted through a system. It measures how many bits are received in error compared to how many are sent.

**Birefringent**
When the refractive index differs in light of different polarizations.

## C

**Cable Assembly**
A cable that is connector terminated and ready for installation.

**Cable Plant**
The cable plant consists of all the optical elements including fiber connectors, splices, etc. between a transmitter and a receiver.

**CCITT (Consultative Committee for the International Telephone and Telegraph)**
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).

**CDS (Complementary Double Shelf)**
The double shelf used in an Extension Bay; two per bay.

### CE (Conformite Europeenne)

The CE Mark is a European proof of conformity and is also described as ″passport″ that allows manufacturers and exporters to circulate products freely within the EU. The letters ″CE″ indicate that the manufacturer has satisfied all assessment procedures specified by law for its product.

### Center Wavelength

In a laser, the nominal value central operating wavelength. It is the wavelength defined by a peak mode measurement where the effective optical power resides. In a LED, the average of the two wavelengths measured at the half amplitude points of the power spectrum.

### Channel

A communications path or the signal sent over that path.

### Chirp

In laser diodes, the shift of the laser's central wavelength during single pulse duration due to laser instability.

### Chromatic Dispersion

The speed at which an optical pulse travels depends on the fiber wavelength. This is caused by several factors including material dispersion, waveguide dispersion and profile dispersion. The net effect is that if an optical pulse contains multiple wavelengths (colors), then the different colors travel at different speeds and arrive at different times, smearing the received optical signal.

### CIO (Controller Input/Output) Circuit Pack

CIO indicates Ethernet port status.

### CIT (Craft Interface Terminal)

The terminal used as the local interface between humans and an NE. It is used to issue commands to the local system or, by way of a remote login, to another system on the same fiber as the local system.

### CL (Coupling Ratio/Loss)

The ratio/loss of optical power from one output port to the total output power, expressed as a percent.

### Cladding

The material that surrounds the core of an optical fiber which has a lower index of refraction compared to that of the core. The lower index of refraction causes the transmitted light to travel down the core.

### CLEI (Common Language Equipment Identifier)

For circuit packs in domestic markets, this is assigned by Telecordia and is 10 bytes (characters) long. The CLEI is mapped to the ECI (Equipment Code Identifier) in the customer database. For international market, the CLEI is assigned by CClib and is 9 characters long.

### Connector
A mechanical or optical device that provides a demountable connection between two fibers or a fiber and a source or detector.

### Connector Plug
A device used to terminate an optical conductor cable.

### Connector Receptacle
The fixed or stationary half of a connection that is mounted on a panel/bulkhead. Receptacles mate with plugs.

### Connector Variation
The maximum value in dB of the difference in insertion loss between mating optical connectors (for example, with re-mating, temperature cycling, etc.). Also called optical connector variation.

### Core
The central portion of the fiber that transmits light. It is composed of material with a higher index of refraction than the cladding.

### Coupler
An optical device that combines or splits power from optical fibers.

### CR (Coupling Ratio/Loss)
The ratio/loss of optical power from one output port to the total output power, expressed as a percent. For a 1 x 2 WDM or coupler with output powers O1 and O2, and Oi representing both output powers.

### CRC (Cyclic Redundancy Check)
A method to detect skipped bits in a byte stream.

### CSA (Canadian Standards Association)
A non-profit independent organization which operates a listing services for electrical and electronic materials and equipment. It is the body that establishes telephone equipment (and other) standards of use in Canada. At least in part, CSA is the Canadian counterpart of the Underwriters Laboratories. CSA also is heavily involved in the development of the ISO standards on quality and Environmental Management.

### CSMA/CD (Carrier Sense Multiple Access with Collision Detection)
A control technique for getting onto and off a LAN. All devices attached to the network listen for transmissions in progress (that is, carrier sense) before starting to transmit (multiple access). If two or more begin transmitting at the same time and their transmissions crash into each other, each backs off (collision detection) for a different amount of time (determined by an algorithm) before again attempting to transmit.

### CTAG (Correlation Tag)

The CTAG of a TL1 command is repeated in the associated response and allows an operator to find matches.

### Current SW Generic (Current Software Generic)

The software and data that the NE is currently using. It is loaded on to the active partition of the FMM.

### CW (Continuous Wave)

The constant optical output from an optical source when it is turned on, but not modulated with a signal.

## D

### DAR (Deutscher AkkreditierungsRat)

The German Accreditation Council (DAR) is a working group established by the Federal Government, the Ministries of the Federal German States and the German industry. DAR coordinates the activities in the area of accreditation and recognition of testing and calibration laboratories, certification and inspection bodies in Germany; runs a central registration of German accreditations and recognitions granted; and represents German interests in national, European and international organizations dealing with general questions of accreditation and recognition.

### Dark Current

The flow of electricity through the diode in a photodiode when no light is present.

### DCC (Data Communication Channel)

A portion of the SDH/SONET signal that contains alarm, surveillance, and performance information.

### DCF (Dispersion Compensating Fiber)

DCF is a special fiber with a negative chromatic dispersion coefficient used to compensate the positive chromatic dispersion of the transmission fiber in the third optical window.

### DCM (Dispersion Compensation Module)

Spooled fiber used to control excess dispersion found in certain fiber types at pre- and post-amplification.

### DCN (Data Communication Network)

DCN supports communications between NEs and the NMS.

### DCS (Digital Cross-Connect System)

A system that has multiple input and output streams, and can interconnect a signal from any input to any output.

**DEMUX or DMX (Demultiplexer)**
A module that separates two or more signals previously combined by compatible multiplexing equipment.

**Detector**
An opto-electric transducer used in fiber optics to convert optical power to electrical current. Usually referred to as a photodiode.

**DGEF (Dynamic Gain Equalization Filter)**
A filter that equalizes the gain of an optical signal

**DHCP (Dynamic Host Control Protocol)**
DHCP enables PCs and workstations to get temporary or permanent IP addresses from the server.

**DIN (Deutsche Industrie Norm)**
DIN is the German Institute for Standardization in Berlin. Since 1975 it has been recognized by the German government as the national standards body and represents German interests at international and European level.

**Directional Coupler**
A coupling device for separately sampling (through a known coupling loss) either the forward (incident) or the backward (reflected) wave in a transmission line.

**Dispersion**
The temporal spreading of a light signal in an optical waveguide caused by light signals traveling at different speeds through a fiber either due to modal or chromatic effects.

**Distortion**
The difference in value between two measurements of a signal (transmitted and received.)

**DL (Data Link)**
The communication links used for data transmission from a source to a destination.

**DSA (Directory System Agent)**
A DSA is an operating system application process that provides the Directory functionality.

**DSF (Dispersion-Shifted Fiber)**
Standard single-mode fibers exhibit optimum attenuation performance at 1550 nm and optimum bandwidth at 1300 nm.

**DTE (Data Terminal Equipment)**
DTE is part of a broader grouping of equipment known as customer premises equipment which includes voice, data, and end terminals.

**Duplex Cable**
A two-fiber cable suitable for duplex transmission.

**Duplex Transmission**
Transmission in both directions, either one direction at a time (half-duplex) or both directions simultaneously (full-duplex).

**DWDM (Dense Wavelength Division Multiplexing)**
Transmitting two or more signals of different wavelengths simultaneously over a single fiber.

## E

**E-LEAF (Enhanced -Large Effective Area Fiber)**
A fiber type manufactured by Corning.

**EDC (Error Detection Code)**
Code construction that provides a way to protect, correct data from errors, and maintain the data integrity.

**EDCV (Error Detection Code Violation)**
An EDCV occurs when the calculated checksum over a signal does not match the received checksum.

**EDFA (Erbium-Doped Fiber Amplifier)**
Optical fibers doped with the rare earth element erbium which can amplify light in the 1550 nm region when pumped by an external light source.

**EEPROM (Electrical Erasable and Programmable Read-Only Memory)**
Kind of non-volatile memory. Often used to store inventory data.

**EMI (Electromagnetic Interference)**
High-energy, electrically induced magnetic fields that cause data corruption in cables passing through the fields.

**EML (Externally Modulated Laser)**
When laser is modulated using a Mach-Zehnder modulator.

**EMR (Electromagnetic Radiation)**
Radiation made up of oscillating electric and magnetic fields and propagated with the speed of light. Includes gamma radiation, X-rays, ultraviolet, visible and infrared radiation, and radar and radio waves.

**EMS (Element Management System)**
Element management systems, for example, OCI or SNMS, which are either directly attached to a NE or remotely by using the DCN.

### Engineering Rules

A set of rules that determine the system configuration possibilities based on fiber type, OA, rate and number of wavelengths. These rules determine the maximum loss per span that can be tolerated, the maximum distance between spans allowed and the maximum number of spans that can be supported.

### EOL (End-Of-Life)

EOL defines the status or values at the end of the guaranteed lifetime. EOL is reached when the wear-out failure rate dominates the component failure rate.

### Error Recovery

The intent to recover from a detected error, such as inconsistent state or configuration information. See also Operational Recovery.

### ES-IS (End System to Intermediate System Protocol)

An ISO OSI network layer protocol (ISO 9542) for End Systems (alias hosts) communicating to Intermediate Systems (alias routers) that dynamically builds the relevant network routing databases (administrative protocol).

### ESD (Electro-Static Discharge)

Static electrical energy potentially harmful to circuit packs and humans.

### ET (End Terminal)

Optical equipment that terminates optical line signals.

### ETSI (European Telecommunications Standards Institute)

Located in Sophia-Antipolis in France, ETSI is the European counterpart to ANSI. Its task is to pave the way for telecommunications integration in the European community as part of the single European market program. It establishes telecommunication standards for the European community.

### External Modulation

Modulation of a light source by an external device that acts like an electronic shutter.

### Extinction Ratio

The ratio of the low, or OFF optical power level (Pl) to the high, or ON optical power level (Ph).

### Eye Pattern

Also called eye diagram. The proper function of a digital system can be quantitatively described by its BER, or qualitatively by its eye pattern. The ″openness″ of the eye relates to the BER that can be achieved.

**F** **Fabric**

The part of an optical system that is responsible for switching voice, data or video from one place to another

**Failure**

A failure is declared when a fault cause persists for a certain period of time.

**Failure Rate**

The number of failures of a device per unit of time.

**Fall Time**

The time required for the trailing edge of a pulse to fall from 90% to 10% of its amplitude; the time required for a component to produce such a result. Typically measured between the 80% and 20% points or alternately the 90% and 10% points. Also called turn-off time.

**Far-End Crosstalk**

Crosstalk which travels along a circuit in the same direction as the signals in the circuit.

**FAS (Frame Alignment Signal)**

A sequence at the beginning of an SDH/SONET frame that detects the frame start.

**FC (Fiber Optic Connector)**

A threaded optical connector (originated in Japan), good for single-mode or multimode fiber and applications requiring low back reflection.

**FC/PC**

A special curved polish on the connector for very low back reflection.

**FCC (Federal Communications Commission)**

The U.S. federal regulatory agency responsible for the regulation of interstate and international communications by radio, television, wire, satellite and cable.

**FDDI (Fiber Distributed Data Interface)**

A 100 Mbps fiber optic LAN.

**FE (Far End)**

Any other network element in a maintenance subnetwork other than the one the user is at or working on. Also called remote.

**FEBE (Far End Block Error)**

A maintenance signal transmitted in the physical overhead indicating that a bit error has been detected at the physical layer at the far end of the link.

### FEC (Forward Error Correction)

A method to correct bit errors in a transmission signal. Additional information is put into the data signal to allow the correction of bit errors. There is no acknowledge information in the back direction.

### Ferrule

A rigid tube that confines or holds a fiber as part of a connector assembly.

### Fiber Optic Attenuator

A component installed in a fiber optic transmission system that reduces the power in the optical signal. It is often used to limit the optical power received by the photo detector to within the limits of the optical receiver.

### Fiber Optic Cable

A cable containing one or more optical fibers.

### Fiber Optic Link

A transmitter, receiver, and cable assembly that can transmit information between two points.

### Fiber Optic Span

An optical fiber/cable terminated at both ends which may include devices that add, subtract, or attenuate optical signals.

### FIT (Failure In Time)

A unit of failure rate in reliability analysis. One FIT is equivalent to one failure per one billion operating hours.

### FIT Rate

Number of device failures in one billion device hours.

### FMM (FlashDisk Memory Module)

A nonvolatile memory device used to store the installation software generic or the NE database.

### Fresnel Reflection

A reflection of light that occurs at the air-glass interface at the ends of an optical fiber.

### Fused Fiber

A bundle of fibers fused together so they maintain a fixed alignment with respect to each other in a rigid rod.

### Fusion Splicer

An instrument that permanently bonds two fibers together by heating and fusing them.

G **Gain**

The increase in power and magnitude of a signal.

**GNE (Gateway Network Element)**

A system node that has a physical attachment to the management system to support the access of the remote NE. The number of remote NEs a GNE can serve is specified in terms of the number of OSI stack associations the GNE can support without running out of local resources.

**GPIO (General Purpose Input/Output)**

GPIO provides a flexible way of interfacing a wide range of peripheral devices with a computer. Among the interface methods GPIO uses are the configurable data sense and handshaking (signals used between a computer and a peripheral to inform each other when either is ready to receive or transmit data).

**Grooming**

Consolidating or segregating traffic for efficiency.

**Ground Loop Noise**

Noise that results when equipment is grounded at points having different potentials thereby creating an unintended current path. The dielectric properties of optical fiber provide electrical isolation that eliminates ground loops.

H **HDDS (High Density Double Shelf)**

The double shelf used in Line Bays; two per bay.

I **ICEA (Insulated Cable Engineers Association)**

ICEA (previously IPCEA) is a professional organization dedicated to developing cable standards for the electric power, control, and telecommunications industries.

**IDI (Initial Domain Identifier)**

Part of the NSAP, the IDI defines the country code of the registration authority responsible for the allocation and assignment of the NSAP address.

**IEC (International Electrotechnical Commission)**

The international standards and conformity assessment body for all fields of electrotechnology, including electricity and electronics.

**IEEE (Institute of Electrical and Electronic Engineers)**

The IEEE helps advance global prosperity by promoting the engineering process of creating, developing, integrating, sharing, and applying knowledge about electrical and information technologies and sciences for the benefit of humanity and the profession.

### IMF (Infant Mortality Factor)

The ratio of the first year failure rate to the steady-state failure rate.

### Index of Refraction

Also refractive index. The ratio of the velocity of light in free space to the velocity of light in a fiber material. Symbolized by n and is greater than or equal to one.

### Index-Matching Gel

A gel with an index of refraction nearly equal to that of the fiber's core. This gel is used to reduce Fresnel reflection at fiber ends.

### Insertion Loss

The loss of power that results from inserting a component, such as a connector or splice, into a previously continuous path.

### Intrinsic Losses

Splice losses arising from differences in the fibers being spliced.

### IR (Intermediate Reach)

Optical sections from a few kilometers (km) to approximately 15 km.

### Irradiance

The amount of power per unit area.

### ISO (International Standards Organization)

A United Nations agency concerned with international standardization in a broad range of industrial and technical field.

### ITU (International Telecommunication Union)

A United Nations telecommunications established to provide standardized communications procedures and practices including frequency allocation and radio regulations on a worldwide basis.

## J

### Jacket

The outer, protective covering of the cable.

### Jitter

Small and rapid variations in the timing of a waveform due to noise, changes in component characteristics, supply voltages, imperfect synchronizing circuits, and so forth.

### Jumper

A short fiber optic cable with connectors on both ends.

**L** **L-Band (Long Band)**

A dispersion-shifted fiber range of 1570 to 1610 nm, where a wide range of wavelengths are possible with low loss. L-Band doubles the number of wavelengths best suited in DWDM applications and uses newer, more expensive optical amplifiers. In LambdaXtreme™ Transport, the L-Band is widened and referred to as an Extended L-Band.

**LAN (Local Area Network)**

1. A communication link between two or more points within a small geographic area, such as between buildings. 2. A data network which has a size of normally up to 10 km. Important LANs are Ethernet, Token Ring, Token Bus and FDDI.

**LAPD (Link Access Protocol on D-channel)**

A special protocol of the OSI Data Link Layer, which provides the functional and procedural means to establish, maintain, and release data link connections for NEs. For NE-NE communications over the DCC, Layer 2 services are provided by LAPD.

**Launch Fiber**

An optical fiber used to couple and condition light from an optical source into an optical fiber Often the launch fiber is used to create an equilibrium mode distribution in multimode fiber. Also called launching fiber.

**LBC (Laser Bias Current)**

Current that runs through the laser to make it work. LBC is monitored by performance monitoring. If the current goes beyond a certain threshold, it means that the circuit pack must be replaced.

**LBO (Line Build Out)**

Attenuation used to simulate a load.

**LC (Lucent Connector)**

A small-form-factor (SFF) design based on a proven 1.25 mm ceramic ferrule. This connector uses RJ-style latching. It facilitates high-speed applications with lower power requirements due to lower insertion loss (0.1 dB typical) and higher return loss (55 dB single mode).

**LD (Laser Diode)**

A semiconductor that emits coherent light when forward biased.

**LEAF (Large Effective Area Fiber)**

A type of fiber manufactured by Corning.

**LED (Light-emitting diode)**

Diodes which translate electrical current into light. Made out of semiconductor material like Gallium-Arsenide; a semiconductor that emits incoherent light when forward biased.

**LGX (Lightguide Cross-Connect)**
(Lucent product family) Fiber termination shelves and hardware used for interconnecting fiber cables, jumpers and closures that connect the switching systems to the transmission equipment.

**LH (Long Haul)**
A 10 Gbps application for transmission of 128 channels, giving a capacity of 1.28 Tbps and a reach of up to 2000 km. Payload (per channel) can be one OC192/STM-64 or four OC48/STM-16 signals.

**LID (Link ID Protocol)**
A Lucent proprietary protocol for exchange of neighbor information over a DCC link. LID makes use of LAPD (OSI) or PPP (IP).

**Interchannel Isolation**
The ability to prevent undesired optical energy from appearing in one signal path as a result of coupling from another signal path.

**LOF (Loss of Frame)**
Loss of frame is detected when the OOF anomaly persists for a certain time.

**Loose-Tube**
A type of fiber optic cable construction where the fiber is contained within a loose tube in the cable jacket.

**LOS (Loss of Signal)**
When the optical input power falls below a certain threshold.

**Loss**
The amount of a signal's power, expressed in dB, that is lost in connectors, splices, or fiber defects.

**LR (Long Reach)**
A standard for optics, concerning transmitters and receivers in a system and ensuring that transmission can be maintained for long distances (tens of kilometers). This standard constrains the output power of the transmitter and the sensitivity of the receiver for long-haul applications (up to 80 km) without the need for regeneration.

## M

**Macrobending**
In a fiber, all macroscopic deviations of the fiber axis from a straight line.

**MAN (Metropolitan Area Network)**
A network covering an area larger than a local area network. A wide area network (two or more local area networks), that covers a metropolitan area.

### Margin
The allowance for attenuation in addition to that explicitly accounted for in system design.

### MAS (Multiplex Alignment Signal)
A byte in the 40G overhead which checks if the four-bit multiplexed 10G data streams are demultiplexed correctly. It has a value of 10100101 in the first 10G data stream, and 01011010 in the other 10G data streams.

### MDI (Miscellaneous Discrete Inputs)
System input ports used to supervise external equipment in the office, for example, doors, fire alarm, and so forth.

### MDO (Miscellaneous Discrete Outputs)
System binary output ports used to control external equipment in the office, for example, light, and so forth.

### Mechanical Splice
An optical fiber splice accomplished by fixtures or materials, rather than by thermal fusion.

### Microbending
Minute but severe bends in fiber that result in light displacement and increased loss.

### Modulation
The process by which the characteristic of one wave (the carrier) is modified by another wave (the signal). Examples include amplitude modulation (AM), frequency modulation (FM), and pulse-coded modulation (PCM).

### MPI (Multipath Interference)
Signal reflections and delayed signal images that interfere with the proper signal path. MPI is caused by reflections from dirty/damaged connectors, and return loss of the jumpers/patch cords. MPI may cause severe system degradation.

### MS (Multiplex Section)
A multiplex section is a maintenance entity between two MS TT functions.

### MTBF (Mean Time Between Failures)
The expected time between failures, usually expressed in hours.

### MTTR (Mean Time To Repair)
The average time that it takes until a failure is repaired, usually expressed in hours.

### Multimode Fiber
An optical fiber that has a core large enough to propagate more than one mode of light The typical diameter is 62.5 micrometers.

### Multiplexing

The process by which two or more signals are transmitted over a single communications channel. Examples include time-division multiplexing and wavelength-division multiplexing.

### MUX (Multiplexer)

A device that combines two or more signals into a single output.

## N

### Navis Optical Element Management System (OEMS)

Navis OEMS is an element management system that provides networks with operational functions such as configuration management, fault management, performance management, and security management.

### NCTL (Network Element Controller)

The NCTL provides control and user interfaces at the NE level.

### NE (Network Element)

Processor controlled entities of a telecommunications network that primarily provide switching and transport network functions and contain network operations functions.

### Near Infrared

The part of the infrared near the visible spectrum, typically 700 nm to 1500 nm or 2000 nm.

### Near-End Crosstalk

The optical power reflected from one or more input ports, back to another input port. Also known as isolation directivity.

### NEBS (Network Equipment Building Systems)

Developed by Telcordia, these are standards that vendors must adhere to if they want to sell equipment to the Regional Bell Operating Companies (RBOCs) and the Competitive Local Exchange Carriers (CLECs).

### NEC (National Electric Code)

A standard governing the use of electrical wire, cable and fixtures installed in buildings; developed by the NEC Committee of the American National Standards Institute (ANSI), and sponsored by the National Fire Protection Association (NFPA).

### NEMA (National Electrical Manufacturers Association)

NEMA, created in the fall of 1926 by the merger of the Electric Power Club and the Associated Manufacturers of Electrical Supplies, provides a forum for the standardization of electrical equipment, enabling consumers to select from a range of safe, effective, and compatible electrical products.

**NFPA (National Fire Protection Association)**
A not-for-profit organization which works with U.S. Congress and federal agencies to promote the adoption and use of fire protection codes and standards, and to promote a uniform national approach to fighting the problem of fires.

**NIM (Non-intrusive Monitor)**
A kind of sink termination point function which does not touch SDH/SONET signals but monitors quality of service.

**NSAP (Network Service Access Point)**
The access point where the Network Layer Services are available to network service users.

**NVM (Non-Volatile Memory)**
NVM denotes memory which survives a shut-down or power-down of the system such as a hard disk, floppy or tape. Xtreme uses a PCMCIA card for NVM.

**NZDSF (Non-Zero Dispersion Shifted Fiber)**
Fiber that was designed to introduce a small amount of dispersion without the zero point crossing being in the WDM passband. With this type of fiber you can eliminate, or at least greatly reduce the degradation due to four wave mixing, a distortion mechanism that requires the spectral components to be phase matched along the fiber. Examples are the TrueWave fiber from Lucent and the LS fiber from Corning.

## O

**OA (Optical Amplifier)**
A device that amplifies an input optical signal without converting it into electrical form. The best OAs developed are optical fibers doped with the rare earth element, erbium.

**OADM (Optical Add Drop Multiplexer) Terminal**
A terminal capable of adding and dropping lower-rate signals from a higher- rate multiplexed signal without completely demultiplexing the signal.

**OBA (Optical Booster Amplifier)**
An optical amplifier with high output power.

**OC-n (Optical Carrier-level n)**
A carrier rate specified in the SONET standard.

**OCWR (Optical Continuous Wave Reflectometer)**
An instrument used to characterize a fiber optic link where an unmodulated signal is transmitted through the link, and the resulting light scattered and reflected back to the input is measured.

**OD (Optical Demultiplexer)**
ODs extract individual wavelengths from the DWDM optical that is generated using an Optical Multiplexer (OM).

### OGC (Optic Gate Controller)

The controller of an Optic Gate module. Its tasks are to control the components of the module and connect it to a circuit pack.

### OLS (Optical Line System)

A lightwave transmission system that can multiplex up 8, 16, 80 or more wavelengths, transmit the resulting multiplexed signal, and then demultiplex the signal at the other end.

### OM (Optical Multiplexer)

The process by which two or more wavelengths are combined onto a single fiber.

### OMON (Optical MONitor)

The OMON circuit pack scans the entire DWDM spectrum to provide Optical Spectrum Analysis (OSA) for up to 4 or 8 selected locations in an NE.

### OMS (Optical Multiplex Section)

A layer in the Xtreme transmission hierarchy.

### OOF (Out of Frame)

State in which the frame alignment sequence of an SDH/SONET frame has not been found for several consecutive frames.

### OOS (Out-of-Service)

The circuit pack is not providing its normal service function (removed from either the working or protection state) either because of a system problem or because the pack has been removed from service.

### Operational Recovery

A recovery with the intent to perform an operation, such as to activate new software version.

### Optical Channel

An optical wavelength band for WDM optical communications.

### Optical Channel Spacing

The wavelength separation between adjacent WDM channels.

### Optical Channel Width

The optical wavelength range of a channel.

### Optical Isolator

A component used to block out reflected and unwanted light. Used in laser modules, for example. Also called an isolator.

### Optical Link Loss Budget

The range of optical loss over which a fiber optic link will operate and meet all specifications. The loss is relative to the transmitter output power.

### Optical Path Power Penalty

The additional loss budget required to account for degradations due to reflections, and the combined effects of dispersion resulting from intersymbol interference, mode-partition noise, and laser chirp.

### Optical Power Meter

An instrument that measures the amount of optical power present at the end of a fiber or cable.

### Orderwire

A section of the supervisory signal that is used for communication between sites.

### ORL (Optical Return Loss)

The ratio (expressed in units of dB) of optical power reflected by a component or an assembly to the optical power incident on a component port when that component or assembly is introduced into a link or system.

### OSA (Optical Spectrum Analyzer)

Optoelectronic device that resolves the incident light into individual wavelengths and display power vs. wavelength. Usually these are based on diffraction-grating.

### OSC (Optical Supervisory Channel)

See SUPVY/SU (Supervisory Channel).

### OSI (Open System Interconnection)

The internationally accepted grouping of standards for communication between different systems made by different vendors.

### OSNR (Optical Signal to Noise Ratio)

The ratio between the optical power of the data signal and the power of the optical noise signal.

### OT (Optical Translators)

OTs do frequency adaptation between LambdaXtreme™ Transport equipment and external equipment that are not optically compatible with LambdaXtreme. OTs also provide 3R functionality (retiming, reshaping, reamplification); and, perform fault management and performance monitoring (Non-intrusive Monitoring) on the SONET/SDH and WaveWrapper signal.

### OTDR (Optical Time Domain Reflectometer)

An instrument that locates faults in optical fibers or infers attenuation by backscattered light measurements.

**OXC (Optical Cross-connect)**
Devices that can switch optical signals between different optical fibers, without the need for conversion to electrical signals.

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## P

**Passive Branching Device**
A device which divides an optical input into two or more optical outputs.

**PCMCIA (Personal Computer Miniature Communications International Association)**
An international standards body and trade association that establishes standards for Integrated Circuit cards and promotes interchangeability among mobile computers where ruggedness, low power, and small size were critical.
PCMCIA publishes the PC Card standard which contains all of the physical, electrical and software specifications for the PC card technology. .

**PCMCIA Adapter (Personal Computer Miniature Communications International Association) Adapter**
A slot on the Network controller or PC where the flash disk is inserted.

**PD (Photodetector)**
An optoelectronic transducer such as a PIN photodiode or avalanche photodiode.

**PDU (Protocol Data Unit)**
PDUs are used for the information exchange between equal protocol layers.

**Peak Power Output**
The output power averaged over that cycle of an electromagnetic wave having the maximum peak value that can occur under any combination of signals transmitted.

**Photodiode**
A device that converts optical energy to electrical energy.

**PID (Password Identification)**
A word or character string recognized by automatic means that permits a user access to protected storage, files, or input or output devices.

**Pigtail**
A short optical fiber permanently attached to a source, detector or other fiber optic device.

**Plastic Clad Silica**
Also called hard clad silica (HCS). A step-index fiber with a glass core and plastic or polymer cladding instead of glass.

**Plenum**

The air handling space between walls, under structural floors, and above drop ceilings, which can be used to route intrabuilding cabling.

**Plenum Cable**

A cable that has flammability and smoke characteristics which allow it to be routed in a plenum area without being enclosed in a conduit.

**PLL (Phase Locked Loop)**

An electronic circuit that controls an oscillator so that it maintains a constant phase angle relative to a reference signal.

**PM (Performance Monitoring)**

Measures the quality of service and identifies any degrading or marginally operating systems (before an alarm would be generated).

**PMD (Polarization Mode Dispersion)**

PMD is an inherent property of all optical media. It is caused by the difference in the propagation velocities of light in the orthogonal principal polarization states of the transmission medium. The net effect is that if an optical pulse contains both polarization components, then the different polarization components travel at different speeds and arrive at different times, smearing the received optical signal.

**pN_EBC (Near-end Errored Block Count)**

Every second the number of near-end errored blocks (N_Bs) within that second is counted as the Near-end Errored Block Count (pN_EBC). This counter is used to determine the degraded defect and as an input for the performance monitoring process.

**Point-to-Point Transmission**

The transmission between two designated stations.

**Polarization**

The direction of the electric field in the lightwave.

**PPP/IP (Point-to-Point Protocol/Internet Protocol)**

A protocol used by a computer to connect to the Internet via a dial up telephone line and modem.

**Pre-Provisioning**

The capability to provision a slot before installing a circuit pack.

**Previous SW Generic (Previous Software Generic)**

The previous SW generic is the software and data on the alternate partition to the currently executed SW/data of the PCMCIA card. It might be installed and activated per user command. After installation previous and current SW generic are exchanged.

### Provisioning

Placing and configuring hardware and software required to activate a telecommunications service for a customer. If the equipment is in place, provisioning may consist of creating or modifying a customer record in a database to activate the services.

### Pulse Spreading

The dispersion of an optical signal as it propagates through an optical fiber.

### Pump laser

A laser used in an optical fiber amplifier.

## Q

### QoS (Quality of Service)

A set of performance parameters that characterize the transmission quality over a given virtual connection.

## R

### Raman Amplification

A technique in which high-power laser light is sent into the outside plant fiber (OSP) transforming part of the fiber itself into an amplifier.

### Rayleigh Scattering

The scattering of light that results from small inhomogeneties of material density or composition.

### RBOC (Regional Bell Operating Company)

One of the seven regional holding companies formed after the AT&T divestiture. These companies included Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Telesis, Southwestern Bell, and U.S. West. Later on, Bell Atlantic and NYNEX merged and became Verizon; Ameritech, Pacific Telesis and Southwestern Bell merged and became SBC; and U.S. West was renamed Quest.

### RDI (Remote Defect Indication)

RDI signals convey the defect status of the trail signal at the trail destination (that is, at trail termination sink function) back to the trail origin (that is, trail termination source function). This mechanism allows alignment of the near-end and far-end performance monitoring processes.

### Receiver

A terminal device that includes a detector and signal processing electronics. It functions as an optical-to-electrical converter.

### Receiver Overload

The maximum acceptable value of average received power for an acceptable BER or performance.

### Receiver Sensitivity

The minimum acceptable value of received power needed to achieve an acceptable BER or performance. It takes into account power penalties caused by use of a transmitter with worst-case values of extinction ratio, jitter, pulse rise and fall times, optical return loss, receiver connector degradations, and measurement tolerances.

### Refractive Index

A property of optical materials that relates to the speed of light in the material.

### Refractive Index Gradient

The change in refractive index with distance from the axis of an optical fiber.

### Refractive Index Profile

The description of the value of the refractive index as a function of distance from the optical axis along an optical fiber diameter

### Regenerator

A repeater, designed for digital transmission, in which digital signals are amplified, reshaped, retimed, and retransmitted. For optical transmission, a device that receives an optical signal, converts it to electrical, regenerates the signal, converts it to optical, then transmits it.

### REI (Remote Error Indication)

REI signals contain either the exact or truncated number of error detection code violations detected in the trail signal at the trail termination sink. This information is conveyed to the trail termination source. REI allows alignment of the near-end and far-end performance monitoring processes. Examples of REI signals are the FEBE bits in SDH signals.

### Repeater

A receiver and transmitter set designed to amplify attenuated signals. Used to extend operating range.

### Responsivity

The ratio of a photodetectors electrical output to its optical input in Amperes/Watt.

### Ribbon Cables

Cables in which many fibers are embedded in a plastic material in parallel, forming a flat ribbon-like structure.

### Rise Time

The time taken to make a transition from one state to another, usually measured between the 10% and 90% completion points of the transition. Alternatively the rise time may be specified at the 20% and 80% amplitudes. Shorter or faster rise times require more bandwidth in a transmission channel.

**Riser Cables**
High-strength cables used in vertical shafts between floors in multi-story buildings.

**RJ (Random Jitter)**
Random jitter is due to thermal noise and may be modeled as a Gaussian process. The peak-to-peak value of RJ is of a probabilistic nature, and thus any specific value requires an associated probability.

**RM (Registration Manager)**
The Registration Manager is an application process that initiates the Registration Request Protocol, and communicates the DSA address and Name-prefix information to the Registration Agent.

**RP (Raman Pump)**
In LambdaXtreme Transport, RPs provide amplification/gain in the outside plant fiber by supplying a counterpropagating signal. The amplification is provided by ″pumping″ high-intensity wavelengths (that are lower than the signal wavelength) into the fiber that carries the incoming DWDM signal. (Also see RPG).

**RPG (Growth Raman Pump)**
In LambdaXtreme Transport, RPGs provide amplification/gain in the outside plant fiber and internally in the Dispersion Compensation Module. RPGs provide copropagating wavelengths to the outside plant fiber at the output DWDM signal and counterpropagating wavelengths to the incoming DWDM signal and to the Dispersion Compensation Module. RPGs are optional; they are used for channels above 188.45 THz. (Also see RP).

## S

**SC (Subscription channel connector.)**
A push-pull type of optical connector that originated in Japan. Some of its features are high packing density, low loss, low backreflection, and low cost.

**Scattering**
The change of direction of light rays or photons after striking small particles. It may also be regarded as the diffusion of a light beam caused by the inhomogeneity of the transmitting material.

**SCOT (Software Control of Transmission)**
The software architecture and algorithms for control of transmissions in LambdaXtreme Transport. Software control includes the following areas: startup, transient control, APR and APR recover, single node failure in a network, adding/deleting channels, and adding the expansion pump pack (RPG).

**SCTL (Shelf Controller)**
SCTL provides control at the double shelf backplane level (half of a bay).

**SDH (Synchronous Digital Hierarchy)**
A family of digital transmission rates from 51.84 Mb/s to 9.953 Gb/s that allows the interconnection of transmission products around the world.

**SEC (SDH Equipment Clock)**
A timing device (equipment) used to synchronize network equipment that operates according to the principles governed by SDH.

**Shelf**
A shelf is a mechanical facility that is in general a housing for circuit packs. Shelves are housed in Bays.

**Simplex**
Single element (for example, a simplex connector is a single-fiber connector).

**Simplex Cable**
A term sometimes used for a single-fiber cable.

**Simplex Transmission**
Transmission in one direction only.

**SIO (System Input/Output) Circuit Pack**
SIO CP connects the NCTL to the SCTLs, provides the main interface to the system, provides LAN interfaces, provides orderwire interfaces, and provides performance monitoring interfaces.

**SNMS (Sub-Network Management System)**
See Navis OEMS.

**Soliton Pulse**
An optical pulse having a shape and power level designed to take advantage of nonlinear effects in an optical fiber waveguide, for the purpose of essentially negating dispersion over long distances. The result is that the pulse retains its original shape as it travels.

**SONET (Synchronous Optical Network)**
A North-American standard developed by Bell-Labs for the optical long distance networks.

**Span**
Fiber link between NEs that may be unidirectional or bidirectional, depending upon network design.

**Span Loss**
Loss (in dB) of optical power due to the span transmission medium (includes fiber loss and splice losses).

### Spectral Width

A measure of the extent of a spectrum. For a source, the width of wavelengths contained in the output at one half of the wavelength of peak power. Typical spectral widths are 50 to 160 nm for an LED and 0.1-5 nm for a laser diode.

### Splice

A permanent connection of two optical fibers through fusion or mechanical means.

### Splitting Ratio

The ratio of power emerging from two output ports of a coupler.

### SPOT (Synchronous Partial Overhead Transparency)

Overhead bytes of SDH/SONET transmission signals which are sent together with payload although they are mapped into higher rate signals. The transparency feature is often used in combination with fiber shortage solutions.

### SR (Short Reach)

Optical sections of 2 km or less.

### SRS (Simulated Raman Scattering)

a broadband effect where power is transferred from a low wavelength channel to a higher-wavelength channel. The short wavelength source acts like a ″pump″.

### SSMF (Standard single-mode fiber)

This is the most common type of fiber deployed. This fiber was designed to provide zero chromatic dispersion at 1310 nm, to support the early long-haul transmission systems operating at this wavelength. It has a chromatic dispersion of at most 20 ps/(nm*km) in the 1550 nm wavelength range and usually around 17 ps/(nm*km).

### ST (Straight tip connector)

Popular fiber optic connector that uses a bayonet style coupling rather than a screw-on coupling.

### Step-Index Fiber

Fiber that has a uniform index of refraction throughout the core.

### Strength Member

The part of a fiber optic cable composed of aramid yarn, steel strands, or fiberglass filaments that increase the tensile strength of the cable.

### SUPVY Pack (Supervisory Pack)

SUPVY circuit pack is a low-speed transmission pack that facilitates communication between LambdaXtreme NEs.

### SUPVY/SUP (Supervisory Channels)

SUPVY/SUP supports the following communications: node-to-node, interworking, client LAN, and orderwire communication.

### SW Generic (Software Generic)

The whole software and (static) data associated with a particular NE release. See also current and previous SW generic.

### Synchronous

A data signal that is sent along with a clock signal.

## T

### T-Carrier

Generic designator for any of several digitally multiplexed telecommunications carrier systems.

### Tap

The entry point into a system module

### Tap Loss

In a fiber optic coupler, the ratio of power at the tap port to the power at the input port.

### Tap Port

In a coupler where the splitting ratio between output ports is not equal, the output port containing the lesser power

### TBOS (Telemetry Byte Oriented Serial) Protocol

A protocol used for transmitting alarms, status, and control points between a NE and the operating system.

### TC (Tandem Connection)

An arbitrary series of contiguous link connections and/or subnetwork connections.

### TCA (Threshold-Crossing Alert)

A condition set when a counter exceeds a user-selected high or low threshold. A TCA does not generate an alarm but is available on demand through the CIT.

### TCP/IP (Transmission Control Protocol/Internet Protocol)

A suite of several networking protocols developed for the Internet that provides communication across interconnected networks, between computers with diverse hardware architectures and various operating systems. Some examples are FTP, SMTP, SNMP, and so forth.

### TD (Transmit Degrade)

Indicates that the transmitted signal has degraded to a level where a certain threshold of error code violations is exceeded.

**TDC (Tunable Dispersion Compensator)**
A device which has negative chromatic dispersion where the amount of dispersion can be adjusted. It is used for compensation of the chromatic dispersion of the transmission fibers.

**Thermal Noise**
Noise resulting from thermally induced random fluctuation in the receiver load resistance current.

**Throughput Loss**
In a fiber optic coupler, the ratio of power at the throughput port to the power at the input port.

**TID (Target Identifier)**
A provisionable parameter used to identify a NE within a TL1 command.

**TL1 (Transaction Language 1)**
TL1 is an OS/NE machine-to-machine language. TL1 messages are expressed as ASCII strings. TL1 messages and syntax are defined by Telcordia requirements.

**TrueWave® Fiber**
Non–zero dispersion-shifted fiber manufactured by Lucent Technologies.

**TSD (Trail Signal Degrade)**
The TSD signal (generated by a trail termination sink function) informs the next function(s) of the ″signal degrade″ condition of the associated data signal.

**TSF (Trail Signal Fail)**
The TSF signal (generated by a trail termination sink function) informs the next downstream function(s) of the ″signal fail″ condition of the associated data signal (which contains, due to that ″signal fail″ condition, the all-ONEs (AIS) pattern).

**TT (Trail Termination)**
An atomic function within a layer that generates, adds, and monitors information concerning the integrity and supervision of adapted information.

## U

**UART (Universal Asynchronous Receiver and Transmitter)**
A receiver/transmitter that converts incoming serial data from a port into parallel form.

**UFEC (Ultra Forward Error Correction)**
An improved method to correct bit errors in a transmission signal. Additional information is put into the data signal to allow the correction of bit errors. There is no acknowledge information in the back direction.

**UHC (Ultra High Capacity)**
A 40G application for transmission of 64 channels for a capacity of 2.56 Tbps and a reach of up to 1000 km. Payload (per channel) can be one OC768/STM-256 or four OC192/STM-64 signals.

**UID (User Identification)**
A CIT user code that comprises one to ten alphanumeric, case-sensitive characters. UID identifies a user when he/she logs into a system.

**ULH (Ultra Long Haul)**
A 10 Gbps application for transmission of 128 channels giving a capacity of 1.28 Tbps and a reach of 2000–4000 km. Payload (per channel) can be one OC192/STM-64 or four OC48/STM-16 signals.

**UNITE (UNIversal high speed TDM Equipment for multi-services)**
A 10G/40G platform.

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## V

**VOA (Variable Optical Attenuator)**
VOA correct the signal strength differences that occur in the transmission line.

**VSR (Very Short Reach)**
VSR is a SONET/SDH interface that provides a low-cost solution interconnection of less than 300 meters between routers, switches and DWDM systems.

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## W

**WAN (Wide Area Network)**
A network whose elements are separated by long distances.

**Waveguide**
A material medium that confines and guides a propagating electromagnetic wave.

**Waveguide Couplers**
A coupler in which light is transferred between planar waveguides.

**Waveguide Dispersion**
The part of chromatic dispersion arising from the different speeds light travels in the core and cladding of a single-mode fiber (that is, from the fiber’s waveguide structure).

**Wavelength**
The distance between points of corresponding phase of two consecutive cycles of a wave. The wavelength, is related to the propagation velocity, and the frequency.

**Wavelength Growth**
A type of growth in which all eight wavelengths are added to a single line before more lines are added.

**WaveWrapper**
WaveWrapper provides network management functions such as optical-layer performance monitoring, error correction and ring protection on a per-wavelength basis.

**WDM (Wavelength-Division Multiplexing)**
Sending several signals through one fiber with different wavelengths of light.

**WGR (Waveguide Grating Router)**
Device used to take a mix of wavelengths and separate into the component wavelengths

**WTR time (Wait To Restore time)**
The WTR time ensures that a previous failed synchronization source is only again considered as available by the selection process if it is fault free for a certain time.

## X

**XT Crosstalk X-talk**
Undesired coupling from a circuit, part of a circuit, or channel to another.

## Y

**Y Coupler**
A variation on the tee coupler in which input light is split between two channels (planar waveguide) that branch out like a Y.

## Z

**Zero DSF (Zero Dispersion Shifted Fiber)**
DSF where the zero dispersion point is shifted from 1310nm to 1550 nm. It is best suited for applications involving single channel transmission at 1550 nm, providing the benefits of zero dispersion as well as taking advantage of the lower attenuation wavelength.

# Index