Lucent Technologies
Bell Labs Innovations



Optical Line System Releases 1 and 2

User/Service Manual

365-575-301
Issue 2/2A/2B/2C/2D
February 1999

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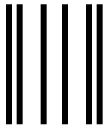
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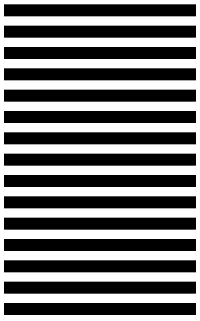
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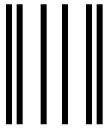
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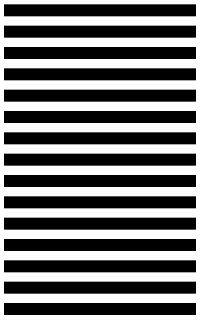
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Contents

About This Document xxvii

- Purpose xxvii
- Intended Audiences xxviii
- Reason for Reissue xxviii
- How to Use This Document xxviii
- Conventions Used xxix
- Safety Instructions xxx
  - Safety Labels xxx
  - Lightwave Safety Guidelines xxx
    - General Laser Information xxx
    - Lasers and Eye Damage xxxi
    - Classification of Lasers xxxi
    - Lightwave Safety Precautions xxxi
    - Safety Precautions for Enclosed Systems xxxii
    - Safety Precautions for Unenclosed Systems xxxiv
  - Electrostatic Discharge (ESD) Considerations xxxv
- Security xxxix
- Related Documentation/Training xxxix
  - Lucent Technologies Practices xxxix
  - Lucent Technologies Modification Implementation Procedures xl
  - Lucent Technologies Drawings xlii
  - Lucent Technologies Practices for Related Equipment xliii
  - Training xliv
- Technical Support xlvii
- Documentation Support l
- How to Order Documents l
- How to Comment on the Optical Line System li
- How to Comment on This Document li
- Electronic Documentation li
- Product Change Notifications lii

Contents

1 System Introduction 1-1

- Overview 1-1
- Introduction to Lucent Technologies Transmission Products 1-1
- What is the Optical Line System? 1-2

2 Applications 2-1

- Overview 2-1
- Optical Transmission Elements 2-2
- Point-to-Point Applications 2-8
  - 1x1 End Terminal Application 2-8
  - Dual 1x1 End Terminal Application 2-9
- Ring Applications 2-11
- Line Capacity Growth Scenario 2-15

3 Platform Description 3-1

- Overview 3-1
- Introduction 3-1
- Equipment Packages 3-2
  - Optical Line System End Terminal for 4 Bidirectional Optical Lines 3-2
  - Optical Line System Repeater for 4 Bidirectional Optical Lines 3-6
  - Optical Line System Dual End Terminal 3-8
  - Optical Line System Dual Repeater 3-11
  - Optical Line System End Terminal and Repeater 3-13
  - Optical Line System End Terminal Shelf (Miscellaneously Mounted) 3-15
  - Optical Line System Repeater Shelf (Miscellaneously Mounted) 3-18
- Indicator Strip 3-19

Contents

- Shelves 3-20
  - End Terminal Shelf 1 3-20
    - Purpose of End Terminal Shelf 1 3-20
    - End Terminal Shelf 1 Circuit Packs/Units 3-21
  - End Terminal Shelf 2 3-24
    - Purpose of End Terminal Shelf 2 3-24
    - End Terminal Shelf 2 Circuit Packs/Units 3-25
  - Repeater Shelf 1 3-27
    - Purpose of Repeater Shelf 1 3-27
    - Repeater Shelf 1 Circuit Packs 3-28
  - Repeater Shelf 2 3-29
    - Purpose of Repeater Shelf 2 3-29
    - Repeater Shelf 2 Circuit Packs 3-30
- Shelf Interfaces 3-31
- Fuse Panel 3-34
- User Panel 3-35
- Heat Baffle 3-36
- Upgrades 3-36

4 Power 4-1

- Overview 4-1
- General 4-1
- Power Distribution 4-2
- Power Dissipation 4-6
- LEDs 4-7

5 Control, Transmission, and Synchronization Interfaces 5-1

- Overview 5-1
- Control 5-1
- Transmission 5-4
  - Optical Line System End Terminal Shelf 5-4
  - Optical Line System Repeater Shelf 5-8

Contents

- Synchronization 5-10

6 Operations Interfaces 6-1

- Overview 6-1
- Craft Interface Terminal (CIT) 6-1
  - General 6-1
  - PC with CIT-PC Software 6-2
  - ASCII-Based Terminal 6-6
  - Local Access Through the CIT (DCE) Port 6-7
  - Dial-Up Access Using a Modem Through the CIT (DTE) Port 6-7
  - Remote Access Using the Supervisory Signal Data Communications Channel (DCC) 6-9
- Indicator Strip/User Panel 6-10
- Fuse Panel 6-13
- Circuit Pack Faceplate LED 6-14
- Office Alarms Interface 6-14
- Parallel Telemetry Interface 6-15
- User-Settable Miscellaneous Discrete Interface 6-16
- Message-Based Operations System Interface 6-18
- Orderwire Interface 6-24

7 Circuit Pack Descriptions 7-1

- Overview 7-1
- General 7-1
- Circuit Pack/Unit and Software Compatibility 7-2
- Control 7-3
  - SYSCTL (LEA1) Circuit Pack Description 7-3
    - Purpose of Circuit 7-3
    - Faceplate LED 7-3
    - General Description of Operation 7-4
    - Detailed Description of Operation 7-4

Contents

Quick Reference Summary 7-7
SYSMEM (LEA2) Circuit Pack Description 7-8
Purpose of Circuit 7-8
Faceplate LED 7-8
General Description of Operation 7-9
Detailed Description of Operation 7-9
Quick Reference Summary 7-13
TOHCTL (LEA5) Circuit Pack Description 7-14
Purpose of Circuit 7-14
Faceplate LED 7-14
General Description of Operation 7-15
Detailed Description of Operation 7-15
Quick Reference Summary 7-17
■ Transmission 7-18
TLM (LDA1) Circuit Pack Description 7-18
Purpose of Circuit 7-18
Faceplate LED 7-18
General Description of Operation 7-19
Detailed Description of Operation 7-19
Quick Reference Summary 7-24
OMU (505A) Description 7-26
Purpose of Circuit 7-26
Faceplate LED 7-26
General Description of Operation 7-27
Detailed Description of Operation 7-27
Quick Reference Summary 7-28
ODU (605A) Description 7-29
Purpose of Circuit 7-29
Faceplate LED 7-29
General Description of Operation 7-30
Detailed Description of Operation 7-30
Quick Reference Summary 7-31
OA (LEA6 and LEA7) Circuit Pack Description 7-32
Purpose of Circuit 7-32
Faceplate LED 7-32
General Description of Operation 7-33
Detailed Description of Operation 7-34

Contents

Quick Reference Summary 7-38

8 Administration and Provisioning 8-1

- Overview 8-1
- Administration 8-1
  - Memory Administration 8-1
  - Version Recognition 8-4
  - Security 8-4
    - General 8-4
    - Port Security 8-5
    - User Login Security 8-6
    - Network Element Login Security 8-7
    - Password Aging 8-8
  - Software Upgrades 8-9
  - Access Identifications 8-10
- Provisioning 8-11
  - Provisionable Parameters and Original Values 8-11
  - Local Provisioning 8-17
  - Preprovisioning Circuit Packs 8-31
  - Provisioning on Circuit Pack Replacement 8-31
  - Auto Provisioning Date/Time 8-31
  - Circuit Pack Slot, Port, and Optical Channel Provisioning States 8-32

9 Maintenance Description 9-1

- Overview 9-1
- Maintenance Philosophy 9-1
- Maintenance Signals 9-2
- Fault Detection, Isolation, and Reporting 9-4
- Protection Switching 9-10
  - General 9-10
  - Supervisory Signal Data Communications Channel Protection 9-10

Contents

- Loopbacks 9-11
- Tests 9-11
  - Auto Turnup 9-11
  - Manual 9-16
  - Operations Interface Tests 9-17
- Provisioning Consistency Audits 9-17
- Performance Monitoring 9-18
  - Performance Parameters 9-18
  - Optical Line Parameters 9-19
  - Optical Channel Parameters 9-20
  - Supervisory Channel Parameters 9-20
  - Performance-Monitoring Data Storage and Reports 9-21
  - Performance Monitoring During Failed Conditions 9-22
  - Performance-Monitoring Parameter Thresholds 9-23
  - Threshold Crossing Alert Transmission to an Operations System 9-23
- Reports 9-24
  - Active Alarms and Status 9-24
  - 6-Hour Autonomous TL1 Report 9-25
  - Provisioning Reports 9-25
  - Performance Monitoring 9-25
  - State 9-26
  - Version/Equipment List 9-26

10 Technical Specifications 10-1

- Overview 10-1
- Optical Connector Interfaces 10-1
- Transmission Medium 10-1
- Lightguide Jumpers 10-2
- Optical Safety (CDRH Classification) 10-2
- Operating Wavelengths 10-3
- Tone Frequencies 10-3
- Input Power 10-4

Contents

- Optical Amplifier Output Power (Nx33-dB Systems) 10-4
- Optical Amplifier Output Power (Mx24-dB/Px25-dB Systems) 10-5
- Optical Dispersion 10-5
- Optical Return Loss 10-5
- Optical Reflections Tolerance 10-5
- Outside Plant Loss 10-6
- Capacity 10-6
- Transmission Characteristics 10-6
- Transmission Delay 10-6
- Signal-to-Noise Ratio Performance 10-7
- Customer Maintenance Signal IS-3 Access 10-7
- Cable Access 10-8
- Power Specifications 10-8
- Cabinet/Shelf Dimensions 10-10
- Circuit Pack/Unit Dimensions 10-10
- Floor Loading Specifications 10-11
- Environmental Specifications 10-11
- Handling and Transportation Specifications 10-12
- Craft Interface Terminal 10-12
  - Personal Computer Requirements 10-12
  - ASCII-Based Terminal Requirements 10-13
- Modem Requirements 10-13
- Operations System Interfaces 10-14
- Reliability Specifications 10-15
- Circuit Pack/Unit FIT Rates 10-16

11 Craft Interface Terminal Usage 11-1

- Overview 11-1
- OLS CIT-PC Software Introduction 11-1
- Commands (Inputs) 11-2
  - Notice Frames and Confirmation Requests 11-2
  - Context Sensitive Help 11-3
  - CIT Function Keys 11-3

Contents

PC Screen Header Line 11-4

- Outputs 11-14
- Examples of Reports [Generated by Various Inputs (Commands)] 11-15
- CIT Tutorial Using CIT-PC Software 11-55

Operation and Maintenance (TOP)

A **Pin Repair** A-1

GL **Glossary** GL-1

IN **Index** IN-1

Figures

About This Document

1. Warning Label xxxiii
2. Compliance Label xxxiii
3. Static Control Wrist Strap xxxvi
4. Product Support xlviii

1 System Introduction

1-1. Optical Line System End Terminal for 4 Bidirectional Optical Lines (Doors Open) 1-3

2 Applications

2-1. Optical Line System Transmission 2-2
2-2. Optical Lines and Optical Sections (Nx33-dB Systems) 2-4
2-3. Electrical Regeneration of Optical Lines 2-5
2-4. Optical Lines and Optical Sections (Mx24-dB Systems) 2-6
2-5. Optical Lines and Optical Sections (Px25-dB Systems) 2-7
2-6. 1x1 End Terminal Application (Equipped with 2 Optical Lines) 2-8
2-7. Dual 1x1 End Terminal Application (Equipped with 2 Optical Lines) 2-9
2-8. Dual 1x1 End Terminal Application (Equipped with 4 Optical Lines) 2-10
2-9. 4-Fiber Ring Application with the FT-2000 OC-48 Large Capacity Terminal, Optical Translator, and the Optical Line System 2-12
2-10. Two 4-Fiber Rings Sharing the Optical Line System 2-13

Figures

2-11. Four 4-Fiber Ring Sharing the Optical Line System 2-14
2-12. Span Capacity Growth Scenario 2-16

3 Platform Description

3-1. Optical Line System End Terminal for 4 Bidirectional Optical Lines (Doors Open) 3-3
3-2. Lucent Technologies ***Newlook 2000*** Cabinet 3-4
3-3. 1A-TX and 1A-RCV Optical Line System End Terminals for 4 Bidirectional Optical Lines (Doors Open) 3-5
3-4. Optical Line System Repeater for 4 Bidirectional Optical Lines (Doors Open) 3-6
3-5. Optical Line System Dual End Terminal (Doors Open) 3-8
3-6. 1A-TX and 1A-RCV Optical Line System Dual End Terminals (Doors Open) 3-10
3-7. Optical Line System Dual Repeater (Doors Open) 3-11
3-8. Optical Line System End Terminal and Repeater (Doors Open) 3-13
3-9. Optical Line System End Terminal Shelf (Miscellaneously Mounted) (Covers Removed) 3-15
3-10. Miscellaneously Mounted Shelf 3-16
3-11. 1A-TX and 1A-RCV Optical Line System End Terminal Shelves (Covers Removed) 3-17
3-12. Optical Line System Repeater Shelf (Miscellaneously Mounted) (Covers Removed) 3-18
3-13. Indicator Strip (OLS End Terminal for 4 Bidirectional Optical Lines and OLS Repeater for 4 Bidirectional Optical Lines) 3-19

Figures

3-14. Indicator Strip (OLS Dual End Terminal and OLS Dual Repeater) 3-19
3-15. End Terminal Shelf 1 (Without Covers) 3-20
3-16. 1A-TX and 1A-RCV End Terminal Shelf 1 (Without Covers) 3-21
3-17. End Terminal Shelf 2 (Without Covers) 3-24
3-18. 1A-TX and 1A-RCV End Terminal Shelf 2 (Without Covers) 3-25
3-19. Repeater Shelf 1 (Without Covers) 3-27
3-20. Repeater Shelf 2 (Without Covers) 3-29
3-21. Interconnection Panel 3-31
3-22. Fuse Panel 3-34
3-23. User Panel for the Miscellaneously Mounted Shelf 3-35

4 Power

4-1. Cabinet Power Distribution 4-2
4-2. Miscellaneously Mounted Shelf Power Distribution 4-3
4-3. Shelf and Circuit Pack Power Distribution 4-4

5 Control, Transmission, and Synchronization Interfaces

5-1. System Control Architecture 5-2
5-2. End Terminal Shelf Transmission Block Diagram 5-4
5-3. Repeater Shelf Transmission Block Diagram 5-8

Figures

6 Operations Interfaces

6-1. Indicator Strip (4 Bidirectional Optical Line Systems) 6-10
6-2. Indicator Strip (Dual Systems) 6-10
6-3. User Panel 6-11
6-4. Fuse Panel 6-13

7 Circuit Pack Descriptions

7-1. SYSCTL (LEA1) Circuit Pack 7-3
7-2. SYSCTL Circuit Pack Block Diagram 7-5
7-3. SYSMEM (LEA2) Circuit Pack 7-8
7-4. SYSMEM Circuit Pack Block Diagram 7-10
7-5. TOHCTL (LEA5) Circuit Pack 7-14
7-6. TOHCTL Circuit Pack Block Diagram 7-15
7-7. TLM (LDA1) Circuit Pack 7-18
7-8. TLM Circuit Pack Block Diagram 7-20
7-9. OMU (505A) 7-26
7-10. OMU Block Diagram 7-27
7-11. ODU (605A) 7-29
7-12. ODU Block Diagram 7-30
7-13. OA (LEA6 and LEA7) Circuit Pack 7-32
7-14. OA Circuit Pack Block Diagram 7-34

9 Maintenance Description

9-1. Local CMS Self-Test (End Terminal) 9-12
9-2. Local CMS Self-Test (Repeater) 9-13
9-3. Local SUPR Self-Test (End Terminal) 9-14
9-4. Local SUPR Self-Test (Repeater) 9-15

Tables

1 System Introduction

1-1. Major Features of Product Releases 1 and 2 1-4

3 Platform Description

3-1. End Terminal Shelf 1 Circuit Pack Slot/Circuit Pack Code/Unit Code/Software Compatibility 3-23

3-2. End Terminal Shelf 2 Circuit Pack Slot/Circuit Pack/Unit Code/Software Compatibility 3-26

3-3. Repeater Shelf 1 Circuit Pack Slot/Circuit Pack Code/Software Compatibility 3-28

3-4. Repeater Shelf 2 Circuit Pack Slot/Circuit Pack Code/Software Compatibility 3-30

4 Power

4-1. Power Dissipation and Current Drains 4-6

5 Control, Transmission, and Synchronization Interfaces

5-1. OC-48 Drop Side Signal Wavelengths and Power Levels 5-6

Tables

7 Circuit Pack Descriptions

7-1. Circuit Packs/Units and Compatible Software 7-2
7-2. Overhead Bytes 7-17
7-3. OA Circuit Pack/Software/Application Compatibility 7-33
7-4. Optical Line System Wavelengths and Tone Frequencies 7-36

8 Administration and Provisioning

8-1. Optical Line System Output Values 8-10
8-2. Provisionable Parameters 8-12
8-3. Provisionable Threshold Crossing Alert (TCA) Parameters 8-16

9 Maintenance Description

9-1. Optical Line System Wavelengths and Tone Frequencies 9-2
9-2. Incoming Signals and Monitored Conditions 9-4
9-3. Condition Descriptions 9-6
9-4. Performance-Monitoring Parameters 9-18

10 Technical Specifications

10-1. Optical Safety Data on Laser-Containing Circuit Packs 10-2
10-2. Wavelength Tone Frequencies 10-3
10-3. Drop Side Input Power 10-4

Tables

11 Craft Interface Terminal Usage

11-1. Release 2 Inputs (Commands) Menu for OLS End Terminal and Repeater (Expert Mode) 11-5

11-2. Release 1 Inputs (Commands) Menu for OLS End Terminal and Repeater (Expert Mode) 11-7

11-3. Input (Command) Definitions (Alphabetized by Verb) 11-9

11-4. List of Inputs (Commands) That Generate Reports for OLS Network Elements [Alphabetized by Qualifier(s)] 11-13

About This Document

Purpose

This user/service manual provides the following information about the Lucent Technologies Optical Line System (OLS):

- Detailed descriptive information to circuit pack level
- Craft interface terminal usage
- Operation and maintenance (O&M) task oriented practice (TOP) supporting acceptance, circuit order, operation, and trouble clearing tasks.

The Optical Line System has a phased release plan. Each phased release provides new sets of features. This user/service manual covers Releases 1 and 2 and will be updated to cover additional releases as they become available. Release 1 provides the Optical Line System platform and supports applications using the FT-2000 OC-48 Large Capacity Terminal, systems with up to three spans, and up to four bidirectional optical lines. Release 2 supports long-reach systems with up to seven or eight spans (subject to certain engineering rules), additional user-settable miscellaneous discrete inputs and outputs, and an enhanced set of TL1 messages.

For more information about the Optical Line System and a complete list of features, refer to 365-575-300, *Optical Line System (OLS), Applications, Planning, and Ordering Guide*.

Intended Audiences

This user/service manual is primarily for end users responsible for operating and maintaining the Optical Line System. It may be used by anyone desiring specific operation and maintenance information.

Reason for Reissue

This document, Issue 2, replaces the *Optical Line System, Release 1 User/Service Manual*, Issue 1/1A. This document was reissued to provide information about Release 2.

Significant changes include the following:

- Applications information was updated.
- Descriptive and maintenance information about the Optical Line System was updated.
- Technical specifications information was updated.

Vertical bars (|) are used in the right margin to indicate **significant changes** from the previous issue.

How to Use This Document

The sections in this document are marked with tabs and provide the following information:

- "About This Document" describes the purpose, intended audience, and organization of this document. This section also presents safety information, references other related documentation, and provides product support information. It also explains how to order and make comments or recommendations for changes to this document.
- Section 1, "System Introduction," introduces and briefly describes the Optical Line System.
- Section 2, "Applications," describes how the Optical Line System operates as a point-to-point optically amplified line system with the FT-2000 OC-48 Large Capacity Terminal.
- Section 3, "Platform Description," introduces the Optical Line System equipment packages and provides a more detailed view of the Optical Line System physical design.
- Section 4, "Power," describes the power distribution and dissipation of the Optical Line System.

- Section 5, "Control, Transmission, and Synchronization Interfaces," describes the Optical Line System interfaces and architecture. The system control and transmission interfaces and architecture are described down to the circuit pack level.
- Section 6, "Operations Interfaces," describes the interfaces that allow access to the Optical Line System and provides alarm and status information.
- Section 7, "Circuit Pack Descriptions," provides a detailed circuit description of each Optical Line System circuit pack.
- Section 8, "Administration and Provisioning," describes administration and provisioning of the Optical Line System.
- Section 9, "Maintenance Description," defines the "maintenance philosophy" outlining the various features available to monitor and maintain the Optical Line System.
- Section 10, "Technical Specifications," lists the technical specifications for the Optical Line System.
- Section 11, "Craft Interface Terminal Usage," describes how the craft interface terminal is used and shows the Optical Line System inputs (commands), output messages, and reports. It also includes a tutorial on the use of the craft interface terminal.
- The "Operation and Maintenance (TOP)" contains specific task oriented procedures for the acceptance, circuit order, operation, and trouble clearing of the Optical Line System.

Conventions Used

The **BOLD** font is used throughout this manual for emphasis. The descriptive sections in this manual use a **Courier Bold** font to identify menu input selections to the system. UPPERCASE letters identify letter designations on panels, shelves, and circuit packs.

The procedures in the "Operation and Maintenance (TOP)" section use a MONOSPACE font to identify text on a screen or a response displayed from the system. A **BOLD** font identifies letter designations on panels, shelves, and circuit packs.

Safety Instructions

Safety Labels

This manual may contain safety labels in the form of **DANGERS, WARNINGS,** and **CAUTIONS**. These admonishments have the following definitions:

- **DANGER** shows the presence of a hazard that *will* cause death or severe personal injury if the hazard is not avoided.
- **WARNING** shows the presence of a hazard that *can* cause death or severe personal injury if the hazard is not avoided.
- **CAUTION** 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.

These safety labels are noted by the alert symbol  .

Lightwave Safety Guidelines

General Laser Information

The Optical Line System 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.

Classification of Lasers

Manufacturers of lasers and laser products in the United States are regulated by the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) under 21 CFR 1040. These regulations require manufacturers to certify each laser or laser product as belonging to one of four major Classes I, II, IIa, IIIa, IIIb, or IV. Lasers are classified according to the accessible emission limits and their potential for causing injury. Lightwave systems are generally classified as Class I, 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.

Lightwave Safety Precautions

Under normal operating conditions, the Optical Line System is totally enclosed and presents no risk of eye injury. It is a Class I system under the FDA/CDRH scheme.

The lightguide cables that interconnect various components of a lightwave system can disconnect or break and may expose people to lightwave emission. Also, certain measures and maintenance procedures may expose the technician to emission from the semiconductor laser during installation and servicing. Unlike more familiar laser devices, such as solid-state and gas lasers, the emission pattern of a semiconductor laser results in a highly divergent beam. In a divergent beam, the irradiance (power 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 Optical Line 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. The label shall read as follows:

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

A warning label (Figure 1) is provided on the faceplate of each Optical Amplifier circuit pack. The word DANGER is in central office white lettering on a red background. The text of the warning label is in black lettering on a white background.

In addition, 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 cabinet and miscellaneously mounted shelf. Figure 2 shows an example of a compliance label. The compliance label is located on the rear of the equipment cabinet (at eye level).

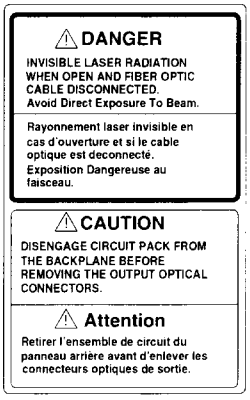


Figure 1. Warning Label

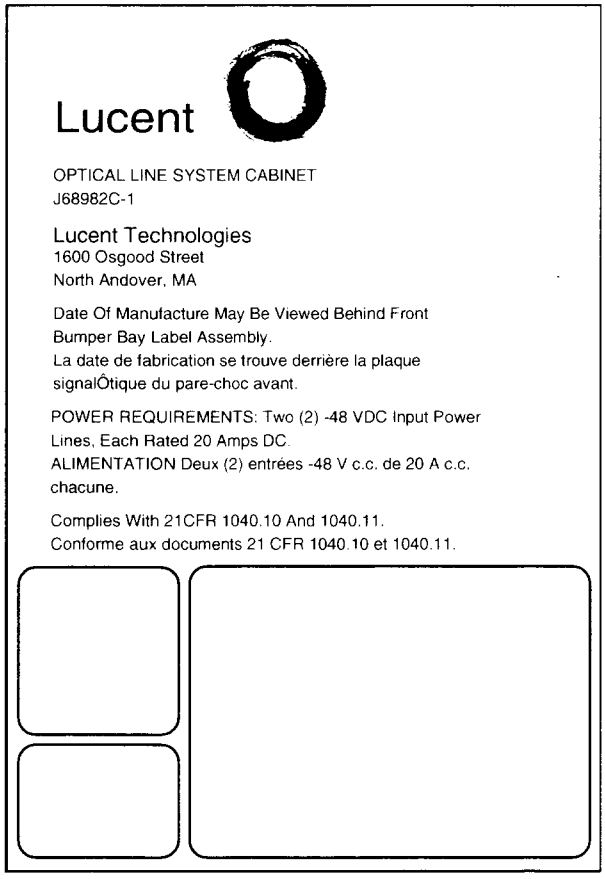


Figure 2. Compliance Label

Safety Precautions for Unenclosed Systems

During service, maintenance, or restoration, the Optical Line 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. Connectors associated with lightwave regenerators are recessed, which limits the exposure distance. However, technicians removing or replacing regenerators should not stare or look directly into the vacant regenerator slot with optical instruments or magnifying lenses. (Normal eyewear or indirect viewing instruments, such as 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*, for guidance on the safe use of lasers in the workplace.

* Registered trademark of the American National Standards Institute.

Electrostatic Discharge (ESD) Considerations

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

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

- Assume all circuit packs contain solid-state electronic components that can be damaged by ESD.
- When handling circuit packs (storing, installing, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, static-dissipating floor mat.
- Handle all circuit packs by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, conductors, or connector pins.
- Observe all warning labels on bags and cartons. Whenever possible, do not remove circuit packs from antistatic packaging until ready to insert them into slots.
- If possible, open all circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats.
- Always store and transport circuit packs in static-safe packaging. Shielding is not required unless specified.
- Keep all static-generating materials such as food wrappers, plastics, and *styrofoam** containers away from all circuit packs. When removing circuit packs from a cabinet, immediately place the circuit packs in static-safe packages.
- Whenever possible, maintain relative humidity above 20 percent.
- Always keep the electromagnetic interference (EMI)/ESD protective front covers on the shelves except during an upgrade or maintenance procedure. Once a circuit pack is replaced in the shelf, immediately close the front cover.

* Registered trademark of the Dow Chemical Company.

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 (Figure 3), while handling circuit packs/units or working on a shelf. The jacks for connection of wrist straps are located on each fuse panel and user panel and the right-front of the equipment cabinet. These jacks are labeled. The wrist straps should be checked periodically with a wrist strap tester to ensure that they are working properly.

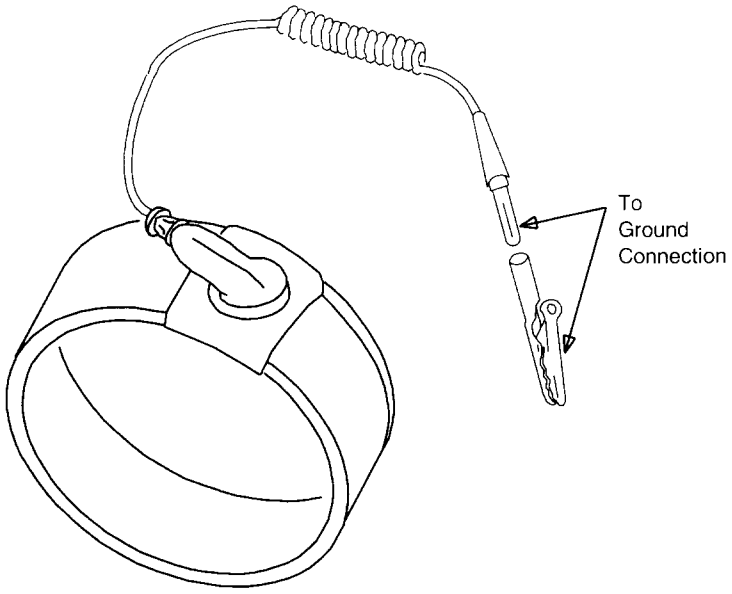


Figure 3. Static Control Wrist Strap

IMPORTANT SAFETY 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:

1. Follow all warnings and instructions marked on the product.
2. Slots and openings in this product and the back or bottom are provided for ventilation. To protect it from overheating, these openings must not be blocked or covered.
3. Opening or removing rear covers or sheet-metal parts may present exposure to high current or electrical energy levels, or to other risks. Refer all servicing in those areas to qualified service personnel.
4. 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.
5. Refer servicing to qualified service personnel.

SAVE THESE INSTRUCTIONS.

IMPORTANT INSTALLATION SAFETY INSTRUCTIONS

READ AND UNDERSTAND ALL INSTRUCTIONS.

1. Use caution when installing and modifying telecommunications lines.
2. Never install telecommunication wiring during a lightning storm.
3. Never install telecommunication jacks in wet locations unless the jack is specifically designed for wet locations.
4. Never touch uninsulated telecommunication wires or terminals unless the telecommunication line has been disconnected at the network interface.
5. 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.
6. This product has two –48 V DC input power feeders. Disconnecting one power feeder will not de-energize the product. To reduce the risk of injury, disconnect both power supply cables when removing power from the system.
7. Metallic telecommunication interfaces should not leave the building premises unless connected to telecommunication devices providing primary and secondary protection, as applicable.
8. For continued protection against risk of fire, replace only with same type and rating of fuse.
9. Use only Lucent Technologies manufactured, recognized circuit packs. Refer to 365-575-310, *Optical Line System (OLS) Installation Manual.*

SAVE THESE INSTRUCTIONS.

Security

Lucent Technologies has designed the craft interface terminal (CIT) so that, when properly administered, it will minimize the ability of unauthorized persons to gain access to the network. Each authorized user should be instructed about the proper use of the CIT.

Related Documentation/Training

Lucent Technologies Practices

The following Lucent Technologies practices provide information about the Optical Line System:

- Number: 365-575-300

  Title: *Optical Line System (OLS), Applications, Planning, and Ordering Guide*

  Audience: System planners and engineers

  Content: Features, applications, general description, system planning/engineering, and ordering information

- Number: 365-575-310

  Title: *Optical Line System (OLS), Installation Manual*

  Audience: Customers planning to install and turn up the equipment

  Content: Customer installation instructions

- Number: 365-575-315* Comcode C107584468

  Title: *Optical Line System (OLS), Software Release Description, Release 1.0.0-OLS*

  Audience: End-user maintenance personnel

  Content: Status of problems fixed and known problems for Release 1.0.0-OLS software

* The software release description is shipped with the Optical Line System and is not orderable from the Lucent Technologies Customer Information Center.

- Number: 365-575-315* Comcode C107896607

  Title: *Optical Line System (OLS), Software Release Description, Release 2.0.0-OLS*

  Audience: End-user maintenance personnel

  Content: Status of problems fixed and known problems for Release 2.0.0-OLS software

- Number: 824-102-176

  Title: *Optical Line System (OLS), Operations Systems Engineering Guide*

  Audience: End-user maintenance personnel

  Content: Operations systems software commands, messages, and other information

Lucent Technologies Modification Implementation Procedures

The following Lucent Technologies Modification Implementation Procedures (MIPs) provide information about the Optical Line System:

- Number: MIP0001-MV

  Title: *Modification Implementation Procedure 0001-MV, Optical Line System In-Service Hardware Modification, Convert 4-Line to Dual 2-Line Cabinet*

  Audience: RTAC, Installers, Engineers, Planners

  Content: Procedures for converting a 4-line cabinet to a dual 2-line cabinet

- Number: MIP0002-MV

  Title: *Modification Implementation Procedure 0002-MV, Optical Line System In-Service Hardware Modification, Convert Dual 2-Line to 4-Line Cabinet*

  Audience: RTAC, Installers, Engineers, Planners

  Content: Procedures for converting a dual 2-line cabinet to a 4-line cabinet

- Number: MIP0010-MV

  Title: *Modification Implementation Procedure 0010-MV, Optical Line System Miscellaneous In-Service Modification, Adding an OC-48 Wavelength*

  Audience: RTAC, Installers, Engineers, Planners

  Content: Procedures for adding an OC-48 wavelength

* The software release description is shipped with the Optical Line System and is not orderable from the Lucent Technologies Customer Information Center.

- Number: MIP0012-MV

  Title: *Modification Implementation Procedure 0012-MV, Optical Line System Miscellaneous In-Service Modification, Deleting an OC-48 Wavelength*

  Audience: RTAC, Installers, Engineers, Planners

  Content: Procedures for deleting an OC-48 wavelength

- Number: MIP0014-MV

  Title: *Modification Implementation Procedure 0014-MV, Optical Line System Miscellaneous In-Service Modification, Replace OC-48 Terminal with OTU*

  Audience: RTAC, Installers, Engineers, Planners

  Content: Procedures for replacing an OC-48 terminal with an Optical Translator Unit

- Number: MIP0016-MV

  Title: *Modification Implementation Procedure 0016-MV, Optical Line System Miscellaneous In-Service Modification, Replace OTU with OC-48 Terminal*

  Audience: RTAC, Installers, Engineers, Planners

  Content: Procedures for replacing an Optical Translator Unit with an OC-48 Terminal

- Number: MIP0018-MV

  Title: *Modification Implementation Procedure 0018-MV, Optical Line System Miscellaneous In-Service Modification, Convert Repeater Office to Dual End Terminal Office*

  Audience: RTAC, Installers, Engineers, Planners

  Content: Procedures for converting a repeater office to a dual end terminal office

Lucent Technologies Drawings

The following Lucent Technologies drawings provide information about the Optical Line System:

J68982C-1	*Optical Line System Cabinet (Equipment and Circuit Packs Ordered with Equipment)*
J68982CS-1	*Optical Line System (Software and Documentation)*
SD-5G276-01	*Optical Line System Application Schematic Drawing*
T-5G276-33	*Optical Line System Interconnection Drawing*
T-5G276-30	*Optical Line System Wiring Drawing*
T-5G273-30	*Optical Line System Shelf Circuit Drawing*
ED-7G033-30	*Optical Line System Cabinet Framework*
ED-7G028-20	*Optical Line System Cable Assembly*
ED-7G028-22	*Optical Line System Intercabinet Cable Assembly*
ED-7G028-30	*Optical Line System Shelf Assembly*
ED-7G027-30	*Optical Line System User/Fuse Panel Assembly*
FPD-804-604-161-( )	*Optical Line System (Floor Plan Data Sheets)*

Lucent Technologies Practices for Related Equipment

The following Lucent Technologies practices provide information about related equipment:

365-575-200	*FT-2000 OC-48 Large Capacity Terminal, Applications, Planning, and Ordering Guide*
365-575-201	*FT-2000 OC-48 Large Capacity Terminal, User/Service Manual*
365-575-210	*FT-2000 OC-48 Large Capacity Terminal, Installation Manual*
365-575-211	*FT-2000 OC-48 Large Capacity Terminal, Integration Manual*
365-575-212	*FT-2000 OC-48 Large Capacity Terminal, Modification Implementation Procedure*
365-575-215	*FT-2000 OC-48 Large Capacity Terminal, Software Release Description*
365-575-400	*Optical Translator, Applications, Planning, and Ordering Guide*
365-575-401	*Optical Translator, User/Service Manual*
365-575-410	*Optical Translator, Installation Manual*
636-299-120	***LGX***® *Distribution System, Planning, Engineering, Installation, and Operation System Reference Guide*
824-102-147	*2000 Product Family Operations Interworking Guide*
824-102-175	*FT-2000 OC-48 Large Capacity Terminal, Operations Systems Engineering Guide*

Training

No product offering is complete without a formal training package. The Customer Training and Information Products Organization provides management courses for system planning, engineering, and ordering, as well as training telecommunications technicians in installation, operations, and maintenance. Suitcasing of these courses is also available. Contact the Customer Training and Information Products Organization on **1-800-TRA-INER** (**1-800-872-4637**) to enroll in training classes. To arrange suitcase sessions, call the Product Training Manager on **1-800-432-7317** (within USA) or **1-614-764-5542** (worldwide).

The following courses are provided by the Customer Training and Information Products Organization:

- Number: LW2250

  Title: FT-2000 OC-48 Large Capacity Terminal/Optical Line System, Applications and Architecture

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

  Content: Basic synchronous optical network (SONET) terms, applications (for example, point-to-point linear add/drop, 4-fiber rings), architecture (that is, cabinets, bays, shelves, circuit packs), and operation, administration, maintenance, and provisioning (OAM&P) features

- Number: LW2350

  Title: FT-2000 OC-48 Large Capacity Terminal/Optical Line System, Equipment Engineering and Planning

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

  Content: Equipment and cabling specifications for engineering and ordering the FT-2000 OC-48 Large Capacity Terminal and Optical Line System

- Number: LW2650

  Title: FT-2000 OC-48 Large Capacity Terminal/Optical Line System, Operations and Maintenance

  Audience: Technicians, installers, maintenance engineers, technical support personnel, product evaluators, and anyone desiring operations and maintenance information for the FT-2000 OC-48 Large Capacity Terminal and the Optical Line System.

  Content: Description of initial turnup and day-to-day operations and maintenance tasks. Emphasis on developing the following:

  — Skills using the user/service manual

  — Competence performing day-to-day provisioning and maintenance tasks.

- Number: TR2450

  Title: *FT-2000 OC-48 Large Capacity Terminal/Optical Line System, Installation and Operation*

  Audience: Technicians, installers, maintenance engineers, technical support personnel, product evaluators, and anyone desiring installation information for the FT-2000 OC-48 Large Capicity Terminal and the Optical Line System

  Content: Practical hands-on experience installing the FT-2000 OC-48 Large Capacity Terminal and Optical Line System, equipping the system with required circuit packs, and conducting installation testing

- Number: LW2252 (Replaces LW2250 and LW2350)

  Title: *Optical Line System Applications, Architecture, Planning and Ordering*

  Audience: Fundamental planners, account executives, private telecommunications network technical consultants, facility planners, outside plant engineers, central office equipment engineers, and private network design engineers

  Content: Basic synchronous optical network (SONET) terms, applications (for example, point-to-point, rings), architecture (that is, cabinets, bays, shelves, circuit packs), operation, administration, maintenance, and provisioning (OAM&P) features, and equipment cabling specifications for engineering/ordering the Optical Line System

- Number: LW2652 (Replaces LW2650)

  Title: *Optical Line System Operations and Maintenance*

  Audience: Technicians, installers, maintenance engineers, technical support personnel, product evaluators, and anyone desiring operations and maintenance information for the Optical Line System

  Content: Description of initial turnup and day-to-day operations and maintenance tasks. Emphasis on developing the following:

  — Skills using the user/service manual

  — Competence performing day-to-day provisioning and maintenance tasks.

- Number: LW2253 (Replaces LW2250 and LW2350)

  Title: *FT-2000 OC-48 Large Capacity Terminal Applications, Architecture, Planning and Ordering*

  Audience: Fundamental planners, account executives, private telecommunications network technical consultants, facility planners, outside plant engineers, central office equipment engineers, and private network design engineers

  Content: Basic synchronous optical network (SONET) terms, applications (for example, point-to-point, rings), architecture (that is, bays, shelves, circuit packs), operation, administration, maintenance, and provisioning (OAM&P) features, and equipment cabling specifications for engineering/ordering the FT-2000 OC-48 Large Capacity Terminal

- Number: LW2653 (Replaces LW2650)

  Title: *FT-2000 OC-48 Large Capacity Terminal Operations and Maintenance*

  Audience: Technicians, installers, maintenance engineers, technical support personnel, product evaluators, and anyone desiring operations and maintenance information for the FT-2000 OC-48 Large Capacity Terminal

  Content: Description of initial turnup and day-to-day operations and maintenance tasks. Emphasis on developing the following:

  — Skills using the user/service manual

  — Competence performing day-to-day provisioning and maintenance tasks.

Technical Support

The Regional Technical Assistance Center (RTAC) and the Customer Technical Support (CTS) Organization provide help in maintaining installed systems. Figure 4 shows that the single point of contact is the RTAC. RTAC personnel troubleshoot field problems 24 hours a day over the phone, and if necessary, on site. For technical help, notify your supervisor, your local technical support organization, or call **1-800-225-RTAC** in accordance with local procedures. The RTAC technical assistance telephone number is also available for customers to provide feedback and enhancement suggestions for improving the Optical Line System. One call guarantees support.

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

The CTS Organization has also established a technical support medium: the COACH customer support tools. COACH is a system of on-line support tools aimed at providing product news and bulletins, diagnostic services, compatibility information, and on-line documents. COACH tools provide you with the most up-to-date product information, so that problems are either prevented or quickly resolved. COACH tools reside on a dedicated time-share computer accessible over toll free lines and are available 24 hours a day, 7 days a week.

Many transmission products are currently supported by COACH, including the Optical Line System.

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

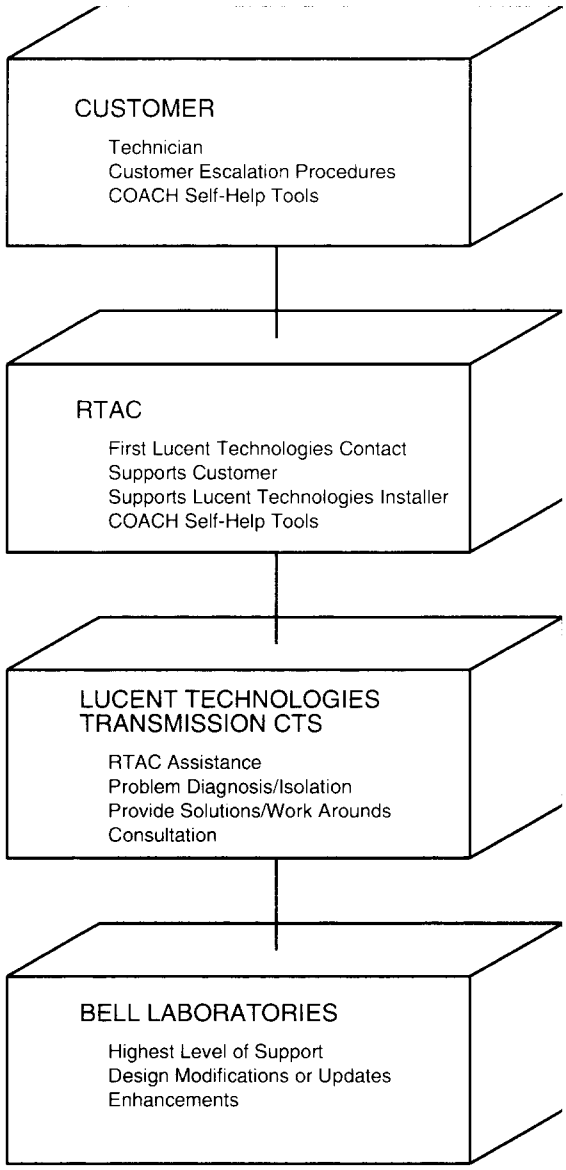


Figure 4. Product Support

These COACH tools are available to the user:

Diagnostic dictionary	The diagnostic dictionary contains histories of previously encountered problems and the descriptions of the solutions or workarounds. Your support staff can use this tool when published documentation or standard diagnostic procedures fail to address a problem.
News and bulletins	Immediately after a user logs into the COACH tools, the news and bulletins tool displays bulletins containing urgent information relating to all the user's products. All users are automatically notified about urgent matters, such as problems with scheduled releases, recalls of hardware or software, or scheduled maintenance for computer support. Less urgent messages are distributed through news items that can be sent to individuals or categories of users. Notification of news appears on the screen immediately following current bulletins.
Compatibility data	Occasionally, hardware/software configuration problems arise when new software releases are issued. The compatibility data tools permit users to view the correct hardware configuration associated with a specific software release. The user simply enters the appropriate software release number and COACH responds with page-formatted lists of circuit packs compatible with the selected software release. This tool also contains the latest issue numbers of the customer documentation.
COACH user's guide	COACH supplies an on-line version of its user's guide. The COACH user's guide includes instructions on using the customer support tools and documents any changes to the previous version of the guide.

For information about how to access COACH, contact:

COACH Software Development
Lucent Technologies — Department JC09110a0
1600 Osgood St.
North Andover, MA 01845

Telephone: **1-800-238-4021**
FAX: **1-508-960-1772**

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

Documentation Support

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

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

Customer	Mail Order	Telephone Order *(Monday through Friday)*
Commercial Customers*	Lucent Technologies Customer Information Center Attention: Order Entry Section 2855 N. Franklin Road P.O. Box 19901 Indianapolis, IN 46219	Within USA and Canada: **1-888-LUCENT-8 (1-888-582-3688)** **(1-888-582-3688)** FAX: **1-800-566-9568** Canada and Caribbean/ Latin American Countries: **1-317-322-6646** Asia/Pacific Region, China, Australia, and New Zealand Toll: **1-317-322-6411** Europe, Middle East, and Africa Toll: **1-317-322-6416** Worldwide: FAX: **1-317-322-6699**
RBOC/BOC	Process through your Company Documentation Coordinator	

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

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

One-time orders include a binder (if applicable) and the document contents for the current issue in effect at the time of order. Also, you may request placement on the standing order list for all later reissues of any document. The standing order list for each document provides automatic distribution for all reissues of the document. RBOC/BOC customers should process document orders or standing order requests through their Company Documentation Coordinator. If you do not have a Company Documentation Coordinator, use the commercial customer telephone number listed above.

How to Comment on the Optical Line System

The Regional Technical Assistance Center (RTAC) technical assistance telephone number is available 24 hours a day for customers to provide feedback and enhancement suggestions for improving the Optical Line System. The toll free number is **1-800-225-RTAC**.

How to Comment on This Document

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

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

Documentation Services
Lucent Technologies
2400 Reynolda Road
Winston-Salem, NC 27106

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

Electronic Documentation

Lucent Technologies electronic documentation on compact disk, read-only memory (CD-ROM) has many advantages over traditional paper documentation, including cost-savings, search and retrieve capability, and the assurance of the most current documentation.

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

- To order, call your Technical Information Resource Manager, your Lucent Technologies Account Executive, or the Lucent Technologies Customer Information Center (1-800-432-6600). The CD-ROM Product Line Order Number for the Lucent Technologies transmission product documentation is 300-100-010.
- For pricing information, contact your Lucent Technologies Account Executive or the Lucent Technologies Customer Information Center (1-800-432-6600).
- For technical information, call Lucent Technologies Documentation Support (1-800-334-0404).

Product Change Notifications

During the life of a product, changes may be required in service to correct an existing or potential problem. Product changes are issued in the form of product change notices (PCNs). Customers are notified about PCNs through the Design Change Management System (DCMS). The DCMS is an on-line tool similar to COACH. For more information about DCMS, contact your local Account Executive.

System Introduction

1

Contents

Overview 1-1

Introduction to Lucent Technologies Transmission Products 1-1

What is the Optical Line System? 1-2

System Introduction

1

Overview

This section introduces the next generation of Lucent Technologies' transmission products and briefly describes the Optical Line System (OLS).

Introduction to Lucent Technologies Transmission Products

Lucent Technologies offers the industry's widest range of high-quality transmission systems and related services designed to provide total network solutions. Lucent Technologies' transmission products are designed to help telecommunications service providers enter a new century of advanced services and revenue generating capabilities. These products enable a broad range of solutions from simple point-to-point applications to self-healing ring applications that provide maximum service assurance. As networks evolve from their telephony base to new time-sensitive, bandwidth intensive services, the need for cost-effective ring applications becomes increasingly critical.

Lucent Technologies offers a wide array of systems and can provide solutions to any specific networking needs. The Optical Line System provides higher capacity per fiber over longer distances in point-to-point and ring applications than previously possible. The Optical Line System is a high capacity, fiber optic transmission system that uses dense wavelength division multiplexing and optical amplification to meet customer needs.

What is the Optical Line System?

The Optical Line System is a flexible, high capacity, lightwave system that transports digitally encoded information contained in up to eight different wavelengths of synchronous optical network (SONET) OC-48 signals (up to 32,256 voice channels each) through standard single-mode or *Truewave*® optical fibers.

The Optical Line System uses dense wavelength division multiplexing and erbium-doped fiber amplifiers to extend the reach and capacity of fiber transmissions. Dense wavelength division multiplexing is used to combine up to eight OC-48 signals with different wavelengths in the 1.5-micrometer (µm) range on the same fiber. One erbium-doped fiber amplifier can amplify the combined signals together, in contrast to a traditional system where the individual optical signals are amplified separately. One erbium-doped fiber amplifier replaces several traditional amplifiers.

The erbium-doped fiber amplifiers use photoluminescent properties of the rare-earth element erbium to amplify an incoming optical signal. When light at the 980-µm wavelength is inserted into a piece of erbium-doped fiber, the photons change state and emit light at the 1.5-µm wavelength. If this emission is combined with a 1.5-µm optical signal, the 1.5-µm optical signal is amplified. The 980-µm light comes from high-powered internal lasers called pump lasers. The light is combined with the 1.5-µm optical signals on the erbium-doped fiber using special internal couplers.

The Optical Line System consists of several equipment packages. These equipment packages include the following:

- Optical Line System End Terminal for 4 Bidirectional Optical Lines
- Optical Line System Repeater for 4 Bidirectional Optical Lines
- Optical Line System Dual End Terminal
- Optical Line System Dual Repeater
- Optical Line System End Terminal and Repeater
- Optical Line System End Terminal Shelf (Miscellaneously Mounted)
- Optical Line System Repeater Shelf (Miscellaneously Mounted).

Different equipment packages enable the Optical Line System to offer flexible features for different applications and to provide different sets of features. The Optical Line System software enables equipment packages to be upgraded with new features when they become available. Figure 1-1 shows the Optical Line System End Terminal for 4 Bidirectional Optical Lines equipment package. For more information about the Optical Line System End Terminal for 4 Bidirectional Optical Lines equipment package and the other equipment packages, refer to Section 3, "Platform Description."

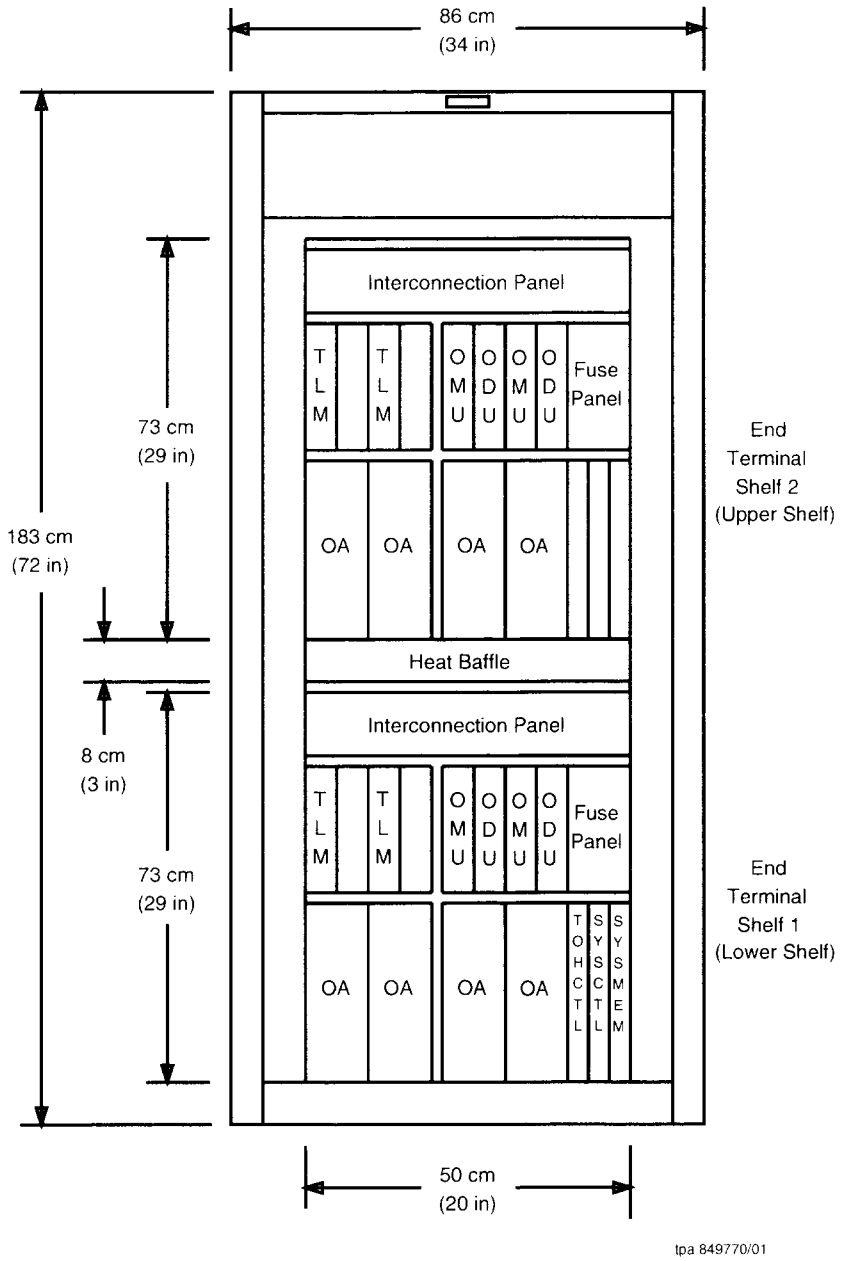


Figure 1-1. Optical Line System End Terminal for 4 Bidirectional Optical Lines (Doors Open)

The Optical Line System is designed to support applications that need to grow to accommodate increasing amounts of information. The Optical Line System can be upgraded in-service with up to eight different wavelengths and up to four bidirectional optical lines.

The Optical Line System is designed for easy installation and operation. Centralized operation is supported by a full set of remote maintenance and control features. Automatic turnup tests and original value provisioning simplify installation and eliminate the need for external test equipment. The personal computer-based craft interface terminal gives assess to sophisticated maintenance and reporting features.

The Optical Line System will be made available in a series of phased product releases. These phased product releases will provide new sets of features. This user/service manual covers Releases 1 and 2 and will be updated to cover additional product releases as they become available. Release 1 provides the Optical Line System platform and supports applications using the FT-2000 OC-48 Large Capacity Terminal, systems with up to three spans, and up to four bidirectional optical lines. Release 2 supports long-reach systems with up to seven or eight spans (subject to certain engineering rules), additional user-settable miscellaneous discrete inputs and outputs, and an enhanced set of TL1 messages.

Table 1-1 also shows the major features of the Optical Line System and the corresponding product releases.

Table 1-1. Major Features of Product Releases 1 and 2

Major Features	Available in Product Release	
	1	2
Applications		
- Applications with the FT-2000 OC-48 Large Capacity Terminal	X	X
- Applications with the FT-2000 OC-48 Add/Drop-Rings Terminal	X	X
- Applications with the SLM-2000 Lightwave System	X	X
- Applications with the Optical Translator System	X	X
- Systems with up to 3 Spans	X	X
- Systems with up to 7 or 8 Spans		X

Continued on next page.

Table 1-1. Major Features of Product Releases 1 and 2 (Contd)

Major Features	Available in Product Release 1	2
High Speed Interfaces		
- Double-Pumped Optical Amplifiers	X	X
- Eight Wavelength Ready	X	X
- Supports up to Four Bidirectional Optical Lines	X	X
Administration and Provisioning		
- Automatic and CIT Provisioning	X	X
- Craft Interface Terminal (CIT)	X	X
- Login and Password Aging	X	X
- Multi-Level Security	X	X
- Orderwire	X	X
- Remote Software Downloads	X	X
- TL1 Operations System Interface	X	X
- Additional User-Settable Miscellaneous Discrete Inputs and Outputs		X
Maintenance		
- 155-Mb/s customer maintenance signal	X	X
- Automatic Fault Detection and Isolation	X	X
- Alarm Gateway Network Element (AGNE) Operation	X	X
- Optical Signal Performance Monitoring	X	X
- Pump Performance Monitoring	X	X
- Parallel Telemetry	X	X
- Threshold Crossing Alert (TCA) Reporting	X	X
- TL1 Gateway Network Element (GNE) Operation	X	X
- Enhanced TL1 Commands and Reports	X	X
- More TL1 Commands and Reports		X

For more information about the Optical Line System releases and their availability, refer to 365-575-300, *Optical Line System (OLS), Applications, Planning, and Ordering Guide.*

Applications

2

Contents

Overview 2-1

Optical Transmission Elements 2-2

Point-to-Point Applications 2-8

- 1x1 End Terminal Application 2-8
- Dual 1x1 End Terminal Application 2-9

Ring Applications 2-11

Line Capacity Growth Scenario 2-15

Applications

2

Overview

This section describes how the Optical Line System (OLS) operates with compatible lightwave terminals and/or the Optical Translator (OT) in point-to-point and ring applications. This section also describes how the Optical Line System meets these diverse needs with the following equipment packages:

- Optical Line System End Terminal for 4 Bidirectional Optical Lines
- Optical Line System Repeater for 4 Bidirectional Optical Lines
- Optical Line System Dual End Terminal
- Optical Line System Dual Repeater
- Optical Line System End Terminal and Repeater
- Optical Line System End Terminal Shelf (Miscellaneously Mounted)
- Optical Line System Repeater Shelf (Miscellaneously Mounted).

For more information about the Optical Line System equipment packages, refer to Section 3, "Platform Description."

Optical Transmission Elements

The Optical Line System is a point-to-point optically amplified line system that can be used in a variety of applications. Figure 2-1 shows two Optical Line System End Terminals (equipped with one optical line) and one Optical Line System Repeater (equipped with one optical line). One Optical Line System End Terminal must be provisioned 1A-TX, and the other Optical Line System End Terminal must be provisioned 1A-RCV. For more information about provisioning, refer to Section 8, "Administration and Provisioning."

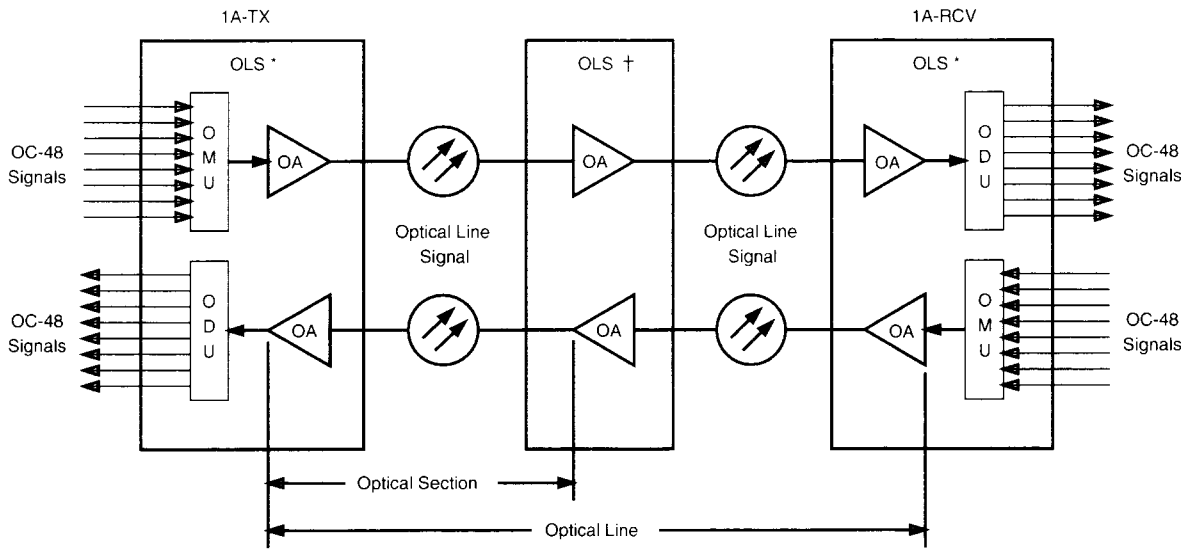


Figure 2-1. Optical Line System Transmission

Each Optical Line System End Terminal accepts up to eight OC-48 signals with different wavelengths in the 1.5-µm range per optical line. The Optical Line System may accept OC-48 signals from the following:

- **FT-2000 OC-48 Large Capacity Terminal**: The FT-2000 OC-48 Large Capacity Terminal must be equipped with Release 1.0.0-LCT or later software and 739D- or 739F-type OC48 Transmitter circuit packs.
- **FT-2000 OC-48 Add/Drop-Rings Terminal**: The FT-2000 OC-48 Add/Drop-Rings Terminal must be equipped with Release 7.2.0-ADR software and 739E-type OC48 Transmitter circuit packs.

- **SLM-2000 STM-16 Terminal**: The SLM-2000 STM-16 Terminal must be equipped with the appropriate software and Transmitter circuit packs.
- **Optical Translator**: The Optical Translator must be equipped with 41A-type Optical Translator Units. The 41A-type Optical Translator Unit can serve as an interface between the Optical Line System and any standard synchronous optical network (SONET) OC-48 or synchronous digital hierarchy (SDH) STM-16 lightwave terminal.

Each Optical Line System End Terminal combines the OC-48 signals onto a single fiber and optically amplifies the combined signal (optical line signal). At the transmitting terminal, optical multiplexing units (OMUs) combine up to eight OC-48 signals onto a single fiber, and the optical amplifiers (OAs) amplify the combined signal (optical line signal) for transmission on the optical line. The Optical Line System Repeater optically amplifies the optical line signal.

At the receiving terminal, the optical amplifiers (OAs) amplify the optical line signal and the optical demultiplexing units (ODUs) demultiplex the optical line signal into up to eight OC-48 signals. The Optical Line System may transmit OC-48 signals to the following:

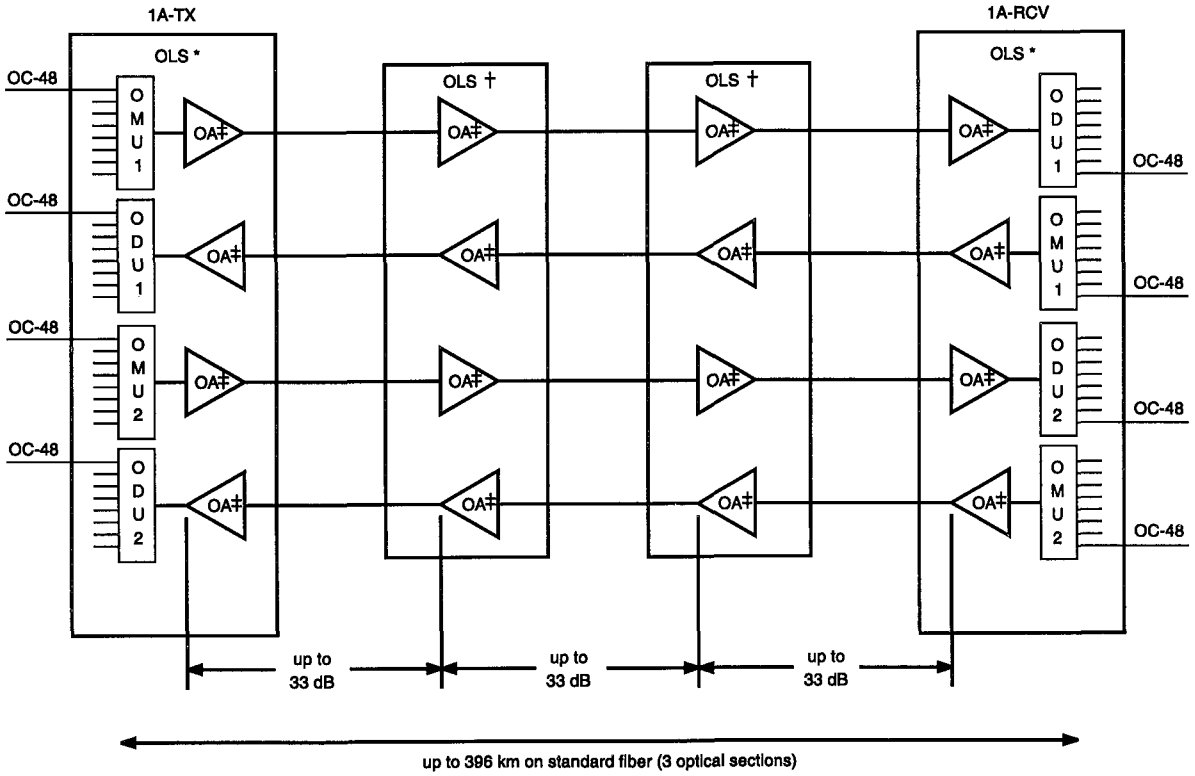
- **FT-2000 OC-48 Large Capacity Terminal**: The FT-2000 OC-48 Large Capacity Terminal must be equipped with Release 1.0.0-LCT or later software and any OC48 Receiver circuit pack.
- **FT-2000 OC-48 Add/Drop-Rings Terminal**: The FT-2000 OC-48 Add/Drop-Rings Terminal must be equipped with Release 7.2.0-ADR software and 839E5 OC48 Receiver circuit packs.
- **SLM-2000 STM-16 Terminal**: The SLM-2000 STM-16 Terminal must be equipped with the appropriate software and Receiver circuit packs.
- **Optical Translator**: The Optical Translator must be equipped with the 41B Optical Translator Units. The 41B Optical Translator Unit can drive any standard SONET OC-48 or SDH STM-16 lightwave terminal.

The Optical Line System End Terminal and the Optical Line System Repeater support up to four bidirectional optical lines. Each optical line may transport up to eight different wavelengths of OC-48 signals. Protection for the traffic carried on the bidirectional optical lines is provided by the SONET OC-48/SDH STM-16 lightwave terminals (for example, the FT-2000 OC-48 Large Capacity Terminal).

In Release 1 and later releases, the Optical Line System supports systems with up to three optical sections. In Release 2 and later releases, the Optical Line System supports systems with up to eight optical sections.

In Release 1 and later releases, a bidirectional optical line may consist of up to three optical sections using standard fiber (Figure 2-2). Up to 33 dB of optical attenuation (approximately 132 kilometers) between end terminals and/or repeaters is possible in an optical section before optical amplification is required. Up to three 33-dB optical sections (approximately 396 kilometers) are possible before electronic regeneration is required.

For complete engineering rules for systems with up to three optical sections, refer to Section 10, "Technical Specifications."

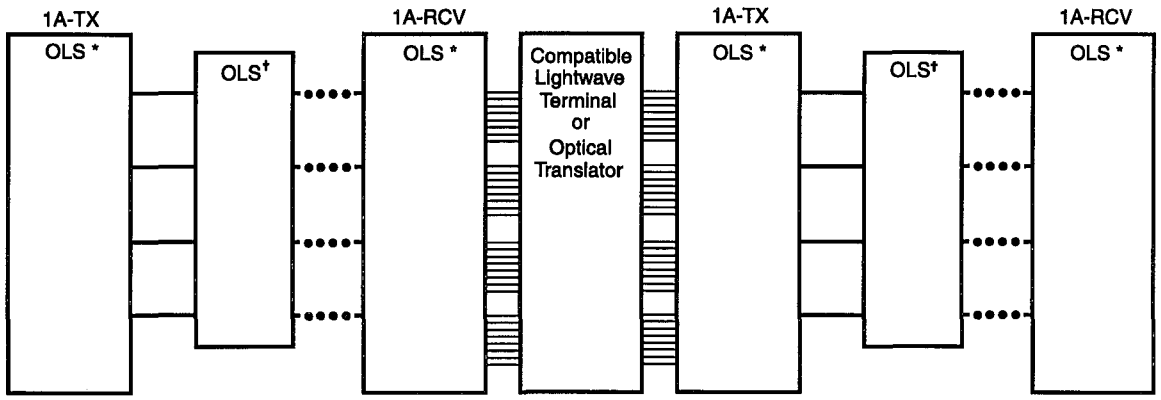


* Optical Line System End Terminal for 4 Bidirectional Optical Lines
† Optical Line System Repeater for 4 Bidirectional Optical Lines
‡ LEA6 Optical Amplifier Circuit Pack only

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Figure 2-2. Systems with Up to 3 Optical Sections

Electronic regeneration is performed by compatible SONET OC-48/SDH STM-16 lightwave terminals (for example, the FT-2000 OC-48 Large Capacity Terminal, FT-2000 OC-48 Add/Drop-Rings Terminal, or SLM-2000 STM-16 Terminal) or the Optical Translator (Figure 2-3). The Optical Translator also supports wavelength add/drop and can serve as an interface between the Optical Line System and any standard SONET OC-48/SDH STM-16 lightwave terminal.



* Optical Line System End Terminal for 4 Bidirectional Optical Lines
† Optical Line System Repeater for 4 Bidirectional Optical Lines

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Figure 2-3. Electrical Regeneration of Optical Lines

In Release 2 and later releases, a bidirectional optical line may consist of up to eight optical sections using standard fiber (Figure 2-4). Up to 22 dB of optical attenuation (approximately 88 kilometers) between end terminals and/or repeaters is possible in an optical section before optical amplification is required. Up to eight 22-dB optical sections (approximately 640 kilometers) are possible before electronic regeneration is required.

For complete engineering rules for systems with up to eight optical sections, refer to Section 10, "Technical Specifications."

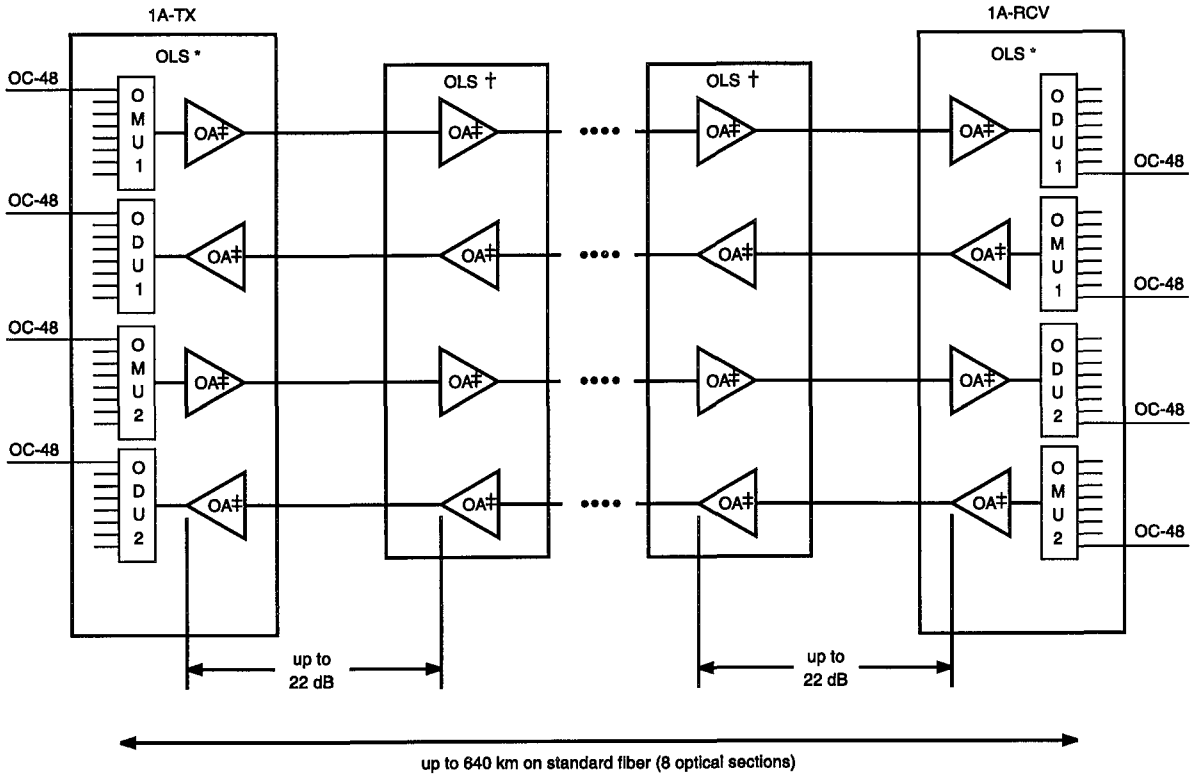


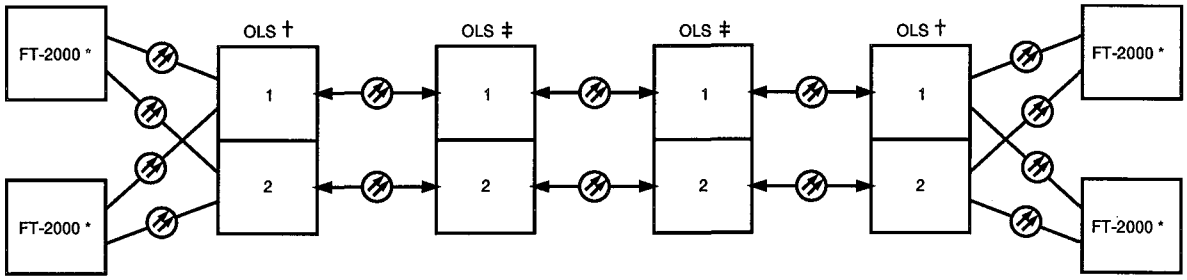
Figure 2-4. Systems with Up to Eight Optical Sections

Electronic regeneration is performed by compatible SONET OC-48/SDH STM-16 lightwave terminals (for example, the FT-2000 OC-48 Large Capacity Terminal, FT-2000 OC-48 Add/Drop-Rings Terminal, or SLM-2000 STM-16 Terminal) or the Optical Translator (Figure 2-3). The Optical Translator also supports wavelength add/drop and can serve as an interface between the Optical Line System and any standard SONET OC-48/SDH STM-16 lightwave terminal.

Point-to-Point Applications

1x1 End Terminal Application

Figure 2-5 shows the Optical Line System configured to operate with the FT-2000 OC-48 Large Capacity Terminal in a 1x1 end terminal application (open 4-fiber ring). Each FT-2000 OC-48 Large Capacity Terminal is connected to the Optical Line System with one service OC-48 line and one protection OC-48 line. The Optical Line System is equipped with two optical lines (optical lines 1 and 2).



* FT-2000 OC-48 Large Capacity Terminal
† Optical Line System End Terminal
‡ Optical Line System Repeater

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Figure 2-5. 1x1 End Terminal Application (Equipped with 2 Optical Lines)

The 1x1 end terminal application, shown in Figure 2-5, uses two Optical Line System End Terminals (equipped with two optical lines) and up to two Optical Line System Repeaters (equipped with two optical lines). All service OC-48 lines are routed from the FT-2000 OC-48 Large Capacity Terminals to the Optical Line System on different wavelengths for optical line 1. All protection lines are routed from the FT-2000 OC-48 Large Capacity Terminals to the Optical Line System on different wavelengths for optical line 2. Service and protection should always be routed on different optical lines.

The Optical Line System can also interface with FT-2000 OC-48 Add/Drop-Rings Terminals (Release 7.2 and later), SLM-2000 STM-16 Terminals, and the Optical Translator. The Optical Translator can serve as an interface between the Optical Line System and any standard SONET OC-48/SDH STM-16 lightwave terminal.

Dual 1x1 End Terminal Application

Figure 2-7 shows the Optical Line System configured to operate with the FT-2000 OC-48 Large Capacity Terminal in a dual 1x1 end terminal application (closed 4-fiber ring). Each FT-2000 OC-48 Large Capacity Terminal is connected to the Optical Line System with two service OC-48 lines and two protection OC-48 lines. The Optical Line System is equipped with two optical lines (optical lines 1 and 2).

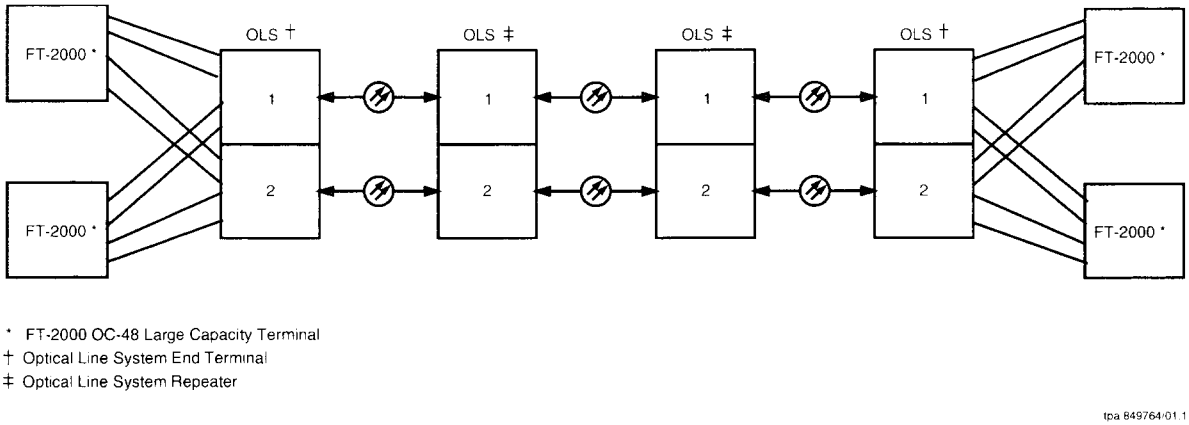


Figure 2-7. Dual 1x1 End Terminal Application (Equipped with 2 Optical Lines)

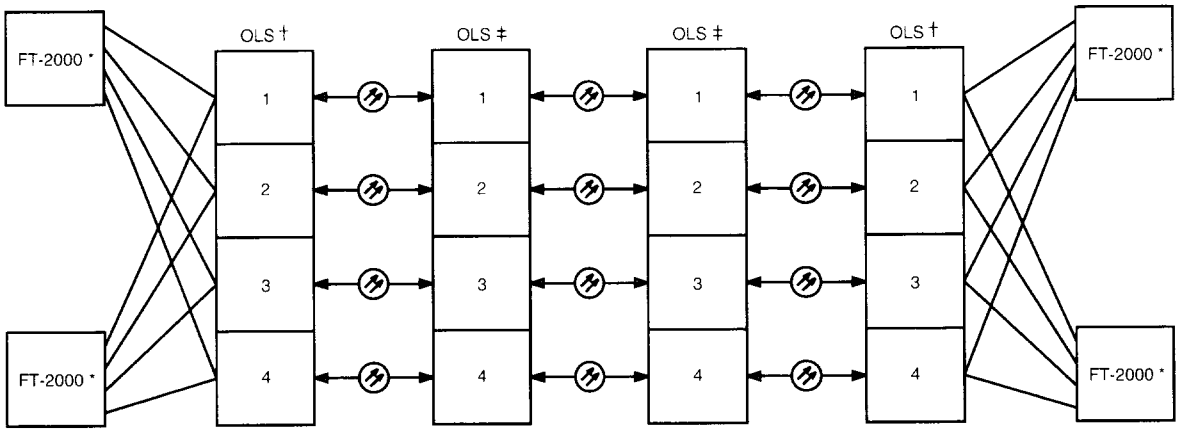
The dual 1x1 end terminal application shown in Figure 2-7 uses two Optical Line System End Terminals (equipped with 2 optical lines) and up to two Optical Line System Repeaters (equipped with 2 optical lines).

NOTE:
The dual 1x1 end terminal application is an FT-2000 OC-48 Large Capacity Terminal application. The Optical Line System is used to increase fiber capacity and/or transmission distances. The term "dual" is part of the application name and does not refer to the Optical Line System Dual End Terminal or the Optical Line System Dual Repeater.

All service OC-48 lines are routed from the FT-2000 OC-48 Large Capacity Terminals to the Optical Line System on different wavelengths for optical line 1. All protection lines are routed from the FT-2000 OC-48 Large Capacity Terminals to the Optical Line System on different wavelengths for optical line 2. Service and protection should always be routed on different optical lines.

The Optical Line System can also interface with FT-2000 OC-48 Add/Drop-Rings Terminals (Release 7.2 and later), SLM-2000 STM-16 Terminals, and the Optical Translator. The Optical Translator can serve as an interface between the Optical Line System and any standard SONET OC-48/SDH STM-16 lightwave terminal.

The dual 1x1 end terminal application shown in Figure 2-8 uses two Optical Line System End Terminals for 4 Bidirectional Optical Lines (equipped with 4 optical lines) and up to two Optical Line System Repeaters for 4 Bidirectional Optical Lines (equipped with 4 optical lines). Each FT-2000 OC-48 Large Capacity Terminal is connected to the Optical Line System with two service OC-48 lines and two protection OC-48 lines. Each OC-48 line is routed on a different optical line.



* FT-2000 OC-48 Large Capacity Terminal
† Optical Line System End Terminal for 4 Bidirectional Optical Lines
‡ Optical Line System Repeater for 4 Bidirectional Optical Lines

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Figure 2-8. Dual 1x1 End Terminal Application (Equipped with 4 Optical Lines)

For more information about the FT-2000 OC-48 Large Capacity Terminal and OC-48 point-to-point applications, refer to 365-575-201, *FT-2000 OC-48 Large Capacity Terminal, User/Service Manual.*

For more information about the FT-2000 OC-48 Add/Drop-Rings Terminal and OC-48 point-to-point applications, refer to 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual.*

For more information about the Optical Translator, refer to 365-575-401, *Optical Translator, User/Service Manual.*

Ring Applications

The Optical Line System can be used in 4-fiber ring applications to increase the distance between FT-2000 OC-48 Large Capacity Terminals, to increase span capacity, and to relieve fiber exhaust.

The Optical Line System can also interface with FT-2000 OC-48 Add/Drop-Rings Terminals (Release 7.2 and later), SLM-2000 STM-16 Terminals, and the Optical Translator. The Optical Translator can serve as an interface between the Optical Line System and any standard SONET OC-48/SDH STM-16 lightwave terminal.

Figure 2-9 shows a 4-fiber ring application with four FT-2000 OC-48 Large Capacity Terminals connected with five separate Optical Line Systems (OLS) and an Optical Translator.

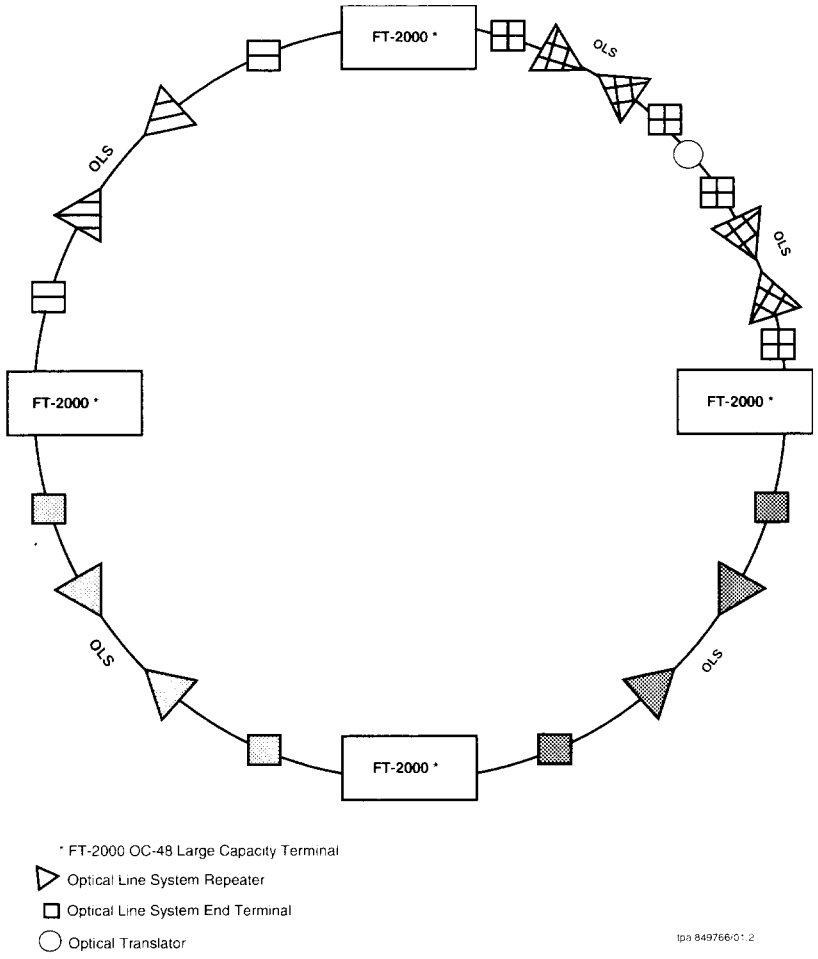
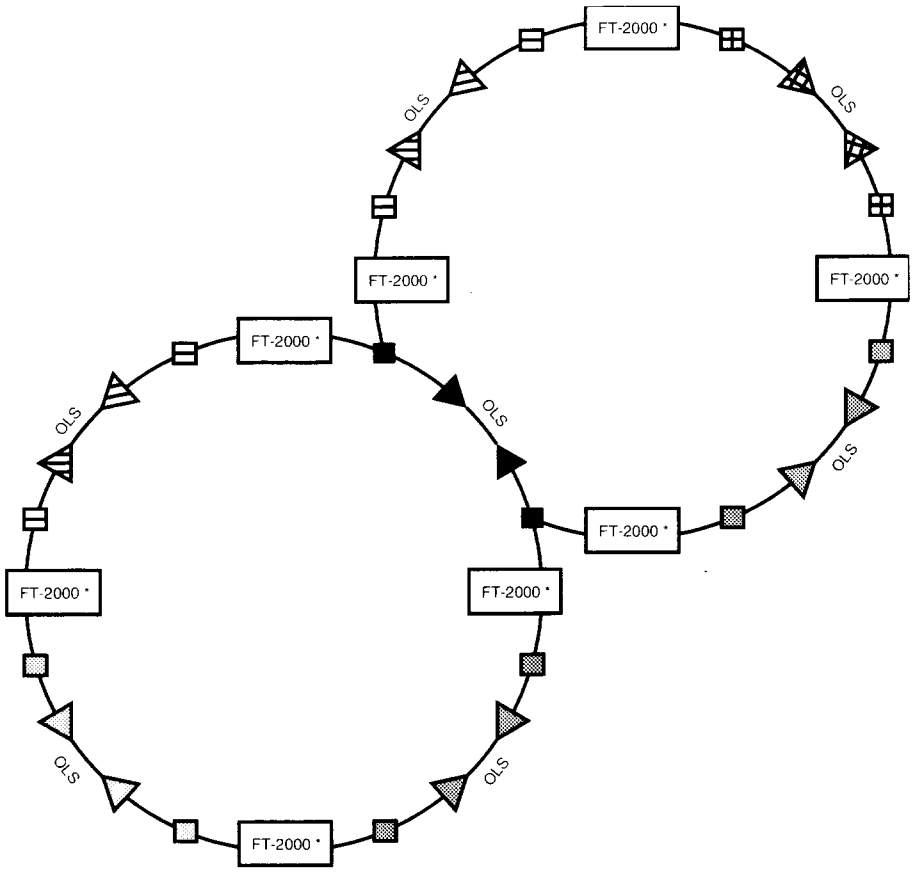


Figure 2-9. 4-Fiber Ring Application with the FT-2000 OC-48 Large Capacity Terminal, Optical Translator, and the Optical Line System

The Optical Translator extends the length of the system and provides wavelength add/drop. With the Optical Translator the Optical Line System can be used to create very large ring networks where express wavelengths bypass intermediate offices without going through a lightwave terminal. In ring applications, a separate Optical Line System is used between each pair of adjacent nodes (span). This can be either an open or closed ring.

In the 4-fiber ring application, the Optical Line System is configured with 2 optical lines. The same wavelength of OC-48 signal can be used on different optical lines in each direction.

The Optical Line System allows flexibility in 4-fiber ring applications. The Optical Line System can accept OC-48 signals from different FT-2000 OC-48 Large Capacity Terminals in different 4-fiber rings. For example, Figure 2-10 shows two 4-fiber rings equipped with FT-2000 OC-48 Large Capacity Terminals sharing the same Optical Line System. The FT-2000 OC-48 Large Capacity Terminals that share the same optical line transmit different wavelengths of OC-48 signals.



* FT-2000 OC-48 Large Capacity Terminal

▽ Optical Line System Repeater for 4 Bidirectional Optical Lines

□ Optical Line System End Terminal for 4 Bidirectional Optical Lines

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Figure 2-10. Two 4-Fiber Rings Sharing the Optical Line System

Figure 2-11 shows four 4-fiber rings equipped with FT-2000 OC-48 Large Capacity Terminals sharing the same Optical Line System.

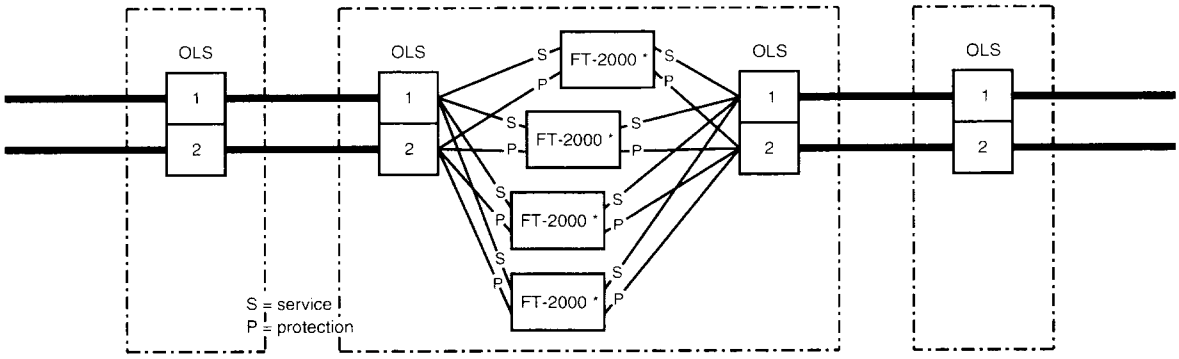


Figure 2-11. Four 4-Fiber Ring Sharing the Optical Line System

For more information about the FT-2000 OC-48 Large Capacity Terminal and 4-fiber ring applications, refer to 365-575-201, *FT-2000 OC-48 Large Capacity Terminal, User/Service Manual.*

For more information about the FT-2000 OC-48 Add/Drop-Rings Terminal and 2-fiber ring applications, refer to 365-575-102, *FT-2000 OC-48 Lightwave System, User/Service Manual.*

For more information about the Optical Translator, refer to 365-575-401, *Optical Translator, User/Service Manual.*

Line Capacity Growth Scenario

A central office equipped with one or two FT-2000 OC-48 Large Capacity Terminals could be upgraded with the Optical Line System. Whether the Optical Line System is used with the FT-2000 OC-48 Large Capacity Terminal depends on the amount of fiber in the ground and the distances required. One fully-equipped FT-2000 OC-48 Large Capacity Terminal supports four bidirectional OC-48 lines.

When the Optical Line System is added, one fiber may support up to eight times the capacity of one fiber from the FT-2000 OC-48 Large Capacity Terminal. One fully-equipped Optical Line System cabinet supports up to 16 fully-equipped and fully-protected (1x1) FT-2000 OC-48 Large Capacity Terminals.

Figure 2-12 shows a scenario in which each central office (CO) has 16 FT-2000 OC-48 Large Capacity Terminals (LCT). Before the Optical Line System is added, 64 fibers are required to transmit the OC-48 service and protection lines.

After the Optical Line System is added, one Optical Line System cabinet (with two fully equipped shelves) is used between central offices to transmit the traffic over 4 optical lines (8 fibers, 4 in each direction). Two optical lines are used for service and two optical lines are used for protection.

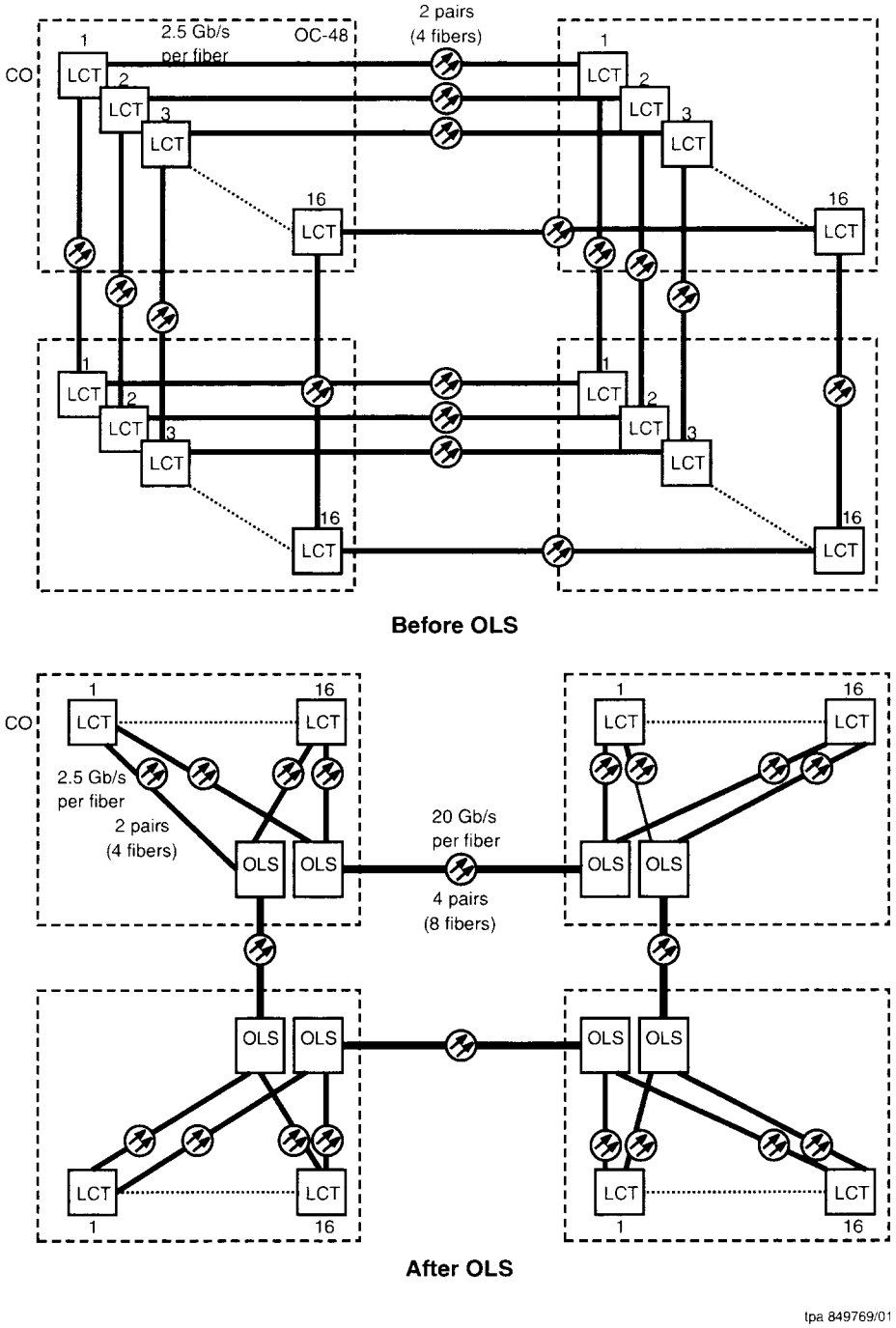


Figure 2-12. Span Capacity Growth Scenario

Platform Description

3

Contents

Overview 3-1

Introduction 3-1

Equipment Packages 3-2

- Optical Line System End Terminal for 4 Bidirectional Optical Lines 3-2
- Optical Line System Repeater for 4 Bidirectional Optical Lines 3-6
- Optical Line System Dual End Terminal 3-8
- Optical Line System Dual Repeater 3-11
- Optical Line System End Terminal and Repeater 3-13
- Optical Line System End Terminal Shelf (Miscellaneously Mounted) 3-15
- Optical Line System Repeater Shelf (Miscellaneously Mounted) 3-18

Indicator Strip 3-19

Shelves 3-20

- End Terminal Shelf 1 3-20
  - Purpose of End Terminal Shelf 1 3-20
  - End Terminal Shelf 1 Circuit Packs/Units 3-21
- End Terminal Shelf 2 3-24
  - Purpose of End Terminal Shelf 2 3-24
  - End Terminal Shelf 2 Circuit Packs/Units 3-25
- Repeater Shelf 1 3-27
  - Purpose of Repeater Shelf 1 3-27
  - Repeater Shelf 1 Circuit Packs 3-28
- Repeater Shelf 2 3-29

Contents

Purpose of Repeater Shelf 2 3-29
Repeater Shelf 2 Circuit Packs 3-30
Shelf Interfaces 3-31
Fuse Panel 3-34
User Panel 3-35
Heat Baffle 3-36
Upgrades 3-36

Platform Description

3

Overview

This section introduces the Optical Line System (OLS) platform and provides a more detailed view of the Optical Line System physical design.

Introduction

The Optical Line System is a flexible, high capacity, optically amplified lightwave system that transports digitally encoded information contained in up to eight different wavelengths of synchronous optical network (SONET) OC-48 signals (up to 32,256 voice channels each) through standard single-mode or *Truewave*® optical fibers. The Optical Line System consists of one platform. A platform is a family of equipment and software configurations designed to support a particular set of applications.

The Optical Line System platform consists of several equipment packages. An equipment package is a hardware variation of a platform. These equipment packages include the following:

- Optical Line System End Terminal for 4 Bidirectional Optical Lines
- Optical Line System Repeater for 4 Bidirectional Optical Lines
- Optical Line System Dual End Terminal
- Optical Line System Dual Repeater
- Optical Line System End Terminal and Repeater
- Optical Line System End Terminal Shelf (Miscellaneously Mounted)
- Optical Line System Repeater Shelf (Miscellaneously Mounted).

These equipment packages enable the Optical Line System to offer flexible and upgradable features for different applications. The Optical Line System software enables the different equipment packages to be upgraded with new features as they become available.

Equipment Packages

Optical Line System End Terminal for 4 Bidirectional Optical Lines

The Optical Line System End Terminal for 4 Bidirectional Optical Lines (Figure 3-1) consists of the J68982C-1 Optical Line System Cabinet and Release 1.0.0-OLS or later software.

In this equipment package, the J68982C-1 Optical Line System Cabinet consists of an indicator strip, two End Terminal Shelves, and a heat baffle mounted in a Lucent Technologies *Newlook 2000* cabinet.

The Lucent Technologies *Newlook 2000* cabinet (Figure 3-2) has two sets of doors that cover the front and rear of the cabinet. Each set of doors consists of a left and right door that open in the middle. The flush-mounted door latch is located in the center of the cabinet. The cabinet can accept cable from above or below. All cabling is accessible from the front of the cabinet. Openings are provided on the side that provide access to the craft interface terminal (CIT) port.

This equipment package provides optical lines 1A/1B, 2A/2B, 3A/3B, and 4A/4B under the control of a single system controller complex. The Optical Line System End Terminal for 4 Bidirectional Optical Lines can accept up to 32 OC-48 drop side signals.

Two Optical Line System End Terminals for 4 Bidirectional Optical Lines are required for a system (Figure 3-3). One Optical Line System End Terminal for 4 Bidirectional Optical Lines must be provisioned and equipped as the 1A-TX terminal (OA lines "A" are transmitters) and the other Optical Line System End Terminal for 4 Bidirectional Optical Lines must be provisioned and equipped as the 1A-RCV terminal (OA lines "A" are receivers). For more information about provisioning, refer to Section 8, "Administration and Provisioning." For more information about equipping shelves with circuit packs and equipment units, refer to the shelf descriptions in this section.

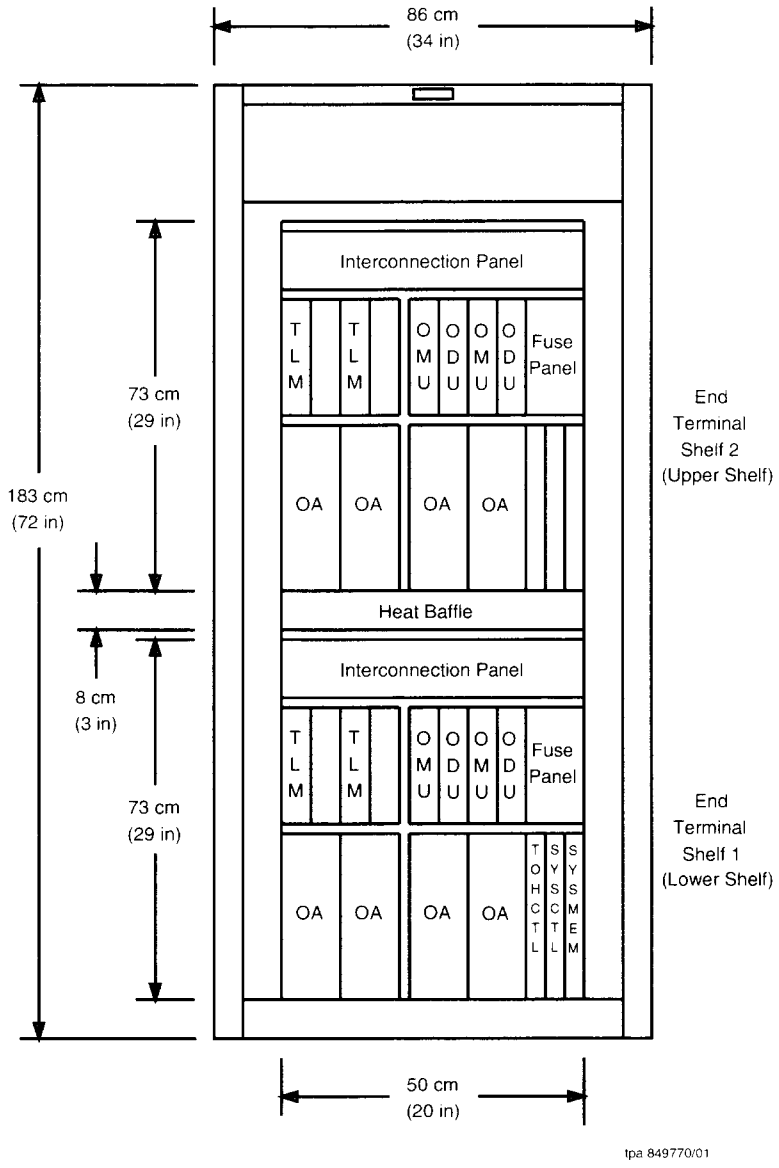


Figure 3-1. Optical Line System End Terminal for 4 Bidirectional Optical Lines (Doors Open)

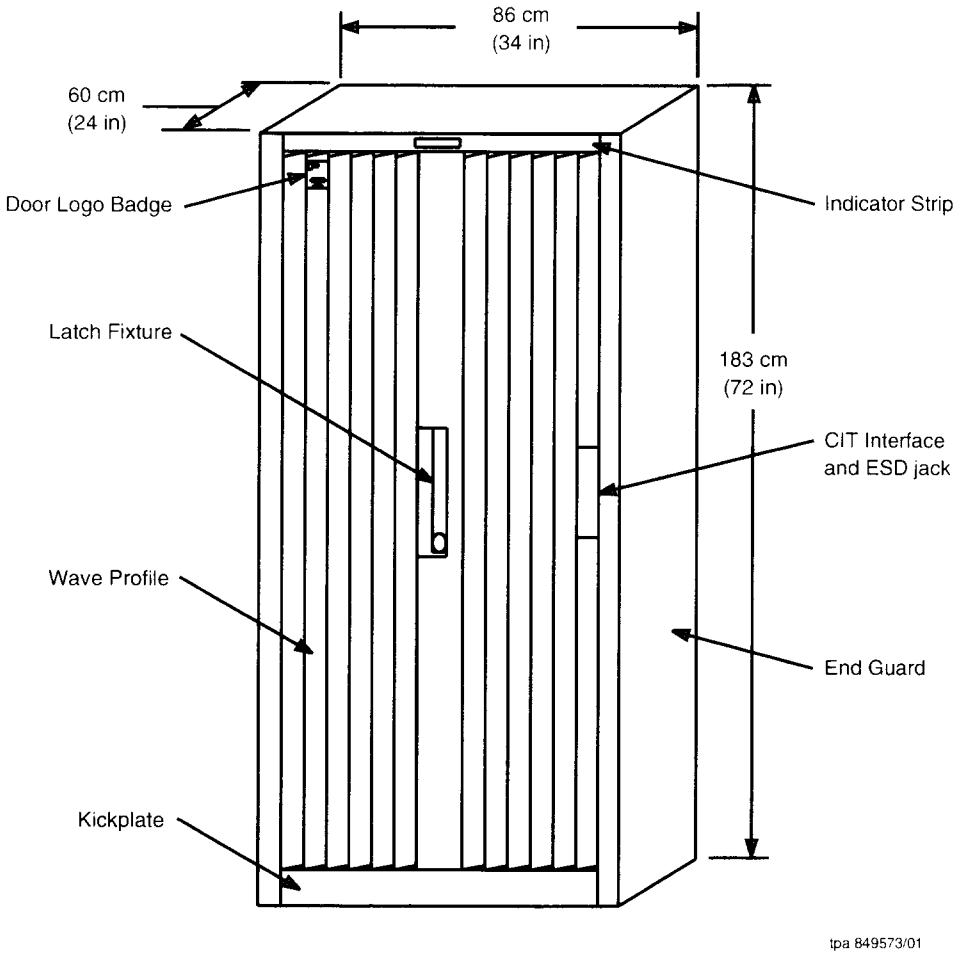


Figure 3-2. Lucent Technologies *Newlook 2000* Cabinet

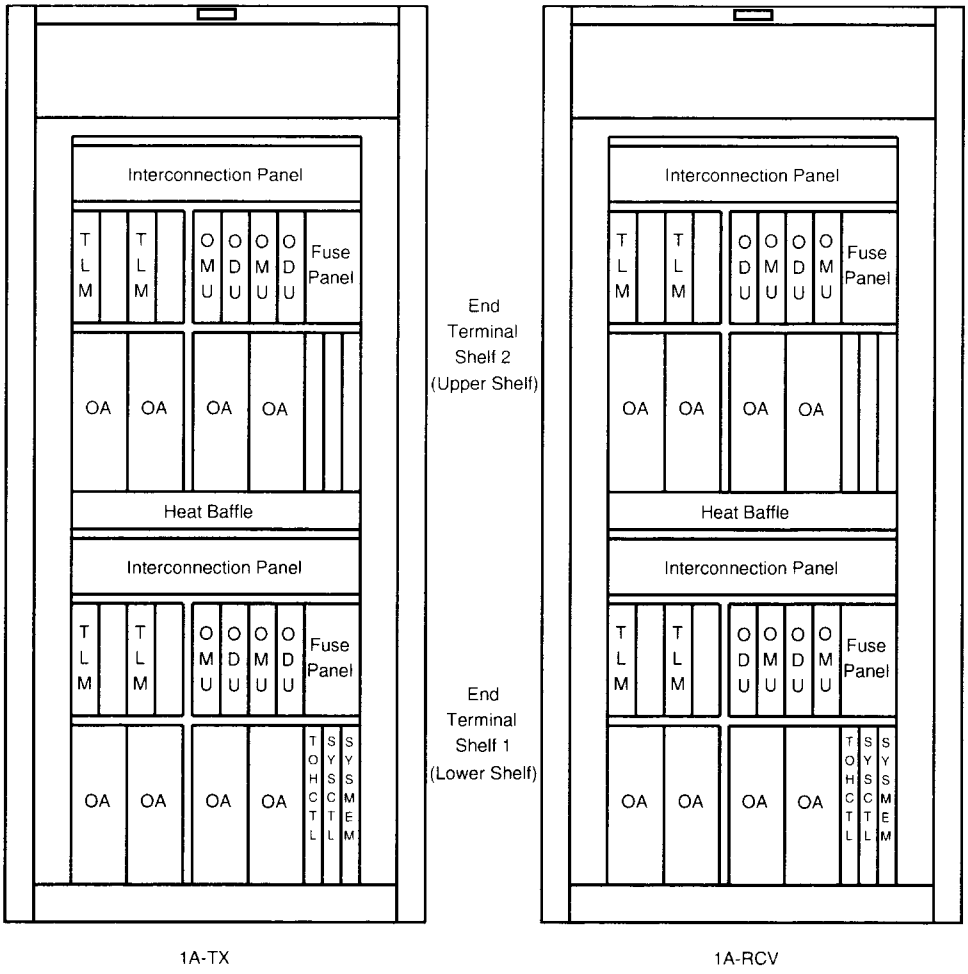


Figure 3-3. 1A-TX and 1A-RCV Optical Line System End Terminals for 4 Bidirectional Optical Lines (Doors Open)

Optical Line System Repeater for 4 Bidirectional Optical Lines

The Optical Line System Repeater for 4 Bidirectional Optical Lines (Figure 3-4) consists of the J68982C-1 Optical Line System Cabinet and Release 1.0.0-OLS or later software.

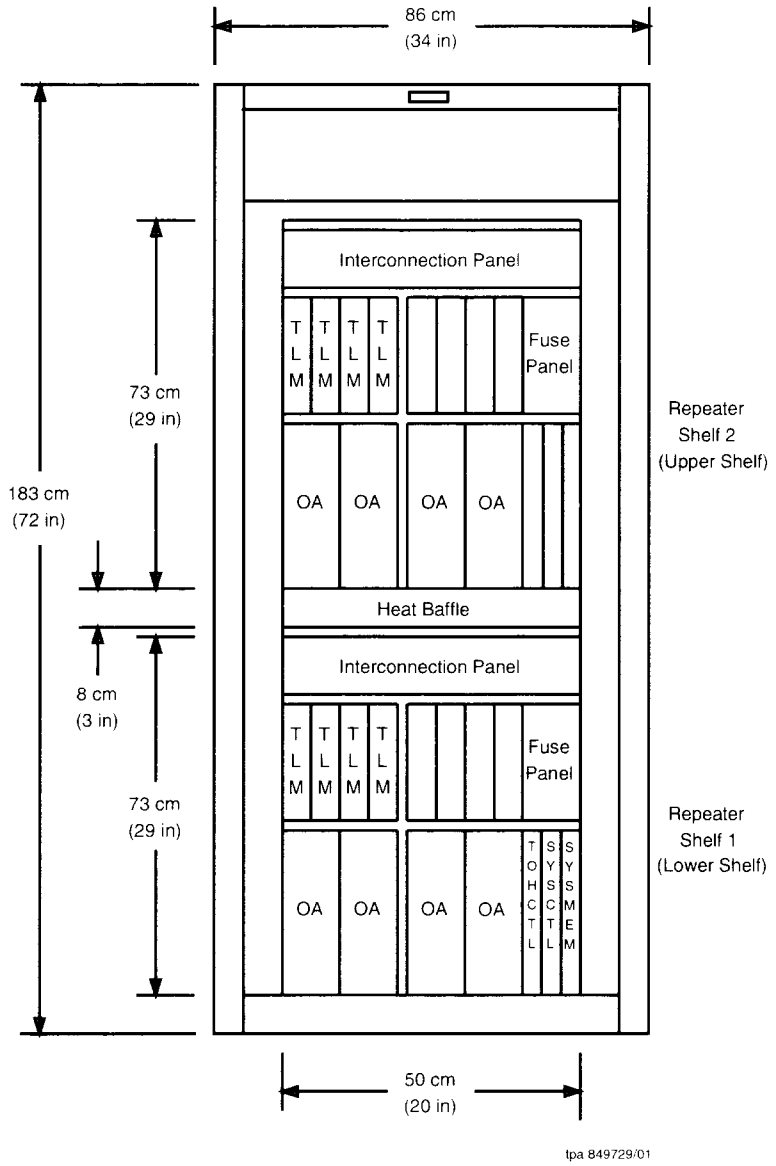


Figure 3-4. Optical Line System Repeater for 4 Bidirectional Optical Lines (Doors Open)

In this equipment package, the J68982C-1 Optical Line System Cabinet consists of an indicator strip, two Repeater Shelves, and a heat baffle mounted in a Lucent Technologies *Newlook 2000* cabinet.

The Lucent Technologies *Newlook 2000* cabinet (Figure 3-2) has two sets of doors that cover the front and rear of the cabinet. Each set of doors consists of a left and right door that open in the middle. The flush-mounted door latch is located in the center of the cabinet. The cabinet can accept cable from above or below. All cabling is accessible from the front of the cabinet.

This equipment package provides optical lines 1A/1B, 2A/2B, 3A/3B, and 4A/4B under the control of a single system controller complex.

Optical Line System Dual End Terminal

The Optical Line System Dual End Terminal (Figure 3-5) consists of the J68982C-1 Optical Line System Cabinet and Release 1.0.0-OLS or later software.

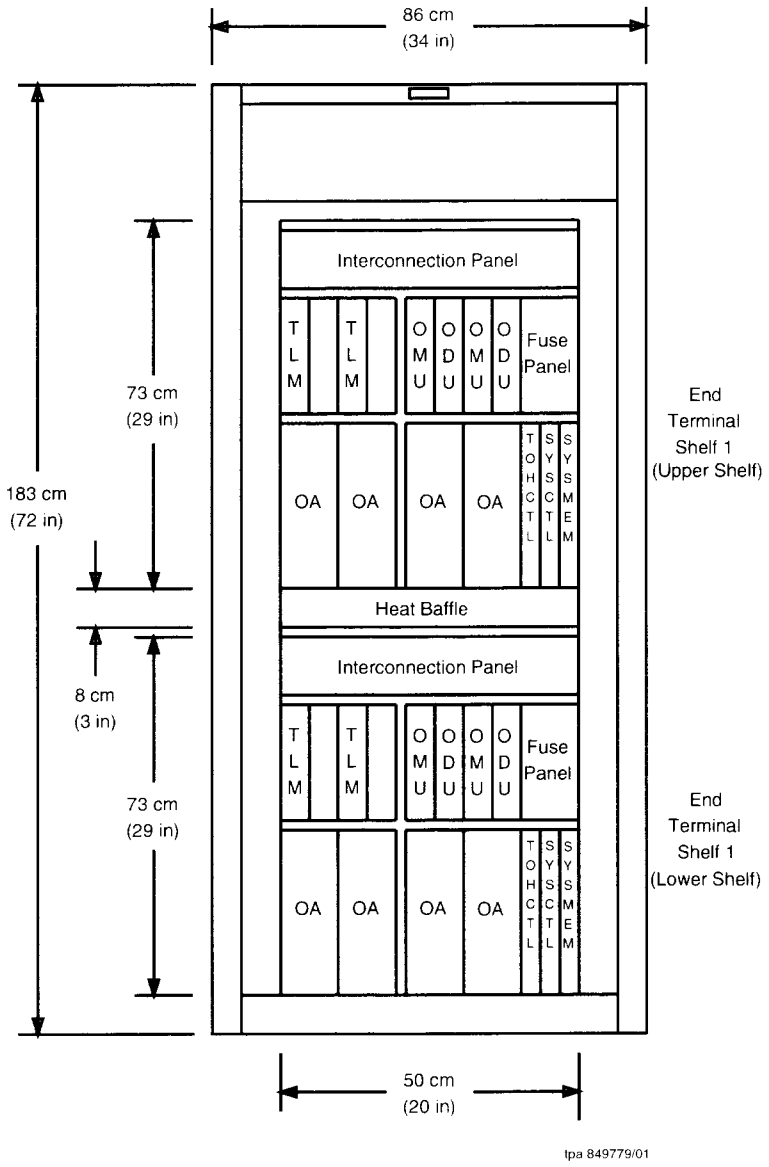


Figure 3-5. Optical Line System Dual End Terminal (Doors Open)

In this equipment package, the J68982C-1 Optical Line System Cabinet consists of an indicator strip, two End Terminal Shelves, and a heat baffle mounted in a Lucent Technologies *Newlook 2000* cabinet.

The Lucent Technologies *Newlook 2000* cabinet (Figure 3-2) has two sets of doors that cover the front and rear of the cabinet. Each set of doors consists of a left and right door that open in the middle. The flush-mounted door latch is located in the center of the cabinet. The cabinet can accept cable from above or below. All cabling is accessible from the front of the cabinet.

This equipment package has two separate end terminals. Each end terminal provides two optical lines (1A/1B and 2A/2B) under the control of a single system controller complex. The Optical Line System Dual End Terminal can accept up to 32 OC-48 drop side signals (up to 16 drop side signal for each end terminal).

Two Optical Line System Dual End Terminals are required for complete systems (Figure 3-6). Each of the two separate end terminals in one Optical Line System Dual End Terminal must be provisioned and equipped as the 1A-TX or 1A-RCV terminal. If one of the separate end terminals is provisioned and equipped as the 1A-TX terminal, the end terminal at the far end of the system must be provisioned and equipped as the 1A-RCV terminal. For more information about provisioning, refer to Section 8, "Administration and Provisioning." For more information about equipping shelves with circuit packs and equipment units, refer to the shelf descriptions in this section.

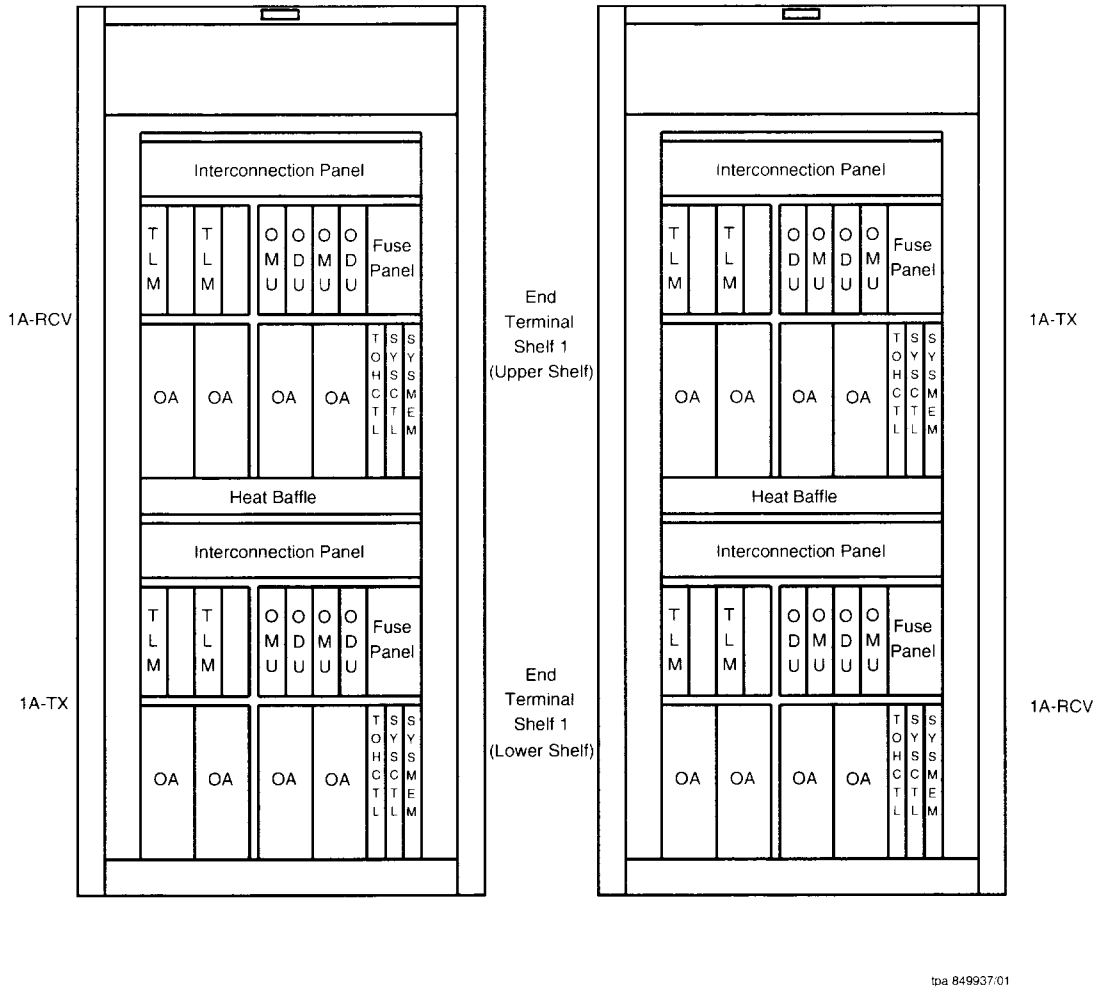


Figure 3-6. 1A-TX and 1A-RCV Optical Line System Dual End Terminals (Doors Open)

Optical Line System Dual Repeater

The Optical Line System Dual Repeater (Figure 3-7) consists of the J68982C-1 Optical Line System Cabinet and Release 1.0.0-OLS or later software.

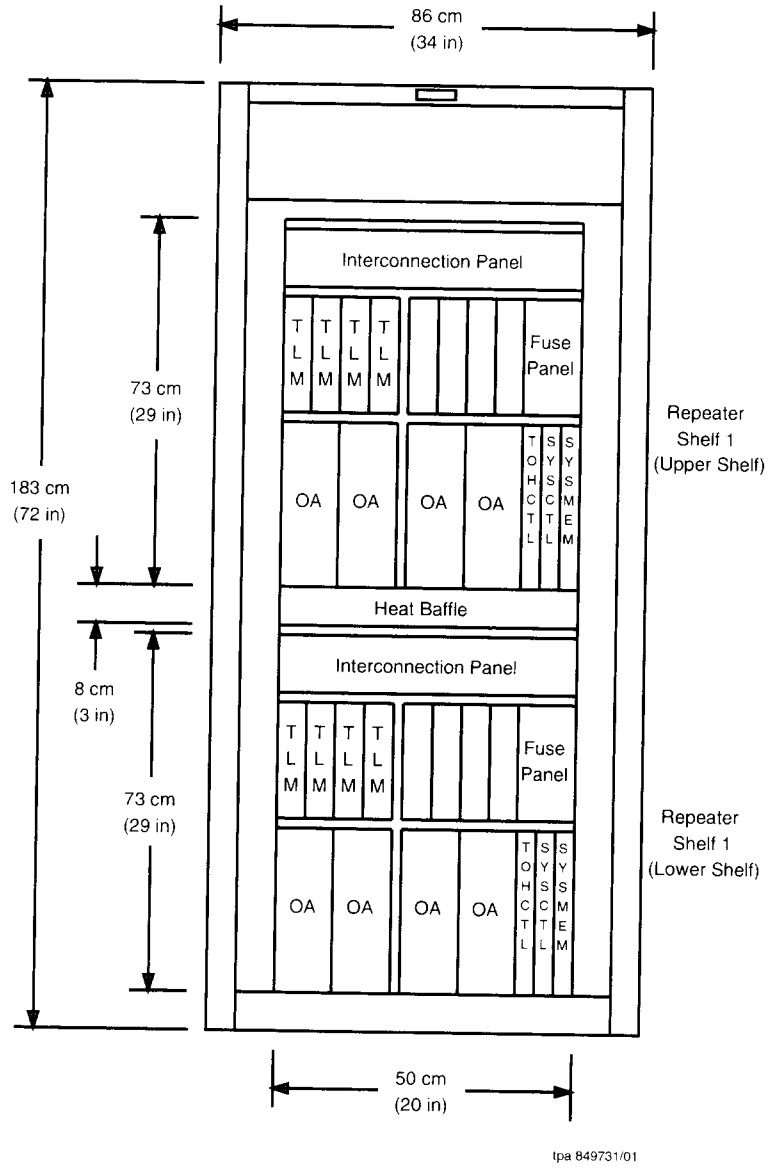


Figure 3-7. Optical Line System Dual Repeater (Doors Open)

In this equipment package, the J68982C-1 Optical Line System Cabinet consists of an indicator strip, two Repeater Shelves, and a heat baffle mounted in a Lucent Technologies *Newlook 2000* cabinet.

The Lucent Technologies *Newlook 2000* cabinet (Figure 3-2) has two sets of doors that cover the front and rear of the cabinet. Each set of doors consists of a left and right door that open in the middle. The flush-mounted door latch is located in the center of the cabinet. The cabinet can accept cable from above or below. All cabling is accessible from the front of the cabinet.

This equipment package has two separate repeaters. Each repeater consists of two optical lines (1A/1B and 2A/2B) under the control of a single system controller complex.

Optical Line System End Terminal and Repeater

The Optical Line System End Terminal and Repeater (Figure 3-8) consists of the J68982C-1 Optical Line System Cabinet and Release 1.0.0-OLS or later software.

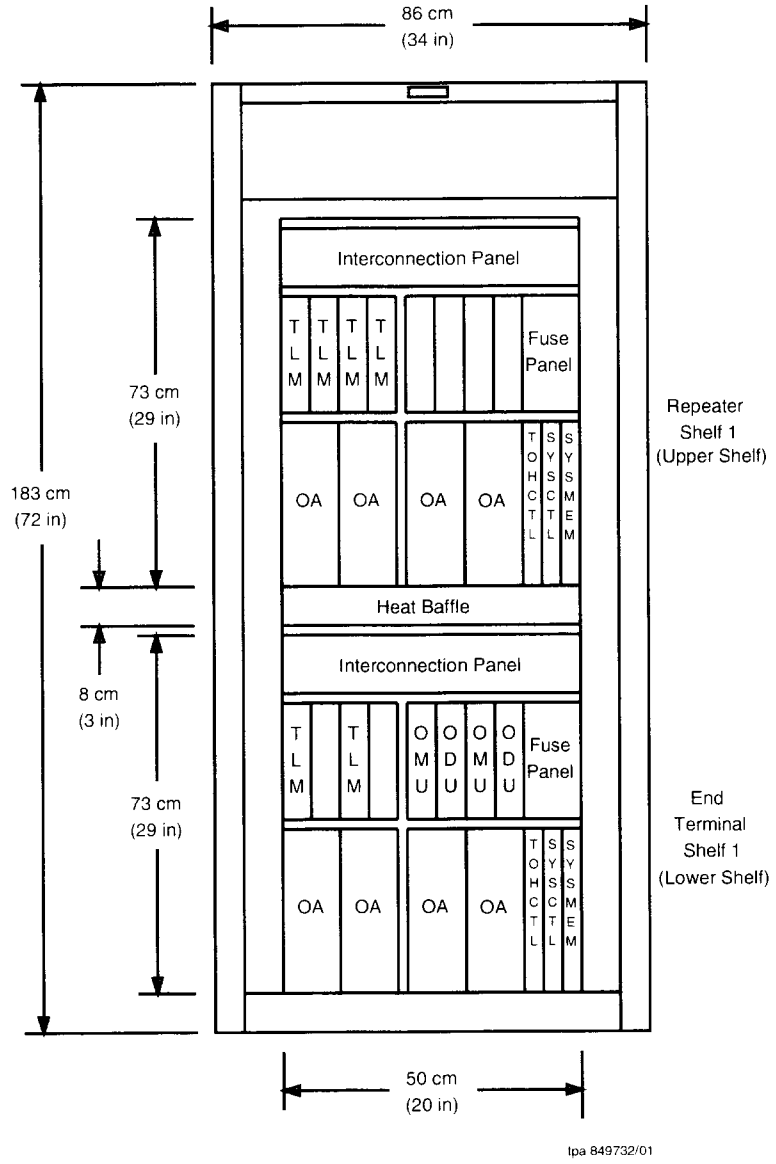


Figure 3-8. Optical Line System End Terminal and Repeater (Doors Open)

In this equipment package, the J68982C-1 Optical Line System Cabinet consists of an indicator strip, one End Terminal Shelf, one Repeater Shelf, and a heat baffle mounted in a Lucent Technologies *Newlook 2000* cabinet.

The Lucent Technologies *Newlook 2000* cabinet (Figure 3-2) has two sets of doors that cover the front and rear of the cabinet. Each set of doors consists of a left and right door that open in the middle. The flush-mounted door latch is located in the center of the cabinet. The cabinet can accept cable from above or below. All cabling is accessible from the front of the cabinet.

This equipment package has a separate end terminal and repeater. The end terminal provides two optical lines (1A/1B and 2A/2B) under the control of a single system controller complex. The Optical Line System End Terminal and Repeater can accept up to 16 OC-48 drop side signals. The repeater consists of two optical lines (1A/1B and 2A/2B) under the control of a single system controller complex.

Optical Line System End Terminal Shelf (Miscellaneously Mounted)

The Optical Line System End Terminal Shelf (Miscellaneously Mounted) (Figure 3-9) consists of a miscellaneously mounted shelf arrangement and Release 1.0.0-OLS or later software.

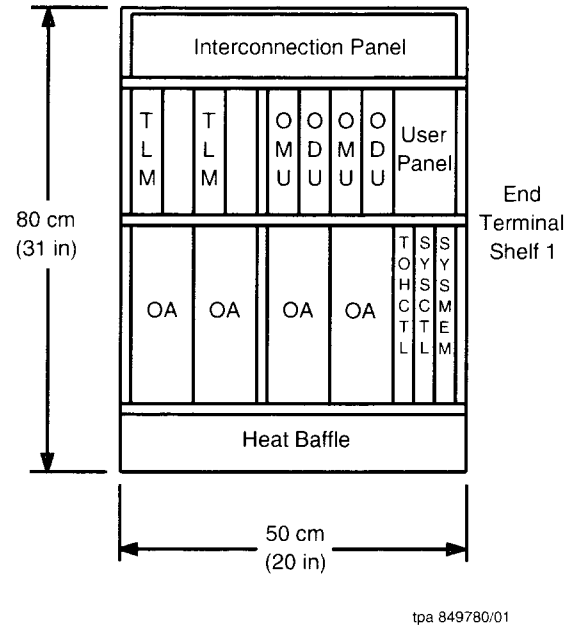


Figure 3-9. Optical Line System End Terminal Shelf (Miscellaneously Mounted) (Covers Removed)

This shelf arrangement consists of a miscellaneously mounted End Terminal Shelf, heat baffle, and a user panel. It is possible to mount the Optical Line System End Terminal Shelf in 800- and 801-type network bay frameworks.

Figure 3-10 shows a miscellaneously mounted shelf with two front covers. One covers the top of the shelf and the other covers the bottom of the shelf. Openings are provided in the top cover that allow the user panel to show through and provide access to the craft interface terminal (CIT) port. The covers are hinged and can be easily removed for maintenance access.

This equipment package provides two optical lines (1A/1B and 2A/2B) under the control of a single system controller complex. The Optical Line System End Terminal Shelf can accept up to 16 OC-48 drop side signals.

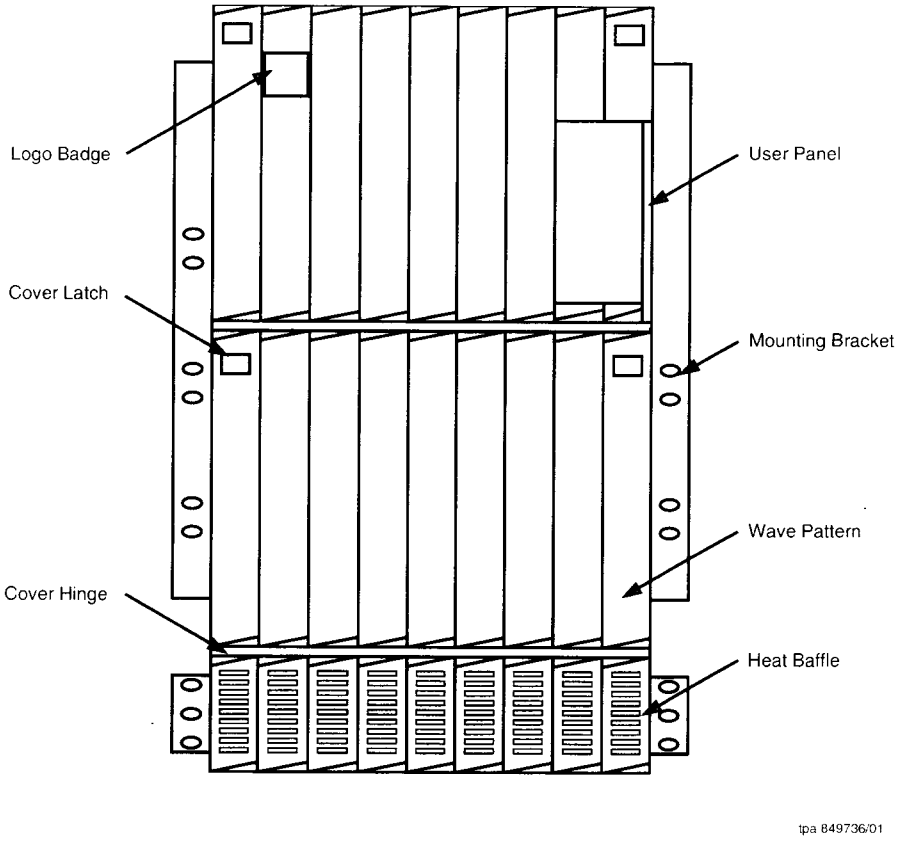


Figure 3-10. Miscellaneously Mounted Shelf

Two miscellaneously mounted Optical Line System End Terminal Shelves are required for complete systems (Figure 3-11). One Optical Line System End Terminal Shelf must be provisioned and equipped as the 1A-TX terminal and the other Optical Line System End Terminal Shelf must be provisioned and equipped as the 1A-RCV terminal. For more information about provisioning, refer to Section 8, "Administration and Provisioning." For more information about equipping shelves with circuit packs and equipment units, refer to the shelf descriptions in this section.

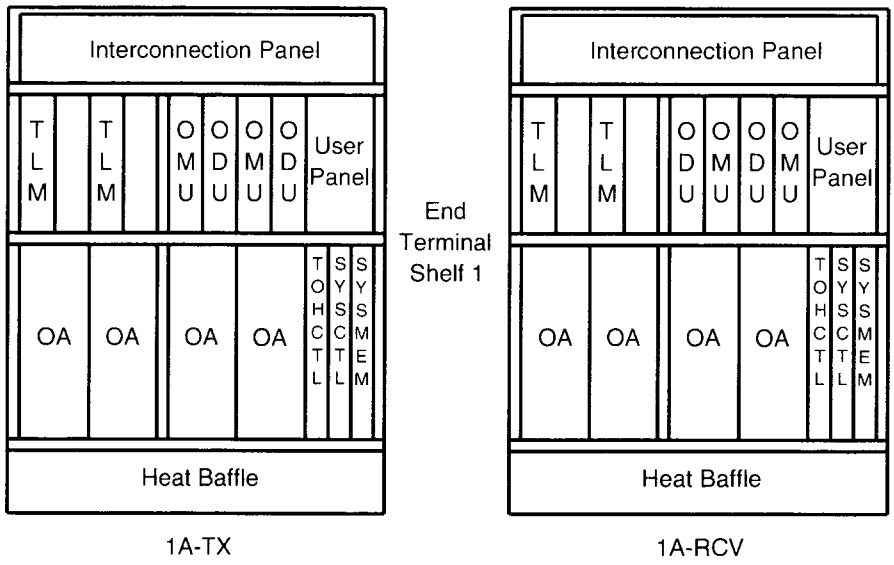


Figure 3-11. 1A-TX and 1A-RCV Optical Line System End Terminal Shelves (Covers Removed)

Optical Line System Repeater Shelf (Miscellaneously Mounted)

The Optical Line System Repeater Shelf (Miscellaneously Mounted) (Figure 3-12) consists of a miscellaneously mounted shelf arrangement and Release 1.0.0-OLS or later software.

This shelf arrangement consists of a miscellaneously mounted Repeater Shelf, heat baffle, and a user panel. It is possible to mount the Optical Line System Repeater Shelf in 800- and 801-type network bay frameworks.

Figure 3-10 shows a miscellaneously mounted shelf with two front covers. One covers the top of the shelf and the other covers the bottom of the shelf. Openings are provided in the top cover that allow the user panel to show through and provide access to the craft interface terminal (CIT) port. The covers are hinged and can be easily removed for maintenance access.

This equipment package provides two optical lines (1A/1B and 2A/2B) under the control of a single system controller complex.

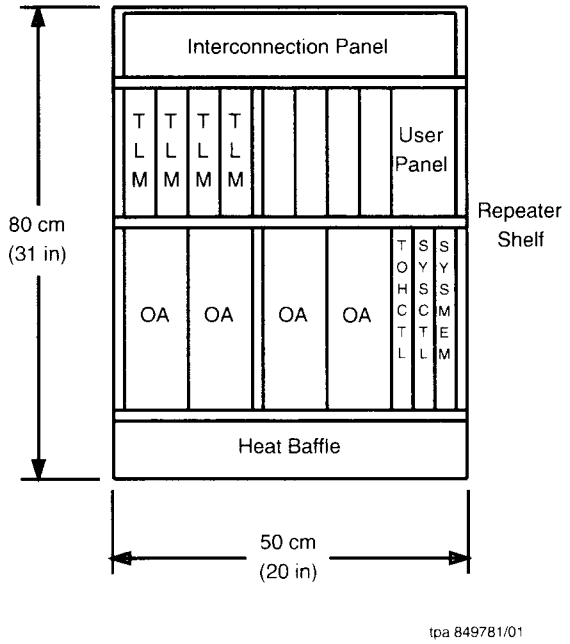


Figure 3-12. Optical Line System Repeater Shelf (Miscellaneously Mounted) (Covers Removed)

Indicator Strip

An indicator strip is located at the front of each Optical Line System cabinet. It provides a power on (PWR ON) LED and system level information. All cabling is connectorized.

Figure 3-13 shows the indicator strip used by the following equipment packages:

- Optical Line System End Terminal for 4 Bidirectional Optical Lines
- Optical Line System Repeater for 4 Bidirectional Optical Lines.

Figure 3-14 shows the indicator strip used by the following equipment packages:

- Optical Line System Dual End Terminal
- Optical Line System Dual Repeater
- Optical Line System End Terminal and Repeater.

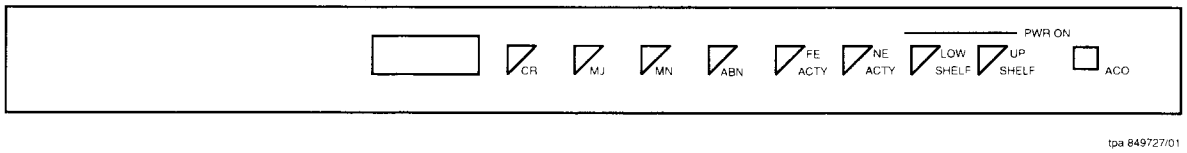


Figure 3-13. Indicator Strip (OLS End Terminal for 4 Bidirectional Optical Lines and OLS Repeater for 4 Bidirectional Optical Lines)

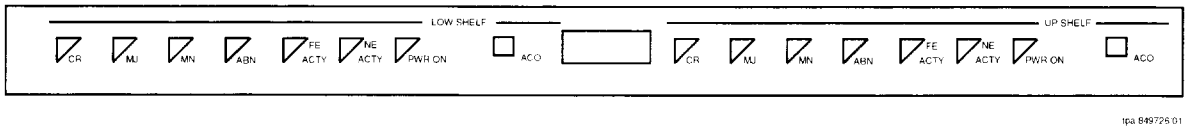


Figure 3-14. Indicator Strip (OLS Dual End Terminal and OLS Dual Repeater)

Shelves

End Terminal Shelf 1

Purpose of End Terminal Shelf 1

The End Terminal Shelf 1 serves as an interface for up to 16 OC-48 drop side signals and 2 bidirectional optical lines (optical lines 1 and 2). Up to 8 OC-48 drop side signals and a supervisory signal are combined onto a single optical line using dense wavelength division multiplexing and optically amplified. The End Terminal Shelf 1 also provides high-level system control functions. The End Terminal Shelf 1 is used in 4-line and dual system.

The End Terminal Shelf 1 (Figure 3-15) consists of a fully connectorized interconnection panel, a fuse panel, and 15 circuit pack/unit slots. It measures 29 inches high by 20 inches wide by 12 inches deep and fits in a Lucent Technologies *Newlook 2000* cabinet. The End Terminal Shelf 1 is designed according to European Telecommunications Standard Institute (ETSI) standards documented in European Telecommunications Standard (ETS) 300119-4, September 1993.

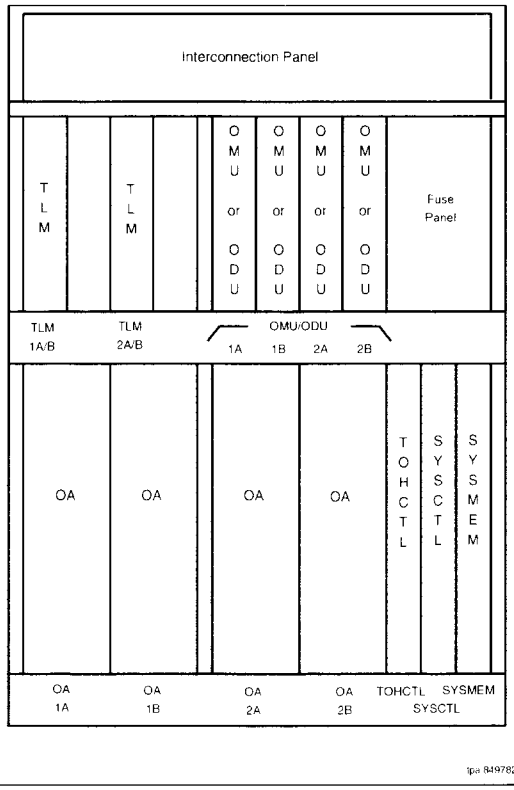


Figure 3-15. End Terminal Shelf 1 (Without Covers)

End Terminal Shelf 1 Circuit Packs/Units

The End Terminal Shelf 1 (Figure 3-15) provides the following circuit pack/unit slots:

- **TLM 1A/B and 2A/B**: Two slots are provided for the LDA1 Telemetry Controller (TLM) circuit pack.
- **OMU/ODU 1A, 1B, 2A, and 2B**: Two slots are provided for the 505A Optical Multiplexing Unit (OMU), and two slots are provided for the 605A Optical Demultiplexing Unit (ODU). The 505A OMU and 605A ODU are units, not circuit packs.

  For end terminals provisioned as 1A-TX, the A slot of the slot pair (1A, 1B) must be equipped with the 505A OMU, and the B slot of the slot pair must be equipped with the 605A ODU (Figure 3-16). For end terminals provisioned as 1A-RCV, the A slot of the slot pair must be equipped with the 605A ODU, and the B slot of the slot pair must be equipped with the 505A OMU.

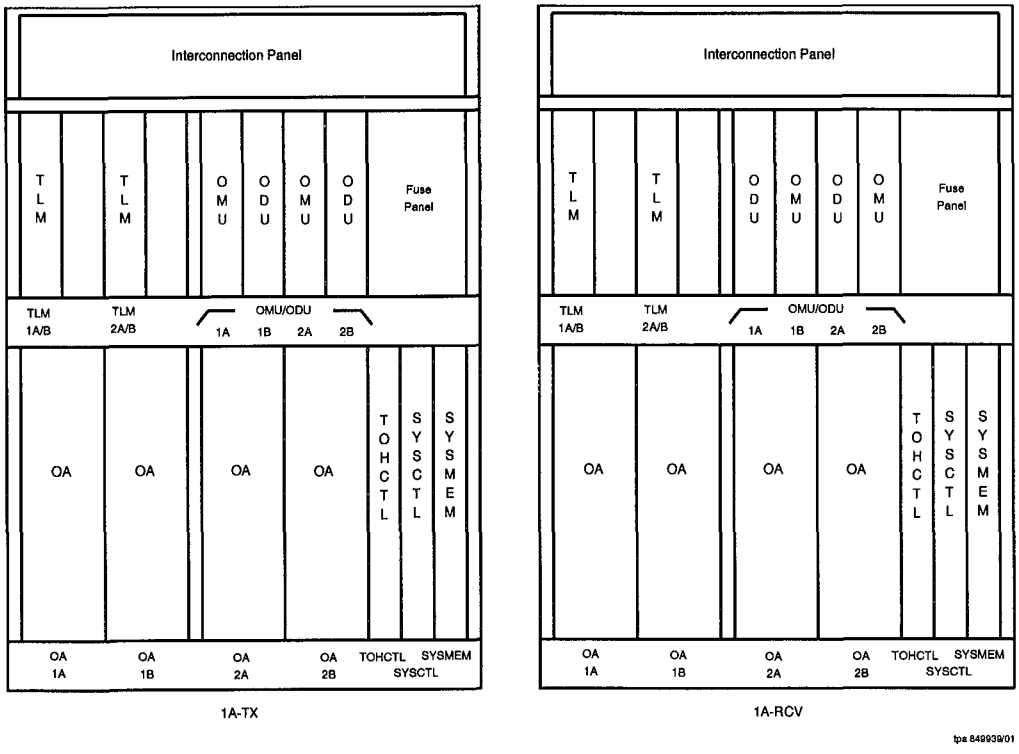


Figure 3-16. 1A-TX and 1A-RCV End Terminal Shelf 1 (Without Covers)

- **OA 1A, OA 1B, OA 2A, and OA 2B**: Four slots are provided for the LEA6 or LEA7 Optical Amplifier (OA) circuit pack. The LEA6 OA circuit pack is compatible with Release 1.0.0-OLS and later software. The LEA7 circuit pack is compatible with Release 2.0.0-OLS and later software. For end terminals provisioned and equipped as 1A-TX, the OA circuit packs in the 1A and 2A slots act as transmitters. For end terminals provisioned and equipped as 1A-RCV, the OA circuit packs in the 1A and 2A slots act as receivers.
- **TOHCTL**: One slot is provided for the LEA5 Tributary - Overhead Controller (TOHCTL) circuit pack.
- **SYSCTL**: One slot is provided for the LEA1 System Controller (SYSCTL) circuit pack.
- **SYSMEM**: One slot is provided for the LEA2 System Memory (SYSMEM) circuit pack.

Table 3-1 also provides circuit pack slot, circuit pack/unit code, and software compatibility information.

The LDA1 TLM circuit packs have one latch assembly at the top of the circuit pack. The 505A OMU and 605A ODU are fastened to the shelf using screws. All circuit packs in the bottom part of the shelf have latch assemblies at the top and bottom of the circuit pack.

Circuit pack keying prevents circuit packs from being accidentally inserted in incorrect slots.

For detailed circuit pack descriptions and software compatibility information, refer to Section 7, "Circuit Pack Descriptions."

Table 3-1. End Terminal Shelf 1 Circuit Pack Slot/Circuit Pack Code/Unit Code/Software Compatibility

Circuit Pack Slot	Supported Circuit Pack/Unit Codes	Compatible Software	
		R1.0.0-OLS	R2.0.0-OLS
TLM 1A/B and 2A/B	LDA1 TLM	X	X
OMU/ODU 1A*	505A OMU	X	X
	605A ODU	X	X
OMU/ODU 1B*	505A OMU	X	X
	605A ODU	X	X
OMU/ODU 2A*	505A OMU	X	X
	605A ODU	X	X
OMU/ODU 2B*	505A OMU	X	X
	605A ODU	X	X
OA 1A - 2B†	LEA6 OA	X	X
	LEA7 OA		X
TOHCTL	LEA5 TOHCTL	X	X
SYSCTL	LEA1 SYSCTL	X	X
SYSMEM	LEA2 SYSMEM	X	X

* For end terminals provisioned as 1A-TX, the A slot of the slot pair (1A ,1B) must be equipped with the 505A OMU, and the B slot of the slot pair must be equipped with the 605A ODU. For end terminals provisioned as 1A-RCV, the A slot of the slot pair must be equipped with the 605A ODU, and the B slot of the slot pair must be equipped with the 505A OMU.

† For end terminals provisioned and equipped as 1A-TX, the OA circuit packs in the 1A and 2A slots act as transmitters. For end terminals provisioned and equipped as 1A-RCV, the OA circuit packs in the 1A and 2A slots act as receivers.

End Terminal Shelf 2

Purpose of End Terminal Shelf 2

The End Terminal Shelf 2 serves as an interface for up to 16 OC-48 drop side signals and 2 bidirectional optical lines (optical lines 3 and 4). Up to 8 OC-48 drop side signals and a supervisory signal are combined onto a single optical line using dense wavelength division multiplexing and optically amplified. The End Terminal Shelf 2 is only used in 4-line systems.

The End Terminal Shelf 2 (Figure 3-17) consists of a fully connectorized interconnection panel, a fuse panel, and 15 circuit pack/unit slots. It measures 29 inches high by 20 inches wide by 12 inches deep and fits in a Lucent Technologies *Newlook 2000* cabinet. The End Terminal Shelf 2 is designed according to European Telecommunications Standard Institute (ETSI) standards documented in European Telecommunications Standard (ETS) 300119-4, September 1993.

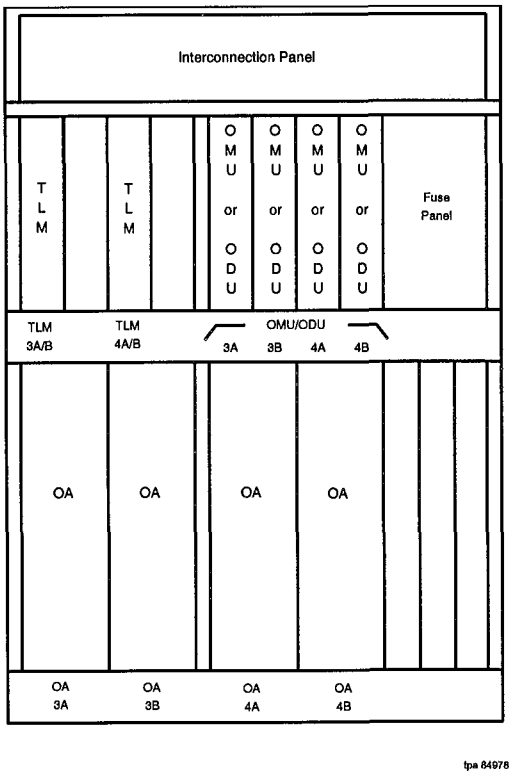


Figure 3-17. End Terminal Shelf 2 (Without Covers)

End Terminal Shelf 2 Circuit Packs/Units

The End Terminal Shelf 2 (Figure 3-17) provides the following circuit pack/unit slots:

- **TLM 3A/B and 4A/B**: Two slots are provided for the LDA1 Telemetry Controller (TLM) circuit pack.
- **OMU/ODU 3A, 3B, 4A, and 4B**: Two slots are provided for the 505A Optical Multiplexing Unit (OMU) and two slots are provided for the 605A Optical Demultiplexing Unit (ODU). The 505A OMU and 605A ODU are units, not circuit packs.

  For end terminals provisioned as 1A-TX, the A slot of the slot pair (3A, 3B) must be equipped with the 505A OMU and the B slot of the slot pair must be equipped with the 605A ODU (Figure 3-18). For end terminals provisioned as 1A-RCV, the A slot of the slot pair must be equipped with the 605A ODU, and the B slot of the slot pair must be equipped with the 505A OMU.

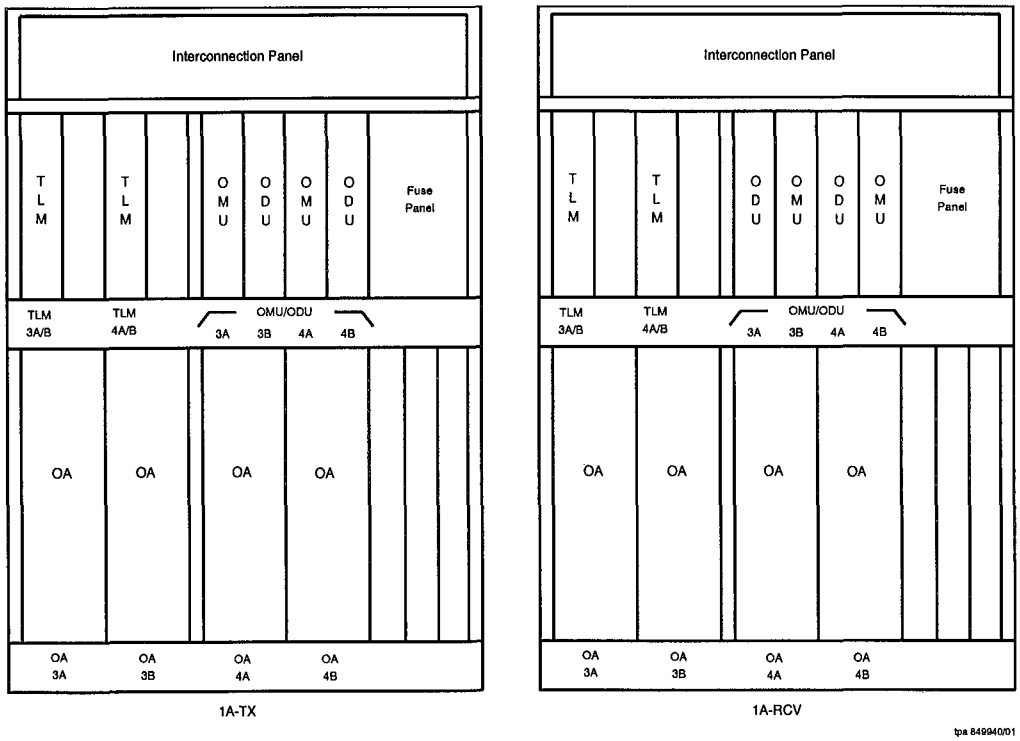


Figure 3-18. 1A-TX and 1A-RCV End Terminal Shelf 2 (Without Covers)

- **OA 3A, OA 3B, OA 4A, and OA 4B**: Four slots are provided for the LEA6 or LEA7 Optical Amplifier (OA) circuit pack. The LEA6 OA circuit pack is compatible with Release 1.0.0-OLS and later software. The LEA7 circuit pack is compatible with Release 2.0.0-OLS and later software. For end terminals provisioned and equipped as 1A-TX, the OA circuit packs in the 3A and 4A slots act as transmitters. For end terminals provisioned and equipped as 1A-RCV, the OA circuit packs in the 3A and 4A slots act as receivers.

Table 3-2 also provides circuit pack slot, circuit pack/unit code, and software compatibility information.

Table 3-2. End Terminal Shelf 2 Circuit Pack Slot/Circuit Pack/Unit Code/Software Compatibility

Circuit Pack Slot	Supported Circuit Pack/Unit Codes	Compatible Software	
		R1.0.0-OLS	R2.0.0-OLS
TLM 3A/B and 4A/B	LDA1 TLM	X	X
OMU/ODU 3A*	505A OMU 605A ODU	X X	X X
OMU/ODU 3B*	505A OMU 605A ODU	X X	X X
OMU/ODU 4A*	505A OMU 605A ODU	X X	X X
OMU/ODU 4B*	505A OMU 605A ODU	X X	X X
OA 3A - 4B†	LEA6 OA LEA7 OA	X	X X

* For end terminals provisioned as 1A-TX, the A slot of the slot pair (3A ,3B) must be equipped with the 505A OMU, and the B slot of the slot pair must be equipped with the 605A ODU. For end terminals provisioned as 1A-RCV, the A slot of the slot pair must be equipped with the 605A ODU, and the B slot of the slot pair must be equipped with the 505A OMU.

† For end terminals provisioned and equipped as 1A-TX, the OA circuit packs in the 3A and 4A slots act as transmitters. For end terminals provisioned and equipped as 1A-RCV, the OA circuit packs in the 3A and 4A slots act as receivers.

The LDA1 TLM circuit packs have one latch assembly at the top of the circuit pack. The 505A OMU and 605A ODU are fastened to the shelf using screws. All circuit packs in the bottom part of the shelf have latch assemblies at the top and bottom of the circuit pack.

Circuit pack keying prevents circuit packs from being accidentally inserted in incorrect slots.

For detailed circuit pack descriptions and software compatibility information, refer to Section 7, "Circuit Pack Descriptions."

Repeater Shelf 1

Purpose of Repeater Shelf 1

The Repeater Shelf 1 provides high-level system control functions and optically amplifies optical line signals for two bidirectional optical lines (optical lines 1 and 2). The Repeater Shelf 1 also adds and drops the supervisory signals associated with optical line 1 and 2. The Repeater Shelf 1 is used in 4-line and dual system.

The Repeater Shelf 1 (Figure 3-19) consists of a fully connectorized interconnection panel, a fuse panel, and 15 circuit pack slots (up to a maximum of 11 are required). It measures 29 inches high by 20 inches wide by 12 inches deep and fits in a Lucent Technologies *Newlook 2000* cabinet. The Repeater Shelf 1 is designed according to European Telecommunications Standard Institute (ETSI) standards documented in European Telecommunications Standard (ETS) 300119-4, September 1993.

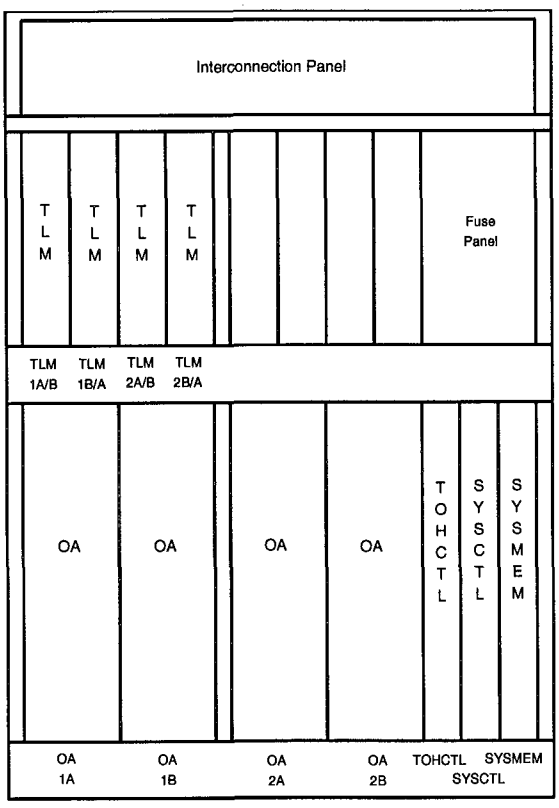


Figure 3-19. Repeater Shelf 1 (Without Covers)

Repeater Shelf 1 Circuit Packs

The Repeater Shelf 1 (Figure 3-19) provides the following circuit pack slots:

- **TLM 1A/B, 1B/A, 2A/B, and 2B/A**: Four slots are provided for the LDA1 Telemetry Controller (TLM) circuit pack.
- **OA 1A, OA 1B, OA 2A, and OA 2B**: Four slots are provided for the LEA6 or LEA7 Optical Amplifier (OA) circuit pack. The LEA6 OA circuit pack is compatible with Release 1.0.0-OLS and later software. The LEA7 circuit pack is compatible with Release 2.0.0-OLS and later software.
- **TOHCTL**: One slot is provided for the LEA5 Tributary - Overhead Controller (TOHCTL) circuit pack.
- **SYSCTL**: One slot is provided for the LEA1 System Controller (SYSCTL) circuit pack.
- **SYSMEM**: One slot is provided for the LEA2 System Memory (SYSMEM) circuit pack.

Table 3-3 also provides circuit pack slot/circuit pack code/software compatibility information.

Table 3-3. Repeater Shelf 1 Circuit Pack Slot/Circuit Pack Code/Software Compatibility

Circuit Pack Slot	Supported Circuit Pack Codes	Compatible Software	
		R1.0.0-OLS	R2.0.0-OLS
TLM 1A/B, 1B/A, 2A/B, and 2B/A	LDA1 TLM	X	X
OA 1A - 2B	LEA6 OA LEA7 OA	X	X X
TOHCTL	LEA5 TOHCTL	X	X
SYSCTL	LEA1 SYSCTL	X	X
SYSMEM	LEA2 SYSMEM	X	X

The LDA1 TLM circuit packs have one latch assembly at the top of the circuit pack. All circuit packs in the bottom part of the shelf have latch assemblies at the top and bottom of the circuit pack.

Circuit pack keying prevents circuit packs from being accidentally inserted in incorrect slots.

For detailed circuit pack descriptions and software compatibility information, refer to Section 7, "Circuit Pack Descriptions."

Repeater Shelf 2

Purpose of Repeater Shelf 2

The Repeater Shelf 2 optically amplifies optical line signals for two bidirectional optical lines (optical lines 3 and 4). The Repeater Shelf 2 also adds and drops the supervisory signals associated with optical line 3 and 4. The End Terminal Shelf 2 is only used in 4-line systems.

The Repeater Shelf 2 (Figure 3-20) consists of a fully connectorized interconnection panel, a fuse panel, and 15 circuit pack slots (up to a maximum of 8 are required). It measures 29 inches high by 20 inches wide by 12 inches deep and fits in a Lucent Technologies *Newlook 2000* cabinet. The Repeater Shelf 2 is designed according to European Telecommunications Standard Institute (ETSI) standards documented in European Telecommunications Standard (ETS) 300119-4, September 1993.

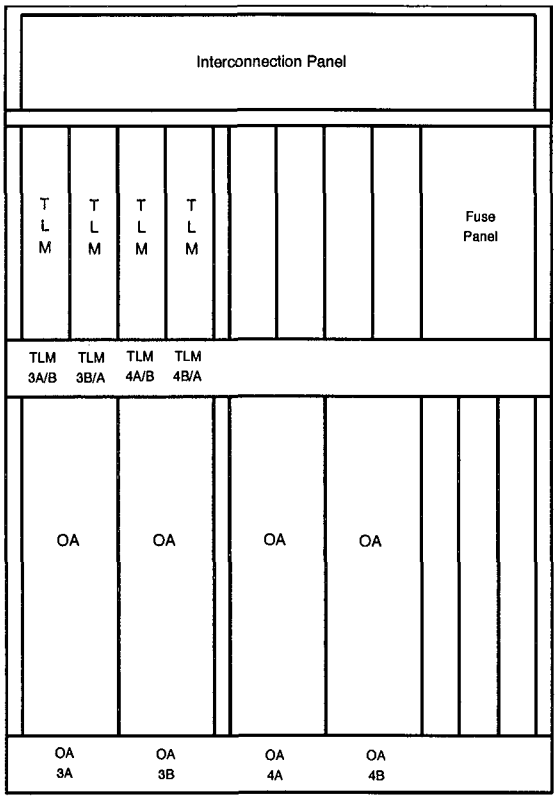


Figure 3-20. Repeater Shelf 2 (Without Covers)

Repeater Shelf 2 Circuit Packs

The Repeater Shelf 2 (Figure 3-20) provides the following circuit pack slots:

- **TLM 3A/B, 3B/A, 4A/B, and 4B/A**: Four slots are provided for the LDA1 Telemetry Controller (TLM) circuit pack.
- **OA 3A, OA 3B, OA 4A, and OA 4B**: Four slots are provided for the LEA6 or LEA7 Optical Amplifier (OA) circuit pack. The LEA6 OA circuit pack is compatible with Release 1.0.0-OLS and later software. The LEA7 circuit pack is compatible with Release 2.0.0-OLS and later software.

Table 3-4 also provides circuit pack slot/circuit pack code/software compatibility information.

Table 3-4. Repeater Shelf 2 Circuit Pack Slot/Circuit Pack Code/Software Compatibility

Circuit Pack Slot	Supported Circuit Pack Codes	Compatible Software	
		R1.0.0-OLS	R2.0.0-OLS
TLM 3A/B, 3B/A, 4A/B, and 4B/A	LDA1 TLM	X	X
OA 1A - 2B	LEA6 OA	X	X
	LEA7 OA		X

The LDA1 TLM circuit packs have one latch assembly at the top of the circuit pack. All circuit packs in the bottom part of the shelf have latch assemblies at the top and bottom of the circuit pack.

Circuit pack keying prevents circuit packs from being accidentally inserted in incorrect slots.

For detailed circuit pack descriptions and software compatibility information, refer to Section 7, "Circuit Pack Descriptions."

Shelf Interfaces

Front access cabling is provided through the interconnection panel (Figure 3-21). The backplane of each shelf provides the necessary intrashelf connections between the circuit packs in the shelf and the connectors on the interconnection panel.

In End Terminal Shelf 1 and Repeater Shelf 1, LINE X is optical line 1 and LINE Y is optical line 2. In End Terminal Shelf 2 and Repeater Shelf 2, LINE X is optical line 3 and LINE Y is optical line 4.

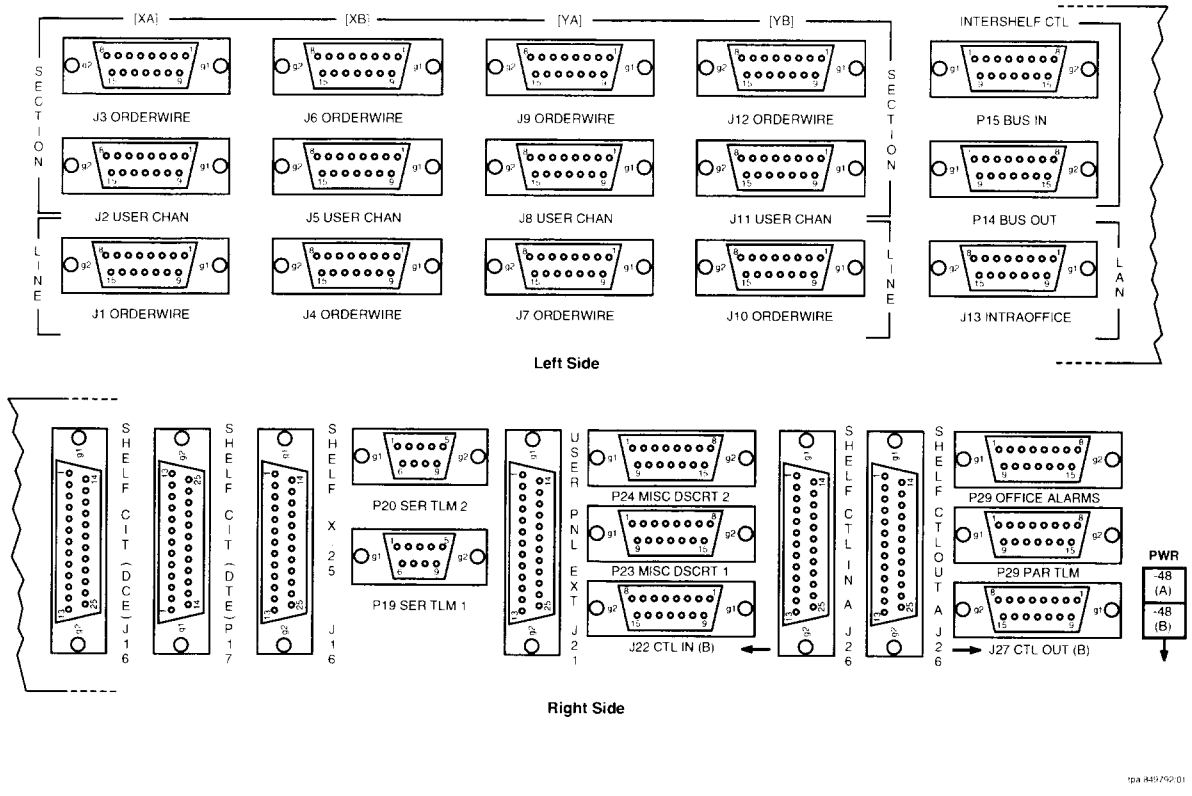


Figure 3-21. Interconnection Panel

The interconnection panel provides the following interfaces:

- **SECTION ORDERWIRE (LINE X A and LINE X B)**: These connectors provide an interface that allows an orderwire set access to the section orderwire (E1 byte) of optical line X for voice communications (local orderwire). For more information about the orderwire interface, refer to Section 6, "Operations Interfaces."
- **SECTION ORDERWIRE (LINE Y A** and **LINE Y B)**: These connectors provide an interface that allows an orderwire set access to the section orderwire (E1 byte) of optical line Y for voice communications (local orderwire). For more information about the orderwire interface, refer to Section 6, "Operations Interfaces."
- **LINE ORDERWIRE (LINE X A** and **LINE X B**): These connectors provide an interface that allows an orderwire set access to the line orderwire (E2 byte) of optical line X for voice communications (express orderwire). For more information about the orderwire interface, refer to Section 6, "Operations Interfaces."
- **LINE ORDERWIRE (LINE Y A** and **LINE Y B**): These connectors provide an interface that allows an orderwire set access to the line orderwire (E2 byte) of optical line Y for voice communications (express orderwire). For more information about the orderwire interface, refer to Section 6, "Operations Interfaces."
- **SECTION USER CHAN (LINE X A** and **LINE X B)**: These connectors provide an interface that allows access to the section user channel (F1 byte) of optical line X.
- **SECTION USER CHAN (LINE Y A** and **LINE Y B)**: These connectors provide an interface that allows access to the section user channel (F1 byte) of optical line Y.
- **INTERSHELF CTL BUS IN** and **BUS OUT**: These connectors provide shelf-to-shelf local area network connections.
- **INTRAOFFICE LAN**: This connector provides an interface for a 10-Mb/s intraoffice local area network (LAN). This connector is reserved for use in a future release.
- **SHELF CIT (DCE)**: This connector provides an interface to the CIT (DCE) port that allows local access. The CIT (DCE) port is located on the side of the Optical Line System cabinet and on the user panel of miscellaneously mounted shelves. For more information about the CIT (DCE) interface, refer to Section 6, "Operations Interfaces."
- **SHELF CIT (DTE)**: This connector provides an interface to a modem that allows dial-up access. For more information about the CIT (DTE) interface, refer to Section 6, "Operations Interfaces."

- **SHELF X.25**: This connector provides an interface to a message-based operations system that uses X.25 protocol and the Transaction Language 1 (TL1) message language. For more information about this message-based operations system interface, refer to Section 6, "Operations Interfaces."
- **SER TLM 1 and SER TLM 2**: In Release 2 and later releases, the SER TLM 1 connector provides an interface to an external miscellaneous discrete unit that provides additional environmental inputs and control outputs. For more information about the additional environmental inputs and control outputs, refer to Section 6, "Operations Interfaces." For detailed information about wiring to an external miscellaneous discrete unit, refer to 365-575-310, *Optical Line System, Installation Manual.*
- **USER PNL EXT**: This connector provides an interface to the alarm and status indicators on the indicator strip (cabinet) and user panel (miscellaneously mounted shelves). For information about the indicator strip and user panel indicators, refer to Section 6, "Operations Interfaces."
- **MISC DSCRT 1 and MISC DSCRT 2**: These connectors provide an interface to external equipment via a terminal strip. This allows an operations system to monitor and control equipment colocated with the Optical Line System. For more information about this user-settable miscellaneous discrete interface, refer to Section 6, "Operations Interfaces." For detailed information about terminal strip wiring, refer to 365-575-310, *Optical Line System, Installation Manual*, and SD-5G276-01, *Optical Line System Cabinet Application Schematic.*
- **CTL IN (B)** and **CTL OUT (B)**: These connectors provide an interface for shelf-to-shelf connections.
- **SHELF CTL IN A** and **SHELF CTL OUT A**: These connectors provide an interface for shelf-to-shelf connections.
- **OFFICE ALMS**: This connector provides an interface to the local office audible and visible alarms. For more information about this office alarm interface, refer to Section 6, "Operations Interfaces."
- **PAR TLM**: This connector provides an interface to an operations center for alarm information. For more information about this parallel telemetry interface, refer to Section 6, "Operations Interfaces."
- **PWR**: These connectors provide an interface to the –48 V power filters on the fuse panel. For more information about power, refer to Section 4, "Power."

All cabling entering the interconnection panel is connectorized with D-subminiature connectors (no wire wrap or solder). The D-subminiature connectors are used on all cables for the operation system and central office interfaces.

All fiber entering the shelf is connectorized with *ST®*, SC, or FC optical connectors. Optical connectors are located on the faceplates of the Optical Multiplexing Unit (OMU), Optical Demultiplexing Unit (ODU), Telemetry Controller (TLM), and Optical Amplifier (OA) circuit pack.

Fuse Panel

The fuse panel (Figure 3-22) provides –48 V fuses and an electrostatic discharge jack. In order not to interrupt the power while removing the fuse panel, neither the fuses nor the ESD jack are physically attached to the panel. The fuse panel can be replaced in the field.

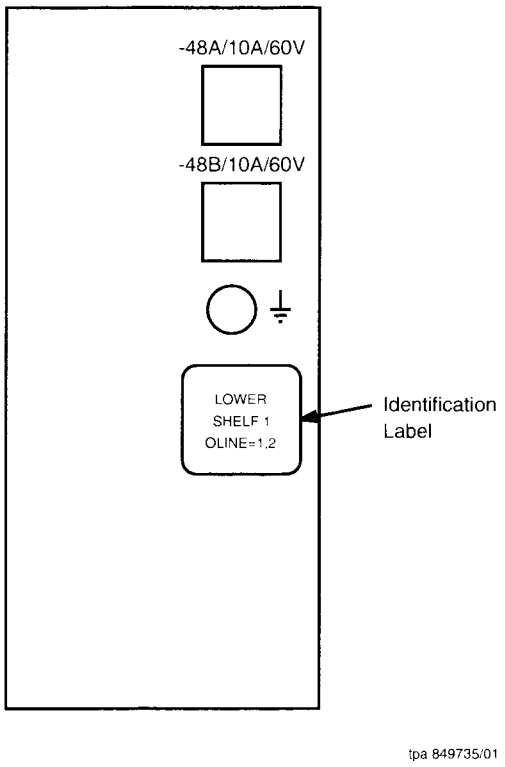


Figure 3-22. Fuse Panel

User Panel

On miscellaneously mounted shelves, the user panel (Figure 3-23) provides –48 V fuses, a power on (PWR ON) LED, an electrostatic discharge jack, and system level information.

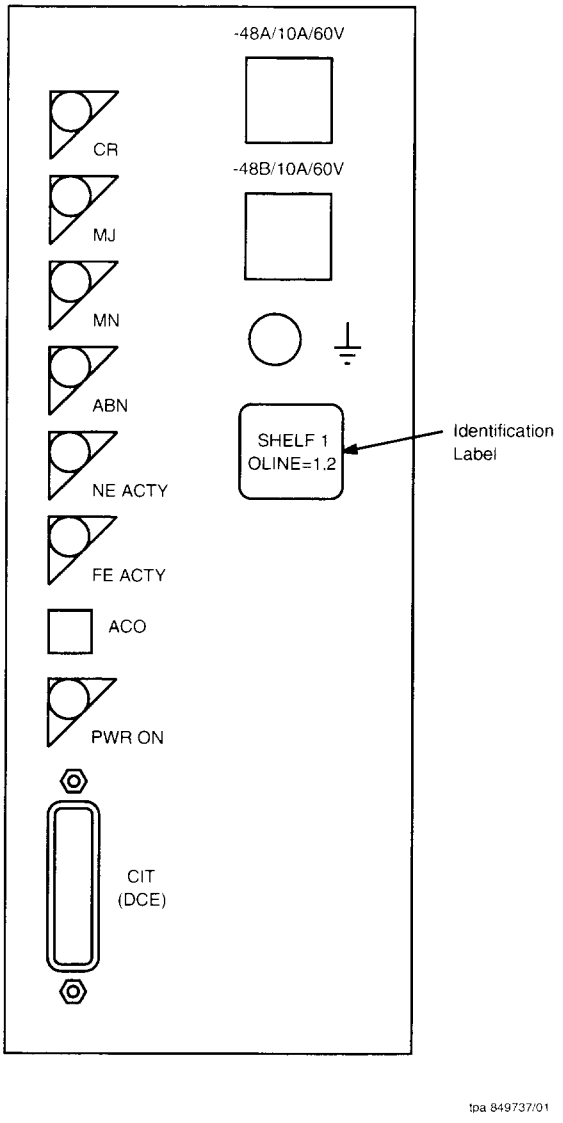


Figure 3-23. User Panel for the Miscellaneously Mounted Shelf

Heat Baffle

The heat baffles prevent heat rising from the shelf below from entering the shelf above. Front covers are provided to satisfy electromagnetic compatibility and *Newlook 2000* cabinet requirements.

Upgrades

For information about possible upgrades, consult your local Account Executive.

For more information about the Optical Line System features release plan and the availability of features, refer to 365-575-300, *Optical Line System (OLS), Applications, Planning, and Ordering Guide.*

Power

4

Contents

Overview	4-1
General	4-1
Power Distribution	4-2
Power Dissipation	4-6
LEDs	4-7

Power

4

Overview

This section describes the power distribution and dissipation of the Optical Line System (OLS).

General

The Optical Line System power distribution philosophy is based on individual rather than bulk power supplies. Each circuit pack contains DC-to-DC converters that change the office battery voltages to the voltages required. This leads to improved system reliability, since heat is dissipated uniformly across the system avoiding "hot spots."

The Optical Line System is powered by –48 volt DC. The voltage range for all the components is –42.75 to –60 volts DC as measured at the battery distribution and fuse bay.

Power Distribution

The Optical Line System accepts two –48 V DC office power feeders for feeder redundancy from the battery distribution and fuse bay (BDFB) or equivalent. Figure 4-1 shows how power is distributed in an Optical Line System cabinet. The power feeders are 15-foot, 8-gauge power feeder stubs gutter-tapped to the feeder cables going to the BDFB. Power feeders can also be ordered to length.

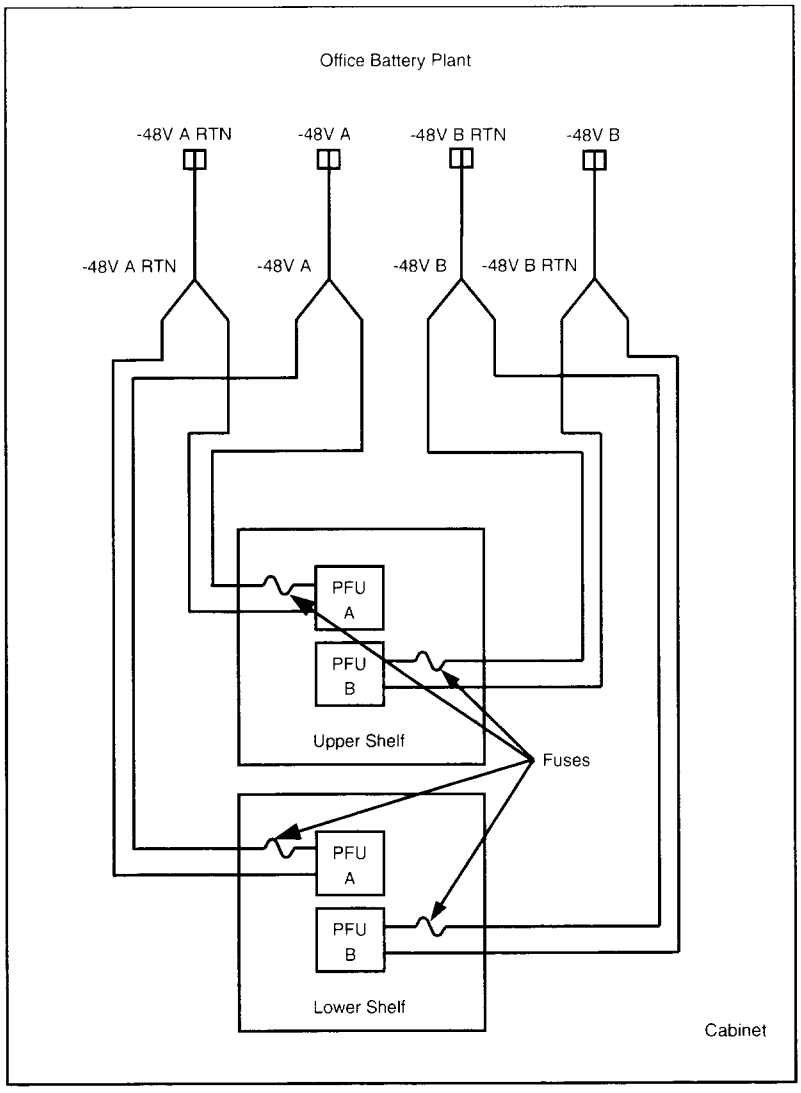


Figure 4-1. Cabinet Power Distribution

The 8-gauge power feeder stubs (power feeder A and power feeder B) enter the top of the cabinet and branch into two 10-gauge power feeder cables.

The 10-gauge power feeders for power feeder A are cabled down the left side of the cabinet to the shelves (when viewed from the front), and the 10-gauge power feeders for power feeder B are cabled down the right side of the cabinet to the shelves.

Figure 4-2 shows an example of how power is distributed to a miscellaneously mounted Optical Line System End Terminal or Repeater Shelf. The 8-gauge power feeder stubs are terminated at two 10-gauge power connectors that are connected to the user panel.

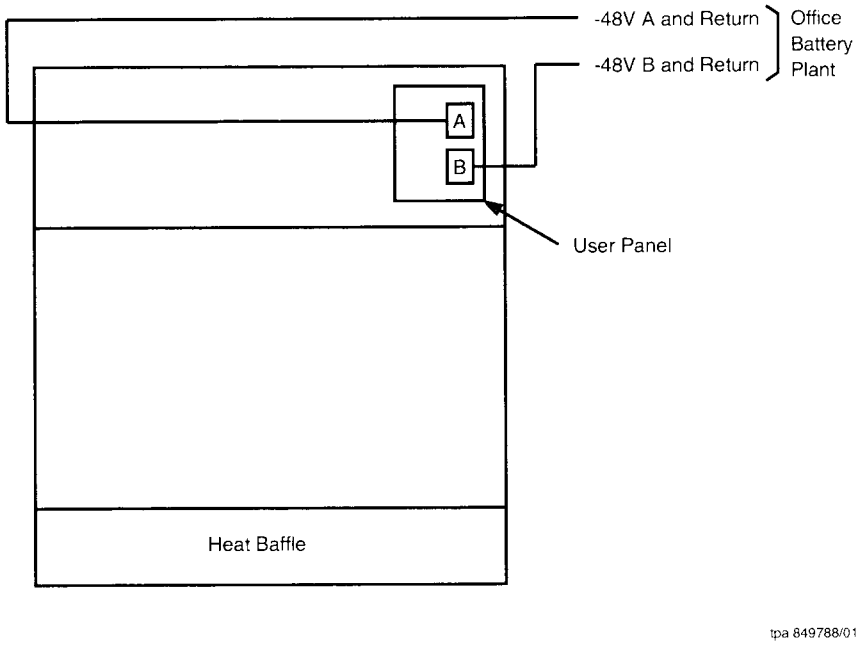


Figure 4-2. Miscellaneously Mounted Shelf Power Distribution

The two independent –48 volt office power feeders (A and B) enter each shelf via a power interface circuit and are distributed to the circuit packs using the printed backplane (Figure 4-3). The power interface circuit consists of a green PWR ON LED, two 10-amp fuses, and two power filter units (PFU).

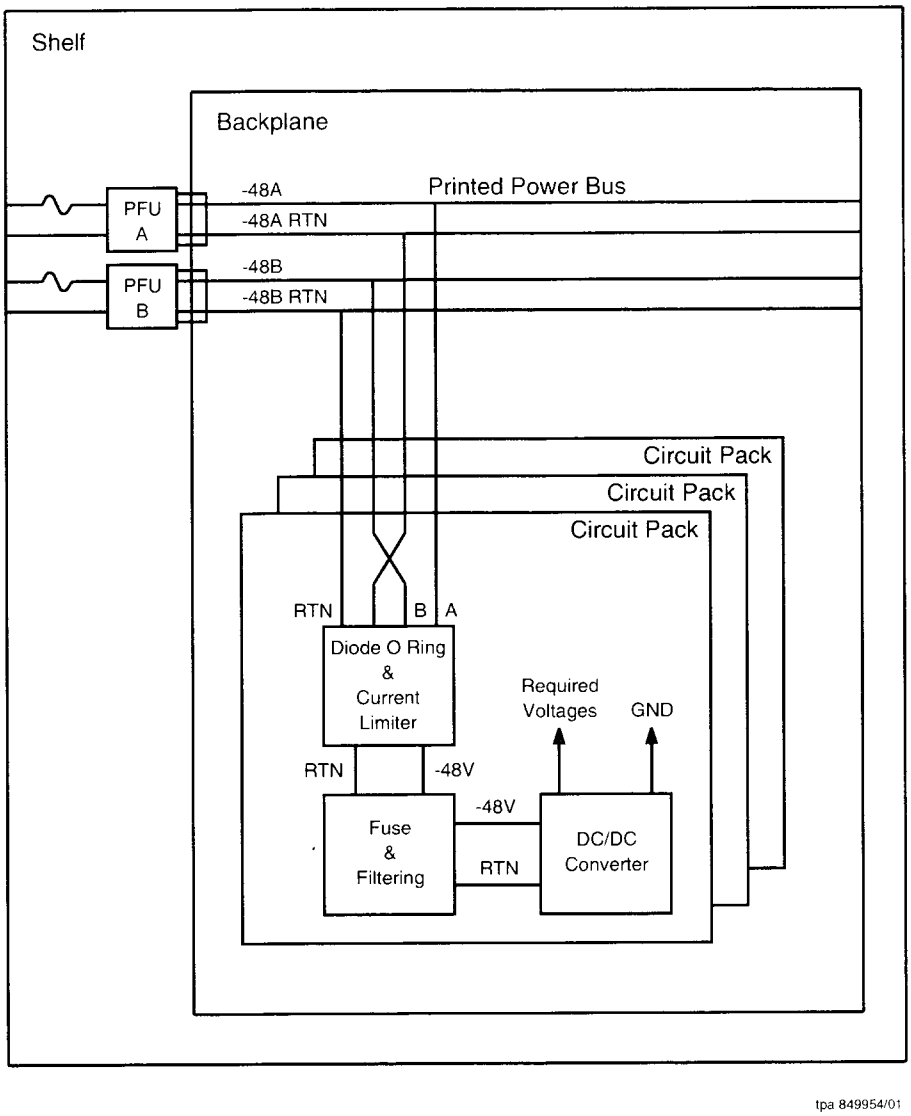


Figure 4-3. Shelf and Circuit Pack Power Distribution

The green PWR ON LED (located on the indicator strip and user panel) shows that the shelf is receiving fused –48 volt power. The green PWR ON LED will remain lighted as long as either –48 volt power feeder is supplying power to the shelf.

Within the fuse panel (cabinet) and user panel (miscellaneously mounted shelf) the power feeders are routed with 10-gauge wire to two 10-amp fuses (red lamp is lighted when blown). One fuse is for power feeder A, and the other fuse is for power feeder B.

The 10-amp fuses protect the shelf if a short-circuit occurs. The current-carrying capacity of an office battery feeder can be in the 100-ampere range.

Each power filter unit smooths the input current and reduces the converter switching noise to the allowed limit. The power filter units plug directly into the backplane via a connector.

From the power filter units, the power feeders are connected to the backplane and distributed to the circuit packs on the shelf. All circuit packs have identical common battery power and return pins. This avoids catastrophic failure if a pack is plugged into the wrong connector.

An active circuit on the circuit packs provides in-rush current protection whenever a circuit pack is inserted and also when circuit packs are equipped and bay power is applied. No special pin sequencing is required.

Each circuit pack is equipped with diodes and fuses that protect the power feeders. If one of these board-mounted fuses fails, the circuit pack fails and must be replaced with a new circuit pack. A filtering section follows the fused input. The on-board filters minimize the noise on the backplane buses. Modular DC-to-DC power converters on each circuit pack convert the –48 V to the voltages required on the circuit pack.

Power Dissipation

Table 4-1 shows the maximum power dissipation and current drains for the Optical Line System.

NOTE:
Refer to the Floor Plan Data Sheet [FPD 804-604-161-( )] for complete information on power engineering for the Optical Line System.

Table 4-1. Power Dissipation and Current Drains

Equipment Package	Maximum Power Dissipated (Watts)	Maximum Power Dissipated ($Watts/ft^2$)	Current Drain per Feeder (Amps) (Two Feeders Required) Nominal (Note 1)	Current Drain per Feeder (Amps) (Two Feeders Required) Maximum (Note 2)
Optical Line System End Terminal for 4 Bidirectional Optical Lines	252	20.2	2.6	5.9
Optical Line System Repeater for 4 Bidirectional Optical Lines	320	25.6	3.3	7.5
Optical Line System Dual End Terminal	276	22.1	2.9	6.5
Optical Line System Dual Repeater	344	27.6	3.6	8.0
Optical Line System End Terminal and Repeater	310	24.8	3.2	7.3
Optical Line System End Terminal Shelf (Miscellaneously Mounted)	138	—	1.4	3.2
Optical Line System Repeater Shelf (Miscellaneously Mounted)	172	—	1.8	4.0

Notes:

1. Nominal (List 1) current drains are used to size batteries and rectifiers. To size batteries and rectifiers, use twice the nominal current drain per feeder. These current drains represent the average busy-hour current at normal operating voltages. Nominal current drains occur at −48 V.
2. Maximum (List 2) current drains are used to size each feeder cable and fuse. To size feeder cables and fuses, use the maximum current drain per feeder. These current drains represent the peak current under worst-case operating conditions. Normally the current for the system is shared equally by both feeders. If one feeder fails, the other feeder carries the total load for both feeders (feeder A + feeder B current). Maximum current drains occur at −42.75 V.

LEDs

The green PWR ON LED (located on the indicator strip and user panel) and the circuit pack red FAULT LED (located on the OA, TLM, TOHCTL, SYSCTL, and SYSMEM circuit pack faceplates) are associated with shelf and circuit pack power. The green PWR ON LED shows that the shelf is receiving fused –48 volt power. The green PWR ON LED will remain lighted as long as either –48 volt power feeder is supplying power to the shelf.

The red FAULT LED shows circuit pack failures. If the fuse or DC-to-DC converter fails on a transmission circuit pack, the red FAULT LED will be operated via a separate power path from the System Controller (SYSCTL) circuit pack.

Control, Transmission, and Synchronization Interfaces

5

Contents

Overview 5-1

Control 5-1

Transmission 5-4

- Optical Line System End Terminal Shelf 5-4
- Optical Line System Repeater Shelf 5-8

Synchronization 5-10

Control, Transmission, and Synchronization Interfaces

5

Overview

This section describes the Optical Line System (OLS) architecture. The system control, transmission, and synchronization architecture are described down to the circuit pack level.

Control

The Optical Line System has a robust, flexible, 2-level system control architecture. Figure 5-1 shows the Optical Line System control architecture. The system control architecture distributes the monitoring and control functions down to the lowest level where a particular function is performed.

At the lowest level of the control hierarchy is the board controller that is located on each Optical Amplifier (OA) circuit pack and Telemetry Controller (TLM) circuit pack. The board controller contains a microprocessor and its supporting circuitry.

The board controller is responsible for the real-time monitor and control functions of the OA and TLM circuit packs. The board controller monitors and controls the OA and TLM circuit packs, isolates faults at the circuit pack level, controls the circuit pack FAULT LEDs, calculates the signal quality factor (SQF), controls hardware provisioning data, maintains a sanity timer, and provides debugging functions.

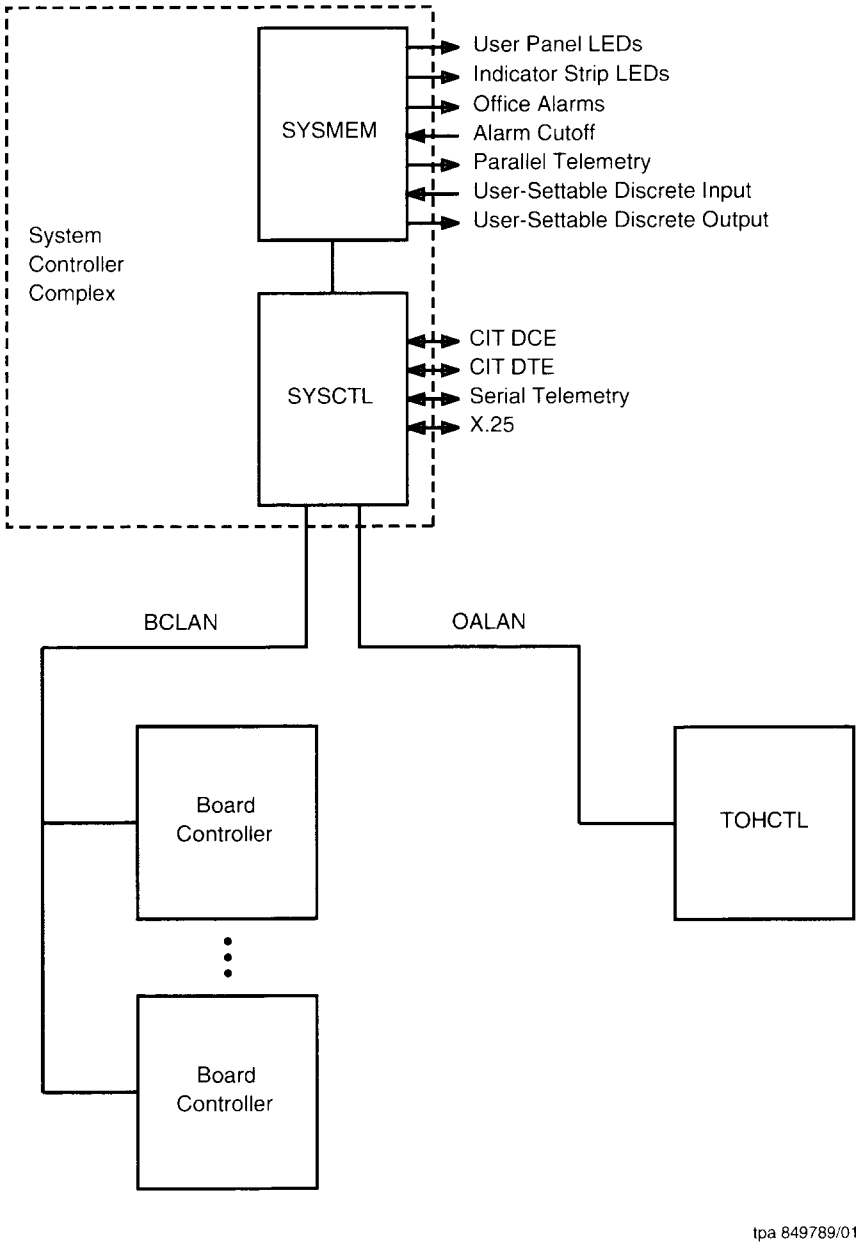


Figure 5-1. System Control Architecture

The system controller complex is the highest level of the control hierarchy. The system controller complex consists of the System Controller (SYSCTL) circuit pack and the System Memory (SYSMEM) circuit pack. The system controller complex performs the non-real time intensive functions requiring overall system knowledge. The system controller complex is responsible for system wide computations and system user interface functions. It plays a major role in providing the extensive operations, administration, maintenance, and provisioning functions. For more information about the operations, administration, maintenance, and provisioning functions, refer to Section 6, "Operations Interfaces," Section 8, "Administration and Provisioning," and Section 9, "Maintenance Description."

A single system controller complex may control up to four bidirectional optical lines. However, in applications involving crossing routes that require two system controller complexes in a single cabinet (for example, the Optical Line System Dual End Terminal), each system controller complex is independent of the other. Therefore, each system controller complex controls two bidirectional optical lines.

The Overhead Controller - Tributary (TOHCTL) circuit pack performs synchronous optical network (SONET) section data communications channel (DCC) processing functions.

The controllers within the control architecture communicate among the different hierarchical levels using internal local area networks (LANs). The board controllers communicate using the board controller local area network (BCLAN). The TOHCTL circuit pack and the system controller complex communicate using the overhead access local area network (OALAN).

The extensive control features of the Optical Line System are available through several craft and operations system (OS) interfaces. In addition to accessing the local terminal, the craft and OS interfaces can reach a remote terminal using the DCC bytes (D1-D3) in the supervisory signal. These functions are provided by the SYSCTL, SYSMEM, and TOHCTL circuit packs.

Transmission

Optical Line System End Terminal Shelf

Figure 5-2 shows a transmission block diagram of the Optical Line System End Terminal Shelf interfacing with eight OC-48 drop side signals, one IS-3 customer maintenance signal, and one bidirectional optical line.

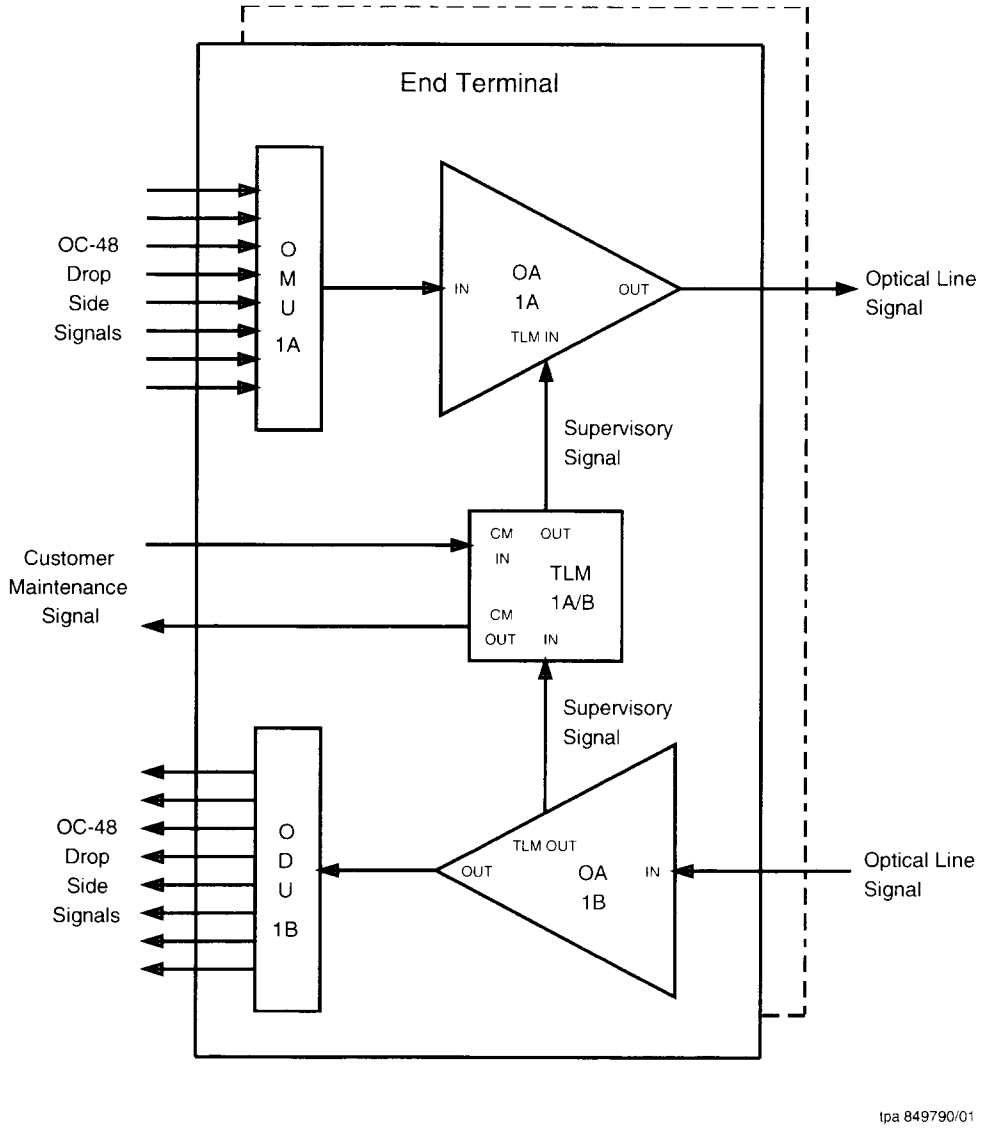


Figure 5-2. End Terminal Shelf Transmission Block Diagram

In Figure 5-2, the End Terminal Shelf is equipped with the following transmission circuit packs:

- One Optical Multiplexing Unit (OMU)
- One Optical Demultiplexing Unit (ODU)
- One Telemetry Controller (TLM) circuit pack
- Two Optical Amplifiers (OA) circuit packs.

The End Terminal Shelf may be equipped with up to two Optical Multiplexing Units (OMUs), two Optical Demultiplexing Units (ODUs), two Telemetry Controller (TLM) circuit packs, and four Optical Amplifier (OA) circuit packs. The End Terminal Shelf interfaces with up to 16 bidirectional OC-48 drop side signals and up to 2 bidirectional optical lines. The End Terminal Shelf also interfaces with up to 2 bidirectional IS-3 customer maintenance signals.

The End Terminal Shelf accepts up to 8 different wavelengths of OC-48 drop side signals in the 1.5 μm range from the following:

- **FT-2000 OC-48 Large Capacity Terminal**: The FT-2000 OC-48 Large Capacity Terminal must be equipped with Release 1.0.0-LCT or later software and 739D- or 739F-type OC48 Transmitter circuit packs.
- **FT-2000 OC-48 Add/Drop-Rings Terminal**: The FT-2000 OC-48 Add/Drop-Rings Terminal must be equipped with Release 7.2.0-ADR software and 739E-type OC48 Transmitter circuit packs.
- **SLM-2000 STM-16 Terminal**: The SLM-2000 STM-16 Terminal must be equipped with the appropriate software and Transmitter circuit packs.
- **Optical Translator**: The Optical Translator must be equipped with 41A- or 41C-type Optical Translator Units. The Optical Translator can serve as an interface between the Optical Line System and any standard SONET OC-48 or synchronous digital hierarchy (SDH) STM-16 lightwave terminal.

Table 5-1 shows the required wavelengths and power levels accepted by the End Terminal Shelf.

Table 5-1. OC-48 Drop Side Signal Wavelengths and Power Levels

Drop Side Signal	Wavelengths (nm)	Nominal Power (dBm)
1	1549.32	–4.0
2	1550.92	–5.3
3	1552.52	–6.5
4	1554.13	–7.2
5	1555.75	–7.7
6	1557.37	–8.2
7	1558.98	–8.0
8	1560.61	–6.5

The 8 different wavelengths of OC-48 drop side signals are combined onto a single fiber using dense wavelength division multiplexing by the Optical Multiplexing Unit (OMU). The OMU sends the combined signal (optical line signal) to the Optical Amplifier (OA) circuit pack.

The Telemetry Controller (TLM) circuit pack accepts one IS-3 customer maintenance signal. The TLM circuit pack formats the customer maintenance signal with the data communications channel (DCC) bytes (D1 - D3) from the Overhead Controller - Tributary (TOHCTL) circuit pack and the overhead bytes (E1, E2, and F1) from the interconnection panel. The TLM circuit pack then sends the formatted signal (supervisory signal) to the OA circuit pack. The wavelength of the supervisory signal is 1532 nm.

The OA circuit pack amplifies the optical line signal from the OMU and combines it with the 1532-nm supervisory signal from the TLM circuit pack for transmission over a standard single mode or *Truewave*® fiber.

In the receive direction, the OA circuit pack accepts a low-level optical line signal and amplifies the optical line signal. The supervisory signal is then split (optically demultiplexed) from the optical line signal and sent to the TLM circuit pack for processing. The optical line signal is sent to the Optical Demultiplexing Unit (ODU).

The Telemetry Controller (TLM) circuit pack accepts the 1532-nm supervisory signal from the OA circuit pack, and performs overhead processing functions. The DCC bytes (D1 - D3) are sent to the TOHCTL circuit pack, and the overhead bytes (E1, E2, and F1) are sent to the interconnection panel. The IS-3 customer maintenance signal is provided to the customer.

The ODU accepts the optical line signal from the OA circuit pack and splits (optically demultiplexes) the optical line signal into 8 different wavelengths of OC-48 drop side signals. The Optical Line System may transmit OC-48 signals to the following:

- **FT-2000 OC-48 Large Capacity Terminal**: The FT-2000 OC-48 Large Capacity Terminal must be equipped with Release 1.0.0-LCT or later software and any OC48 Receiver circuit pack.
- **FT-2000 OC-48 Add/Drop-Rings Terminal**: The FT-2000 OC-48 Add/Drop-Rings Terminal must be equipped with Release 7.2.0-ADR software and 839E5 OC48 Receiver circuit packs.
- **SLM-2000 STM-16 Terminal**: The SLM-2000 STM-16 Terminal must be equipped with the appropriate software and Receiver circuit packs.
- **Optical Translator**: The Optical Translator must be equipped with the 41A-, 41B-, or 41C-type Optical Translator Units. The Optical Translator can drive any standard SONET OC-48 or SDH STM-16 lightwave terminal.

For detailed circuit pack descriptions, refer to Section 7, "Circuit Pack Descriptions."

The Optical Line System provides no optical line protection switching. However, the Optical Line System does provide data communications channel switching between adjacent nodes. For more information about data communications channel switching, refer to Section 9, "Maintenance Description."

The End Terminal Shelf is used in the following equipment packages:

- Optical Line System End Terminal for 4 Bidirectional Optical Lines
- Optical Line System Dual End Terminal
- Optical Line System End Terminal and Repeater
- Optical Line System End Terminal Shelf (Miscellaneously Mounted).

For more information about the Optical Line System equipment packages, refer to Section 3, "Platform Description."

Optical Line System Repeater Shelf

Figure 5-3 shows a transmission block diagram of the Optical Line System Repeater Shelf regenerating two optical line signals (for one bidirectional optical line) and interfacing with two IS-3 customer maintenance signals.

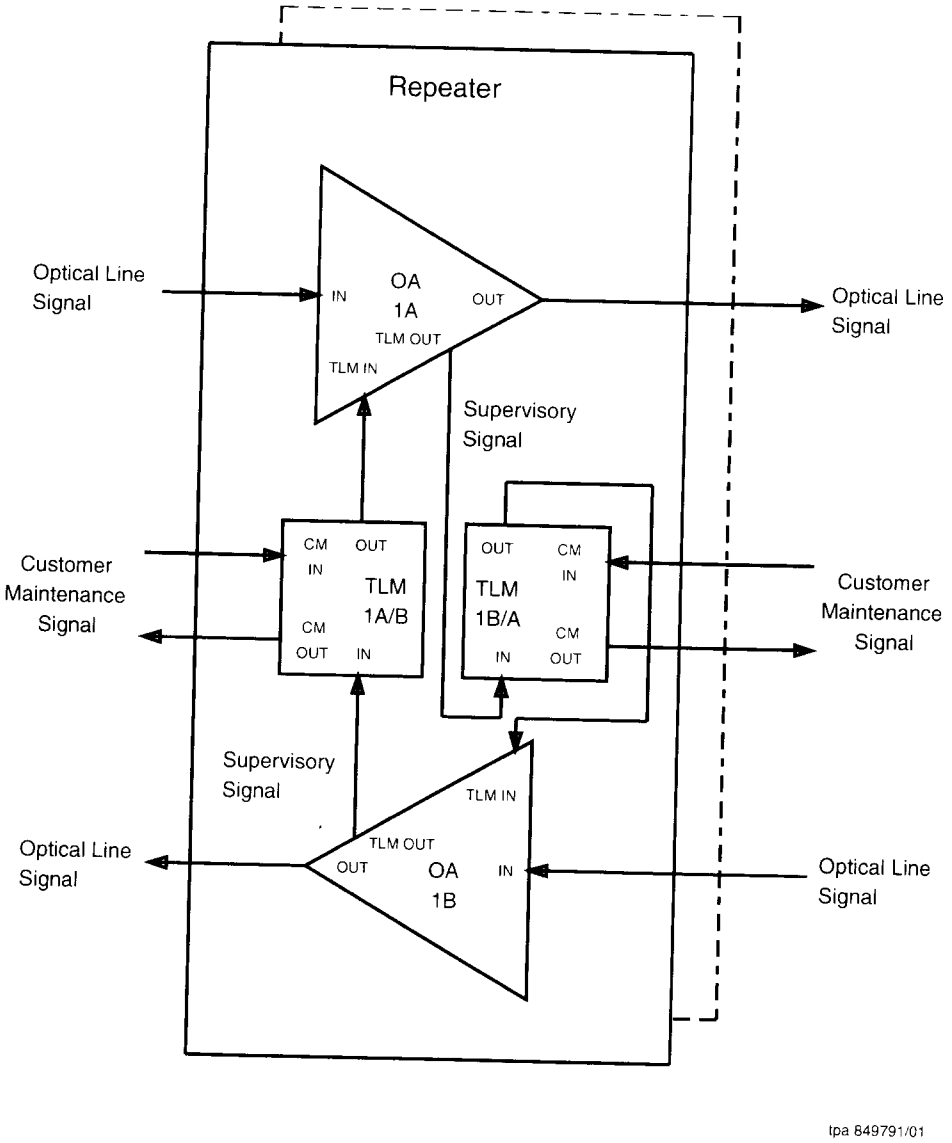


Figure 5-3. Repeater Shelf Transmission Block Diagram

In Figure 5-3, the Repeater Shelf is equipped with the following transmission circuit packs:

- Two Telemetry Controller (TLM) circuit packs
- Two Optical Amplifiers (OA) circuit packs.

The Repeater Shelf may be equipped with up to four Telemetry Controller (TLM) circuit packs and four Optical Amplifier (OA) circuit packs. The Repeater Shelf may regenerate up to four optical line signals for two bidirectional optical lines. The Repeater Shelf also interfaces with up to four bidirectional IS-3 customer maintenance signals.

In Figure 5-3, the OA 1A circuit pack accepts an incoming optical line signal produced at an End Terminal Shelf and amplifies the optical line signal. The supervisory signal is then split (optically demultiplexed) from the optical line signal and sent to the TLM 1B circuit pack for processing.

The TLM 1B circuit pack accepts the 1532-nm supervisory signal from the OA 1A circuit pack and performs overhead processing functions. The DCC bytes (D1 - D3) are sent to the TOHCTL circuit pack, and the overhead bytes (E1, E2, and F1) are sent to the interconnection panel. The IS-3 customer maintenance signal is provided to the customer.

The TLM 1A circuit pack may also accept an IS-3 customer maintenance signal. The TLM 1A circuit pack formats the customer maintenance signal with the data communications channel (DCC) bytes (D1 - D3) from the Overhead Controller - Tributary (TOHCTL) circuit pack and the overhead bytes (E1, E2, and F1) from the interconnection panel. The TLM 1A circuit pack then sends the formatted signal (supervisory signal) to the OA 1A circuit pack. The wavelength of the supervisory signal is 1532 nm.

The OA 1A circuit pack combines the amplified optical line signal with the 1532-nm supervisory signal from the TLM 1A circuit pack for transmission over a standard single mode or *Truewave* fiber.

In the opposite direction, the OA 1B circuit pack accepts an incoming optical line signal produced at an End Terminal Shelf and amplifies the optical line signal. The supervisory signal is then split (optically demultiplexed) from the optical line signal and sent to the TLM 1A circuit pack for processing.

The OA 1B circuit pack then combines the amplified optical line signal with the 1532-nm supervisory signal from the TLM 1B circuit pack for transmission over a standard single mode or *Truewave* fiber.

For detailed circuit pack descriptions, refer to Section 7, "Circuit Pack Descriptions."

The Optical Line System provides no optical line protection switching. However, the Optical Line System does provide data communications channel switching between adjacent nodes. For more information about data communications channel switching, refer to Section 9, "Maintenance Description."

The Repeater Shelf is used in the following equipment packages:

- Optical Line System Repeater for 4 Bidirectional Optical Lines
- Optical Line System Dual Repeater
- Optical Line System End Terminal and Repeater
- Optical Line System Repeater Shelf (Miscellaneously Mounted).

For more information about the Optical Line System equipment packages, refer to Section 3, "Platform Description."

Synchronization

The Optical Line System is an optically amplified line system; therefore, synchronization considerations are minimized. The only synchronization required is associated with the Telemetry Controller (TLM) circuit pack.

The following synchronization modes are used to synchronize the supervisory signal:

- If the incoming customer maintenance signal is present and valid, the incoming customer maintenance signal is used to synchronize the supervisory signal.
- If there is no incoming customer maintenance signal or the incoming customer maintenance signal is invalid, the on-board stratum 3 clock (51.84 MHz) is used to synchronize the supervisory signal.

The following synchronization modes are used to synchronize the outgoing customer maintenance signal:

- If the dropped supervisory signal is present and valid, the dropped supervisory signal is used to synchronize the outgoing customer maintenance signal.
- If there is no dropped supervisory signal or the dropped supervisory signal is invalid, the on-board stratum 3 clock (51.84 MHz) is used to synchronize the outgoing customer maintenance signal.

Operations Interfaces

6

Contents

Overview 6-1

Craft Interface Terminal (CIT) 6-1

- General 6-1
- PC with CIT-PC Software 6-2
- ASCII-Based Terminal 6-6
- Local Access Through the CIT (DCE) Port 6-7
- Dial-Up Access Using a Modem Through the CIT (DTE) Port 6-7
- Remote Access Using the Supervisory Signal Data Communications Channel (DCC) 6-9

Indicator Strip/User Panel 6-10

Fuse Panel 6-13

Circuit Pack Faceplate LED 6-14

Office Alarms Interface 6-14

Parallel Telemetry Interface 6-15

User-Settable Miscellaneous Discrete Interface 6-16

Message-Based Operations System Interface 6-18

Orderwire Interface 6-24

Operations Interfaces

6

Overview

This section presents the operations interfaces that allow access to the Optical Line System (OLS) and provide alarm and status information. Local operations interfaces include the craft interface terminal and the circuit pack faceplate light emitting diodes (LEDs). Other operations interfaces include office alarms, parallel telemetry, a user-settable miscellaneous discrete interface, a message-based operations system interface, and orderwire.

Craft Interface Terminal (CIT)

General

The craft interface terminal (CIT) provides full access to the administrative, maintenance, and provisioning capabilities of the Optical Line System. The Optical Line System supports CIT local access through the CIT (DCE) port, dial-up access using a modem through the CIT (DTE) port, and remote access using the data communications channel (DCC) of the supervisory signal.

The following functions are provided using the CIT:

- Reports
- Loopbacks and testing
- Initializing performance-monitoring storage registers
- Provisioning.

The Optical Line System also provides a security function to protect against unauthorized access to the CIT system functions (for example, provisioning). Logins, passwords, functional capabilities, authorization levels, and access to the system capabilities are provided. For more information about security, refer to Section 8, "Administration and Provisioning."

The CIT may be one of the following:

- A personal computer (PC) loaded with the CIT-PC software
- An American Standard Code for Information Interchange (ASCII) based (dumb) terminal.

The Optical Line System may be provisioned to accept a PC loaded with CIT-PC software or an ASCII-based (dumb) terminal as the CIT using the **SECURITY-Set-Security-Port** input. For more information about provisioning and the **SECURITY-Set-Security-Port** input, refer to Section 8, "Administration and Provisioning."

PC with CIT-PC Software

A PC loaded with CIT-PC software communicates with the Optical Line System using the F-interface protocol. A PC loaded with CIT-PC software has a graphical user interface that uses pull-down menus. Extensive on-line help is also provided. A PC loaded with CIT-PC software must be used to install software in the Optical Line System.

A PC must meet the following minimum requirements to be loaded with CIT-PC software and used as a CIT:

- 386SX *IBM** compatible desktop or laptop PC (25 MHz or greater clock)
- Disk drive — one 1.44 Megabyte (3.5 inch)
- Hard disk with approximately 5 Megabytes of free space
- 4 Megabytes random access memory (RAM)†
- *MS-DOS*‡ operating system, version 5.0 or later
- Serial port (EIA-232-D) — configured as COM1, COM2, COM3, or COM4
- Parallel port — configured as LPT1
- VGA color monitor.

The following PCs meet the minimum requirements and can be used as a CIT. This is not an exhaustive list of compatible PCs.

AT&T 6386 WGS computer
Kenitech 386SX-25 computer
NCR§ *Globalyst*¶ 200S or 250P computer
*Gateway 2000*** 4DX2-66N

The CIT-PC software will run in a *Windows*†† 3.1 or *Windows* 95 environment. However, the CIT-PC software was not designed to operate with *Windows*, and operation with *Windows* is not supported or recommended. Users can create multiple windows running the CIT-PC software to control the same Optical Line System. The most recent user to log in supersedes all previous users. When this user logs out, all sessions are deleted.

When running the CIT-PC software in a *Windows* 95 environment, create a shortcut to the CIT-PC program on the desktop. Refer to the *Windows* 95 user guide or the *Windows* 95 on-line help for more information about creating shortcuts.

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* Registered trademark of International Business Machines Corporation.

† No memory resident programs running in the background. 565 Kilobytes of free conventional memory and 2 Megabytes of extended memory are required. If less than 565 Kilobytes of free conventional memory are available, a memory manager (for example, HIMEM.SYS with *MS-DOS* 5.0 and later) is required to increase the free conventional memory.

‡ Registered trademark of Microsoft Corporation.

§ Trademark of NCR Corporation.

¶ Registered trademark of NCR Corporation.

** Registered trademark of Gateway 2000, Inc.

†† Trademark of Microsoft Corporation.

When running the CIT-PC software in a *Windows* 3.1 environment, a program information file (PIF) must be created for the CIT. The PIF file should specify that the task be "exclusive" for 386 enhanced mode. If running in standard mode, users should select "directly modifies" for the COM port they will be using. In addition, users should select some of the other options (like no screen saver, no task switching, etc.) to reduce the amount of memory required. A CIT icon must also be defined and linked to the PIF file.

The following is an example of a CIT.PIF for the 386 enhanced mode:

PIF Editor	
Program Filename:	CIT.EXE
Window Title:	FT-2000 CIT Interface
Optional Parameters:	
Start-up Directory:	Use your directory name!
Video Memory:	Text
Memory Requirements:	KB Required 565 KB Desired 640
EMS Memory:	KB Required 2 MB Desired 2
XMS Memory:	KB Required 0 KB Desired 1024
Display Usage:	Full Screen
Execution:	Exclusive
Close Window on Exit:	Yes

Advanced Options	
Multitasking Options:	
Background Priority:	50
Foreground Priority:	100
Detect Idle Time:	Yes
Memory Options:	
Lock Application Memory:	Yes
Display Options:	
Monitor Ports:	Emulate Text Mode
Other Options:	
Allow Fast Paste:	Yes

The following is an example of a CIT.PIF for the standard mode:

Program Filename:	CIT.EXE
Window Title:	FT-2000 CIT Interface
Optional Parameters:	
Start-up Directory:	Use your directory name!
Video Memory:	Text
Memory Requirements:	KB Required 565
XMS Memory:	KB Required 0 KB Desired 0
Directly Modifies:	COM1
Close Window on Exit:	Yes
No Screen Exchange:	Yes
Prevent Program Switch:	Yes
No Screen Save:	Yes

ASCII-Based Terminal

An ASCII-based terminal may be used to interface with the Optical Line System. Users communicate with the Optical Line System using an ASCII-based terminal and Transaction Language 1 (TL1) messages. The same TL1 message set is used by the message-based operations system interface (X.25/TL1). The TL1 messages must be entered manually by an experienced user.

The TL1 message set consists of maintenance commands (excludes autonomous messages) and cannot be used to install software in the Optical Line System. On-line help messages and menus are not supported. For detailed information about TL1 messages, refer to 824-102-176, *Optical Line System (OLS), Operations Systems Engineering Guide.*

An ASCII-based terminal must meet the following minimum requirements to be used as a CIT:

- ASCII-based data communications terminal with an 80-column display
- Scroll capability
- Local echo
- Serial port (EIA-232-D)
- Data transmission speed should be from 1200 to 9600 baud
- XON/XOFF flow control capability.

The ASCII-based terminal should be configured for byte serial data transmission of eight-bit bytes with one start bit and one stop bit. Parity should be "none" and the flow control should be "DC1/DC3." With flow control, entering **<Ctl-S>** stops the output (X/off state), and **<Ctl-Q><CR>**, **<Ctl-Q><Ctl-J>**, or **<Ctl-Q><Ctl-M>** resumes the output (X/on state).

Local Access Through the CIT (DCE) Port

The Optical Line System supports CIT local access through the CIT (DCE) port on the right front of Optical Line System cabinets and the user panel of miscellaneously mounted shelves. The CIT (DCE) port is configured as data circuit equipment (DCE) for direct CIT access. This port is also compatible with the ASCII EIA-232-D standard.

The CIT (DCE) port allows a PC running CIT-PC software to communicate with the Optical Line System using the F-interface protocol. A PC running CIT-PC software automatically selects the highest usable baud rate (up to 9600 baud).

The CIT (DCE) port can also be provisioned using the **SECURITY-Set-Security-Port** input to allow an ASCII-based terminal to access the Optical Line System. An ASCII-based terminal communicates with the Optical Line System using the same TL1 message set (excluding autonomous messages) as the message-based operations system interface (X.25/TL1). For more information about provisioning and the **SECURITY-Set-Security-Port** input, refer to Section 8, "Administration and Provisioning."

For more information about local access using the CIT (DCE), refer to DLP-501 in the "Operation and Maintenance (TOP)" Section.

NOTE:
If a CIT login session is active and the cable connecting the CIT to the CIT (DCE) port is inadvertently disconnected, reconnect the cable and continue the session. When the cable is disconnected, a "Login to NE disconnected" message will appear at the CIT; however, the Optical Line System will report that the CIT login session on the CIT (DCE) port is still active.

Dial-Up Access Using a Modem Through the CIT (DTE) Port

The Optical Line System supports CIT dial-up access using a modem through the CIT (DTE) port on the interconnection panel of the End Terminal Shelf and Repeater Shelf. The CIT (DTE) port is configured as data terminating equipment (DTE) to allow a permanent connection to a modem. The CIT (DTE) port also allows local access using a modified null modem adapter. This port is also compatible with the ASCII EIA-232-D standard.

The CIT (DTE) port allows a PC running CIT-PC software to communicate with the Optical Line System using the F-interface protocol. A PC running CIT-PC software automatically selects the highest usable baud rate (up to 9600 baud).

The CIT (DTE) port can also be provisioned using the **SECURITY-Set-Security-Port** input to allow an ASCII-based terminal to access the Optical Line System. An ASCII-based terminal communicates with the Optical Line System using the same TL1 message set (excluding autonomous messages) as the message-based operations system interface (X.25/TL1). For more information about provisioning and the **SECURITY-Set-Security-Port** input, refer to Section 8, "Administration and Provisioning."

NOTE:
If a CIT login session is active and the cable connecting the CIT to the CIT (DTE) port is inadvertently disconnected, reconnect the cable and continue the session. When the cable is disconnected, a "Login to NE disconnected" message will appear at the CIT; however, the Optical Line System will report that the CIT login session on the CIT (DTE) port is still active.

A pair of compatible modems allows remote dial-up access to the Optical Line System from a CIT over the public switched telephone network. One modem is connected to the CIT (DTE) port at the Optical Line System, and the other modem is connected to the serial port of the CIT. An internal modem in the CIT may be used instead of a stand-alone modem.

A digital data network may be used in place of the modem pair to provide remote dial-up access to the Optical Line System from the CIT.

A compatible modem or digital data network must meet the following minimum requirements:

- Full duplex
- Asynchronous
- Byte serial data transmission of eight bit bytes
- One start bit
- One stop bit
- Data transmission speed should be from 1200 to 9600 baud.

The modem must comply with one of the following transmission standards depending on the desired baud rate. These standards apply to signaling used between modems.

Standard	Baud Rate(s)
Bell 212A	1200
V.22	1200
V.22 bis	2400
V.32	4800,9600
V.32 bis	9600 (fax), 14400 (data)

For more information about establishing dial-up access using a modem or the *Datakit*® network, and local access using a null modem adapter, refer to DLP-520 in the "Operation and Maintenance (TOP)" section.

Remote Access Using the Supervisory Signal Data Communications Channel (DCC)

The Optical Line System supports the following CIT remote access using the supervisory signal data communications channel (DCC):

- Remote access from an end terminal to the other end terminal
- Remote access from an end terminal to a repeater
- Remote access from a repeater to an end terminal
- Remote access from a repeater to another repeater.

The Optical Line System supports one incoming remote login session and one outgoing login session at a time. For example, a local user can gain remote access to a remote end terminal at the same time as a remote user can gain remote access to the local end terminal.

Remote access to the FT-2000 OC-48 Large Capacity Terminal is not supported. There is no data communications channel connectivity between the Optical Line System and the FT-2000 OC-48 Large Capacity Terminal.

For more information about establishing remote access, refer to DLP-518 in the "Operation and Maintenance (TOP)" section.

Indicator Strip/User Panel

The indicator strip is located along the header (top) of the Optical Line System cabinets. It runs the full width of the cabinet over the door in the front. Figure 6-1 shows the indicator strip for the following equipment packages:

- Optical Line System End Terminal for 4 Bidirectional Optical Lines
- Optical Line System Repeater for 4 Bidirectional Optical Lines.

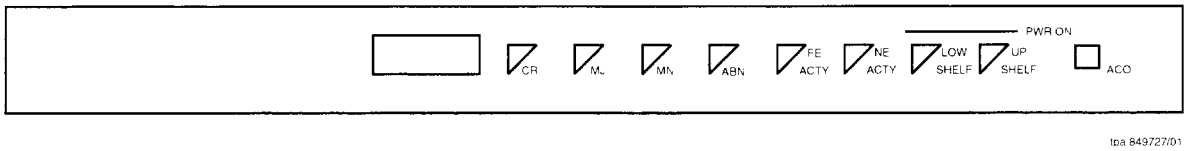


Figure 6-1. Indicator Strip (4 Bidirectional Optical Line Systems)

Figure 6-2 shows the indicator strip for the following equipment packages:

- Optical Line System Dual End Terminal
- Optical Line System Dual Repeater
- Optical Line System End Terminal and Repeater.

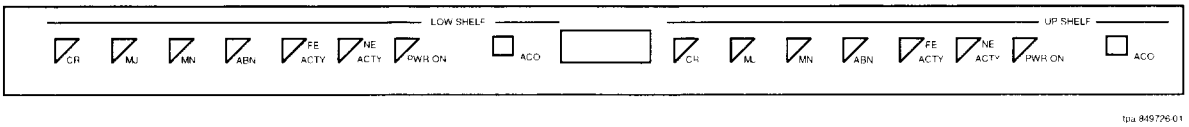


Figure 6-2. Indicator Strip (Dual Systems)

The user panel (Figure 6-3) is a factory-installed unit mounted next to the right-hand flange of the miscellaneously mounted Optical Line System End Terminal Shelf and Optical Line System Repeater Shelf.

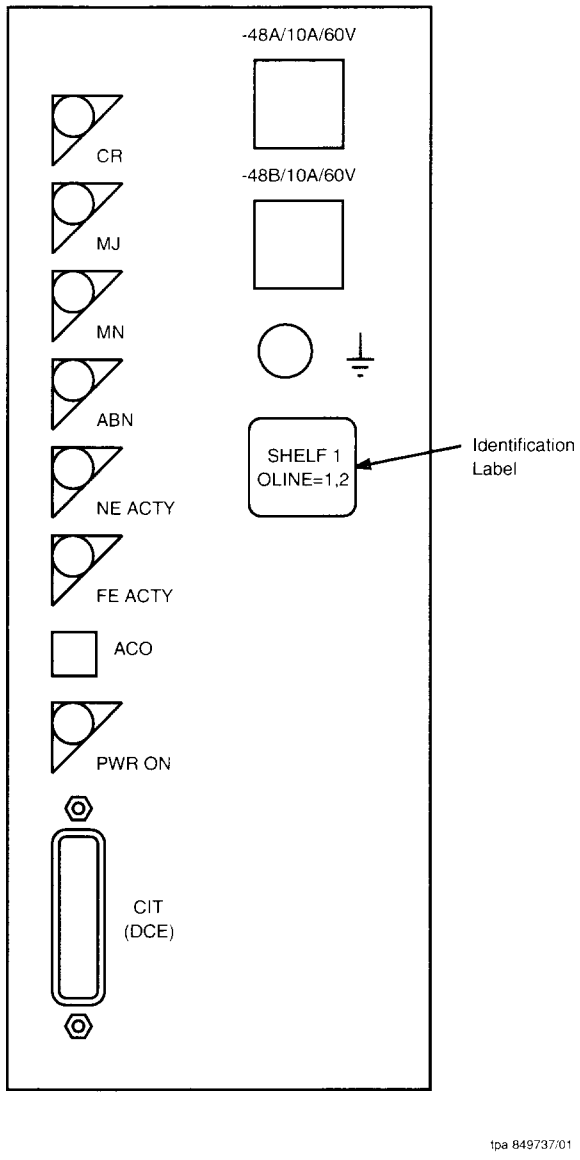


Figure 6-3. User Panel

The indicator strip and user panel LEDs show the following local system information:

- The active alarm level is shown by red LEDs for critical (CR) and major (MJ) alarms and by a yellow LED for minor (MN) alarms.
- The yellow abnormal (ABN) LED is lighted when a temporary condition potentially affecting transmission exists.
- The yellow near-end activity (NE ACTY) LED is lighted when any alarm or status condition exists at the local end terminal or local repeater site.
- The yellow far-end activity (FE ACTY) LED is lighted when any alarm or status condition exists at a remote end terminal or remote repeater site. (The remote activity reporting parameter must be enabled, using the **SECURITY-Set-Far End Communications** input. In Release 2 and later releases, the remote activity reporting parameter may be enabled through the message-based operations system interface, using X.25 protocol and TL1 messages.)
- A green alarm cutoff (ACO) pushbutton with a built-in LED activates the alarm cutoff function and lights the LED.
- The green power on (PWR ON) LED is lighted when the shelf is receiving –48 V power.

The user panel on miscellaneously mounted shelves also provides two –48 V, 10-amp fuses (one for feeder A and one for feeder B) and an electrostatic discharge jack.

Fuse Panel

The fuse panel (Figure 6-4) is a factory-installed unit mounted next to the right-hand flange of End Terminal Shelves and Repeater Shelves mounted in Optical Line System cabinets. The fuse panel has two –48 V, 10-amp fuses (one for feeder A and one for feeder B) and an electrostatic discharge jack.

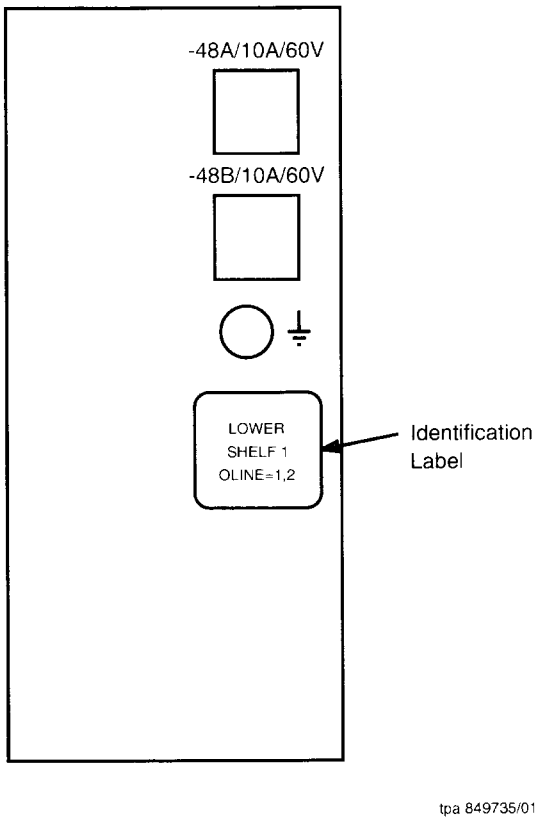


Figure 6-4. Fuse Panel

Circuit Pack Faceplate LED

To supplement the indicator strip/user panel system-level view, each Optical Amplifier (OA), Telemetry Controller (TLM), Overhead Controller - Tributary (TOHCTL), System Controller (SYSCTL), and System Memory (SYSMEM) circuit pack has a red FAULT LED on its faceplate. The Optical Multiplexing Units (OMUs) and Optical Demultiplexing Units (ODUs) do not have a red FAULT LED on their faceplate. A continuously lighted FAULT LED means that the Optical Line System has isolated a failure to this circuit pack. A flashing FAULT LED shows the following:

- A flashing FAULT LED on an OA or TLM circuit pack shows that an incoming signal to that circuit pack has failed.
- A flashing FAULT LED on the SYSMEM circuit pack shows that the contents of the nonvolatile memory differs from the duplicate copy in the SYSCTL circuit pack. It can also indicate corrupted data in the nonvolatile memory of the SYSMEM circuit pack.

Office Alarms Interface

The Optical Line System provides relays for connection to the local office audible and visible alarms. Relays are provided for each alarm condition: CR (critical), MJ (major), and MN (minor). The steady state current for office alarm connections must not exceed 0.9 A at 60 V or 1.8 A at 30 V. The maximum transient currents (20 msec duration) during initial contact closure must not exceed 9 A at 60 V or 18 A at 30 V.

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

To prevent intermittent failures from causing unnecessary maintenance activity, a provisionable incoming signal alarm delay is provided. The office alarms will not be activated unless an incoming signal condition of greater duration than the alarm delay occurs. When a failure clears, an alarm clear delay prevents premature clearing of the alarm.

To accommodate Bell Operating Company (BOC) practices, the MJ and CR relay closures are designed to allow these office alarms to be OR'ed together and reported as an office MJ alarm.

As with the indicator strip and user panel LEDs, when multiple alarm conditions occur, the highest level office alarm (audible and visible) is activated. When the highest level alarm condition clears, the office alarm "bumps down" to the next highest level alarm condition.

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

The office alarms (OFFICE ALMS) interface is located on the interconnection panel of the End Terminal Shelf and Repeater Shelf. Refer to Section 3, "Platform Description," for more information about the physical location of the office alarm interface.

Parallel Telemetry Interface

The parallel telemetry interface of the Optical Line System brings a minimum set of alarm information to an operations center. Six alarm closures show critical, major, and minor alarms for the local and remote network elements. The appropriate contact is activated when an alarm condition is detected.

The parallel telemetry interface is designed for a maximum open circuit voltage of 60 V and a maximum current of 35 mA.

As with the user panel LEDs and office alarms, when multiple alarms are active, the highest level parallel telemetry closure is activated. When the highest level alarm clears, the parallel telemetry output "bumps down" to the next highest level active alarm.

Since the parallel telemetry alarm closures reflect the office alarms, the alarm delay and alarm clear parameters set for office alarms also apply to parallel telemetry alarm closures.

The parallel telemetry (PAR TLM) interface is located on the interconnection panel of the End Terminal Shelf and Repeater Shelf. Refer to Section 3, "Platform Description," for more information about the physical location of the parallel telemetry interface.

Refer to 824-102-176, *Optical Line System (OLS), Operations Systems Engineering Guide*, for detailed information about the parallel telemetry interface.

User-Settable Miscellaneous Discrete Interface

The user-settable miscellaneous discrete interface allows an operations system to monitor and control equipment colocated with the Optical Line System through a set of input and output contact closures. In Release 1, the Optical Line System provides sixteen environmental inputs and four control outputs. The environmental inputs are used to monitor environmental conditions (for example, open door, high temperature, etc.), and the control outputs are used control external equipment (for example, pumps, generators, etc.).

In Release 2 and later releases, the Optical Line System also provides a serial telemetry interface to an external miscellaneous discrete unit that provides an additional 128 miscellaneous discrete environmental inputs and 32 control outputs. The serial telemetry interface transfers alarm, status, and control information to and from the external miscellaneous discrete unit via a 2400-baud EIA-422 port (SER TLM 1).

The external miscellaneous discrete unit is an external unit manufactured by *DANTEL** Incorporated and *HARRIS*† Corporation that supports the additional miscellaneous discrete environmental inputs and control outputs. The external miscellaneous discrete unit detects failures at a colocated Optical Translator and reports them to the Optical Line System. The *DANTEL* external miscellaneous discrete unit can be miscellaneously mounted or wall mounted. The *HARRIS* external miscellaneous discrete unit can be miscellaneously mounted only.

Any external customer equipment to be monitored by the Optical Line System must provide the electrical equivalent of a contact closure across the corresponding environmental input wiring pairs. The contact closure must be capable of passing at least 10 mA of drive current.

The power source to enable the Optical Line System to control external customer equipment may be from a minimum of 3 V to a maximum of 72 V. The Optical Line System provides a unidirectional opto-isolator connection across each corresponding control output wiring pair. The load current across each control output wiring pair must be limited by the external customer equipment and must not exceed 35 mA. For detailed wiring information, refer to 365-575-310, *Optical Line System (OLS), Installation Manual* and SD-5G276-01, *Optical Line System Cabinet Application Schematic.* For detailed information about wiring from the Optical Translator to the external miscellaneous discrete unit, refer to 365-575-410, *Optical Translator, Installation Manual.*

* Registered trademark of Dantel Incorporated.

† Registered trademark of Harris Corporation.

In Release 1, the environmental inputs are addressed by the numbers 1 through 16, and the control outputs are addressed by the numbers 1 through 4. In Release 2, the additional environmental inputs are addressed starting with the number 17, and the additional control outputs are addressed starting with the number 5. The environmental inputs and control outputs can be assigned in any order. Refer to Section 8, "Administration and Provisioning," for information about provisioning a string of characters associated with an environmental input or control output.

Operations system access to individual environmental inputs and control outputs at the Optical Line System is provided through the X.25 interface.

Local access to the environmental inputs is provided through the CIT interface using the **FAULT-Retrieve-Alarm (and Status)** input. Local access to the control outputs is provided through the CIT interface using the **FAULT-Operate-Control** and **FAULT-Release-Control** inputs. For more information, refer to the **FAULT-Retrieve-Alarm (and Status)**, **FAULT-Operate-Control** and **FAULT-Release-Control** inputs in Section 11, "Craft Interface Terminal Usage."

The miscellaneous discrete (MISC DSCRT 1 and MISC DSCRT 2) interfaces are located on the interconnection panel of the End Terminal Shelf and the Repeater Shelf. The MISC DSCRT 1 and MISC DSCRT 2 interfaces each provide eight environmental inputs and two control outputs. Refer to Section 3, "Platform Description," for more information about the physical location of the miscellaneous discrete interface.

The serial telemetry (SER TLM 1) interface is located on the interconnection panel of the End Terminal Shelf and the Repeater Shelf. Refer to Section 3, "Platform Description," for more information about the physical location of the serial telemetry interface.

For more information about the *DANTEL* external miscellaneous discrete unit, refer to the *Installation and Operation Manual* provided with the unit. For more information about the *HARRIS* external miscellaneous discrete unit, refer to the *User Guide* provided with the unit.

Message-Based Operations System Interface

The Optical Line System provides a message-based operations system interface to the Bellcore Network Monitoring and Analysis (NMA) operations system, the Bellcore Operations System/Intelligent Network Elements (OPS/INE), and the Lucent Technologies TRANSVU II systems. This interface uses an X.25 protocol and the Transaction Language 1 (TL1) message language. Different virtual circuits on the X.25/TL1 interface may be used to interface to different operations systems.

In Release 1, the Optical Line System supports two permanent virtual circuits (PVCs) and up to six switched virtual circuits (SVCs). In Release 2, the Optical Line System supports up to 16 SVCs. The OS type and the associated TL1 autonomous messages are provisionable on a virtual circuit basis using the **SECURITY-Set-Security-Port** input. The OS type is a filter that determines the types of TL1 autonomous messages that are transmitted on a virtual circuit to the OS. The calling address is also provisionable for each switched virtual circuit using the **SECURITY-Set-Security-Port** input. The calling address is used to determine the X.25 logical channel number for switched virtual circuits. There is a fixed association between permanent virtual circuits and X.25 logical channel numbers. The interface operates over a synchronous line at 1200 to 19,200 baud.

NOTE:
If an X.25 login session is active and the cable connected to the Shelf X.25 port is inadvertently disconnected, reconnect the cable and continue the session. When the cable is disconnected, the Optical Line System will report that the X.25 login session on the Shelf X.25 port is still active.

The Optical Line System also provides a security function for the X.25/TL1 interface to protect against unauthorized access to the system functions (for example, provisioning). Logins, passwords, functional capabilities, authorization levels, and access to the system capabilities are provided. For more information about security, refer to Section 8, "Administration and Provisioning."

The Optical Line System supports an X.25/TL1 interface to report alarm and status conditions and performance monitoring data to the NMA, OPS/INE, and TRANSVU II systems. The X.25/TL1 interface provides significantly more detailed information, such as identifying specific circuit packs and facilities, than the parallel telemetry interface. The TL1 messages are based on Bellcore's TR-TSY-000833, Issue 3, Rev. 1*.

* Where TR-TSY-000833, Issue 3, Rev. 1 was deficient, the FT-2000 OC-48 Lightwave System conforms to Bellcore's TR-NWT-000833, Issue 4.

An Optical Line System network element can also operate as a TL1 gateway network element (GNE) that serves as a single interface to the local X.25 message-based operations system for other Optical Line System network elements in a network.

The gateway network element receives operations information from all the Optical Line System network elements in the network through the supervisory signal data communications channel (DCC) and reports that information, along with its own, to the X.25 message-based operations system. The operations information is in the form of TL1 messages. The operations system can also send TL1 commands through the gateway network element to any Optical Line System network element in the network.

Any Optical Line System network element in a network will automatically operate as a gateway network element if it receives TL1 messages through the local X.25 interface that are for another network element in the network.

The number of gateway network elements in a network is based on operation needs. For example, to reduce the number of X.25 links between the network and the operations system, one Optical Line System network element may operate as the gateway network element. If redundancy is desired, two or more Optical Line System network elements may operate as gateway network elements.

NOTE:
A single network element may be the TL1 gateway network element, the directory services network element (DS-NE), and the alarm group network element (AGNE). However, for networks larger than 5 to 7 nodes, it is recommended that the TL1 gateway network element, DS-NE, and AGNE functions reside at different network elements.

The message-based operations interface (Shelf X.25) is located on the interconnection panel of the End Terminal Shelf and the Repeater Shelf. Refer to Section 3, "Platform Description," for more information about the physical location of the Shelf X.25.

The following autonomous messages are supported:

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

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

REPORT CONDITIONS (`REPT COND`) —
autonomous reports of active status (nonalarmed) conditions

REPORT DATABASE CHANGES (`REPT DBCHG`) —
autonomous reports of internal changes and optical line termination parameters

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

The following command/response messages are supported:

ACTIVATE-USER (ACT-USER) —
activates a TL1 access login session

ALLOW-MESSAGE (ALW-MSG) —
allows transmission of autonomous messages

CANCEL-USER (CANC-USER) —
terminates a TL1 login session

COPY-PROGRAM (CPY-PRGM) —
copies the system software from one network element to another network element

DELETE-TID ADDRESS MAP (DLT-TADRMAP)* —
deletes a TID from the network address map at the DSNE

DELETE-USER-SECURITY (DLT-USER-SECU) —
deletes the security parameters associated with a user

EDIT-DATE (ED-DAT) —
changes the system date and time

EDIT-PASSWORD ID (ED-PID) —
changes the user password

EDIT-USER-SECURITY (ED-USER-SECU) —
changes the login ID, password, and/or user privileges of any non-privileged user

ENTER-CHANNEL ID-SECURITY (ENT-CID-SECU)* —
enters set port security parameters for X.25, DTE, DCE, DCC, and SER TLM ports

ENTER-FAR END COMMUNICATIONS (ENT-FECOM)* —
enables/disables remote access capabilities

ENTER-NETWORK ELEMENT-SECURITY (ENT-NE-SECU)* —
enters the global security parameters of the system

ENTER-rr (ENT-rr) —
provisions various parameters of the supervisory channel, optical line channels, and customer maintenance signal ports

ENTER-SYSTEM (ENT-SYS) —
enters network element name and other system level parameters

ENTER-USER-SECURITY (ENT-USER-SECU) —
enters the security parameters associated with a user

---

* Available in Release 2 and later releases.

INHIBIT-MESSAGE (**INH-MSG**) —
inhibits transmission of all autonomous TL1 messages, office alarms, and/or parallel telemetry from a network element

INITIALIZE-REGISTER (**INIT-REG**) —
initializes all current day and/or current 15-minute performance-monitoring storage registers

INITIALIZE-SYSTEM (**INIT-SYS**) —
initializes (resets) provisionable parameters to their original value and restarts the network element software

OPERATE-ALARM CUTOFF (**OPR-ACO**) —
operates alarm cutoff to silence the audible office alarms

OPERATE-EXTERNAL-CONTROL (**OPR-EXT-CONT**) —
operates an external miscellaneous discrete control output

RELEASE-EXTERNAL-CONTROL (**RLS-EXT-CONT**) —
releases an external miscellaneous discrete control output

RETRIEVE-ALARM (**RTRV-ALM**) —
retrieves active alarm conditions

RETRIEVE-ALARM-ENVIRONMENT (**RTRV-ALM-ENV**) —
retrieves active environmental alarm conditions

RETRIEVE-ALARM-NETWORK (**RTRV-ALM-NTWK**)* —
retrieves active network alarm conditions

RETRIEVE-AUTONOMOUS OUTPUT (**RTRV-AO**) —
retrieves copies of autonomous TL1 messages

RETRIEVE-ATTRIBUTE-ALARM (**RTRV-ATTR-ALM**) —
retrieves the values of the incoming signal alarm delay, alarm clear delay interval, and power minor alarm parameters

RETRIEVE-ATTRIBUTE-CONTROL (**RTRV-ATTR-CONT**) —
retrieves the provisioned description of the miscellaneous discrete control outputs

RETRIEVE-ATTRIBUTE-ENVIRONMENT (**RTRV-ATTR-ENV**) —
retrieves the provisioned description of the miscellaneous discrete environmental inputs

RETRIEVE-ATTRIBUTE (**RTRV-ATTR-rr**) —
retrieves the notification code associated with incoming signal failure events

RETRIEVE-BASELINE (**RTRV-BASELINE**)* —
retrieves the time and the reason for last baseline of the optical parameters of optical lines

---

* Available in Release 2 and later releases.

RETRIEVE-CHANNEL ID SECURITY (**RTRV-CID-SECU**)* —
retrieves the current CIT or TL1 port provisioning information

RETRIEVE-CONDITION (**RTRV-COND**) —
retrieves all active alarm and status conditions

RETRIEVE-DATE (**RTRV-DAT**)* —
retrieves the date and daylight savings time provisioning information

RETRIEVE-EQUIPMENT (**RTRV-EQPT**) —
retrieves circuit pack and version information for one or more slots

RETRIEVE-FAR END COMMUNICATIONS (**RTRV-FECOM**)* —
retrieves the provisioned state of the OC-48 section data communications channel (DCC)

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

RETRIEVE-LOG (**RTRV-LOG**)* —
retrieves the history log

RETRIEVE-MAP-NETWORK (**RTRV-MAP-NETWORK**) —
retrieves a list of all network elements in the local synchronous optical network (SONET) subnetwork

RETRIEVE-MAP-RING (**RTRV-MAP-RING**) —
retrieves a list of all network elements in the local network

RETRIEVE-NETWORK ELEMENT-SECURITY (**RTRV-NE-SECU**)* —
retrieves the network element global security information

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

RETRIEVE-PERFORMANCE MONITORING-START TIME (**RTRV-PM-STIME**)* —
retrieves the start time for measuring the day bins

RETRIEVE-RELATIVE SIGNAL POWER (**RTRV-RELSPR**)* —
retrieves the instantaneous signal power of each channel in an optical line relative to the strongest signal in a scale of 0 to 100

RETRIEVE-ATTRIBUTES (**RTRV-rr**) —
retrieves attributes and state information for high and low speed transmission objects

RETRIEVE-STATE (**RTRV-STATE**)* —
retrieves network element protection switching state and switch priority information

---

* Available in Release 2 and later releases.

RETRIEVE-SYSTEM (**RTRV-SYS**) —
retrieves network element name and other system level parameters

RETRIEVE-THRESHOLD (**RTRV-TH**) —
retrieves the current threshold level of one or more monitored parameters

RETRIEVE-USER-SECURITY (**RTRV-USER-SECU**) —
retrieves security parameters associated with a login

SET-ATTRIBUTE-ALARM (**SET-ATTR-ALM**) —
sets the values of the incoming signal alarm delay, alarm clear delay interval, and power minor alarm parameters

SET-ATTRIBUTE-CONTROL (**SET-ATTR-CONT**) —
provisions the description of the miscellaneous discrete control outputs

SET-ATTRIBUTE-ENVIRONMENT (**SET-ATTR-ENV**) —
provisions the description of the miscellaneous discrete environmental inputs

SET-ATTRIBUTE (**SET-ATTR-rr**) —
sets notification code associated with incoming signal failure events

SET-PERFORMANCE MONITORING-START TIME (**SET-PM-STIME**)* —
sets the start time for measuring all 24-hour performance monitoring parameters

SET-SITE ID (**SET-SID**) —
sets the target identifier (TID) of the network element

SET-THRESHOLD (**SET-TH**) —
sets the current threshold level of one or more monitored parameters

UPDATE-SYSTEM (**UPD-SYS**) —
updates the state of all the automatically provisioned parameters

The X.25/TL1 interface (X.25) is located on the interconnection panel of the End Terminal Shelf and Repeater Shelf. Refer to Section 3, "Platform Description," for more information about the physical location of the X.25/TL1 interface.

Refer to 824-102-176, *Optical Line System (OLS), Operations Systems Engineering Guide*, for detailed information about the X.25/TL1 interface and TL1 message/command descriptions.

* Available in Release 2 and later releases.

Orderwire Interface

The orderwire and section user channel interfaces provide a facility for voice communications between adjacent network elements for maintenance personnel to perform facility maintenance. The End Terminal Shelf and Repeater Shelf provide the following channels per optical line and per direction for customer use:

- 64-kb/s line orderwire (SONET E2 byte)
- 64-kb/s section orderwire (SONET E1 byte)
- 64-kb/s section user channel (SONET F1 byte).

The line orderwire, section orderwire, and section user channel interfaces are EIA-422.

The End Terminal Shelf can provide up to a maximum of 3 channels (2 orderwire and 1 user channel) per optical line for customer use. The Repeater Shelf can provide up to a maximum of 3 channels (2 orderwire and 1 user channel) per optical line and per direction for customer use.

The line orderwire (LINE ORDERWIRE), section orderwire (SECTION ORDERWIRE), and section user channel (SECTION USER CHAN) interfaces are located on the interconnection panel of the End Terminal Shelf and Repeater Shelf. Refer to Section 3, "Platform Description," for more information about the physical location of the line and section orderwire interfaces.

Standard equipment can be connected to the orderwire interface. For example, a *DANTEL** orderwire shelf may be used with the Optical Line System. The orderwire and user channel interfaces provide channels for voice communications on a point-to-point basis between Optical Line System End Terminals and/or Optical Line System Repeaters. Each orderwire and user channel interface† provides a balanced pair for the following signals:

- Transmit clock
- Transmit frame
- Receive clock
- Receive frame
- Receive data

The user must provide a balanced pair for the transmit data signal.

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* Registered trademark of DANTEL Incorporated.

† The transmit and receive directions are not necessarily synchronized with each other. The phase and frequency will differ. The receive clock and frame signals are recovered from the incoming OC-48 signal. The transmit clock and frame signals are derived locally or derived from the incoming customer maintenance signal.

All the balanced pairs use RS-422 signal levels and characteristics. These signals are provided as 12 pins in a 15-pin D-sub connector field. For detailed wiring and connector information, refer to SD-5G276-01, *Optical Line System Cabinet Application Schematic*.

The user side of the orderwire interface is configured as data circuit equipment (DCE). Internally, the Optical Line System flips the transmit and receive data streams.

Circuit Pack Descriptions

7

Contents

Overview 7-1

General 7-1

Circuit Pack/Unit and Software Compatibility 7-2

Control 7-3

- SYSCTL (LEA1) Circuit Pack Description 7-3
  - Purpose of Circuit 7-3
  - Faceplate LED 7-3
  - General Description of Operation 7-4
  - Detailed Description of Operation 7-4
    - Control Circuitry 7-4
    - Memory 7-4
    - Interface Circuitry 7-5
    - Power Circuitry 7-6
  - Quick Reference Summary 7-7
    - Control Functions 7-7
    - Interface Functions 7-7
- SYSMEM (LEA2) Circuit Pack Description 7-8
  - Purpose of Circuit 7-8
  - Faceplate LED 7-8
  - General Description of Operation 7-9
  - Detailed Description of Operation 7-9
    - Memory 7-9
    - Office Alarms Interface 7-11
    - Indicator Strip/User Panel LEDs and Controls 7-11
    - Parallel Telemetry Interface 7-12
    - User-Settable Miscellaneous Discrete Interface 7-12

Contents

Power Circuitry 7-12
Quick Reference Summary 7-13
Control Functions 7-13
Interface Functions 7-13
- TOHCTL (LEA5) Circuit Pack Description 7-14
Purpose of Circuit 7-14
Faceplate LED 7-14
General Description of Operation 7-15
Detailed Description of Operation 7-15
Control Circuitry 7-15
Memory 7-16
Interface Circuitry 7-16
Power Circuitry 7-17
Quick Reference Summary 7-17

Transmission 7-18

- TLM (LDA1) Circuit Pack Description 7-18
Purpose of Circuit 7-18
Faceplate LED 7-18
General Description of Operation 7-19
Detailed Description of Operation 7-19
Transmission Circuitry 7-19
Control Circuitry 7-21
Overhead Controller Circuitry 7-22
Timing Circuitry 7-22
Fault Detection Circuitry 7-22
Power Circuitry 7-23
Quick Reference Summary 7-24
Transmit Functions 7-24
Receive Functions 7-24
Timing and Control Functions 7-25
Maintenance Signal Functions 7-25
- OMU (505A) Description 7-26
Purpose of Circuit 7-26
Faceplate LED 7-26
General Description of Operation 7-27
Detailed Description of Operation 7-27
Transmission Circuitry 7-27
Control Circuitry 7-28
Quick Reference Summary 7-28
Transmit Functions 7-28

Contents

- ODU (605A) Description 7-29
  - Purpose of Circuit 7-29
  - Faceplate LED 7-29
  - General Description of Operation 7-30
  - Detailed Description of Operation 7-30
    - Transmission Circuitry 7-30
    - Control Circuitry 7-31
  - Quick Reference Summary 7-31
    - Receive Functions 7-31
- OA (LEA6 and LEA7) Circuit Pack Description 7-32
  - Purpose of Circuit 7-32
  - Faceplate LED 7-32
  - General Description of Operation 7-33
  - Detailed Description of Operation 7-34
    - Transmission Circuitry 7-34
    - Control Circuitry 7-35
    - Fault Detection Circuitry 7-36
    - Power Circuitry 7-37
  - Quick Reference Summary 7-38
    - Transmit Functions 7-38
    - Control Functions 7-38

Circuit Pack Descriptions

7

Overview

This section provides a detailed functional description of the Optical Line System (OLS) circuit packs and units.

General

The Optical Line System circuit packs and units are divided into two main categories:

- Control circuit packs
  - — System Controller (SYSCTL) LEA1
  - — System Memory (SYSMEM) LEA2
  - — Overhead Controller - Tributary (TOHCTL) LEA5
- Transmission circuit packs/units
  - — Optical Amplifier (OA) LEA6
  - — Optical Amplifier (OA) LEA7
  - — Optical Multiplexing Unit (OMU) 505A
  - — Optical Demultiplexing Unit (ODU) 605A
  - — Telemetry Controller (TLM) LDA1.

Circuit Pack/Unit and Software Compatibility

Refer to Table 7-1 for information about circuit packs/units and compatible software.

Table 7-1. Circuit Packs/Units and Compatible Software

Circuit Pack/Unit		Compatible Software	
Code	**Name**	**R1.0.0-OLS**	**R2.0.0-OLS**
LDA1	TLM	X	X
LEA1	SYSCTL	X	X
LEA2	SYSMEM	X	X
LEA5	TOHCTL	X	X
LEA6	OA	X	X
LEA7	OA		X
505A	OMU	X	X
605A	ODU	X	X

Control

SYSCTL (LEA1) Circuit Pack Description

Purpose of Circuit

The System Controller (SYSCTL) circuit pack is the main controller in the system. It has control over all Optical Line System functions and, together with the System Memory (SYSMEM) circuit pack, provides all user interfaces to the system.

Faceplate LED

The SYSCTL circuit pack has a red FAULT LED on its faceplate (Figure 7-1). The red FAULT LED is lighted when a circuit pack failure is detected or when the circuit pack loses power. If the circuit pack loses power, a separate path is provided for power from the SYSMEM circuit pack to light the FAULT LED on the SYSCTL circuit pack.

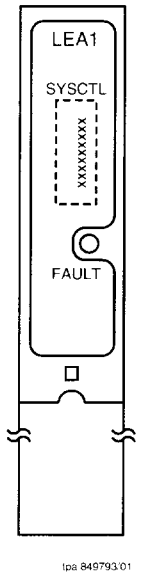


Figure 7-1. SYSCTL (LEA1) Circuit Pack

The sanity check circuitry detects hardware and software faults. When a fault occurs, the microprocessor is reset and the FAULT LED on the circuit pack faceplate is lighted.

General Description of Operation

The SYSCTL circuit pack provides overall administrative control of the Optical Line System. It performs system-wide computations and performance monitoring. It also provides the serial user interfaces.

The SYSCTL circuit pack also interfaces with the System Memory (SYSMEM), and Overhead Controller - Tributary (TOHCTL) circuit packs.

Detailed Description of Operation

Control Circuitry

Microprocessor. Figure 7-2 provides an overall block diagram of the SYSCTL circuit pack. The SYSCTL circuit pack is the highest level processor in the 2-level control hierarchy of the Optical Line System.

Memory

Start-Up Memory. The start-up memory consists of 64 kilobytes of read-only memory. The start-up memory contains the program that allows the microprocessor to copy the executable code and data for the system from the nonvolatile memory of the SYSMEM circuit pack into the operating memory of the SYSCTL circuit pack. This allows the microprocessor to start up operation during a power-up or a reset condition or when initializing new software. The SYSCTL circuit pack also has a unique network services access point (NSAP) code in the read-only memory.

Operating Memory. The main operating memory consists of 8 megabytes of dynamic random access memory (DRAM). Direct memory access (DMA) allows the SYSCTL circuit pack to copy the executable code and data for the system from the nonvolatile memory of the SYSMEM circuit pack into the operating memory during a power-up or reset condition, or when initializing new software.

Nonvolatile Memory. The nonvolatile memory consists of 128 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the history of the SYSCTL circuit pack, such as the *Common Language* CLEI* code and type/version information.

For more information about memory administration, refer to Section 8, "Administration and Provisioning."

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

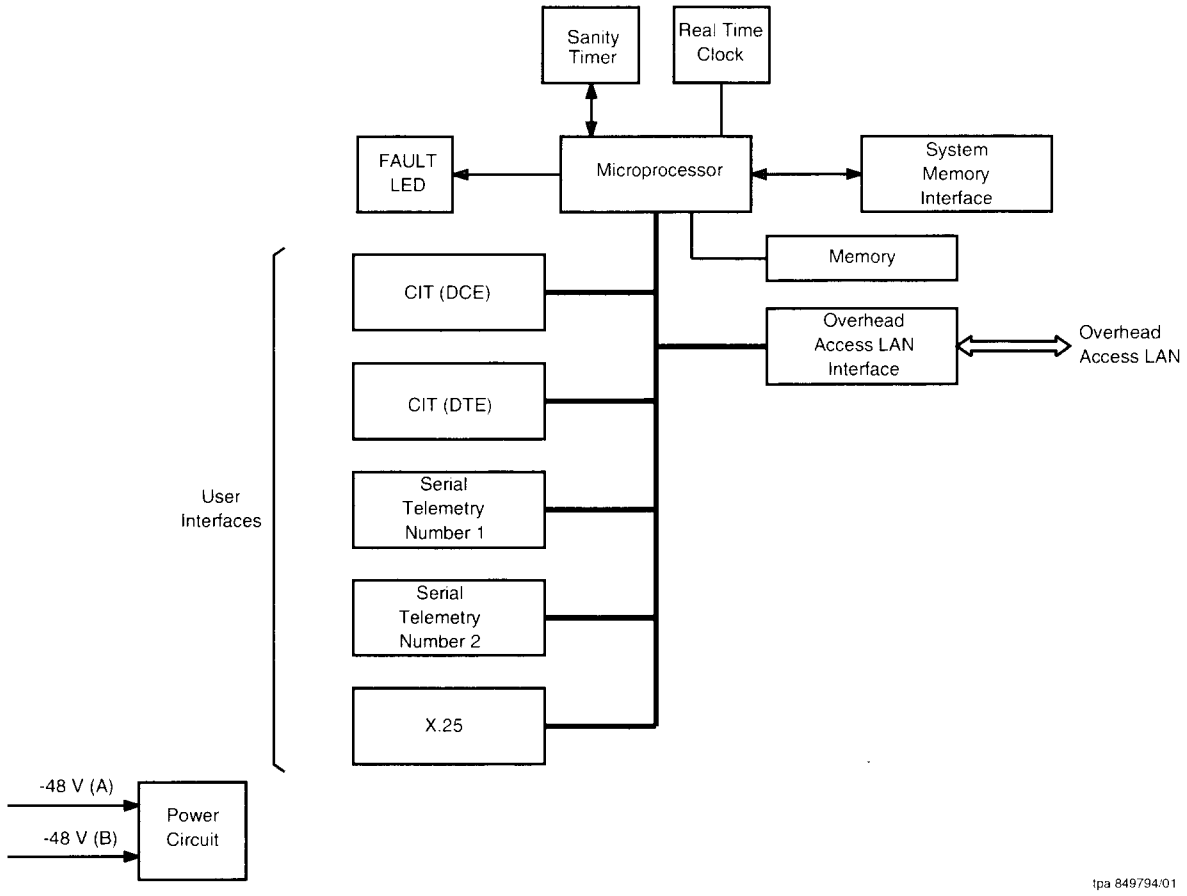


Figure 7-2. SYSCTL Circuit Pack Block Diagram

Interface Circuitry

Overhead Access Interface. The overhead access allows the SYSCTL circuit pack to communicate with the Overhead Controller - Tributary (TOHCTL) circuit pack.

Serial User Interfaces. The SYSCTL circuit pack provides the following serial user interfaces:

- **CIT (DCE) interface**: The CIT (DCE) interface is configured as data circuit equipment (DCE) for direct craft interface terminal (CIT) access. The CIT (DCE) interface allows direct access to a PC running CIT-PC software. The CIT (DCE) interface may also be provisioned to allow direct access to an ASCII-based terminal. The CIT (DCE) interface supports data rates up to 9600 baud.
- **CIT (DTE) interface**: The CIT (DTE) interface is configured as data terminating equipment (DTE) to allow a permanent connection to a modem. The CIT (DTE) interface allows dial-up access to a PC running CIT-PC software. The CIT (DTE) interface may also be provisioned to allow access to an ASCII-based terminal. The CIT (DTE) interface supports data rates up to 9600 baud.
- **Serial telemetry interface**: In Release 2 and later releases, the serial telemetry interface is used to transfer alarm, status, and control information to and from an external miscellaneous discrete unit via a 2400-baud EIA-422 port. The external miscellaneous discrete unit provides an additional 128 miscellaneous discrete environmental inputs and 32 control outputs.
- **X.25 interface**: The X.25 interface supports X.25 protocol and the Transaction Language 1 (TL1) message language. The X.25 interface is used to report alarm and status conditions and performance-monitoring data to the Bellcore Network Monitoring and Analysis (NMA) system, the Bellcore Operations System/Intelligent Network Elements (OPS/INE), and the Lucent Technologies TRANSVU II systems using an EIA-232-D port operating at 1200 to 19,200 baud.

For more information about these interfaces, refer to Section 6, "Operations Interfaces."

Power Circuitry

The SYSCTL circuit pack receives two sources of –48 volts that are diode OR'd, fused, and filtered. A modular DC-to-DC power converter produces +5 volts and –5 volts used on the circuit pack. The power converter also provides a +5 volt source for the FAULT LED on any circuit pack that has a power failure.

The SYSCTL circuit pack monitors the two –48 volt sources to the circuit pack. If the SYSCTL circuit pack detects a failure of the onboard fuse or power converter, the red FAULT LED will light. If the fuse or power converter fails, the SYSMEM circuit pack provides +5 volts to light the FAULT LED on the SYSCTL circuit pack.

Quick Reference Summary

Control Functions

The SYSCTL circuit pack performs the following control and maintenance functions:

(a) Stores the operating copy of the system executable code and data

(b) Performs system-wide maintenance computations and performance monitoring

(c) Automatically resets the system during power up

(d) Maintains the real-time clock

(e) Performs self audits

(f) Controls the circuit pack faceplate FAULT LED on the SYSCTL and the SYSMEM circuit packs.

Interface Functions

The SYSCTL circuit pack provides the following interface functions:

(a) Communications between the SYSCTL and SYSMEM circuit packs using the SYSCTL/SYSMEM interface

(b) Communications between the SYSCTL circuit pack and the TOHCTL circuit pack

(c) CIT (DCE) interface for direct local access to the system operating at 1200, 2400, 4800, or 9600 baud

(d) CIT (DTE) interface for remote dial-up access to the system operating at 1200, 2400, 4800, or 9600 baud

(e) Serial telemetry interface for additional miscellaneous discrete environmental inputs and control outputs operating at 2400 baud

(f) X.25 interface for advanced provisioning, performance monitoring, administration, and maintenance activities operating at 1200 to 19,200 baud.

SYSMEM (LEA2) Circuit Pack Description

Purpose of Circuit

The System Memory (SYSMEM) circuit pack provides the nonvolatile memory necessary for storing the executable code and data for the system. The SYSMEM circuit pack also contains the office alarm circuitry and the processor parallel input/output (I/O) circuitry.

Faceplate LED

The SYSMEM circuit pack has a red FAULT LED on its faceplate (Figure 7-3). The red FAULT LED is lighted during a reset condition, when a circuit pack failure is detected or when the circuit pack loses power. If the circuit pack loses power, a separate path is provided for power from the System Controller (SYSCTL) circuit pack to light the FAULT LED on the SYSMEM circuit pack.

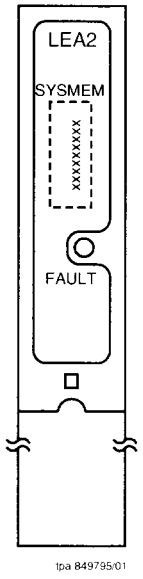


Figure 7-3. SYSMEM (LEA2) Circuit Pack

General Description of Operation

The SYSMEM circuit pack provides the following:

- Nonvolatile program (executable code) and configuration (data) memory
- Office alarms interface
- User panel LEDs and controls
- Parallel telemetry interface
- User-settable miscellaneous discrete interface.

Detailed Description of Operation

Memory

Nonvolatile Program (Executable Code) Storage. Figure 7-4 shows a functional block diagram of the SYSMEM circuit pack. The nonvolatile program storage is provided by 8 megabytes of flash erasable programmable read-only memory (flash-EPROM). This contains the main system software for all the controllers in the system (for example, System Controller, and board controllers). Flash-EPROM combines the nonvolatility of EPROM with the in-circuit reprogramming ability of electrically erasable programmable read-only memory (EEPROM). Flash-EPROM allows in-service software upgrades to be performed locally or remotely (via modem connections).

Nonvolatile Configuration (Data) Storage. The nonvolatile configuration storage is provided by 128 kilobytes of EEPROM. This contains all system state and user-provisioned data. This includes all system parameters with their original and current values. EEPROM is byte erasable and writable. This allows configuration information to be easily changed during system operation.

Nonvolatile Memory. The nonvolatile memory consists of 128 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the history of the SYSMEM circuit pack such as the *CLEI* code and type/version information.

For more information about memory administration, refer to Section 8, "Administration and Provisioning."

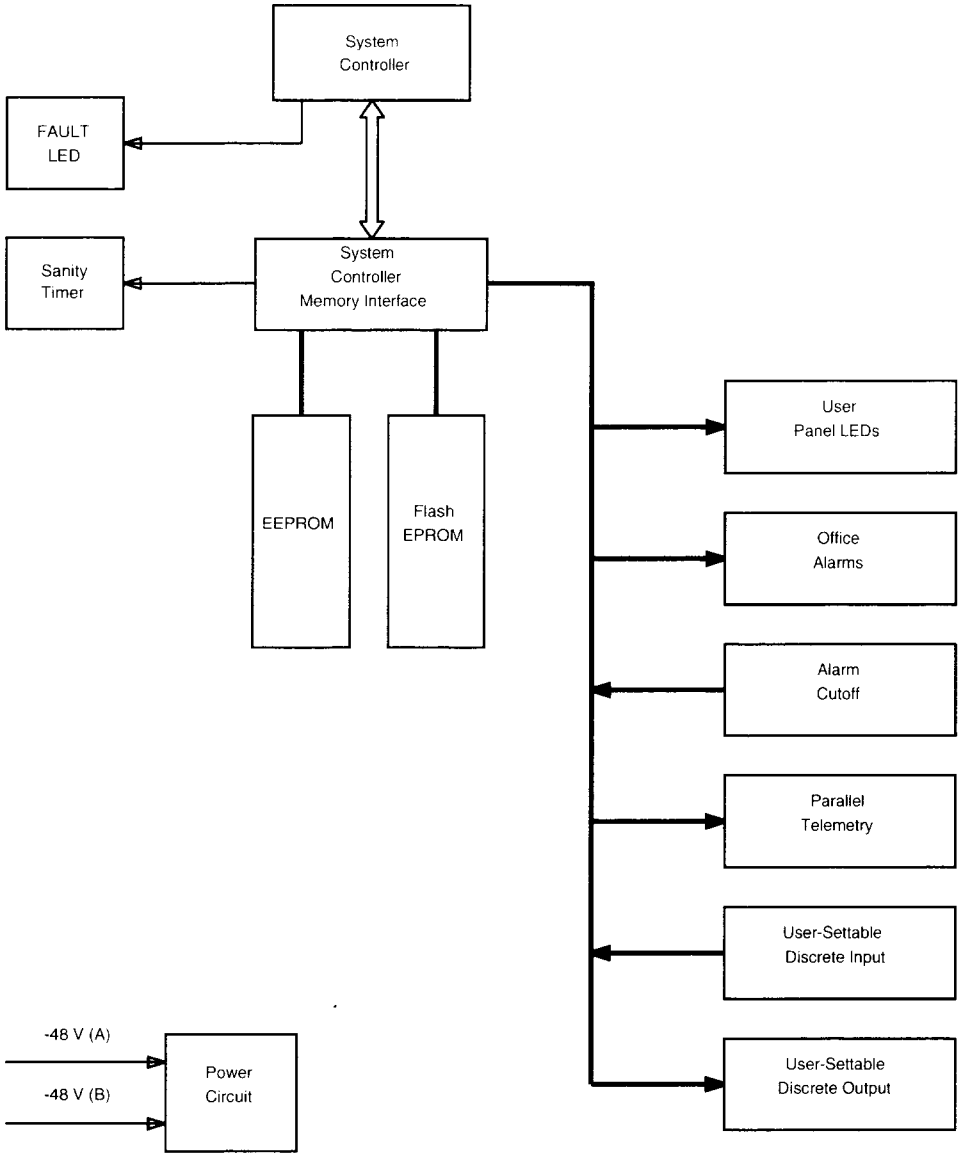


Figure 7-4. SYSMEM Circuit Pack Block Diagram

Office Alarms Interface

The SYSMEM circuit pack provides relays for the Optical Line System to interface with a central office alarm grid. The relays are controlled by the microprocessor on the SYSCTL circuit pack. Relays are provided for audible and visible alarms for the following:

- Critical
- Major
- Minor.

The normally closed contacts for the critical and major relays provide the alarm closure if power fails. For more information about the office alarms interface, refer to Section 6, "Operations Interfaces."

Indicator Strip/User Panel LEDs and Controls

The SYSMEM circuit pack provides the outputs to light the following LEDs on the indicator strip/user panel:

- Critical (CR) alarm
- Major (MJ) alarm
- Minor (MN) alarm
- Abnormal (ABN) status
- Near-end activity (NE ACTY)
- Far-end activity (FE ACTY).

The SYSMEM circuit pack also accepts the alarm cutoff (ACO) input from the indicator strip of Optical Line System cabinets or the user panel of Optical Line System miscellaneously mounted shelves. For more information about the indicator strip and user panel, refer to Section 6, "Operations Interfaces."

Parallel Telemetry Interface

The SYSMEM circuit pack supplies the following alarms from the Optical Line System as remote information accessible to an operations system:

- Local CR, MJ, and MN alarms
- Remote CR, MJ, and MN alarms.

For more information about the parallel telemetry interface, refer to Section 6, "Operations Interfaces."

User-Settable Miscellaneous Discrete Interface

The SYSMEM circuit pack accepts 16 user-settable environmental inputs and provides 4 user-settable control outputs at an Optical Line System network element. For more information about the miscellaneous discrete interface, refer to Section 6, "Operations Interfaces."

Power Circuitry

The SYSMEM circuit pack receives two sources of –48 volts that are diode OR'd, fused, and filtered. Two modular DC-to-DC power converters produce +5 volts and +12 volts used on the circuit pack. The +5 volt power converter provides a +5 volt source for the FAULT LED on the System Controller (SYSCTL) circuit pack if a power failure occurs on the SYSCTL circuit pack. The +12 volt power converter is used to program the flash memory.

The SYSMEM circuit pack monitors the two –48 volt sources to the circuit pack. If the SYSMEM circuit pack detects a failure of the onboard fuse or power converter, the red FAULT LED will light. If the fuse or +5 volt power converter fails, the SYSCTL circuit pack provides +5 volts to light the FAULT LED on the SYSMEM circuit pack.

Quick Reference Summary

Control Functions

The SYSMEM circuit pack performs the following control functions:

(a) Provides program (executable code) memory storage

(b) Provides configuration (data) memory storage.

Interface Functions

The SYSMEM circuit pack provides the following interface functions:

(a) Office alarms

(b) Indicator strip/user panel LEDs and controls

(c) Parallel telemetry to remotely report alarm information to an operations system

(d) User-settable miscellaneous discrete interface that provides environmental inputs and control outputs.

TOHCTL (LEA5) Circuit Pack Description

Purpose of Circuit

The Overhead Controller - Tributary (TOHCTL) circuit pack provides access to the synchronous optical network (SONET) section overhead of the supervisory signal. The SONET overhead contains section data communications channel (DCC) bytes (bytes D1-D3).

Faceplate LED

The TOHCTL circuit pack has a red FAULT LED on its faceplate (Figure 7-5). The red FAULT LED is lighted during a reset condition, when a circuit pack failure is detected or when the circuit pack loses power. If the circuit pack loses power, a separate path is provided for power from the System Controller (SYSCTL) circuit pack to light the FAULT LED on the TOHCTL circuit pack.

The sanity check circuitry detects hardware and software faults. When a fault occurs, the microprocessor is reset and the FAULT LED on the circuit pack faceplate is lighted.

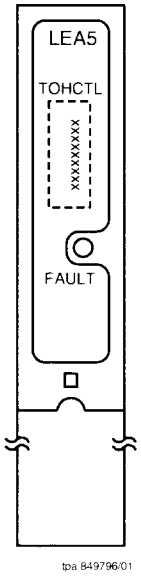


Figure 7-5. TOHCTL (LEA5) Circuit Pack

General Description of Operation

The TOHCTL circuit pack terminates up to eight section overhead channels. However, end terminals only use one channel, and repeaters use two channels. The section overhead channel includes section data communications channel bytes D1-D3.

Detailed Description of Operation

Control Circuitry

Processor. Figure 7-6 provides an overall block diagram of the TOHCTL circuit pack. The processor performs protocol processing for layer 3 (network) of the Open Systems Interconnection (OSI) 7-layer stack for the SONET section DCC. The processor also manages the overhead access local area network (OALAN) communications with the SYSCTL circuit pack.

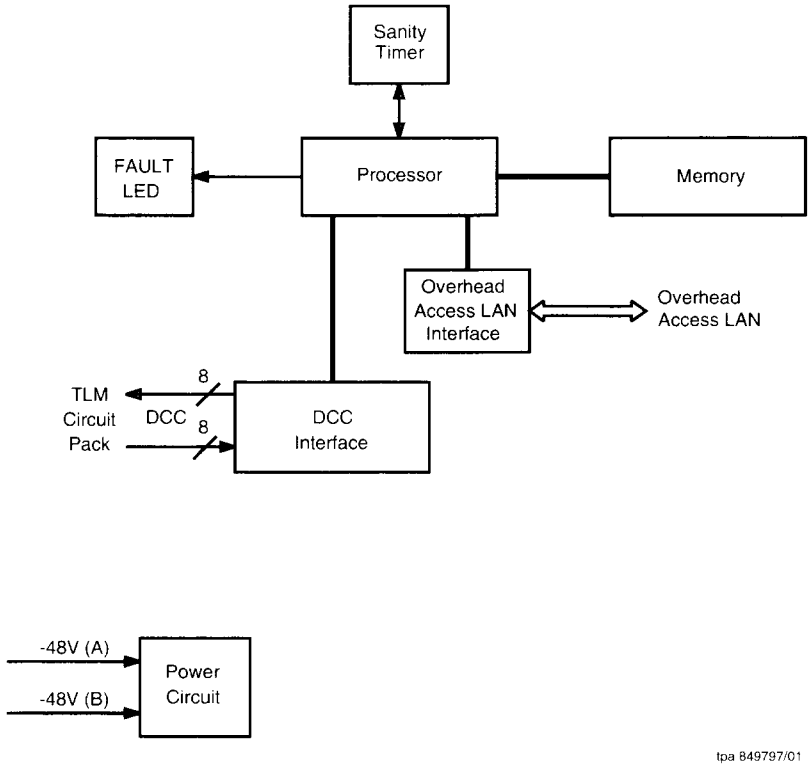


Figure 7-6. TOHCTL Circuit Pack Block Diagram

Memory

Start-Up Memory. The start-up memory consists of 64 kilobytes of read-only memory. The start-up memory contains the program that allows the processor to load the executable code and data from the SYSCTL circuit pack into the operating memory. This allows the processor to start up operation during a power-up, or a reset condition, or when initializing new software.

Operating Memory. The main operating memory consists of 4 megabytes of DRAM. Direct memory access (DMA) allows the processor to load the executable code and data received from the SYSCTL circuit pack (via the overhead access local area network) into the operating memory during a power-up, or reset condition, or when initializing new software.

Nonvolatile Memory. The nonvolatile memory consists of 128 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the history of the TOHCTL circuit pack such as the *CLEI* code and type/version information.

Interface Circuitry

DCC Interface. The DCC interface interacts with the Telemetry Controller (TLM) circuit packs. The DCC interface performs protocol processing for layer 1 (physical) and layer 2 (data link) of the OSI 7-layer stack for the section DCC of the supervisory signal.

In the receive direction, the TLM circuit pack transmits the DCC overhead bytes via the overhead channel to the DCC interface. The DCC interface transmits the information to the processor for layer 3 (network) protocol processing.

In the transmit direction, the DCC interface accepts the DCC bytes from the processor and transmits the information via the overhead channel to the TLM circuit pack. This information provides end-to-end communications and maintenance.

The DCC interface also supports bidirectional 1x1 protection switching for the supervisory signal DCC.

Table 7-2 shows the section DCC bytes that are provided by the TOHCTL circuit pack.

Table 7-2. Overhead Bytes

Name	Overhead Byte	Data Rate	Access
DCC	D1-D3	192 kb/s	System Controller

Overhead Access Local Area Network Interface. The overhead access local area network (OALAN) interface allows the TOHCTL circuit pack to communicate with the SYSCTL circuit pack. The SYSCTL circuit pack allows users to access the section DCC using the CIT and message-based operations system (X.25) interfaces for single-ended operations.

Power Circuitry

The TOHCTL circuit pack receives two sources of –48 volts that are diode OR'd, fused, and filtered. A modular DC-to-DC power converter produces +5 volts used on the circuit pack.

The TOHCTL circuit pack monitors the two –48 volt sources to the circuit pack. If the TOHCTL circuit pack detects a failure of the onboard fuse or power converter, the red FAULT LED will light. If the fuse or power converter fails, the SYSCTL circuit pack provides +5 volts to light the FAULT LED on the TOHCTL circuit pack.

Quick Reference Summary

The TOHCTL circuit pack performs the following control and interface functions:

(a) Interfaces with the TLM circuit packs to send and receive DCC data

(b) Performs low-level (layers 1 through 3 of the OSI 7-layer stack) protocol processing for the section DCC of the supervisory signal

(c) Provides communications with the SYSCTL circuit pack using the OALAN interface

(d) Performs debugging functions, trace functions, and sanity checks

(e) Controls the circuit pack faceplate FAULT LED.

Transmission

TLM (LDA1) Circuit Pack Description

Purpose of Circuit

The Telemetry Controller (TLM) circuit pack provides a bidirectional interface between an IS-3 customer maintenance signal and the supervisory signal. The TLM circuit pack also performs maintenance functions that are used to monitor the performance of the optical line.

Faceplate LED

The TLM circuit pack has a red FAULT LED on its faceplate (Figure 7-7). The red FAULT LED is continuously lighted when a circuit pack failure is detected or when the circuit pack loses power. If the circuit pack loses power, a separate path is provided for power from the System Controller (SYSCTL) circuit pack to light the FAULT LED on the TLM circuit pack.

The board controller on the TLM circuit pack detects hardware and software faults on the circuit pack. When a fault occurs, the FAULT LED on the circuit pack is continuously lighted. If an incoming customer maintenance signal from the lightguide cross-connect panel (or equivalent) fails, the FAULT LED will flash on and off.

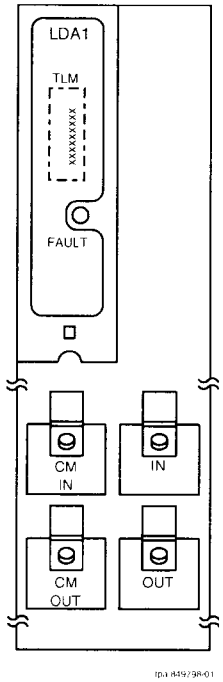


Figure 7-7. TLM (LDA1) Circuit Pack

General Description of Operation

The TLM circuit pack terminates one bidirectional IS-3 customer maintenance signal. In the transmit direction (toward the optical line), the TLM circuit pack converts the incoming IS-3 optical signal to an electrical STS-3 signal (155.52 Mb/s). The STS-3 signal is demultiplexed into three STS-1 signals (51.84 Mb/s) and synchronized to the system clock. The three STS-1 signals are then multiplexed back to one STS-3 signal. The overhead channel bytes are added to the STS-3 signal, and the STS-3 signal is converted to an IS-3 supervisory signal and transmitted to the Optical Amplifier (OA) circuit pack. In the receive direction (toward the customer maintenance signal), the TLM circuit pack converts the incoming IS-3 supervisory signal to an electrical STS-3 signal (155.52 Mb/s). The overhead channel bytes are removed from the STS-3 signal and sent to the transport overhead hyperchannel (TOH) processor. The STS-3 signal is demultiplexed into three STS-1 signals (51.84 Mb/s) and synchronized to the system clock. The three STS-1 signals are then multiplexed back to one STS-3 signal. The STS-3 signal is then converted to an IS-3 customer maintenance signal and transmitted to the customer.

Detailed Description of Operation

Transmission Circuitry

Transmit Direction. Figure 7-8 provides an overall block diagram of the TLM circuit pack. In the transmit direction (toward the optical line), the circuit pack accepts one IS-3 (155.52 Mb/s) non-return-to-zero (NRZ) synchronous optical network (SONET) compatible optical signal. Fiber access to the TLM circuit pack is via a fixed *ST*®-type buildout block and a removable *ST*-type, FC-type, or SC-type lightguide buildout on the circuit pack faceplate (labeled CM IN). Lightguide buildouts are chosen based on the attenuation desired, the type of connector interface, and the type of lightguide jumpers (single-mode or multimode). All factory-equipped TLM circuit packs come with a removable *ST*-type 0-dB lightguide buildout. When installing or removing lightguide buildouts, do not pull the beam (front tab) outward. Pulling the beam (front tab) outward could result in breaking the beam (front tab).

The customer maintenance signal (CMS) receiver accepts the IS-3 signal, converts it to an electrical STS-3 signal (155.52 Mb/s), and sends it to a timing recovery circuit. The timing recovery circuit recovers a 155.52 MHz clock signal from the STS-3 signal and retimes the STS-3 signal with the recovered clock signal. This clock signal provides all the timing for the transmit direction. The STS-3 and clock signals are then sent to the customer maintenance signal (CMS) STS-3 byte processor. The CMS STS-3 byte processor descrambles and demultiplexes the STS-3 signal into three STS-1 signals (51.84 Mb/s) and outputs the three STS-1 signals and a common clock signal to the supervisory (SUP) STS-3 byte processor.

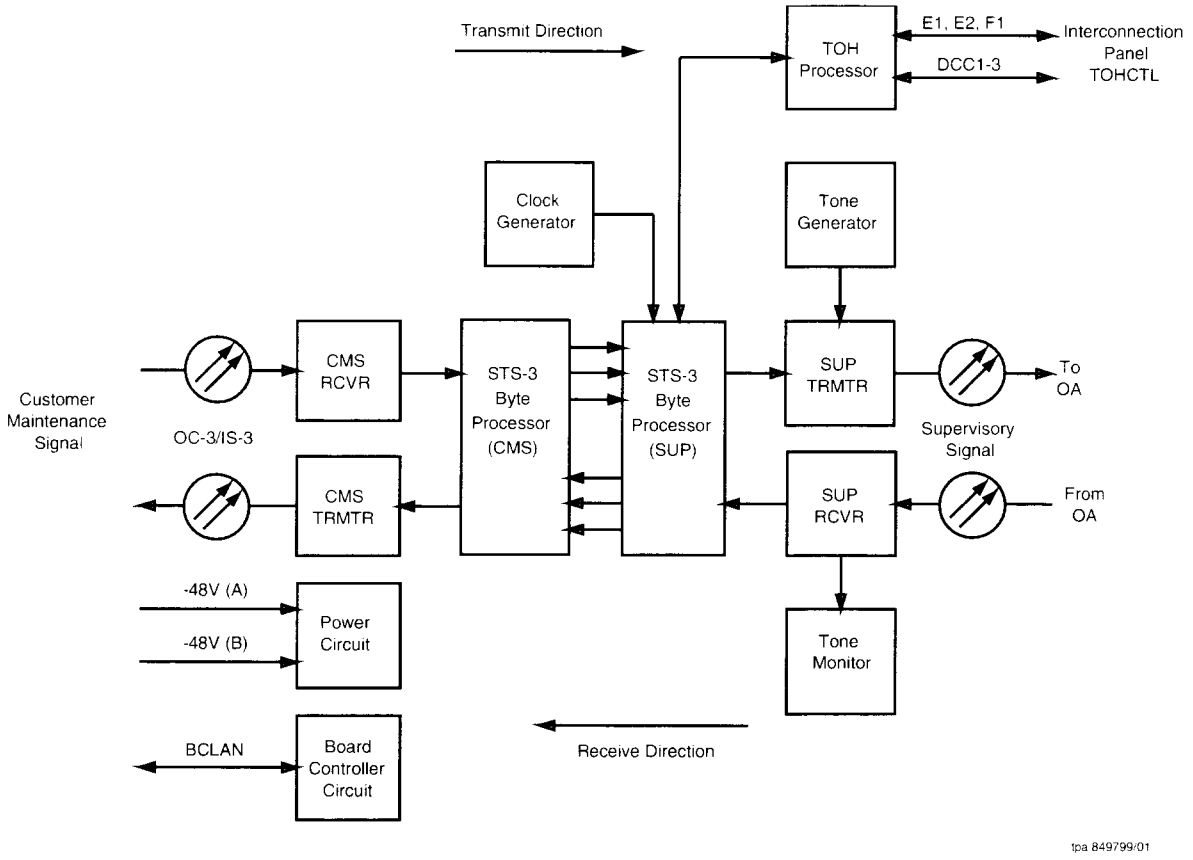


Figure 7-8. TLM Circuit Pack Block Diagram

The SUP STS-3 byte processor scrambles and multiplexes the three STS-1 signals back to one STS-3 signal (155.52 Mb/s). The SUP STS-3 byte processor also accepts the overhead channel bytes (D1-3, E1, E2, and F1 bytes) from the transport overhead hyperchannel (TOH) processor and adds the bytes to the STS-3 signal. The STS-3 signal is timed using a 155.52-MHz signal generated by the clock generator.

The SUP transmitter converts the STS-3 signal to a 1532-nm IS-3 supervisory signal for transmission to an Optical Amplifier (OA) circuit pack. Fiber access to the TLM circuit pack is via a fixed *ST*-type buildout block and a removable *ST*-type, FC-type, or SC-type lightguide buildout on the circuit pack faceplate (labeled OUT).

Receive Direction. In the receive direction (toward the customer maintenance signal line), the SUP receiver accepts the STS-3 signal (155.52 Mb/s). Fiber access to the TLM circuit pack is via a fixed *ST*-type buildout block and a removable *ST*-type, FC-type, or SC-type lightguide buildout on the circuit pack faceplate (labeled IN). Lightguide buildouts are chosen based on the attenuation desired, the type of connector interface, and the type of lightguide jumpers (single-mode or multimode).

All factory-equipped TLM circuit packs come with a removable *ST*-type 0-dB lightguide buildout. When installing or removing lightguide buildouts, do not pull the beam (front tab) outward. Pulling the beam (front tab) outward could result in breaking the beam (front tab).

The SUP receiver accepts the IS-3 supervisory signal, converts it to an electrical STS-3 signal (155.52 Mb/s), and sends it to a timing recovery circuit. The timing recovery circuit recovers a 155.52 MHz clock signal from the STS-3 signal and retimes the STS-3 signal with the recovered clock signal. This clock signal provides all timing for the receive direction. The STS-3 and clock signals are then sent to the SUP STS-3 byte processor. The STS-3 byte processor descrambles and demultiplexes the STS-3 signal into three STS-1 signals (51.84 Mb/s) and outputs the three STS-1 signals and a common clock signal to the CMS STS-3 byte processor. The SUP STS-3 byte processor also recovers the overhead bytes and sends them to the TOH processor.

The CMS STS-3 byte processor scrambles and multiplexes the three STS-1 signals back to one STS-3 signal (155.52 Mb/s). The CMS transmitter converts the STS-3 signal to an IS-3 CMS signal (155.52 Mb/s) for transmission. Fiber access to the TLM circuit pack is via a fixed *ST*-type buildout block and a removable *ST*-type, FC-type, or SC-type lightguide buildout on the circuit pack faceplate (labeled CM OUT). Lightguide buildouts are chosen based on the attenuation desired, the type of connector interface, and the type of lightguide jumpers (single-mode or multimode). All factory-equipped TLM circuit packs come with a removable *ST*-type 0-dB lightguide buildout. When installing or removing lightguide buildouts, do not pull the beam (front tab) outward. Pulling the beam (front tab) outward could result in breaking the beam (front tab).

Control Circuitry

The board controller circuit controls all the circuit pack activities. The board controller circuit interfaces with the SYSCTL circuit pack using the board controller local area network (BCLAN). The TLM circuit pack reports the status of the circuit pack and the incoming customer maintenance and supervisory signals, as well as the circuit pack inventory information (*CLEI* code, serial number, etc.). The SYSCTL circuit pack uses the status information for fault detection and isolation. The TLM circuit pack also responds to control signals from the SYSCTL circuit pack.

Overhead Controller Circuitry

The transport overhead hyperchannel (TOH) circuitry provides access to the overhead bytes of the supervisory signal. Access is only provided to the DCC (D1-D3 bytes), orderwire (E1, E2 bytes), and section user channel (F1 byte).

Timing Circuitry

Timing for the transmit direction of the TLM pack (toward the optical line) is normally derived from the IS-3 customer maintenance signal. Timing for the receive direction is normally derived from the supervisory signal received from the Optical Amplifier (OA) circuit pack. When the customer maintenance signal is not present or other customer maintenance signal alarm conditions are present, the SUP STS-3 byte processor sends an alarm indication signal (AIS) or unequipped signal with clock provided by the local, free running, 51.84 MHz clock generator circuitry. If the CMS receiver detects a loss of signal or loss of frame, the board controller circuitry will switch to the local clock.

When the supervisory signal coming from the OA circuit pack is lost, the entire receive portion of the TLM circuit pack is lost. For example, the DCC channels and E1, F1, and E2 bytes must be obtained from another optical line. However, the CMS STS-3 byte processor sends AIS to the customer using the local clock generator circuitry.

Fault Detection Circuitry

Monitoring and Testing. The board controller circuit monitors all the activities on the circuit pack. The TLM circuit pack has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the board controller reports the error to the SYSCTL circuit pack using the board controller local area network (BCLAN). An out-of-service test is performed whenever the TLM circuit pack is inserted in a slot or when a reset is performed.

The tone generator circuitry provides a 12.960-KHz signal to modulate the supervisory signal. This modulation will be detected on the receive side of an OA to OA optical section to estimate the performance of the supervisory channel. The 12.960 KHz tone is derived from the clock generator circuitry.

Performance Monitoring. The TLM circuit pack monitors the following performance-monitoring parameters for the supervisory signal:

- Laser bias current (LBC-SU)
- Signal power received (SPR-SU)
- Line (B2) coding violations (CV-L)
- Line (B2) errored seconds (ES-L)
- Line (B2) severely errored seconds (SES-L)
- Line (B2) unavailable seconds (UAS-L).

When an incoming customer maintenance signal defect from the customer is detected, the TLM circuit pack inserts STS-1 path AIS in each STS-1 tributary of the STS-3 signal (155.52 Mb/s) transmitted toward the OA circuit pack.

When an incoming supervisory signal defect from the OA circuit pack is detected, the TLM circuit pack inserts STS-1 path AIS in each STS-1 tributary of the customer maintenance signal transmitted toward the customer.

When an internal fault is detected, the TLM circuit pack inserts STS-1 path AIS in each STS-1 tributary of the supervisory signal transmitted toward the OA circuit pack and in the customer maintenance signal transmitted toward the customer.

Power Circuitry

The TLM circuit pack receives two sources of –48 volts that are diode OR'd, fused, and filtered. A modular DC-to-DC power converter produces +5 volts used on the circuit pack.

If the TLM circuit pack detects the failure of the onboard fuse or power converter, the red FAULT LED will light. If the fuse or power converter fails, the SYSCTL circuit pack provides +5 volts to light the FAULT LED on the TLM circuit pack.

Quick Reference Summary

Transmit Functions

The TLM circuit pack performs the following transmit functions:

(a) Receives one IS-3 customer maintenance signal [(155.52 Mb/s) non-return-to-zero (NRZ) SONET compatible optical signal] from the customer

(b) Converts the customer maintenance signal to an electrical STS-3 signal

(c) Recovers a 155.52 MHz clock signal from STS-3 signal and retimes the STS-3 signal with the recovered clock

(d) Descrambles and demultiplexes the STS-3 signal into three STS-1 signals (51.84 Mb/s)

(e) Scrambles and multiplexes the three STS-1 signals to an STS-3 signal (155.52 Mb/s)

(f) Adds overhead channel bytes (D1-3, E1, E2, and F1)

(g) Provides the supervisory signal to an OA circuit pack

(h) Accepts the SONET section DCC bytes from the TOHCTL circuit pack

(i) Accepts the SONET section orderwire and user channel byte from the interconnection panel.

Receive Functions

The TLM circuit pack performs the following receive functions:

(a) Receives an IS-3 supervisory signal (155.52 Mb/s) from an OA circuit pack

(b) Recovers a 155.52 MHz clock signal from STS-3 signal and retimes the STS-3 signal with the recovered clock

(c) Recovers the overhead bytes from the STS-3 signal

(d) Descrambles and demultiplexes the STS-3 signal into three STS-1 signals (51.84 Mb/s)

(e) Scrambles and multiplexes the three STS-1 signals to an STS-3 signal (155.52 Mb/s)

(f) Converts the electrical STS-3 signal to an IS-3 customer maintenance signal

(g) Provides the customer maintenance signal to the customer.

(h) Provides the SONET section DCC bytes to the TOHCTL circuit pack

(i) Provides the SONET section orderwire and user channel bytes to the interconnection panel.

Timing and Control Functions

The TLM circuit pack performs the following timing and control functions:

(a) Uses the incoming supervisory signal to synchronize the outgoing customer maintenance signal

(b) Uses the incoming customer maintenance signal to synchronize the outgoing supervisory signal

(c) Performs internal fault detection and interfaces with the SYSCTL circuit pack using the board controller local area network (BCLAN)

(d) Stores inventory information (*CLEI* code, serial number, etc.)

(e) Controls the circuit pack faceplate FAULT LED.

Maintenance Signal Functions

The TLM circuit pack performs the following maintenance signal functions:

(a) Detects incoming (from the customer) customer maintenance signal (CMS) loss of signal (LOS), loss of frame (LOF), and signal degrade (SD) based on the B2 error rate

(b) Detects incoming (from the optical line) supervisory signal loss of signal (LOS), loss of frame (LOF), and signal degrade (SD) based on the B2 error rate

(c) Inserts STS-1 path AIS in each STS-1 tributary of the customer maintenance signal (155.52 Mb/s) transmitted toward the customer when incoming (from the optical line) supervisory signal LOS or LOF is detected

(d) Inserts STS-1 path AIS in each STS-1 tributary of the supervisory signal (155.52 Mb/s) transmitted toward the OA circuit pack when incoming (from the customer) CMS LOS or LOF is detected

(e) Inserts STS-1 path AIS in each STS-1 tributary of the supervisory signal transmitted toward the OA circuit pack and in the customer maintenance signal transmitted toward the customer when an internal fault is detected.

OMU (505A) Description

Purpose of Circuit

The Optical Multiplexing Units (OMU) provide an interface between up to 8 incoming OC-48 drop side signals and an outgoing wavelength division multiplexed optical line signal.

Faceplate LED

The OMU does not have a red FAULT LED on its faceplate (Figure 7-9). The faceplate has optical connectors for up to 8 incoming OC-48 drop side signals and one optical connector for the outgoing optical line signal.

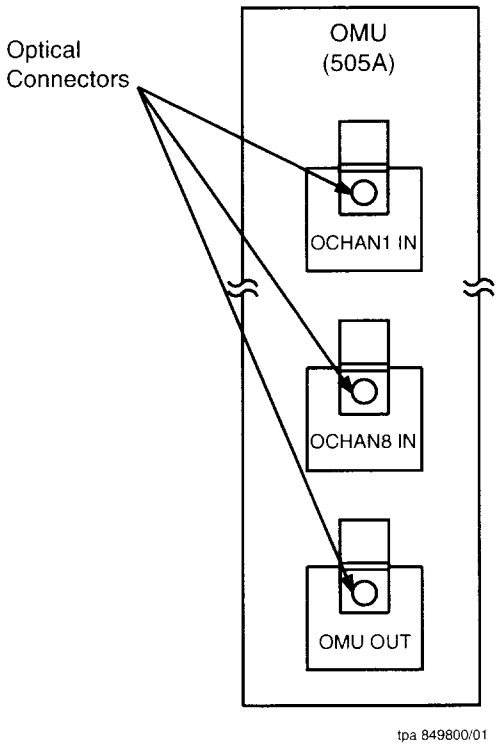


Figure 7-9. OMU (505A)

General Description of Operation

The OMU accepts up to 8 incoming OC-48 drop side signals. The OMU combines the incoming OC-48 drop side signals using wavelength division multiplexing onto a single outgoing fiber.

Detailed Description of Operation

Transmission Circuitry

Figure 7-10 provides an overall block diagram of the OMU. The OMU accepts up to eight 2.5-Gb/s SONET OC-48 signals. The OMU will pass through all optical signals into the system. The combiner module of the OMU optically combines the OC-48 drop side signals onto a single fiber. The combined signal (optical line signal) is sent to the Optical Amplifier (OA) circuit pack.

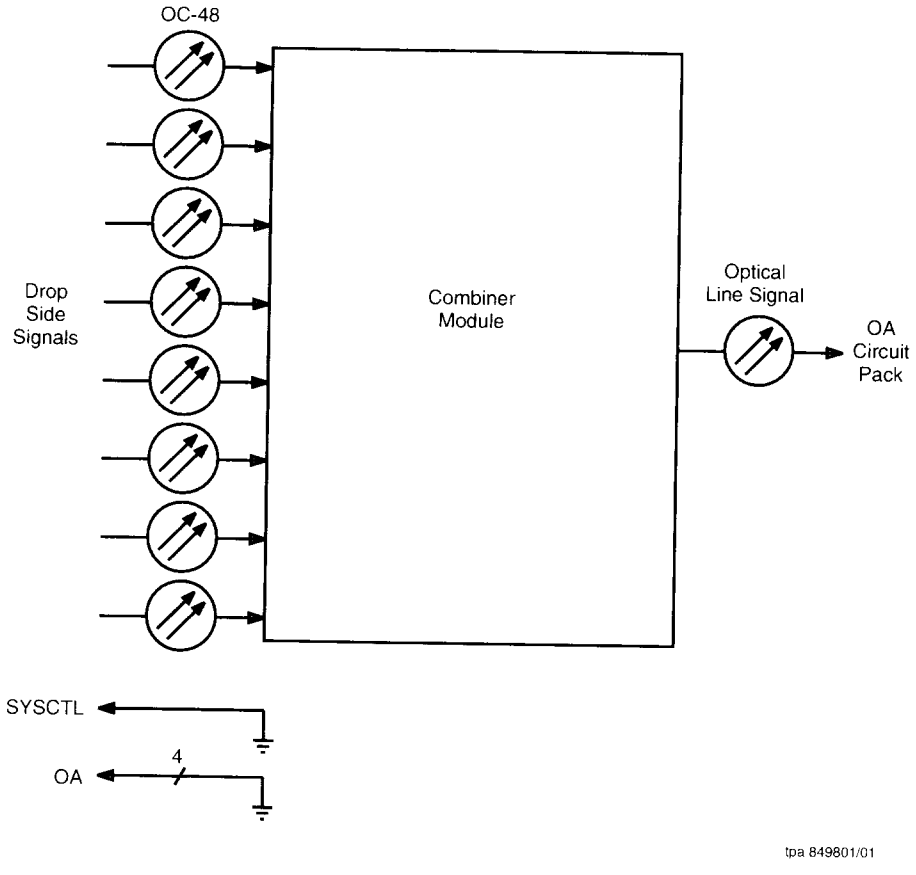


Figure 7-10. OMU Block Diagram

Control Circuitry

The OMU does not have a board controller circuit. However, the OMU has an equip lead that is connected to the System Controller (SYSCTL) circuit pack. This equip lead is shared among all the OMUs and Optical Demultiplexing Units (ODUs). The equip lead becomes active when any OMU or ODU becomes equipped.

Four status leads connect each OMU to an OA circuit pack. These four leads are used to indicate version/type information to the board controller on an OA circuit pack.

Quick Reference Summary

Transmit Functions

The OMU performs the following transmit functions:

(a) Receives up to eight SONET OC-48 drop side signals (2.5 Gb/s) from a compatible lightwave system

(b) Wavelength division multiplexes the OC-48 drop side signals onto a single fiber

(c) Provides the combined signal (optical line signal) to an OA circuit pack.

ODU (605A) Description

Purpose of Circuit

The Optical Demultiplexing Unit (ODU) provides an interface between an incoming wavelength division multiplexed optical line signal and up to 8 outgoing OC-48 drop side signals.

Faceplate LED

The ODU does not have a red FAULT LED on its faceplate (Figure 7-11). The faceplate has optical connectors for an incoming optical line signal and up to 8 outgoing OC-48 drop side signals.

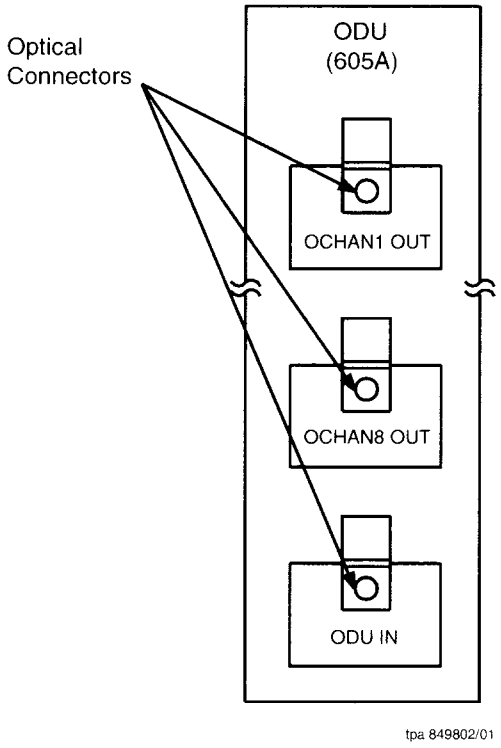


Figure 7-11. ODU (605A)

General Description of Operation

The ODU accepts one optical line signal and splits the optical line signal using wavelength division multiplexing into up to 8 OC-48 drop side signals.

Detailed Description of Operation

Transmission Circuitry

Figure 7-12 provides an overall block diagram of the ODU. The ODU accepts one optical line signal from an Optical Amplifier (OA) circuit pack. The splitter module optically splits the optical line signal into up to 8 OC-48 drop side signals. The ODU is designed with specific passbands. Optical signals outside the specific bands will not pass through.

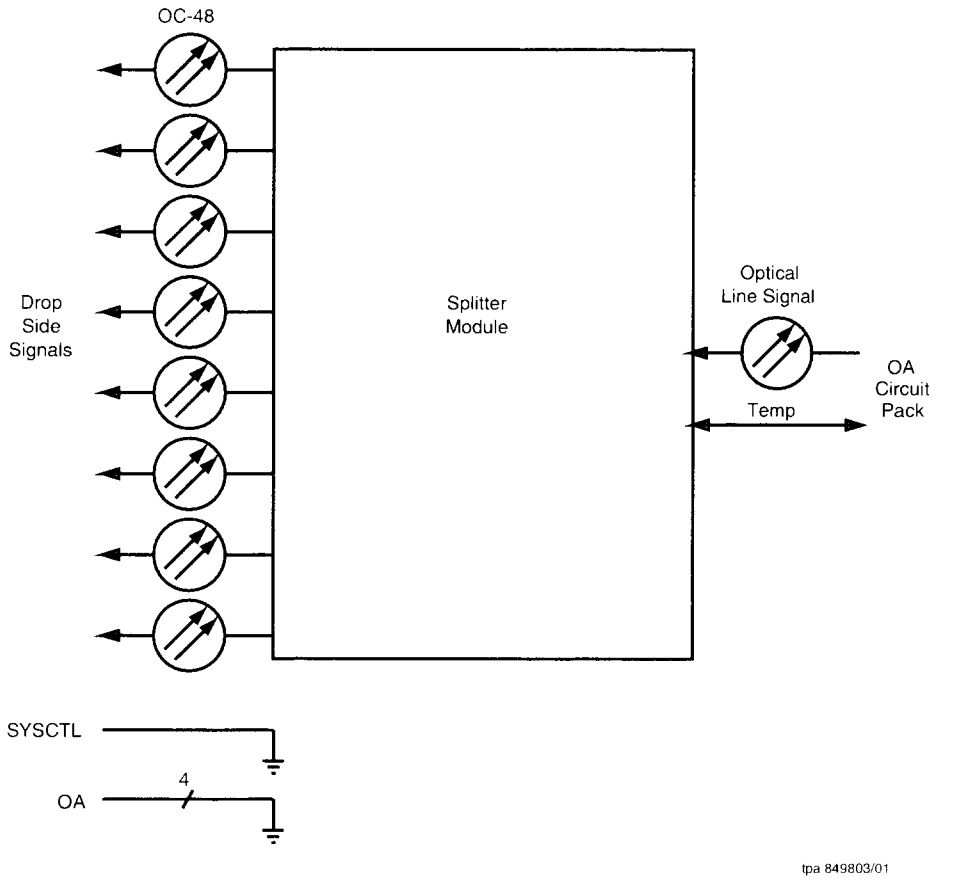


Figure 7-12. ODU Block Diagram

Control Circuitry

The ODU does not have a board controller circuit. However, the ODU has an equip lead that is connected to the System Controller (SYSCTL) circuit pack. This equip lead is shared among all the ODU and Optical Multiplexing Units (OMUs). The equip lead becomes active when any ODU or OMU becomes equipped.

Four status leads connect each ODU to an OA circuit pack. These four leads are used to indicate version/type information to the board controller on an OA circuit pack.

The passband filter in the ODU must be temperature controlled for proper operation. The temperature monitor/control is located on the OA circuit pack.

Quick Reference Summary

Receive Functions

The ODU performs the following receive functions:

(a) Receives one optical line signal from an OA circuit pack

(b) Splits the optical line signal into up to eight OC-48 drop side signals (2.5 Gb/s)

(c) Provides the OC-48 drop side signals to compatible lightwave systems.

OA (LEA6 and LEA7) Circuit Pack Description

Purpose of Circuit

The LEA6 and LEA7 Optical Amplifier (OA) circuit packs optically amplify an optical line signal and provide an add/drop function for the supervisory signal. The LEA6 circuit pack supports applications that consist of up to three 33-dB optical sections (approximately 396 km). The LEA7 circuit pack supports applications that consist of up to eight 22-dB optical sections (approximately 640 km). For more information about applications, refer to Section 2, "Applications."

The LEA6 OA circuit pack is compatible with Release 1.0.0-OLS and later software. The LEA7 OA circuit pack is compatible with Release 2.0.0-OLS and later software.

Faceplate LED

The OA circuit pack has a red FAULT LED on its faceplate (Figure 7-13).

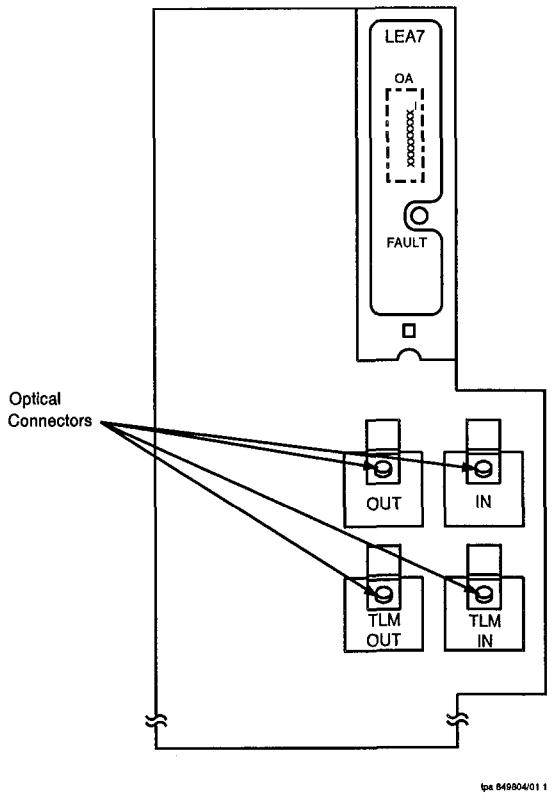


Figure 7-13. OA (LEA6 and LEA7) Circuit Pack

The red FAULT LED is continuously lighted when a circuit pack failure is detected or when the circuit pack loses power. If the circuit pack loses power, a separate path is provided for power from the System Controller (SYSCTL) circuit pack to light the FAULT LED on the OA circuit pack.

The board controller on the OA circuit pack detects hardware and software faults on the circuit pack. When a fault occurs, the FAULT LED on the circuit pack is continuously lighted. If an incoming OC-48 drop side signal or optical line signal fails, the FAULT LED will flash on and off.

General Description of Operation

The OA circuit pack optically amplifies an optical line signal. The OA circuit pack accepts an optical line signal from an Optical Multiplexing Unit (OMU) or from another OA circuit pack. The OA circuit pack also accepts a supervisory signal from the Telemetry Controller (TLM) circuit pack. The supervisory signal is combined with the amplified optical line signal using wavelength division multiplexing. The OA circuit pack provides the amplified optical line signal to an Optical Demultiplexing Unit (ODU) or another OA circuit pack.

Detailed Description

Transmission Circuitry

Figure 7-14 provides an overall block diagram of the OA circuit pack. The OA circuit pack accepts one optical line signal and one supervisory signal. Fiber access to the OA circuit pack is via fixed *ST*-type buildout blocks and a removable *ST*-type, FC-type, or SC-type lightguide buildout on the circuit pack faceplate (labeled IN, OUT, TLM IN, and TLM OUT). Lightguide buildouts are chosen based on the attenuation desired, the type of connector interface, and the type of lightguide jumpers (single-mode or multimode). All factory-equipped OA circuit packs come with a removable *ST*-type 0-dB lightguide buildout. When installing or removing lightguide buildouts, do not pull the beam (front tab) outward. Pulling the beam (front tab) outward could result in breaking the beam (front tab).

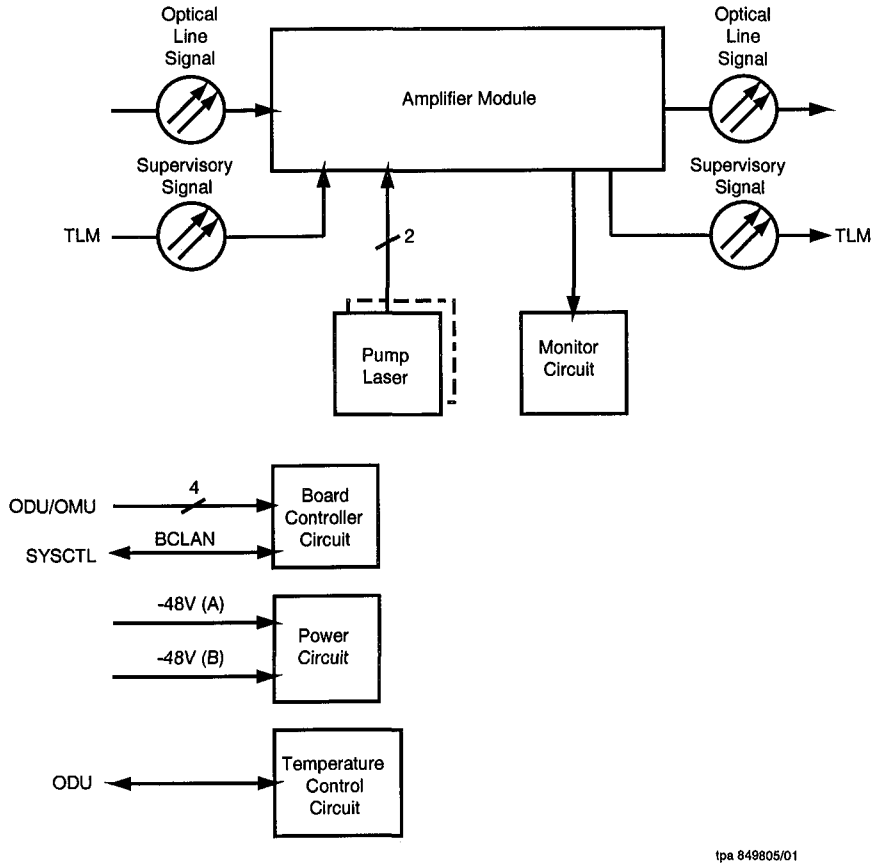


Figure 7-14. OA Circuit Pack Block Diagram

The OA circuit pack provides optical amplification for optical line signals within the 1555-nm±6 nm wavelength. Pump lasers provide the power for amplification. The LEA7 OA circuit pack has two pump power settings (Nx33 and Mx24/Px25) The pump power settings are CIT provisionable using the `SECURITY-Set-Network Element` input. The LEA6 OA circuit pack has one pump power setting. For more information about provisioning, refer to Section 8, "Administration and Provisioning."

The optical line signal input to the OA circuit pack passes through erbium-doped fiber. The same fiber is also driven with a 980-nm optical output from the pump lasers. The erbium-doped fiber transfers energy from the 980-nm pump laser signal to the optical line signal.

For detailed information about amplifier characteristics and engineering rules, refer to Section 10, "Technical Specifications."

The OA circuit pack accepts an optical line signal, drops the 1532-nm supervisory signal to a TLM circuit pack after the pre-amplifier stage, combines the amplified optical line signal (after the pre-amplifier and post-amplifier stages) with the 1532-nm supervisory signal from a TLM circuit pack, and outputs the combined optical line signal and supervisory signal.

Control Circuitry

The board controller circuit controls all the circuit pack activities. The board controller circuit interfaces with the SYSCTL circuit pack using the board controller local area network (BCLAN). The OA circuit pack reports the status of the circuit pack and the incoming optical line and supervisory signals, as well as the circuit pack inventory information (*CLEI* code, serial number, etc.). The board controller also reads OMU/ODU inventory information using four status leads. The SYSCTL circuit pack uses the status information for fault detection and isolation. The OA circuit pack also responds to control signals from the SYSCTL circuit pack.

The board controller circuit also monitors and controls the temperature of the passband filters on the 605A Optical Demultiplexing Unit (ODU).

Fault Detection Circuitry

Monitoring and Testing. The board controller circuit monitors all the activities on the circuit pack. The OA circuit pack has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the board controller reports the error to the SYSCTL circuit pack using the board controller local area network (BCLAN). An out-of-service test is performed whenever the OA circuit pack is inserted in a slot or when a reset is performed.

The temperature control circuit monitors and controls the temperature of the passband filters on the 605A ODU. The temperature control unit monitors the resistance and passes current through a simple heater circuit on the 605A ODU to increase the temperature (the component itself does not generate any heat). The component cannot be cooled but can only be allowed to cool by free convection. The OA circuit packs monitor and control the temperature of the 605A ODU in the same-numbered OMU/ODU slot. For example, the OA circuit pack in slot 1A of a shelf monitors and controls the temperature of the 605A ODU in the OMU/ODU 1A slot.

The monitor circuitry detects an amplitude modulated (AM) signal that is superimposed on each OC-48 drop side signal by the transmitting lightwave system. A different tone frequency is used for each possible wavelength. Table 7-3 shows the eight possible wavelengths and the approximate associated tone frequencies. The total bandwidth allocated to the tone frequencies is 5 to 30 kHz.

Table 7-3. Optical Line System Wavelengths and Tone Frequencies

Optical Channel	Wavelength (nm)	Tone Frequency (Hz)
1	1549.32	5273
2	1550.92	6934
3	1552.52	9277
4	1554.13	11328
5	1555.75	14746
6	1557.37	17285
7	1558.98	19336
8	1560.61	21680
9 (Supv. Channel)	1532.00	12960

The monitor circuitry samples the optical power after the first stage of amplification in the amplifier module. The monitor circuitry converts the optical signal to an electrical signal and measures the power of the electrical signals that are present in the 5- to 30-kHz frequency band.

The monitor circuitry measures the following parameters:

- **Tone Power**: The tone power is the amplitude of the signal present in the frequency band dedicated to each of the tones. The magnitude of the measured signal is assumed to be proportional to the magnitude of the optical signal that carries the tone.
- **Total Power (Signal plus Noise)**: The total power is the sum of the tone powers of the eight optical channels excluding the supervisory channel. The measured value is proportional to the total optical power in the optical channels.

Performance Monitoring. The OA circuit pack monitors the following performance-monitoring parameters for the optical line signal:

- Total optical power received (TOPR-OL)
- Laser bias current for pump 1 (LBC-P1)
- Laser bias current for pump 2 (LBC-P2)
- Laser backface current for pump 1 (LBFC-P1)
- Laser backface current for pump 2 (LBFC-P2)

The OA circuit pack also monitors the signal power received (SPR-C) performance-monitoring parameter for each optical channel.

Power Circuitry

The OA circuit pack receives two sources of –48 volts that are diode OR'd, fused, and filtered. A modular DC-to-DC power converter produces +5 volts used on the circuit pack.

If the OA circuit pack detects the failure of the onboard fuse or power converter, the red FAULT LED will light. If the fuse or power converter fails, the SYSCTL circuit pack provides +5 volts to light the FAULT LED on the OA circuit pack.

Quick Reference Summary

Transmit Functions

The OA circuit pack performs the following transmit functions:

(a) Optically amplifies the optical line signal

(b) Adds/drops the supervisory signal.

Control Functions

The OA circuit pack performs the following timing and control functions:

(a) Performs internal fault detection and interfaces with the SYSCTL circuit pack using the board controller local area network (BCLAN)

(b) Stores inventory information for ODU/OMU and OA circuit pack (*CLEI* code, serial number, etc.)

(c) Monitors and controls the temperature of the passband filters on the 605A ODU

(d) Controls the circuit pack faceplate FAULT LED.

Administration and Provisioning

8

Contents

Overview 8-1

Administration 8-1

- Memory Administration 8-1
- Version Recognition 8-4
- Security 8-4
  - General 8-4
  - Port Security 8-5
  - User Login Security 8-6
  - Network Element Login Security 8-7
  - Password Aging 8-8
- Software Upgrades 8-9
- Access Identifications 8-10

Provisioning 8-11

- Provisionable Parameters and Original Values 8-11
- Local Provisioning 8-17
- Preprovisioning Circuit Packs 8-31
- Provisioning on Circuit Pack Replacement 8-31
- Auto Provisioning Date/Time 8-31
- Circuit Pack Slot, Port, and Optical Channel Provisioning States 8-32

Administration and Provisioning

8

Overview

This section describes the administration and provisioning features of the Optical Line System (OLS). It also presents a list of provisionable parameters with their ranges and original values.

Administration

Memory Administration

The Optical Line System memory consists of the following:

- Executable code: This is the collection of "programs" that controls the operation of the system.
- Data: This is a collection of system parameters and their associated values. A parameter is a characteristic of the system that affects its operation. A value is a number, text string, or other menu selection associated with a parameter.

There are two complete copies of executable code in the system under normal conditions. One complete copy of executable code is located in the nonvolatile memory of the System Memory (SYSMEM) circuit pack. The other copy is distributed in the volatile memory of the System Controller (SYSCTL) circuit pack and the individual board controllers on the Overhead Controller - Tributary (TOHCTL), Telemetry Controller (TLM), and Optical Amplifier (OA) circuit packs. [The Optical Multiplexing Units (OMUs) and Optical Demultiplexing Units (ODUs) do not have board controllers.] The system executes the copy in the board controllers and the SYSCTL circuit packs.

There are three sets of data in the system under normal conditions:

- Two sets of data are located in the nonvolatile memory of the SYSMEM circuit pack.
  - — One set contains the system parameters and their original values (value assigned to a parameter at the factory).
  - — The second set contains the system parameters and their current values (values currently being used by the system).
- The third set of data is located in the volatile memory of the SYSCTL circuit pack, plus the board controller of the other circuit packs. This set contains the system parameters and their current values.

If the system loses power and then regains power, the executable code and the data (with current values) are copied from the nonvolatile memory in the SYSMEM circuit pack to the volatile memory in the SYSCTL circuit pack. The system then starts running the executable code.

If the SYSCTL circuit pack is replaced, the executable code and data (with current values) are copied from the nonvolatile memory in the SYSMEM circuit pack to the volatile memory in the SYSCTL circuit pack. The system then starts running the executable code.

If the SYSMEM circuit pack is replaced and the executable code in the new SYSMEM circuit pack is different from what is running in the SYSCTL circuit pack, one of the following functions can be performed:

- Restart the system with the version of executable code in the new SYSMEM circuit pack.
- Load another copy of the currently running version of the executable code from the craft interface terminal (CIT) to the SYSMEM circuit pack.
- Copy the currently running version of the executable code from the SYSMEM at another network element to the SYSMEM circuit pack via the supervisory signal data communications channel (DCC).

The Optical Line System supports the following CIT memory administration functions:

- Install-Software: This copies the executable code and original values from floppy disks in the CIT to the SYSMEM circuit pack. Refer to the Install-Software function in the "Operation" tab of this manual.
- Initialize-System: The `CONFIGURATION-Initialize-System` input replaces most current values in the SYSMEM circuit pack with the original values in the SYSMEM circuit pack and initiates the reset function (see Reset). Automatically provisioned parameters are unaffected by this command. The current values that are not replaced with their original values are those set with the following inputs:
  - `CONFIGURATION-Set-Date`
  - `SECURITY-Set-Password`
  - `SECURITY-Set-Login`
  - `SECURITY-Set-Security`
  - `SECURITY-Set-Far End Communications`
  - `SECURITY-Set-Network Element`. [The current values of the Target Identifier (TID) and Directory Service Network Element (DSNE) parameters are not replaced with their original values; but, the current values of the other parameters provisioned with this input are replaced with their original values.]
- Reset: The `FAULT-Reset` input copies the current values from the SYSCTL circuit pack to the SYSMEM circuit pack and the executable code from the SYSMEM circuit pack to the SYSCTL circuit pack. The executable code in the SYSCTL circuit pack is then restarted and the current values in the SYSMEM circuit pack are reformatted to work with the new executable code.
- Update: The `CONFIGURATION-Update` input updates the state of all the automatically provisioned parameters based on what circuit packs are present and the condition of the incoming signals. Refer to "Provisionable Parameters and Original Values" in this section for more information about automatically provisioned parameters.
- Copy-Program: The `CONFIGURATION-Copy-Program` input copies the executable code and original values from the SYSMEM circuit pack of the network element (where the input is invoked) to the SYSMEM circuit pack of any other network element. Refer to the Copy-Software function in the "Operation" tab of this manual.

Version Recognition

The Optical Line System provides automatic version recognition of all the hardware and software installed. The Optical Line System is able to report the type and version of the circuit pack that is installed in each slot. The *Common Language* CLEI* code and serial number of each circuit pack are stored on the circuit pack and are accessible by the System Controller circuit pack. The equipment catalog item (ECI) version identification and apparatus code for each circuit pack are also provided. Refer to the `CONFIGURATION-Retrieve-Equipment` input in Section 11, "Craft Interface Terminal Usage."

Security

General

The Optical Line System provides a security function to protect against unauthorized access to the CIT functions (for example, provisioning). The security function limits access to the Optical Line System to legitimate users only. Security is provided using a four-tier approach that provides maximum flexibility and control. The four tiers are as follows:

- Port security
- User login security
- Network element login security
- Password aging.

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

Port Security

Port security provides the capability to control user access to the Optical Line System on a per port basis. Port security includes the following:

- **Provisionable port status**: Dial-up access using the CIT (DTE) port and remote access using the supervisory signal data communications channel (DCC) may be enabled to allow users to log in to that port or disabled to deny any attempt to log in to that port. Local access to the CIT (DCE) port may never be disabled. However, legitimate logins to the CIT (DCE) port are required.
- **Inactivity timers**: A provisionable inactivity timer (0-999 minutes) is provided for the local CIT (DCE) and CIT (DTE) ports. Inactivity timers do not apply to logins using the X.25 interface or DCC. If the user does not interact with the Optical Line System within the provisioned time, the user will automatically be disconnected. The inactivity timer is reset by any data received at the port from a user, regardless of whether the data is addressed to a local or remote login session. The inactivity timer is also reset by any output addressed to the local port, regardless of origin (local or remote login session).

The **`SECURITY-Set-Security-Port`** input is used to provision port security. For more information about provisioning port security, refer to the **`SECURITY-Set-Security-Port`** input in the "Local Provisioning" part of this section.

The **`SECURITY-Retrieve-Security-Port`** input is used to report port status. For information about the access port security configuration report, refer to the **`SECURITY-Retrieve-Security-Port`** input in Section 11, "Craft Interface Terminal Usage." In Release 2 and later releases, port security may be provisioned through the message-based operations system interface, using X.25 protocol and Transaction Language 1 (TL1) messages.

User Login Security

User login security provides the capability to control access to the Optical Line System on an individual user basis. User login security includes the following:

- **Login ID and password**: All users must properly identify themselves by providing a valid login ID and password before gaining access to the Optical Line System.
- **Four levels of access privileges**: Each user login ID is assigned one of the following access levels to control which system functions may be performed.
  - — Privileged/Expert: A privileged login gains access to the "expert" input set by invoking the CIT-PC program in the expert mode. A privileged login in the expert mode has access to all the system functional capabilities. A privileged login in the expert mode is also allowed to execute the auto turnup tests and specify certain inputs that affect all optical lines in the system (for example, inputs that have the potential for massive service interruption).
  - — Privileged: Privileged logins have access to all system functional capabilities except those with potential for massive service interruption. Only the privileged logins have access to the security and access functions. These functions include assigning/changing logins/passwords for other users, enabling/disabling ports, setting target identifier (TID) names, and resetting the system. There are only two privileged logins.
  - — General: The general logins have access to all the system functional capabilities except the security, access, system initialization, and software installation functions. General logins do not have access to the **`Set-Date`** input.
  - — Reports Only: The reports only logins have access to the **`Retrieve`**, **`Set-Password`**, **`Test-LED`**, and **`Operate-Alarm Cutoff`** inputs. The reports only logins are not allowed to change any of the system provisioning values; however, reports only logins may change their password.
- **Visitor Logins**: Visitor logins may be provisioned with expiration dates. Visitor logins are automatically deleted on the provisioned expiration date regardless of their use. Visitor logins are general or reports only logins.

A privileged user can create up to 98 nonprivileged logins (general and reports only) per system. Login IDs and passwords are administered with the **SECURITY-Set-Login-Enter**, **SECURITY-Set-Login-Change**, and **SECURITY-Set-Login-Delete** inputs. For more information about provisioning user login security, refer to the **SECURITY-Set-Login-Enter**, **SECURITY-Set-Login-Change**, and **SECURITY-Set-Login-Delete** inputs in the "Local Provisioning" part of this section.

The **SECURITY-Retrieve-Login** input is used to report login status. For information about the login report, refer to the **SECURITY-Retrieve-Login** input in Section 11, "Craft Interface Terminal Usage."

Network Element Login Security

Network element login security provides the capability to control access to the Optical Line System on a network element basis. Network element login security is provided by controlling whether or not nonprivileged (general or reports only) users are allowed to access the network element. When logins are allowed, nonprivileged users may log in and access the network element. When logins are not allowed, login attempts are denied. Privileged users are not affected by this security measure and are always allowed to log in.

Network element security is intended to disable nonprivileged logins quickly on a temporary basis. This capability might be used during routine maintenance or upgrade activities. Permanent security should be provided using port security or user login security.

Login aging prevents inactive, nonprivileged users from accessing the Optical Line System. If the difference between the last login date and the current date* of a nonprivileged login exceeds the provisioned login lifetime parameter, the login is automatically deleted. An audit runs each day at 11:59 p.m. to check for and delete expired logins. The same audit automatically deletes visitor logins at 11:59 p.m. on the provisioned expiration date. Login aging applies only to nonprivileged logins. A privileged login is never deleted.

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* A privileged user may change the current date using the **Set-Date** input so that the login lifetime is exceeded, even though the number of calendar days since the last login attempt is less.

The **SECURITY-Set-Security-Network Element** input is used to enable/disable nonprivileged user logins. For more information about provisioning network element security, refer to the **SECURITY-Set-Security-Network Element** input in the "Local Provisioning" part of this section.

The **SECURITY-Retrieve-Security-Network Element** input is used to report whether logins are allowed or not. For information about the global security report, refer to the **SECURITY-Retrieve-Security-Network Element** input in Section 11, "Craft Interface Terminal Usage." In Release 2 and later releases, network element security may be provisioned through the message-based operations system interface, using X.25 protocol and Transaction Language 1 (TL1) messages.

Password Aging

Password aging provides the capability to force users to periodically change their password. If the users do not change their password within the provisioned period of time, their password will expire. The next time the users attempt to log in, they will not be allowed to execute any commands until they change their password.

To enable password aging, the password aging interval must be provisioned in the range of 7 to 999 days. To disable password aging, the password aging interval must be provisioned to 0 days.

If password aging is enabled, a user may not change a password unless at least 7 days have passed since the last password change for that login. Any attempt to change a password when less than 7 days have passed is denied.

The **SECURITY-Set-Security-Network Element** input is used to enable/disable password aging and provision the password aging interval. For more information about provisioning password aging, refer to the **SECURITY-Set-Security-Network Element** input in the "Local Provisioning" part of this section.

The **SECURITY-Retrieve-Security-Network Element** input is used to report the password aging interval in days. For information about the global security report, refer to the **SECURITY-Retrieve-Security-Network Element** input in Section 11, "Craft Interface Terminal Usage." In Release 2 and later releases, network element security may be provisioned through the message-based operations system interface, using X.25 protocol and Transaction Language 1 (TL1) messages.

Software Upgrades

The Optical Line System provides an in-service software upgrade capability using a CIT locally or remotely (with a modem or digital data network). The CIT (PC running CIT-PC software) must be used locally to install the initial software into a system. Remote software upgrades over the supervisory channel DCC are possible.

The Optical Line System is **fully** operational during the software upgrade. For example, the Optical Line System maintains all transmission, performance monitoring, and system reporting functions. For detailed information about installing a particular software release, refer to the applicable software release description:

Release 1.0.0-OLS	Comcode 107584468, *Optical Line System (OLS) Software Release Description, Release 1.0.0-OLS*
Release 2.0.0-OLS	Comcode 107896607, *Optical Line System (OLS) Software Release Description, Release 2.0.0-OLS*

The software release descriptions are shipped with the software and are not orderable from the Lucent Technologies Customer Information Center.

Access Identifications

The access identifications (AIDs) are used to access the functionality of the Optical Line System. The Optical Line System also uses AIDs to identify, address, and report on entities within the system. Entities are circuit pack slots, ports, signals, transmission lines, operations interfaces, data communications channels (DCC), and alarm interfaces.

Table 8-1 shows the Optical Line System output values.

Table 8-1. Optical Line System Output Values

Entity	Values
System	system
Optical Line	oline-{1a-4b}
Optical Channel	ochan-{1a-4b}-{1-8}
Supervisory Channel	supr-{1a,2a,3a,4a} [End Terminals]
Supervisory Channel	supr-{1a-4b} [Repeaters]
Port (CMS)	cms-{1a,2a,3a,4a} [End Terminals]
Port (CMS)	cms-{1a-4b} [Repeaters]
Port (COM)	{dce,dte,dcc,x.25,ser_tlm1*}
Slot (OA)	oa-{1a-4b}
Slot (TLM)	tlm-{1a,2a,3a,4a} [End Terminals]
Slot (TLM)	tlm-{1a-4b} [Repeaters]
Slot (SYSCTL)	sysctl
Slot (SYSMEM)	sysmem
Slot (TOHCTL)	tohctl
Operations Interface (CIT)	cit-{dce,dte,dcc} tl1-{dce,dte,dcc,x25}
Operations Interface (UID)	<User-Login>
Operations Interface (DCC-SUPR)	dccsupr-{1a,1b,2a,2b}
Miscellaneous Discrete (Control Point)†	cont-{1-4}
Miscellaneous Discrete (Control Point)*	cont-{1-36}
Miscellaneous Discrete (Environmental Point)†	env-{1-16}
Miscellaneous Discrete (Environmental Point)*	env-{1-144}
Shelf	shlf-{1-2}
PM Register	reg-{day,QH}

* Available in Release 2 and later releases.

† Available in Release 1 only.

Provisioning

Provisionable Parameters and Original Values

Installation provisioning is minimized with provisionable parameters and original values. Each CIT provisionable parameter is assigned an original value. The provisionable parameters and original values are copied from floppy disks in the CIT to the SYSMEM circuit pack.

The SYSMEM circuit pack contains one copy of the provisionable parameters with their original values and another copy of the provisionable parameters with their current values. The SYSCTL circuit pack, plus the board controllers on the other circuit packs, contain one copy of the provisionable parameters with their current values.

The original values cannot be changed. The current values can be changed through local provisioning.

NOTE:
The Optical Line System has no switch-settable parameters.

Table 8-2 shows the provisionable parameters of the Optical Line System. This includes the parameters that can be provisioned using the CIT, plus the parameters that are automatically provisioned or have fixed values (cannot be changed). The original value for each provisionable parameter in Table 8-2 is shown in brackets [ ]. Table 8-2 also shows the applicable CIT-PC and TL1 commands.

Table 8-3 shows the provisionable threshold crossing alert (TCA) parameters of the Optical Line System. This includes the threshold range and original values for the quarter-hour and day bins of each performance-monitoring parameter. The original value for each provisionable parameter in Table 8-3 is shown in brackets [ ].

Table 8-2. Provisionable Parameters

Parameter	Options [Original Value]	Method	CIT-PC Input [TL1 Command]	CIT-PC Report [TL1 Report]
System Identification				
- Target Identifier (TID)	[PF-2000]‡‡≤*20 characters*			
- Directory Service Network Element (DSNE)	Yes, [No]	CIT	**SECURITY-Set Network Element [ENT-SYS]**	**SECURITY-Retrieve Network Element [RTRV-SYS]**
- X.25 Packet Size	128, [256]			
- Alarm Group	0-[255]			
- Alarm Gateway Network Element (AGNE)	Yes, [No]			
- Direction (DIRN) (End Terminals only)	[1A-TX], 1A-RCV			
- System Type¶	[Nx33], Mx24/Px25			
Performance Monitoring				
- Start Time	0-23 [0]	CIT	**PERFORMANCE-Set-PM-Stime [SET-PM-STIME]**	**PERFORMANCE-Retrieve-PM-Stime [RTRV-PM-STIME]**
Operations				
- Operation Ports	CIT (DCE), CIT (DTE), DCC, X.25	Choice*	None	**SECURITY-Retrieve-Security Port [RTRV-CID-SECU]**
- Operation Port Baud Rates				
CIT (DCE)	1200, 2400, 4800, 9600 [No Original Value]	Autobaud	None	None
CIT (DTE)	1200, 2400, 4800, 9600 [No Original Value]			
X.25†	1200, 2400, 4800, 9600, 19200 [No Original Value]	Automatic		

See footnotes at end of table.

Table 8-2. Provisionable Parameters (Contd)

Parameter	Options [Original Value]	Method	CIT-PC Input [TL1 Command]	CIT-PC Report [TL1 Report]
Operations (Contd)				
- Remote Access			SECURITY-	SECURITY-
Remote Activity Reporting	Enable, [Disable]	CIT	Set-Far End	Retrieve-Far End
Remote Office Alarms	Enable, [Disable]		Communications	Communications
			[ENT-FECOM]	[RTRV-FECOM]
- Network Element Security				
Logins Allowed	[Yes], No		SECURITY-Set	SECURITY-Retrieve
Password Aging	[0], 7-999 Days	CIT	Security-	Security-
Login Aging	[0], 7-999 Days		Network Element	Network Element
			[ENT-NE-SECU]	[RTRV-NE-SECU]
- Port Security				
Type	DCE, DTE, DCC, X.25 [No Original Value]			
Port Access	[Enable], Disable			
Port Protocol				
CIT (DCE)	[CIT], TL1			
CIT (DTE)	[CIT], TL1			
Baud Rates				
CIT (DCE) (TL1 Protocol)	1200,2400,4800,[9600]	CIT	SECURITY-Set-	SECURITY-Retrieve-
CIT (DTE) (TL1 Protocol)	1200,2400,4800,[9600]		Security Port	Security Port
X.25 Channel Type	Switched, Permanent [No Original Value]		[ENT-CID-SECU]	[RTRV-CID-SECU]
OS Type				
X.25 PVC #1	[maintenance], memry-admin, cmd-resp, other, rst¶			
X.25 PVC #2	maintenance, memry-admin, [cmd-resp], other, rst¶			
X.25 SVC #1-#16††	maintenance, memry-admin, [cmd-resp], other, none, rst¶			
SVC Calling Address				
X.25 SVC #1-#16††	*15 or Less Numeric Characters*			
Timeout	0-999 Minutes [15]			
- Login Security				
Logins 1-100	[LUCENT01 *or* LUCENT02‡] *1 to 10 Alphanumeric Characters*	CIT	SECURITY- Set-Login [ENT-USER-SECU]	SECURITY- Retrieve-Login [RTRV-USER-SECU]
Password	[FT-2000§‡]*6 to 10 Characters, (at least 1 numeric character and 1 symbolic character)*	CIT	SECURITY-Set- Password [ED-PID]	None

See footnotes at end of table.

Table 8-2. Provisionable Parameters (Contd)

Parameter	Options [Original Value]	Method	CIT-PC Input [TL1 Command]	CIT-PC Report [TL1 Report]
Operations (Contd)				
User Privilege	Reports Only, [General]	CIT	SECURITY-Set-Login [ENT-USER-SECU]	SECURITY-Retrieve-Login [RTRV-USER-SECU]
Visitor Login	Yes, [No]	CIT	SECURITY-Set-Login [ENT-USER-SECU)	SECURITY-Retrieve-Login [RTRV-USER-SECU]
- Incoming Signal Alarm Delay - Alarm Clear Delay	0-120 Seconds [2] 0-120 Seconds [10]	CIT	CONFIGURATION-Set-Attribute-Alarm [SET-ATTR-ALM]	CONFIGURATION-Retrieve-Attribute-Alarm [RTRV-ATTR-ALM]
- User-Settable Miscellaneous Discretes Description of Control Outputs 1-36**	["Control *n*"] *≤26 Characters*	CIT	CONFIGURATION-Set-Attribute-Control [SET-ATTR-CONT]	CONFIGURATION-Retrieve-Attribute-Control [RTRV-ATTR-CONT]
Description of Environmental Inputs 1-144** Environmental Input Alarm Level	["Environment *n*"] *≤26 Characters* CR, MJ, [MN], NA, NR	CIT	CONFIGURATION-Set-Attribute Environment [SET-ATTR-ENV]	CONFIGURATION-Retrieve-Attribute Environment [RTRV-ATTR-ENV]
- Date - Hours - Minutes - Seconds - Standard Time Zone - Start Daylight Savings Date - Stop Daylight Savings Date - Daylight Savings Time Zone	YY-MM-DD [94-06-30] 0-23 [0] 0-59 [0] 0-59 [0] [*blank*] *≤3 Letter Characters* MM-DD [01-01] MM-DD [01-01] [*blank*] *≤3 Letter Characters*	CIT	CONFIGURATION-Set-Date [ED-DAT]	CONFIGURATION-Retrieve-Date [RTRV-HDR] [RTRV-DAT]¶
Slot State Provisioning - All Slots	EQ, [AUTO]	Automatic	None	FAULT-Retrieve-State [RTRV-STATE]
OC-48 Termination LBO (Optical)	0,5,10,15,or 20 dB	Lightguide Jumper	None (Manually Installed)	None (Stamping on LBO)
IS-3 Termination LBO (Optical)	0 dB, 7.1 dB	Lightguide Jumper	None (Manually Installed)	None (Stamping on LBO)

See footnotes at end of table.

Table 8-2. Provisionable Parameters (Contd)

Parameter	Options [Original Value]	Method	CIT-PC Input [TL1 Command]	CIT-PC Report [TL1 Report]
Supervisory Channel Alarm Level	[CR], MJ, MN, NA, NR	CIT	CONFIGURATION-Set-SUPR [ENT-ATTR-rr]	CONFIGURATION-Retrieve-SUPR [RTRV-ATTR-rr]
Supervisory Channel Signal Degrade Threshold	10^{-5},[10^{-6}],10^{-7},10^{-8},10^{-9}	CIT	CONFIGURATION-Set-SUPR [ENT-rr]	CONFIGURATION-Retrieve-SUPR [RTRV-rr]
Optical Channel State Provisioning - Port	[AUTO], NMON	CIT	CONFIGURATION-Set-State-OCHAN [ENT-rr]	FAULT-Retrieve-State [RTRV-rr] [RTRV-STATE]¶
- Port	[AUTO], IS	Automatic	None	FAULT-Retrieve-State [RTRV-rr] [RTRV-STATE]¶
CMS Provisioning - Port	[AUTO], NMON	CIT	CONFIGURATION-Set-State-CMS [ENT-rr]	FAULT-Retrieve-State [RTRV-rr] [RTRV-STATE]¶
- Port	[AUTO], IS	Automatic	None	FAULT-Retrieve-State [RTRV-rr] [RTRV-STATE]¶

* Select the desired port by installing the appropriate cabling.

† The baud rate is determined by the clock to the X.25 interface.

‡ At startup, there are exactly two privileged logins and no others.

§ FT-2000 is the original value of the password for LUCENT01 and LUCENT02.
There is no original password value for any other logins.

¶ Available in Release 2 and later releases.

** 4 control outputs and 16 environmental inputs are available in Release 1.
36 control outputs and 144 environmental inputs are available in Release 2 and later releases.

†† SVC #1-#6 are available in Release 1. SVC #1-#16 are available in Release 2 and later releases.

‡‡ ATT-FT-2000 is the original value in Release 1. PF-2000 is the original value in Release 2 and later releases.

Table 8-3. Provisionable Threshold Crossing Alert (TCA) Parameters

Parameter	Threshold Range [Original Value] Current Quarter Hour	Current Day	CIT-PC Input [TL1 Command]	CIT-PC Report [TL1 Report]
Optical Line			PERFORMANCE-Set-PM Threshold-OLINE [SET-TH]	PERFORMANCE-Retrieve-PM Threshold-OLINE [RTRV-TH]
- TCA Autonomous Report (TOPR-L)	[Enable]/Disable	[Enable]/Disable		
- Total Optical Power	10,20,30,40,50 [60],70,80,90,100	10,20,30,40,50 [60],70,80,90,100		
Optical Channel			PERFORMANCE-Set-PM Threshold-OCHAN [SET-TH]	PERFORMANCE-Retrieve-PM Threshold-OCHAN [RTRV-TH]
- TCA Autonomous Report (SPR-C)	[Enable]/Disable	[Enable]/Disable		
- Signal Power Received per Channel (SPR-C)	0,10,20,30,40,50 [60],70,80,90,100	0,10,20,30,40,50 [60],70,80,90,100		
Supervisory Channel				
- TCA Autonomous Report (LBC-SU)*	[Enable]/Disable	[Enable]/Disable		
- TCA Autonomous Report (SPR-SU)*	[Enable]/Disable	[Enable]/Disable		
- TCA Autonomous Report†	[Enable]/Disable	[Enable]/Disable	PERFORMANCE-Set-PM Threshold-SUPR [SET-TH]	PERFORMANCE-Retrieve-PM Threshold-SUPR [RTRV-TH]
- Line Coding Violations (CV-L)‡	-7,-8,[-9],-10	-7,-8,-9,[-10],-11,12		
- TCA Autonomous Report (CV-L)*	[Enable]/Disable	[Enable]/Disable		
- Line Errored Seconds (ES-L)	1-900 [25]	1-65535[250]		
- TCA Autonomous Report (ES-L)*	[Enable]/Disable	[Enable]/Disable		
- Line Severely Errored Seconds (SES-L)	1-63 [10]	1-4095 [40]		
- TCA Autonomous Report (SES-L)*	[Enable]/Disable	[Enable]/Disable		
- Line Unavailable Seconds (UAS-L)	1-63 [10]	1-4095 [10]		
- TCA Autonomous Report (UAS-L)*	[Enable]/Disable	[Enable]/Disable		

* Available in Release 2 and later releases.

† Available in Release 1 only.

‡ The coding violations parameter specifies the coding violations *error rate* that will cause a TCA and is the base 10 logarithm of the desired error rate. However, the specified report will show the *number* of coding violations that will cause a TCA.

Local Provisioning

The following CIT-PC inputs (listed in alphabetical order) and corresponding TL1 commands are used to provision the Optical Line System. (Refer to Section 6, "Operations Interfaces," or Section 10, "Technical Specifications," for information about minimum CIT requirements.)

- **CONFIGURATION-Set-Attribute-Alarm** (TL1 = **SET-ATTR-ALM**): This input provisions the incoming Signal Alarm Delay and the Alarm Clear Delay intervals.
  - — The Incoming Signal Alarm Delay parameter sets the time (0 to 120 seconds) that the network element will wait, after it finds an incoming signal condition, before reporting the event using all autonomous indicators. This parameter applies to defects in the optical line signals, supervisory signals, and customer maintenance signals.
  - — The Alarm Clear Delay parameter sets the time (0 to 120 seconds) that the network element will wait, after a condition clears, before reporting the clear event using all indicators. This parameter applies to all conditions.

- **CONFIGURATION-Set-Attribute-Control** (TL1 = **SET-ATTR-CONT**): This input sets the Descriptions for the miscellaneous discrete control output points.
  - — The Point parameter selects the miscellaneous discrete control output point to provision.
  - — The Description parameter is the text string associated with the selected miscellaneous discrete control output point. It is a character string of up to 26 characters, where the characters are letters, digits, or spaces. It is used to identify the point in the **Retrieve-History** and **Retrieve-Alarm (and Status)** reports.

- **CONFIGURATION-Set-Attribute-Environment** (TL1 = **SET-ATTR-ENV**): This input sets the Descriptions and Alarm Levels for the miscellaneous discrete environmental input points.
  - — The Point parameter selects the miscellaneous discrete environmental input point to provision.

— The Alarm Level parameter provisions the severity of the condition associated with the closing of the selected miscellaneous discrete environmental input point. The choices are as follows:

- "CR": critical
- "MJ": major
- "MN": minor
- "NA": status not alarmed
- "NR": status not alarmed and not reported to the OS.

— The Description parameter is the text string associated with the selected miscellaneous discrete environmental input point. It is a character string of up to 26 characters, where the characters are letters, digits, or spaces. It is used to identify the point in the **Retrieve-History** and **Retrieve-Alarm (and Status)** reports.

■ **CONFIGURATION-Set-Date** (TL1 = **ED-DAT**): This input sets the network element clock date and time and provisions automatic daylight savings time processing.

— The Date parameter sets the current date in the network element clock. It is entered in the form YY-MM-DD where:

- YY is the year (00-99)
- MM is the month (1-12)
- DD is the day (1-31).

— The Hours parameter sets the hour (0 to 23) in the network element clock. A value of "zero" may be entered as "–0," "0," or "+0." These entries are treated as the same value.

— The Minutes parameter sets the minute (0 to 59) in the network element clock. A value of "zero" may be entered as "–0," "0," or "+0." These entries are treated as the same value.

— The Seconds parameter sets the second (0 to 59) in the network element clock. A value of "zero" may be entered as "–0," "0," or "+0." These entries are treated as the same value.

— The Standard Time Zone parameter is the 3-letter string (for example, EST, MST) that is indicated as part of the date and time stamp in command responses when Standard Time is in effect. Entering three spaces results in no Time Zone reported in the response messages.

— The Start Daylight Savings Date parameter sets the date when the network element moves the current time forward by 1 hour. It should be entered in the form MM-DD where:

- MM is the month (1-12)
- DD is the Day (1-31).

If this value is different from the Stop Daylight Savings Date parameter value, daylight savings time is enabled and the time change will occur at 02:00:00 on the chosen date. If the two values are the same, daylight savings time processing is disabled. The value 2-29 is not allowed.

— The Stop Daylight Savings Date parameter sets the date when the network element moves the current time backward by 1 hour. It should be entered in the form MM-DD where:

- MM is the month (1-12)
- DD is the Day (1-31).

If this value is different from the Start Daylight Savings Date parameter value, daylight savings time is enabled and the time change will occur at 02:00:00 on the chosen date. If the two values are the same, daylight savings time processing is disabled. The value 2-29 is not allowed.

— The Daylight Savings Time Zone parameter is the 3-letter character string (for example, EST, MST) that is printed as part of the date and time stamp in command responses when Daylight Savings Time is in effect. Entering three spaces results in no Time Zone reported in the response messages.

■ **CONFIGURATION-Set-State-CMS** (TL1 = **ENT-rr**): This input sets the Primary State of the customer maintenance signal port to "AUTO" or "NMON."

— The Primary State parameter provisions the state of the selected port(s) to either:

- "NMON": The selected customer maintenance signal(s) are not monitored for errors. No conditions are reported and PM quantities will be "-" for this port. The port will not make a transition to the IS (in service) state if a good signal appears. The only way to change the state of the port is to reprovision it to AUTO.
- "AUTO": Alarms will not be raised and PM quantities will not be reported until after a valid signal appears on the selected direction of this port. After the signal appears, it is continuously monitored, and the port transitions to the IS (in service) state.

- **CONFIGURATION-Set-State-OCHAN** (TL1 = **ENT-rr**): This input sets the Primary State of the Optical Channel.
  - — The Primary State parameter provisions the state of the selected optical channel to either:
    - "NMON": The optical line signals for the selected optical channel are not monitored for errors. No conditions are reported and PM quantities will be "-" for this channel. The channel will not make a transition to the IS (in service) state if a good optical line signal appears. The only way to change the state of the port is to reprovision it to AUTO.
    - "AUTO": Alarms will not be raised until after a valid optical line signal appears on the selected optical channel. After the signal appears, it is continuously monitored, and the channel transitions to the IS state.

- **CONFIGURATION-Set-SUPR** (TL1 = **ENT-rr**): This input sets the Alarm Level and Signal Degrade Threshold of the supervisory channels.
  - — The Alarm Level parameter sets the severity of an incoming supervisory signal failure condition. The choices are as follows:
    - "CR": critical
    - "MJ": major
    - "MN": minor
    - "NA": status not alarmed
    - "NR": status not alarmed and not reported to the OS
    - "NO": no failure conditions reported.
  - — The Signal Degrade Threshold is the base 10 logarithm of the supervisory signal parity (B2) error rate threshold. The allowed values are "-5," "-6," "-7," "-8," and "-9." A signal degrade condition is reported for supervisory signals with error rates greater than the threshold.

- **PERFORMANCE-Set-PM Start-Time** (TL1 = **SET-PM-STIME**): This input sets the start time for the measurement of all 24-hour performance-monitoring parameters. The start time is set relative to the current clock and time zone. When the command is executed, all parameters in the current Day bin are marked corrupt with a "?".
  - — The Start Hour parameter specifies the start hour for all 24-hour performance-monitoring parameters. The performance-monitoring parameters will reset and begin daily at the provisioned time.

- **PERFORMANCE-Set-PM Threshold-OCHAN** (TL1 = **SET-TH**): This input provisions values for the threshold crossing alert parameters associated with optical channels.
  - The TCA Autonomous Report (SPR-C) parameter specifies whether autonomous reporting of threshold crossing alerts (TCAs) via TL1 is "Enable" or "Disable" for the selected performance-monitoring bin and optical channels.
  - The Signal Power Received per Channel (SPR-C) parameter specifies the signal power level per optical channel that will cause a threshold crossing alert for the optical channel. The threshold is independent of bins.

- **PERFORMANCE-Set-PM Threshold-OLINE** (TL1 = **SET-TH**): This input provisions values for the threshold crossing alert parameters associated with the optical health data collected for each optical line.
  - The TCA Autonomous Report (TOPR-L) parameter specifies whether autonomous reporting of threshold crossing alerts (TCAs) via TL1 is "Enable" or "Disable" for the selected performance-monitoring bin and optical line(s).
  - The Total Optical Power (TOPR-L) parameter specifies the signal power level that will cause a threshold crossing alert for the selected performance-monitoring bin and optical channel. The threshold setting is independent of bins.

- **PERFORMANCE-Set-PM Threshold-SUPR** (TL1 = **SET-TH**): This input provisions values for the threshold crossing alert (TCA) parameters associated with the supervisory channels.
  - The TCA Autonomous Report (LBC-SU) parameter (Release 2 and later) specifies whether autonomous reporting of threshold crossing alerts (TCAs) via TL1 is "Enable" or "Disable" for the selected performance-monitoring bin and supervisory channel(s).
  - The TCA Autonomous Report (SPR-SU) parameter (Release 2 and later) specifies whether autonomous reporting of threshold crossing alerts (TCAs) via TL1 is "Enable" or "Disable" for the selected performance-monitoring bin and supervisory channel(s).
  - The TCA Autonomous Report parameter (Release 1 only) specifies whether autonomous reporting of threshold crossing alerts (TCAs) via TL1 is "Enable" or "Disable" for the selected performance-monitoring bin and supervisory channel(s).

— The Line Coding Violations (CV-L) parameter specifies the number of line coding violations that will cause a threshold crossing alert (TCA) for the selected performance-monitoring bin and supervisory channel(s). This parameter is the base 10 logarithm of the desired error rate. The values are integers from -10 to -7 (inclusive) for the quarter-hour bin and integers from -12 to -7 (inclusive) for the day bin.

— The TCA Autonomous Report (CV-L) parameter (Release 2 and later) specifies whether autonomous reporting of threshold crossing alerts (TCAs) via TL1 is "Enable" or "Disable" for the selected performance-monitoring bin and supervisory channel(s).

— The Line Errored Seconds (ES-L) parameter specifies the number of line errored seconds that will cause a threshold crossing alert for the selected performance-monitoring bin and supervisory channel(s). A line errored second is recorded for each second during which there are one or more B2 coding violations, or a line AIS defect is detected. This parameter is an integer from 1 to 900 (inclusive) for the quarter-hour bin and an integer from 1 to 65535 (inclusive) for the day bin.

— The TCA Autonomous Report (ES-L) parameter (Release 2 and later) specifies whether autonomous reporting of threshold crossing alerts (TCAs) via TL1 is "Enable" or "Disable" for the selected performance-monitoring bin and supervisory channel(s).

— The Line Severely Errored Seconds (SES-L) parameter specifies the number of line severely errored seconds that will cause a threshold crossing alert for the selected performance-monitoring bin and supervisory channel(s). A line severely errored second is recorded for each second during which there are nine or more B2 coding violations or a line AIS defect is detected. For intervals with 10 or more contiguous severely errored seconds, the severely errored seconds will be recorded as unavailable seconds, not as severely errored seconds. This parameter is an integer from 1 to 63 (inclusive) for the quarter-hour bin and an integer from 1 to 4095 (inclusive) for the day bin.

— The TCA Autonomous Report (SES-L) parameter (Release 2 and later) specifies whether autonomous reporting of threshold crossing alerts (TCAs) via TL1 is "Enable" or "Disable" for the selected performance-monitoring bin and supervisory channel(s).

— The Line Unavailable Seconds (UAS-L) parameter specifies the number of line unavailable seconds that will cause a threshold crossing alert for the selected performance-monitoring bin and supervisory channel(s). A line unavailable second is recorded after 10 consecutive line severely errored seconds. These 10 seconds are counted, and each subsequent second is counted until there are 10 consecutive seconds without a line severely errored second. The 10 consecutive seconds without a line severely errored second are not counted as unavailable seconds. This parameter is an integer from 1 to 63 (inclusive) for the quarter-hour bin and an integer from 1 to 4095 (inclusive) for the day bin.

— The TCA Autonomous Report (UAS-L) parameter (Release 2 and later) specifies whether autonomous reporting of threshold crossing alerts (TCAs) via TL1 is "Enable" or "Disable" for the selected performance-monitoring bin and supervisory channel(s).

- **SECURITY-Set-Far End Communications** (TL1 = **ENT-FECOM**): This input sets the Remote Activity Reporting and Remote Office Alarms parameters.

  — Remote Activity Reporting parameter specifies whether remote alarms are included by the **Retrieve-Network Alarms** input, and whether the FE ACTY LED is "enabled" or "disabled." If "Enabled," conditions at a remote network element will cause the local FE ACTY LED to be lighted, and the **Retrieve-Network Alarms** input will report local and remote conditions. If "Disabled," the FE ACTY LED will be lighted only when the **FAULT-Test-LED** input is executed, and the **Retrieve-Network Alarms** input will report only local conditions. The value of this parameter does not affect other network elements in the network reporting conditions at the local network element.

  — Remote Office Alarms parameter specifies whether the network element will cause local office alarms when remote office alarms occur. If "Enabled," then remote office alarms will also cause local office alarms (alarm contacts). If "Disabled," then remote office alarms will not cause local office alarms. The value of this parameter does not affect the local FE ACTY LED or the conditions reported by the **Retrieve-Network Alarms** input.

  The Far End Parallel Telemetry is enabled if the Remote Activity Reporting or Remote Office Alarms parameter is "Enabled." This input may only be executed via the CIT(DCE) or CIT(DTE) port.

- **SECURITY-Set-Login-Change** (TL1 = **ED-USER-SECU**): This input edits the user ID, password, user privileges, and status of any nonprivileged login, and changes the other privileged login's login ID and password. This input is also used to re-enable a nonprivileged login ID that has expired due to login aging.

  — The Login parameter is the login ID of the login to be changed. (The **Retrieve-Login** input will list the login IDs.)

  — The New Login parameter replaces the login ID for the selected login. It must be a string of from 1 to 10 alphanumeric characters, in which the difference between uppercase and lowercase is significant, and it must be different from all other login IDs in this network element. If ENTER is pressed, the system defaults to the current login ID.

  — The New Password parameter becomes the new password for the selected login ID. A password consists of a string of alphabetic, numeric, or symbolic characters conforming to the following rules:

  - String must contain from 6 to 10 characters
  - At least 2 of the characters must be nonalphabetic
  - At least 1 of the characters must be symbolic (The \, @, #, ?, $, &, comma, :, ;, _, or space not allowed)
  - The difference between uppercase and lowercase is significant.

  If ENTER is pressed, the system defaults to the current password.

  — The Re-enter Password parameter confirms the New Password parameter. Reenter the exact characters that were entered for the New Password parameter.

  — The User Privilege parameter sets the user's security level for nonprivileged users to one of the following:

  - "Reports Only": User will be able to execute only the **Retrieve**, **Set-Password**, **Operate-Alarm Cutoff**, and **Test-LED** inputs.
  - "General": User will be able to execute all commands, except **Initialize-System**, **Set-Far End Communications**, **Set-Login**, **Set-Network Element**, and **Set-Security**.

  The user privilege parameter for a privileged user can only be set to Privileged.

  — The Visitor parameter specifies whether the login will be changed to a visitor login (Yes or No). A visitor login is a temporary login.

— The Expiration Date parameter (YY-MM-DD) sets the date when the Visitor Login will expire. The FT-2000 OC-48 Large Capacity Terminal assumes the two-digit year (YY) is later than the currently set date. For example, if the current date is set to 96-01-24 and an expiration date of 02-01-24 is provided; it is assumed to be January 24, 2002. If an expiration date of 96-01-23 is provided; it is assumed to be January 23, 2096. The CIT will not reject any valid date entered.

— The Status parameter enables or disables the login. The status parameter for a privileged user can only be set to Enabled.

- **SECURITY-Set-Login-Delete** (TL1 = **DLT-USER-SECU**): This input deletes a nonprivileged login (general and reports only). If the login is active at the time this command is executed, the user is immediately logged off the system.

  — The Login parameter selects the login that is to be deleted. (The **Retrieve-Login** input will list login IDs.)

- **SECURITY-Set-Login-Enter** (TL1 = **ENT-USER-SECU**): This input enters a new login, including password and user privileges. A privileged user can create up to 98 nonprivileged logins (general and reports only). There are 2 privileged user IDs allowed per network element.

  — The New Login parameter is the login ID for the login being created. It must be a string of from 1 to 10 alphanumeric characters, in which the difference between uppercase and lowercase is significant, and it must be different from all other login IDs in this network element.

  — The New Password parameter is the password for the login being created. A password consists of a string of alphabetic, numeric, or symbolic characters conforming to the following rules:

    - String must contain from 6 to 10 characters
    - At least 2 of the characters must be nonalphabetic
    - At least 1 of the characters must be symbolic
      (The \, @, #, ?, $, &, comma, :, ;, _, or space not allowed)
    - The difference between uppercase and lowercase is significant.

  — The Re-enter Password parameter confirms the New Password parameter. Reenter the exact characters that were entered for the New Password parameter.

— The User Privilege parameter sets the user's security level to one of the following:

- "Reports Only": User will be able to execute only the **Retrieve**, **Set-Password**, **Operate-Alarm Cutoff**, and **Test-LED** inputs.
- "General": User will be able to execute all commands, except **Initialize-System**, **Set-Far End Communications**, **Set-Login**, **Set-Network Element**, and **Set-Security**.

— The Visitor parameter specifies if the new login will be a visitor login (Yes or No). A visitor login is a temporary login.

— The Expiration Date parameter (YY-MM-DD) sets the date when the Visitor Login will expire. The FT-2000 OC-48 Large Capacity Terminal assumes the two-digit year (YY) is later than the currently set date. For example, if the current date is set to 96-01-24 and an expiration date of 02-01-24 is provided; it is assumed to be January 24, 2002. If an expiration date of 96-01-23 is provided; it is assumed to be January 23, 2096. The CIT will not reject any valid date entered.

- **SECURITY-Set-Network Element** (TL1 = **ENT-SYS**): This input sets the TID (Target IDentifier), Directory Service Network Element (DSNE), X.25 packet size, alarm group, alarm gateway network element (AGNE), Direction (DIRN), and System Type parameters.

  — The TID (Target IDentifier) parameter is the name used to identify the local network element within a SONET network. The TID is used on all CIT and TL1 reports and is the destination address for all remote logins. It is a character string of up to 20 characters, where the characters are letters, digits, -, +, %, or #. Lowercase letters will be translated into uppercase before they are stored in the network element. Each TID in the network must be unique.

  Whenever the value of the TID parameter is changed, the user should enter the **Retrieve-Map-Ring** input or log off and log back in again to ensure that the new value of the TID parameter is included in the ring map.

  NOTE 1:
  If a user logs in to the system while a `reset in progress` condition is active, wait until the condition clears and enter the **Retrieve-Map-Ring** input or log off and log back in again to ensure that the list of TIDs in the ring map is complete.

  NOTE 2:
  Changing the value of the local TID will result in all *incoming* remote TL1 sessions being disconnected. This means the local network element will terminate all login sessions that were requested from TL1 gateway network elements.

— The Directory Service Network Element (DSNE) parameter specifies ("Yes" or "No") whether the network element is the directory services network element (DSNE). There must be one and only one DSNE. The DSNE is the single reference point in a network. The DSNE stores the IDs of the other network elements in the network and updates the other network elements after configuration changes.

CAUTION:
Changing the value of the directory server parameter may affect the operation of other network elements in the network.

NOTE:
A single network element may be the DS-NE, AGNE, and TL1 gateway network element. However, for networks larger than 5 to 7 nodes, it is recommended that the DS-NE, AGNE, and TL1 gateway network element functions reside at different network elements.

— The X.25 Packet Size parameter specifies the X.25 packet size to be used for a TL1 session to the local network element.

CAUTION:
Changing the value of the X.25 packet size parameter will cause the X.25 link to be reset and all active TL1 logins will be automatically dropped. All established SVCs and PVCs on the affected X.25 link will have to be reestablished.

CAUTION:
Changing the value of the X.25 packet size parameter and the directory server parameter will cause the X.25 link to be reset and all active TL1 logins will be automatically dropped. All established SVCs and PVCs on the affected X.25 link will have to be reestablished. Also, the operation of other network elements in the network may be affected.

— The Alarm Group parameter specifies the alarm group to which the local network element belongs. An alarm group is a set of network elements that share remote alarm information. Network elements in the same alarm group exchange alarm and status information through at least one alarm gateway network element (AGNE). The alarm and status information is reported using remote office alarms, far-end parallel telemetry, a far-end activity LED, and a network alarms report.

The Alarm Group parameter may have a value of 0 to 255. A value of 0 indicates that the local network element does not exchange remote status information with other network elements. All other values (1 to 255) indicate that the local network element exchanges remote status information with all other network elements that have the same value for the alarm group parameter.

— The Alarm Gateway Network Element (AGNE) parameter specifies whether the local network element will serve the other network elements in the alarm group as the AGNE. One network element in an alarm group must be provisioned as the AGNE. If redundancy is required, two (maximum) network elements can be provisioned as AGNEs.

NOTE:
A single network element may be the DS-NE, AGNE, and TL1 gateway network element. However, for networks larger than 5 to 7 nodes, it is recommended that the DS-NE, AGNE, and TL1 gateway network element functions reside at different network elements.

— The Direction (DIRN) parameter specifies whether the end terminal is designated as 1A transmit (1A-TX) or 1A receive (1A-RCV). The end terminal with an Optical Multiplexing Unit (OMU) in the first OMU/ODU slot should be designated 1A-TX. The end terminal with an Optical Demultiplexing Unit (ODU) in the first OMU/ODU slot should be designated 1A-RCV. Lowercase letters will be translated into uppercase before they are stored in the network element.

NOTE:
The direction (DIRN) parameter at one end terminal must be provisioned 1A-TX, and the other end terminal in the system must be provisioned 1A-RCV.

— The System Type parameter specifies the pump power setting used by the LEA7 OA circuit pack. The System Type parameter should be provisioned as follows:

System Type Parameter	Number of Spans	Span Loss (dB)	
		Minimum (Note)	Maximum
Nx33	1	22	33
	2	22	30
	3	22	28
Mx24/Px25	4	21	26
	5	21	26
	6	21	26
	7	17	22
	8	17	22

Note: Minimum losses can be achieved with the use of LBOs.

NOTE:
The System Type parameter has no affect on the LEA6 OA circuit pack. The LEA6 OA circuit pack has one pump power setting (Nx33).

- **SECURITY-Set-Password** (TL1 = **ED-PID**): This input changes your password.
  - — The Old Password parameter must match the user's current password.
  - — The New Password parameter replaces the old password. The New Password must be different from the old password. A password consists of a string of alphabetic, numeric, or symbolic characters conforming to the following rules:
    - String must contain from 6 to 10 characters
    - At least 2 of the characters must be nonalphabetic
    - At least 1 of the characters must be symbolic (The \, @, #, ?, $, &, comma, :, ;, _, or space not allowed)
    - The difference between uppercase and lowercase is significant.
  - — The Re-enter Password parameter confirms the New Password parameter. Reenter the exact characters that were entered for the New Password parameter.

- **SECURITY-Set-Security-Network Element** (TL1 = **ENT-NE-SECU**): This input sets the global security parameter for the system.
  - — The Logins Allowed parameter specifies whether nonprivileged users (general and reports only) are allowed to log in to the system. When Logins Allowed is set to "No," all nonprivileged users will be immediately logged off.
  - — The Password Aging parameter specifies the password aging interval. The password aging interval must be zero (0) or a number between 7 and 999 days. If zero (0) is specified, the password aging mechanism is disabled.
  - — The Login Aging parameter specifies the login aging interval. The login aging interval must be zero (0) or a number between 7 and 999 days. If zero (0) is specified, the login aging mechanism is disabled.

- **SECURITY-Set-Security-Port** (TL1 = **ENT-CID-SECU**): This input enables or disables user access via the CIT-DCC and CIT-DTE. This input enables a privileged user to condition a CIT/TL1 port.
  - — The Type parameter chooses the Operations Interface(s) to enable or disable. The choices are as follows:
    - "DTE": dial-up access
    - "DCC": remote login
    - "X.25": for TL1 only.
  - — The Channel Type parameter selects the switched type or the permanent type virtual circuit(s) of X.25 for setting the parameters.

— The Table Entry Qualifier parameter selects the circuit(s) of the X.25 port for setting the parameters. [PVC #1, PVC #2, SVC #1-#6 (Release 1), SVC #1-#16 (Release 2 and later)]

— The OS Type parameter selects the autonomous message set to be reported on the selected X.25 virtual circuit. Values are from the following:

- "maintenance": all autonomous messages but REPT DBCHG
- "memry-admin": all REPT DBCHG autonomous messages
- "cmd-resp": no autonomous messages
- "other": all autonomous messages
- "none": if no calling address is specified for SVC
- "rst": all autonomous messages but REPT EVT

When a new OS Type is selected, any previously provisioned Calling Address value must be reentered.

— The Calling Address parameter specifies a 15-digit dial string for the X.25 switched virtual circuits [SVC #1-#6 (Release 1) or SVC #1-#16 (Release 2 and later)].

— The Port Access parameter enables or disables access to the selected port(s).

NOTE:
If a port is enabled that is already enabled and has an active session, the active session is terminated.

— The Inactivity Timeout parameter sets the period of minutes during which no activity results in automatic logout from a port. This parameter must be between zero (0) and 999 minutes. If zero (0) is specified, the inactivity timeout mechanism is disabled. The Inactivity Timeout parameter does not apply to a port provisioned for TL1 input/output.

— The Port (Protocol) Type parameter sets the communications protocol used at the CIT (DCE) or CIT (DTE) port. If "CIT" is selected, the F-interface protocol is used to communicate with a PC running the CIT-PC software. An ASCII-based (dumb) terminal cannot communicate with a port provisioned as "CIT." If "TL1" is selected, TL1 protocol is used to communicate with an ASCII-based (dumb) terminal. A PC running the CIT-PC software cannot communicate with a port provisioned as "TL1."

NOTE:
When logging in to a CIT (DCE) or CIT (DTE) port that is provisioned as "TL1," enter **<Ctrl-Q><cr>** before entering the initial **ACT-USER** TL1 command. The **<Ctrl-Q>** ensures that the port is not in the X/off state and the **<cr>** clears the input buffer.

— The Baud Rate parameter selects the baud rate used for the CIT (DCE) or CIT (DTE) port that is configured for TL1 input/output. The values are "1200, 2400, 4800, or 9600."

For more information about the CIT-PC inputs, refer to Section 11, "Craft Interface Terminal Usage." For more information about the TL1 commands, refer to 824-102-176, *Optical Line System (OLS), Operations Systems Engineering Guide*.

Preprovisioning Circuit Packs

To simplify circuit pack installation, parameters can be provisioned before installing the corresponding circuit pack. All system parameters and values (current and original) are preserved by the Optical Line System in the nonvolatile memory of SYSMEM circuit pack. The parameters and values are protected by the nonvolatile memory if a power failure occurs and are retrievable on demand regardless of the means used for provisioning. The parameters are automatically downloaded when the affected circuit pack is installed.

Provisioning on Circuit Pack Replacement

Replacement of a failed circuit pack is simplified by the Optical Line System's automatic provisioning of the original circuit pack values. The SYSCTL and SYSMEM circuit packs maintain a provisioning map of the entire system, so when a transmission circuit pack is replaced, the SYSCTL and SYSMEM circuit packs automatically download provisioning parameters and current values to the new circuit pack.

Auto Provisioning Date/Time

When the SYSCTL circuit pack is reseated/replaced or a node power failure/recovery occurs, the Optical Line System uses the original date/time values (70-01-01, 00:00:00) in all reports. During ring startup the node obtains the correct date and time from the node provisioned as directory services network element (DS-NE). If the SYSCTL circuit pack is reseated/replaced or a node power failure/recovery occurs at the DS-NE, the DS-NE obtains the correct date and time from an adjacent node during ring startup.

Circuit Pack Slot, Port, and Optical Channel Provisioning States

The OA and TLM circuit pack slots may be in one of the following states:

- **AUTO (Auto)**: AUTO is the original value of the circuit pack slot state parameter. AUTO refers to a circuit pack slot that is available for automatic provisioning. A circuit pack slot makes a transition from the AUTO state to the EQ state when the presence of a circuit pack is detected.
- **EQ (Equipped)**: EQ refers to a circuit pack slot that is fully monitored and alarmed. A circuit pack slot makes a transition from the EQ state to the AUTO state when the **CONFIGURATION-Update** input is executed while the absence of a circuit pack is detected.

The IS-3 customer maintenance signal (CMS) ports may be in one of the following states:

- **AUTO (Auto)**: AUTO is the original value of the CMS port state parameter. AUTO refers to a CMS port that is available for automatic provisioning. A CMS port makes a transition from the AUTO state to the IS state after a good signal is detected. A CMS port in the AUTO state can also be provisioned to the NMON state, using the **CONFIGURATION-Set-State-CMS** input.
- **IS (In Service)**: IS refers to a CMS port that is fully monitored and alarmed. A CMS port makes a transition from the IS state to the AUTO state when the **CONFIGURATION-Update** input is executed while the absence of a good signal is detected. A CMS port also makes a transition from the IS state to the AUTO state when the associated circuit pack slot makes an EQ-to-AUTO circuit pack slot state transition. A CMS port in the IS state can also be provisioned to the AUTO or NMON state, using the **CONFIGURATION-Set-State-CMS** input.
- **NMON (Not Monitored)**: NMON refers to a CMS port that is not monitored and will not make a transition to the IS state when a good signal is detected. A CMS port in the NMON state can be provisioned to the AUTO state, using the **CONFIGURATION-Set-State-CMS** input.

The optical channels may be in one of the following states:

- **AUTO (Auto)**: AUTO is the original value of the optical channel state parameter. AUTO refers to an optical channel that is available for automatic provisioning. An optical channel makes a transition from the AUTO state to the IS state after the presence of an optical channel is detected. An optical channel in the AUTO state can also be provisioned to the NMON state, using the **CONFIGURATION-Set-State-OCHAN** input.
- **IS (In Service)**: IS refers to an optical channel that is fully monitored and alarmed. An optical channel makes a transition from the IS state to the AUTO state when the **CONFIGURATION-Update** input is executed while a loss of signal is detected. An optical channel in the IS state can also be provisioned to the AUTO or NMON state, using the **CONFIGURATION-Set-State-OCHAN** input.
- **NMON (Not Monitored)**: NMON refers to an optical channel that is not monitored and will not make a transition to the IS state when the presence of an optical channel is detected. An optical channel in the NMON state can be provisioned to the AUTO state, using the **CONFIGURATION-Set-State-OCHAN** input.

The Optical Line System monitors, reports, and alarms trouble conditions associated with optical channels, supervisory channels, and CMS ports according to the optical channel state, CMS port state, and the circuit pack slot state. The circuit pack slot state must be in the EQ state.

Maintenance Description

9

Contents

Overview 9-1

Maintenance Philosophy 9-1

Maintenance Signals 9-2

Fault Detection, Isolation, and Reporting 9-4

Protection Switching 9-10

- General 9-10
- Supervisory Signal Data Communications Channel Protection 9-10

Loopbacks 9-11

Tests 9-11

- Auto Turnup 9-11
- Manual 9-16
- Operations Interface Tests 9-17

Provisioning Consistency Audits 9-17

Performance Monitoring 9-18

- Performance Parameters 9-18
- Optical Line Parameters 9-19
- Optical Channel Parameters 9-20
- Supervisory Channel Parameters 9-20
- Performance-Monitoring Data Storage and Reports 9-21
- Performance Monitoring During Failed Conditions 9-22
- Performance-Monitoring Parameter Thresholds 9-23
- Threshold Crossing Alert Transmission to an Operations System 9-23

Contents

Reports 9-24

- Active Alarms and Status 9-24
- 6-Hour Autonomous TL1 Report 9-25
- Provisioning Reports 9-25
- Performance Monitoring 9-25
- State 9-26
- Version/Equipment List 9-26

Maintenance Description

9

Overview

This section defines the maintenance philosophy and outlines the various features available to monitor and maintain the Optical Line System (OLS).

Maintenance Philosophy

The Optical Line System detects failures, monitors performance degradation, isolates faults to specific circuit packs, and reports trouble conditions. Maintenance consists of reactive maintenance and performance monitoring. Reactive maintenance identifies a failure after it occurs. Performance monitoring identifies performance degradation before it causes a trouble condition.

The Optical Line System also allows operation and maintenance of a remote network element in a network from the local central office location. The Optical Line System uses the synchronous optical network (SONET) supervisory signal data communications channel (DCC) to provide the following:

- Craft interface terminal (CIT) remote access: The local network element provides a remote login capability from its CIT to a remote network element in the local network.
- Indicator strip/user panel remote access: The indicator strip and user panel provides a far-end activity (FE ACTY) LED to show that a remote network element in the local network or alarm group has a lighted near-end activity (NE ACTY) LED.
- X.25/TL1 remote access: The X.25/TL1 interface provides a message-based operations system access to the local network element and other network elements in the subnetwork.

For more information about the CIT, indicator strip, user panel, and X.25/TL1 interface, refer to Section 6, "Operations Interfaces."

Maintenance Signals

The Optical Line System uses several maintenance related signals and messages to aid locating faults. The Optical Line System is an optically amplified line system and has no access to the digital data in the optical line signal. Therefore, the Optical Line System cannot insert alarm indications signals (AIS), upstream failure indication signals (for example, remote defect indicator signals), and path unequipped signals at any of the SONET layers. However, the Optical Line System uses the following signals to support maintenance:

- **Tone signal**: The tone signal is a low frequency signal that is amplitude modulated on an OC-48 drop side signal by the FT-2000 OC-48 Large Capacity Terminal. Each OC-48 drop side signal wavelength is assigned a tone signal with a unique frequency. The Telemetry Controller (TLM) circuit pack amplitude modulates a tone signal on the supervisory signal. Table 9-1 shows the OC-48 drop side signal wavelengths and the approximate associated tone signal frequencies. The Optical Amplifier (OA) circuit packs use the tone signals to detect the presence of a signal.

  The Optical Line System also uses the tone signal to derive the signal power of the OC-48 drop side signal. The power of the tone signal is proportional to the power of the OC-48 drop side signal.

Table 9-1. Optical Line System Wavelengths and Tone Frequencies

Optical Channel	Wavelength (nm)	Tone Frequency (Hz)
1	1549.32	5273
2	1550.92	6934
3	1552.52	9277
4	1554.13	11328
5	1555.75	14746
6	1557.37	17285
7	1558.98	19336
8	1560.61	21680
9 (Supv. Channel)	1532.00	12960

- **Supervisory signal**: The supervisory signal is a 155.52-Mb/s signal that is transmitted between Optical Line System network elements. The supervisory signal is transported in the supervisory channel of the optical line signal. The supervisory signal consists of the supervisory overhead (SONET overhead portion) and the customer maintenance payload (SONET payload portion). The supervisory overhead carries the data communications channel for communications between network elements.
- **Optical line ID**: The optical line ID is a value (0-4) used to uniquely identify each optical line. The TLM circuit pack inserts the optical line ID in the three least significant bits of the K2 byte of the supervisory overhead. The optical line ID is verified by the downstream TLM circuit pack. The optical line ID is used to identify any fiber misconnections between Optical Line System network elements.

The data communications channel of the supervisory signal carries the following out-of-band alarm indication messages to suppress downstream alarms:

- **Optical channel alarm indication message**: The optical channel alarm indication message notifies downstream equipment when an incoming optical channel loss of signal defect is declared at an OA circuit pack.
- **Optical line alarm indication message**: The optical line alarm indication message notifies downstream equipment when an incoming optical line loss of signal or an OA circuit pack defect is declared.

Fault Detection, Isolation, and Reporting

The Optical Line System continuously monitors its internal condition and incoming signals according to the state of the circuit pack slots, customer maintenance signal (CMS) ports, optical channels, and optical lines. (For information about circuit pack slot, CMS ports, optical channels, and optical line states and transitions, refer to Section 8, "Administration and Provisioning.") If a circuit pack slot is in the EQ state, the Optical Line System monitors the circuit pack and activates the appropriate indicators when a failure occurs. Table 9-2 shows the incoming signals and the associated conditions the Optical Line System monitors.

Table 9-2. Incoming Signals and Monitored Conditions

Incoming Signal Level	Monitored Conditions
Optical Line*	Loss of Signal (LOS)
Optical Channel*	Loss of Signal (LOS)
Supervisory Channel†	failure Signal Degrade (SD) Signal Fail (SF)
Customer Maintenance Signal†	Loss of Frame (LOF) Loss of Signal (LOS) Signal Degrade (SD) Signal Fail (SF)

* If the OA slots are in the EQ state, the associated incoming optical line signal is also monitored and alarmed.

† If the TLM slots are in the EQ state, the incoming supervisory signals are monitored and alarmed.

When a trouble condition is detected, the Optical Line System employs automatic diagnostics to isolate the failed circuit pack or signal. Most faults are isolated to a maximum of two circuit packs, but some faults may be isolated to more than two circuit packs. Failures are reported to the local technician and operations systems so that repair decisions can be made. If desired, operations system personnel and the local technician can use the CIT to gain more detailed information on the trouble condition.

All trouble conditions detected and isolated by the Optical Line System are stored and made available to be reported, on demand, through the CIT. In addition, a history of the past 500 alarm and status conditions and CIT events is maintained and available for on-demand reporting. The CIT events include condition starting events, condition clearing events, autonomous actions by the system, and user actions. Each event is date and time stamped. The alarm level associated with each condition is the alarm level of the system at the time the condition is recorded.

The Optical Line System also automatically reports all detected alarm and status conditions and CIT events through indicators that are subject to the provisionable incoming signal alarm delay and through indicators that are *not* subject to incoming signal alarm delay.

The following indicators that are subject to incoming signal alarm delay:

- Audible and visible office alarm outputs
- Parallel telemetry outputs
- TL1 autonomous messages*
- Critical (CR), major (MJ), and minor (MN) LEDs on the indicator strip/user panel
- Status field in the upper left-hand corner of the CIT screen.

The following indicators that are *not* subject to incoming signal alarm delay:

- FAULT LEDs on the circuit packs
- All CIT reports
- TL1 command response messages
- Abnormal (ABN), near-end activity (NE ACTY), far-end activity (FE ACTY), alarm cutoff (ACO), and POWER ON LEDs on the indicator strip/user panel.

The incoming signal alarm delay only applies to autonomous indications of the following incoming signal conditions:

- `incoming CMS LOF`
- `incoming CMS LOS`
- `incoming CMS SD`
- `incoming CMS SF`
- `incoming optical channel LOS`
- `incoming optical line LOS`
- `incoming supr chnl fail`
- `incoming supr chnl SD`
- `incoming supr chnl SF`

* TL1 autonomous messages for alarm and status conditions are only available on X.25 virtual circuits when the value of the OS Type parameter is provisioned "maintenance" or "other" using the **`SECURITY-Set-Security-Port`** input.

Table 9-3 contains a list of alarm and condition descriptions and their likely causes.

CAUTION:
This table is for information only and should not be used for trouble clearing. Refer to the Operation and Maintenance (TOP) section for trouble clearing information.

Table 9-3. Condition Descriptions

Description (from **Retrieve-Alarm** Report)	Meaning
`CP reset in progress`	A circuit pack has been installed and the necessary software is being downloaded to the circuit pack.
`CP (unknown type) failure`	The circuit pack in the indicated slot has failed, but its type is unknown.
`CP (unknown type) removed`	The circuit pack in the indicated slot has been removed, but its type is unknown.
`CPYPGM:IP tid`	Copy program in progress.
`DCC APS data error`	An error has been detected in the DCC APS byte.
`DCC startup in progress`	The DCC is starting up.
`DS-NE not reachable`	One of the network elements in the ring network has not been provisioned "DSNE," far end communications has been disabled to the "DSNE," or communication to the provisioned "DSNE" has been interrupted.
`duplicate TID defined`	A recently entered target identifier (TID) value is a duplicate of the TID of another network element in the ring network.
`fuse/power failure A`	The network element has a blown fuse in feeder A, a power failure to a shelf, or a power failure within the cabinet. Likely causes: A blown 10A fuse or a defective filter board in the filter panel.
`fuse/power failure B`	The network element has a blown fuse in feeder B, a power failure to a shelf, or a power failure within the cabinet. Likely causes: A blown 10A fuse or a defective filter board in the filter panel.

Table 9-3. Condition Descriptions (Contd)

Description (from **Retrieve-Alarm** Report)	Meaning
incoming CMS LOF	A CMS loss-of-frame (LOF) condition has been detected on an incoming CMS line. Likely cause: Failure of the far end customer equipment or the local TLM circuit pack.
incoming CMS LOS	A CMS loss-of-signal (LOS) condition has been detected on an incoming CMS line. Likely causes: Failure of the far end customer equipment, the incoming CMS line (receive fiber), or the local TLM circuit pack.
incoming CMS SD	A signal degrade (SD) condition has been detected on an incoming CMS line. The line parity error rate threshold has been exceeded. Likely causes: Failure of the far end customer equipment or the local TLM circuit pack.
incoming CMS SF	A signal failure (SF) condition has been detected on an incoming CMS line. Likely causes: Failure of the far end customer equipment, the incoming CMS line (receive fiber), or the local TLM circuit pack.
inc. (from SUPR) DCC failure	The local network element cannot communicate through the supervisory signal data communications channel (DCC).
incoming optical channel LOS	An optical channel loss-of-signal (LOS) condition has been detected on an incoming optical channel.
incoming optical line LOS	An optical line loss-of-signal (LOS) condition has been detected on an incoming optical line.
incoming supr chnl fail	An incoming supervisory channel loss-of-frame (LOF) or loss-of-signal (LOS) condition has been detected on an incoming (from the optical line) supervisory channel.
incoming supr chnl SD	A signal degrade (SD) condition has been detected on an incoming (from the optical line) supervisory channel.
incoming supr chnl SF	A signal failure (SF) condition has been detected on an incoming (from the optical line) supervisory channel.
inhibit alarms-office alarms	Alarm reporting via the office alarms interface is disabled.
inhibit alarms-parallel telem	Alarm reporting via the parallel telemetry interface is disabled.

Table 9-3. Condition Descriptions (Contd)

Description (from **Retrieve-Alarm** Report)	Meaning
inhibit alarms-X.25	Alarm reporting via the X.25 (TL1) interface is disabled.
logins inhibited	Logins are disabled.
multiple DS-NEs defined	Two or more network elements in a ring network have their "Directory Server" (DSNE) parameter provisioned to "Yes". There must be one and only one DSNE in the ring network.
NE status comm failure	The NE is not associated with an AGNE or the AGNE cannot establish associations with all of the NEs in the alarm group. If the AGNE loses power, all NEs in the alarm group will report this condition; however, the condition may not be reported for several minutes.
OA failure	Failure of an OA circuit pack.
OA removed	An OA circuit pack is missing from slot.
OLS system incomplete	The designated DSNE network element is unable to create a complete ring map because of a controller or transmission failure in the network.
OLS system startup in progress	This is a normally transient condition that indicates the network is starting up.
OMU/ODU mismatch or missing	An OMU/ODU mismatch has been detected or an OMU/ODU is missing.
optical line ID mismatch	A fiber misconnection has been detected between Optical Line System network elements.
provisionedcontrolpt	The specified control point (miscellaneous discrete output) is active. Note: The actual message that appears in the condition description report for this condition can be provisioned; this is the default message. See the **Retrieve-Attribute-Control** and **Set-Attribute-Control** commands.
provisionedenvironmentalpt	A contact closure is present at an environmental input point of the network element. Note: The actual message that appears in the condition description report for this condition can be provisioned; this is the default message. See the **Retrieve-Attribute-Environment** and **Set-Attribute-Environment** commands.

Table 9-3. Condition Descriptions (Contd)

Description (from **Retrieve-Alarm** Report)	Meaning
reset in progress	The OLS network element is in progress of downloading its software from SYSMEM to SYSCTL, to TOHCTLs, and to all other circuit pack board controllers. Likely cause: **Reset** or **Initialize-System** has been executed.
SER TLM 1 port failure	The serial telemetry 1 port has failed.
software download in progress	A software download from the CIT-PC to the SYSMEM is currently in progress.
SYSCTL failure	Failure of SYSCTL circuit pack.
SYSMEM failure	Failure of SYSMEM circuit pack.
SYSMEM removed	SYSMEM circuit pack is missing from slot.
SYSMEM/SYSCTL code mismatch	A software mismatch has been detected between the software stored in the SYSMEM circuit pack and the software version running in the OLS network element. Likely cause: A software upgrade procedure is in progress.
SYSMEM unrecognizable code	The software stored in the SYSMEM circuit pack has become corrupted and is no longer usable. Likely causes: Corrupted software download to SYSMEM circuit pack or spontaneous corruption of the software in the SYSMEM circuit pack.
test alarm in progress	An office alarm test is in progress.
test auto turnup in progress	An auto turnup test is in progress.
test telemetry in progress	A telemetry test is in progress.
TL-1 link failure	An incoming TL1 link failure has been detected.
TLM failure	Failure of a TLM circuit pack.
TLM removed	TLM circuit pack is missing from slot.
TOHCTL failure	Failure of TOHCTL circuit pack.
TOHCTL removed	TOHCTL circuit pack is missing from slot.
unexpected CP type	A circuit pack has been replaced with a defective circuit pack.

Protection Switching

General

The Optical Line System does not provide protection switching to maintain transmission; however, the Optical Line System does perform supervisory signal data communications channel (DCC) protection switching. If a transmission-affecting failure occurs, the Optical Line System will raise a minor (MN) non-service affecting condition. The FT-2000 OC-48 Large Capacity Terminal will independently detect the failure and protect transmission by switching traffic to the protection OC-48 line.

Supervisory Signal Data Communications Channel Protection

The Optical Line System performs 1x1 data communications channel (DCC) protection switching in response to automatically detected faults. No manual DCC switching is supported.

The supervisory signal DCC uses bidirectional 1x1 revertive protection switching on an optical section basis. Bidirectional refers to when protection switching is performed in the transmit and receive directions. In revertive switching, the DCC switches from the supervisory signal of optical line 1 to the supervisory signal of optical line 2 when a fault occurs. When the fault clears, the DCC switches back (reverts) to the supervisory signal of optical line 1.

The supervisory signal on optical line 1 carries the DCC between adjacent nodes. If a fiber or TLM circuit pack fails on optical line 1, the Optical Line System reports the `inc. (from SUPR) DCC failure` condition and switches the DCC to the supervisory signal on optical line 2. If a fiber or TLM circuit pack fails on optical line 2, the Optical Line System does *not* report the `inc. (from SUPR) DCC failure` condition. The Optical Line System does not monitor the DCC on optical line 2.

The K1 and K2 bytes of the supervisory signal on optical line 2 are used to control the DCC protection switching. The supervisory signals on optical lines 3 and 4 do not carry the DCC.

Loopbacks

The Optical Line System allows loopbacks to be performed on all optical line interfaces and customer maintenance signal interfaces. Front access to the optical connectors on the Optical Amplifier (OA) circuit pack faceplates allows a manual optical loopback. This loopback is performed by connecting the OUT optical connector on the faceplate of an OA circuit pack to the IN optical connector on the faceplate of the corresponding OA circuit pack with a single-mode fiber jumper and a lightguide buildout.

Front access to the optical connectors on the Telemetry Controller (TLM) circuit pack faceplates allows a manual optical loopback. This loopback is performed by connecting the CMS OUT optical connector on the faceplate of a TLM circuit pack to the CMS IN optical connector with a multimode fiber jumper.

Tests

Auto Turnup

The auto turnup tests are performed by the Optical Line System, along with manual tests, to verify that the system has been installed correctly: These tests verify the system transmission capabilities and test all the transmission paths to detect any cabling errors.

The auto turnup tests are controlled using the CIT and should only be performed on an out-of-service system. Before executing an auto turnup test at the CIT, no trouble conditions should be present in the system except the conditions associated with the test setup. After executing an auto turnup test, the CIT will not accept any commands until the test is complete. An auto turnup test can be aborted at any time or terminated prematurely if a condition exists that prevents the test from completing. The test results are displayed on the CIT. For more information about auto turnup tests, refer to the "Operation and Maintenance (TOP)" section.

The **FAULT-Test-Auto Turnup-Local** input provides the following CMS and SUPR local tests:

- **CMS**: The local (CMS) test verifies the transmission path between the CMS IN and CMS OUT ports of the Telemetry Controller (TLM) circuit pack at end terminals (Figure 9-1) and at repeaters (Figure 9-2).

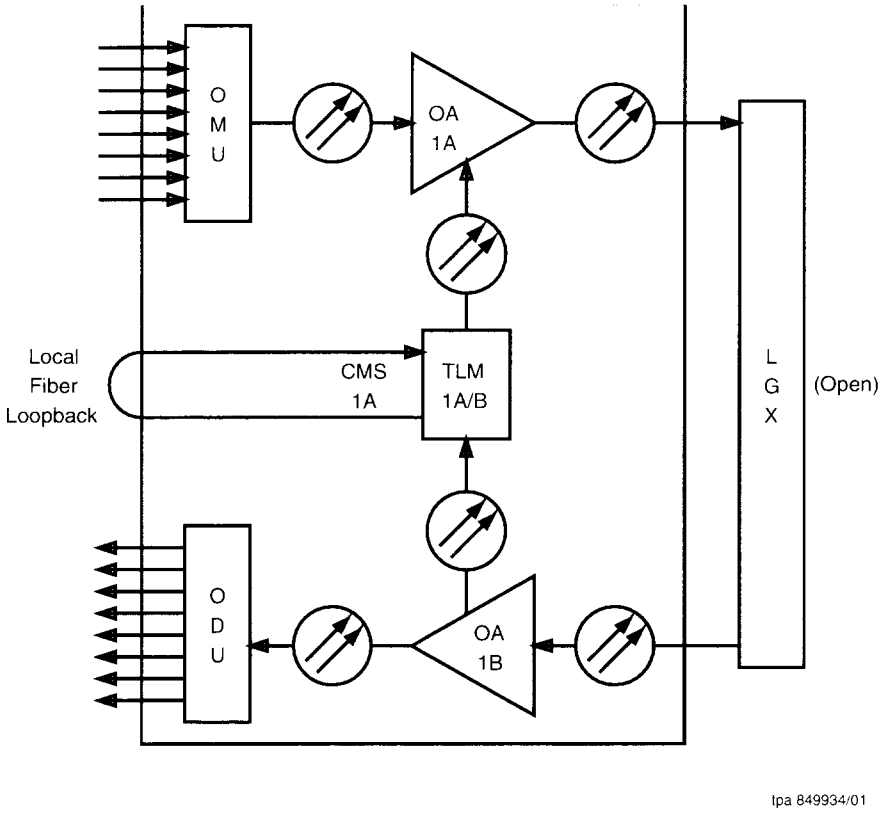


Figure 9-1. Local CMS Self-Test (End Terminal)

For the local CMS test, the output (CM OUT) of the TLM circuit pack(s) of the optical line under test must be looped back with a multimode fiber jumper to the input (CM IN) of the TLM circuit pack. For example, when all optical lines are being tested, all TLM circuit packs must be manually looped back.

The corresponding OA circuit pack output (OUT) and input (IN) connections of the optical line(s) under test must be open.

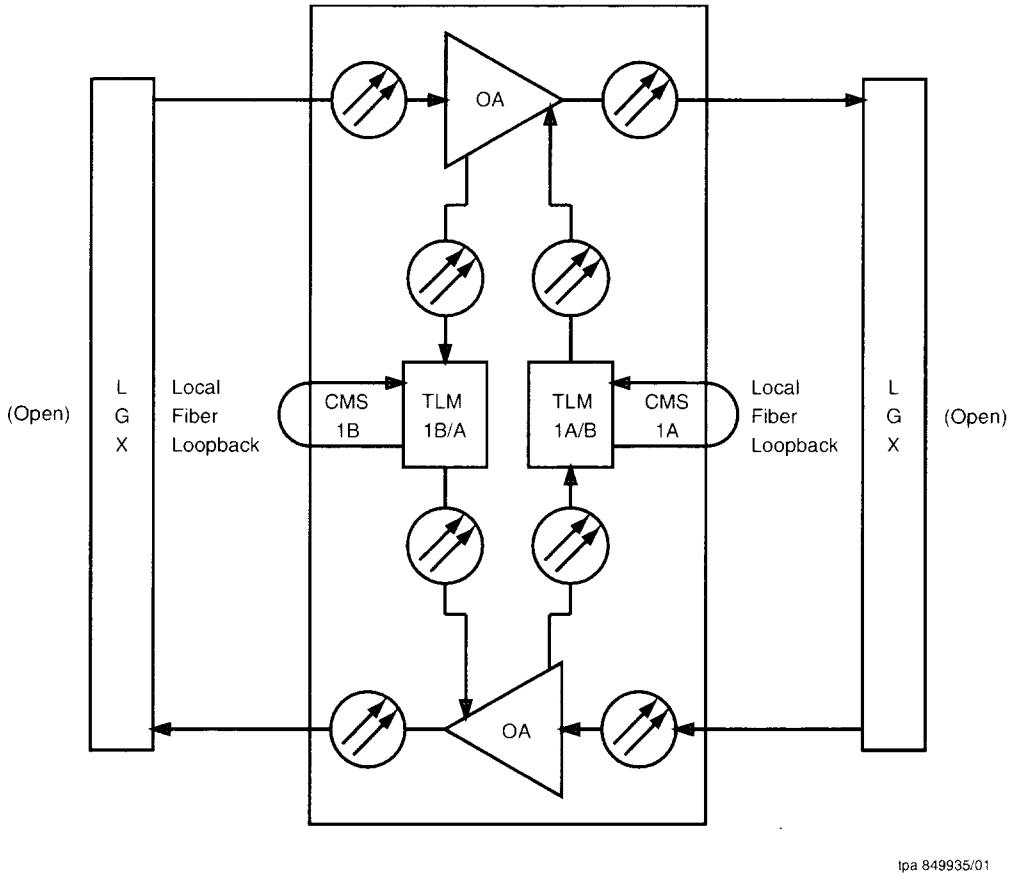


Figure 9-2. Local CMS Self-Test (Repeater)

To verify the continuity of each CMS transmission path, each TLM circuit pack inserts one parity bit error on the outgoing CMS signal toward the CMS line. The output of the TLM circuit pack is looped back to the input of the TLM circuit pack and the TLM circuit pack monitors the incoming CMS signal. If only one parity bit error is detected within 1 second, the test passes.

- **SUPR**: The local (SUPR) test verifies the transmission path between the Telemetry Controller (TLM) circuit packs and the Optical Amplifier (OA) circuit packs at end terminals (Figures 9-3) and at repeaters (Figure 9-4).

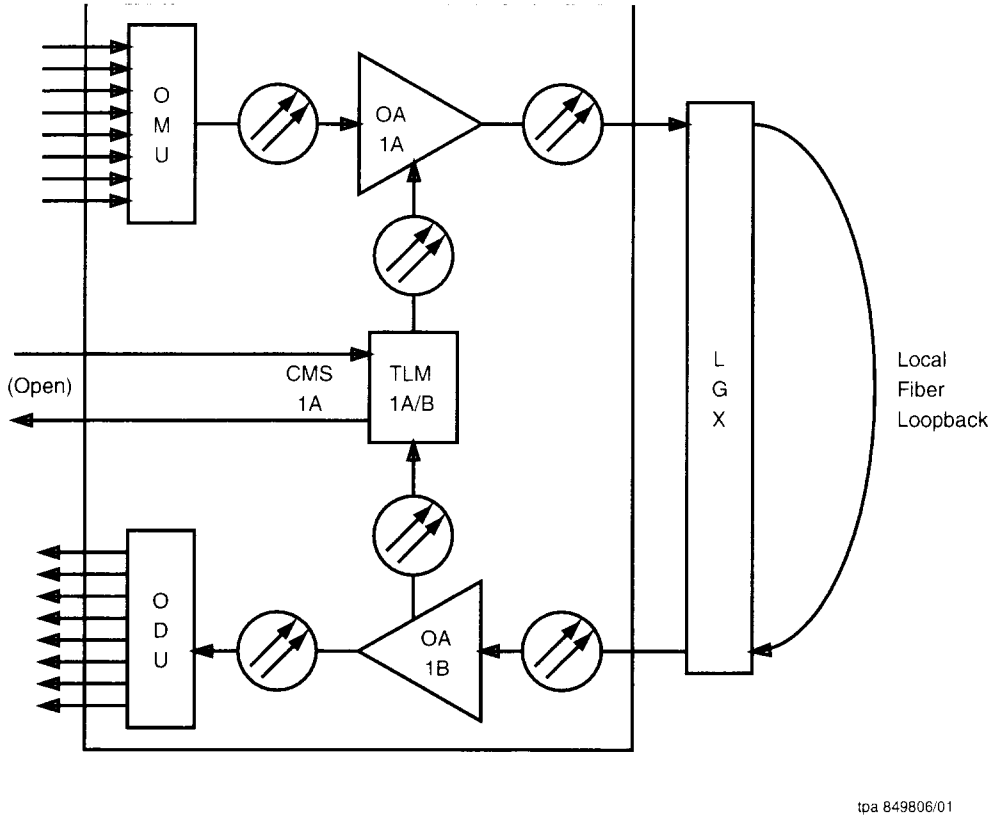


Figure 9-3. Local SUPR Self-Test (End Terminal)

For the local SUPR test, the output (OUT) of the OA circuit pack(s) must be looped back with a single-mode fiber jumper at the lightguide cross connect panel (if available) and a lightguide buildout to the input (IN) of corresponding OA circuit pack on the optical line(s) to be tested. For example, when all optical lines are being tested, all OA circuit pack pairs must be manually looped back.

The CMS ports of each TLM circuit pack of the optical line under test must be open. Loop back any optical lines that are not in service, but not under test, to prevent any trouble conditions from denying the test.

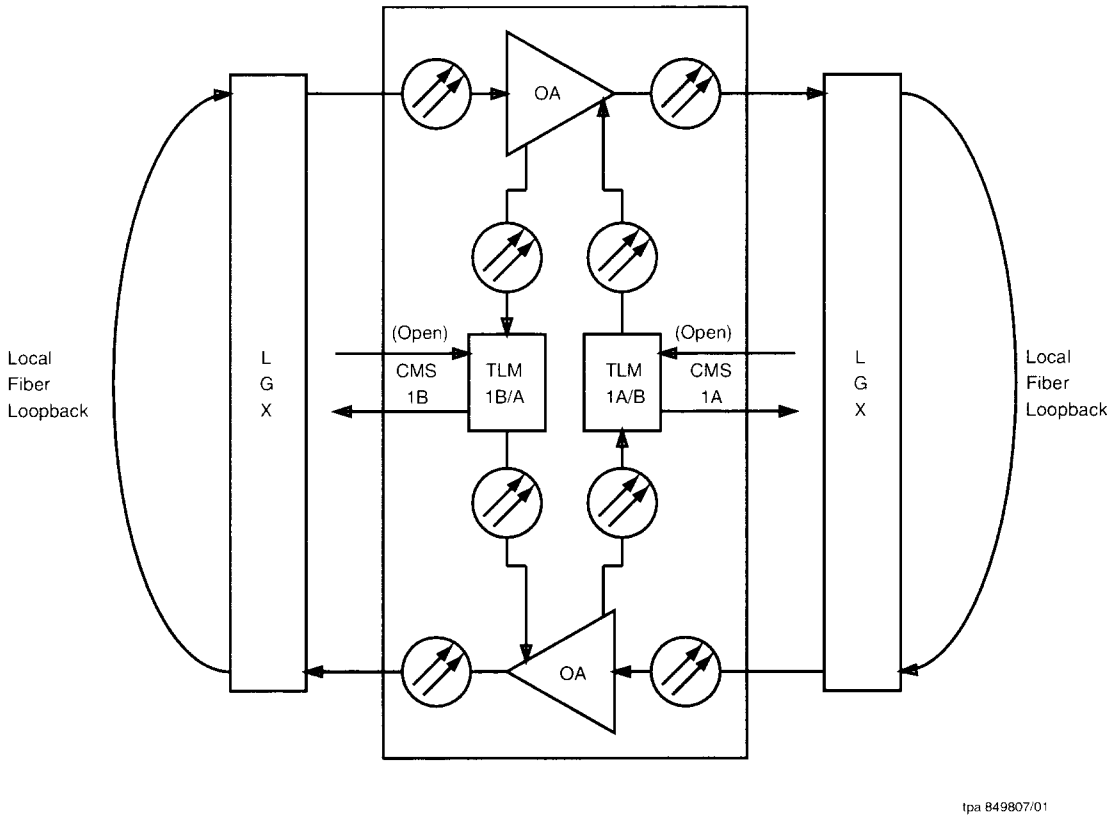


Figure 9-4. Local SUPR Self-Test (Repeater)

To verify the continuity of each transmission path between the TLM circuit pack(s) and OA circuit pack(s), each TLM circuit pack inserts one parity bit error on the supervisory signal toward the optical line. The output of the OA circuit pack is looped back to the corresponding OA circuit pack and the TLM circuit pack monitors the supervisory signal from the optical line. If only one parity bit error is detected within 1 second, the test passes.

There is no self-test for the Optical Multiplexing Unit (OMU), Optical Demultiplexing Unit (ODU), and Overhead Controller - Tributary (TOHCTL) circuit pack. The OMU and ODU are tested manually with noise measurements (refer to "Manual" tests). The TOHCTL circuit pack is tested at the factory.

Manual

Manual tests are required to test the fiber cables to the Optical Multiplexing Unit (OMU) and from the Optical Demultiplexing Unit (ODU) at end terminals. In the manual tests, the OA circuit packs transmit amplified noise to the ODU as the source signal for verifying signal continuity. Through a specific procedure using fiber loopbacks, each cable to and from the OMU and ODU should be tested. An optical power meter is required to verify the continuity of the cabling path.

Signal quality may be verified for the OMU-OA-OA-ODU path by using a signal generated by the FT-2000 OC-48 Large Capacity Terminal as the test signal source. However, this procedure will not verify the cabling to/from the TLM circuit pack.

The continuity of the CMS fiber cables are also determined by manual tests. For more information about auto turnup tests, refer to the "Operation and Maintenance (TOP)" section.

Operations Interface Tests

The Optical Line System provides the following inputs to test LEDs, parallel telemetry interfaces, and office alarms:

- **FAULT-Test-LED**: This input lights the specified LEDs. The test consists of one or more test cycles repeated as many times as specified. Each test cycle the LED(s) is lighted for 10 seconds, then turned off for 10 seconds. The LED(s) reverts to normal operation after the test is completed. The PWR ON LED is always on if the bay is powered and cannot be tested with this input.
- **FAULT-Test-Telemetry-Parallel**: This input tests the operation of the local parallel telemetry and miscellaneous discrete control output points. Each test cycle activates the selected control output point(s) for 20 seconds, then clears the control output point(s) for 20 seconds. The control output points revert to normal operation after the test is completed.
- **FAULT-Test-Alarm**: This input tests the audible and visible office alarm outputs and their corresponding user panel LEDs (CR, MJ, and MN). The test consists of one or more test cycles repeated as many times as specified. The alarms revert to normal operation after the test is completed.

Provisioning Consistency Audits

The Optical Line System audits (monitors) the following provisioning information:

- **Target Identifier (TID)**: Each Optical Line System network element in a network must have a unique TID. The Optical Line System automatically detects and reports any duplicated TIDs.
- **End Terminal Direction**: Each Optical Line System end terminal must have the direction parameter provisioned as 1A-TX or 1A-RCV. The direction parameter at one end terminal in a network must be provisioned as 1A-TX and the direction parameter at the other end terminal must be provisioned as 1A-RCV. The direction parameter at both end terminals must not be provisioned the same value. The Optical Line System automatically detects and reports any inconsistent values.

The Optical Line System also makes provisioning consistency information available in the OLS System Provisioning Report. For more information about the OLS System Provisioning Report, refer to the **CONFIGURATION-Retrieve-Network Element** input in Section 11, "Craft Interface Terminal Usage."

Performance Monitoring

Performance Parameters

The Optical Line System provides performance monitoring to support proactive maintenance of a network. Proactive maintenance refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming, but indicative of an impending hard or soft failure.

Proactive maintenance consists of monitoring performance parameters associated with the optical lines, optical channels, supervisory channels, and customer maintenance signals. Table 9-4 lists the performance parameters monitored.

Performance parameter thresholds are set to show degraded performance. When a performance-monitoring threshold is crossed, it is reported to the operations system where all threshold crossings associated with a particular path can be correlated, and the likely source of the degradation can be identified.

For more information about provisioning thresholds and enabling/disabling the reporting of threshold crossing alerts (TCAs) to an operations system, refer to Section 8, "Administration and Provisioning."

Table 9-4. Performance-Monitoring Parameters

Facility	Measured Parameter	Maximum Counts	
		Current Quarter Hour	Current Day
Optical Line	Total Optical Power Received (TOPR-OL)	—	—
	Laser Bias Current for Pump 1 (LBC-P1)	—	—
	Laser Bias Current for Pump 2 (LBC-P2)	—	—
	Laser Backface Current for Pump 1 (LBFC-P1)	—	—
	Laser Backface Current for Pump 2 (LBFC-P2)	—	—
Optical Channel	Signal Power Received (SPR-C)	—	—
Supervisory Channel	Signal Power Received (SPR-SU)	—	—
	Laser Bias Current (LBC-SU)	—	—
	Line (B2) Coding Violations (CV-L)	16383	1048575
	Line (B2) Errored Seconds (ES-L)	900	65535
	Line (B2) Severely Errored Seconds (SES-L)	900	65535
	Line (B2) Unavailable Seconds (UAS-L)	900	65535

Optical Line Parameters

The following optical line parameters are monitored continuously to detect degraded performance of the laser:

- **Total Optical Power Received (TOPR-OL)**: This parameter is the total power for all the optical channels. The total optical power received is reported using a scale from 0 to 100. The total optical power received parameter can be used with other proactive performance-monitoring parameters to isolate the source of an impending optical line failure.
- **Laser Bias Current for Pump 1 (LBC-P1)**: This parameter indicates whether the system optics are working within normal margins (in range or out of range). The upper limit is 1.5 times the initial factory (nominal) value. There is no lower limit.
- **Laser Bias Current for Pump 2 (LBC-P2)**: This parameter indicates whether the system optics are working within normal margins (in range or out of range). The upper limit is 1.5 times the initial factory (nominal) value. There is no lower limit.
- **Laser Backface Current for Pump 1 (LBFC-P1)**: This parameter indicates whether the laser for pump 1 is working within normal margins (in range or out of range).
- **Laser Backface Current for Pump 2 (LBFC-P2)**: This parameter indicates whether the laser for pump 2 is working within normal margins (in range or out of range).

Threshold crossing alerts (TCAs) are generated if the TOPR-OL parameter exceeds the set thresholds. (Threshold crossing alerts are not supported for the LBC-P1, LBC-P2, LBFC-P1, and LBFC-P2 parameters.) The generation of TCAs for the TOPR-OL parameter can be enabled or disabled using the **`PERFORMANCE-Set-PM Threshold-OLINE`** input. In Release 2 and later releases, TCAs can be enabled or disabled for a single parameter.

Optical Channel Parameters

The following optical channel parameters are monitored continuously to detect degraded performance of the laser:

- **Signal Power Received (SPR-C)**: This parameter is the measurement of the signal power per channel. The signal power is determined by monitoring the power of the tone on the supervisory signal. The signal power received is reported using a scale from 0 to 100. The signal power received parameter can be used with other proactive performance-monitoring parameters to isolate the source of an impending optical channel failure.

Threshold crossing alerts (TCAs) are generated if the SPR-C parameter exceeds the set thresholds. The generation of TCAs can be enabled or disabled using the **`PERFORMANCE-Set-PM Threshold-OCHAN`** input. In Release 2 and later releases, TCAs can be enabled or disabled for a single parameter.

Supervisory Channel Parameters

The following supervisory channel parameters are monitored continuously to detect degraded performance of the laser:

- **Signal Power Received (SPR-SU)**: This parameter is the measurement of the supervisory channel signal power. The signal power is determined by monitoring the power of the tone on the supervisory signal. The signal power received is reported using a scale from 0 to 100. The signal power received parameter can be used with other proactive performance-monitoring parameters to isolate the source of an impending supervisory channel failure.
- **Laser Bias Current (LBC-SU)**: This parameter indicates whether the system optics are working within normal margins (in range or out of range). The upper limit is 1.5 times the initial factory (nominal) value. There is no lower limit.
- **Line (B2) Coding Violations (CV-L)**: To monitor the performance of the supervisory channel, the line B2 parity is calculated, written, and checked for errors. The line B2 parity violation counter is incremented for each line bit interleaved parity (BIP) error detected. Each line BIP-8 can detect up to eight errors per STS-1 frame.
- **Line (B2) Errored Seconds (ES-L)**: An errored second (ES) is a second in which there are one or more B2 parity violations or a supervisory channel defect detected.
- **Line (B2) Severely Errored Seconds (SES-L)**: A severely errored second (SES) is a second in which there are 9 or more B2 parity violations or a supervisory channel AIS defect detected.

- **Line (B2) Unavailable Seconds (UAS-L)**: An unavailable second (UAS) is a second during which the supervisory channel is "unavailable." Unavailable seconds are counted after 10 consecutive line (B2) severely errored seconds (SES). These 10 severely errored seconds are counted, and each subsequent second is counted until there are 10 consecutive seconds without a severely errored second. The 10 consecutive seconds without a severely errored second are not counted as unavailable seconds.

A threshold crossing alert (TCA) is generated if a CV-L, ES-L, SES-L, or UAS-L parameter exceeds the provisionable threshold. The generation of TCAs can be enabled or disabled using the **PERFORMANCE-Set-PM Threshold-SUPR** input. In Release 2 and later releases, TCAs can be enabled or disabled for a single parameter.

Performance-Monitoring Data Storage and Reports

The Optical Line System provides current quarter-hour and current day registers for all accumulated performance parameters. There is also 5 previous day registers and 31 previous quarter-hour registers (8 hours).

NOTE:
The quarter-hour and day intervals are accurate to within ±10 seconds. For example, a quarter-hour interval (900 seconds) varies from 890 to 910 seconds.

The Optical Line System can initialize the current quarter-hour and/or current day registers through the CIT locally or remotely at any time, as well as retrieve and report the contents of any parameter storage register at any time. When performance-monitoring data is retrieved, any previous day or quarter-hour register with all zero data is not reported. The current day and quarter-hour registers are always reported, even when they contain all zero data. For more information, refer to the **PERFORMANCE-Initialize-PM**, **PERFORMANCE-Retrieve-PM-OLINE**, **PERFORMANCE-Retrieve-PM-OCHAN**, and **PERFORMANCE-Retrieve-PM-SUPR** inputs in Section 11, "Craft Interface Terminal Usage."

The Optical Line System can also initialize (baseline) certain optical parameters of an optical line through the CIT locally or remotely at any time. The initialized (baseline) value of the affected optical parameters is measured and used as the normal operating reference. The affected optical parameters include the total optical power received for an optical line (TOPR-OL) and the optical channel signal power (SPR-C) of the addressed optical line. The optical parameters should be initialized when an Optical Amplifier circuit pack is replaced, the outside plant loss changes or an optical channel is deleted. When these optical parameters are initialized, the current day and/or current quarter-hour registers for the TOPR-OL and SPR-C parameters will be corrupted. For more information, refer to the **PERFORMANCE-Initialize-Optics** input in Section 11, "Craft Interface Terminal Usage."

A single start time can be provisioned for measuring all the current day performance-monitoring parameters. The start time can be provisioned to start at any hour. The performance-monitoring parameters will reset and begin daily at the provisioned start time. For more information about provisioning the performance-monitoring start time, refer to Section 8, "Administration and Provisioning."

Performance Monitoring During Failed Conditions

When a trouble condition is detected, the Optical Line System stops accumulating affected performance parameters per Bellcore requirements. All unaffected performance parameters continue to be accumulated during the trouble condition.

The coding violations (CV) and errored seconds (ES) counts are accumulated until a severely errored second (SES) is counted. When a severely errored second (SES) is counted, the coding violations (CV) count is inhibited. The errored seconds (ES) and severely errored seconds (SES) counts continue to be accumulated until an unavailable second (UAS) is counted. When an unavailable second (UAS) is counted, the coding violations (CV), errored seconds (ES), and severely errored seconds (SES) counts are inhibited.

The unavailable seconds (UAS) parameter counts are not inhibited.

Performance-Monitoring Parameter Thresholds

The current quarter-hour and current day thresholds for each performance-monitoring parameter are provisionable using the CIT. Whenever the current quarter-hour or the current day threshold for a given performance-monitoring parameter is reached or exceeded, the Optical Line System generates a threshold crossing alert (TCA). The TCA is then entered into the appropriate performance-monitoring report. For more information about provisioning thresholds using the CIT, refer to the `PERFORMANCE-Set-PM Threshold-OLINE`, `PERFORMANCE-Set-PM Threshold-OCHAN`, and `PERFORMANCE-Set-PM Threshold-SUPR` inputs in the "Local Provisioning" part of Section 8, "Administration and Provisioning." Also refer to the `PERFORMANCE-Retrieve-PM Threshold-OLINE`, `PERFORMANCE-Retrieve-PM Threshold-OCHAN`, and `PERFORMANCE-Retrieve-PM Threshold-SUPR` inputs in Section 11, "Craft Interface Terminal Usage."

Threshold Crossing Alert Transmission to an Operations System

To trigger proactive maintenance activity within an operations system, the Optical Line System supports autonomous messages reporting threshold cross alerts. These autonomous messages show the crossing of a performance-monitoring threshold for the current quarter-hour and day registers."

Reports

Active Alarms and Status

The Optical Line System provides a report that shows all the local active alarm and status conditions. The Optical Line System also provides a report that shows the active alarm level at each network element with active alarm and status conditions.

The local active alarms and status report is automatically displayed on the CIT immediately after a user logs in. The report shows the following alarm levels for each active condition:

- Critical (CR)
- Major (MJ)
- Minor (MN)
- Abnormal (ABN)
- Near-end activity (NE ACTY).

The alarm level of each active condition is reported to allow multiple active conditions to be prioritized.

The source address and description of the alarm condition (for example, controller failure, incoming optical signal failure, etc.) are included in the report, along with the date and time detected. The report also shows if the condition affects service. The option to display specified subsets of conditions by alarm level is also provided.

If no LEDs are lighted on the indicator strip/user panel (no active conditions), the report states "There are no active alarms or status conditions."

The network alarms report includes the highest active alarm level at each network element. The network alarms report shows the following alarm levels:

- Critical (CR)
- Major (MJ)
- Minor (MN)
- Abnormal (ABN)
- Near-end activity (NE ACTY).

If there are no active system alarm conditions, the report states "There are no active alarms or status conditions."

If the NE ACTY LED is lighted at the local network element, use the local active alarm and status report. If the FE ACTY LED is lighted at the local network element, use the network alarms report. If the NE ACTY and FE ACTY LEDs are both lighted, use the network alarms report. For more information, refer to the **FAULT-Retrieve-Alarm (and Status)** and **FAULT-Retrieve-Network Alarms** inputs in Section 11, "Craft Interface Terminal Usage."

6-Hour Autonomous TL1 Report

The Optical Line System generates REPT-COND messages periodically and autonomously to report active status conditions to a remote operations system. The REPT-COND messages are generated every 6 hours (that is, 6:00 AM, 12:00 noon, 6:00 PM, and 12:00 midnight).

Provisioning Reports

Provisioning reports list the current state of all provisionable options in the Optical Line System. For more information, refer to the following inputs in Section 11, "Craft Interface Terminal Usage" within the **CONFIGURATION** category:

Retrieve-Equipment
Retrieve-Attribute-Alarm
Retrieve-Attribute-Environment
Retrieve-SUPR
Retrieve-Attribute-Control
Retrieve-Date

Also refer to the following inputs in Section 11, "Craft Interface Terminal Usage" within the **SECURITY** category:

Retrieve-Security-Network Element
Retrieve-Security-Port
Retrieve-Login
Retrieve-Network Element
Retrieve-Far End Communications

Also refer to the **FAULT-Retrieve-State** input in Section 11, "Craft Interface Terminal Usage."

Performance Monitoring

The Optical Line System provides reports that contain a snapshot of all the performance-monitoring registers at the time the report is requested. The time each register was last reinitialized is also included. The reports contain a summary of all requested performance parameters that have crossed their quarter-hour and day threshold within the last 24 hours. For more information, refer to the **PERFORMANCE-Retrieve-PM-OLINE**, **PERFORMANCE-Retrieve-PM-OCHAN**, and **PERFORMANCE-Retrieve-PM-SUPR** inputs in Section 11, "Craft Interface Terminal Usage."

State

An on-demand report displays the state of each addressed slot, optical line, optical channel, supervisory channel, and customer maintenance signal port. For more information, refer to the **FAULT-Retrieve-State** input in Section 11, "Craft Interface Terminal Usage."

Version/Equipment List

The version/equipment list report is an on-demand report that lists the circuit pack version and the software release (if applicable) for the Optical Line System. This report also lists all the circuit packs that are present. For more information, refer to the **CONFIGURATION-Retrieve-Equipment** input in Section 11, "Craft Interface Terminal Usage."

Technical Specifications

10

Contents

Overview	10-1
Optical Connector Interfaces	10-1
Transmission Medium	10-1
Lightguide Jumpers	10-2
Optical Safety (CDRH Classification)	10-2
Operating Wavelengths	10-3
Tone Frequencies	10-3
Input Power	10-4
Optical Amplifier Output Power (Nx33-dB Systems)	10-4
Optical Amplifier Output Power (Mx24-dB/Px25-dB Systems)	10-5
Optical Dispersion	10-5
Optical Return Loss	10-5
Optical Reflections Tolerance	10-5
Outside Plant Loss	10-6
Capacity	10-6
Transmission Characteristics	10-6
Transmission Delay	10-6
Signal-to-Noise Ratio Performance	10-7
Customer Maintenance Signal IS-3 Access	10-7
Cable Access	10-8

Contents

Power Specifications 10-8

Cabinet/Shelf Dimensions 10-10

Circuit Pack/Unit Dimensions 10-10

Floor Loading Specifications 10-11

Environmental Specifications 10-11

Handling and Transportation Specifications 10-12

Craft Interface Terminal 10-12

- Personal Computer Requirements 10-12
- ASCII-Based Terminal Requirements 10-13

Modem Requirements 10-13

Operations System Interfaces 10-14

Reliability Specifications 10-15

Circuit Pack/Unit FIT Rates 10-16

Technical Specifications

10

Overview

This section contains the technical specifications for the Optical Line System (OLS). Bellcore Technical Reference 253 (TR 253) is the basis for this information.

Optical Connector Interfaces

The Optical Amplifier, Telemetry Controller, Optical Multiplexing Unit, and Optical Demultiplexing Unit circuit packs use *ST*® lightguide connectors (standard), FC lightguide connectors, or SC lightguide connectors.

Transmission Medium

Single-Mode Fiber

Lightguide Jumpers

Single-mode lightguide jumpers are used for the optical line signals on the Optical Amplifier circuit pack and the supervisory signal on the Telemetry Controller circuit pack.

Multimode lightguide jumpers are used for the customer maintenance signal on the Telemetry Controller circuit packs.

Optical Safety (CDRH Classification)

Table 10-1 shows the optical safety data for the circuit packs that contain lasers.

Table 10-1. Optical Safety Data on Laser-Containing Circuit Packs

Circuit Pack Code (Note 1) (Note 2)	Bit Rate	Wavelength (nm)	Power Range (dBm)	CDRH Classification (Note 3)
LEA6 Optical Amplifier*	N/A	1550	10.0 to 16.0	Class IIIB
LEA7 Optical Amplifier*	N/A	1550	6.0 to 14.1	Class IIIB
LDA1 Telemetry Controller	155 Mb/s	1532	–4.5 to 0	Class I

Notes:

1. All optical transmitter circuit packs utilize faceplate-mounted universal-type connector build-out blocks. These build-out blocks are normally equipped with lightguide buildouts (LBOs) with *ST*-type connectors, but the build-out blocks can also accommodate LBOs with the FC- and SC-type connectors.
2. All fiber pigtails and jumpers used are single mode, with an 8.3 micron core diameter and 8.8 micron mode field diameter.
3. The CDRH classification for the entire system is Class I. The classifications listed above are for the individual circuit packs.

* The LEA6 and LEA7 Optical Amplifier circuit packs utilize 2 internal pump lasers, which operate at the wavelength of 980 nm with an output power of 19.5 dBm; however, no residual radiation in the 980 nm range is emitted outside of the OA pack or even into the optical fiber transmission line. The only radiation emitted into the optical fiber transmission line is the incident signal at 1550 nm which is amplified by the LEA6 OA circuit pack to a maximum power of 16.7 dBm and by the LEA7 OA circuit pack to a maximum power of 16.0 dBm.

Operating Wavelengths

The optical channels and supervisory channel within the optical line signal have the following wavelengths:

Optical Channel	Wavelength (nm)
1	1549.32
2	1550.92
3	1552.52
4	1554.13
5	1555.75
6	1557.37
7	1558.98
8	1560.61
Supervisory Channel	1532.00

Tone Frequencies

Table 10-2 shows the approximate tone frequencies associated with each wavelength.

Table 10-2. Wavelength Tone Frequencies

Optical Channel	Wavelength (nm)	Tone Frequency (Hz)
1	1549.32	5273
2	1550.92	6934
3	1552.52	9277
4	1554.13	11328
5	1555.75	14746
6	1557.37	17285
7	1558.98	19336
8	1560.61	21680
Supervisory Channel	1532.00	12960

Input Power

Table 10-3 shows the input power requirements for each drop side signal wavelength.

Table 10-3. Drop Side Input Power

Drop Side Signal	Wavelength (nm)	Nominal Power (dBm)
1	1549.32	–4.0
2	1550.92	–5.3
3	1552.52	–6.5
4	1554.13	–7.2
5	1555.75	–7.7
6	1557.37	–8.2
7	1558.98	–8.0
8	1560.61	–6.5

Optical Amplifier Output Power (Nx33-dB Systems)

The following output power ranges are based on the OUT connector on the faceplate of the Optical Amplifier circuit pack equipped with a 0-dB LBO.

No. of Optical Channels Equipped	Output Power (dBm)
0	10.0
1	12.3
2	12.3
3	13.7
4	14.5
5	15.2
6	15.7
7	16.0
8	16.0

Optical Amplifier Output Power (Mx24-dB/Px25-dB Systems)

The following output power ranges are based on the OUT connector on the faceplate of the Optical Amplifier circuit pack equipped with a 0-dB LBO.

No. of Optical Channels Equipped	Output Power (dBm)
0	6.0
1	8.6
2	9.1
3	10.8
4	11.8
5	12.7
6	13.3
7	13.9
8	14.1

Optical Dispersion

Single-mode nondispersion-shifted fiber with a maximum dispersion of 19 ps/nm-km should be used between Optical Amplifier circuit packs.

Optical Return Loss

Maximum system optical return loss	>40.0 dB

Optical Reflections Tolerance

Maximum at Optical Amplifier	–27 dB

Loss Budgets

OA Circuit Pack Code	Number of Spans	Span Loss (dB)		Total System Loss (dB)	Distance (km)	
		Min.	Max.(Note 1)		Span (Note 2)	Total System (Note 2)
LEA6	1	22	33	33	132	132
	2	22	33	66	132	132
	3	22	33	99	132	132
LEA7	1	22	33	33	132	132
	2	22	30	60	120	240
	3	22	28	84	112	336
	4	21	26	104	104	416
	5	21	26	130	104	520
	6	21	26	156	104	624
	7	17	22	154	88	616
	8	17	22	176	88	640*

1. Some spans with span losses more than the maximum value may be accommodated. Lucent Technologies provides network engineering support to optimize systems for networks. Please contact a Lucent Technologies sales representative for more information.
2. Based on a maximum fiber loss of 0.25 db/km.

* This distance is limited by the dispersion characteristics of standard single-mode fiber (640 km x 17 ps/nm-km=10880 ps/nm).

Capacity

384 DS3 Equivalent Signals (258,048 two-way voice circuits per fiber pair).
Up to 4 fiber pairs per cabinet.

Transmission Characteristics

The Optical Line System meets single-mode interoffice digital fiber optic systems requirements and objectives as specified in TR 253 and TR 499.

Error Rate ..... $<10^{-9}$ accumulated error rate for systems up to 400 kilometers (250 miles)

Transmission Delay

The Optical Line System has a worst-case measured one-way transmission delay time through a single Optical Amplifier of 250 nanoseconds.

Signal-to-Noise Ratio Performance

Condition	System Output Signal-to-Noise Ratio (SNR)
Worst Case Minimum SNR (no pump failure)	20.0 dB
Worst Case Minimum SNR (1 pump failure per optical line)	16.5 dB

Customer Maintenance Signal IS-3 Access

The customer maintenance signal has an IS-3 interface. This is an STS-3 rate and format signal with the following optical interface specifications:

Interface	Standard IS-3 intermediate reach (IR) and short reach (SR) interface as specified by TR-253*
Growth Increment	One IS-3 per circuit pack
Line Code	Scrambled nonreturn to zero (NRZ)
Protection Scheme	0x1 (circuit pack and line)
Minimum Wavelength	1270 nm
Maximum Wavelength	1380 nm
Spectral Width	170 nm
Maximum Transmitter Power	−14.0 dBm
Minimum Transmitter Power	−20.8 dBm
Maximum Received Power	−14.0 dBm
Receiver Sensitivity	−30.8 dBm
Minimum System Gain†	10.0 dB
Optical Path Penalty‡	1.0 dB
Connector Loss§	1.5 dB
Unallocated Margin	2.0 dB
Minimum Loss Budget	0.0 dB
Maximum Loss Budget	5.5 dB

* The TLM circuit pack is IR and SR compliant as shipped from the factory. The TLM circuit pack can be configured for applications with spans up to 3.6 kilometers.

† The minimum system gain takes into account aging, temperature, and manufacturing tolerances.

‡ Optical path penalty includes effects of dispersion, reflection, and jitter that occur on the optical path.

§ One connector (0.75 dB) on each end is assumed.

The IS-3 interface can interwork with an OC-3 interface or an IS-3 interface over multi-mode fiber, subject to the following distance limitations:

Fiber Bandwidth	Distance
1000 MHz-km	3.4 km
800 MHz-km	3.3 km
500 MHz-km	2.7 km
300 MHz-km	1.9 km

Cable Access

- Front for all customer access
- Connectorized cabling with commercially available connectors.

Power Specifications

NOTE:
Consult FPD 804-604-161 for complete engineering of battery plant and feeders.

Voltage Range, all components	–42.75 to –60 V DC
Power Feeders	Two –48 V power feeders ("A" and "B")
Fuse Size (per shelf)	10 amps
Maximum Power Dissipation	
— Optical Line System End Terminal for 4 Bidirectional Optical Lines	252 watts (20.2 watts/ft.^{2})
— Optical Line System Repeater for 4 Bidirectional Optical Lines	320 watts (25.6 watts/ft.^{2})
— Optical Line System Dual End Terminal	276 watts (22.1 watts/ft.^{2})
— Optical Line System Dual Repeater	344 watts (27.6 watts/ft.^{2})
— Optical Line System End Terminal and Repeater	310 watts (24.8 watts/ft.^{2})
— Optical Line System End Terminal Shelf (Miscellaneously Mounted)	138 watts (NA)
— Optical Line System Repeater Shelf (Miscellaneously Mounted)	172 watts (NA)

Current Drains per Feeder Cable

Nominal (List 1*) (@ –48 V DC)

— Optical Line System End Terminal 14 Bidirectional Optical Lines	2.6 amps
— Optical Line System Repeater 4 Bidirectional Optical Lines	3.3 amps
— Optical Line System Dual End Terminal	2.9 amps
— Optical Line System Dual Repeater	3.6 amps
— Optical Line System End Terminal and Repeater	3.2 amps
— Optical Line System End Terminal Shelf (Miscellaneously Mounted)	1.4 amps
— Optical Line System Repeater Shelf (Miscellaneously Mounted)	1.8 amps

Maximum (List 2†) (@ –42.75 V DC)

— Optical Line System End Terminal 4 Bidirectional Optical Lines	5.9 amps
— Optical Line System Repeater 4 Bidirectional Optical Lines	7.5 amps
— Optical Line System Dual End Terminal	6.5 amps
— Optical Line System Dual Repeater	8.0 amps
— Optical Line System End Terminal and Repeater	7.3 amps
— Optical Line System End Terminal Shelf (Miscellaneously Mounted)	3.2 amps
— Optical Line System Repeater Shelf (Miscellaneously Mounted)	4.0 amps

* Nominal (List 1) current drains used to size batteries and rectifiers. To size batteries and rectifiers, use twice the nominal (List 1) current drain per feeder. These current drains represent the average busy-hour current at normal operating voltages.

† Maximum (List 2) current drains used to size each feeder cable and fuse. To size feeder cables and fuses, use the maximum (List 2) current drain per feeder. These current drains represent the peak current under worst-case operating conditions. Normally the current for the system is shared equally by both feeders. If one feeder fails, the other feeder carries the total load for both feeders (feeder A + feeder B current).

Cabinet/Shelf Dimensions

Optical Line System Cabinet*	72 inches (183 cm) high 34 inches (86 cm) wide 24 inches (60 cm) deep
Optical Line System Shelf (Cabinet)	29 inches (73 cm) high 20 inches (50 cm) wide 12 inches (30 cm) deep
Optical Line System Heat Baffle (Cabinet)	3 inches (8 cm) high 20 inches (50 cm) wide 12 inches (30 cm) deep
Optical Line System Shelf (Miscellaneous)	31 inches (80 cm) high 20 inches (50 cm) wide 12 inches (30 cm) deep

Circuit Pack/Unit Dimensions

SYSCTL	14 inches (36 cm) high 1.2 inches (3 cm) wide 8 inches (20 cm) deep
SYSMEM	14 inches (36 cm) high 0.8 inches (2 cm) wide 8 inches (20 cm) deep
TOHCTL	14 inches (36 cm) high 0.8 inches (2 cm) wide 8 inches (20 cm) deep
OA	14 inches (36 cm) high 4 inches (10 cm) wide 8 inches (20 cm) deep
TLM	9 inches (23 cm) high 2 inches (5 cm) wide 8 inches (20 cm) deep
OMU	9 inches (23 cm) high 2 inches (5 cm) wide 6 inches (15 cm) deep
ODU	9 inches (23 cm) high 2 inches (5 cm) wide 6 inches (15 cm) deep

* Optical Line System cabinets and miscellaneous shelves are central office white, and the cabinet end guards, cable racks, and lower door frame are central office soft blue.

Floor Loading Specifications

1-Shelf Cabinet (End Terminal)	568 lbs (45.4 lbs/ft.^{2})
2-Shelf Cabinet (End Terminal)	615 lbs (49.2 lbs/ft.^{2})
1-Shelf Cabinet (Repeater)	564 lbs (45.1 lbs/ft.^{2})
2-Shelf Cabinet (Repeater)	608 lbs (48.6 lbs/ft.^{2})
End Terminal Shelf (Miscellaneously Mounted)	95 lbs
Repeater Shelf (Miscellaneously Mounted)	90 lbs

Environmental Specifications

Normal Operating Temperature	41°F to 104°F (5°C to 40°C)
Short Term* Operating Temperature	23°F to 122°F (–5°C to 50°C)
Normal Operating Humidity†	5 to 85 percent
Short Term* Operating Humidity†	5 to 90 percent
Maximum Operating Temperature Change Rate	1.8°F per minute (1°C/minute)

Earthquake and vibration, fire resistance, and airborne contaminant requirements meet GR-63-CORE Issue 1, October 1995. Electrostatic, electromagnetic, electrical grounding, and safety requirements meet GR-63-CORE Issue 1, October 1995. The Optical Line System is also designed to meet the electromagnetic compatibility requirements of GR-1089-CORE.

The Optical Line System is *UL*‡ and *CSA*§ certified.

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* Short term refers to a period of up to 72 consecutive hours and a total of up to 15 days in 1 year.

† Noncondensing.

‡ Registered trademark of Underwriters Laboratories Inc.

§ Registered trademark of Canadian Standards Association.

Handling and Transportation Specifications

Handling and Shock Design Criteria	Complies with GR-63-CORE Issue 1, October 1995
Temperature (Transport/Storage)	–40°F to 150°F (–40°C to 70°C)
Relative Humidity (Transport/Storage)	5 to 95 percent
Storage/Shipment Altitude	–200 to 40,000 feet (–61 to 12,2000 meters)

Craft Interface Terminal

Personal Computer Requirements

A PC may be used as a CIT. The PC must meet the following minimum requirements:

- 386SX *IBM**-compatible desktop or laptop PC (25 MHz or greater clock)
- Disk drive — one 1.44 megabyte (3.5 inch)
- Hard disk with approximately 5 megabytes of free space
- 4 megabytes RAM†
- *MS-DOS*‡ operating system version 5.0 or later
- Serial port (EIA-232-D) — configured as COM1, COM2, COM3, or COM4
- Parallel port — configured as LPT1
- VGA color monitor.

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* Registered trademark of International Business Machines Corporation.

† No memory resident programs running in the background. 565 kilobytes of free conventional memory and 2 Megabytes of extended memory are required. If less than 565 kilobytes of free conventional memory is available, a memory manager (for example, HIMEM.SYS with *MS-DOS* 5.0 and later) is required to increase the free conventional memory.

‡ Registered trademark of Microsoft Corporation.

ASCII-Based Terminal Requirements

An ASCII-based (dumb) terminal may be used as a CIT. The ASCII-based terminal must meet the following minimum requirements:

- ASCII-based data communications terminal with an 80-column display
- Scroll capability
- Local echo
- Serial port (EIA-232-D)
- Data transmission speed should be from 1200 to 9600 baud
- XON/XOFF flow control capability.

The ASCII-based terminal should be configured for byte serial data transmission of eight-bit bytes with one start bit and one stop bit. Parity should be "none" and the flow control should be "DC1/DC3."

Modem Requirements

A compatible modem or digital data network must meet the following minimum requirements:

- Full duplex
- Asynchronous
- Byte serial data transmission of eight-bit bytes
- One start bit
- One stop bit
- Data transmission speed should be from 1200 to 9600 baud.

The modem must comply with one of the following transmission standards, depending on the desired baud rate. These standards apply to signaling used between modems.

Standard	Baud Rate(s)
Bell 212A	1200
V.22	1200
V.22 bis	2400
V.32	4800,9600
V.32 bis	9600 (fax), 14400 (data)

Operations System Interfaces

- Office alarms: The steady state current for office alarm connections should not exceed 0.9 A at 60 V or 1.8 A at 30 V. The maximum transient currents (20 ms duration) during initial contact closure should not exceed 9 A at 60 V or 18 A at 30 V.
- Parallel Telemetry: The parallel telemetry interface is designed for a maximum open circuit voltage of 60 V and a maximum current of 35 mA.
- Miscellaneous Discretes: Any external customer equipment to be monitored by the Optical Line System must provide the electrical equivalent of a contact closure across the corresponding environmental input wiring pairs. The contact closure must be capable of passing at least 10 mA of drive current.

  The power source to enable the Optical Line System to control external customer equipment may be from a minimum of 3 V to a maximum of 72 V. The Optical Line System provides a unidirectional opto-isolator connection across each corresponding control output wiring pair. The load current across each control output wiring pair must be limited by the external customer equipment and must not exceed 35 mA.
- Serial Telemetry: The serial telemetry interface operates at 2400-baud through an EIA-422 port.
- X.25 Protocol/Transaction Language 1 (TL1): The X.25/TL1 interface operates at 1200 to 19,200 baud through an EIA-232-D port.

Reliability Specifications

OC-48 Channel Unavailability* (hardware only)	
— 2 Line† End Terminal	0.003 minutes/year, per channel
— 2 Line† Repeater	0.002 minutes/year, per channel
— 4 Line† End Terminal	0.006 minutes/year, per channel
— 4 Line† Repeater	0.005 minutes/year, per channel
— 360 km 4 Line† System (two 4 Line† End Terminals and two 4 Line† Repeaters)	0.02 minutes/year, per channel
Telemetry Channel Unavailability* (hardware only)	
— Independent End Terminal	42 minutes/year, per channel
— Independent Repeater	49 minutes/year, per channel
— 1+1 End Terminal	0.0017 minutes/year, per channel
— 1+1 Repeater	0.0023 minutes/year, per channel
Silent Failure Unavailability	
— End Terminal or Repeater	0

* Based on Method I of the Bellcore, *Reliability Prediction Procedure for Electronic Equipment*, Issue 5, December 1995.

† One optical line is used for protection.

Mean Time* Between Maintenance Activities	
— 2 Line End Terminal	42 months
— 2 Line Repeater	40 months
— 4 Line End Terminal	21 months
— 4 Line Repeater	20 months
Infant Mortality	≤ 1.6 times the steady state failure rate
Product Design Life	25 years

Circuit Pack/Unit FIT Rates

Circuit Pack/Unit	Failures/10^9 hours† (FIT)
LEA1 SYSCTL	3387
LEA2 SYSMEM	7118
LEA5 TOHCTL	2549
605A ODU	1540
505A OMU	1538
LEA6 OA	16848
LEA7 OA	16848
LDA1 TLM	6625

* Based on the Lucent Reliability Information Notebook, 7th Edition, August 1995.

† Based on Method I of the Bellcore, *Reliability Prediction Procedure for Electronic Equipment*, Issue 5, December 1995.

Craft Interface Terminal Usage

11

Contents

Overview 11-1

OLS CIT-PC Software Introduction 11-1

Commands (Inputs) 11-2

Notice Frames, Confirmation Requests, and Aborting Commands 11-2

Context-Sensitive Help 11-3

CIT Function Keys 11-3

PC Screen Header Line 11-4

Table 11-1 - Release 2 Inputs (Commands) Menu for OLS End Terminal and Repeater (Expert Mode) 11-5

Table 11-2 - Release 1 Inputs (Commands) Menu for OLS End Terminal and Repeater (Expert Mode) 11-7

Table 11-3 - Input (Command) Definitions (Alphabetized by *Verb*) 11-9

Table 11-4 - List of Inputs (Commands) That Generate Reports for OLS Network Elements (Alphabetized by Qualifiers) 11-13

Outputs 11-14

Examples of Reports [Generated by Various Inputs (Commands)] 11-15

CIT Tutorial Using CIT-PC Software 11-55

Craft Interface Terminal Usage

11

Overview

This section covers the following topics:

- OLS CIT-PC Software Introduction
- Commands (Inputs)
- Notice Frames, Confirmation Requests, and Aborting Commands
- Context-Sensitive Help
- CIT Function Keys
- PC Screen Header Line
- Outputs
- Examples of Reports
- Craft Interface Terminal (CIT) Tutorial.

The user should be familiar with the information in this tab before using the Operation and Maintenance Task Oriented Practices (TOP) procedures in this manual.

OLS CIT-PC Software Introduction

OLS CIT-PC software is the user-friendly, menu-driven interface used with the Optical Line System. OLS CIT-PC software consists of a series of menus with different security levels (CIT or CIT expert). The software package runs on an *MS-DOS*† compatible personal computer (PC).

† Registered trademark of Microsoft Corporation.

The PC and the OLS CIT-PC software together make up the craft interface terminal (CIT). The CIT connects to an OLS network element (also referred to as an OLS end terminal or an OLS repeater bay/shelf in this manual).

Commands (Inputs)

Commands (inputs) to OLS CIT-PC consist of a series of selections from menus and parameter inputs followed by pressing function key **F9**, labeled `EXECUTE`. This sequence of selecting and executing can be called an "input" or a "command."

Table 11-1 (Release 2) lists the inputs (commands) menu for **OLS End Terminal** and **OLS Repeater** (Expert Mode).

Table 11-2 (Release 1) lists the inputs (commands) menu for **OLS End Terminal** and **OLS Repeater** (Expert Mode).

Table 11-3 provides a brief description of inputs (commands) which are arranged alphabetically by the verb and are applicable to both the OLS end terminal and the OLS repeater bay/shelf.

Table 11-4 provides a list of inputs (commands) that generates reports for the OLS network elements.

Notice Frames, Confirmation Requests, and Aborting Commands

Some inputs are potentially service-affecting and will cause a notice frame or confirmation request to appear on the screen. This alerts the user to the possible consequences of executing the selected inputs.

- A notice frame is acknowledged and cleared by pressing [ESC].
- A confirmation request consists of a caution message followed by inputs entered and the prompt "`Execute? (Yes/No)`". Pressing `y` and [ENTER] causes inputs to be executed. Pressing `n` and [ENTER] causes the parameter value entry frame to be displayed again.
- Inputs can be aborted by pressing function key **F8**, when labeled `CANCEL`.

Context-Sensitive Help

Help for inputs is provided in three forms:

1. Message Line Help — This appears near the bottom of the screen immediately above the display of the function keys. This line provides procedural information, status of the Optical Line System (OLS), or yes/no response information, for example, "`Highlight the desired item and press return to select`" or "`Execution in progress`".
2. Function key **F1** Help — When function key **F1** is labeled `HELP`, it can be pressed to display a context-sensitive description of the highlighted menu item, parameter, notice frame, etc.
3. Question mark (**?**) Help — When a parameter is highlighted in a parameter frame, a menu of allowable values (point-and-shoot) or the parameter range is displayed when a question mark (**?**) or a wrong value is entered.

CIT Function Keys

The function keys, **F1** through **F9**, displayed at the bottom of the screen provide a particular function when labeled. The nine function keys are available to expedite certain operations. All function keys are not active at all times. An active function key is shown by its label. Inactive function keys are not labeled. The operation of a function key may vary with time, and this is indicated by changes in the labeling.

F1 When labeled `HELP`, context-sensitive information is available for the highlighted menu item. By pressing the **F1** key, this additional and specific information is displayed.

F2 When labeled `REMOTE` in the local only state or session, this key initiates a connection to a remote OLS network element. **F2** is labeled `REMOTE` in the local state and `LOCAL` in the remote state, thereby allowing local/remote toggling.

F3 When labeled `OUTPUT`, this key clears the screen of menus and parameter frames so the output frame can be viewed. By pressing **F3** again (now labeled `INPUT`), the screen is restored with the menus or parameter frames. This capability is particularly useful while entering parameters because the user can review information that was displayed just previously and then resume the entry of parameters from the same point, without repeating what has already been done.

When labeled `DIAL` in the local connect state, this key allows the user to enter control data for a modem.

When labeled `BREAK` in the dial state, this key sends a break character to the communications port.

F4 When labeled LOGOUT, this key permits the user to terminate the connection to the OLS network element.

When labeled CHECK, this key sends the autobaud character sequence (break, enter, enter) to an OLS network element.

F5 When labeled EXIT, this key permits the user to terminate the connection and exit the OLS CIT-PC software, returning the user back to the *MS-DOS* prompt.

F6 When labeled SETUP, this key permits the user to configure the operating parameters of the PC.

F7 When labeled PRINT, this key permits the user to send the OLS network element's output to a printer, to a file, or to do both.

F8 When labeled CANCEL, this key permits the user to discard all user entries for the current command or cancels/aborts the dial request. If **F8** is pressed after executing a command, an attempt to cancel the command is sent to the OLS network element.

F9 When labeled EXECUTE, this key permits the user to execute the completed command (valid parameter values).

When labeled REPEAT, this key permits the user to repeat the last command or display the last command and edit it.

When labeled ALARM, this key permits the user to execute a `Retrieve-Alarm:All` command with a single keystroke.

When labeled CONT in the Dialup Modem window, this key permits the user to continue with the local connection establishment.

F10 Currently, this key is not being used.

PC Screen Header Line

The six fields displayed from left to right across the **top of the screen** are as follows:

-Network element status indicator (displays highest current system status). (This field is blank when there are no alarms or any NE or FE activity present.)

-AT&T (fixed in program)

-OLS (fixed in program)

-Software release and platform string (currently running in the SYSCTL)

-Terminal identification [target identifier (TID) of the network element]

-Session context (CIT connection state as follows):

LOCAL ONLY — CIT is only connected to local network element.

REMOTE (Flashing) — CIT is connected to remote network element from local network element.

LOCAL — CIT is connected to remote network element, but it is toggled back to local network element.

Table 11-1 - Release 2 Inputs (Commands) Menu for OLS End Terminal and Repeater (Expert Mode)

Management Category	Verb	First Modifier	Second Modifier	Security Level	Report Example
FAULT	Retrieve	Alarm (and Status)		Report Only	2
		History		Report Only	9
		Network Alarms		Report Only	13
		State		Report Only	25
	Test	Alarm		General	
		Auto Turnup	Local	Privileged*	
		LED		Report Only	
		Telemetry	Parallel	General	
	Operate	Alarm Cutoff		Report Only	
		Control		General	
	Release	Control		General	
	Allow	Alarm		General	
	Inhibit	Alarm		General	
	Reset			General	
	Debug			General	
	Factory	Unit		General	
		Utility		General	
CONFIGURATION	Retrieve	Attribute	Alarm	Report Only	3
			Control	Report Only	4
			Environment	Report Only	5
		Date		Report Only	6
		Equipment		Report Only	7
		Map	Network	Report Only	11
			Ring	Report Only	12
		SUPR		Report Only	26
	Set	Attribute	Alarm	General	
			Control	General	
			Environment	General	
		Date		Privileged	
		State	CMS	General	
			OCHAN	General	
		SUPR		General	

* See footnote at end of table.

Continued on next page

Table 11-1 - Release 2 Inputs (Commands) Menu for OLS End Terminal and Repeater (Expert Mode) (Contd)

Management Category	Verb	First Modifier	Second Modifier	Security Level	Report Example
CONFIGURATION (Contd)	Delete	TID		Privileged	
	Copy	Program		Privileged*	
	Update			General	
	Initialize	System		Privileged*	
PERFORMANCE	Retrieve	PM	OCHAN	Report Only	15
			OLINE	Report Only	16
			SUPR	Report Only	18
			Start Time	Report Only	17
		PM Threshold	OCHAN	Report Only	19
			OLINE	Report Only	20
			SUPR	Report Only	21
		Relspr		Report Only	22
	Set	PM	Start Time	General	
		PM Threshold	OCHAN	General	
			OLINE	General	
			SUPR	General	
	Initialize	Optics		General	
		PM	Day, QH	General	
SECURITY	Retrieve	Active	User	Report Only	1
		Far End Comm.		Report Only	8
		Login		Report Only	10
		Network Element		Report Only	14
		Security	Network Element	Report Only	23
			Port	Report Only	24
	Set	Far End Comm.		Privileged	
		Login	Change	Privileged	
			Delete	Privileged	
			Enter	Privileged	
		Network Element		Privileged	
		Password		Report Only	
		Security	Network Element	Privileged	
			Port	Privileged	

* User must invoke "cit expert" mode for CIT-PC software.

Table 11-2 - Release 1 Inputs (Commands) Menu for OLS End Terminal and Repeater (Expert Mode)

Management Category	Verb	First Modifier	Second Modifier	Security Level	Report Example
FAULT	Retrieve	Alarm (and Status)		Report Only	2
		History		Report Only	9
		Network Alarms		Report Only	13
		State		Report Only	25
	Test	Alarm		General	
		Auto Turnup	Local	Privileged*	
		LED		Report Only	
		Telemetry	Parallel	General	
	Operate	Alarm Cutoff		Report Only	
		Control		General	
	Release	Control		General	
	Allow	Alarm		General	
	Inhibit	Alarm		General	
	Reset			General	
	Debug			General	
	Factory	Unit		General	
		Utility		General	
CONFIGURATION	Retrieve	Attribute	Alarm	Report Only	3
			Control	Report Only	4
			Environment	Report Only	5
		Date		Report Only	6
		Equipment		Report Only	7
		Map	Network	Report Only	11
			Ring	Report Only	12
		SUPR		Report Only	26
	Set	Attribute	Alarm	General	
			Control	General	
			Environment	General	
		Date		Privileged	
		State	CMS	General	
			OCHAN	General	
		SUPR		General	
	Copy	Program		Privileged*	
	Update			General	
	Initialize	System		Privileged*	

* See footnote at end of table.

Continued on next page

Table 11-2 - Release 1 Inputs (Commands) Menu for OLS End Terminal and Repeater (Expert Mode) (Contd)

Management Category	Verb	First Modifier	Second Modifier	Security Level	Report Example
PERFORMANCE	Retrieve	PM	OCHAN	Report Only	15
			OLINE	Report Only	16
			SUPR	Report Only	18
			Start Time	Report Only	17
		PM Threshold	OCHAN	Report Only	19
			OLINE	Report Only	20
			SUPR	Report Only	21
	Set	PM	Start Time	General	
		PM Threshold	OCHAN	General	
			OLINE	General	
			SUPR	General	
	Initialize	Optics		General	
		PM	Day, QH	General	
SECURITY	Retrieve	Active	User	Report Only	1
		Far End Comm.		Report Only	8
		Login		Report Only	10
		Network Element		Report Only	14
		Security	Network Element	Report Only	23
			Port	Report Only	24
	Set	Far End Comm.		Privileged	
		Login	Change	Privileged	
			Delete	Privileged	
			Enter	Privileged	
		Network Element		Privileged	
		Password		Report Only	
		Security	Network Element	Privileged	
			Port	Privileged	

* User must invoke "cit expert" mode for CIT-PC software.

Table 11-3 - Input (Command) Definitions (Alphabetized by *Verb*)

Selected Input	Purpose
FAULT-*Allow*-Alarm	Allows the user to enable the reporting of alarms at an alarm-reporting interface.
CONFIGURATION-*Copy*-Program	Copies the software contained in one SYSMEM (source NE) to another SYSMEM (destination NE) via the DCC.
FAULT-*Debug*	Places the factory user into a special debugger program. After executing this command, the user must exit the CIT and login again to return to the command menus. It is not available in the GA product.
CONFIGURATION-*Delete*-TID	Removes a Network Element (NE) from the ring and the network map reports at all other NEs in the sub-network served by the local DSNE.
FAULT-*Factory*-Unit	Allows the factory user to execute internal test procedures designed to ensure product quality, and address temperature and environmental conditions in the factory. It is not available in the GA product.
FAULT-*Factory*-Utility	Allows the factory user to execute internal test procedures designed to ensure product quality, and address temperature and environmental conditions in the factory. It is not available in the GA product.
FAULT-*Inhibit*-Alarm	Suppresses the autonomous reporting of failures at office alarms, parallel telemetry, and/or X.25 based OS interfaces.
PERFORMANCE-*Initialize*-Optics	Certain optical line parameters are baselined or recalculated in the network element.
PERFORMANCE-*Initialize*-PM	Initializes the current day and quarter hour performance-monitoring storage registers to zero.
CONFIGURATION-*Initialize*-System	Causes current values in the SYSMEM to be replaced by the original values in the SYSMEM and then restarts the software.
FAULT-*Operate*-Alarm Cutoff	Silences the office audible alarms.
FAULT-*Operate*-Control	Operates external miscellaneous discrete controls either momentarily or continuously.
FAULT-*Release*-Control	Releases external miscellaneous discrete controls either momentarily or continuously.
FAULT-*Reset*	Restarts the OLS network element software as follows: (1) Current memory values are copied from the SYSCTL to the SYSMEM, (2) executable code is copied from the SYSMEM to the SYSCTL, (3) the executable code in the SYSCTL is restarted, and (4) the current values in the SYSMEM are reformatted as necessary to work properly with the executable code running in the SYSCTL.

Continued on next page

Table 11-3 - Input (Command) Definitions (Alphabetized by Verb) (Contd)

Selected Input	Purpose
SECURITY-*Retrieve*-Active User	Allows a user to retrieve the current CIT and TL1 port provisioning and who is currently logged into each port.
FAULT-*Retrieve*-Alarm	Generates an active alarm and status report on (and Status) the OLS.
CONFIGURATION-*Retrieve*-Attribute-Alarm	Retrieves the alarm attributes for the OLS network element.
CONFIGURATION-*Retrieve*-Attribute-Control	Retrieves the descriptive name associated with the user-settable miscellaneous discrete control output points.
CONFIGURATION-*Retrieve*-Attribute-Environment	Retrieves the alarm and descriptive name associated with the user-settable miscellaneous discrete environmental input points.
CONFIGURATION-*Retrieve*-Date	Retrieves provisioned information on current date and time, and start and stop dates for daylight saving time.
CONFIGURATION-*Retrieve*-Equipment	Retrieves the equipage and version information for the OLS network element.
SECURITY-*Retrieve*-Far End Communications	Retrieves status information on the far-end communications access that uses the data communications channel.
FAULT-*Retrieve*-History	Retrieves the maintenance history information on about 500 events for the OLS network element.
SECURITY-*Retrieve*-Login	Retrieves at the privilege user level a complete list containing all users' login and their assigned security level but not their password.
CONFIGURATION-*Retrieve*-Map-Network	Retrieves a current list of all network elements in the maintenance subnetwork.
CONFIGURATION-*Retrieve*-Map-Ring	Retrieves the current values in the addressing parameters of the nodes in a ring network.
FAULT-*Retrieve*-Network Alarms	Generates a report that summarizes the alarm and status conditions currently being reported for a specific OLS terminal or OLS repeater bay/shelf.
SECURITY-*Retrieve*-Network Element	Retrieves characteristics of the OLS network element.
PERFORMANCE-*Retrieve*-PM-Ochan	Generates a status report containing optical channel performance-monitoring data.
PERFORMANCE-*Retrieve*-PM-Oline	Generates a status report containing optical line performance-monitoring data.
PERFORMANCE-*Retrieve*-PM-Start Time	Generates a status report stating the start time for measuring the day bins.

Continued on next page

Table 11-3 - Input (Command) Definitions (Alphabetized by Verb) (Contd)

Selected Input	Purpose
PERFORMANCE-*Retrieve*-PM-Supr	Generates a status report containing supervisory channel performance-monitoring data.
PERFORMANCE-*Retrieve*-PM Threshold-Ochan	Reports the performance monitoring TCA threshold values for the optical channel performance monitoring data.
PERFORMANCE-*Retrieve*-PM Threshold-Oline	Reports the performance monitoring TCA threshold values for the optical line performance monitoring data.
PERFORMANCE-*Retrieve*-PM Threshold-Supr	Reports the performance monitoring TCA threshold values for the supervisory channel performance monitoring data.
PERFORMANCE-*Retrieve*-Relspr	Reports the relative signal power of each channel in an optical line relative to the strongest signal (0 to 100.)
SECURITY-*Retrieve*-Security-Network Element	Retrieves only at the privileged user level the security provisioning of login aging, password aging, and allowed logins of the OLS network elements.
SECURITY-*Retrieve*-Security-Port	Retrieves only at the privileged user level the security provisioning of login aging, password aging, and allowed logins of the timeout information on the craft access ports.
FAULT-*Retrieve*-State	Retrieves slot, CMS port, optical channel, optical line, and supervisory channel state information for the OLS terminal.
CONFIGURATION-*Retrieve*-Supr	Retrieves provisioned information, non-provisional information, and attributes of a supervisory channel.
CONFIGURATION-*Set*-Attribute-Alarm	Provisions the alarm attributes of the OLS terminal.
CONFIGURATION-*Set*-Attribute-Control	Provisions the character strings associated with the miscellaneous discrete control output points.
CONFIGURATION-*Set*-Attribute-Environment	Provisions the character strings associated with the miscellaneous discrete environmental input points.
CONFIGURATION-*Set*-Date	Provisions the correct time, calendar date, and time-zone.
SECURITY-*Set*-Far End Communications	Provisions the control of the far end communications access to the OLS terminal over the DCC.
SECURITY-*Set*-Login-Change	Only a privileged user can make changes to the provisioned login parameters (which are new login, password, verify password, user privilege, and status).
SECURITY-*Set*-Login-Delete	Only a privileged user can delete the provisioned nonprivileged user logins.
SECURITY-*Set*-Login-Enter	Only a privileged user can provision the login parameters (which are new login, password, verify password, and user privilege).
SECURITY-*Set*-Network Element	Provisions the OLS network element identification (TID).

Continued on next page

Table 11-3 - Input (Command) Definitions (Alphabetized by Verb) (Contd)

Selected Input	Purpose
SECURITY-*Set*-Password	Provisions the user's password. All user's can change their own password.
PERFORMANCE-*Set*-PM Start Time	Provisions the start time for measuring the day (24 hour) bins.
PERFORMANCE-*Set*-PM Threshold-Ochan	Provisions the performance monitoring TCA threshold values for the optical channel. The value includes a signal power per channel (SPR-C).
PERFORMANCE-*Set*-PM Threshold-Oline	Provisions the performance monitoring TCA threshold value for the optical line. The value is the total optical power received from the fiber (TOPR-OL).
PERFORMANCE-*Set*-PM Threshold-Supr	Provisions the performance monitoring TCA threshold values for the supervisory channel. The value is the signal power of the supervisory channel (SPR-SU) received at the telemetry circuit pack.
SECURITY-*Set*-Security-Network Element	Provisions (only by the privilege user) the network element parameters.
SECURITY-*Set*-Security-Port	Provisions (only by the privilege user) the port access parameters.
CONFIGURATION-*Set*-State-CMS	Provisions the memory administrative state of a the customer maintenance signal port in the OLS.
CONFIGURATION-*Set*-State-Ochan	Provisions the memory administrative state of a the optical channel in the OLS.
CONFIGURATION-*Set*-Supr	Provisions the characteristics of a supervisory channel. They are the severity of the alarm assigned to the supervisory channel failures and the signal degrade threshold.
FAULT-*Test*-Alarm	Tests the audible and visible office alarms and their corresponding user panel LEDs.
FAULT-*Test*-Auto Turnup-Local	Initiates an automatic turnup test of the internal transmission health of the OLS network element. The test includes path testing between circuit packs requiring cabling, and testing the telemetry channel via the optical amplifiers. Testing must be done when an OLS is out of service.
FAULT-*Test*-LED	Tests the alarm and status LEDs on the user panel and circuit packs.
FAULT-*Test*-Telemetry-Parallel	Tests the parallel telemetry and miscellaneous discrete points.
CONFIGURATION-*Update*	Updates the OLS equipment data base of an OLS network element to reflect the existing hardware and incoming signals. For example, an empty operational slot would change to the AUTO state and the in-service ports receiving bad signals would change to the AUTO state.

Table 11-4 - List of Inputs (Commands) That Generate Reports for OLS Network Elements [Alphabetized by Qualifier(s)]

Input (Command)	Report (Note)	Example
SECURITY-Retrieve-*Active-User*	Active User Report	1
FAULT-Retrieve-*Alarm*	Active Alarm and Status Report	2
CONFIGURATION-Retrieve-*Attribute-Alarm*	System Alarm Attributes Report	3
CONFIGURATION-Retrieve-*Attribute-Control*	Control Point Provisioning Report	4
CONFIGURATION-Retrieve-*Attribute-Environment*	Environmental Input Provisioning Report	5
CONFIGURATION-Retrieve-*Date*	Date and Time Report	6
CONFIGURATION-Retrieve-*Equipment*	Equipage and Version Report	7
SECURITY-Retrieve-*Far End Communications*	Far End Communication Configuration Report	8
FAULT-Retrieve-*History*	Maintenance History Report	9
SECURITY-Retrieve-*Login*	Login Provisioning Report	10
CONFIGURATION-Retrieve-*Map-Network*	Network Map Report	11
CONFIGURATION-Retrieve-*Map-Ring*	Ring Map Report	12
FAULT-Retrieve-*Network Alarms*	Network Alarms Report	13
SECURITY*-Retrieve-*Network Element*	OLS System Provisioning Report	14
PERFORMANCE-Retrieve-*PM-Ochan*	Optical Channel Performance Monitoring Status Report	15
PERFORMANCE-Retrieve-*PM-Oline*	OLS Optical Line Performance Monitoring Status Report	16
PERFORMANCE-Retrieve-*PM-Start Time*	Performance Monitoring Day Bin Start Time Report	17
PERFORMANCE-Retrieve-*PM-Supr*	Supervisory Channel Performance Monitoring Status Report	18
PERFORMANCE-Retrieve-*PM Threshold-Ochan*	Optical Channel Performance Monitoring Threshold Value Report	19
PERFORMANCE-Retrieve-*PM Threshold-Oline*	Optical Line Performance Monitoring Threshold Value Report	20
PERFORMANCE-Retrieve-*PM Threshold-Supr*	Supervisory Channel Performance Monitoring Threshold Value Report	21
PERFORMANCE-Retrieve-*Relspr*	Optical Channel Performance Monitoring Status Report	22
SECURITY-Retrieve-*Security-NE*	Access Security Global Configuration Report	23
SECURITY-Retrieve-*Security-Port*	Access Port Security Configuration Report	24
FAULT-Retrieve-*State*	State Report	25
CONFIGURATION-Retrieve-*Supr*	Supervisory Channel Provisioning Report	26

Note: These reports appear on the following pages.

Outputs

Every OLS CIT-PC input that is executed will result in an output on the CIT screen. The output response is in a 2-line standard format and consists of the OLS network element identification, date and time (line 1), and the command name (executed input is echoed back), followed by either `COMPLD` or `DENY` (line 2).

- `COMPLD` indicates that the action requested by the input was completed. The output may include a report, if applicable.
- `DENY` indicates that the input was denied. The output includes a 4-letter error code and an explanation of the denial.

Table 11-1 has a column that shows the number of the report example. Each example is introduced by its heading that shows the OLS CIT-PC input that produces the report. An example is shown for each report, along with an explanation of the column headings and parameters. Table 11-3 lists the OLS CIT-PC inputs (commands) that produce reports.

Some reports are too long to fit on a single screen and the question `Continue report page-by-page?(y/n)Yes` is displayed on the message line (help). Pressing ENTER selects the default (`Yes`) and the next page of the report is then displayed. If `No` was selected, then the question `Continue report without paging?(y/n)Yes` is displayed and must be answered. Scrolling (↑, ↓ keys) allows the user to bring information back to the screen after it has scrolled off, especially the long reports.

Examples of Reports [Generated by Various Inputs (Commands)]

Example 1 - SECURITY-Retrieve-Active-User

```
   Delta-1  94-06-15 23:15:15 EST
M  Retrieve-Active-User:All:  COMPLD
   /* Active User Report
   ========================================================================
   Access           Port Type/    TL1 Calling       Active
   Port    Channel  OS Type       Address/GNE TID   User
   ========================================================================
   dce              cit                             -
   dte              tl1                             -
   ------------------------------------------------------------------------
   dcc     vc-0     cit                             ATT02
   dcc     vc-1     memry-admin                     ATT01
   dcc     vc-2     cmd-resp                        ATT03
              :
   dcc     vc-8     -                               -
   ------------------------------------------------------------------------
   x25     pvc-1    maintenance                     NMA01
   x25     pvc-2    other                           TMAS
   ------------------------------------------------------------------------
   x25     svc-1    other        1234               SNC2000
              :
   x25     svc-6    -            -                  -
   */
;
```

Example 1 shows the current CIT and TL1 port provisioning and who is currently logged in on each port.

`Access Port` - Shows a specific operations interface (physical port) for which the status is being displayed.

`Channel` - Shows a virtual channel (vc) associated with the Access Port. For dte and dce ports, a blank (" ") is always reported. For the dcc port, virtual channel 1 through 8 is reported. For the x.25 port, the permanent virtual channel (pvc) 1 or 2 and the switched virtual channels (svc) from 1 through 6.

Continued on next page

`Port Type/ OS Type`	-	Shows how a given port is operating; for example, the dce and dte ports are either "cit" or "tl1". All virtual channels of the x.25 port are "maintenance", "memry-admin", "cmd-resp", or "other". The dcc port, virtual channel 0, is the "cit" and virtual channels 1 through 8 are either "maintenance", "memry-admin", "cmd-resp", or "other." A dash (—) means that no user is currently logged in to the port.
`TL1 Calling Address/ GNE TID`	-	Shows the calling address the user entered as part of the x.25 dial string and is reported for x.25 virtual channels only or for DCC virtual channels (vc 1 through 8) for the gateway network element (GNE) at the time of the report. The GNE TID on the report may not be current due to some provisioning after logging into the GNE. (The GNE routes TL1 alarm messages over the X.25 port to the OSs.) For all other ports (and associated virtual channels), this parameter is reported as a blank (" ").
`Active User`	-	Shows the current login of the user. A dash (—) indicates the user is not currently logged in on the port/(virtual channel).

Example 2 - FAULT-Retrieve-Alarm

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Alarm:All:  COMPLD
   /* Active Alarms and Status Report
   ================================================================================
   Alarm   Source        Date  Time      Srv  Description
   Level   Address       Detected
   ================================================================================
   CR      bbbbbbbbbbbb  mm-dd hh:mm:ss  eee  fffffffffffffffffffffffffffff
   --------------------------------------------------------------------------------
   MJ      bbbbbbbbbbbb  mm-dd hh:mm:ss  eee  fffffffffffffffffffffffffffff
   --------------------------------------------------------------------------------
   MN      bbbbbbbbbbbb  mm-dd hh:mm:ss  eee  fffffffffffffffffffffffffffff
   --------------------------------------------------------------------------------
   ABN     bbbbbbbbbbbb  mm-dd hh:mm:ss  eee  fffffffffffffffffffffffffffff
   --------------------------------------------------------------------------------
   NE ACTY bbbbbbbbbbbb  mm-dd hh:mm:ss  eee  fffffffffffffffffffffffffffff
   */
;
```

Example 2 shows no active alarm conditions, but three status conditions are shown (near-end activities) in the OLS network element. The greatest severity condition appears first and the least severity condition appears last. Equal severity conditions are listed chronologically, starting with the most recent at the top of the group listing.

`Alarm Level` - Shows the alarm and status level with the greatest severity to the least severity. Highest alarm level also corresponds to associated user panel LED. If no LEDs are lighted at the user panel (no active alarms), then an output status message is shown.

Alarm level/status condition will be one or more of the following:

- CR (critical alarm)
- MJ (major alarm)
- MN (minor alarm)
- ABN (abnormal status)
- NE ACTY (near end-activity status)

The `FE ACTY` LED on the user panel and the CIT only refers to activity at the far end and will not be reflected in this CIT report.

Continued on next page

If a protected (non-service-affecting) failure becomes unprotected (service-affecting) because of a failure to the protecting circuit pack or line, then both failures are reported as service-affecting failures, and the alarm levels for both failures are adjusted accordingly. Similarly, if an unprotected failure becomes protected, the alarm level of that failure is adjusted accordingly.

`Source Address` - Shows the address for the condition within the OLS network element. A dash (—) indicates no particular address for a condition (for example, a protected power failure). Some conditions give an address, for example "ochan-2", meaning the condition on optical channel 2 of the addressed line indicates an "incoming optical channel LOS."

`Date Time Detected` - Shows the month, day, and time in hours, minutes, and seconds that the alarm condition was first detected. If an alarm level changes because of a second failure (higher alarm level), the time will change to correspond to the second failure.

`Srv` - Shows when service is affected (SA), or not affected (nsa). `SA` could be a "OA failure," and an `nsa` could be an "DCC APS data error" failure.

`Description` - Shows a brief description of the condition. Explanations of these conditions are provided in a table in Section 9, "Maintenance Description."

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Alarm:All:  COMPLD
   /* Active Alarms and Status Report
   ================================================================================
   There are no active alarms or status conditions of the requested level.
   */
;
```

The report above shows that no active alarms or status conditions of the requested level are reported for the addressed OLS network element.

Example 3 - CONFIGURATION-Retrieve-Attribute-Alarm

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Attribute-Alarm:All:  COMPLD
   /* System Alarm Attributes Report
   ================================================================
   Parameter                     Value
   ================================================================
   Incoming Signal Alarm Delay   20
   Alarm Clear Delay             20
   */
;
```

Example 3 shows the provisioned delay values of the alarm attributes at the OLS end terminal or repeater.

`Incoming Signal Alarm Delay` - Shows how many seconds the OLS network element will wait, after declaration of an incoming signal defect, before activating all indicators.

`Alarm Clear Delay` - Shows how many seconds the OLS network element will wait after the alarm retires before reporting it to the external maintenance interfaces (for example, user panel, operations systems).

`Value` - The delay value is the time in seconds with a range of 0 through 120 seconds.

Example 4 - CONFIGURATION-Retrieve-Attribute-Control

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Attribute-Control:All:  COMPLD
   /* Control Point Provisioning Report
   ============================================================
   Address   Description
   ============================================================
   cont-1    StartGenerator
   cont-2    Start Pump
   cont-3    control 3
   cont-4    control 4
   */
;
```

Example 4 shows the descriptive name associated with the user-settable miscellaneous discrete control output points. These output points are wired to control/identify the output control points at a remote site.

`Address` - Shows number selected (up to four) output points for the report.

`Description` - Shows the name (26-character string) associated with the output points, such as "start pump," "start generator," etc.

Example 5 - CONFIGURATION-Retrieve-Attribute-Environment

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Attribute-Environment:All:  COMPLD
   /* Environmental Alarm Provisioning Report
   ================================================================
   Address   Alarm   Description
             Level
   ================================================================
   env-1     CR      Fire
   env-2     NA      Open Door
   env-3     MN      environment /3
   .         .            .
   .         .            .
   .         .            .
   env-16    MN      environment 16
   */
;
```

Example 5 shows the descriptive name associated with the user-settable miscellaneous discrete environmental input points. Usually, these input points are wired to monitor equipment at a remote site.

`Address` - Shows number selected (up to 16) input points.

`Alarm Level` - Shows the provisioned alarm level (severity) of the environmental input, such as:

CR (critical alarm)
MJ (major alarm)
MN (minor alarm)
NA (status not alarmed)
NR (status not alarmed and not reported to the OS)

`Description` - Shows descriptive name the user specified for the alarm condition, such as "fire," "open door," etc. This information is also reported in the condition description of the Active Alarms and Status Report and the History Report.

Example 6 - CONFIGURATION-Retrieve-Date

```
   Delta-1  95-08-03 13:15:15 EST
M  Retrieve-Date:  COMPLD
   /* Date and Time Report
   ============================================================================
   Parameter                          Value
   ============================================================================
   Current Date                       93-01-19
   Current Time                       23:15:15
   Standard Time Zone                 EST
   Start Daylight Savings Time        04-15
   Stop Daylight Savings Time         10-05
   Daylight Savings Time Zone         EDT
   */
;
```

Example 6 shows the provisioned daylight savings time information. If the start and stop daylight savings time dates are the same, automatic switching to daylight savings time is disabled.

`Current Date` - Shows current year, month, and date.

`Current Time` - Shows current time in hours, minutes, and seconds.

`Standard Time Zone` - Shows the standard time zone that is outside of daylight savings time (for example, EST, CST, MST, and PST).

`Start Daylight Savings Time*` - Shows the month and day that daylight savings time is to start.

`Stop Daylight Savings Time*` - Shows the month and day that daylight savings time is to stop.

`Daylight Savings Time Zone` - Shows the daylight savings time zone (for example EDT, CDT, MDT, and PDT).

---

* The Daylight Savings Time feature is "disabled" (disabled will be shown on the report) when the same date is entered for Start Daylight Savings Time and Stop Daylight Savings Time.

Example 7 - CONFIGURATION-Retrieve-Equipment

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Equipment:All:  COMPLD
   /* Equipage and Version Report
   ================================================================================
   Slot       Circuit   Apparatus   Series   CLEI         ECI      Serial
   Address    Pack      Code        Number   Code         Code     Number
   ================================================================================
   sysctl     SYSCTL    LEA1        S1:2     SNPQWAWAAA   673254   95MV08616574
              Optical Line System RELEASE 1.0.0-OLS
   sysmem     SYSMEM    LEA2        S1:2     SNPQWA1AAA   673230   95MV08616747
              Optical Line System RELEASE 1.0.0-OLS
   --------------------------------------------------------------------------------
   tohctl-1   TOHCTL    LEA5        S1:1     SNPQAHWAAA   680009   95MV06581722
   --------------------------------------------------------------------------------
   oa-1a      OA        LEA6        S2:2     SNPQAHWAAA   679492   95MV08615555
   oa-1b      OA        LEA6        S2:2     SNPQAHWAAA   679492   95MV08615556
   oa-2a      OA        LEA6        S2:2     SNPQAHWAAA   679492   95MV08615557
   oa-2b      OA        LEA6        S2:2     SNPQAHWAAA   679492   95MV08615558
   --------------------------------------------------------------------------------
   tlm-1a     TLM       LDA1        S1:1     SNPQAHWAAA   679113   95MV08615527
   tlm-2a     TLM       LDA1        S1:1     SNPQAHWAAA   679113   95MV08615528
```

Example 7 shows the equipage and version information for an OLS end terminal with two optical lines. If either the SYSCTL or SYSMEM is addressed, a software version is displayed. The currently running software release is displayed when SYSCTL is addressed, and the stored software release is displayed when SYSMEM is addressed (for example, after a download or before a `Reset` is entered). If the requested information is not available, a report is generated stating "Equipment Data Unavailable."

If any of the circuit packs associated with an optical line pair is inserted (that is, at least one TLM or one OA), the Retrieve-Equipment command displays the message "CP removed, complete information not available" for all circuit packs associated with that optical line that are not inserted. Note that the CONFIGURATION-Update command does not clear the "CP removed, complete information not available" message unless all of the circuit packs associated with that optical line pair are physically removed when the CONFIGURATION-Update command is run.

`Slot Address` - Shows the address of the slot for the selected line.

`Circuit Pack*` - Shows the functional name of the circuit pack.

`Apparatus Code*` - Shows the assigned code of the circuit pack.

See footnotes on next page.

Continued on next page.

`Series Number*` - Shows the series number of the circuit pack.

`CLEI Code*` - Shows the *COMMON LANGUAGE†* equipment identifier code of the circuit pack.

`ECI Code*` - Shows the equipment catalog item code of the circuit pack.

`Serial Number*` - Shows the serial number of the circuit pack.

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Equipment:All:  COMPLD
   /* Equipage and Version Report
   ================================================================================
   Slot       Circuit   Apparatus   Series   CLEI          ECI      Serial
   Address    Pack      Code        Number   Code          Code     Number
   ================================================================================
   sysctl     SYSCTL    LEA1        S1:2     SNPQWAWAAA    673254   95MV08616594
              Optical Line System RELEASE 1.0.0-OLS
   sysmem     SYSMEM    LEA2        S1:2     SNPQWA1AAA    673230   95MV08616797
              Optical Line System RELEASE 1.0.0-OLS
   --------------------------------------------------------------------------------
   tohctl-1   TOHCTL    LEA5        S1:1     SNPQAHWAAA    680009   95MV06581792
   --------------------------------------------------------------------------------
   oa-1a      OA        LEA6        S2:2     SNPQAHWAAA    679492   95MV08615595
   oa-1b      OA        LEA6        S2:2     SNPQAHWAAA    679492   95MV08615596
   oa-2a      OA        LEA6        S2:2     SNPQAHWAAA    679492   95MV08615597
   oa-2b      OA        LEA6        S2:2     SNPQAHWAAA    679492   95MV08615598
   --------------------------------------------------------------------------------
   tlm-1a     TLM       LDA1        S1:1     SNPQAHWAAA    679113   95MV08615597
   tlm-1b     TLM       LDA1        S1:1     SNPQAHWAAA    679113   95MV08615598
   tlm-2a     TLM       LDA1        S1:1     SNPQAHWAAA    679113   95MV08615597
   tlm-2b     TLM       LDA1        S1:1     SNPQAHWAAA    679113   95MV08615598
```

The report shows the equipage and version information for an OLS repeater bay/shelf. If either the SYSCTL or SYSMEM is addressed, a software version is displayed. The currently running software release is displayed when SYSCTL is addressed, and the stored software release is displayed when SYSMEM is addressed (for example, after a download or before a `Reset` is entered). If the requested information is not available, a report is generated stating "Equipment Data Unavailable."

If any of the circuit packs associated with an optical line pair is inserted (that is, at least one TLM or one OA), the Retrieve-Equipment command displays the message "CP removed, complete information not available" for all circuit packs associated with that optical line that are not inserted. Note that the CONFIGURATION-Update command does not clear the "CP removed, complete information not available" message unless all of the circuit packs associated with that optical line pair are physically removed when the CONFIGURATION-Update command is run.

---

* A dash ("-") is displayed when a field is not applicable; for example, a slot is not equipped. A question mark ("?") is displayed when the field information is not available; for example, a failed circuit pack.

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

Example 8 - SECURITY-Retrieve-Far End Communications

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Far End Communications:  COMPLD
   /* Far End Communication Configuration Report
   ================================================================
   Parameter                  Value
   ================================================================
   Remote Activity Reporting  enabled
   Remote Office Alarms       enabled
   */
;
```

Example 8 shows that access to a remote location over the data communications channel (DCC) is enabled (access is allowed).

`Remote Activity Reporting` - Shows that remote reporting is enabled or disabled. For example, when enabled, far-end activity is indicated by the `FE ACTY` LED being lighted and reported in the Retrieve-Network Alarms Report.

`Remote Office Alarms` - Shows that the remote office alarms are allowed to be displayed locally (enabled) or not (disabled). For example, when disabled, only local office alarms are reported locally.

Example 9 - FAULT-Retrieve-History

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-History:  COMPLD
   /* Maintenance History Report
   ================================================================================
   Date  Time       System   Source      Event
   of Event         Alarm    Address     Description
   ================================================================================
   01-31 21:18:47   -        cit-dce     Set-Date
   01-31 21:17:47   -        cit-dce     Login
   01-31 21:16:17   -        system      Reset in progress - cleared
   01-31 21:14:07   MJ       system      Reset in progress
   01-31 21:12:23   MN       Site-1-02   repeater bay environment input-cleared
          .          .          .              .
          .          .          .              .
          .          .          .              .
   01-30 19:49:32   MN       Site-1-02   repeater bay environment input
   */
;
```

Example 9, normally a multiple page report, shows up to 500 of the most recent events that have occurred in the Optical Line System. The events are shown with the most recent events at the top and include:

- The beginning and end of OLS system alarm and status conditions
- Completed CIT inputs, except for `Retrieve-modifier(s)`, `Operate-Alarm-Cutoff`, and `Test-LED` inputs
- Automatic provisioning state transitions
- Operations systems interface
- All login and logout attempts.

`Date of Event` - Shows the month, day, hours, minutes, and seconds the event occurred.

`System Alarm` - Shows the active alarm level at the time and date shown. Possible alarms are CR, MJ, MN, ABN, NE ACTY, and dash (-) when no alarms exist in the system.

`Source Address` - Shows the address of where the event occurred.

`Event Description` - A brief description of the event.

Example 10 - SECURITY-Retrieve-Login

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Login:  COMPLD
   /* Login Provisioning Report
   ================================================================
   Login        Privilege      Visitor  Expiration    Last Logged In
   ================================================================
   Priv1        privileged     -        -             12:20:09  91-12-25
   Priv2        privileged     -        -             -
   ----------------------------------------------------------------
   crafta       general        no       -             01:01:09  92-10-05
   craftb       general        yes      93-02-18      04:02:50  93-02-17
   ----------------------------------------------------------------
   clerk1       reports only   no       -             -
   */
;
```

Example 10 shows a user the authorization information on that OLS network element. The report lists each user's login and their authorization privileges but not the user's password. Different groups of users are separated by a row of hyphens
(---).

`Login` - Shows the user's login (up to 10 characters) as assigned by `Set-Login-Enter`.

`Privilege` - Shows the assigned privilege (reports only, general, and privileged).

`Visitor` - Shows the login to be a visitor (yes) or not (no).

`Expiration` - Shows the date that the visitor login expires. A dash (-) is shown for nonvisitor logins.

`Last Logged In` - Shows the time in hours, minutes, and seconds and the date by year, month, and day that the user last successfully logged into the OLS network element. A dash "-" is shown if a user has never logged in.

Example 11 - CONFIGURATION-Retrieve-Map-Network

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Map-Network:All:  COMPLD
   /* Network Map Report
   ================================================================================
                              DCC     Product                 Alarm
   TID                        Status  Type       DSNE  ASNE   Group
   ================================================================================
   LOWEST-TID NSAP-GOES-HERE  good    FT-2000    yes           251
   ANOTHER-TID-HERE-0         good    FT-2000                  251
   TID-3-GOES-HERE            good    FT-2000                  251
   LAST-TID-LISTED            good    FT-2000                  251
   --------------------------------------------------------------
   ANOTHER-TID-HERE-1         good    FT-2000                  251
   ANOTHER-TID-HERE-2         good    FT-2000                  251
   ANOTHER-TID-HERE-3         good    FT-2000                  251
   ANOTHER-TID-HERE-4         good    DDM-OC3          yes     253
   ANOTHER-TID-HERE-5         good    DDM-OC3                  253
   ANOTHER-TID-HERE-6         good    DDM-OC12         yes     253
   ANOTHER-TID-HERE-7         good    DACS IV          yes     253
   ANOTHER-TID-HERE-8         good    FbrRch                   253
   ANOTHER-TID-HERE-9         good    ?                        ?
   */
;
```

Example 11 lists all network elements (NEs) in the maintenance subnetwork (limit of 64 network elements). The NEs above the dashed line are in the local ring arranged in a West-to-East sequence. And below the dashed line, all other NEs are accessible via DCC channels and/or intra-office LANs (IAO-LANs). The report shows that the local ring network is complete (DCC continuity is `good`). An incomplete/open ring network is indicated by `FAIL` in the `DCC Status` column.

`TID` - Shows the target identifier assigned to the node (up to 20 characters).

`DCC Status` - Shows either `good` or `FAIL` for the data communications channel (DCC) between the local network element and the remote network element.

`Product Type` - Shows the listed network element as OLS, FT-2000, DDM-OC3 (DDM-2000 OC-3), DDM-OC12 (DDM-2000 OC-12), DACS IV (DACS IV-2000), SLC®-2000, FbrRch (Fiber Reach), and ? (unknown, foreign, and all others).

`DSNE` - Shows if this network element is serving as the directory service network element (DSNE) in the subnetwork.

`ASNE` - Shows if this network element is serving as an alarm server network element (ASNE) in the subnetwork.

`Alarm Group` - Shows a value from zero to 255 where the value represents a SONET maintenance sub-branch (SMSB) alarm group of network elements that exchange alarm information. A zero (0) means no remote alarm information is exchanged.

Example 12 - CONFIGURATION-Retrieve-Map-Ring

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Map-Ring:  COMPLD
   /* Ring Map Report
   ================================================================================
                                    DCC     Fiber
   TID                    DSNE     Status  Connection
   ================================================================================
   1A-TX-End-1            yes      good    1A-TX
   1A-TX-Rptr-1                    good      -
   1A-TX-Rptr-2                    good      -
   1A-RCV-End-2                    good    1A-RCV
   */

            Information below shows an incomplete span

   Notice:
   Span Incomplete/Open

   1A-TX-End-1            yes      good      -
   */

            Information below shows an isolated span

   1A-TX-End-1            yes      good    1A-TX
   1A-TX-Rptr-1                    FAIL      -
   1A-TX-Rptr-2                    FAIL      -
   1A-RCV-End-2                    good    1A-RCV
   */
```

Example 12 shows the current network topology (network is complete) and reports on the communication status to each network element (NE). The topmost entry is the NE where the report is requested (local), followed by all remaining NEs in a transmit direction. The two intermediate NEs are repeaters. When data is unavailable, a "**?**" appears in the appropriate column of the report.

TID	-	Shows the target identifier assigned to the node (up to 20 characters).
DSNE	-	Shows if this network element is serving as the directory service network element (DSNE).
DCC Status	-	Shows either good or FAIL for the data communications channel (DCC) between the local network element and the remote network element.
Fiber Connection	-	Shows if a node is incomplete or isolated from the other nodes by either a good, FAIL, or hyphen (-) indication. A hyphen (-) in this column indicates an OLS repeater. Connectivity indicates whether optical lines are connecting traffic in the transmit (from OLS) direction or the receive (to OLS) direction.

Example 13 - FAULT-Retrieve-Network Alarms

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Network Alarms:  COMPLD
   /* Network Alarms Report
   ================================================================================
   System    Date   Time      TID                    Product    Local
   Alarm                                             Type       Ring
   ================================================================================
   MN        01-19  21:18:47  Delta-2                FT-2000    Yes
   MN        01-19  21:18:27  Delta-3                FT-2000    Yes
   MN        01-19  21:20:57  Echo-1                 DDM-2000   no
   */
```

Example 13 shows the alarm and status conditions that are currently being reported in the maintenance subnetworks. If no alarms exist in the network, the following report will be generated: `There are no active system alarms.`

The warning statement ("information incomplete" message) is appended to the report header and appears as follows:

```
WARNING! The information displayed may be incomplete. Check
         Retrieve-Map-Network, Retrieve-Far End Communications
         Retrieve-Alarm for further details.
```

The information displayed may also be incomplete when a `NE status comm failure` condition exists, but the above warning statement is not displayed for such a condition. Future releases will output the above warning statement when the `NE status comm failure` condition exists.

`System Alarm` - Shows the highest system alarm at each node in the ring network. The alarm corresponds to the topmost user panel LED that is lighted at an OLS network element or the alarm level reported by the OLS repeater.

`Date` - Shows the date in month and day for each event when it was first reported.

`Time` - Shows the time in hours, minutes, and seconds for each event when it was first reported.

`TID` - Shows the target identifier assigned to the network element.

`Product Type` - Shows the category or type of network element.

`Local Ring` - Shows either yes or no to indicate if the network element is in the local ring.

Example 14 - SECURITY-Retrieve-Network Element

```
   Delta  95-08-03 13:15:15 EST
M  Retrieve-Network Element:  COMPLD
   /* OLS System Provisioning Report
   ================================================================
   Parameter                                          Value
   ================================================================
   TID                                          system_name234567892
   Directory Service NE                         yes
   X25 Packet Size                              256
   Alarm Group                                  247
   Alarm Gateway NE                             yes
   Direction*                                   1A-TX
   System Type†                                 Mx24
   */
```

Example 14 shows the provisioned parameters and values for an individual network element (NE). The retrieved parameter values include target ID (TID), directory services NE (DSNE), the X.25 packet size, the site address (SADD), the alarm group, and the alarm gateway network element (AGNE).

TID	-	Shows the unique identification of the node.
Directory Service NE	-	Shows whether or not this network element is serving as the directory server node in the ring network. Only one node is provisioned as the DS-NE in the ring network.
X25 Packet Size	-	Shows the X.25 packet size to be used for a TL1 session to this network element. The original value (size) is 256 but may be 128.
Alarm Group	-	Shows a value from zero to 255 where the value represents a SONET maintenance sub-branch (SMSB) alarm group of network elements that exchange alarm information. A zero (0) means no remote alarm information is exchanged.
Alarm Gateway NE	-	Shows whether or not the local NE will serve the other members of its alarm group as an alarm gateway network element (AGNE).
Direction*	-	For OLS end terminal only. Indicates whether the optical line is transmitting signals or receiving signals.
System Type†	-	Release 2 and later. Shows the provisioned OA pump power setting (Nx33 or Mx24. The Mx24 applies to the Px25 db span configuration where $1 \leq P \leq 7$.

Example 15 - PERFORMANCE-Retrieve-PM-Ochan

```
   Delta  95-08-09 23:15:15 EST
M  Retrieve-PM-Ochan:1A:All:  COMPLD
   /* Optical Channel Performance Monitoring Status Report
      Bin Start Time:  quarter hour registers at 95-08-04 15:50:32
                         day registers at 95-08-04 15:50:32
   ================================================================================
               Start     NORMALIZED VALUE         BASELINE VALUE
   Address     Time           SPR-C                    SPR-C
   ================================================================================
   ochan-1a-1  Today           -                        80
   --------------------------------------------------------------------------------
               00:15           -                        80
   ================================================================================
   ochan-1a-2  Today          100>                      80
   --------------------------------------------------------------------------------
               00:15          100>                      80
   ================================================================================
   ochan-1a-3  Today           -                        80
   --------------------------------------------------------------------------------
               00:15           -                        80
   ================================================================================
                 :             :                         :
                 :             :                         :
   ochan-1a-8  Today           -                        80
   --------------------------------------------------------------------------------
               00:15           -                        80
   */
;
```

Example 15, which can be a multiple page report, shows the performance-monitoring data (day and quarter-hour) for all optical channels on optical line 1A. When only one optical channel is requested, the report displays the total values for the reported day and quarter values of today. Data is collected from the optical line. When a greater than sign (>) is displayed, it means the violations are greater than the maximum value for the parameter. When a question mark (?) is displayed, it means corrupted data or an incomplete time interval for that parameter. An asterisk (*) is displayed whenever the threshold-crossing alert (TCA) is reached.

`Address` - Shows the AID of the optical line, and optical channel.

`Start Time` - Shows the time in hours and minutes (quarter-hour increments) that data collection started. Yesterday is shown by MM-DD.

`SPR-C` - Shows the normalized value of signal power for the optical channel.

`SPR-C` - Shows the baseline value of signal power for the optical channel.

Example 16 - PERFORMANCE-Retrieve-PM-Oline

```
   Delta  95-08-15 13:15:15 EST
M  Retrieve-PM-Oline:All:  COMPLD
   /* OLS Optical Line Performance Monitoring Status Report
      Bin Start Time:  quarter hour registers at yy-mm-dd hh:mm:ss
                             day registers at yy-mm-dd hh:mm:ss
   ================================================================================
                Start ----------NORMALIZED VALUES----------   BASELINE
   Address      Time TOPR-OL LBC-P1  LBFC-P1  LBC-P2  LBFC-P2  TOPR-OL
   ================================================================================
   oline-1a     Today  80    1.04    1.04     1.04    1.03        80
                              in      in       in      in
                             range   range    range   range
   --------------------------------------------------------------------------------
                09:15  80    1.03    1.03     1.04    1.02        80
                              in      in       in      in
                             range   range    range   range
   ================================================================================
   oline-1b     Today  70    1.04    1.04     1.02    1.03        80
                              in      in       in      in
                             range   range    range   range
   --------------------------------------------------------------------------------
                09:15  70    1.03    1.03     1.02    1.02        80
                              in      in       in      in
                             range   range    range   range
   ================================================================================
   oline-2a     Today  60    2.00    2.00     1.00    1.00        80
                              in      in       in      in
                             range   range    range   range
   --------------------------------------------------------------------------------
                09:15  60    2.00    2.00     0.99    0.99        80
                              in      in       in      in
                             range   range    range   range
   ================================================================================
   oline-2b     Today  70    0.97    0.97     0.97    0.97        80
                              in      in       in      in
                             range   range    range   range
   --------------------------------------------------------------------------------
                09:15  40    0.99    0.99     0.99    0.99        80
                              in      in       in      in
                             range   range    range   range
   --------------------------------------------------------------------------------
   */
```

Example 16 shows the current performance-monitoring data for optical lines 1 and 2. When a greater than sign (">") is displayed, it means the violations are greater than the maximum value for the parameter (overflow). The maximum value is displayed. When a question mark ("?") is displayed, it means corrupted data or incomplete time cycle for that parameter. An asterisk is displayed whenever the threshold-crossing alert (TCA) is reached. This report is not available at the repeater site.

Continued on next page

Address	-	Shows the specified OC-48 line.
Start Time	-	Shows the time in hours and minutes (quarter-hour increments) that data collection started. Yesterday is shown by MM-DD.
TOPR-OL	-	Shows the normalized value of total optical power received from the fiber.
LBC-P1	-	Shows the normalized value of the laser bias currents for pump 1.
LBFC-P1	-	Shows the normalized value of the laser backface current for pump 1.
LBC-P2	-	Shows the normalized value of the laser bias currents for pump 2.
LBFC-P2	-	Shows the normalized value of the laser backface current for pump 2.
TOPR-OL	-	Shows the baseline value of total optical power received from the fiber.

Example 17 - PERFORMANCE-Retrieve-PM-Start Time

```
   Delta  95-08-08 13:15:15 EST
M  Retrieve-PM-Start Time:All:  COMPLD
   /* Performance Monitoring Day Bin Start Time Report
   ================================================================
      Parameter    Value
   ================================================================
      Start Time   13:00
   */
;
```

Example 17 shows the start time for measuring the day bins for the performance monitoring data.

`Start Time` - Shows the provisioned hours:minutes. Hours may be 00 to 23 and minutes is always "00."

Example 18 - PERFORMANCE-Retrieve-PM-SUPR

```
   Delta  95-08-14 13:15:15 EST
M  Retrieve-PM-Supr:Optical:All:  COMPLD
   /* Supervisory Channel Performance Monitoring Status Report
      Bin Start Time:  quarter hour registers at yy-mm-dd hh:mm:ss
                              day registers at yy-mm-dd hh:mm:ss
   ================================================================
               Start     -NORMALIZED VALUES-
   Address     Time      SPR-SU         LBC-SU
   ================================================================
   supr-1a     Today     in range       0.99 in range
   ----------------------------------------------------------------
                09:15    in range       0.99 in range
   ================================================================
   supr-2a     Today     OUT-OF-RANGE   0.97 in range
   ----------------------------------------------------------------
                09:15    OUT-OF-RANGE   0.99 in range
   ================================================================
   supr-3a     Today     in range       0.97 in range
   ----------------------------------------------------------------
                09:15    in range       0.99 in range
   ================================================================
   supr-4a     Today        -                 -
   ----------------------------------------------------------------
                09:15       -                 -
   ================================================================
   */
;
```

Example 18 (can be a multiple page report) shows performance- monitoring data for all supervisory channels for an OLS end terminal. When a greater than sign (">") is displayed, it means the violations are greater than the maximum value for the parameter. When a question mark ("?") is displayed, it means corrupted data or an incomplete time cycle for that parameter. When a hyphen ("-") is displayed, it means the data is unavailable, such as any port in the NMON or AUTO state. An asterisk (*) is displayed whenever the threshold-crossing alert (TCA) is reached. This report is not available at the repeater site.

`Address` - Shows the path name including the line, slot or tributary, and port.

`Start Time` - Shows the time in hours and minutes (quarter-hour increments) that data collection started. But if month and day are shown, the data is for yesterday.

`SPR-SU` - Shows the signal power of the supervisory channel received at the telemetry pack.

`LBC-SU` - Shows the normalized value of the laser bias current.

Continued on next page

```
   Delta  95-08-14 13:15:15 EST
M  Retrieve-PM-Supr:Optical:All:  COMPLD
   /* Supervisory Channel Performance Monitoring Status Report
      Bin Start Time:  quarter hour registers at yy-mm-dd hh:mm:ss
                                day registers at yy-mm-dd hh:mm:ss
   ================================================================
               Start     -NORMALIZED VALUES-
   Address     Time      SPR-SU      LBC-SU
   ================================================================
   supr-1a     Today     in range    0.99 in range
   ----------------------------------------------------------------
                09:15    in range    0.99 in range
   ================================================================
   supr-1b     Today     in range    0.97 in range
   ----------------------------------------------------------------
                09:15    in range    0.99 in range
   ================================================================
   supr-2a     Today     in range    0.97 in range
   ----------------------------------------------------------------
                09:15    in range    0.99 in range
   ================================================================
   supr-2b     Today     in range    0.97 in range
   ----------------------------------------------------------------
                09:15    in range    0.99 in range
        :
        :
   ================================================================
   supr-4b     Today     in range    0.97 in range
   ----------------------------------------------------------------
                09:15    in range    0.99 in range
   */
```

The above report shows all supervisory channels for an OLS repeater having two optical lines. Notice that both directions 1a and 1b are shown for a repeater.

`Address` - Shows the path name including the line, slot or tributary, and port.

`Start Time` - Shows the time in hours and minutes (quarter-hour increments) that data collection started. But if month and day are shown, the data is for yesterday.

`SPR-SU` - Shows the signal power of the supervisory channel received at the telemetry pack.

`LBC-SU` - Shows the normalized value of the laser bias current.

Continued on next page

```
   Delta  95-08-14 13:15:15 EST
M  Retrieve-PM-Supr:Optical:2A:  COMPLD
   /* Supervisory Channel Performance Monitoring Status Report
      Bin Start Time:  quarter hour registers at yy-mm-dd hh:mm:ss
                                day registers at yy-mm-dd hh:mm:ss
   ================================================================================
                Start     -NORMALIZED VALUES-
   Address      Time      SPR-SU       LBC-SU
   ================================================================================
   supr-2a      Today     in range     0.97 in range
                05-07     in range     0.97 in range
                05-06     in range     0.97 in range
                05-05     in range     0.97 in range
                05-04     in range     0.97 in range
                05-03     in range     0.97 in range
                05-02     in range     0.97 in range
   --------------------------------------------------------------------------------
                09:15     in range     0.99 in range
                09:00     in range     0.99 in range
                08:45     in range     0.99 in range
                08:30     in range     0.99 in range
                08:15     in range     0.99 in range
                08:00     in range     0.99 in range
                07:45     in range     0.99 in range
                07:30     in range     0.99 in range
                07:15     in range     0.99 in range
                07:00     in range     0.99 in range
   */
```

The report is generated for Retrieve-PM-SUPR:Type=Optical and supervisory channel=2A.

`Address` - Shows the path name including the line, slot or tributary, and port.

`Start Time` - Shows the time in hours and minutes (quarter-hour increments) that data collection started. But if month and day are shown, the data is for yesterday.

`SPR-SU` - Shows the signal power of the supervisory channel received at the telemetry pack.

`LBC-SU` - Shows the normalized value of the laser bias current.

Continued on next page

```
   Delta  95-08-14 13:15:15 EST
M  Retrieve-PM-Supr:Digital:All:  COMPLD
   /* Supervisory Channel Performance Monitoring Status Report
      Bin Start Time:  quarter hour registers at yy-mm-dd hh:mm:ss
                              day registers at yy-mm-dd hh:mm:ss
   ================================================================================
               Start          ----SUPR Line (B2)---
   Address     Time     CV-L       ES-L   SES-L  UAS-L
   ================================================================================
   supr-1a     Today      31596      13       0      11
   --------------------------------------------------------------------------------
                09:15         4       1       0       0
   ================================================================================
   supr-2a     Today      31596      13       0      11
   --------------------------------------------------------------------------------
                09:15         4       1       0       0
   ================================================================================
   supr-3a     Today      31596      13       0      11
   --------------------------------------------------------------------------------
                09:15         4       1       0       0
   ================================================================================
   supr-4a     Today      31596      13       0      11
   --------------------------------------------------------------------------------
                09:15         4       1       0       0
   ================================================================================
   */
```

The above report shows all supervisory channels having Type=Digital for an OLS end terminal having two optical lines. A report for an OLS repeater would show both directions of 1a and 1b. When a greater than sign (">") is displayed, it means the violations are greater than the maximum value for the parameter. When a question mark ("?") is displayed, it means corrupted data or an incomplete time cycle for that parameter. When an asterisk ("*") is displayed, it means the threshold crossing alerts are indicated.

`Address` - Shows the path name including the line, slot or tributary, and port.

`Start Time` - Shows the time in hours and minutes (quarter-hour increments) that data collection started. But if month and day are shown, the data is for yesterday.

`CV-L` - Shows the supervisory line (B2) code violations reported in the bin during the specified time that will cause a TCA.

`ES-L` - Shows the supervisory line (B2) errored seconds reported in the bin during the specified time that will cause a TCA.

`SES-L` - Shows the supervisory line (B2) severely errored seconds reported in the bin during the specified time that will cause a TCA.

`UAS-L` - Shows the supervisory line (B2) unavailable seconds reported in the bin during the specified time that will cause a TCA.

Example 19 - PERFORMANCE-Retrieve-PM Threshold-Ochan

Release 2 and Later

```
   Delta  95-08-14 23:15:15 EST
M  Retrieve-PM Threshold-Ochan:1A:All:  COMPLD
   /* Optical Channel Performance Monitoring Threshold Value Report
   ========================================================================
   Address          Bin    SPR-C
   ========================================================================
   ochan-1a-1       QH       60E
                    Day      60E
   ochan-1a-2       QH       60D
                    Day      60E
   ochan-1a-3       QH       60E
                    Day      60E
   ochan-1a-4       QH       60E
                    Day      60D
   ochan-1a-5       QH       60D
                    Day      60D
   ochan-1a-6       QH       60D
                    Day      60D
   ochan-1a-7       QH       60D
                    Day      60D
   ochan-1a-8       QH       60D
                    Day      60D
   ochan-1b-1       QH       60D
                    Day      60D
   ochan-1b-2       QH       60E
                    Day      60E
   ochan-1b-3       QH       60E
                    Day      60E
   ochan-1b-4       QH       60E
                    Day      60E
   ochan-1b-5       QH       60E
                    Day      60E
   ochan-1b-6       QH       60E
                    Day      60E

   Notice: This report was cancelled before completion by the user.

   */
```

Example 19 shows the current performance-monitoring threshold crossing alert (TCA) values for all optical channels in optical line 1A. Also available is a report for a specific optical channel.

`Address` - Shows the specific slot and port for the optical channel.

`Bin` - Shows either quarter-hour (QH) or day bin.

`SPR-C` - Shows the signal power per channel received from the fiber as an integer in the range of 0 to 100. The "E" implies enabled and "D" implies disabled.

Continued on next page

Release 1

```
   Delta  95-08-14 23:15:15 EST
M  Retrieve-PM Threshold-Ochan:1A:All:  COMPLD
   /* Optical Channel Performance Monitoring Threshold Value Report
   ================================================================================
                        TCA
   Address       Bin    Report      SPR-C
   ================================================================================
   ochan-1a-1    QH     Enable        60
                 DAY    Enable        60
   ochan-1a-2    QH     Disable       60
                 DAY    Disable       60
   ochan-1a-3    QH     Disable       60
                 DAY    Disable       60
   ochan-1a-4    QH     Disable       60
                 DAY    Disable       60
   ochan-1a-5    QH     Disable       60
                 DAY    Disable       60
   ochan-1a-6    QH     Disable       60
                 DAY    Disable       60
   ochan-1a-7    QH     Disable       60
                 DAY    Disable       60
   ochan-1a-8    QH     Disable       60
                 DAY    Disable       60
   */
```

The Release 1 report shows the current performance-monitoring threshold crossing alert (TCA) values for all optical channels in optical line 1A. Also available is a report for a specific optical channel.

`Address` - Shows the specific slot and port for the optical channel.

`Bin` - Shows the quarter-hour (QH) and day bins.

`TCA Report` - Shows if the automatic reporting of TCAs is enabled or disabled.

`SPR-C` - Shows the signal power per channel received from the fiber as an integer in the range of 0 to 100.

Example 20 - PERFORMANCE-Retrieve-PM Threshold-Oline

Release 2 and Later

```
Delta  95-08-14  13:15:15 EST
/* Optical Line Performance Monitoring Threshold Value Report
================================================================================

Address       Bin    TOPR-L
================================================================================
123456789112  123      123T
oline-1a      QH        60E
              Day       60E
oline-1b      QH        60E
              Day       60E
oline-2a      QH        70E
              Day       70E
oline-2b      QH        50E
              Day       50E
oline-3a      QH        60E
              Day       60E
oline-3b      QH        60E
              Day       60E
oline-4a      QH        70E
              Day       70E
oline-4b      QH        60E
              Day       60E
*/
```

Example 20 shows the current performance-monitoring threshold crossing alert (TCA) values for four optical lines. Also available is a report for a specific optical line.

`Address` - Shows all or the specific optical line for that platform.

`Bin` - Shows the quarter-hour (QH) and day bins.

`TOPR-L` - Shows the total optical power (0 to 100) at which a TCA is generated with a baseline of 80. The "E" implies enabled and "D" implies disabled.

Continued on next page

Release 1

```
   Delta  95-08-14  13:15:15 EST
M  Retrieve-PM Threshold-Oline:All:  COMPLD
   /* Optical Line Performance Monitoring Threshold Value Report
   ================================================================================
                         TCA         Total
   Address       Bin     Report    Optical Power
   ================================================================================
   oline-1a      QH      Enable       60
                 DAY     Enable       60
   oline-1b      QH      Disable      60
                 DAY     Enable       60
   oline-2a      QH      Enable       70
                 DAY     Enable       70
   oline-2b      QH      Enable       50
                 DAY     Enable       50
   oline-3a      QH      Disable      60
                 DAY     Enable       60
   oline-3b      QH      Enable       60
                 DAY     Enable       60
   oline-4a      QH      Enable       70
                 DAY     Enable       70
   oline-4b      QH      Enable       60
                 DAY     Enable       60
   */
```

The Release 1 report shows the current performance-monitoring threshold crossing alert (TCA) values for four optical lines. Also available is a report for a specific optical line.

`Address` - Shows all or the specific optical line for that platform.

`Bin` - Shows the quarter-hour (QH) and day bins.

`TCA Report` - Shows if the automatic reporting of TCAs is enabled or disabled.

`Total Optical Power` - Shows the total optical power received from the fiber as an integer in the range of 0 to 100.

Example 21 - PERFORMANCE-Retrieve-PM Threshold-Supr

Release 2 and Later

```
   Delta  95-08-14  13:15:15 EST
M  Retrieve-PM Threshold-Supr:Optical:All:  COMPLD
   /* Supervisory Channel Performance Monitoring Threshold Value Report
   ================================================================================
   Address        Bin     SPR-SU         LBC-SU
   ================================================================================
   supr-1a        QH           E              E
                  Day          E              D
   */
```

Example 21 shows the current performance-monitoring threshold crossing alert (TCA) values for four supervisory channels at an OLS end terminal. The report is generated for Type=Optical and Supervisory Channel=1a. Also available is a report for a all supervisory channels. A report at an OLS repeater includes both directions (1A and 1B) instead of only one direction at an OLS end terminal. The "E" implies enabled and "D" implies disabled.

`Address` - Shows the specific supervisory channel or all channels.

`Bin` - Shows the quarter-hour (QH) and day bins.

`SPR-SU` - Shows the signal power of the supervisory channel received at the telemetry circuit pack.

`LBC-SU` - Shows the normalized value of the laser bias current in the supervisory channel.

Continued on next page

```
/* Supervisory Channel Performance Monitoring Threshold Value Report
================================================================================
Address       Bin       CV-L    ES-L    SES-L   UAS-L
================================================================================
supr-1a       QH         -9D     50D      10E     20E
              Day       -10D    500D     100E     30E
*/
```

The Release 2 report shows the current performance-monitoring threshold crossing alert (TCA) values for four supervisory channels at an OLS end terminal. The report is generated for Type=Digital and Supervisory Channel=1a. Also available is a report for a all supervisory channels. A report at an OLS repeater includes both directions (1A and 1B) instead of only one direction at an OLS end terminal. The "E" implies enabled and "D" implies disabled.

`Address` - Shows the specific supervisory channel or all channels.

`Bin` - Shows the quarter-hour (QH) and day bins.

`CV-L` - Shows the number of line code violations reported during the specified time that exceeded the BER setting.

`ES-L` - Shows the provisioned number of line errored seconds for the QH bin and the Day bin that will cause a TCA.

`SES-L` - Shows the provisioned number of line severely errored seconds for the QH bin and the Day bin that will cause a TCA.

`UAS-L` - Shows the provisioned number of unavailable seconds for the QH bin and the Day bin that will cause a TCA.

Continued on next page

Release 1

```
   Delta  95-08-14  13:15:15 EST
M  Retrieve-PM Threshold-Supr:Optical:All:  COMPLD
   /* Supervisory Channel Performance Monitoring Threshold Value Report
   ================================================================================
                          TCA
   Address        Bin     Report
   ================================================================================
   supr-1a        QH      Enable
                  DAY     Enable
   supr-2a        QH      Enable
                  DAY     Enable
   supr-3a        QH      Enable
                  DAY     Enable
   supr-4a        QH      Enable
                  DAY     Enable
   */
```

The Release 1 report shows the current performance-monitoring threshold crossing alert (TCA) values for four supervisory channels at an OLS end terminal. The report is generated for Type=Optical and Supervisory Channel=all. Also available is a report for a specific supervisory channel. A report at an OLS repeater includes both directions (1A and 1B) instead of only one direction (1A or 1B) at an OLS end terminal.

`Address` - Shows the specific supervisory channel or all channels.

`Bin` - Shows the quarter-hour (QH) and day bins.

`TCA Report` - Shows if the automatic reporting of TCAs is enabled or disabled.

Continued on next page

```
   Delta  95-08-14  13:15:15 EST
M  Retrieve-PM Threshold-Supr:Digital:1A:  COMPLD
   /* Supervisory Channel Performance Monitoring Threshold Value Report
   ================================================================================
                        TCA
   Address        Bin    Report     CV-L    ES-L    SES-L   UAS-L
   ================================================================================
   supr-1a        QH     Enable       -9      50       10      20
                  DAY    Enable      -10     500      100      30
   */
```

The Release 1 report is generated for Type=Digital and Supervisory Channel=supr-1A.

`Address` - Shows the specific supervisory channel or all channels.

`Bin` - Shows the quarter-hour (QH) and day bins.

`TCA Report` - Shows if the automatic reporting of TCAs is enabled or disabled.

`CV-L` - Shows the number of line code violations reported during the specified time that exceeded the BER setting.

`ES-L` - Shows the provisioned number of line errored seconds for the QH bin and the Day bin that will cause a TCA.

`SES-L` - Shows the provisioned number of line severely errored seconds for the QH bin and the Day bin that will cause a TCA.

`UAS-L` - Shows the provisioned number of unavailable seconds for the QH bin and the Day bin that will cause a TCA.

Example 22 - PERFORMANCE-Retrieve-Relspr

Release 2 and Later

```
   Delta  95-08-10 13:15:15 EST
M  Retrieve-Relspr:  COMPLD
   END TERMINAL 70-01-01 07:35:00
   /* Optical Channel Performance Monitoring Status Report
      Start Time: hr:min
   ================================================================================
                Start       RELATIVE SIGNAL POWER
   Address      Time        REL SPR-C
   ================================================================================
   ochan-1a-1   07:35          80
   --------------------------------------------------------------------------------
   ochan-1a-2   07:35          70
   --------------------------------------------------------------------------------
   ochan-1a-3   07:35         100
   --------------------------------------------------------------------------------
   ochan-1a-4   07:35          70
   --------------------------------------------------------------------------------
   ochan-1a-5   07:35          60
   --------------------------------------------------------------------------------
   ochan-1a-6   07:35          60
   --------------------------------------------------------------------------------
   ochan-1a-7   07:35          50
   --------------------------------------------------------------------------------
   ochan-1a-8   07:35          50
   ================================================================================
   */
;
```

Example 22 shows the instantaneous signal power of optical channel 1A in an optical line relative to the strongest signal in a scale of 0 to 100. The report is meaningful only for end terminals with an OMU. The data is available when at least one channel is present in the line, and the data shall be reported for all channels regardless of their state.

`Address`	-	Shows the optical channel within the optical line.
`Start Time`		Shows the time in hours and minutes when the relative signal power per channel is measured.
`REL SPR-C`		Shows the relative signal power for the optical channel. A hypen "-" indicates that the channel is not equipped or the corresponding optical line is in the IS state but the OA circuit pack is not inserted (or removed and no Update is executed).

Example 23 - SECURITY-Retrieve-Security-Network Element

```
   OLS  95-08-10 13:15:15 EST
M  Retrieve-Security-Network Element:  COMPLD
   /* Access Security Global Configuration Report
   ========================================================================
   Parameter          Value
   ========================================================================
   Logins Allowed     yes
   Password Aging      60 days
   Login Aging         60 days
   */
;
```

Example 23 shows if a user is allowed to retrieve global security information.

`Logins Allowed` - Shows if nonprivileged users are allowed to log in or not. Privileged users are always allowed to log in.

`Password Aging` - Shows the lifetime interval in days before the user must select a new password. A zero interval will disable this parameter.

`Login Aging` - Shows the period in days before the user must login at least once to retain the login. Applies only to general and report-only user's. A zero interval will disable this parameter.

Example 24 - SECURITY-Retrieve-Security-Port

```
   Delta  95-08-10 13:15:15 EST
M  Retrieve-Security-Port:All:  COMPLD
   /* Access Port Security Configuration Report
   ================================================================
   Access          Port       Port Type/   Baud Rate/        Inactive
   Port    Channel Status     OS Type      Calling Address   Timer
   ================================================================
   dce             enabled    cit          auto              10
   dte             enabled    tl1          9600              15
   dcc     vc-0    disabled   cit                            10
   ----------------------------------------------------------------
   x25     pvc-1              memry-admin
   x25     pvc-2              maintenance
   ----------------------------------------------------------------
   x25     tbl-1              cmd-resp     19089492810
   x25     tbl-2              cmd-resp     12125551212
   x25     tbl-3              cmd-resp     19142348217
   x25     tbl-4              cmd-resp     -
   x25     tbl-5              cmd-resp     -
   x25     tbl-6              cmd-resp     -
   */
;
```

Example 24 shows the current CIT and TL1 port provisioning and who is currently logged in on each port.

`Access Port` - Shows a specific operations interface (physical port) for which the status is being displayed.

`Channel` - Shows the TL1 calling address table entry and may be a virtual channel (vc)-0, a permanent virtual channel (pvc) 1 or 2, or table entry 1 through 6. A blank (" ") is always reported for the dte and dce ports. A pvc -1 or -2 or a table entry 1 through 6 is reported for an x.25 port.

`Port Status` - Shows if the port will or will not accept nonprivileged user logins (enabled or disabled).

`Port Type OS Type` - Shows the protocol used (cit or tl1) on the port and displays the autonomous message set reported on the port as "maintenance," "memry-admin," "cmd-resp," or "other."

`Baud Rate` - Shows the provisioned baud rate as (blank, auto, 9600, 4800, 2400, or 1200).

`Calling Address` - Shows the value of the x.25 address key used to associate the port type with the user.

`Inactive Timer` - Shows the inactivity timeout in minutes (0 to 999).

Example 25 - FAULT-Retrieve-State

```
   Delta  95-08-11 13:15:15 EST
M  Retrieve-State:All:  COMPLD
/* State Report
================================================================================
Address      CP     Entity
             Type   State
================================================================================
oa-1a        OA
oa-1b        OA
oa-2a        OA
oa-2b        OA
oa-3a        -
oa-3b        -
oa-4a        -
oa-4b        -
--------------------------------------------------------------------------------
tlm-1a       TLM
tlm-2a       TLM
tlm-3a       -
Continue report page-by-page?(y/n)Yes
```

```
================================================================================
Address      CP     Entity
             Type   State
================================================================================
tlm-4a       -
--------------------------------------------------------------------------------
cms-1a               in:is
cms-2a               in:auto
cms-3a               in:-
cms-4a               in:-
--------------------------------------------------------------------------------
oline-1a             is
oline-1b             is
oline-2a             is
oline-2b             is
oline-3a             -
oline-3b             -
oline-4a             -
oline-4b             -
--------------------------------------------------------------------------------
Continue report page-by-page?(y/n)Yes
```

Continued on next page

```
supr-1a             is
supr-2a             is
supr-3a             -
supr-4a             -
-------------------------------------------------------------------------------
ochan-1a-1          is
ochan-1a-2          is
ochan-1a-3          is
ochan-1a-4          is
ochan-1a-5          is
ochan-1a-6          is
ochan-1a-7          is
ochan-1a-8          is
-------------------------------------------------------------------------------
ochan-1b-1          is
ochan-1b-2          is

Continue report page-by-page?(y/n)Yes
```

```
ochan-1b-3          is
ochan-1b-4          is
ochan-1b-5          is
ochan-1b-6          is
ochan-1b-7          is
ochan-1b-8          is
-------------------------------------------------------------------------------
ochan-2a-1          is
ochan-2a-2          auto
ochan-2a-3          is
ochan-2a-4          is
ochan-2a-5          is
ochan-2a-6          is
-------------------------------------------------------------------------------
Continue report page-by-page?(y/n)Yes
```

```
ochan-2a-7          nmon
ochan-2a-8          is
ochan-2b-1          is
ochan-2b-2          is
ochan-2b-3          is
ochan-2b-4          is
ochan-2b-5          is
ochan-2b-6          is
ochan-2b-7          is
ochan-2b-8          is
-------------------------------------------------------------------------------
Continue report page-by-page?(y/n)Yes
*/
```

Continued on next page

```
ochan-3a-1          -
ochan-3a-2          -
ochan-3a-3          -
ochan-3a-4          -
   :                :
   :                :
ochan-4b-5          -
ochan-4b-6          -
ochan-4b-7          -
ochan-4b-8          -
------------------------------------------------------------------------------
*/
```

Example 25 (multipage report) shows the state of slots, CMS ports, optical lines, supervisory channels, and optical channels at the OLS end terminal. If the requested data is unavailable, a report is generated stating "State Data Unavailable". A report for an OLS repeater will generate more entries because of the opposite direction in the tlm, cms, and supr address fields.

`Address` - Shows the address by slot function, optical line designation, and optical channel location.

`CP Type` - Shows the functional name of the circuit pack. A question mark "?" indicates the slot is equipped (EQ) and the provisioned circuit pack type is none. The control slots (SYSCTL, SYSMEM, and TOHCTL) will not be listed.

`Entity State` - Shows the state of the entity for every direction requested. The state values are `is` for in service, `auto` for automatic, `nmon` for not monitored, a dash ("-") for not applicable (when the slot is not equipped), and a blank for equipped slots, it implies in service state. The OUT port of CMS is not reported because it is not monitored.

Example 26 - CONFIGURATION-Retrieve-Supr

```
   Delta  95-08-11 13:15:15 EST
M  Retrieve-Supr:All:  COMPLD
/* Supervisory Channel Provisioning Report
================================================================================

   Channel  Signal  Alarm  Signal Degrade
   Address  Level   Level  Threshold

================================================================================
   supr-1a  OC3     CR     -6
   supr-2a  OC3     MJ     -8
   supr-3a  OC3     MN     -6
   supr-4a  OC3     NA     -8
   */
;

                Data below is for an OLS Repeater

   supr-1a  OC3     CR     -6
   supr-1b  OC3     CR     -6
   supr-2a  OC3     MJ     -8
   supr-2b  OC3     MJ     -8
   supr-3a  OC3     MN     -6
   supr-3b  OC3     NA     -6
   supr-4a  OC3     NA     -6
   supr-4b  OC3     NA     -8
   */
```

Example 26 shows the provisioned information and attributes of a supervisory channel at an OLS end terminal. It provides information on the severity of the alarm implied by the failure of the supervisory channel and the signal degrade threshold. It also provides information on the non-provisioned signal level of the supervisory channel. Notice the repeater includes the other direction 1B) entries.

`Channel Address` - Shows a specific supervisory channel and direction.

`Signal Level` - Shows the non-provisioned signal level of the supervisory channel. No signal level is reported for unequipped channels.

`Alarm Level` - Shows the provisioned service affecting (SA) alarm level assigned to the channel. The highest alarm level is associated by a corresponding lighted user panel LED. If no LEDs are lighted, then status is shown as not alarmed (NA), not reported (NR), or not indicated (NO) if provisioned as such. If provisioned as NO, then none of the underlying failure conditions will be reported.

`Signal Degrade Threshold` - Shows the provisioned signal degrade threshold (–5, –6, –7, –8, –9) of the channel. The example shows a –6, meaning the error rate 10^{-6}.

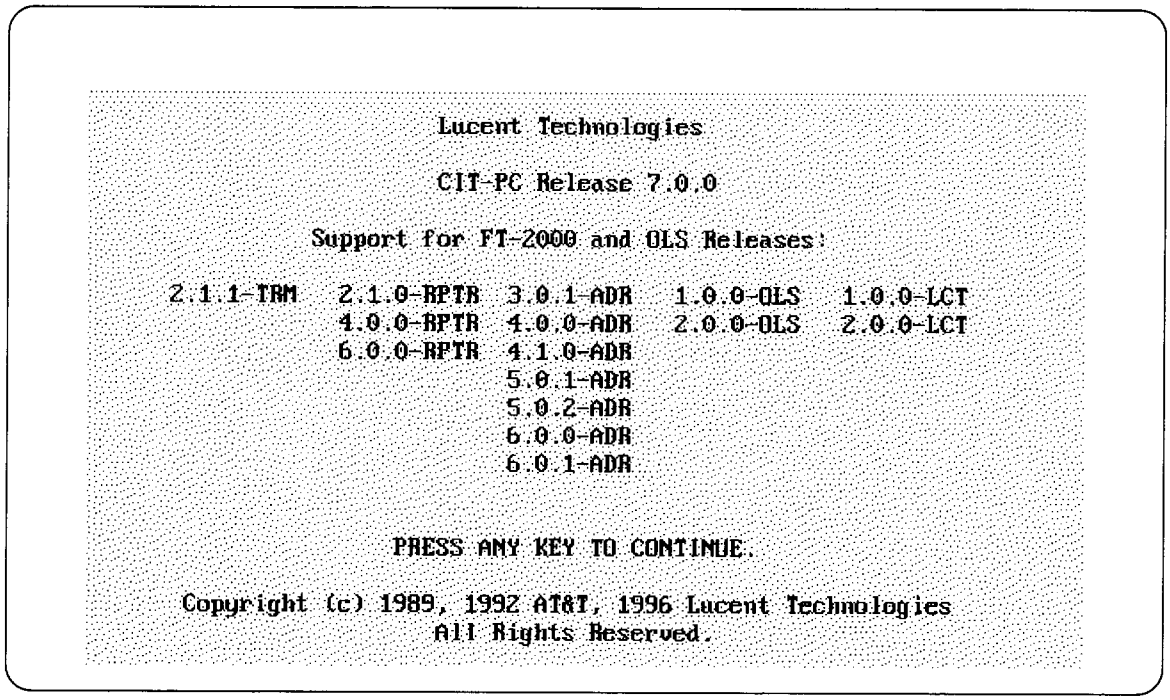
CIT Tutorial Using CIT-PC Software

General: This tutorial illustrates, through a series of exercises, the features of the OLS CIT-PC software. This software which supports the OLS user interface is menu-driven and user-friendly. *It is strongly recommended that this tutorial only be used with an OLS network element that is* ***out of service.***

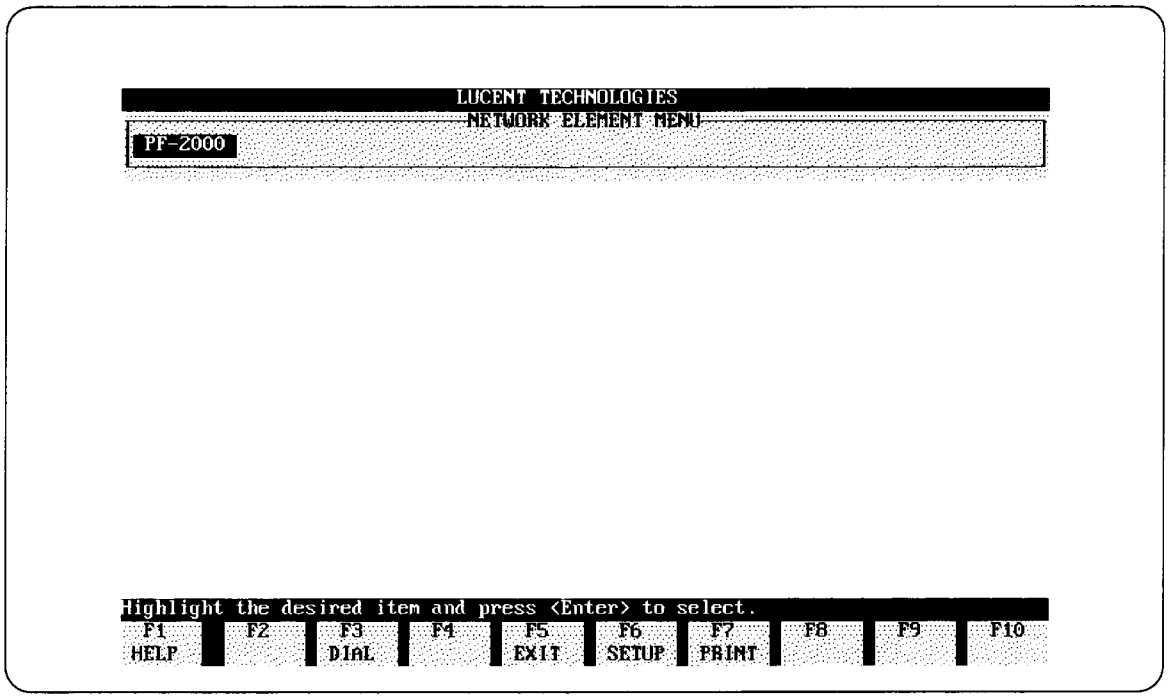
It is assumed that the craft interface terminal (CIT) is conditioned and connected to the OLS network element. If it is not, refer to **DLP-501** in the Detailed Level Procedures section of this manual for assistance in getting to that point. Press **F5**, labeled `EXIT`, if it is shown on the screen.

1. Change directory to where the OLS CIT-PC software is installed, for example "cd cit".

2. Enter "`cit`" and press [ENTER]. This enters the user into the standard mode and not into the expert mode.



3. Press 'space bar' or any other key to display next screen.

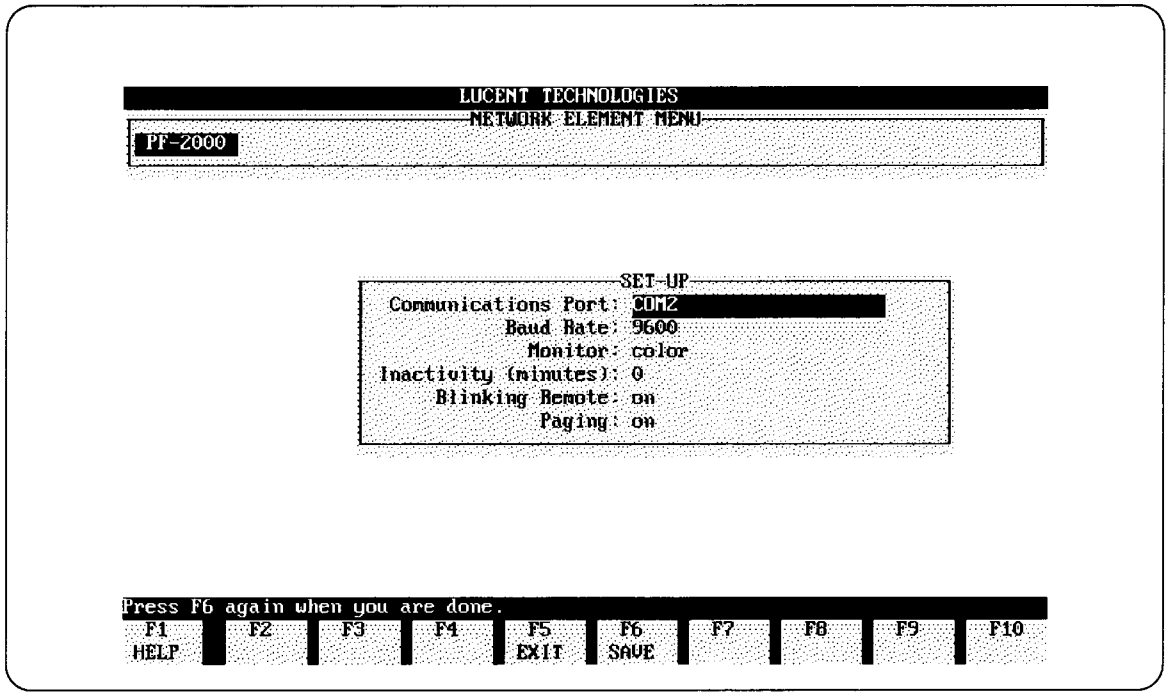


4. Press function key F6 for SETUP menu.

5. Compare displayed screen with information below and note any differences:

Communications:	com-1 (as appropriate)
Baud Rate:	9600
Monitor:	(appropriate value for type of monitor)
Inactivity (minutes):	(value between 0* and 9999)
Blinking Remote:	on
Paging:	on

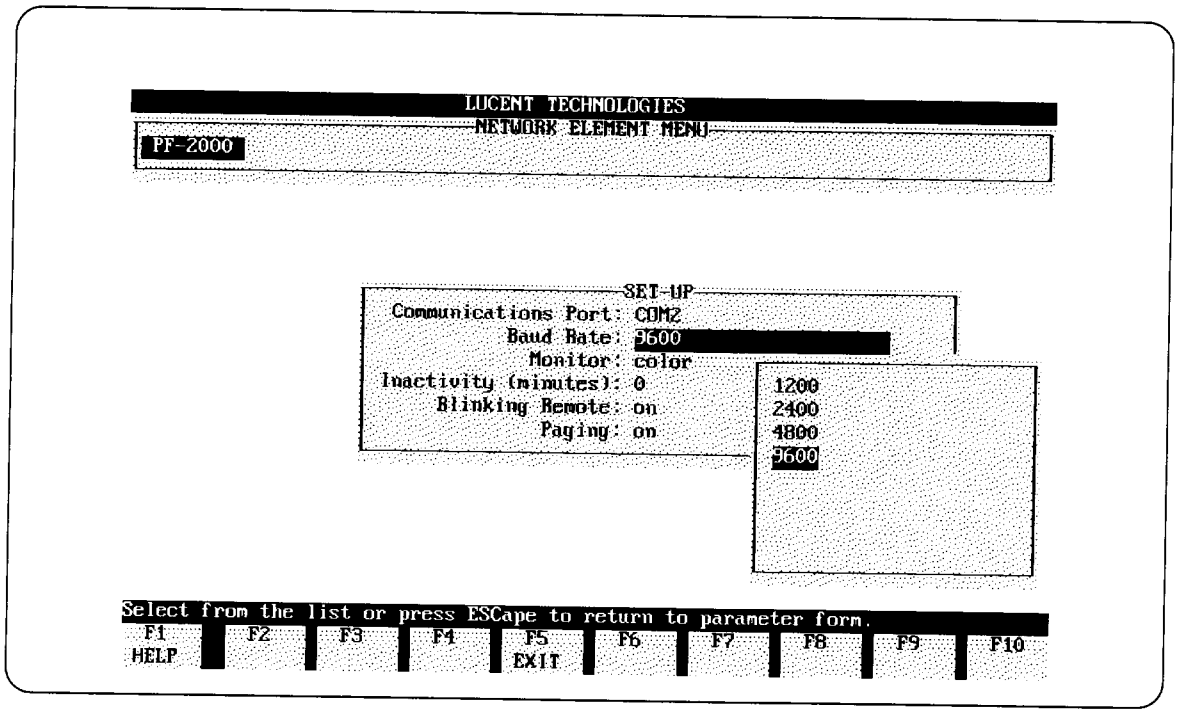
* This value (zero) disables the inactivity timer.



6. ⇒ **NOTE:**
As an exercise, the baud rate will be set to 9600, even if it is already set to 9600.

Use up (↑) and down (↓) arrow keys to move highlighted area to `Baud Rate:` parameter value.

7. Type a "?" when `Baud Rate` is highlighted.



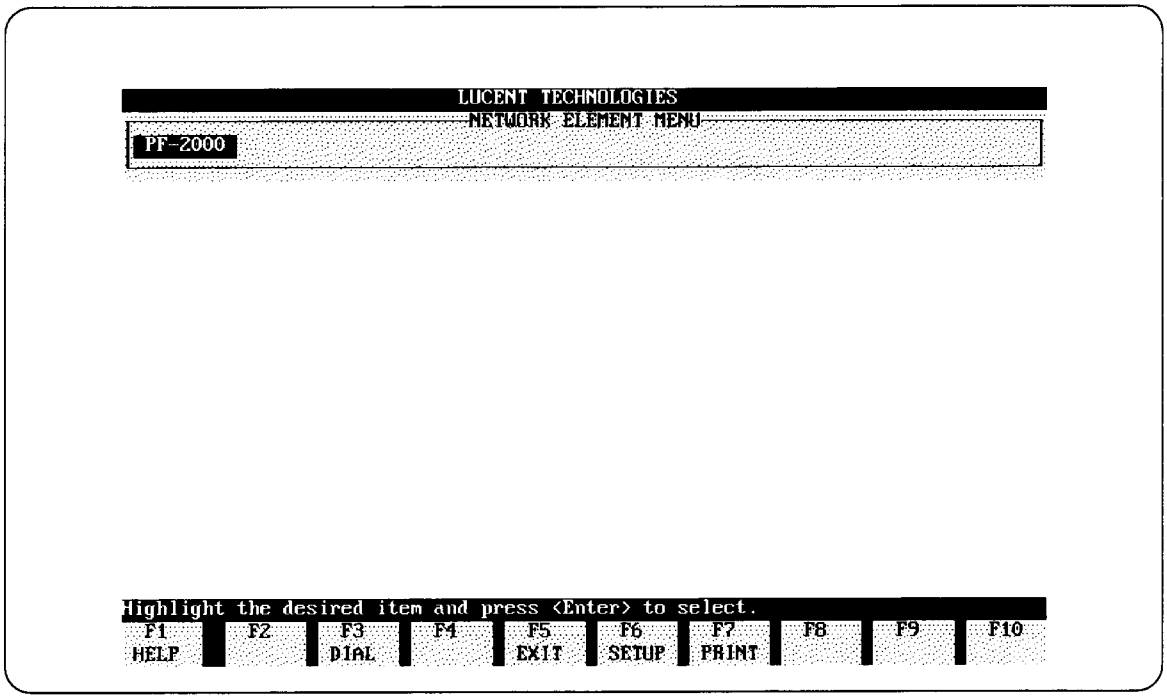
8. Use ↑ and ↓ arrow keys to select desired value "9600".

9. Press ENTER.

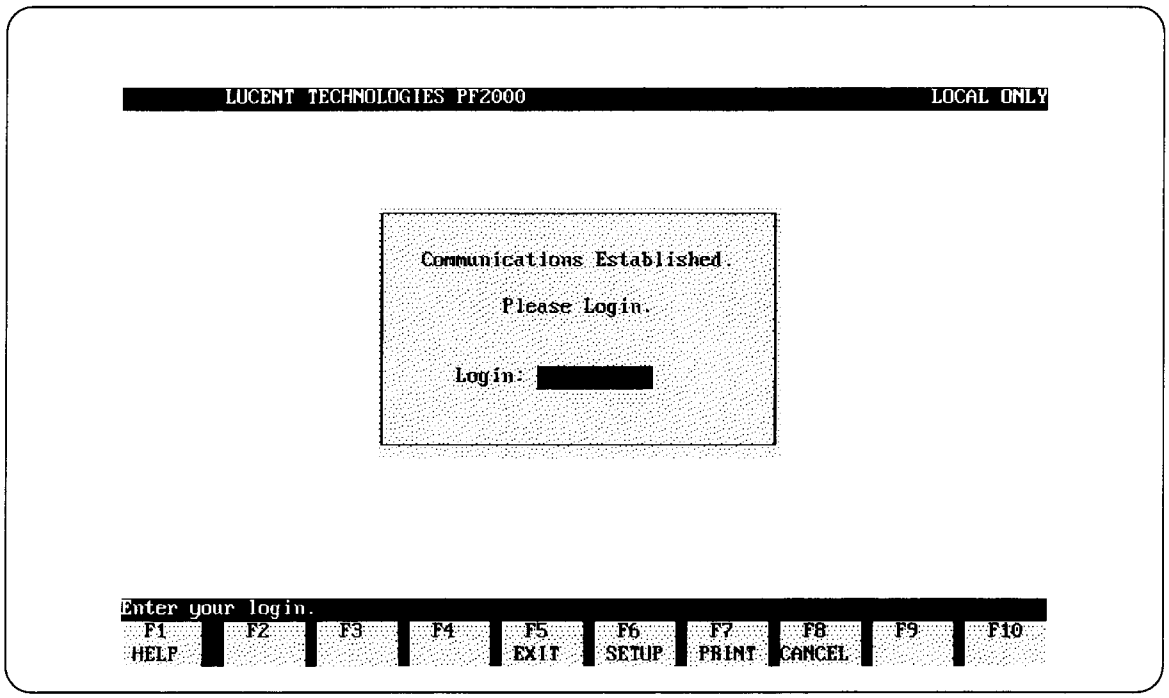
10. Use arrow keys and "?"; set any other parameter values (if necessary) to values given in Step 5.

11. ⇒ NOTE:
The **message line** immediately over the display of the function keys will always show what is to be done next. For example, it now says "Highlight the desired item and press <Enter> to select"; PF-2000 is highlighted at this time.

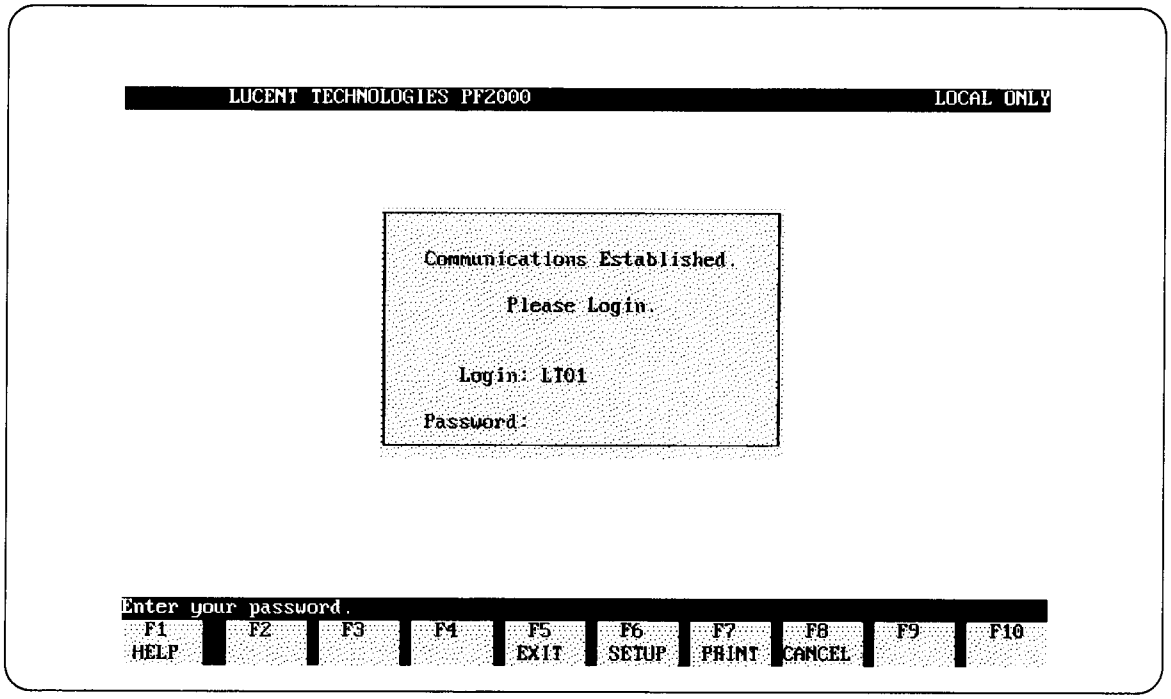
Press [F6] again when parameters are set.



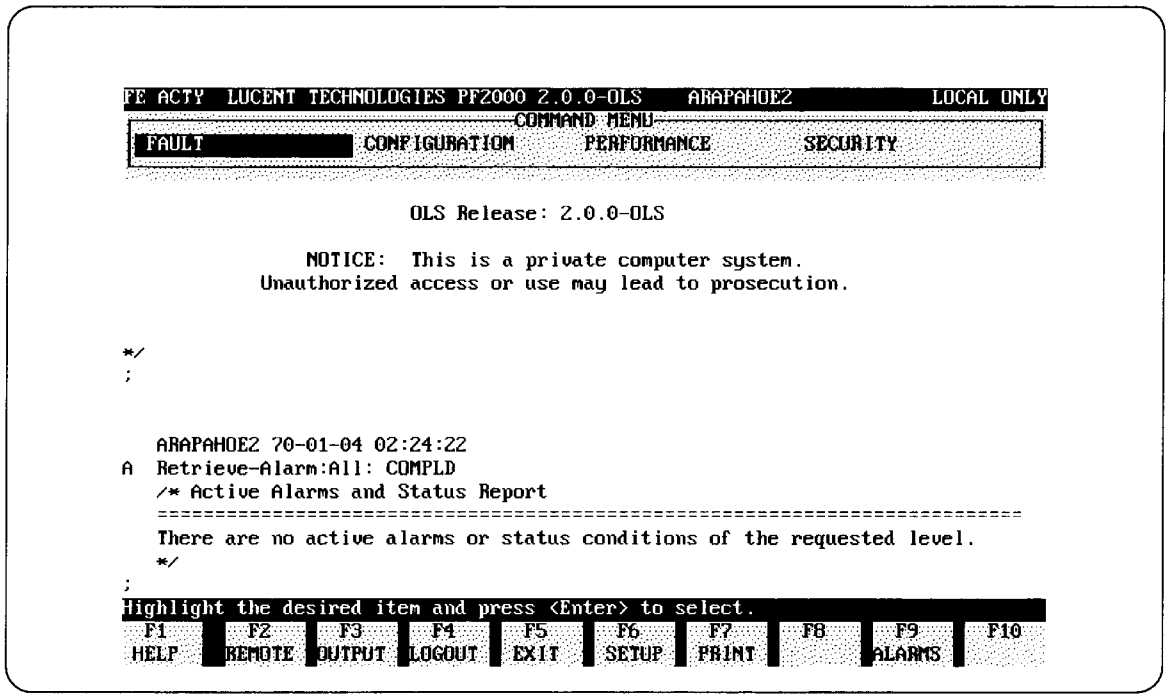
12. Press ENTER.



13. Enter a valid login (obtained from the system administrator) and press ENTER.



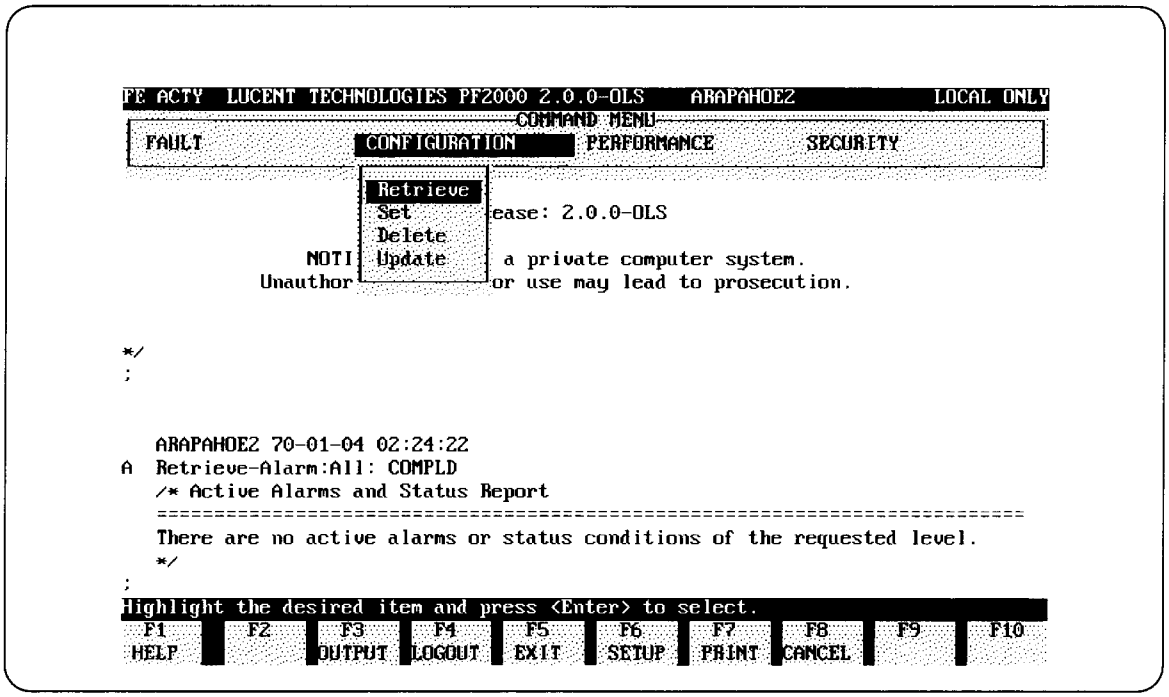
14. Enter the appropriate password (obtained from the system administrator) and press ENTER.



15. Notice that after a successful login, an Active Alarms and Status Report is displayed. An example is shown above. The top line shows the actual target identifier (TID) of the network element.

16. Use ← and → arrow keys to highlight `CONFIGURATION` but **do not press ENTER at this time**.

17. Press ↓ key once to display CONFIGURATION menu. The screen shows a report for an OLS end terminal. The menu for other platforms may differ slightly. Also, the menu is slightly different when the user is in the expert mode.

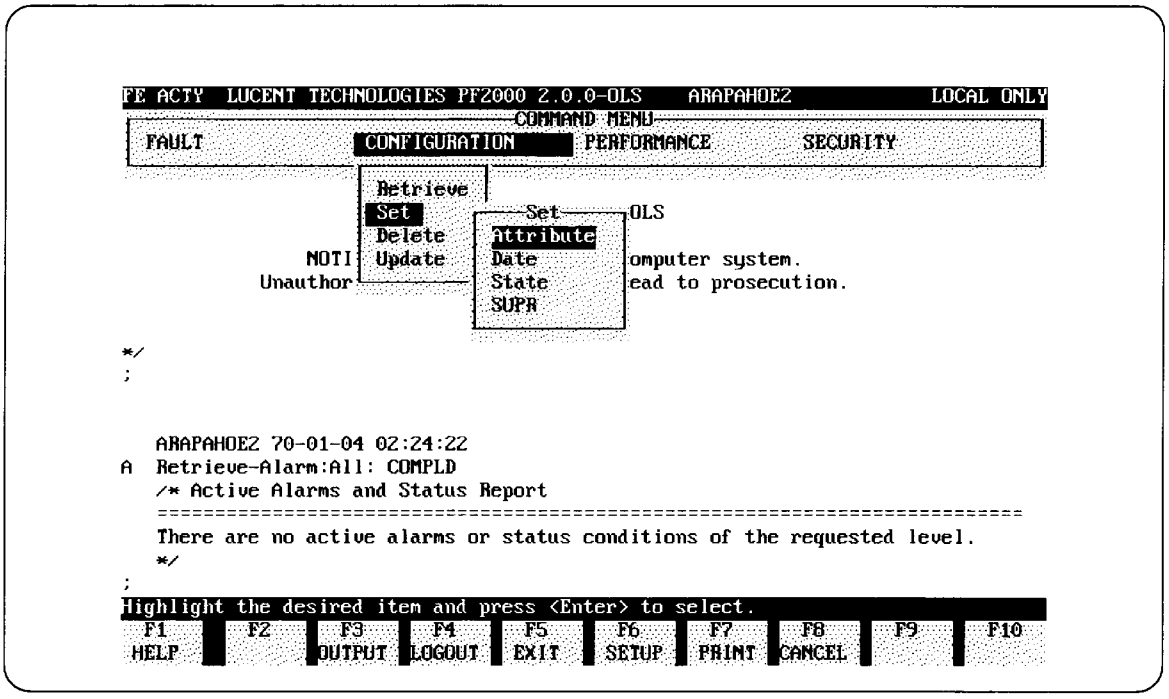


18. Notice that the following tables list all of the inputs available under each of the four management categories (FAULT, CONFIGURATION, PERFORMANCE, and SECURITY).

    - Table 11-1 Release 2 Inputs (Commands) Menu for OLS End Terminal and Repeater
    - Table 11-2 Release 1 Inputs (Commands) Menu for OLS End Terminal and Repeater
    - Table 11-3 Input (Command) Definitions (Alphabetized by Verb) of this section provides a brief description of each of these inputs.

19. ⇒ NOTE:
    You are now going to use the `Set-Date` command to set the hour of the day. (After completing this tutorial, you may want to set the time back to the original value.)

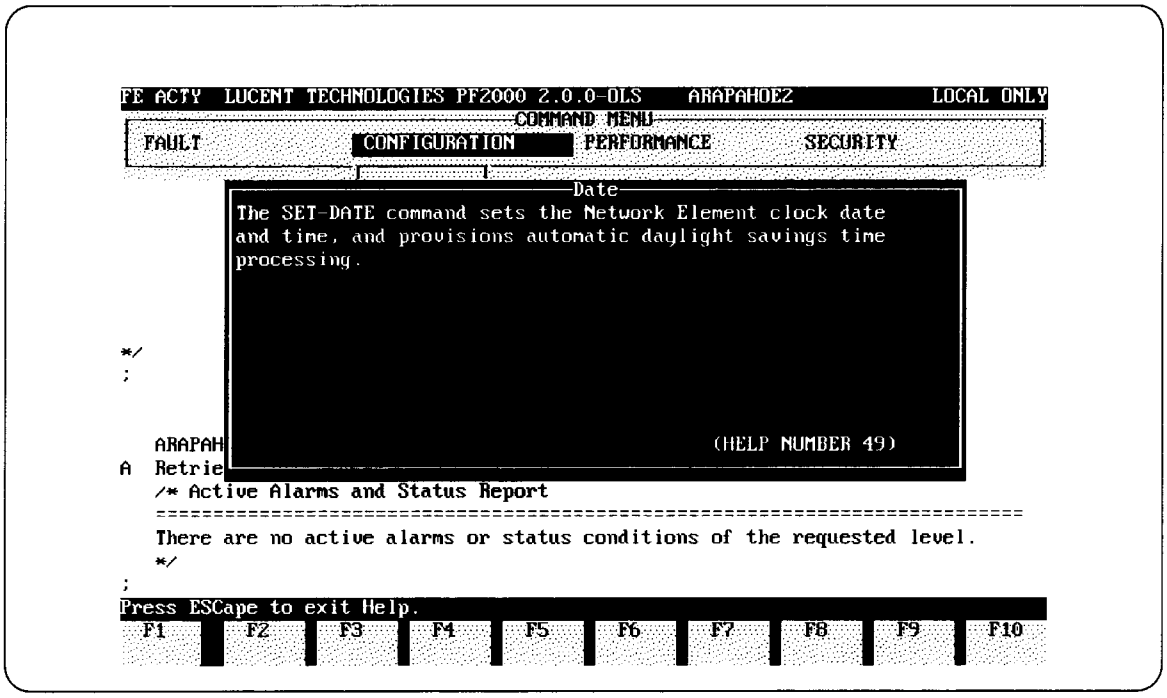
    Use the ↑ and ↓ arrow keys to highlight the verb `Set` and press ENTER. The figure shows the menu for an OLS End Terminal. The menu for other platforms may differ slightly.



20. Use ↓ and ↑ keys to highlight `Date:` but **do not press ENTER at this time**.

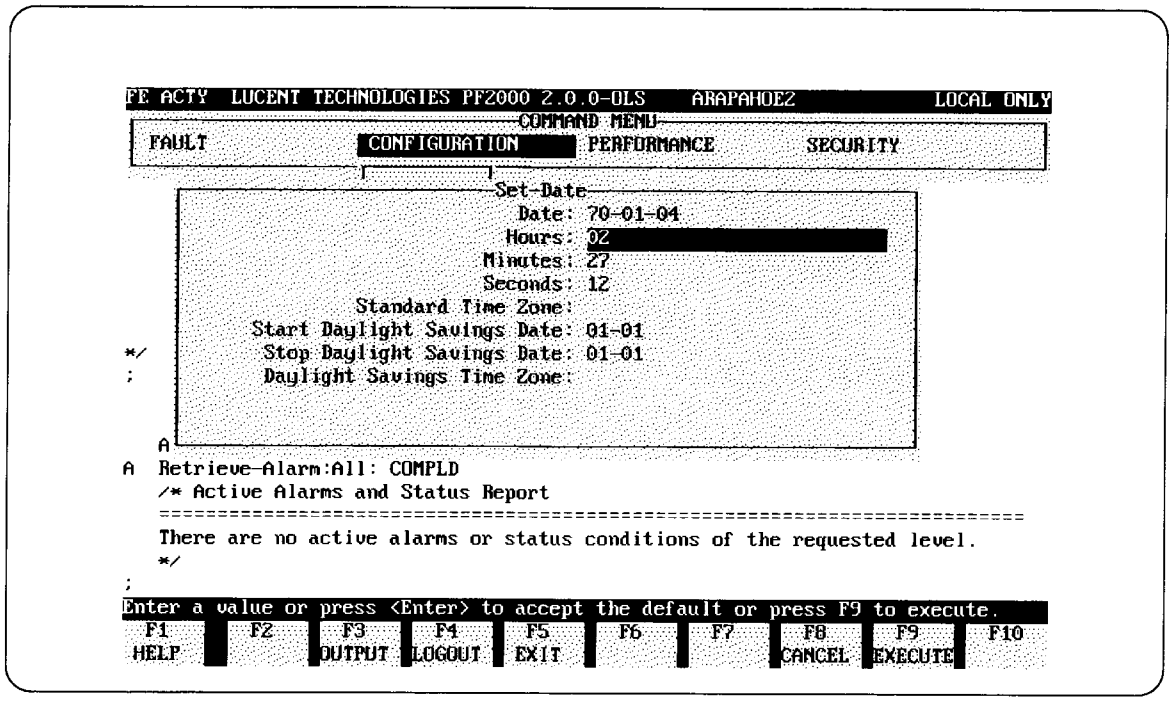
21. ⇒ **NOTE:**
When function key [F1] is labeled HELP, it can be pressed to obtain information about the item highlighted on the screen.

Press function key [F1] labeled HELP to display the explanation of the highlighted item.



22. After reading the information, press [ESC] (escape) key, then press [ENTER] to select Date (highlighted).

23. Use the ↑ and ↓ keys to highlight `Hours:` but **do not press** ENTER **at this time.**



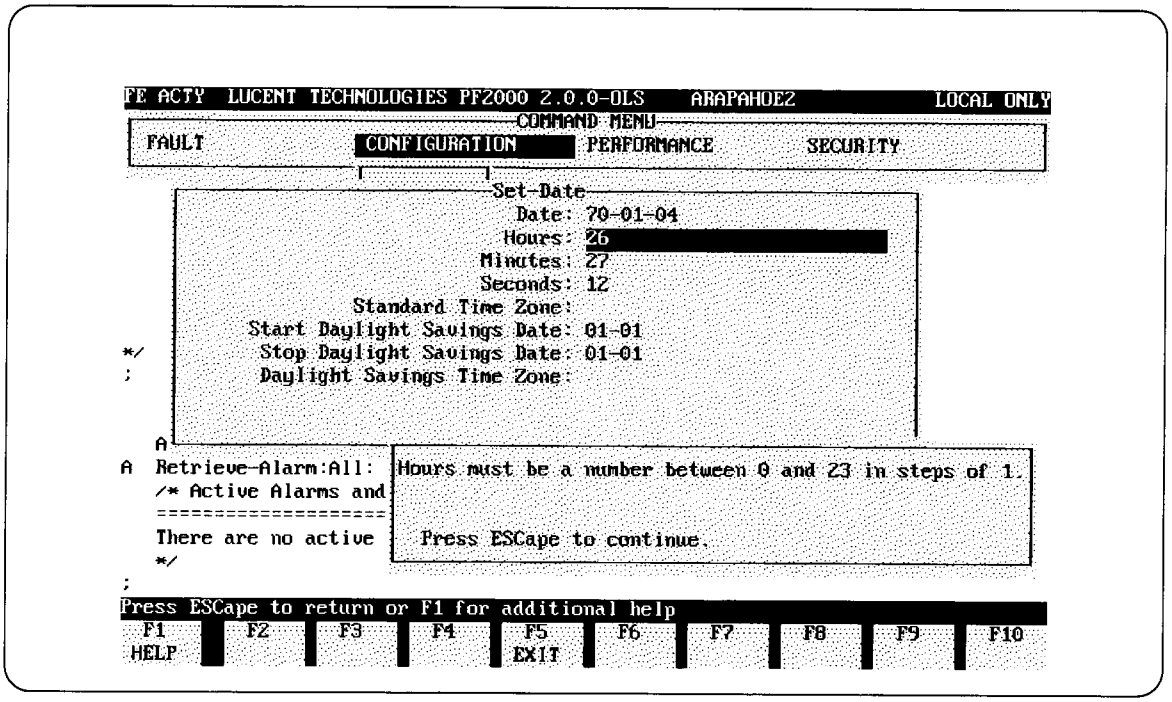
24. ⇒ NOTE:
You will now deliberately mistype a value.

Enter "99" (without the quotes) for `Hours:` but **do not press the ENTER at this time.**

25. Use the BACK SPACE key to erase your entry.

26. ⇒ NOTE:
You will now deliberately enter an invalid value.

Enter "26" for the hour followed by ENTER.



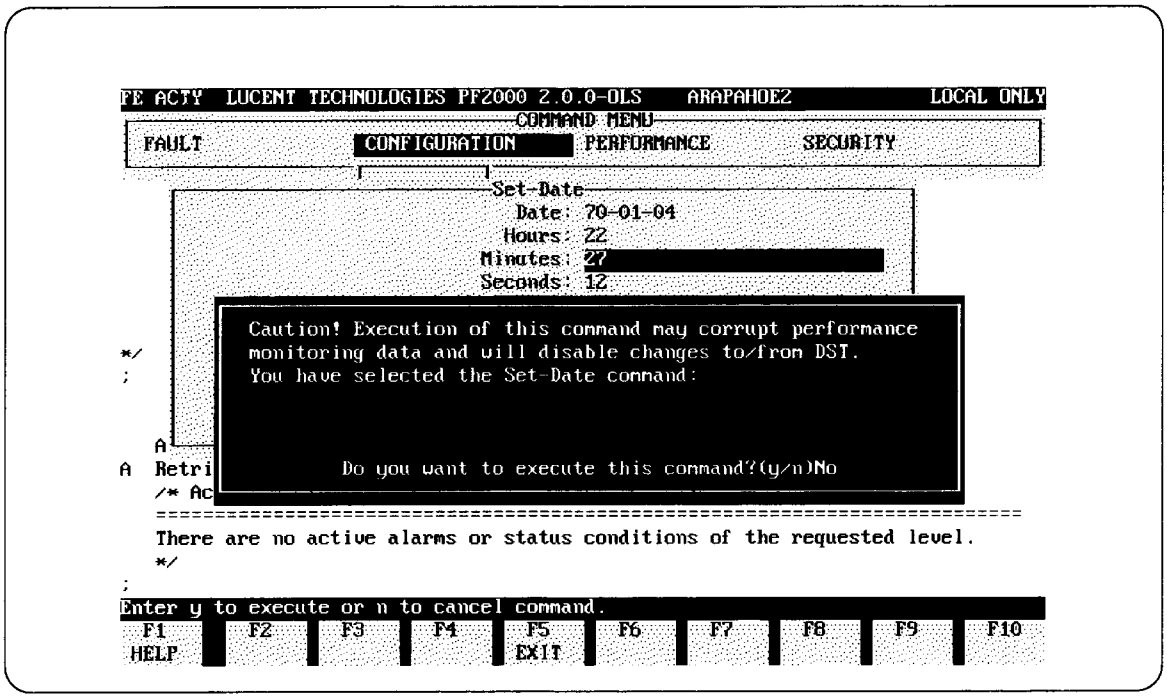
27. ⇒ NOTE:
A screen appears and displays the allowable values for `Hours:`.

Press the ESC key.

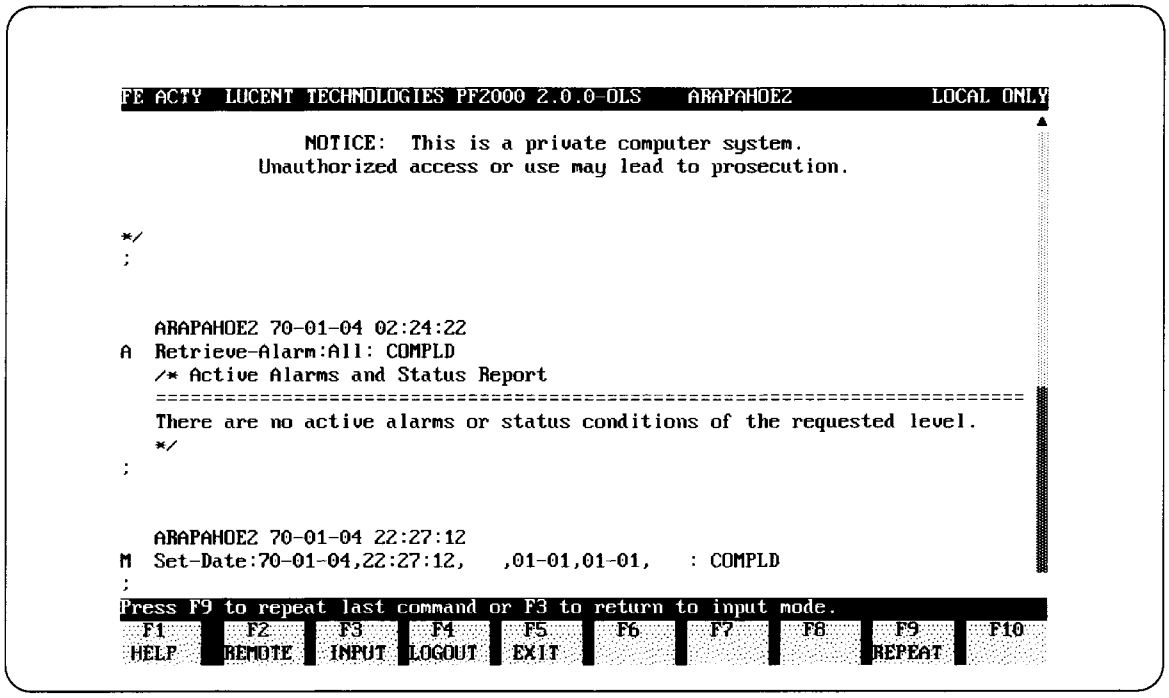
28. Enter a different or correct value (hour) than the one displayed, followed by ENTER.

29. Press function key F9 to execute the input.

30. Notice that a confirmation frame appears on the screen with a Caution statement.



31. Enter `y` for the "yes" selection and press [ENTER].



32. Notice that the `COMPLD` output echoes the command. Function key [F3] is now labeled `INPUT` because the display is now in the output mode. ([F3] toggles between `INPUT` and `OUTPUT` modes. You may experiment with the F3 key now.)

33. Notice that when the CIT is in the output mode, a **scroll bar** appears on the right side of the screen. You can scroll the screen either forward or backward depending on whether the darker-shaded portion of the bar is at top or bottom. Use the ↑ and ↓ keys to scroll the screen.

34. ⇒ **NOTE:**
    You just used `CONFIGURATION-Set-Date` to set the hour. You will now use `Retrieve-Date` to look at the value of that parameter.

    Press [F3] to return to INPUT mode.

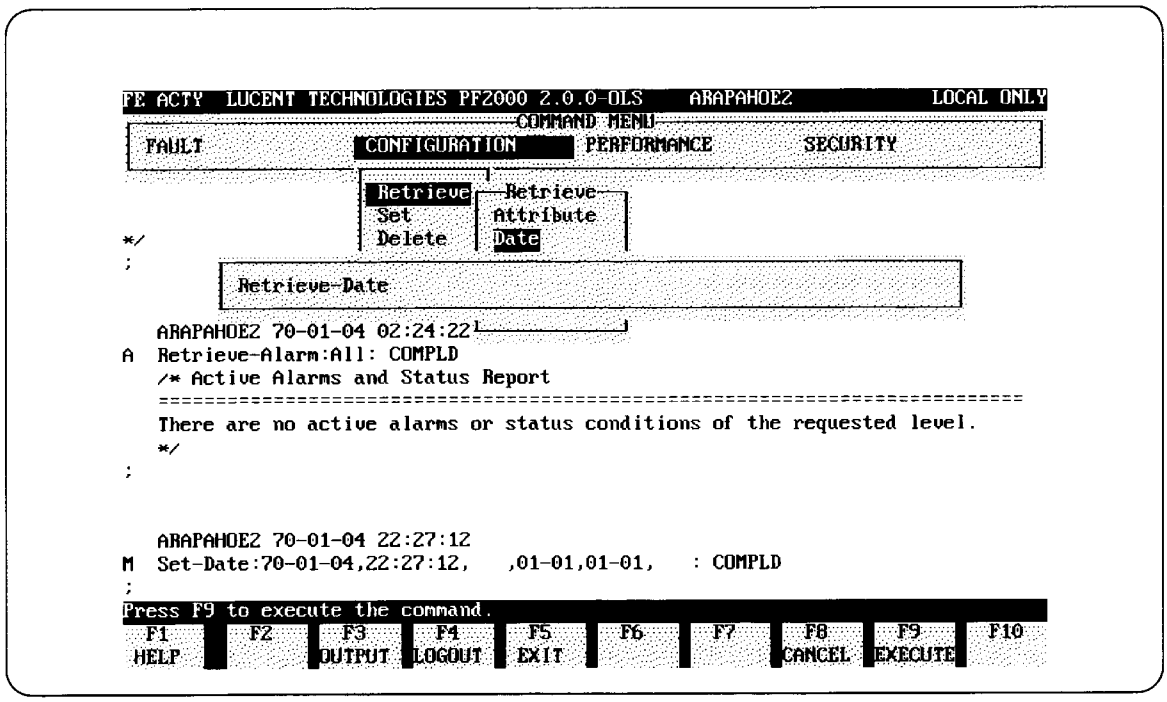
35. Under the `CONFIGURATION` category, select `Retrieve` and then press ENTER.

36. ⇒ **NOTE:**
    You will now deliberately make an incorrect selection of `Retrieve-Attribute` instead of `Retrieve-Date`.

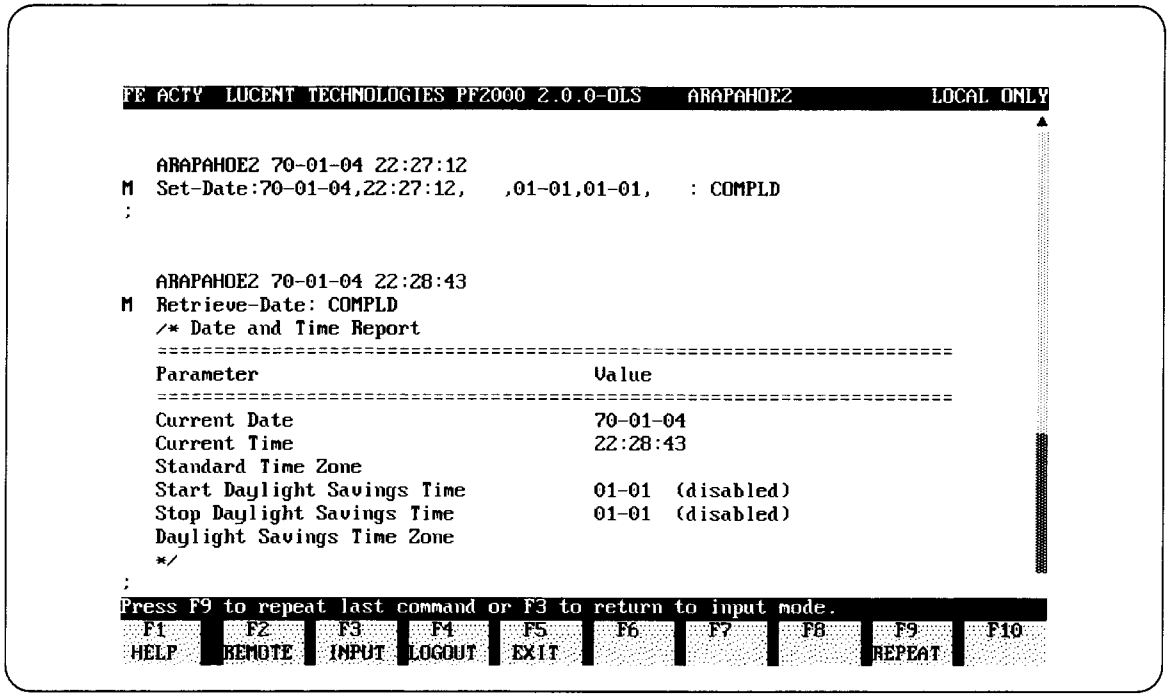
    Under `Retrieve`, highlight `Attribute` and press ENTER.

37. To correct, press ESC to back up to the preceding screen. Any time you are in the INPUT mode, you can back up one screen at a time by pressing the ESC key.

38. Under `Retrieve`, highlight `Date` (by using ↓ and ↑ arrow keys) and press ENTER.



39. Press function key F9 to execute.



40. Refer to Table 11-4 [List of Inputs (Commands) That Generate Reports for OLS Network Elements] in this section to determine the report generated by `Retrieve-Date`. Then refer to the indicated example and read the definition of the parameters.

41. Refer to the report on the CIT screen and note that the `Hours:` has been changed.

42. If appropriate, use `CONFIGURATION-Set-Date` to set the `Hours:` back to the original value. Otherwise, continue with the next step.

43. At this point in the tutorial, you must decide to either stop or continue with the CIT-PC training. If you continue, the additional training pertains to an OLS end terminal and to an OLS repeater.

    If **exiting the tutorial**, then continue with Step 44.

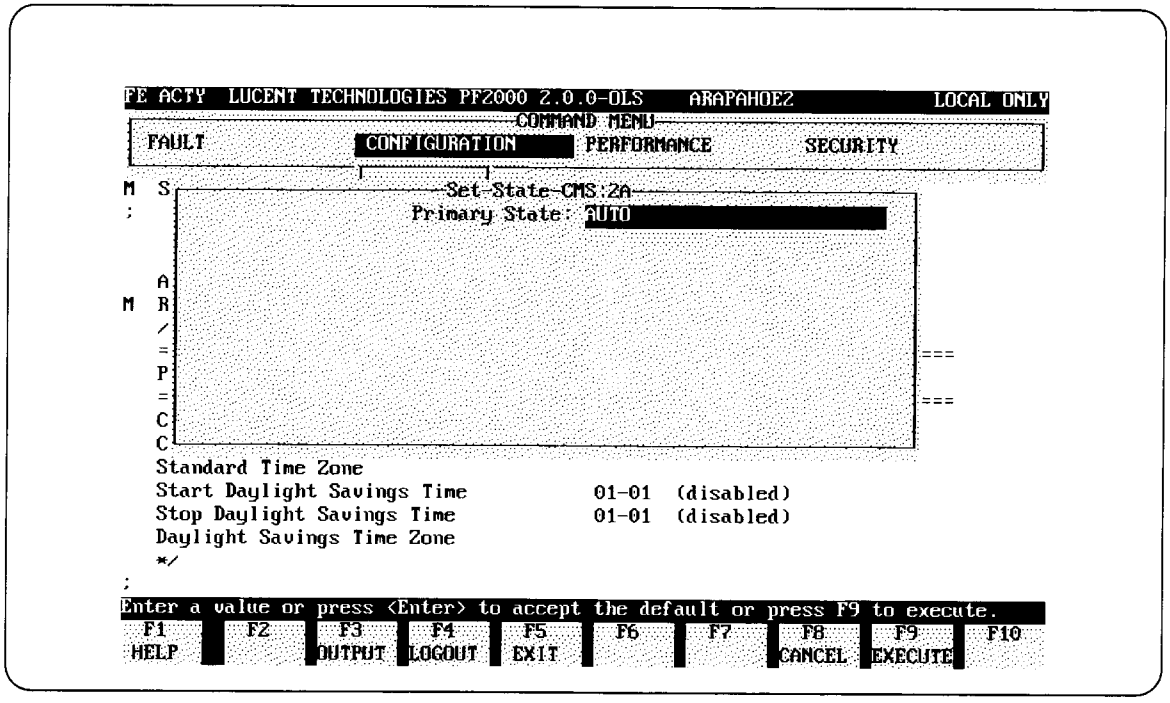
    If **continuing the tutorial**, then continue with Step 45.

44. Log off of the CIT by pressing F4 (LOGOUT from the OLS network element) or exit the OLS CIT-PC software by pressing F5 (EXIT) as appropriate.

Additional Training on an Optical Line System

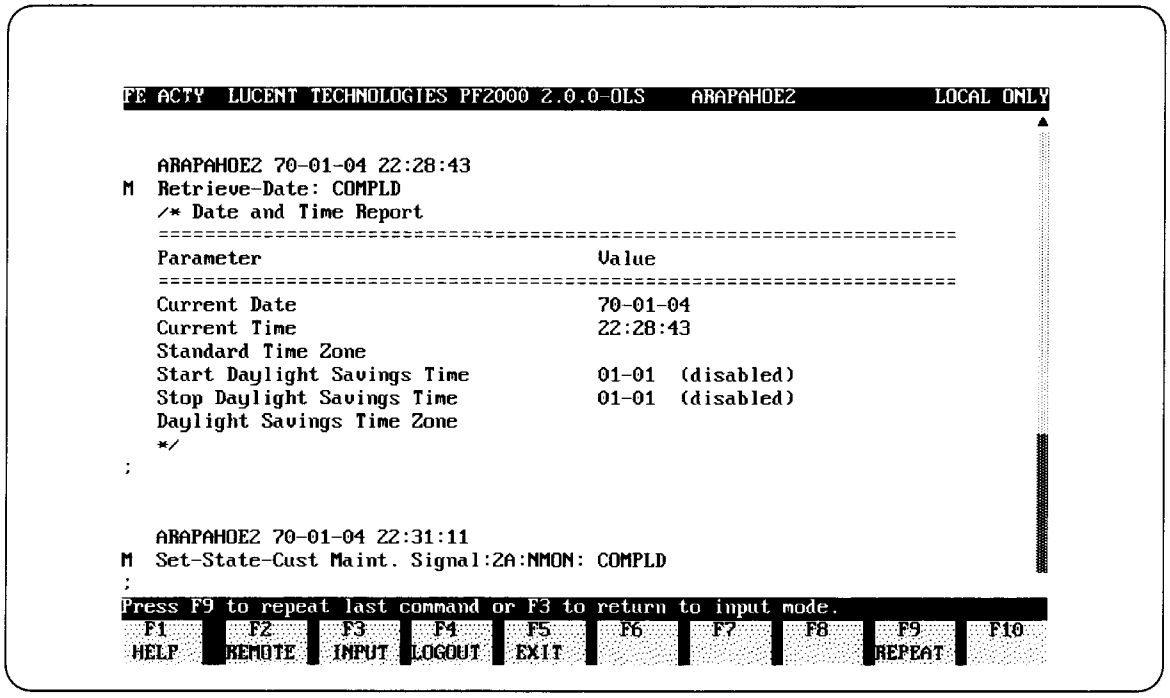
45. ⇒ NOTE:
You are now going to use `CONFIGURATION-Set-State-CMS` command to set the administrative state of customer maintenance signal port 2A to `NMON`. (After completing this portion of the tutorial, you may want to set the CMS-2A port state to `AUTO`.)

Press function key [F3] to return to the input mode and select `CONFIGURATION-Set-State-CMS:2A` by using the ←, →, ↑, and ↓ arrow keys to highlight the command and press [ENTER].



46. Enter "nmon" for the primary state followed by ENTER.

47. Press function key F9 to execute the inputs.



48. ⇒ **NOTE:**
You just used CONFIGURATION-Set-State-CMS to provision or set the administrative state of port 2a to NMON. You will now use FAULT-Retrieve-State-CMS to look at the value of that parameter.

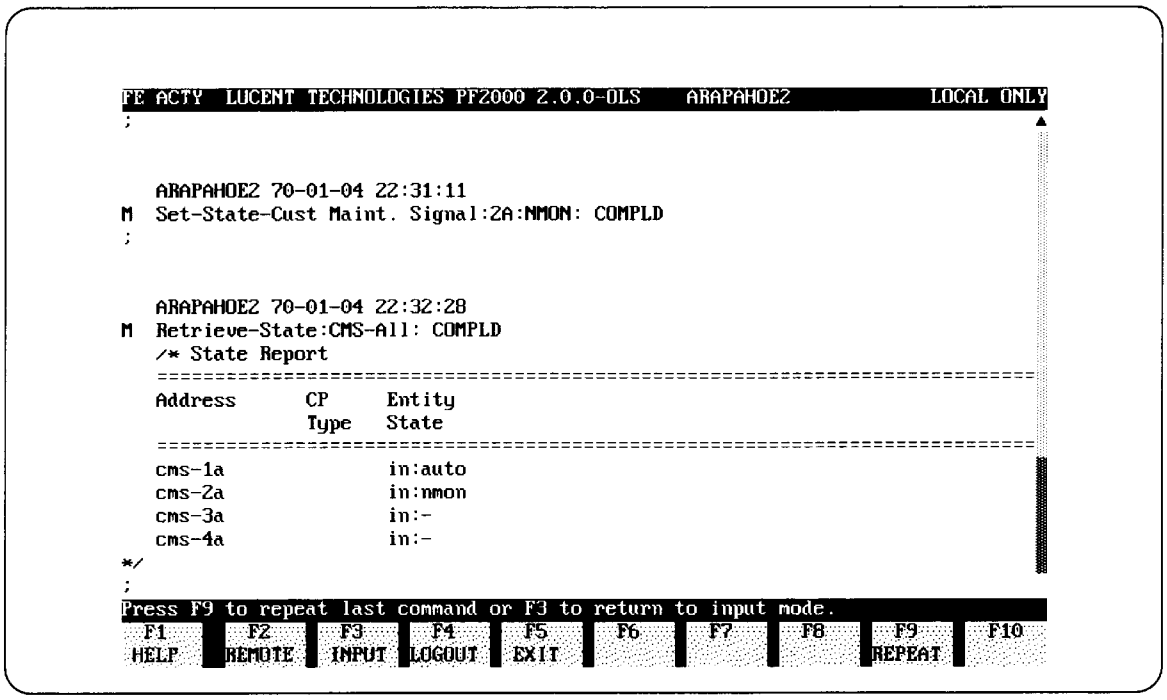
Press F3 to return to the INPUT mode.

49. Select FAULT-Retrieve-State-CMS (by using ↑ and ↓ arrow keys) and then press ENTER.

50. Enter "All" (without quotes) for Port and then press ENTER.

51. Press function key [F9] to execute.

52. Refer to the report displayed on the CIT screen and note that the port has been set to NMON. (nmon should appear in the Entity State column for optical channel 1.)



53. Scrolling is now possible by using the ↑ and ↓ arrow keys.

54. If appropriate, use CONFIGURATION-Set-State-CMS to provision or set port 2A to AUTO. Otherwise, continue with the next step.

55. Log off of the CIT by pressing [F4] (LOGOUT) or exit OLS CIT-PC by pressing [F5] (EXIT) as appropriate.

56. **STOP! YOU HAVE COMPLETED THE END TERMINAL TUTORIAL.**

Operation And Maintenance (TOP)

This section supports operation and maintenance of the Optical Line System (OLS) product via task oriented practices (TOP) procedures. Use of these procedures should be preceded by a general knowledge and understanding of the software for the OLS. Refer to Section 11, "Craft Interface Terminal Usage." The TOP procedures are included in the following five separate tabs:

- Acceptance — Yellow
- Circuit Order — Orange
- Operation — Green
- Trouble Clearing — Red
- Detailed Level Procedures — Blue.

Reason for Reissue

This document is reissued to provide updated information for Release 2. A complete list of Release 2 features appears in the OLS Features Release Plan of 365-575-300, *Optical Line System, Applications, Planning, and Ordering Guide*. As a result of a customer's suggestion, "road maps" have been included at the end of the non-trouble-clearing procedures (NTPs) to help technicians find their way among the procedures.

Vertical bars are used in the right margin of the descriptive TOP information to indicate **significant changes** from the previous issue. Vertical bars are not used in trouble analysis procedures (TAPs) or the detailed level procedures (DLPs) because every appropriate step of the procedure must be performed. The bars are used in the "Master Task Index" and the "Numerical List of Procedures" to indicate new procedures in addition to the changed procedures.

TOP Section Organization

The **Acceptance** tab covers procedures that are used to accept the hardware AFTER installation by someone else.

The **Circuit Order** tab covers procedures that are used when adding or deleting work order items for an optical line, an OC-48 channel, or the customer maintenance signal (CMS) to an in-service OLS.

The **Operation** tab covers procedures that can be used in day-to-day operations. Such procedures are to enter/change/delete a user's login, to establish a remote login using the craft interface terminal (CIT), to establish remote access to a network element by using a dial-up modem, etc. A complete listing is in the "Operation Task Index" (Operation: IXL-001).

The **Trouble Clearing** tab covers procedures on clearing the "condition" that caused the alarm and clearing trouble reports. These procedures are consistent with the maintenance philosophy given in **TAD-1000**, Technical Assistance.

The **Detailed Level Procedures** (**DLP**) tab contains detailed "how to" instructions, beginning with DLP-500.

Some procedures have an introductory "**Overview**" section that explains the purpose of the procedure. The other procedures are self-explanatory from the title.

How To Use This TOP Section

A tutorial is provided for you in Section 11 of this manual to familiarize yourself with the interactions of the CIT-PC software and the network element. However, *it is strongly recommended that this tutorial only be used with an OLS network element that is* ***out of service.***

To find the instructions for performing acceptance, circuit order, operation, or trouble-clearing tasks, proceed as follows:

1. Find your job in the Task Index under the appropriate colored tab and go to the referenced procedure; for example, **Acceptance IXL-001**. (This is the index for the acceptance tasks.) Or, you may use the Master Task Index (**Operation and Maintenance: IXL-001**) to find your job.
2. Go to the referenced procedure. This is a director level procedure and includes one of the following types:
    a. Non-Trouble-Clearing Procedure (**NTP**) — a director level procedure that lists normal work items to perform other than trouble clearing.

b. Trouble Analysis Procedure (**TAP**) — a director level procedure that contains step-by-step trouble-clearing instructions to locate and/or fix troubles. The technical assistance hierarchical is contained in trouble analysis data (**TAD**)-100.

c. Some DLPs are director level procedures. These procedures combine the "what to do" with the "how to do" information; for example, change, delete, or enter a user's login in DLP-519.

All procedures are listed in numerical order but are not used in numerical order. A "Numerical List of Procedures" is provided as a **reference only** and should not be used alone in finding instructions for performing tasks.

3. Perform all the items in the director level procedure in the suggested order unless it sends you to another director level procedure. After you have completed a director level procedure, you have finished the task. Where more detailed information is required, you will be sent to a Detailed Level Procedure **DLP-( );** or you may be sent to a Detailed Level Procedure by another Detailed Level Procedure.

4. **IMPORTANT:** When you complete a Detailed Level Procedure, you **MUST** return to the procedure (NTP, TAP, or DLP) that sent you there unless the DLP is a director level procedure; for example, change, delete, or enter a user's login (DLP-519).

5. **IMPORTANT:** Unless otherwise instructed, if one director level procedure sends you to another director level procedure, you should not return to the first director level procedure after you complete the second.

6. Sometimes you will be asked to verify that things have occurred. This may take the form of a formal statement of the expected response. At other times, the instructions will merely state *verify that ...* .

   If the expected response is not observed and a specific trouble-clearing reference is not made, you should reference the "Trouble Clearing Task Index" to start trouble clearing.

7. If you need help in clearing a trouble after completing all the applicable trouble-clearing procedures in this section, contact your local or regional maintenance assistance group. Then, the group may contact the Regional Technical Assistance Center (RTAC) at **1-800-225-RTAC** in accordance with local procedures.

Faulty equipment being returned for repair should be sent to the following address:

Lucent Technologies Network Systems
Returned Goods Dept.
Dept. 11MV287122
1600 Osgood Street
North Andover, Massachusetts 01845

Screen Display and Equipment Designation Fonts

The procedures in this manual use a MONOSPACE font to identify text on a screen or a response displayed from the network. A **BOLD** font identifies the lettering designations on panels, shelves, and circuit packs. Also, the bold font is used throughout this manual for emphasis.

Optical Line System Installation

The 365-575-310, *Optical Line System (OLS) Installation Manual*, is available for customers planning to install the equipment themselves. To acquire this manual, refer to "How to Order Documents" in the "About This Document" tab. Other associated installation manuals include 365-575-210, *FT-2000 OC-48 Large Capacity Terminal*, and 365-575-211, *FT-2000 OC-48 Large Capacity Terminal, LCT Integration Manual*.

OLS Software Release Description

Different releases have different comcode numbers and/or document numbers, but all documents contain information such as known problems, problems that have been fixed from an earlier release, and upgrade/download procedures. For the specific release and document, refer to the **Operation: NTP-002** or to the "Related Documentation/Training" part of the "About This Document" section at the beginning of this manual.

Safety Instructions

Admonishments

This section may contain admonishments as ***DANGERS, WARNINGS,*** and ***CAUTIONS***. These admonishments have the following definitions:

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

Lightwave Safety

A Lucent Technologies' lightwave digital transmission system and associated optical test sets use semiconductor laser transmitters. The lasers emit lightwaves, at or near infrared wavelengths, into lightguide cables. This light is at the red end of the visible spectrum. Direct exposure at close distances should be avoided.

WARNING:
Never view any unterminated optical connector with optical instruments other than indirect image-converting devices, such as the FIND-R-SCOPE, since viewing optics tends to collimate the energy from an optical connector and, hence, increases the potential risk for injury.

For Warning Label and Compliance Label information, refer to the "About This Document" section.

Electrostatic Discharge (ESD) Considerations

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

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

- Assume all circuit packs contain solid-state electronic components that can be damaged by ESD.
- When handling circuit packs (storing, inserting, removing, etc.) or when working on the backplane, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, static-dissipating floor mat.
- Handle all circuit packs by the faceplate or latch and by the top and bottom outermost edges. Never touch the components, conductors, or connector pins.
- Observe warning labels on bags and cartons. Whenever possible, do not remove circuit packs from antistatic packaging until ready to insert them into slots.

- If possible, open all circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats.
- Always store and transport circuit packs in static-safe packaging. Shielding is not required unless specified.
- Keep all static-generating materials, such as food wrappers, plastics, and Styrofoam containers away from all circuit packs. On removal from bay, immediately put circuit packs into static-safe packages.
- Whenever possible, maintain relative humidity above 20 percent.
- Keep the electromagnetic interference (EMI)/ESD protective front covers on the shelves at all times except during an upgrade or maintenance procedure. Once a circuit pack is replaced in the shelf, close the front cover immediately.

To reduce the possibility of ESD damage, shelves are equipped with grounding jacks to enable personnel to ground themselves using wrist straps (Figure 1) while handling circuit packs or working on a shelf. The jacks for connection of wrist straps are located at the lower right-hand corner of each user panel and filter panel and at the rear of the bay. These jacks are labeled. The wrist straps should be checked periodically with a wrist strap tester to ensure that they are working properly.

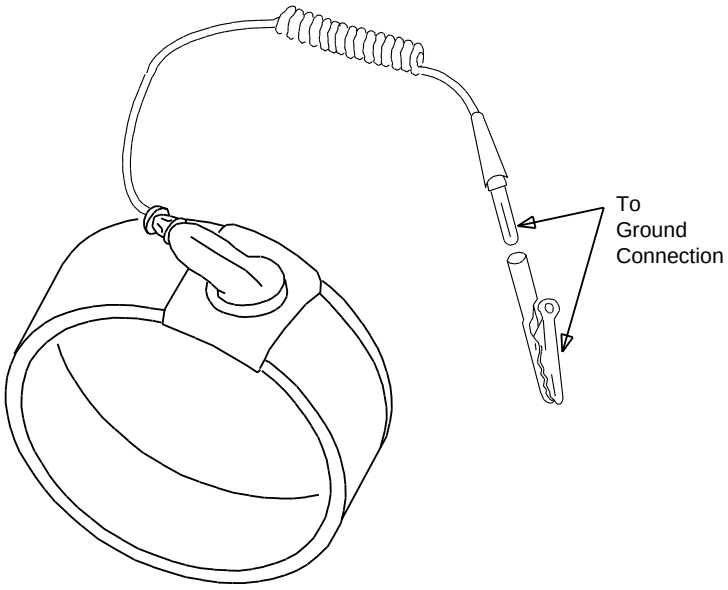


Figure 1. Static Control Wrist Strap

IMPORTANT SAFETY 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:

1. Follow all warnings and instructions marked on the product.
2. Slots and openings in this product and the back or bottom are provided for ventilation. To protect it from overheating, these openings must not be blocked or covered.
3. Opening or removing rear covers or sheet-metal parts may present exposure to high current or electrical energy levels, or to other risks. Refer all servicing in those areas to qualified service personnel.
4. 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.
5. Refer servicing to qualified service personnel.

Master Task Index

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Accept Optical Line System (OLS)	Acceptance: NTP-002
Add Customer Maintenance Signal (CMS) to In-Service OLS	Circuit Order: NTP-002
Add New Optical Line to In-Service OLS	Circuit Order: NTP-003
Add OCHAN() (OC-48) to In-Service OLS	Circuit Order: NTP-004
Change, Delete, or Enter a User's Login	DLP-519
Clear Local Office Alarm When **NE ACTY** and **FE ACTY** LEDs are Off	Trouble Clearing: TAP-136
Clear NE ACTY and/or FE ACTY (Regardless of Alarm Level)	Trouble Clearing: TAP-103
Clear Trouble in CIT (CIT Does Not Respond to Commands)	Trouble Clearing: TAP-128
Clear Trouble Report (of Bad Outgoing Signals From Local Network Element)	Trouble Clearing: TAP-104
Copy Software from One Network Element to Another Network Element	Operation: NTP-003

Continued on next page

Master Task Index (Contd)

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Delete Customer Maintenance Signal (CMS) from In-Service OLS	Circuit Order: NTP-005
Delete OCHAN() (OC-48) from In-Service OLS	Circuit Order: NTP-006
Delete Optical Line from In-Service OLS	Circuit Order: NTP-007
Establish Modem or *Datakit*® Network Access	DLP-520
Establish or Disconnect Remote Login Using CIT	DLP-518
Install Software (Initial Installation/Upgrade/Change) into CIT and FT-2000 Network Element	Operation: NTP-002
Introduction to the PC	DLP-516
Remove and/or Install OMU or ODU	DLP-521
Technical Assistance	Trouble Clearing: TAD-100

Numerical List of Procedures

Acceptance Tab:	
IXL-001	Acceptance Task Index
NTP-002	Accept Optical Line System (OLS)
Circuit Order Tab:	
IXL-001	Circuit Order Task Index
NTP-002	Add Customer Maintenance Signal (CMS) to In-Service OLS
NTP-003	Add New Optical Line to In-Service OLS
NTP-004	Add OCHAN() (OC-48) to In-Service OLS
NTP-005	Delete Customer Maintenance Signal (CMS) from In-Service OLS
NTP-006	Delete OCHAN() (OC-48) from In-Service OLS
NTP-007	Delete Optical Line from In-Service OLS
Operation Tab:	
IXL-001	Operation Task Index
NTP-002	Install Software (Initial Installation/Upgrade/Change) into CIT and Optical Line System Network Element
NTP-003	Copy Software from One Network Element to Another Network Element
Trouble Clearing Tab:	
IXL-001	Trouble Clearing Task Index
TAD-100	Technical Assistance
TAP-101	Clear NE ACTY and/or FE ACTY (Regardless of Alarm Level)
TAP-102	Clear Trouble Using Craft Interface Terminal (CIT)
TAP-103	Clear 'DCC APS Data Error'
TAP-104	Clear Trouble Report
TAP-105	Clear 'OMU/ODU Mismatch or Missing'
TAP-106	Address 'TL-1 Link Failure'
TAP-107	Address Environmental Input and/or Control Output Condition
TAP-108	Address Missing or Incorrect Response
TAP-109	Clear 'Optical Line ID Mismatch'
TAP-110	Address Incoming Signal Failure
TAP-111	Clear 'Circuit Pack Failure'
TAP-112	Clear 'Circuit Pack Removed'
TAP-113	Clear 'SYSMEM Failure' or 'SYSCTL Failure'
TAP-114	Clear Non-Alarm Condition
TAP-115	Clear No TL1 Response After System Reset (When No Cable Connection Between DTE and External Equipment)
TAP-116	Clear Unsuccessful Circuit Pack Replacement
TAP-117	Clear 'CPYPGM:IP (tid)'
TAP-118	Clear 'NE Status Comm Failure'

Continued on next page

Trouble Clearing Tab: (Contd)	
TAP-119	Clear 'Fuse/Power Failure (A/B)'
TAP-120	Clear 'Incoming (From Supr) DCC Failure'
TAP-121	Address CP Reset in Progress
TAP-122	Clear 'CP(Unknown Type) Removed'
TAP-123	Clear 'CP (Unknown Type) Failure'
TAP-124	Address 'Reset In Progress'
TAP-125	Clear 'SYSMEM Unrecognizable Code'
TAP-126	Clear 'SYSMEM/SYSCTL Code Mismatch'
TAP-127	Clear 'Unexpected CP Type'
TAP-128	Clear Trouble in CIT (CIT Does Not Respond to Commands)
TAP-129	Clear 'DCC Startup In Progress'
TAP-130	Restore Network Element Operation After Power Loss
TAP-131	Clear 'Software Download in Progress'
TAP-132	Clear 'OLS System Startup In Progress'
TAP-133	Clear 'SYSMEM Removed'
TAP-134	Clear 'OLS System Incomplete'
TAP-135	Clear 'Multiple DS-NEs Defined'
TAP-136	Clear Alarm When **NE ACTY** and **FE ACTY** LEDs Are Off
TAP-137	Clear 'DS-NE Not Reachable'
TAP-138	Clear 'Duplicate TID Defined'
TAP-139	Clear 'SER TLM 1 Port Failure'
Detailed Level Procedures Tab:	
DLP-500	Connect Optical Power Meter for Measurement in OLS
DLP-501	Connect and Condition Craft Interface Terminal (CIT)
DLP-502	Test LEDs on Front Panel and Circuit Packs
DLP-503	Fiber Connections and Circuit Pack Locations Used in OLS
DLP-504	Test Office Alarm Operation
DLP-505	Perform Provisioning
DLP-506	Verify OLS Network Elements Are Connected
DLP-507	Identify Source of Incoming Signal
DLP-508	Test Parallel Telemetry
DLP-509	Install/Remove Apparatus (Circuit Pack) Blank
DLP-510	Clean Optical Fibers and Connectors
DLP-511	Open/Close Cabinet Doors or Install/Remove Shelf Cover
DLP-512	Install/Remove Lightguide Buildout
DLP-513	Test Miscellaneous Discrete Telemetry
DLP-514	Install/Remove Circuit Pack
DLP-515	Replace Fuse in Power Distribution and Fuse Panel or User Panel
DLP-516	Introduction to the PC
DLP-517	Inspect (Repair) Optical Fiber(s)

Continued on next page

Detailed Level Procedures Tab: (Contd)	
DLP-518	Establish or Disconnect Remote Login Using CIT
DLP-519	Change, Delete, or Enter a User's Login
DLP-520	Establish Modem or *Datakit*® Network Access
DLP-521	Remove and/or Install OMU or ODU

Acceptance Task Index

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Accept Optical Line System (OLS) ..... Acceptance: NTP-002 I

Accept Optical Line System (OLS)

DO ITEMS BELOW IN ORDER LISTED . . . . . FOR DETAILS, GO TO

1. **Overview:** This acceptance procedure can be performed from any OLS network element (end terminal or repeater) connected in the system. This procedure is only used if the OLS was installed by someone else. If the installation has not been completed, notify the installation personnel or refer to 365-575-310 to complete the installation. *If you completed the installation following the procedures in 365-575-310, do not perform this procedure.*

   Required Test Equipment:
   Craft Interface Terminal (CIT)
   Wrist Strap

⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to beam.

⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an OLS network element to prevent electrostatic discharge (ESD) damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100.**

⇒ NOTE:
If at any point in this procedure any OLS network element or system fails to respond in the indicated way, refer the trouble to installation personnel.

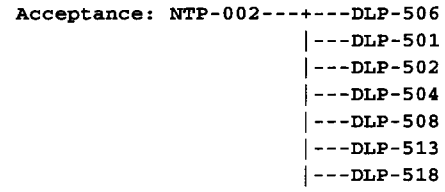
Verify that the **NE ACTY** and the **FE ACTY** LEDs are off at the user panel or indicator panel. —

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
2. Connect the craft interface terminal (CIT) to the local OLS network element and log into the network element to be tested.	DLP-501
3. Verify that the OLS network elements are connected in an OLS 4-fiber bidirectional (minimum) point-to-point configuration.	DLP-506
4. At the CIT, select `SECURITY-Retrieve-Network Element` and execute to obtain an OLS System Provisioning Report for the local OLS network element.	—

5. Verify that the report agrees with the engineering records, particularly the Directory Service NE value where only one is allowed per OLS. Verify the other parameters. Section 11 shows example of report.
`TID`
`Directory Service NE`
`X25 Packet Size`
`Alarm Group`
`Alarm Gateway NE`
`Direction` (end terminal only)
`System type` (not in Release 1).
	—

6. Make an LED test.	DLP-502
NOTE: 7. If you are remotely logged in, you will require assistance at the distant network element in order to perform this step. If required, test office alarm operation.	DLP-504
NOTE: 8. If you are remotely logged in, you will require assistance at the distant network element in order to perform this step. If required, check telemetry interfaces. a. Parallel telemetry b. Miscellaneous discrete telemetry	DLP-508 DLP-513

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
9. Establish a remote login to one of the other OLS network elements.	**DLP-518**
10. Repeat Steps 4 through 8 for that OLS network element.	—
11. Discontinue the remote login.	**DLP-518**
12. Repeat Steps 9 through 11 for each of the remaining OLS network elements.	—
13. At the CIT, select `FAULT-Retrieve-Network Alarms` command and execute to obtain a Network Alarms Report.	—
14. Are there any alarms indicated on the report? If **NO**, then continue with Step 15. If **YES**, then the trouble must be referred to the group that installed it.	—
15. If required, notify personnel at the remote maintenance site (OS center) that the OLS is ready for any operational tests they wish to perform using the X.25 link.	—
16. The OLS has passed this acceptance test and is now ready to provide service.	—



Circuit Order Task Index

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Add Customer Maintenance Signal (CMS) to In-Service OLS ..... Circuit Order: NTP-002

Add New Optical Line to In-Service OLS ..... Circuit Order: NTP-003

Add OCHAN() (OC-48) to In-Service OLS ..... Circuit Order: NTP-004

Delete Customer Maintenance Signal (CMS) from In-Service OLS ..... Circuit Order: NTP-005

Delete OCHAN() (OC-48) from In-Service OLS ..... Circuit Order: NTP-006

Delete Optical Line from In-Service OLS ..... Circuit Order: NTP-007

Add Customer Maintenance Signal (CMS) to In-Service OLS

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

1. **Overview:** This procedure adds a Customer Maintenance Signal (CMS) to an **in-service** Optical Line System (OLS). The CMS is a 155 Mb/s optical signal (IS-3 format) that originates and terminates at customer supplied equipment.

   Required Test Equipment:
   Craft Interface Terminal (CIT)
   Wrist Strap
   Technical assistance at the other network elements on the OLS.

   ⚠ WARNING:
   Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to beam.

   ⚠ CAUTION:
   Use a static ground wrist strap whenever handling circuit packs or working on an FT-2000 network element to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100.**

   Obtain the circuit order instructions and note which optical line is associated with the CMS to be added. —

2. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front. **DLP-511**

3. Connect the craft interface terminal (CIT) and log in to the local OLS network element. **DLP-501**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
4. At the LGX® or equivalent, identify the transmit and receive fibers (going to and coming from the customer provided equipment) for the customer maintenance (CM) signal(s). Verify that the fibers are connected.	—
5. Make a power measurement on the incoming fiber (that's going to the **CM IN** port) and determine the correct LBO value.	**DLP-500**
6. Install the appropriate LBO at the **CM IN** port of the TLM circuit pack and connect the incoming fiber (transmit side of customer provided equipment).	**DLP-512**
7. Connect the outgoing fiber (receive side of customer provided equipment) to the **CM OUT** port of the TLM circuit pack. A 0-dB LBO should be connected to this port.	**DLP-512**
8. Repeat Steps 4 through 7 for any remaining CM signals to be added in this cabinet or shelf.	—
9. Close the cabinet door or install the shelf cover.	**DLP-511**
10. Does the customer provided equipment appear to be operating properly? If **NO**, then continue with Step 11. If **YES**, then continue with Step 13.	—

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
⇒ NOTE: 11. It is possible that one or more customer provided equipment locations have an incorrect provisioned state. Meaning that a good signal is not detected and the state cannot change from AUTO to IS. At the CIT, select `CONFIGURATION-Set-State-CMS` command and provision to AUTO (not NMON) for the customer provided equipment location not operating properly.	—
12. Wait until the **NE ACTY** LED goes off (approximately 5 minutes).	—
13. This completes adding a customer maintenance signal to an existing OLS. If required to add an OC-48 optical channel or an optical line with this CM signal, then refer to the appropriate circuit order procedure.	**Circuit Order: NTP-004** **Circuit Order: NTP-003**

```
Circuit Order: NTP-002---+---TAD-100
                         |---DLP-500
                         |---DLP-501
                         |---DLP-510
                         |---DLP-511
                         |---DLP-512
                         |---Circuit Order: NTP-003
                         |---Circuit Order: NTP-004
```

Add New Optical Line to In-Service OLS

DO ITEMS BELOW IN ORDER LISTED . . . . . FOR DETAILS, GO TO

1. **Overview:** This procedure applies to the OLS end terminals and to any and all OLS repeaters when adding optical lines 2, 3, and/or 4. Optical line 1 has already been installed (Figure 1). Optical power measurements are made at each section along the optical line, therefore, assistance is very beneficial because a section can be up to 120 km.

   Required Test Equipment:
   Craft Interface Terminal (CIT)
   Wrist Strap
   Optical Power Set or Equivalent

⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an OLS network element to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100.**

Obtain the circuit order instructions to add an optical line(s) and note the assigned line number(s) and associated circuit packs. The optical line is bidirectional, meaning 2 fibers. **DLP-503**

2. Obtain all required circuit packs per the circuit order. —

3. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front. **DLP-511**

4. Install TLM circuit packs in shelf 1 (line 2) or shelf 2 (lines 3 and 4) for the added optical line per the circuit order instructions. **DLP-514**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. Connect the craft interface terminal (CIT) and log in to the OLS end terminal.	**DLP-501**
6. Close the OA circuit pack latches and slide the OA into the shelf (the OA pack is not engaged at this time.)	—
7. Remove the protector caps and clean the fiber jumper ends to be used between the OA and TLM circuit packs.	**DLP-510**

⇒ NOTE:

8. Labeling information is contained in Chapter 7 of the Installation Manual (365-575-310). An OLS to OLS label sheet is comcode 847419629 and OLS to LCT is comcode 847344611.

Connect and label fiber jumpers between OA and TLM circuit packs per circuit order. Refer to Figure 2 for the 1A-TX or to Figure 3 for the 1A-RCV.	—
9. Remove the protector caps and clean the outside plant fibers for the optical line being placed in service.	**DLP-510**

⇒ NOTE:

10. Care must be used to ensure the correct transmission direction when connecting the outside plant fibers. Maintain the 1A-TX direction from end terminal, repeater(s), to end terminal and vice versa for the 1A-RCV direction. See Figure 1.

Connect the outside plant fibers to the appropriate **OUT** connector on the transmit end terminal OA circuit packs per circuit order.	—

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
11. Open the transmit OA circuit pack latches and push to seat the OA circuit pack.	—
12. Is a repeater being used with this in-service OLS? If **NO**, then continue with Step 25. If **YES**, then continue with Step 13.	—
⇒ NOTE: 13. You will need assistance at the repeater site or travel to that location. Steps 13 through 23 apply to a repeater. Obtain all required circuit packs per the circuit order instructions.	**DLP-503**
14. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.	**DLP-511**
15. Install TLM circuit packs in shelf 1 (line 2) or shelf 2 (lines 3 and 4) for the added optical line per the circuit order instructions.	**DLP-514**
16. Connect the craft interface terminal (CIT) and log in to the OLS repeater.	**DLP-501**
17. If necessary, close both latches on the OA circuit pack.	—
18. Place the OA circuit pack into the slot guides and slowly slide it into the shelf until the latches touch the shelf. DO NOT ROCK THE CIRCUIT PACK OR UNIT BACK AND FORTH. The OA circuit pack is not engaged at this time.	—

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
⇒ NOTE: 19. Labeling information is contained in Chapter 9 of the Installation Manual (OLS to OLS label sheet is comcode 847419629). Clean, connect, and label fiber jumpers between OA and TLM circuit packs per circuit order. Refer to Figure 4.	**DLP-510**
20. Select and install the correct LBO at the **IN** connector of the receive OA circuit pack.	**DLP-500**
⇒ NOTE 1: 21. Care must be used to ensure the correct transmission direction when connecting the outside plant fibers. Maintain the 1A-TX direction from end terminal, repeater(s), to end terminal and vice versa for the 1A-RCV direction. ⇒ NOTE 2: Labeling information is contained in Chapter 9 of the Installation Manual (365-575-310). An OLS to OLS label sheet is comcode 847419629 and OLS to LCT is comcode 847344611. Connect and label the outside plant fibers to the appropriate **IN/OUT** connector on the repeater OA circuit pack per circuit order. Refer to Figure 4.	—
22. Verify that the `inc optical line LOS` condition has been cleared by selecting `FAULT-Retrieve-Alarms (and Status)` command for the Active Alarms and Status Report.	—
23. Close the cabinet doors or replace the shelf cover.	**DLP-511**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
24. Repeat Steps 13 through 23 if another repeater is present in the in-service OLS.	—
⇒ NOTE: 25. You will need assistance at the receive end terminal or travel to that location. Steps 25 through 41 apply to the receive end terminal. Obtain all required circuit packs per the circuit order instructions.	—
26. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.	**DLP-511**
27. Install TLM circuit packs in shelf 1 (line 2) or shelf 2 (lines 3 and 4) for the added optical line per the circuit order instructions.	**DLP-514**
28. Connect the craft interface terminal (CIT) and log in to the OLS receive end terminal.	**DLP-501**
29. If necessary, close both latches on the OA circuit pack.	—
30. Place the OA circuit pack into the slot guides and slowly slide it into the shelf until the latches touch the shelf. DO NOT ROCK THE CIRCUIT PACK OR UNIT BACK AND FORTH. The OA circuit pack is not engaged at this time.	—
31. Remove the protector caps and clean the fiber jumper ends to be used between the OA and TLM circuit packs.	**DLP-510**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
⇒ NOTE: 32. Labeling information is contained in Chapter 7 of the Installation Manual (365-575-310). An OLS to OLS label sheet is comcode 847419629 and OLS to LCT is comcode 847344611. Connect and label fiber jumpers between OA and TLM circuit packs per circuit order. Refer to Figure 2 for the 1A-TX or to Figure 3 for the 1A-RCV.	—
33. Remove the protector caps and clean the outside plant fibers for the optical line being placed in service.	**DLP-510**
34. Select and install the correct LBO at the **IN** connector of the receive OA circuit pack.	**DLP-500**
⇒ NOTE 1: 35. Care must be used to ensure the correct transmission direction when connecting the outside plant fibers. Maintain the 1A-TX direction from end terminal, repeater(s), to end terminal and vice versa for the 1A-RCV direction. See Figure 1. ⇒ NOTE 2: Labeling information is contained in Chapter 8 of the Installation Manual (OLS to OLS label sheet is comcode 847419629 and OLS to LCT is comcode 847344611.) Connect and label the outside plant fibers to the appropriate **IN** connector at the receive end terminal OA circuit packs per circuit order. Refer to Figure 2 for the 1A-TX or to Figure 3 for the 1A-RCV.	—

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
36. Open the latches on the OA circuit pack and push the circuit pack until it engages the connector pins.	—
37. With a thumb on each latch, continue sliding the circuit pack with one firm, continuous motion until the latches are fully engaged (the clips are in the locked position).	—
38. Verify that the `incoming optical line LOS` condition has been cleared by selecting `FAULT-Retrieve-Alarms (and Status)` command for the Active Alarms and Status Report.	—
39. Repeat Steps 4 through 38 for the other direction of transmission.	—
40. At the CIT, select the `CONFIGURATION-Update` command and execute.	—
41. Remotely log in to every OLS network element one at a time and repeat Step 40.	**DLP-518**
42. Close the cabinet doors or replace the shelf cover.	**DLP-511**
43. An optical line has been added to the OLS and is now ready for service.	—

```
Circuit Order: NTP-004---+---TAD-100
                         |---DLP-500
                         |---DLP-501
                         |---DLP-503
                         |---DLP-510
                         |---DLP-511
                         |---DLP-512
                         |---DLP-514
                         |---DLP-518
```

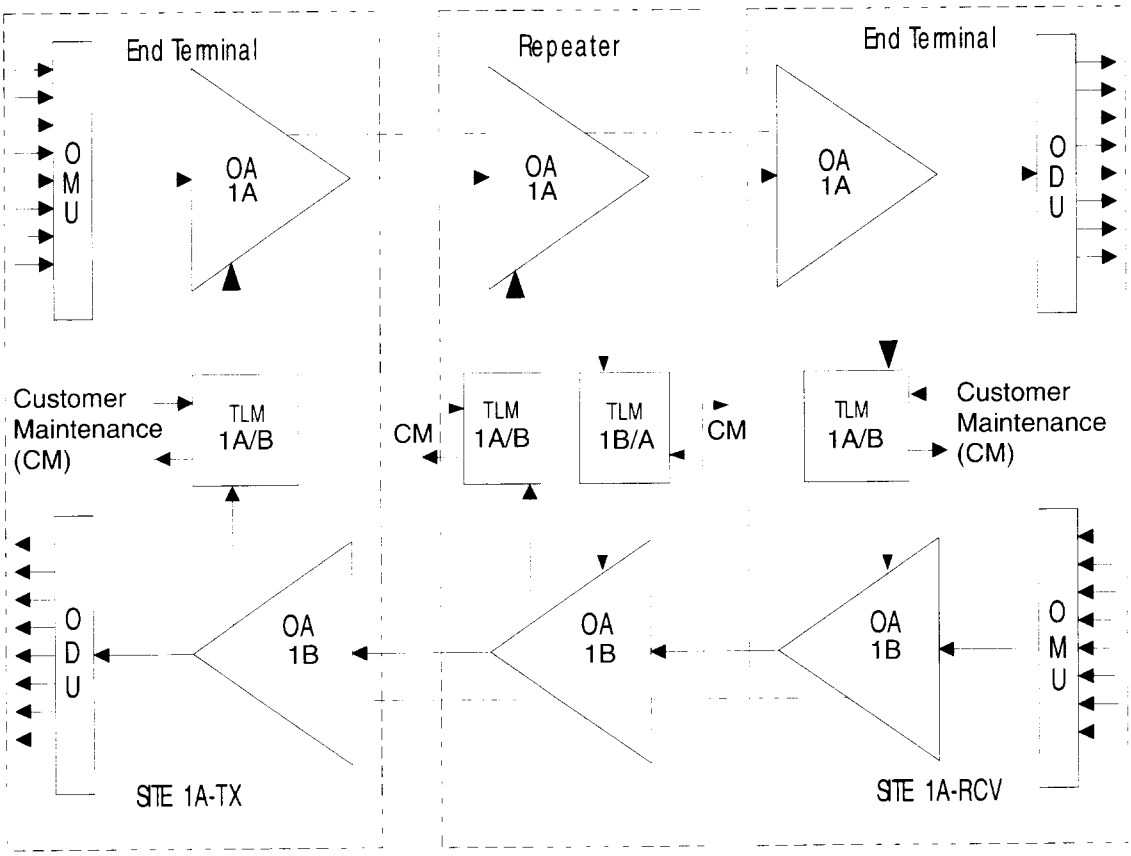
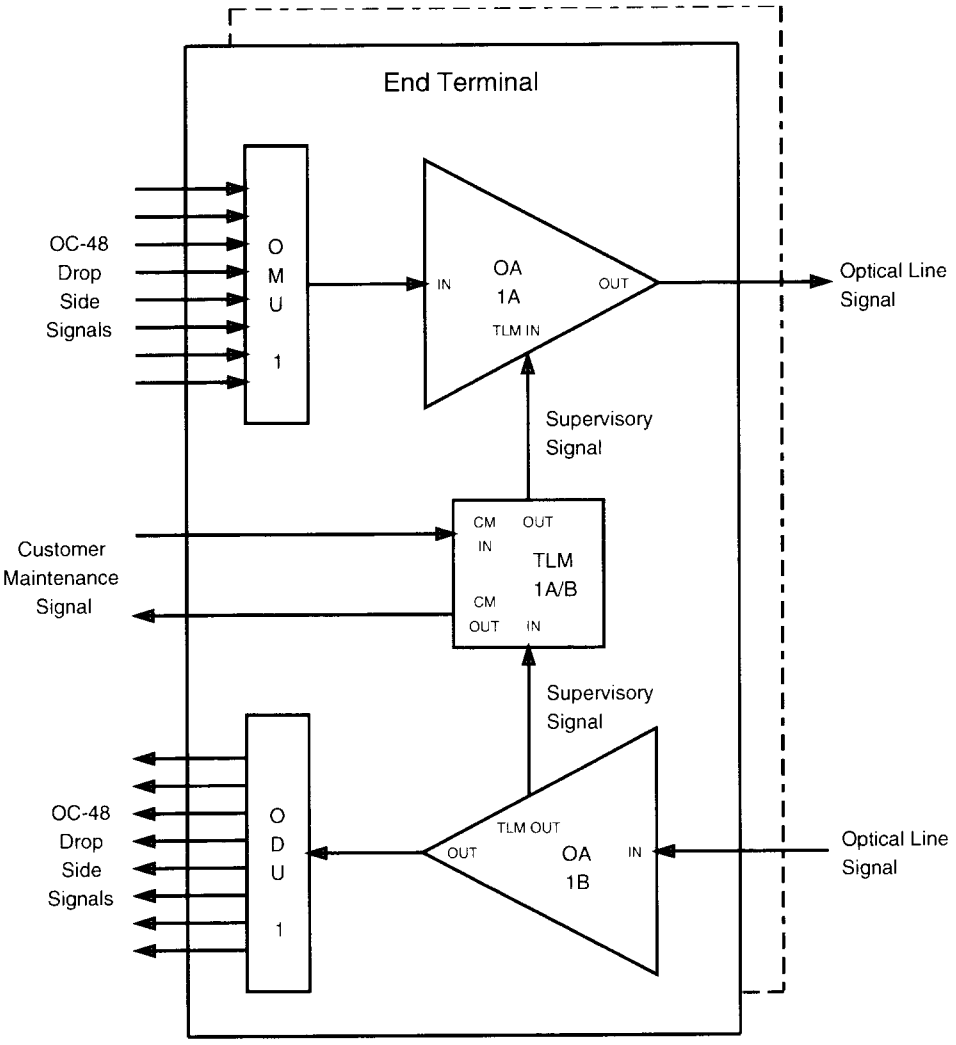


Figure 1 - Fiber Connections at OLS (Only Line 1 Shown)



tpa 849790/01

Figure 2 - Fiber Connections at 1A-TX OLS End Terminal (Only Line 1 Shown)

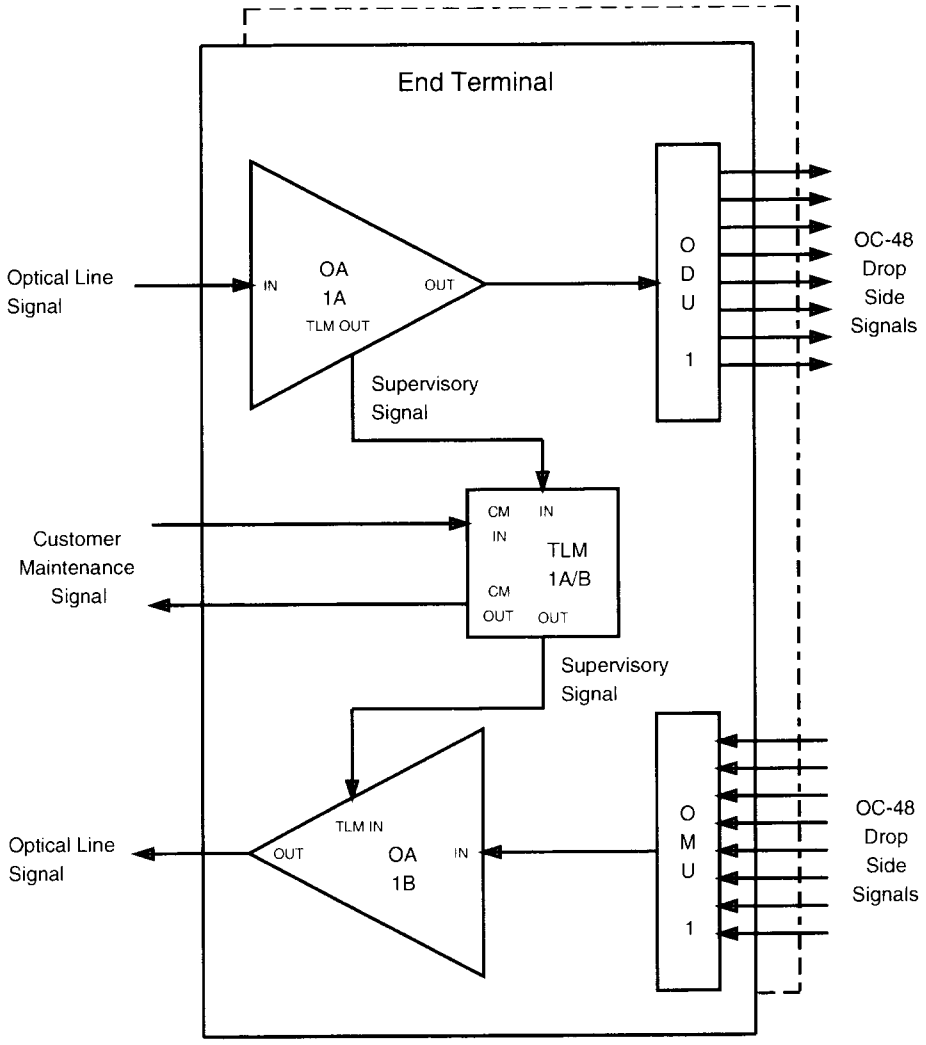


Figure 3 - Fiber Connections at 1A-RCV OLS End Terminal

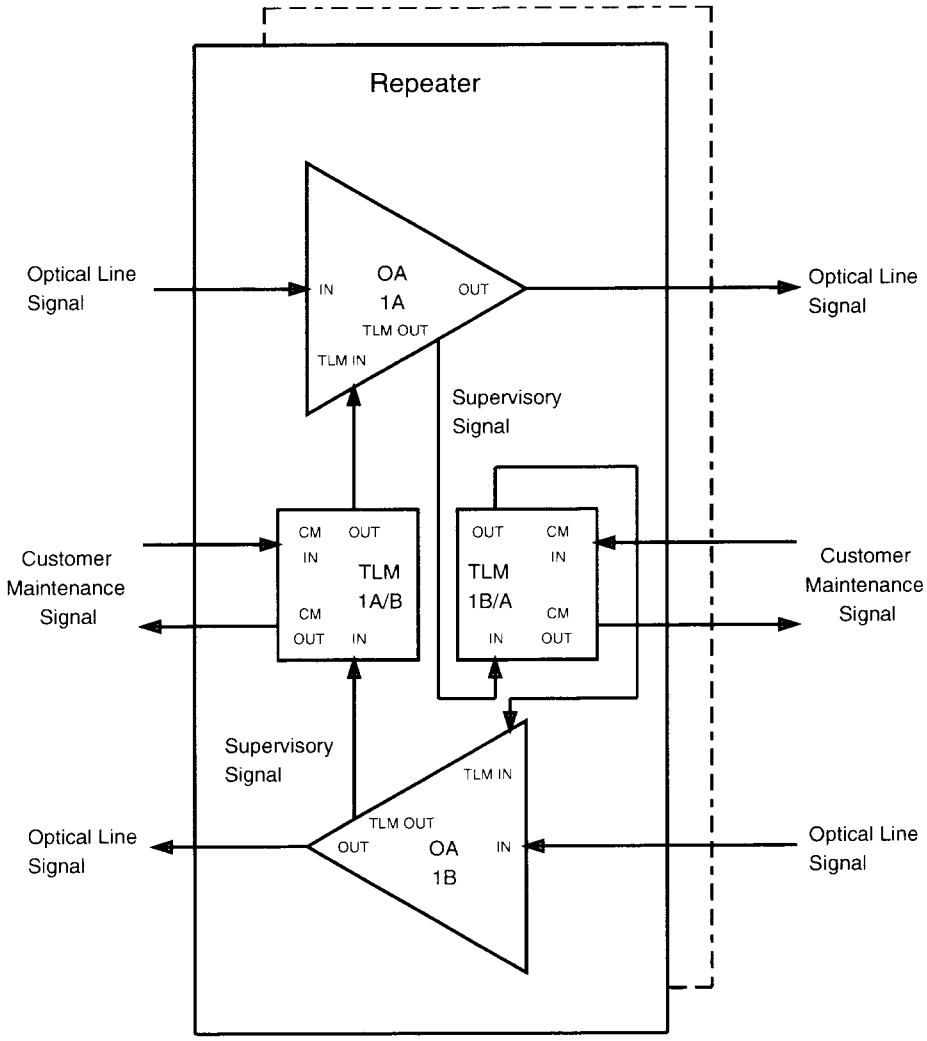


Figure 4 - Fiber Connections at OLS Repeater (Only Line 1 Shown)

365-575-301
Issue 2 March 1997

Add OCHAN() (OC-48) to In-Service OLS

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

1. **Overview:** This procedure requires physical work functions at the end terminals but the required actions at the repeater sites may be accomplished by remotely logging in to the repeater. Work functions are first completed at the transmit end of the channel, then continues at the receive end.

   Required Test Equipment:
   Craft Interface Terminal (CIT)
   Wrist Strap
   Optical Power Set or Equivalent

⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an Optical Line System (OLS) end terminal to prevent electrostatic discharge (ESD) damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100.**

⚠ CAUTION:
DO NOT ADD more than one channel at a time. When more than one optical channel is added simultaneously, degradation of the other in-service channels is likely to occur.

⇒ NOTE:
An OMU/ODU (505A/605A) has eight OCHAN() (OC-48) ports or channels.

Obtain the circuit order instructions to add an optical channel. The channel is assumed to be bidirectional. —

2. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front. **DLP-511**

3. Connect the craft interface terminal (CIT) and log in. **DLP-501**

At Transmit End of Channel

4. At the CIT, select `FAULT-Retrieve-Network Alarms` command to obtain a Network Alarms Report. —

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
5. Are there any alarm or status conditions listed in the report? If **NO**, then continue with Step 6. If **YES**, then go to **Trouble Clearing IXL-001**.	—
6. Remove the protector cap and clean the **OCHAN() IN** port at the OMU for the channel being placed in service.	**DLP-510**
7. If not already installed, clean and install a 0 dB lightguide buildout into the OMU **OCHAN() IN** port for the channel being added.	**DLP-512**
⇒ NOTE: 8. Each OCHAN(1-8) has a different required power level. Connect the optical power meter to the incoming fiber jumper (incoming from the LCT TRMTR or OTU circuit pack) and verify the correct LCT/OTU transmit power.	**DLP-500**
9. Connect the incoming fiber jumper (LCT/OTU transmit) to the **OCHAN() IN** port of the OMU.	—
10. Which software release is running in the OLS? If **Release 1**, then continue with Step 11. If **Release 2**, then continue with Step 14.	—
11. At the CIT, select `FAULT-Retrieve-State-ochan:all` command and obtain a State Report.	—
12. From the report, verify that the channel being added has transitioned to `IS`.	—
13. The transmit direction (for Release 1) has been completed. Go to Step 29 for the receive direction.	—

DO ITEMS BELOW IN ORDER LISTED . . . . . FOR DETAILS, GO TO

NOTE:

14. The report is meaningful only for the end terminals with an OMU, and the data is only available when the channel signal is in the IS or NMON state.

    At the CIT, select `PERFORMANCE-Retrieve-Relspr` command and obtain an Optical Channel Performance Monitoring Status Report. —

15. Verify that the retrieved Relative Signal Power for the channel being added is correct by comparing the report value with a value in Table A. —

How to use Table A: The table lists the acceptable **minimum** Relative Signal Power values for OLS channels at installation. From the report, find the highest channel (it will be the only channel with a Relative Signal Power value of 100). Locate the row corresponding to this highest channel in Table A. Move across the table to the column corresponding to the newly installed channel and note the value.

Table A — Values for Properly Installed Optical Channels

Highest Channel	Minimum RELSPR for Properly Installed Channel							
	ch 1	ch 2	ch 3	ch 4	ch 5	ch 6	ch 7	ch 8
1	100	50	40	30	30	20	20	30
2	80	100	50	40	40	30	30	30
3	90	80	100	60	50	40	40	40
4	--	80	70	100	60	50	50	50
5	--	90	80	70	100	60	50	60
6	--	--	90	80	80	100	60	70
7	--	--	90	80	80	70	100	80
8	--	90	80	70	70	60	60	100

16. Is the Relative Signal Power correct? —

    If **NO**, then continue with Step 17.
    If **YES**, then continue with Step 29.

17. Remove the incoming fiber jumper from the OMU **OCHAN() IN** port and remeasure the optical power coming from the LCT/OTU. **DLP-500**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
18. Replace, if required, the lightguide buildout (LBO) in the OMU for this channel.	DLP-512
19. Clean the LBO, port, and incoming fiber jumper for this channel.	DLP-510
20. Re-connect the incoming fiber jumper from the LCT/OTU to the OMU port.	—
NOTE: 21. The report is meaningful only for the end terminals with an OMU, and the data is only available when the channel signal is in the IS or NMON state. At the CIT, select `PERFORMANCE-Retrieve-Relspr` command and obtain an Optical Channel Performance Monitoring Status Report.	—
22. Verify that the retrieved Relative Signal Power for the channel being added is correct by comparing the report value with a value in Table A.	—
23. Is the Relative Signal Power correct? If **NO**, then continue with Step 24. If **YES**, then continue with Step 29.	—
24. Remove the incoming fiber jumper for the channel being added at the OMU and install protector caps on the fiber jumper and OMU port.	—
25. At the CIT, select `CONFIGURATION-Update` command and execute to update the equipment database.	—
26. At the CIT, select `PERFORMANCE-Initialize-Optics-Reason for Baseline-Line()` command and execute to baseline certain optical parameters on the optical line.	—

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
27. Remotely login to each node (end terminal and repeaters) and repeat Steps 25 and 26.	**DLP-518**
28. Contact the appropriate maintenance support organization for further technical assistance. You have made two attempts to add an OCHAN and the relative signal power has been low both times.	—

At Receive End of Channel

⇒ NOTE:
29. You will need assistance at the receive end or travel to that location.

Remove the protector cap and clean the **OCHAN() OUT** port on the ODU for the channel being placed in service.	**DLP-510**
30. If not already installed, clean and install a 0 dB lightguide buildout (LBO) in the ODU **OCHAN() OUT** port for the channel being added.	**DLP-512**
31. Clean the outgoing fiber jumper to the LCT/OTU and connect it to the **OCHAN() OUT** port of the ODU.	**DLP-510**

⇒ NOTE 1:
32. If the LCT/OTU is not colocated with the OLS end terminal, assistance will be required at the LCT/OTU.

⇒ NOTE 2:
Each OCHAN(1-8) has a different required power level.

Determine the required LBO values for the **OCHAN() OUT** port of the ODU and for the RCVR IN connector of the LCT or IN connector of the OTU.	**DLP-500**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

NOTE:

33. Multiple LBOs may be required as determined from the measured power for that channel. If so, placement of the LBOs will be required at the ODU **OCHAN() OUT** port and at the RCVR IN connector of the LCT or IN connector of the OTU.

Clean and install the LBOs as determined in Step 32.	**DLP-512**
34. As required, connect the outgoing fiber jumper to the **OCHAN() OUT** port of the ODU and to the RCVR IN connector of the LCT or IN connector of the OTU.	—
35. Repeat Steps 4 through 34 for the channel's other direction of transmission.	—
36. Close the cabinet doors or install the shelf cover.	**DLP-511**

NOTE:

37. The Line () number is the line on which this OCHAN() is being added.

At the near-end terminal and using the CIT, select `PERFORMANCE-Initialize-Optics-Reason for Baseline-Line()` command and execute. [For Release 1, use `PERFORMANCE-Initialize-Optics-Line()`].	—
38. At the far-end terminal and using the CIT, select `PERFORMANCE-Initialize-Optics-Reason for Baseline-Line()` command and execute. [For Release 1, use `PERFORMANCE-Initialize-Optics-Line()`].	—
39. Does the optical line carrying the added channel have any repeaters? If **NO**, then continue with Step 44. If **YES**, then continue with Step 40.	—

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
40. Establish a remote login to an OLS repeater.	**DLP-518**
41. At the CIT, select `PERFORMANCE-Initialize-Optics-Line()` command and execute. [For Release 1, use `PERFORMANCE-Initialize-Optics-Line()`].	—
42. Log out of the remote OLS repeater.	**DLP-518**
43. Repeat Steps 40 through 42 for each remaining repeater in the OLS.	—
44. The optical channel is now ready for service.	—

```
Circuit Order: NTP-004---+---TAD-100
                         |---DLP-500
                         |---DLP-501
                         |---DLP-510
                         |---DLP-511
                         |---DLP-512
                         |---DLP-518
```

Delete Customer Maintenance Signal (CMS) from In-Service OLS

DO ITEMS BELOW IN ORDER LISTED . . . . . FOR DETAILS, GO TO

1. **Overview:** This procedure is used to delete a Customer Maintenance Signal (CMS) from an **in-service** Optical Line System (OLS). The procedure is written from the local OLS network element perspective although action is required at the other OLS network elements.

   Required Test Equipment and Personnel:
   Craft Interface Terminal (CIT)
   Wrist Strap
   Technical assistance at the other network elements on the OLS.

⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to beam.

⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an FT-2000 terminal to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100.**

Obtain the circuit order instructions and note which optical line is associated with the CMS to be Deleted. —

2. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front. **DLP-511**

3. Connect the craft interface terminal (CIT) and log in to the local OLS network element. **DLP-501**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
⇒ NOTE: 4. Each OLS repeater contains two TLM circuit packs per optical line whereas an OLS end terminal contains one TLM circuit pack per optical line. The TLM circuit pack provides optical terminations for the customer maintenance (CM) signal. Locate and remove the appropriate optical connections from the **CM IN** and **CM OUT** ports on the TLM circuit pack as specified per the circuit order.	**DLP-503**
5. Repeat Steps 1 through 4 for any remaining CMSs to be deleted in this cabinet or shelf.	—
6. Close the cabinet door or install the shelf cover.	**DLP-511**
7. At the CIT, select `CONFIGURATION-Update` command to reflect the existing hardware and incoming signals in the system database. The port is now in the `in:auto` state (use `FAULT-Retrieve-State:cms` command to verify.)	—
8. Repeat Steps 1 through 7 for the remaining network element(s) on the OLS.	—
9. Wait until the **NE ACTY** LED goes off (approximately 5 minutes).	—
10. This completes deleting a CMS from an existing OLS. If required to delete an OC-48 optical channel or an optical line associated with this CMS, then refer to the appropriate circuit order procedure.	**Circuit Order: NTP-006** **Circuit Order: NTP-007**

```
Circuit Order: NTP-005---+---DLP-501
                         |---DLP-503
                         |---DLP-511
                         |---Circuit Order: NTP-006
                         |---Circuit Order: NTP-007
```

Delete OCHAN() (OC-48) from In-Service OLS

DO ITEMS BELOW IN ORDER LISTED . . . . . FOR DETAILS, GO TO

1. **Overview:** This procedure provides a list of actions required to delete an optical channel (OC-48) from an in-service OLS. The OC-48 fiber jumpers are removed first for the channel being deleted, then all network elements are updated and initialized.

   Required Test Equipment:
   Craft Interface Terminal (CIT)
   Wrist Strap

⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an OLS end terminal to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100.**

⚠ CAUTION:
Use care in locating the optical line and assigned ports to avoid possible service interruption.

⚠ CAUTION:
DO NOT DELETE more than one channel at a time. When more than one optical channel is deleted simultaneously, degradation of the other in-service channels is likely to occur.

⇒ NOTE:
An OMU/ODU (505A/605A) has eight OCHAN() (OC-48) ports or channels.

Obtain the circuit order instructions to delete an optical channel and note the associated optical line and assigned channels. The channel is assumed to be bidirectional. —

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
At The (Near End) End Terminal	
2. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.	**DLP-511**
3. Locate the specific channel to be deleted at the OMU and ODU (optical fiber pair).	**DLP-503**
4. Connect the CIT and log in.	**DLP-501**
5. At the CIT, select `FAULT-Retrieve-Network Alarms` command to obtain a Network Alarms Report.	—
6. From the report, verify that there are no system alarms other than those on the channel being deleted. Clear any other system or channel alarms before proceeding.	—
7. Disconnect the incoming OC-48 fiber to the OMU **OCHAN() IN** connector for the channel being deleted from service on the optical line(s) specified in the circuit order instructions.	—
8. Place protector caps over the end of the incoming OC-48 fiber and over the OMU **OCHAN() IN** connector.	—
9. Disconnect the outgoing OC-48 fiber from the ODU **OCHAN() OUT** connector for the channel being deleted from service on the optical line(s) specified in the circuit order instructions.	—
10. Place protector caps over the end of the outgoing OC-48 fiber and over the ODU **OCHAN() OUT** connector.	—

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

At The (Far End) End Terminal

NOTE:

11. You may travel to the other end terminal or obtain assistance at that terminal.

Repeat Steps 1 through 10 at the other end terminal (far end). —

12. At the CIT, select `CONFIGURATION-Update` command and execute to update the equipment database. —

13. At the CIT, select `PERFORMANCE-Initialize-Optics-Reason for Baseline-Optical Line()-Optical Channel()` command and execute to baseline certain optical parameters on the optical line. [For Release 1, use `PERFORMANCE-Initialize-Optics-Optical Line()`]. —

14. Verify that the slot address indicates that the OCHAN() was not inadvertently left in the `NMON` state (use the `FAULT-Retrieve-State:OCHAN():All` command). —

NOTE:

15. Steps 12, 13, and 14 must be performed at both end terminals.

Repeat Steps 12 through 14 at the far end (end terminal). —

16. Does the optical line carrying the deleted channel have any repeaters? —

If **NO**, then continue with Step 22.
If **YES**, then continue with Step 17.

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
17. Establish a remote login to the OLS repeater.	**DLP-518**
18. At the CIT, select `CONFIGURATION-Update` command and execute to update the equipment database.	—
19. At the CIT, select `PERFORMANCE-Initialize-Optics-Reason for Baseline-Oline ()` command and execute to baseline certain optical parameters on the optical line. [For Release 1, use `PERFORMANCE-Initialize-Optics-Optical Line()`].	—
20. Log out of the repeater.	**DLP-518**
21. Repeat Steps 17 through 20 for any remaining repeaters in the OLS.	—
22. At the CIT, select `FAULT-Retrieve-Network Alarms` command to obtain a Network Alarms Report.	—
23. From the report, verify that there are no system alarms.	—
24. Close the cabinet doors or install the shelf cover.	**DLP-511**
25. The optical channel has been deleted from service.	—

```
Circuit Order: NTP-006---+---TAD-100
                         |---DLP-501
                         |---DLP-503
                         |---DLP-511
                         |---DLP-512
                         |---DLP-518
```

Delete Optical Line from In-Service OLS

DO ITEMS BELOW IN ORDER LISTED . . . . . FOR DETAILS, GO TO

1. **Overview:** This procedure applies to the OLS end terminals and to any and all OLS repeaters when deleting an optical line(s). Assistance may be necessary at the other OLS network elements because a section can be up to 120 km.

   Required Test Equipment:
   Craft Interface Terminal (CIT)
   Wrist Strap

⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an OLS network element to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100.**

	Obtain the circuit order instructions to delete an optical line(s) from an in-service OLS and note the assigned line number(s) and associated circuit packs. The optical line is bidirectional, meaning 2 fibers.	**DLP-503**
2.	Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.	**DLP-511**
3.	Connect the craft interface terminal (CIT) and log in to the OLS network element.	**DLP-501**
4.	Remove the optical fibers from the TLM circuit pack(s) for the optical line being deleted from service.	—
5.	Remove the OA fibers from the shelf guide below.	—
6.	Disengage the OA circuit pack(s) from the shelf.	—

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
7. Remove the optical fibers from the OA circuit pack(s) for the optical line being deleted from service.	—
8. If required, remove any LBO from the circuit packs for future use.	**DLP-512**
9. Place protector caps over the end of the optical fibers and plugs in LBOs and the **IN/OUT** connectors of the OMU/ODU, OA, and TLM circuit packs.	—
10. As required, remove any remaining fibers going to/coming from the OA circuit pack.	—
11. Remove circuit packs in shelf 1 (for lines 1 and 2) or shelf 2 (for lines 3 and 4) for the deleted optical line per the circuit order instructions.	**DLP-514**
12. At the CIT, select the `FAULT-Retrieve-Alarms (and Status)` command and execute.	—
13. From the report, verify that any and all alarms are associated with the line being deleted. If any alarms are associated with an in-service line, clear the in-service alarm first before proceeding.	—
14. At the CIT, select the `CONFIGURATION-Update` command and execute.	—
15. Repeat Steps 4 through 14 for each optical line being deleted from this shelf.	—

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
16. Disconnect the craft interface terminal (CIT) from the OLS network element, if required.	—
17. Close the cabinet doors or install the shelf cover.	DLP-511
18. Repeat Steps 2 through 17 for the next OLS network element where the optical line is being deleted.	—
19. An optical line(s) has been deleted from service.	—

```
Circuit Order: NTP-004---+---TAD-100
                         |---DLP-501
                         |---DLP-503
                         |---DLP-511
                         |---DLP-512
                         |---DLP-514
```

Operation Task Index

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Change, Delete, or Enter a User's Login	DLP-519
Copy Software from One Network Element to Another Network Element	Operation: NTP-003
Establish Modem or *Datakit*® Network Access	DLP-520
Establish or Disconnect Remote Login Using CIT	DLP-518
Install Software (Initial Installation/Upgrade/Change) into CIT and OLS Network Element	Operation: NTP-002
Introduction to the PC	DLP-516
Remove and/or Install OMU or ODU	DLP-521

Install Software (Initial Installation/Upgrade/Change) into CIT and Optical Line System Network Element

DO ITEMS BELOW IN ORDER LISTED . . . . . FOR DETAILS, GO TO

1. **Required Test Equipment:**
   Craft Interface Terminal (CIT)
   Wrist Strap

⚠ CAUTION:
When installing software, the CIT-PC software must be the same release or a higher release than the software currently running in the OLS network element.

⚠ CAUTION:
All network elements within a particular OLS must be running the same software release. The CIT-PC software must be the same release as the network elements or a higher release.

NOTE 1:
Disks available includes the 3-½ inch floppies.

NOTE 2:
For a general description on using a personal computer (PC) in the following procedures, refer to **DLP-516**.

Verify that the software package consists of a CIT-PC and INSTALL DISK, several GENERIC and DATA numbered disks, and the appropriate documentation as listed in Table A. —

DO ITEMS BELOW IN ORDER LISTED . . . . . FOR DETAILS, GO TO

Table A — Optical Line System (End Terminal and Repeater)

Optical Line System *Software Release Description* *Release 2.0.0-OLS* *365-575-315*	Comcodes: 107623068 (CIT-PC & Install) 107623076 (Generic & Data)
Optical Line System *Software Release Description* *Release 1.0.0-OLS* *365-575-315*	Comcode 107584468

2. Refer to and perform the appropriate software download procedure (initial installation/ upgrade/change) per the software release description for your particular release. —

Copy Software from One Network Element to Another Network Element

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

1. **Overview:** This procedure is used to copy the software in one OLS network element to another OLS network element through the data communications channel (DCC) residing in the supervisory signal. All of the OLS network elements must be running the same software release. This procedure can be accomplished while the OLS is **in service**.

   Required Test Equipment:
   Craft Interface Terminal (CIT)
   Wrist Strap

   NOTE:
   For a general description on using a personal computer in the following procedure, refer to **DLP-516**.

   If required, connect the craft interface terminal (CIT) to the local OLS network element and condition it. — **DLP-501**

   NOTE:
2. The CIT user must have a "privileged" security level.

   Log in to the CIT using the expert mode by entering `cit expert`. —

3. Verify that there are no active alarms or status conditions by selecting the `FAULT-Retrieve-Alarms (and Status):All` or by pressing function key **F9**. Review the Active Alarms and Status Report and clear any conditions before proceeding with this procedure. —

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
4. At the CIT, select `CONFIGURATION-Retrieve-Map-Network` command to obtain the Network Map Report. An example of this report with a description of the output parameters is provided in Section 11 of this manual.	—
5. Refer to the appropriate software release description from Table A for your particular release and perform the **remote (DCC) download** procedure. The software release description is shipped with the software.	—

Table A — Optical Line System (End Terminal and Repeater)

Optical Line System Software Release Description Release 2.0.0-OLS 365-575-315	Comcodes: 107623068 (CIT-PC & Install) 107623076 (Generic & Data)
Optical Line System Software Release Description Release 1.0.0-OLS 365-575-315	Comcode 107584468

```
Operation: NTP-003---+---DLP-501
                     |---DLP-516
```

Trouble Clearing Task Index

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Clear Local Office Alarm When **NE ACTY** and **FE ACTY** LEDs Are Off	TAP-136
Clear NE ACTY and/or FE ACTY (Regardless of Alarm Level)	TAP-101
Clear No TL1 Response After System Reset (When No Cable Connection Between DTE and External Equipment)	TAP-115
Clear Trouble in CIT (CIT Does Not Respond to Commands)	TAP-128
Clear Trouble Report (of Bad Outgoing Signals From Local Network Element)	TAP-104
Technical Assistance	TAD-100
Restore Network Element Operation After Power Loss	TAP-130

Technical Assistance

Overview: Technical assistance is built on gathering Optical Line System (OLS) information. A local visual inspection of the equipment may be made, but most internal hardware problems are detected and corrected using the craft interface terminal (CIT). A CIT is used to obtain detailed information on the Optical Line System. The CIT retrieves detailed reports about performance monitoring, alarms and status, and configurations for the local and remote OLS network elements.

Trouble Analysis Procedures

The trouble analysis procedures in this document involve replacing faulty circuit packs and obtaining performance reports and/or alarm and status reports for analysis to determine the status of the OLS. If a trouble cannot be corrected, the procedures direct the technician to obtain help. This means that the trouble is of a nature that requires local maintenance engineering or a higher level technical assistance.

RTAC Assistance

The technician must make the decision regarding trouble analysis, corrective action, and obtaining assistance. The technician and the local technical support staff may choose to continue trouble analysis based on their knowledge or experience with the OLS, or they may elect to obtain assistance by calling the Regional Technical Assistance Center **1-800-225-RTAC** in accordance with local procedures.

COACH Assistance

Various customer computer-support tools are on-line and available via COACH. A login identification and password must be obtained to gain access to the COACH tools. The tools consist of a diagnostic dictionary, compatibility data, news and bulletin, and a COACH user's guide. Only the first three tools are mentioned here. Contact your regional account executive for information on obtaining a COACH login.

Diagnostic Dictionary

The Diagnostic Dictionary tool gives the user access to previously detected symptoms, problems, temporary fixes, cautions, and solutions. These may be usable in diagnosing, correcting, or avoiding an OLS problem.

Compatibility Data

The Compatibility Data tool gives the user access to hardware configuration data that is compatible to a user-specified software generic.

News and Bulletin

The News and Bulletin tool allows the user to process News and Bulletin information. News consists of messages that may be of general interest to the user. Bulletins contain information of a more urgent nature.

Circuit Pack Failures

Circuit pack failures are identified by LEDs and reported by OLS network alarms and reports.

Circuit packs are replaced in a specified sequence, but only one circuit pack is replaced at a time. If trouble is not cleared after replacing a circuit pack, the original circuit pack should be reinstalled. This reduces the chances of returning nondefective circuit packs for repair.

Electrostatic Discharge (ESD) Considerations

Any integrated circuit on a circuit pack can be damaged by static electricity that builds up within a work area, particularly in areas with low relative humidity. This static buildup on work surfaces and on personnel and their clothing is produced by the various charging effects of even simple movements and by contact between various objects.

As a rule, the greatest potential for electrostatic damage occurs in areas with the lowest relative humidity. But, because such damage can occur anywhere, all personnel handling circuit packs should take the following precautions:

1. Since materials such as food wrappers, plastics, and Styrofoam containers tend to generate static electricity, keep them away from all circuit packs.

2. Be sure to read all warning labels on bags and cartons before opening any packaging.

3. If possible, open all circuit packs at a static-safe work position using properly grounded wrist straps and table mats that can dissipate static electricity.

4. Whenever possible, wait to remove circuit packs from their protective antistatic packaging until it is time to insert them into a shelf.

5. Never touch a circuit pack's components, conductors, or connector pins. Handle all circuit packs only by the faceplate or latch or by the top and bottom outermost edges.

6. When handling circuit packs (storing, installing, removing, etc.) or when working on backplanes, always wear a grounded wrist strap or wear a heel strap and stand on a grounded, static-dissipating floor mat.

7. Always store and transport circuit packs in static-safe packages. (Shielding is not required unless specified.)

8. When removing a circuit pack from the shelf, immediately put it into a static-safe package.

9. Try to keep relative humidity above 20 percent.

10. OLS network elements are equipped with grounding jacks for connecting the static ground wrist strap. The jacks are located on the user panel and on the filter panel.

11. Keep the electromagnetic interference (EMI)/ESD protective front shelf covers closed at all times. Close the cover immediately after a maintenance procedure such as replacing a circuit pack.

Clear NE ACTY and/or FE ACTY (Regardless of Alarm Level)

Overview: This procedure directs the technician to either the local OLS network element or to a remote OLS network element based on one or more conditions indicated by a lighted **NE ACTY** and/or **FE ACTY** LED(s) at the indicator strip (or user panel). (These conditions may or may not be accompanied by an alarm.)

1. Are both (**NE ACTY** and **FE ACTY** LEDs) lighted at the local indicator strip (or user panel)?

   If **YES**, then continue with Step 4.
   If **NO**, then continue with Step 2.

2. Is the **NE ACTY** LED lighted on the user panel?

   If **YES**, then go to **TAP-102** (the trouble to be cleared is at the local OLS network element).
   If **NO**, then continue with Step 10.

3. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

4. Is the CIT conditioned and connected to the **local OLS network element?**

   If **YES**, then continue with Step 5.
   If **NO**, then complete **DLP-501** and return to this procedure.

5. At the CIT, select `FAULT-Retrieve-Alarms` to obtain an Active Alarms and Status Report (an example is shown in Chapter 11 of this manual.)

6. Are there any local failures?

   If **NO**, then continue with Step 7.
   If **YES**, then go to **TAP-102**.

7. At the CIT, select `FAULT-Retrieve-Network Alarms` to obtain a Network Alarms Report (an example is shown in Chapter 11 of this manual.)

8. ⇒ NOTE 1:
   The Target ID (TID) of the local network element appears at the top of the CIT screen to the left of `LOCAL` (or `LOCAL ONLY`).

   ⇒ NOTE 2:
   If the local TID appears in the Network Alarms Report and is among the group of entries with the highest alarm level, the trouble condition is first cleared at the local network element before proceeding with trouble clearing at another network element.

   Is the **local OLS network element** (TID) in the group with the highest alarm level?

   If **YES**, then go to **TAP-102** (the trouble to be cleared is at the local OLS network element).
   If **NO**, then continue with Step 10.

9. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

10. Are you responsible for maintaining the **remote OLS network element** as well as the **local OLS network element**?

    If **YES**, then continue with Step 14.
    If **NO**, then continue with Step 11.

11. At the CIT, select `FAULT-Retrieve-Network Alarms` to obtain a Network Alarms Report (an example is shown in Chapter 11 of this manual.)

12. ⇒ NOTE:
    The condition to be cleared is at a remote OLS network element.

    Referring to the topmost entry in the Network Alarms Report, issue a Trouble Report to the remote OLS network element by using the `TID` in the `TID` column.

13. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

14. ⇒ NOTE:
The trouble clearing process begins at a remote OLS network element. Remember, when the following procedures refer to the local CIT, that it is really logged in to a remote network element and that any corrective action will apply to the remote OLS network element.

Press the CIT function key **F2**, labeled REMOTE and press RETURN.

15. Were you able to log in to the **remote OLS network element**?
If **YES**, then continue with Step 16.
If **NO**, then continue with Step 18.

16. ⇒ NOTE 1:
You may require assistance at the remote OLS network element to replace a circuit pack(s) or to observe LEDs.

⇒ NOTE 2:
Trouble clearing begins with the topmost entry in the report.

Clear the particular condition at the **remote OLS network element**.
Reference: **TAP-102**

17. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

18. You must travel to the **remote OLS network element** location or obtain assistance at the **remote OLS network element** location to clear the trouble.

19. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Trouble Using Craft Interface Terminal (CIT)

Overview: This procedure is used to clear the conditions listed in the Active Alarms and Status Report in the order listed, from top to bottom, regardless of the indicated alarm severity, date, or time.

1. ⇒ NOTE:
   If at any time during the following procedure you observe that the **PWR ON** light emitting diode (LED) on the addressed shelf is not lit, go to **TAP-119** to restore power to the shelf.

   Is the CIT conditioned and connected to the OLS network element?
   If **YES**, then continue with Step 2.
   If **NO**, then complete **DLP-501** and return to this procedure.

2. At the CIT, select `FAULT-Retrieve-Alarm (and Status):All` to obtain an Active Alarms and Status Report.

3. ⇒ NOTE:
   The report shown below is an example that shows several entries. There may be only one entry in the actual report.

   Record the information in the `Source Address` and the `Description` columns for the topmost entry in the Active Alarms and Status Report.

```
   Delta-1 96-11-08 13:15:15
M  Retrieve-Alarm:All:  COMPLD
   /* Active Alarms and Status Report
   ============================================================
   Alarm     Source    Date    Time                 Srv  Description
   Level     Address   Detected
   ============================================================
   CR        1B-OA     05-19   23:15:41   SA    OA removed
   ------------------------------------------------------------
   MJ        system    05-19   23:15:42   nsa   TID address map full
   ------------------------------------------------------------
   NE ACTY   system    05-19   23:15:42   nsa   incoming supr chnl fail
   */
```

4. Was `env-(1-144)` or `cont-(1-36)`, the `Source Address` recorded in Step 3?

   If **YES**, then go to **TAP-107**.
   If **NO**, then continue with Step 5.

5. Find the `Description` information that was recorded in Step 3 in Table A and go to the referenced TAP.

Table A — Trouble Conditions

Description	Go To TAP
CP reset in progress	TAP-121
CP (unknown type) failure	TAP-123
CP (unknown type) removed	TAP-122
CPYPGM:IP tid	TAP-117
DCC APS data error	TAP-103
DCC startup in progress	TAP-129
DS-NE not reachable	TAP-137
duplicate TID defined	TAP-138
fuse/power failure A	TAP-119
fuse/power failure B	TAP-119
incoming CMS LOF	TAP-110
incoming CMS LOS	TAP-110
incoming CMS SD	TAP-110
incoming CMS SF	TAP-110
incoming (from Supr) DCC failure	TAP-120
incoming optical channel LOS	TAP-110
incoming optical line LOS	TAP-110
incoming supr chnl fail	TAP-110
incoming supr chnl SD	TAP-110
incoming supr chnl SF	TAP-110
inhibit alarms-office alarms	TAP-114
inhibit alarms-parallel telem	TAP-114

Continued on next page

Table A - Trouble Conditions (Contd)

Description	Go To TAP
inhibit alarms-X.25	TAP-114
logins inhibited	TAP-114
multiple DS-NEs defined	TAP-135
NE status comm failure	TAP-118
OA failure	TAP-111
OA removed	TAP-112
OLS system incomplete	TAP-134
OLS system startup in progress	TAP-132
OMU/ODU mismatch or missing	TAP-105
optical line ID mismatch	TAP-109
reset in progress	TAP-124
ser tlm 1 port failure	TAP-139
software download in progress	TAP-131
SYSCTL failure	TAP-113
SYSMEM failure	TAP-113
SYSMEM removed	TAP-133
SYSMEM/SYSCTL code mismatch	TAP-126
SYSMEM unrecognizable code	TAP-125
test alarm in progress	TAP-114
test auto turnup in progress	TAP-114
test telemetry in progress	TAP-114
TL-1 link failure	TAP-106
TLM failure	TAP-111
TLM removed	TAP-112
TOHCTL failure	TAP-111
TOHCTL removed	TAP-112
unexpected CP type	TAP-127

Clear 'DCC APS Data Error'

1. ⇒ NOTE 1:
   This condition applies only to the supervisory channel of optical line 2.

   ⇒ NOTE 2:
   The APS channel (K1 and K2) on the optical line 2 supervisory overhead will be used to control the DCC protection switching. The DCC protection switching is revertive, bidirectional 1X1 switching.

   Determine the location of the transmit TLM circuit pack for optical line 2.

   Reference: **DLP-503**

2. Replace the transmit TLM circuit pack.

   Reference: **DLP-514**

3. Wait 5 minutes for the OLS diagnostics to stabilize. After this time, the `DCC APS data error` condition should be cleared.

4. Obtain another Active Alarms and Status Report. Has the condition cleared?

   If **NO**, then continue with Step 5.
   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

5. ⇒ NOTE:
   Assistance may be required at the receive end of optical line 2 or travel to that location.

   Repeat Steps 1 through 3 except for the receive TLM circuit pack.

6. Obtain another Active Alarms and Status Report. Has the condition cleared?

   If **NO**, then call for technical assistance in the next level of trouble clearing.
   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Trouble Report

Overview: This procedure is used to clear a Trouble Report that was received from a remote location. The remote location is receiving a bad signal or other condition from this local OLS network element.

1. Is the **NE ACTY** LED lighted on the user panel?

   If **YES**, then continue with Step 4.
   If **NO**, then continue with Step 2.

2. Test the LEDs at the local user panel or indicator strip as follows: At the CIT, select `FAULT-Test-LED:All` command, and then execute.

3. Did all the LEDs light?

   If **YES**, then continue with Step 4.
   If **NO**, then go to **TAP-108**.

4. Obtain an Active Alarms and Status Report as follows: At the CIT, select `FAULT-Retrieve-Alarm`, then `ALL` for alarm levels.

5. Are any alarm or status conditions indicated on the report?

   If **YES**, then go to **TAP-102**.
   If **NO**, then continue with Step 6.

6. Does the Trouble Report (received) relate to more than one of the OLS outputs?

   If **YES**, then continue with Step 7.
   If **NO**, then continue with Step 9.

7. ⇒ NOTE:
   The trouble is less likely to be in the outgoing cables than in the internal cable between the receive OA identified in Table A and the ODU.

   Make a visual inspection of the cable between the receive OA and the ODU, and correct any problem(s) found.

   Reference: **DLP-517**

8. Was a problem found with the cable?

   If **YES**, then continue with Step 19.
   If **NO**, then continue with Step 9.

9. Make a visual inspection of ALL outgoing cable(s) and connection(s) and correct any problem(s) found.

   Reference: **DLP-517**

10. Was a problem(s) found with the outgoing cable(s) or connection(s).

    If **YES**, then continue with Step 19.
    If **NO**, then continue with Step 11.

11. Replace the local transmit circuit pack as indicated from the Trouble Report and Table A.

    Reference: **DLP-514**

12. Contact office that issued Trouble Report and determine if the trouble has cleared?

    If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with Step 13.

13. Remove the replacement circuit pack (installed in Step 11) and reinstall the original circuit pack.

    Reference: **DLP-514**

14. ⇒ **NOTE:**
    There is a remote possibility that an `incoming optical channel LOS` condition at the tail-end OA can be associated with an unreported drop in the level of the incoming optical channel at the head-end OA.

    Was the condition that sent you here an `incoming optical channel LOS` condition at the tail-end OA?

    If **YES**, then continue with Step 15.
    If **NO**, then continue with Step 17.

15. Use **TAP-110** to trouble shoot the head-end OA as if there were an active `incoming optical channel LOS` condition at that NE. For example, when **TAP-110** asks if the `incoming optical channel LOS` condition has cleared you will check to see if that condition has cleared at the tail-end OA.

16. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

17. Return a NO TROUBLE FOUND conclusion to the report (no active local alarms or visual problems).

18. ⇒ NOTE:
    OC-48 and/or OC-3 optical lines can be tested by using optical line meters and/or optical time domain reflectometers (OTDR) to help locate a fiber bend or cut. Refer to local operating procedures for further guidance in addressing this condition.

    STOP! YOU HAVE COMPLETED THIS PROCEDURE.

19. Contact office that issued Trouble Report and notify them that a cable problem was found and corrected.

20. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Table A - Failures, Addresses, and Associated Slot (Note)

Failure Condition	Source Address	Associated Slot
incoming optical line LOS	oline-xx	OA XX
incoming optical channel LOS	ochan-xx-y	OA XX
incoming CMS LOP	cms-xx	TLM XX
incoming CMS LOS	cms-xx	TLM XX
incoming CMS SD	cms-xx	TLM XX
incoming CMS SF	cms-xx	TLM XX
incoming supr channel fail	supr-xx	TLM XX
incoming supr channel SD	supr-xx	TLM XX
incoming supr channel SF	supr-xx	TLM XX

Note: For example, an "incoming CMS LOP" condition with a source address of "cms-2a" is associated with slot TLM 2A.

Clear 'OMU/ODU Mismatch or Missing'

Overview: This condition implies an incorrect provisioned OLS end terminal or an incorrect fiber connection at an end terminal. It is very probable the DCC is not functioning between end terminals.

1. ⇒ NOTE:
   Assistance is required at the end terminal having the condition if you are not already physically located there.

   Log in to the OLS end terminal with the `OMU/ODU mismatch or missing` condition.

2. At the CIT, select `SECURITY-Retrieve-Network Element` command to obtain an OLS Provisioning Report.

3. From the report, is the `Direction` parameter provisioned per the office records?

   If **NO**, then continue with Step 4.
   If **YES**, then continue with Step 8.

4. At the CIT, select the `SECURITY-Set-Network Element` command and provision `Direction` to the correct parameter per the office records.

5. Wait 1 minute for the system to stabilize.

6. At the CIT, select `FAULT-Retrieve-Alarms (and Status)` command to obtain an Active Alarms and Status Report.

7. Has the `OMU/ODU mismatch or missing` condition been cleared?

   If **NO**, then continue with Step 8.
   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

8. Open the cabinet door or remove the shelf cover to gain access to the fibers on the front of the circuit packs.

   Reference: **DLP-511**

9. Locate the circuit packs associated with the optical line having the `OMU/ODU mismatch or missing` condition.

   Reference: **DLP-503**

10. Is this end terminal provisioned as the 1A-TX (transmit) or 1A-RCV (receive)?

    If **Transmit**, then continue with Step 11.

    If **Receive**, then continue with Step 14.

11. Verify the ODU is in the correct physical slot.

    Reference: **DLP-503**

12. Check the fiber connections between the OA and TLM circuit packs and make the necessary corrections.

    Reference: **DLP-503**

13. Has the `OMU/ODU mismatch or missing` condition been cleared?

    If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then call for technical assistance in the next level of trouble clearing.

14. Verify the OMU is in the correct physical slot.

    Reference: **DLP-503**

15. Check the fiber connections between the OA and TLM circuit packs and make the necessary corrections.

    Reference: **DLP-503**

16. Has the `OMU/ODU mismatch or missing` condition been cleared?

    If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then call for technical assistance in the next level of trouble clearing.

Address 'TL-1 Link Failure'

1. Does the Active Alarms and Status Report show a controller failure (TOHCTL or SYSCTL circuit pack)?

   If **YES**, then go to **TAP-102**.

   If **NO**, then continue with Step 2.

2. Initiate a Trouble Report to the responsible Operations System stating an incoming TL1 link failure has been detected on this network.

3. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Address Environmental Input and/or Control Output Condition

Overview: If either condition appears in the Active Alarms and Status Report, it indicates that the condition is active. These conditions are provisioned by the customer (user enters the text string). There are one hundred forty-four environmental (input) points and thirty-six control (output) points. (Release 1 has sixteen inputs and four outputs.)

1. Which condition are you to address?

   If **environmental**, then continue with Step 2.
   If **control**, then continue with Step 4.

2. ⇒ NOTE:
   The environmental condition is external to the OLS network element.

   Consult and follow the local maintenance procedures to clear the indicated environmental condition. This condition may be cleared by something as simple as closing a door and completing a contact closure or the resetting of a relay switch, thus clearing the condition.

3. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

4. At the CIT, select `CONFIGURATION-Retrieve-Attribute-Control` to obtain a list of the control outputs.

5. Consult and follow the local maintenance procedures to clear the indicated control condition. The control condition is external to the OLS network element and can be (if required) released by a manual command at the CIT (refer to TAP-114).

6. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Address Missing or Incorrect Response

Overview: You were sent here from another procedure because the OLS Network Element responded in an unexpected manner. This unexpected response was a missing or incorrect LED indication or CIT message.

1. Review, and remember, the unexpected response that sent you to this TAP.

2. Was the unexpected response from an LED or from the CIT?

   If from an **LED**, then continue with Step 3.
   If from the **CIT**, then continue with Step 8.

3. At the CIT, select `FAULT-Test-LED` command.

   Response: All LEDs are lighted for 10 seconds, off for 10 seconds, then they return to their normal condition.

4. Did the LED(s) of interest operate as indicated above?

   If **YES**, then continue with Step 5.

   If **NO**, then continue with Step 12.

5. ⇒ NOTE:
   The LED operation appears to be normal.

   Is the same unexpected response still observed?

   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

   If **YES**, then continue with Step 6.

6. Return to the procedure that sent you here. If the same unexpected response is observed again, contact the appropriate maintenance support organization for further technical assistance.

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

8. At the CIT, select `FAULT-Reset` command.

9. Wait 10 minutes for the Reset to complete. During this time the lighting of LEDs and clicking of relays will be observed.

10. Return to the procedure that sent you here. If the same unexpected response is observed again, contact the appropriate maintenance support organization for further technical assistance.

11. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

12. Replace the circuit pack, indicator strip, user panel, or filter panel containing the LED(s) that did not operate as indicated in Step 4.

    Reference: For Circuit Packs: DLP-514
    For Panels: Drawing ED-7G027-30 or Installation Manual
    For Strip: Drawing ED-6G994-30 or Installation Manual

13. Return to the procedure that sent you here. If the same unexpected response is observed again, contact the appropriate maintenance support organization for further technical assistance.

14. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'Optical Line ID Mismatch'

Overview: The three least significant bits of the K2 byte on the supervisory overhead channel carry the optical line ID. The optical line ID is added via the TLM circuit pack at the transmit end and read at the next receive TLM circuit pack in the optical section. This condition indicates that optical fiber connections in the optical section are incorrect.

1. Check the fiber connections between the TLM and OA circuit packs at the **local** network element and correct if necessary.

   Reference: **DLP-503**

2. Were any fibers incorrectly connected?

   If **NO**, then continue with Step 5.

   If **YES**, then continue with Step 3.

3. At the CIT, select `FAULT-Retrieve-Alarm (and Status)` to obtain an Active Alarms and Status Report.

4. Has the `optical line ID mismatch` condition been cleared?

   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with Step 5.

5. Check the fiber connections between the outside plant fibers and the OA circuit packs at the **local** network element and compare with office records, and correct if necessary.

   Reference: **DLP-503**

6. Were any fibers incorrectly connected?

   If **NO**, then continue with Step 9.

   If **YES**, then continue with Step 7.

7. At the CIT, select `FAULT-Retrieve-Alarm (and Status)` to obtain an Active Alarms and Status Report.

8. Has the `optical line ID mismatch` condition been cleared?

   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then continue with Step 9.

9. Repeat Steps 1 through 8 for the **remote** network element.

10. Replace the TLM circuit packs at the **local** network element.

    Reference: **DLP-514**

11. At the CIT, select `FAULT-Retrieve-Alarm (and Status)` to obtain an Active Alarms and Status Report.

12. Has the `optical line ID mismatch` condition been cleared?

    If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with Step 13.

13. Repeat Steps 10 through 12 at the **remote** network element.

14. At the CIT, select `FAULT-Retrieve-Alarm (and Status)` to obtain an Active Alarms and Status Report.

15. Has the `optical line ID mismatch` condition been cleared?

    If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then call for technical assistance in the next level of trouble clearing.

Address Incoming Signal Failure

NOTE 1:
One of the following incoming signal failures was detected:

```
Incoming CMS LOF (loss of frame)
Incoming CMS LOS (loss of signal)
Incoming CMS SD (signal degrade)
Incoming CMS SF (signal failure)
Incoming optical channel LOS (loss of signal)
Incoming optical line LOS (loss of signal)
Incoming supr chnl fail
Incoming supr chnl SD (signal degrade)
Incoming supr chnl SF (signal failure).
```

NOTE 2:
Multiple incoming optical channel LOS failure conditions can be caused by:

- for the receive direction, optical line power levels that are marginal.
- for the transmit direction, OMU failures, fiber jumper or connector failures between the OMU and OA circuit pack.

1. Refer to the Active Alarms and Status Report and determine the type of incoming signal failure.

2. Open the cabinet door or remove the shelf cover. All connections can be accessed from the front.

   Reference: **DLP-511**

3. **NOTE:**
   The circuit pack associated with the indicated failure condition and indicated `Source Address` is indicated in Table A.

   Make a visual inspection of the incoming signal cable(s) and connection(s) and correct any problems found.

   Reference: **DLP-517**

4. Was an OA circuit pack associated with the incoming failure?

   If **NO**, continue with Step 6.
   If **YES**, continue with Step 5.

5. **CAUTION:**
   Failure to follow instructions in this step could result in service interruptions.

   Notify the person that is responsible for all affected LCTs that have service or protection signals assigned to this OA; (1) to manually switch the service line to a protection line, and (2) ensure that any LCT protection lines that are assigned to this OA are not being used for service.

6. If a visual inspection did not reveal any problems, make an optical measurement on the appropriate incoming fiber.

   Reference: **DLP-500**

7. Was the optical power measurement correct?

   If **NO**, then continue with Step 20.
   If **YES**, then continue with Step 8.

8. Clean and reconnect the incoming fiber.

   Reference: **DLP-510**

9. At the CIT, select `FAULT-Retrieve-Alarms (and Status)` to obtain the Active Alarms and Status Report.

10. Referring to the report obtained in Step 9, is the same incoming signal failure still listed?

    If **YES**, then continue with Step 11.
    If **NO**, then continue with Step 31.

11. **NOTE:**
    The circuit pack associated with the indicated failure condition and indicated `Source Address` is indicated in Table A.

    Replace the receive circuit pack as indicated in the `Source Address` column of the report from Step 9 and Table A.

    Reference: **DLP-514**

12. Obtain another report (as in Step 9). Is the same incoming signal failure still listed?

    If **YES**, then continue with Step 18.
    If **NO**, then continue with Step 13.

13. Did you replace an OA circuit pack in Step 11?

    If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
    If **YES**, then continue with Step 14.

14. Did you replace an end terminal OA circuit pack in Step 11?

    If **NO**, continue with Step 15.
    If **YES**, continue with Step 24.

15. At the CIT, select `PERFORMANCE-Initialize-Optics` command and execute to baseline certain optical parameters on the replacement OA circuit pack.

16. Notify the person that is responsible for all affected LCTs that have service or protection signals assigned to this OA that this Optical Line can now be returned to service.

17. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

18. Remove the replacement circuit pack (installed in Step 11) and reinstall the original circuit pack.

    Reference: **DLP-514**

19. Is the incoming signal failure in the receive line direction or transmit line direction?

    If **receive direction**, then continue with Step 20.
    If **transmit direction**, then continue with Step 22.

20. **NOTE:**
At this point, it appears that the local network element is operating correctly. The trouble is in the line or in the far-end network element.

Initiate a Trouble Report to the source of the failed incoming signal indicating the type of failure. If the source of the failed incoming signal returns a Trouble Report indicating "no trouble found," then contact the appropriate maintenance support organization for further technical assistance before following the prescribed operating procedures to fault isolate the cable/fiber carrying the failed incoming signal.

Reference: **DLP-507**

21. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

22. **NOTE:**
At this point, it appears the trouble is in the local network element.

Visually check and note any problems at the OMU fiber connections including the fiber jumper between the OMU and the transmit OA circuit pack. Contact the appropriate maintenance support organization for further technical assistance before correcting any problems.

23. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

24. Wait 15 minutes for ODU temperatures to stabilize.

25. **NOTE 1:**
At the LCT, use the `PERFORMANCE-Retrieve-PM-Line` command and execute to verify line performance. See Chapter 11 for additional information.

NOTE 2:
For OTUs, you may need to contact the center that monitors the MD1 contact closures on that line to verify line performance.

Monitor all LCTs and OTUs connected to this OLS to verify an error free operation for at least one quarter hour interval (15 minutes).

26. Were any errors detected?

If **NO**, then continue with Step 30.
If **YES**, then continue with Step 27.

27. At the LCT, measure the receive power for each optical channel and install LBOs (new values as required) at the LCT **IN** and ODU **OUT** connectors.

    Reference: **DLP-500** (Replacing end terminal OA)

28. Clean the optical fiber(s) and connector(s).

    Reference: **DLP-510**

29. Connect the optical fibers to the LBOs on the ODU **OCHAN() OUT** and LCT **IN** port.

30. At the CIT, select `PERFORMANCE-Initialize-Optics` command and execute to baseline certain optical parameters on the replacement OA circuit pack.

31. Notify the person that is responsible for all affected LCTs that have service or protection signals assigned to this OA that this Optical Line can now be returned to service.

32. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Table A — Failures, Addresses, and Associated Slot (Note)

Failure Condition	Source Address	Associated Slot
incoming optical line LOS incoming optical channel LOS	oline-{1a-4b} ochan-{1a-4b}-{1-8}	OA 1A,1B,2A,2B,3A,3B,4A,4B
incoming CMS LOF incoming CMS LOS incoming CMS SD incoming CMS SF	cms-{1a,2a,3a,4a} for ET or cms-{1a-4b} for Repeater	End Terminal: TLM 1A/B,2A/B,3A/B,4A/B Repeater: TLM 1A/B,1B/A,2A/B,2B/A, 3A/B,3B/A,4A/B,4B/A
incoming supr channel fail incoming supr channel SD incoming supr channel SF	supr-{1a,2a,3a4a} for ET or supr-{1a-4b} for Repeater	

Note: For example, an "incoming CMS LOF" condition with a source address of "cms-2a" is associated with slot TLM 2A.

Clear 'Circuit Pack Failure'

Overview: This procedure is used to replace a circuit pack with a lighted **FAULT** LED in response to one of these indicated failures:

```
OA failure
TOHCTL failure
TLM failure.
```

NOTE:
A "silent" failure of the TOHCTL circuit pack at the network element sending a failed DCC input or at the network element detecting it is possible.

1. At the CIT, select `FAULT-Retrieve-Alarms (and Status)` command and execute to obtain an Active Alarms and Status Report.

2. **NOTE:**
   The `SYSMEM/SYSCTL code mismatch` or `SYSMEM unrecognizable code` condition may not be listed as the top condition.

   Is the `SYSMEN/SYSCTL code mismatch` or `SYSMEM unrecognizable code` condition listed in the report?

   If **NO**, then continue with Step 3.
   If **YES**, then go to **TAP-102** for that condition and clear it first before returning to this procedure.

3. Are BOTH failures indicated (combination `TLM failure` and `OA failure`)?

   If **NO**, then continue with Step 4.
   If **YES**, then go to **TAP-140**.

4. Identify the appropriate shelf associated with the `circuit pack failure` condition.

   Reference: **DLP-503**

5. Open the cabinet doors or remove shelf cover. All connections can be accessed from the front.

   Reference: **DLP-511**

6. Is the **FAULT** LED lighted on the circuit pack identified in the `Source Address` column (Active Alarms and Status Report)?

   If **YES**, then continue with Step 7.
   If **NO**, then go to **TAP-108**.

7. Is the circuit pack with the lighted **FAULT** LED an OA circuit pack?

   If **NO**, then continue with Step 10.
   If **YES**, then continue with Step 8.

8. Has there been a planned cable intrusion (PCI) activity on the optical line that is indicating the `OA failure`?

   If **NO**, then continue with Step 9.
   If **YES**, then continue with Step 27.

9. **CAUTION:**
   Failure to follow instructions in this step could result in service interruptions.

   Notify the person that is responsible for all affected LCTs that have service or protection signals assigned to this OA; (1) to manually switch the service line to a protection line, and (2) ensure that any LCT protection lines that are assigned to this OA are not being used for service.

10. **NOTE:**
    A series number **S1:2** is the same series number as **S1:4**. The 2 and 4 refer to minor changes within series 1.

    Obtain a replacement circuit pack with the same or a higher series number and install it in place of the circuit pack with the lighted **FAULT** LED. As required, make the appropriate optical connections on the OA or TLM circuit pack(s).

    Reference: **DLP-514**

11. Wait for the time indicated in Table A.

Table A — Mini Reset Waiting Times

CP Inserted	Waiting Time
OA	1 minute
TOHCTL	10 minutes
TLM	1 minute

12. Is the **FAULT** LED lighted on the replacement circuit pack?

    If **YES**, then continue with Step 13.
    If **NO**, then continue with Step 17.

13. Was the circuit pack replaced a TLM circuit pack?

    If **NO**, then go to **TAP-116**.
    If **YES**, then continue with Step 14.

14. Are the fiber jumpers between the **TLM OUT** of the OA circuit pack and the **IN** of the TLM circuit pack properly connected and conditioned?

    If **NO**, then connect or replace the fiber jumper and continue with Step 26.
    If **YES**, then continue with Step 15.

15. Contact the upstream node and have them replace the associated TLM circuit pack on that line and wait 1 minute.

16. At the upstream node, is the **FAULT** LED lighted on the replacement circuit pack?

    If **YES**, then go to **TAP-116**.
    If **NO**, then continue with Step 25.

17. Was an OA circuit pack just replaced (Step 10)?

    If **NO**, then continue with Step 25.
    If **YES**, then continue with Step 18.

18. Was the circuit pack replaced an end terminal receive OA circuit pack?

    If **NO**, then continue with Step 23.
    If **YES**, then continue with Step 19.

19. Wait 15 minutes for the ODU temperatures to stabilize.

20. **NOTE 1:**
    At an LCT, use the `PERFORMANCE-Retrieve-PM-Line` command to verify line performance. See Chapter 11 for additional information.

    NOTE 2:
    For OTUs, you may need to contact the center that monitors the MD1 contact closures on that line to verify line performance.

    Monitor all LCTs and OTUs connected to this OLS to verify an error free operation for at lease one quarter hour interval (15 minutes).

21. Were any errors detected?

    If **NO**, then continue with Step 23.
    If **YES**, then continue with Step 22.

22. Measure optical power and determine correct LBO values for the LCT **RCVR IN** port and ODU **OCHAN() OUT** port.

    Reference: **DLP-500** (Replacing end terminal receive OA)

23. At the CIT, select `PERFORMANCE-Initialize-Optics` command and execute to baseline certain optical parameters on the replacement OA circuit pack.

24. Notify the person that is responsible for all affected LCTs that have service or protection signals assigned to this OA that this Optical Line can now be returned to service.

25. Close the cabinet doors or replace the shelf cover.

    Reference: **DLP-511**

26. Is the **NE ACTY** LED lighted at the user panel?

    If **YES**, then go to **Trouble Clearing: IXL-001**.
    If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

27. ⇒ **NOTE:**
The following steps pertain to the `OA failure` that happened immediately after restoring a disconnected optical line. Traffic is trouble free but some or all of the down stream OA circuit packs indicate a failed state.

Measure the optical power level at the OA **IN** connector for the line and if necessary, install a different LBO.

Reference: **DLP-500**

28. At each downstream node showing an `OA failure` condition, perform a system reset by executing the `FAULT-Reset` command from the CIT.

29. Has all the `OA failure` conditions been cleared?

If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
If **NO**, then call for technical assistance in the next level of trouble clearing.

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Clear 'Circuit Pack Removed'

Overview: This procedure is used to clear one of the conditions below by (1) installing the missing circuit pack or (2) updating the SYSMEM circuit pack to reflect the current equipage:

```
OA removed
TLM removed
TOHCTL removed.
```

1. Identify the appropriate shelf associated with the removed circuit pack.

   Reference: **DLP-503**

2. Open the cabinet door or remove the shelf cover. All connections can be accessed from the front.

   Reference: **DLP-511**

3. Is the indicated slot empty?

   If **YES**, then continue with Step 4.
   If **NO**, then go to **TAP-108**.

4. Do the office records show that the slot should contain a circuit pack?

   If **YES**, then continue with Step 8.
   If **NO**, then continue with Step 5.

5. At the CIT, select `CONFIGURATION-Update` (records the current hardware arrangement in SYSMEM circuit pack).

6. Close the cabinet door or replace the shelf cover.

   Reference: **DLP-511**

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

8. Obtain the missing circuit pack and install it into the appropriate slot. As required, make the appropriate optical connections on the TLM and OA circuit pack(s).
   Reference: **DLP-514**

9. Wait for the time indicated in Table A.

Table A - Mini Reset Waiting Times

CP Inserted	Waiting Time
SYSCTL	15 minutes
SYSMEM	15 minutes
TOHCTL	10 minutes
All Others	1 minute

10. Is the **FAULT** LED lighted on the replacement circuit pack?
    If **YES**, then go to **Trouble Clearing: IXL-001**.
    If **NO**, then continue with Step 11.

11. Was the circuit pack replaced an end terminal receive OA circuit pack?
    If **NO**, then continue with Step 14.
    If **YES**, then continue with Step 12.

12. Measure optical power and determine correct LBO value at LCT.
    Reference: **DLP-500** (Replacing end terminal receive OA)

13. Install correct LBOs at appropriate LCT RCVR IN port and ODU OCHAN() OUT port.
    Reference: **DLP-512**

14. Close the cabinet door or replace shelf cover.
    Reference: **DLP-511**

15. Is the **NE ACTY** LED lighted at the user panel?
    If **YES**, then go to **Trouble Clearing: IXL-001**.
    If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'SYSMEM Failure' or 'SYSCTL Failure'

1. ⚠ CAUTION:
   Do not remove the SYSCTL circuit pack unless instructed to do so by this procedure. If removed, provisioning data (current values) could be lost. Current values were provisioned with the `Set` commands.

   ⇒ NOTE 1:
   The installation of a replacement SYSMEM circuit pack may generate certain unexpected alarm conditions. Ignore these indications until the `code mismatch` condition has been cleared, then clear any remaining condition(s).

   ⇒ NOTE 2:
   This procedure begins with the replacement of the SYSMEM circuit pack even though the SYSCTL circuit pack **FAULT** LED may be lighted.

   Remove the SYSMEM circuit pack and install a replacement circuit pack having the same or a higher series number. For example, an LEA2 with series number **S1:2** is the same series number as **S1:4**. The 2 and 4 refer to minor changes within series 1.

   Reference: **DLP-514**

2. Wait 15 minutes or until the **MJ** LED is off at the user panel, whichever comes first.

3. At the CIT, select `CONFIGURATION-Retrieve-Equipment:SYSCTL` to obtain an Equipage and Version Report.

4. Refer to the Equipage and Version Report and compare the software release stored in SYSMEM [shown under `sysmem-( )` entry in report] with the software release running in the OLS [shown under `sysctl-` entry in report].

5. Are software releases and/or platforms identical?

   If **YES**, then continue with Step 7

   If **NO**, then continue with Step 6.

6. Install identical software into the SYSMEM circuit pack that is running in the OLS.

   Reference: **Operation: NTP-002**

7. At the CIT, select `FAULT-Reset` and execute.

8. Wait 15 minutes or until the **MJ** LED is off at the user panel, whichever comes first. Reset takes approximately 15 minutes but some user panel LEDs flash and relays click in about a minute indicating that reset has started.

9. At the CIT, select `FAULT-Retrieve-Alarm` to obtain an Active Alarm and Status Report.

10. Does the `SYSCTL failure` or `SYSMEM failure` appear under the `Description` column of the report?

    If **YES**, then continue with Step 11.

    If **NO**, then continue with Step 16.

11. Reinstall the SYSMEM circuit pack that was removed in Step 1.

12. ⇒ NOTE:
    For circuit pack and software compatibility, refer to Table 7-1 in Section 7, "Circuit Pack Description."

    Remove the SYSCTL circuit pack and install a replacement circuit pack having the same or a higher series number. For example, an LEA1 with series number **S1:2** is the same series number as **S1:4**. The 2 and 4 refer to minor changes within series 1.

    Reference: **DLP-514**

13. Wait 15 minutes or until the **MJ** LED is off at the user panel, whichever comes first.

14. At the CIT, select `FAULT-Retrieve-Alarm` to obtain an Active Alarm and Status Report.

15. Does a `SYSCTL failure` or `SYSMEM failure` appear under the `Description` column of the report?

    If **YES**, then go to **TAP-116**.

    If **NO**, then continue with Step 16.

16. Is the **NE ACTY** LED off at the user panel?

    If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

    If **NO**, then go to **Trouble Clearing: IXL-001**.

RETRIEVE-SYSTEM (**RTRV-SYS**) —
retrieves network element name and other system level parameters

RETRIEVE-THRESHOLD (**RTRV-TH**) —
retrieves the current threshold level of one or more monitored parameters

RETRIEVE-USER-SECURITY (**RTRV-USER-SECU**) —
retrieves security parameters associated with a login

SET-ATTRIBUTE-ALARM (**SET-ATTR-ALM**) —
sets the values of the incoming signal alarm delay, alarm clear delay interval, and power minor alarm parameters

SET-ATTRIBUTE-CONTROL (**SET-ATTR-CONT**) —
provisions the description of the miscellaneous discrete control outputs

SET-ATTRIBUTE-ENVIRONMENT (**SET-ATTR-ENV**) —
provisions the description of the miscellaneous discrete environmental inputs

SET-ATTRIBUTE (**SET-ATTR-rr**) —
sets notification code associated with incoming signal failure events

SET-PERFORMANCE MONITORING-START TIME (**SET-PM-STIME**)* —
sets the start time for measuring all 24-hour performance monitoring parameters

SET-SITE ID (**SET-SID**) —
sets the target identifier (TID) of the network element

SET-THRESHOLD (**SET-TH**) —
sets the current threshold level of one or more monitored parameters

UPDATE-SYSTEM (**UPD-SYS**) —
updates the state of all the automatically provisioned parameters

The X.25/TL1 interface (X.25) is located on the interconnection panel of the End Terminal Shelf and Repeater Shelf. Refer to Section 3, "Platform Description," for more information about the physical location of the X.25/TL1 interface.

Refer to 824-102-176, *Optical Line System (OLS), Operations Systems Engineering Guide*, for detailed information about the X.25/TL1 interface and TL1 message/command descriptions.

* Available in Release 2 and later releases.

Orderwire Interface

The orderwire and section user channel interfaces provide a facility for voice communications between adjacent network elements for maintenance personnel to perform facility maintenance. The End Terminal Shelf and Repeater Shelf provide the following channels per optical line and per direction for customer use:

- 64-kb/s line orderwire (SONET E2 byte)
- 64-kb/s section orderwire (SONET E1 byte)
- 64-kb/s section user channel (SONET F1 byte).

The line orderwire, section orderwire, and section user channel interfaces are EIA-422.

The End Terminal Shelf can provide up to a maximum of 3 channels (2 orderwire and 1 user channel) per optical line for customer use. The Repeater Shelf can provide up to a maximum of 3 channels (2 orderwire and 1 user channel) per optical line and per direction for customer use.

The line orderwire (LINE ORDERWIRE), section orderwire (SECTION ORDERWIRE), and section user channel (SECTION USER CHAN) interfaces are located on the interconnection panel of the End Terminal Shelf and Repeater Shelf. Refer to Section 3, "Platform Description," for more information about the physical location of the line and section orderwire interfaces.

Standard equipment can be connected to the orderwire interface. For example, a *DANTEL** orderwire shelf may be used with the Optical Line System. The orderwire and user channel interfaces provide channels for voice communications on a point-to-point basis between Optical Line System End Terminals and/or Optical Line System Repeaters. Each orderwire and user channel interface† provides a balanced pair for the following signals:

- Transmit clock
- Transmit frame
- Receive clock
- Receive frame
- Receive data

The user must provide a balanced pair for the transmit data signal.

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* Registered trademark of DANTEL Incorporated.

† The transmit and receive directions are not necessarily synchronized with each other. The phase and frequency will differ. The receive clock and frame signals are recovered from the incoming OC-48 signal. The transmit clock and frame signals are derived locally or derived from the incoming customer maintenance signal.

Clear No TL1 Response After System Reset (When No Cable Connection Between DTE and External Equipment)

Overview: This procedure is used to clear trouble in the TL1 DTE port caused by executing a reset with no cable connections between DTE and external equipment.

1. At the CIT, use the `Set-Security-Port` command to provision the port type of the DTE port to "`cit`".

2. Use the `Set-Security-Port` command to provision the port type of the DTE port to "`tl1`".

3. Does the DTE port now respond to valid TL1 messages?

   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then refer the trouble to the next level of support.

Clear Unsuccessful Circuit Pack Replacement

Overview: Only use this procedure in the unlikely event that you were sent here by another procedure (for example, **TAP-123**) because a circuit pack replacement did not clear the associated failure indicator(s). This procedure is used to replace other circuit packs that could possibly cause such a failure indication(s).

1. NOTE 1:
   A series number **S1:2** is the same series number as **S1:4**. The 2 and 4 refer to minor changes within series 1.

   NOTE 2:
   In this procedure, the circuit pack that first indicated "failed" is called the ***original circuit pack***. The replacement circuit pack that did not clear the failure is called the ***original replacement circuit pack*** (same type of circuit pack). If the failure still exists, then one or more circuit packs which are called ***alternative replacement circuit packs*** are substituted.

   NOTE 3:
   The Equipage and Version Report generated by the `CONFIGURATION-Retrieve-Equipment` command indicates an `alternative CP` to be used when replacing the circuit pack identified in the Active Alarms and Status Report failed to clear the trouble indication.

   At the CIT, select `CONFIGURATION-Retrieve-Equipment` to obtain an Equipage and Version Report.

2. NOTE:
   If there is no alternative circuit pack given, you should contact the appropriate maintenance support organization for technical assistance before proceeding with other trouble clearing procedures.

   Referring to the entry in the Equipage and Version Report for the circuit pack just replaced, note the type and slot address of the ***alternative circuit pack*** (shown as `alternative CP` in the report).

3. Obtain a circuit pack of the type identified in Step 2 and install it in the slot address identified in Step 2.

   Reference: **DLP-514**

4. Wait for the time indicated in Table A.

Table A - Mini Reset Waiting Times

CP Inserted	Waiting Time
SYSCTL	15 minutes
SYSMEM	15 minutes
TOHCTL	10 minutes
All Others	1 minute

5. Is the **FAULT** LED on the ***original replacement circuit pack*** lighted?

   If **YES**, then continue with Step 6.
   If **NO**, then continue with Step 13.

6. Remove the ***alternative replacement circuit pack*** and reinstall the circuit pack that was removed in Step 3.

7. Wait for the time indicated in Table A.

8. Is the **FAULT** LED still lighted on the ***original replacement circuit pack*** (that sent you to this procedure)?

   If **YES**, then continue with Step 9.
   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

9. ⇒ NOTE:
   The failure could possibly be due to a broken or bent backplane pin.

   Remove the ***original replacement circuit pack*** and carefully examine its backplane connector for a broken backplane pin. In the same way, examine the backplane connectors on the ***alternative replacement circuit pack*** and the ***original circuit pack***.

10. Was a broken pin found in the connector of any of the three circuit packs examined in Step 9?

    If **YES**, then continue with Step 16.
    If **NO**, then continue with Step 11.

11. Obtain a suitable light source and examine the backplane behind the circuit pack removed in Step 9.

12. ⚠ CAUTION:
    *Do not put the **original circuit pack*** back into the NE.

    Is there a broken or bent pin in the backplane?

    If **YES**, then continue with Step 16.
    If **NO**, then reinstall the ***original replacement circuit pack*** that was removed in Step 9 and go to **TAP-108**.

13. ⇒ NOTE:
    The remaining steps help prevent returning nondefective circuit packs for repair.

    Reinstall the ***original circuit pack*** (that sent you to this procedure).

14. Wait for the time indicated in Table A.

15. Is the **FAULT** LED still lighted on the ***original circuit pack***?

    If **YES**, then go to **TAP-108**.
    If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

16. The trouble is most likely due to the broken or bent backplane pin(s). Repair the broken or bent pin(s) per the instructions in Appendix A of this document, or refer the trouble to the next level of technical support for assistance.

17. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'CPYPGM:IP (tid) '

1. ⇒ NOTE 1:
   This condition means that software is being copied from this OLS network element to the OLS network element whose target identification (TID) appears in the message.

   ⇒ NOTE 2:
   The software download is performed in the background (about 10 minutes) and is from one SYSMEM circuit pack to another SYSMEM circuit pack. Up to three downloads can occur simultaneously.

   ⇒ NOTE 3:
   You **cannot cancel** the background download **once it is initiated**.

   If desired, you may perform other CIT-PC activities during this time, for example, checking the status of the download [use the `FAULT-Retrieve-Alarm (and Status)` command].

   If an error message appears on the screen during the background download, reinitiate the software download per **Operation: NTP-003**.

2. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'NE Status Comm Failure'

Overview: This condition could arise from situations such as (1) the Directory Service Network Element (DSNE) is not reachable, (2) one or more nodes are not reachable because of a supervisory channel failure, or (3) an alarm gateway network element (AGNE) was not provisioned for the alarm group. Remember, that for this procedure, a network element (NE) and a node are interchangeable.

1. ⇒ NOTE 1:
   This procedure assumes that you are logged into the NE with the `NE status comm failure` condition.

   ⇒ NOTE 2:
   This condition is complicated because it may be caused by other trouble conditions; therefore, these other conditions must be cleared first. If you obtain any reports, one or all may be inaccurate (not up-to-date).

   At the CIT, select `FAULT-Retrieve-Alarms` command and execute to obtain an Active Alarms and Status Report.

2. ⇒ NOTE:
   The `SYSMEM/SYSCTL code mismatch` or `SYSMEM unrecognizable code` condition may not be listed as the top condition.

   Is the `SYSMEN/SYSCTL code mismatch` or `SYSMEM unrecognizable code` condition listed in the report?

   If **NO**, then continue with Step 3.
   If **YES**, then go to **TAP-102** for that condition and clear it first before returning to this procedure.

3. Is an `OMU/ODU mismatch or missing` condition shown on the report?

   If **YES**, then go to **TAP-105**, clear the condition, and return to this procedure.
   If **NO**, then continue with Step 4.

4. Is an `optical line ID mismatch` condition shown on the report?

   If **YES**, then go to **TAP-109**, clear the condition, and return to this procedure.
   If **NO**, then continue with Step 5.

5. Is a `TOHCTL failure` condition shown on the report?

   If **YES**, then go to **TAP-111**, clear the condition, and return to this procedure.
   If **NO**, then continue with Step 6.

6. Is a `DS-NE not reachable` condition shown on the report?

   If **NO**, then continue with Step 7.
   If **YES**, then clear this condition first (refer to **TAP-137**). Wait 5 minutes for condition to stabilize, and return to this procedure.

7. Wait 5 minutes for condition to stabilize.

8. Obtain another Active Alarms and Status Report. Is the `NE status comm failure` condition still shown?

   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
   If **YES**, then continue with Step 9.

9. At the CIT, select `CONFIGURATION-Retrieve-Map-Network` command and execute to obtain a Network Map Report.

10. ⇒ **NOTE:**
    Each NE has a provisionable alarm group value (default value is 255).

    From the report in Step 9, determine the alarm group value for this NE (the NE with the `NE status comm failure` condition.)

11. Determine from office records which NE is designated as the AGNE for the alarm group.

12. Log in to the node that should be the AGNE, if required. If a remote login is required and you need additional help, refer to **DLP-518**.

13. At the CIT, select `SECURITY-Retrieve-Network Element` command and execute to obtain an OLS System Provisioning Report.

14. From the report in Step 13, determine the value of the `Alarm Group`.

15. Does the alarm group value match the value in the office records?
    If **NO**, then continue with Step 16.
    If **YES**, then continue with Step 18.

16. At the CIT, select `SECURITY-Set-Network Element` command to provision the `Alarm Group` to the correct value.

17. Wait 2 minutes for the system to stabilize (condition will clear).

18. From the report (Step 13), determine if this node is provisioned to `Yes` for the `Alarm Gateway NE`.

19. Is the `Alarm Gateway NE` from the report (Step 13) match that in the office records?
    If **NO**, then continue with Step 20.
    If **YES**, then continue with Step 23.

20. At the CIT, select `SECURITY-Set-Network Element` command to provision the `Alarm Gateway NE` to `Yes`.

21. Wait 2 minutes for the system to stabilize (condition will clear).

22. If you wish to verify the provisioning, obtain another OLS System Provisioning Report (use `SECURITY-Retrieve-Network Element`).

23. At the CIT, select `FAULT-Retrieve-Alarm` command and execute to obtain an Active Alarms and Status Report.

24. Is a trouble condition listed in the `Descriptive` column of the report?
    If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
    If **YES**, then call for technical assistance in the next level of trouble clearing.

Clear 'Fuse/Power Failure'

Overview: This procedure is used to clear a fuse/power failure by replacing a blown fuse (lighted) at the top of the bay, by clearing a voltage supply problem at the battery distribution and fuse bay (BDFB), or by replacing a failed power filter on a shelf.

⚠ CAUTION:
Do not press non-lighted fuses. This may cause momentary power failure on that fuse's power feed.

NOTE:
Contact the maintenance support organization before proceeding if a failure of both fuses (A and B) or both power feeders (A and B) to a bay exists.

1. Is a fuse lighted (blown) at the top of the bay?

   If **YES**, then continue with Step 2.
   If **NO**, then continue with Step 4.

2. NOTE:
   The fuse cap lamp is a fuse status indicator (Comcode 407411719). The cap lamp works correctly when it is fully engaged and the fuse retainer is locked in place. If the lamp lights in any other position, it may incorrectly indicate a bad fuse.

   Replace the lighted fuse with a new fuse (Comcode 405749920).

   Reference: **DLP-515**

3. Did the fuse blow (light) again?

   If **YES**, then continue with Step 11.
   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

4. Are all User Panel LEDs extinguished?

   If **YES**, then continue with Step 6.
   If **NO**, then continue with Step 5.

5. Is the **MJ** LED on?

   If **YES**, then continue with Step 8.
   If **NO**, then continue with Step 11.

6. ⇒ NOTE:
   Both power feeder cables are NOT supplying voltage to the bay that has its **PWR** LEDs off.

   Check at the BDFB or equivalent and correct the voltage supply problem.

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

8. ⇒ NOTE:
   One power feeder cable is NOT supplying voltage to a bay.

   At the CIT, select `FAULT-Retrieve-Alarm` command and execute to obtain a report.

9. Determine from the report, which power feeder cable is dead and correct the voltage supply problem at the BDFB or equivalent.

10. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

11. ⚠ CAUTION:
    Steps 11 through 13 requires a voltage measurement at the power filter. The filter associated with feeder A is located above the filter associated with feeder B.

    Remove the faceplate to the User Panel or Fuse Panel on the shelf associated with the lighted fuse or power failure. Notice that the -48V filter associated with the A feeder has red/black power cable connections and is above the power filter associated with the B feeder on the shelf which has gray/slate power cable connections.

12. Measure the voltage at the rear of the appropriate fuse.

13. Does the voltage measure between -42.75 and -60 volts?

    If **YES**, then continue with Step 16.
    If **NO**, then continue with Step 14.

14. Visually check within the bay for a loose connection or a shorted power cable between the power distribution panel and the shelf with the failure.

15. Was a problem found?

    If **YES**, then correct the problem and notify Technical Support.
    If **NO**, then continue with Step 16.

16. ⚠ CAUTION:
    Steps 16 through 20 requires replacement of a power filter. Replacing the wrong power filter will interrupt power to the shelf that is providing service.

    Contact Technical Support and indicate that you are about to start replacing a power filter on a shelf.

17. Replace the appropriate filter on the appropriate shelf. For example, if fuse A is blown on a shelf, replace the top filter on the shelf.

    Reference: **DLP-522**

18. Did the `fuse/power failure ( )` clear?

    If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then continue with Step 19.

19. Contact Technical Support that you are checking and may replace a panel attributing to other potential shelf troubles as follows:

    - If the shelf has power but the **PWR ON** LED is off, then replace the User Panel, Power Indicator Panel, or Filter Panel.

      Reference: **Drawing ED-7G027-30, G1** User/Fuse Panel
      Reference: **Drawing ED-7G028-30, G1** Shelf Assembly

    - If the User Panel on the Switch Fabric shelf No. 1 has any other defective LEDs, replace that panel.

      Reference: **Drawing ED-7G027-30, G1** User/Fuse Panel.
      Reference: **Drawing ED-7G028-30, G1** Shelf Assembly

20. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'Incoming (From Supr) DCC Failure'

1. ⇒ **NOTE:**
   Failure of the incoming data communications channel (DCC) is usually associated with hardware failure(s) at the source of the incoming supervisory signal or with other troubles involving the incoming supervisory signal from that source.

   At the CIT, select `FAULT-Retrieve-Alarms` to obtain the Active Alarms and Status Report.

2. Referring to the report obtained in Step 1, are there any conditions other than `incoming (from Supr) DCC failure`?

   If **YES**, then continue with Step 3.
   If **NO**, then continue with Step 6.

3. Referring to the report obtained in Step 1, identify the topmost condition other than the `incoming (from Supr) DCC failure`.

4. ⇒ **NOTE 1:**
   While following the instructions in the procedure(s) to which you will now be sent, you MUST ignore the `incoming (from Supr) DCC failure` in the Active Alarms and Status Report. For example, if you are asked whether there are any alarm or status conditions listed and the only condition shown in the report is `incoming (from Supr) DCC failure` the answer is NO.

   ⇒ **NOTE 2:**
   After clearing the condition identified in Step 3, continue the trouble clearing procedure using TAP-102 at the network element that initially reported the `incoming (from Supr) DCC failure` condition.

   Find the condition identified in Step 3 in Table A of **TAP-102** and go to the indicated TAP to clear that condition [ignoring the `incoming (from Supr) DCC failure` condition throughout the remainder of the trouble clearing procedure].

5. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

6. ⇒ NOTE:
   The source of the failed DCC input may be the upstream OLS network element.

   From office records, determine which network element is upstream of the failed DCC input.

7. ⇒ NOTE:
   You may not be able to remotely log in to the network element sending the failed DCC input. If you cannot log in to that network element, you will need assistance there to continue with this procedure.

   At the source of the failed DCC input, use the CIT to obtain an Active Alarms and Status Report.

8. ⇒ NOTE:
   It is possible that an `incoming (from Supr) DCC failure` will also be observed at this network element. If so, you MUST ignore the `incoming (from Supr) DCC failure` condition in the Active Alarms and Status Report.

   Referring to the report obtained in Step 7, are there any conditions other than `incoming (from Supr) DCC failure` listed?

   If **YES**, then continue with Step 9.
   If **NO**, then continue with Step 12.

9. Referring to the report obtained in Step 7, identify the topmost condition other than the `incoming (from Supr) DCC failure` condition.

10. ⇒ **NOTE 1:**
While following the instructions in the procedure(s) to which you will now be sent, you MUST ignore the `incoming (from Supr) DCC failure` condition in the Active Alarms and Status Report. For example, if you are asked whether there are any alarm or status conditions listed and the only condition shown in the report is `incoming (from Supr) DCC failure`, the answer is NO.

⇒ **NOTE 2:**
After clearing the condition identified in Step 9, continue the trouble clearing procedure using TAP-102 at the network element that initially reported the `incoming (from Supr) DCC failure` condition.

Find the condition identified in Step 9 in Table A of TAP-102 and go to the indicated TAP to clear that condition [ignoring the `incoming (from Supr) DCC failure` condition throughout the remainder of the trouble clearing procedure].

11. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

12. ⇒ **NOTE:**
The `incoming (from Supr) DCC failure` is possibly due to a "silent" failure of the TOHCTL circuit pack at the network element sending the failed DCC input or at the network element detecting it.

At the CIT, select `CONFIGURATION-Retrieve-Equipment:OHCTL` command and execute for the upstream node identified in Step 6.

13. From the report, replace the OHCTL circuit pack for the line associated with the failed DCC output.

Reference: **DLP-514**

14. Wait 10 minutes for the TOHCTL circuit pack to reboot.

15. Is the `incoming (from Supr) DCC failure` condition still reported at the network element where it was initially detected?

    If **YES**, then continue with Step 16.

    If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

16. At the network element that originally reported the `incoming (from Supr) DCC failure` condition, replace the TOHCTL circuit pack for the line associated with the failed DCC output.

17. Wait 10 minutes for the circuit pack to reboot.

18. Is the `incoming (from Supr) DCC failure` condition still reported at the network element where it was initially detected?

    If **YES**, then continue with Step 22.

    If **NO**, then continue with Step 19.

19. At the network element identified in Step 6, return the original TOHCTL circuit pack to service by removing the replacement circuit pack and installing the original TOHCTL.

20. Wait 10 minutes for the TOHCTL circuit pack to reboot.

21. Is the `incoming (from Supr) DCC failure` condition still reported at the network element where it was initially detected?

    If **YES**, then continue with Step 22.

    If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

22. Consult the appropriate maintenance support organization for further technical assistance.

23. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

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Address 'CP Reset In Progress'

1. ⇒ NOTE:
   When a circuit pack is installed, it is downloaded with the necessary software. While this is occurring, the `CP reset in progress` condition will be active.

   Find the circuit pack with the `CP reset in progress` condition in Table A and wait for the indicated time.

Table A - Circuit Pack Reset Time

Circuit Pack	Time
SYSCTL	15 minutes
SYSMEM	15 minutes
TOHCTL	10 minutes
All Others	1 minutes

2. At the CIT, select the `FAULT-Retrieve-Alarm` and execute to obtain another Active Alarms and Status Report.

3. Is the `CP reset in progress` condition still indicated for the same circuit pack?

   If **YES**, then go to **TAP-108**.

   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'CP (Unknown Type) Removed'

1. ⇒ NOTE:
   The `Source Address` of the removed circuit pack is shown in the Active Alarms and Status Report.

   Identify the appropriate shelf associated with the removed circuit pack.

   Reference: **DLP-503**

2. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.

   Reference: **DLP-511**

3. Is the indicated slot empty?

   If **YES**, then continue with Step 4.
   If **NO**, then go to **TAP-108**.

4. Do office records show that the slot should contain a circuit pack?

   If **YES**, then continue with Step 8.
   If **NO**, then continue with Step 5.

5. At the CIT, select `CONFIGURATION-Update` (records the current hardware arrangement in SYSMEM circuit pack).

6. Close the cabinet doors or replace the shelf cover.

   Reference: **DLP-511**

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

8. Obtain the type of circuit pack determined from office records and install it in the appropriate slot. As required, make the appropriate optical connections on the OA or TLM circuit pack(s).

   Reference: **DLP-514**

9. Wait for the time indicated in Table A.

Table A - Mini Reset Waiting Times

CP Inserted	Waiting Time
SYSCTL	15 minutes
SYSMEM	15 minutes
TOHCTL	10 minutes
All Others	1 minute

10. Is the **FAULT** LED lighted on the replacement circuit pack?

    If **YES**, then replace shelf cover and go to **Trouble Clearing: IXL-001**.
    If **NO**, then continue with Step 11.

11. Close the cabinet doors or replace the shelf cover.

    Reference: **DLP-511**

12. Is the **NE ACTY** LED lighted at the user panel.

    If **YES**, then go to **Trouble Clearing: IXL-001**. If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'CP (Unknown Type) Failure'

1. If the affected circuit pack was just installed, wait for the time indicated in Table A to allow the software in the affected circuit pack to start up.

Table A - Mini Reset Waiting Times

CP Inserted	Waiting Time
SYSCTL	15 minutes
SYSMEM	15 minutes
TOHCTL	10 minutes
All Others	1 minute

2. ⇒ NOTE 1:
   The circuit pack in the indicated slot has failed, but its type is unknown to the software. The type or code appears on the circuit pack faceplate.

   ⇒ NOTE 2:
   Section 3, "Platform Descriptions," lists the circuit pack codes that are supported by the slot for a particular shelf. Also listed is the compatible software for the particular circuit pack code.

   Consult office records to determine the type of circuit pack to be installed in the slot.

3. Obtain and install a replacement circuit pack determined in Step 2. As required, make the appropriate optical connections on the OA or TLM circuit pack(s).

   Reference: **DLP-514**

4. Wait for the time indicated in Table A for the download of software.

5. Did the **FAULT** LED on the replacement circuit pack go off?

   If **YES**, then continue with Step 6.
   If **NO**, then go to **TAP-116**.

6. Is the **NE ACTY** LED lighted?

   If **YES**, then go to **Trouble Clearing: IXL-001**.
   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Address 'Reset in Progress'

1. ⇒ NOTE:
   A software reset is in progress. This involves downloading software from SYSMEM to SYSCTL, and to TOHCTLs and to board controllers on all other circuit packs. This can take as long as 10 minutes. During this time, the miscellaneous discrete control points are deactivated.

   Is the **MJ** LED lighted?

   If **YES**, then wait 10 minutes before proceeding with Step 2.

   If **NO**, then continue with Step 5.

2. At the CIT, select `FAULT-Retrieve-Alarm` to obtain an updated Active Alarm and Status Report.

3. Is `reset in progress` still reported?

   If **YES**, then continue with Step 4.

   If **NO**, then continue with Step 7.

4. Wait 10 minutes or until the **MJ** LED is off at the user panel.

5. At the CIT, select `FAULT-Retrieve-Alarm` to obtain updated Active Alarm and Status Report.

6. Is `reset in progress` still reported?

   If **YES**, then go to **TAP-108**.

   If **NO**, then continue with Step 7.

7. Is the **NE ACTY** LED lighted?

   If **YES**, then go to **Trouble Clearing: IXL-001**.

   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'SYSMEM Unrecognizable Code'

Overview: The software code stored in the nonvolatile memory of the SYSMEM circuit pack is corrupted or its version is not recognized by the SYSCTL circuit pack. The recommended way to clear this condition is to download new software code from the CIT to the SYSMEM circuit pack. Another way to clear this condition is to install a replacement SYSMEM circuit pack loaded with the correct code.

1. At the CIT, select `CONFIGURATION-Retrieve-Equipment:sysctl` to obtain an Equipage and Version Report.

2. Refer to the report and record the software release information from the line immediately under the `sysctl` entry. For example, `OLS RELEASE 1.0.0`. This software release is now running in the SYSCTL circuit pack.

3. Do you want to download new software or replace the SYSMEM circuit pack?

   To **download new software**, go to **OPERATION: NTP-002**.
   To **replace the SYSMEM circuit pack**, continue with Step 4.

4. Open the cabinet door or remove the shelf cover. All connections can be accessed from the front.

5. Is the **FAULT** LED flashing at the SYSMEM circuit pack?

   If **YES**, then continue with Step 6.
   If **NO**, then go to **TAP-108**.

6. Obtain a replacement SYSMEM circuit pack containing an exact copy of the software identified in Step 2.

7. ⇒ NOTE:
   The installation of a replacement SYSMEM circuit pack may generate certain unexpected alarm conditions. Ignore these indications until the `code mismatch` condition has been cleared, then clear any remaining condition(s).

   Remove the SYSMEM circuit pack and install the replacement SYSMEM circuit pack.

   Reference: **DLP-514**

8. Wait several minutes for the OLS to stabilize (indicated by the **FAULT** LED on the SYSMEM circuit pack being continuously lighted, flashing, or off.)

9. Is the **FAULT** LED continuously lighted on the SYSMEM circuit pack?

   If **YES**, then continue with Step 10.
   If **NO**, then continue with Step 12.

10. Is a second replacement SYSMEM circuit pack available?

    If **YES**, then continue with Step 11.
    If **NO**, then continue with Step 13.

11. Replace the SYSMEM circuit pack with the second replacement SYSMEM circuit pack (loaded with an exact copy of the software identified in Step 2.)

    Reference: **DLP-514**

12. Is the **FAULT** LED flashing on the SYSMEM circuit pack?

    If **YES**, then go to **TAP-108**.
    If **NO**, then continue with Step 15.

13. Reinstall the original SYSMEM circuit pack.

    Reference: **DLP-514**

14. Install new software (same release as currently running in the SYSCTL circuit pack).

    Reference: **Operation: NTP-002**.

15. Close the cabinet door or replace the shelf cover.

    Reference: **DLP-511**

16. Is the **NE ACTY** LED lighted at the user panel?

    If **YES**, then go to **Trouble Clearing: IXL-001**.
    If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'SYSMEM/SYSCTL Code Mismatch'

Overview: The software code stored in the nonvolatile memory of the SYSMEM circuit pack is different from the current code running in the SYSCTL circuit pack. The OLS network element is currently functioning from the code running in the SYSCTL circuit pack. The 'SYSMEM/SYSCTL code mismatch' condition will be cleared by one of the following actions:

- by executing `Reset` that causes the SYSMEM circuit pack to download code to the SYSCTL circuit pack.
- by downloading the code from diskettes via the CIT to the SYSMEM circuit pack.
- by performing a remote (DCC) download procedure that will copy code from another network element.

NOTE:
During the duration of the code mismatch, a major indication will exist at the control panel. Ignore this indication until the code mismatch condition has been cleared, then clear any remaining trouble conditions.

1. At the CIT, select `CONFIGURATION-Retrieve-Equipment:sysctl` to obtain an Equipage and Version Report.

2. Refer to the report and record the software release information from the line immediately under the `sysctl` entry; for example, `OLS RELEASE 1.0.0-OLS`. This software release is now running in the SYSCTL circuit pack.

3. Refer to the report and record the software release information from the line immediately under the `sysmem` entry; for example, `OLS RELEASE 1.0.0-OLS`. This software release is stored in the nonvolatile memory of the SYSMEM circuit pack.

4. Are the software releases and/or platforms recorded in Steps 2 and 3 different from each other?

   If **YES**, then continue with Step 5.

   If **NO**, then go to **TAP-108**.

5. Determine which of the two software releases is supposed to be running in the OLS network element.

6. Is the software release running in the SYSCTL (software release recorded in Step 2) supposed to be running in this OLS network element?

   If **YES**, then continue with Step 11.
   If **NO**, then continue with Step 7.

7. Is the software release running in the SYSMEM (software release recorded in Step 3) supposed to be running in this OLS network element?

   If **YES**, then continue with Step 8.
   If **NO**, then continue with Step 11.

8. At the CIT, select `FAULT-Reset` and execute. During the reset time, the miscellaneous discrete control points will be deactivated.

9. Wait 15 minutes or until the **MJ** LED is off at the user panel.

10. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

11. Is the correct software release running in a remote OLS network element and is the DCC connection good to that network element?

    If **YES**, then go to **OPERATION: NTP-003** to copy software.
    If **NO**, then go to **OPERATION: NTP-002** to install software.

12. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'Unexpected CP Type'

Overview: The `unexpected CP type` condition is issued whenever the OLS software detects a difference between what it expects in a circuit pack (CP) slot and which CP is actually in the slot. This condition is normally cleared by correcting the difference (wrong CP type or incomplete records).

1. At the CIT, select `CONFIGURATION-Retrieve-Equipment:All` to obtain the Equipage and Version Report.

2. Determine from office records the correct CP type for the slot in question.

3. Compare the Equipage and Version Report with the office records and determine which indicates the correct CP type.

4. Is the correct CP actually plugged into the slot?

   If **YES**, then continue with Step 5.
   If **NO**, then continue with Step 7.

5. At the CIT, select `CONFIGURATION-Update` to update the network element.

6. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

7. Obtain the correct CP type according to office records.

8. If required, open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.

   Reference: **DLP-511**

9. Remove the incorrect CP type from the slot and insert the correct CP type.

   Reference: **DLP-514**

10. Close the cabinet doors or replace the shelf cover.

    Reference: **DLP-511**

11. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Trouble In CIT (CIT Does Not Respond to Commands)

Overview: This procedure is used to clear trouble within the Craft Interface Terminal (CIT) such as a software hang-up or a malfunction.

1. Was a notice frame (warning message) displayed on the CIT?

   If **YES**, then follow the instructions displayed on the screen and press `F1 HELP` key or ask for technical assistance from your OLS administrator.

   If **NO**, then continue with Step 2.

2. ⇒ NOTE:
   Some keys on the keyboard may be locked up (inoperative).

   Press function key **F5**, labeled `EXIT`.

3. Wait 1 minute or until the PC prompt (typically **C:\>**) is displayed.

4. Are the keys on the keyboard operative?

   If **YES**, then continue with Step 7.
   If **NO**, then continue with Step 5.

5. Perform a hard boot on the PC by pressing the "RESET" switch or by turning the power switch off and then back on.

6. Did the PC reboot (**C:\>** is displayed)?

   If **YES**, then continue with Step 7.
   If **NO**, then replace the PC.

7. Start the CIT software (change to directory where software is located, enter `cit` or `cit expert`, and press RETURN).

8. Is the OLS CIT-PC software running?

   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then go to Step 9.

9. Are you logged into a CIT port that is provisioned for TL1 messages?

   If **YES**, then go to Step 10.
   If **NO**, then go to **Operation: NTP-002**.

10. Use one of the following methods to reset a DCE port back to CIT if a TL1 function was selected in error:

    - Have the Alarm Center change the DCE port to CIT via a remote TL1 command.
    - Have another remote NE log in to this terminal and select `SECURITY-Set-Security-Port (DCE)-Port Type (CIT).`
    - Using a null modem (see DLP-520, Figure 5) and a gender changer, connect your PC to the DTE port. Then select `SECURITY-Set-Security-Port (DCE)-Port (CIT).`

11. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'DCC Startup In Progress'

1. ⇒ NOTE:
   The data communication channel (DCC) is starting up. This interaction between the OLS network elements takes from 10 to 15 minutes.

   Wait 15 minutes or until the **NE ACTY** LED goes off.

2. Did the "DCC startup in progress" condition clear?

   If **YES**, then continue with Step 3.
   If **NO**, then go to **TAP-108**.

3. Is the **NE ACTY** LED lighted?

   If **YES**, then go to **Trouble Clearing: IXL-001**.

   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Restore Network Element Operation After Power Loss

1. ⇒ NOTE:
   The network element has had its power restored and one or more circuit packs have an "unexpected" or "unrecognized" failure.

   Is the green **POWER ON** LED on the user panel lighted?

   If **NO**, then go to **TAP-119**.

   If **YES**, then continue with Step 2.

2. ⇒ NOTE:
   If one or more **FAULT** LEDs is lighted during the reset process, it should be ignored during this procedure.

   Wait 15 minutes for all circuit packs to reset.

3. At the CIT, select `FAULT-Retrieve-Alarm:All` command and execute to obtain an Active Alarms and Status Report.

4. Are any conditions listed in the `Descriptive` column of the report?

   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

   If **YES**, then continue with Step 5.

5. At the CIT, select `CONFIGURATION-Reset` command and execute to reset the network element.

6. Wait 15 minutes for all circuit packs to reset.

7. At the CIT, select `FAULT-Retrieve-Alarm:All` command and execute to obtain an Active Alarms and Status Report.

8. Are any conditions listed in the `Descriptive` column of the report?

   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

   If **YES**, then go to **TAP-102**.

Clear 'Software Download in Progress'

1. ⇒ NOTE:
   A software download can take as long as 2 hours at 9600 baud (less time at the higher baud rate of 19,200 or 38,400).

   Wait for the download to be completed.

2. Did the "software download in progress" condition clear?

   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then refer the trouble to the people doing the software download.

Clear 'OLS System Startup In Progress'

1. ⇒ NOTE 1:
   This condition is normally a transient condition.

   ⇒ NOTE 2:
   An event can occur that will cause a node to default to the original date/time (70-01-01 00:00:00). Then as part of the system startup process, the node will acquire the date and time from the DSNE node (or neighboring node) once the system startup has successfully completed.

   Wait 5 minutes or until the **NE ACTY** LED on the user panel goes off.

2. At the CIT, select `FAULT-Retrieve-Alarms` to obtain an Active Alarms and Status Report.

3. Has the `OLS system startup in progress` condition cleared?

   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
   If **NO**, then go to **TAP-108** to clear the unexpected response.

Clear 'SYSMEM Removed'

1. ⚠ CAUTION:
   Do not remove the SYSCTL circuit pack. If removed, provisioning data (current values) will be lost. Current values were provisioned with the `Set` command.

   NOTE:
   A series number **S1:2** is the same series number as **S1:4**. The 2 and 4 refer to minor changes within series 1.

   Obtain a replacement SYSMEM circuit pack having the same or a higher series number.

2. Install the replacement SYSMEM circuit pack.

   Reference: **DLP-514**

3. Wait 10 minutes or until the **MJ** LED goes off.

4. Is the **NE ACTY** LED off?

   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

   If **NO**, then go to **TAP-101**.

Clear 'OLS System Incomplete'

1. ⇒ NOTE:
   This condition indicates that the designated DS-NE network element is unable to create a complete system map because of a controller or transmission failure in the network or an NE reset.

   At the CIT, select `FAULT-Retrieve-Network Alarms` to obtain a Network Alarms Report.

2. Does a controller circuit pack (SYSCTL, SYSMEM, or TOHCTL) condition or an incoming optical line condition appear in the Active Alarms and Status Reports?

   If **YES**, then go to **TAP-102** to clear the indicated condition(s).
   If **NO**, then continue with Step 3.

3. ⇒ NOTE 1:
   You cannot obtain a valid Ring Map Report or Network Map Report while this condition exists.

   ⇒ NOTE 2:
   The optical line may not be configured per office records. Select `CONFIGURATION-Retrieve-Map-Network` to verify all the network elements.

   Consult office records to determine the Target Identifiers (TIDs) of the other nodes in the network.

4. ⇒ NOTE:
   When the network is in this state, you will probably not be able to establish remote login to one or more of the other nodes. If a remote login is possible and if you need additional help, refer to DLP-518. Otherwise, local CIT assistance will be required at those nodes.

   Establish a remote login to any one of the other network elements identified in Step 3. If you need help with the remote login, refer to **DLP-518**.

5. At the CIT, select `FAULT-Retrieve-Alarms` to obtain an Active Alarms and Status Report for that network element.

6. Does a controller circuit pack (SYSCTL, SYSMEM, or TOHCTL) condition or an incoming optical line condition appear in the Active Alarms and Status Reports?

   If **YES**, then go to **TAP-102** to clear the indicated condition(s).
   If **NO**, then continue with Step 7.

7. Repeat Steps 4 through 6 for each of the remaining network elements identified in Step 3.

8. Is the `ring incomplete` condition still active at the original network element?

   If **YES**, then continue with Step 9.
   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

9. Consult the appropriate maintenance support organization for further technical assistance.

10. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'Multiple DS-NEs Defined'

1. ⇒ NOTE:
   This condition means that two or more network elements in a network have their "Directory Service" (DS-NE) parameter provisioned to "Yes." There must be one and only one DS-NE in the network.

   At the CIT, select `CONFIGURATION-Retrieve-Map-Network` to obtain a Network Map Report. The topmost entry shows the TID of the local node, which is where the report is requested followed by all remaining nodes.

2. ⇒ NOTE:
   To clear the `multiple DS-NEs defined` condition, all nodes in the network must first be provisioned to `No`, then only the designated node is provisioned to `Yes`.

   At the CIT, select `SECURITY-Set-Network Element` and provision the `Directory Server` parameter to `No`.

3. ⇒ NOTE 1:
   When the network is in this state, you will probably not be able to establish remote login to one or more of the other nodes. If a remote login is possible and if you need additional help, refer to DLP-518. Otherwise, local CIT assistance will be required at those nodes.

   ⇒ NOTE 2:
   The TOHCTL takes about 5 minutes to stabilize after provisioning the DS-NE parameter.

   Ask for assistance at the next node on the report or travel to that location and condition and connect the CIT to the network element.

   Reference: **DLP-501**

4. After you are logged in to that node, repeat Step 2.

5. Log off of the network element.

6. Repeat Steps 3, 4, and 5 for each of the remaining nodes in the network.

7. Determine from office records which network element is to be the DS-NE.

8. Log in to that network element (the designated DS-NE). If a remote login is possible and you need additional help, refer to **DLP-518**.

9. At the CIT, select `SECURITY-Set-Network Element` and provision the `Directory Server` parameter to `Yes`.

10. ⇒ **NOTE:**
    The TOHCTL takes about 5 minutes to stabilize after provisioning the DS-NE parameter.

    Ask for assistance at the next node on the report or travel to that location and condition and connect the CIT to the network element.

    Reference: **DLP-501**

11. At the CIT, select `CONFIGURATION-Retrieve-Map-Network` to obtain a Network Map Report.

12. Verify from the report that **one and only one node** is provisioned as the DS-NE.

13. Log off of the network element.

14. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Local Office Alarm When 'NE ACTY' and 'FE ACTY' LEDs are Off

Overview: This procedure is used to clear an active office alarm originating at an OLS network element when both the **NE ACTY** and the **FE ACTY** LED's on the user panel are off.

1. Is the green **POWER ON** LED on the user panel lighted?

   If **YES**, then continue with Step 2.
   If **NO**, then go to **TAP-119**.

2. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.

   Reference: **DLP-511**

3. Is the CIT conditioned and connected to the OLS network element?

   If **YES**, then continue with Step 4.
   If **NO**, then complete **DLP-501** and return to this procedure.

4. ⇒ NOTE:
   It is unlikely that the CIT will be able to communicate with the network element under these conditions.

   At the CIT, select `FAULT-Retrieve-Alarm` to try to obtain an Active Alarms and Status Report.

5. Were you able to communicate with the network element (and obtain an Active Alarms and Status Report)?

   If **YES**, then continue with Step 6.
   If **NO**, then continue with Step 7.

6. Make a note that the office alarm outputs and/or the **NE ACTY** and **FE ACTY** LEDs on the user panel are not operating properly and go to **TAP-108**.

7. ⇒ NOTE:
The SYSCTL and/or the SYSMEM circuit pack has either failed or been removed.

Are SYSCTL and SYSMEM circuit packs installed?

If **YES**, then continue with Step 8.
If **NO**, then continue with Step 17.

Reference: **DLP-503**

8. ⇒ NOTE 1:
The installation of a replacement SYSMEM circuit pack may generate certain unexpected alarm conditions. Ignore these indications until the `code mismatch` condition has been cleared. Then clear any remaining condition(s).

⇒ NOTE 2:
This procedure begins with the replacement of the SYSMEM circuit pack even though the SYSCTL circuit pack **FAULT** LED may be lighted.

Remove the SYSMEM circuit pack, and install a replacement circuit pack having the same or a higher series number. For example, a series number **S1:2** is the same series number as **S1:4**. The 2 and 4 refer to minor changes within series 1.

Reference: **DLP-514**

9. Wait 15 minutes. (If an Active Alarms and Status Report is obtained during this time and the Description Column shows a `reset in progress` condition, don't worry because this is a normal software download operation).

10. Is the **NE ACTY** and/or **FE ACTY** LED lighted?

If **YES**, then continue with Step 21.
If **NO**, then continue with Step 11.

11. Are visual and/or audible office alarms off?

If **YES**, then continue with Step 21.
If **NO**, then continue with Step 12.

12. Reinstall the original SYSMEM circuit pack removed in Step 8.

    Reference: **DLP-514**

13. Remove the SYSCTL circuit pack and install a replacement circuit pack having the same or a higher series number. For example, a series number **S1:2** is the same series number as **S1:4**. The 2 and 4 refer to minor changes within series 1.

    Reference: **DLP-514**

14. Wait 15 minutes.

15. Is the **NE ACTY** and/or **FE ACTY** LED lighted?

    If **YES**, then continue with Step 21.
    If **NO**, then continue with Step 16.

16. Are visual and/or audible office alarms off?

    If **YES**, then continue with Step 21.
    If **NO**, then contact your local maintenance support group for a higher level of technical assistance.

17. Install a replacement SYSMEM and/or SYSCTL circuit pack in the appropriate slot(s).

    Reference: **DLP-514**

18. Wait 15 minutes, or until the **NE ACTY** or **FE ACTY** LED is on, or until the office alarm(s) is off, whichever comes first.

19. Is the **NE ACTY** and/or **FE ACTY** LED lighted?

    If **YES**, then continue with Step 21.
    If **NO**, then continue with Step 20.

20. Are visual and/or audible office alarms off?

    If **YES**, then continue with Step 21.
    If **NO**, then contact your local maintenance support group for a higher level of technical assistance.

21. Log into the network element as directed by the instructions on the CIT screen.

22. At the CIT, select `CONFIGURATION-Retrieve-Equipment:SYSCTL` to obtain an Equipage and Version Report.

23. Refer to the Equipage and Version Report and compare the software version stored in the SYSMEM (shown under the `sysmem` entry in the report) and the software version running in the network element (shown under the `sysctl` entry in the report) with office records. If office records are not available, log in remotely to another network element and obtain a report to determine what software version is running in the network.

24. Is the correct software version stored in the SYSMEM and running in the network element?

    If **YES**, then continue with Step 26.
    If **NO**, then continue with Step 25.

25. Install the appropriate software into the SYSMEM circuit pack.

    Reference: **Operation: NTP-002**

26. At the CIT, select `FAULT-Reset` and execute.

27. Wait 15 minutes or until the **MJ** LED is off at the user panel, whichever comes first. Reset takes approximately 15 minutes, but some user panel LEDs flash and relays click in about a minute, indicating that reset has started.

28. Close the cabinet doors or replace the shelf cover.

    Reference: **DLP-511**

29. Is the **NE ACTY** LED off?

    If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**
    If **NO**, then go to the **Trouble Clearing: IXL-001**

Clear 'DS-NE Not Reachable'

1. ⇒ NOTE:
   This condition indicates that one of the network elements (nodes) in the network has not been provisioned "DS-NE" or more likely that the DCC has failed and is in reset.

   Determine from office records which node is designated the "Directory Service NE" (DS-NE) in the network.

2. ⇒ NOTE:
   A `TOHCTL failure` condition must be cleared before a `DS-NE not reachable` condition.

   Is there a `TOHCTL failure` condition at the far end (FE)?

   If **YES**, then go to **TAP-111**, clear the `TOHCTL failure` condition, and return to this procedure.
   If **NO**, then continue with Step 3.

3. ⇒ NOTE:
   When the network is in this state, you will probably not be able to establish remote login to one or more of the other nodes. If a remote login is possible and if you need additional help, refer to DLP-518. Otherwise, local CIT assistance will be required at those nodes.

   Ask for assistance at the DS-NE location or travel to that location and condition and connect the CIT to the network element.

   Reference: **DLP-501**

4. At the CIT connected to the node designated to be the DS-NE, select `SECURITY-Set-Network Element` and provision the `Directory Service NE` parameter (DS-NE) of that network element to `Yes`. The remaining nodes in the network must be provisioned to `No` for the `Directory Service NE` parameter.

5. Wait 10 minutes for the OLS diagnostics to stabilize. After this time, the `DS-NE not reachable` condition should be cleared.

   Nice to Know: You can verify that only one node is provisioned as the DS-NE by obtaining a Ring Map Report (at the CIT, select `CONFIGURATION-Retrieve-Map-Ring`).

6. Did the `DS-NE not reachable` condition clear?

   If **YES**, then continue with Step 7.
   If **NO**, then call for technical assistance in the next level of trouble clearing.

7. Log off of the network element.

8. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'Duplicate TID Defined'

1. ⇒ NOTE 1:
   A recently entered target identifier (TID) value is a duplicate of another network element in the OLS.

   ⇒ NOTE 2:
   Make sure that 1 minute has elapsed between starting this procedure and detecting the `duplicate TID defined` condition.

   Determine from office records the correct TID for the network elements showing the duplicate values.

2. Log in to the network element that is in error. If a remote login is required and you need additional help, refer to **DLP-518**.

3. At the CIT, select `SECURITY-Set-Network Element` and enter the correct TID for that network element.

4. Log off of the network element, as required.

5. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear 'SER TLM 1 Port Failure'

Overview: The external miscellaneous discrete unit (EMDU) has failed to respond to polling by the local OLS network element. The OLS network element is connected to the EMDU via the SER TLM 1 port. The communication is based on a telemetry byte-oriented serial (TBOS) protocol, with the OLS network element functioning as master. The OLS network element polls the EMDU at an interval of every 10 to 13 seconds. This alarm condition indicates that the EMDU is not responding to the poll.

1. Open the cabinet doors or remove shelf cover. All connections can be accessed from the front.

   Reference: **DLP-511**

2. Make an inspection of the serial telemetry cable connected to the **P19 SER TLM 1** connector at the interconnect panel. (Verify cable is properly seated in the connector.)

3. At the CIT, select `FAULT-Retrieve-Alarms (and Status)` command and execute to obtain an Active Alarms and Status Report.

4. Referring to the report obtained in Step 3, is the `SER TLM 1 port failure` still listed?

   If **YES**, then continue with Step 5.
   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

5. Use the appropriate vendor maintenance documents to determine if the EMDU is operating properly.

   If **operating properly**, then continue with Step 6.
   If **not operating properly**, then clear trouble using vendor supplied maintenance documents.

6. Contact the appropriate maintenance support organization for further technical assistance.

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Combination 'TLM Failure' and 'OA Failure'

Overview: This procedure is used to clear a trouble that is characterized by a series of circuit pack failures, first the TLM and OA circuit packs, then approximately 90 minutes later, the TOHCTL and SYSCTL circuit packs fail with the SYSCTL locking up.

1. ⇒ **NOTE:**
   The CIT will disconnect from the network element when the `CONFIGURATION-Initialize-System` command is executed.

   At the CIT, select `CONFIGURATION-Initialize-System: TID(All):PH(3)` command and execute.

2. Did the Optical Line System (network element) respond to the CIT?

   If **NO**, then continue with Step 3.
   If **YES**, then continue with Step 4.

3. ⇒ **NOTE:**
   This indicates the SYSCTL circuit pack is locked up.

   Go to Step 7 ONLY AFTER VERIFING from an alternate maintenance history log (if available) that a combination TLM failure and OA failure occurred. If unable to verify, contact your next level of technical support.

4. Wait 15 minutes or until the **MJ** LED is off at the user panel, whichever comes first. Reset takes approximately 15 minutes but some user panel LEDs flash and relays click in about a minute indicating that reset has started. If the network element is equipped with OTPMs, wait an additional 5 minutes.

5. At the CIT, select `FAULT-Retrieve-Condition-All` command and execute to obtain a report.

6. Have BOTH failures cleared (combination `TLM failure` and `OA failure`)?

   If **NO**, then continue with Step 7.
   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

7. **NOTE 1:**
   For circuit pack and software compatibility, refer to Table 7-1 in Section 7, "Circuit Pack Description."

   NOTE 2:
   If this step does not clear the combination TLM failure and OA failure, contact your next level of technical support.

   Remove the SYSCTL circuit pack and install a replacement circuit pack having the same or a higher series number. For example, an LEA1 with series number **S1:2** is the same series number as **S1:4**. The 2 and 4 refer to minor changes within series 1.

   Reference: **DLP-514**

8. Return the SYSCTL circuit pack for repair.

9. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

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Connect Optical Power Meter for Measurement in OLS

Overview: This procedure provides the correct fiber connections required when making an optical power measurement. Also, appropriate tables are provided for determining the correct lightguide buildout (LBO) values (Figure 1).

Required Test Equipment:
Craft Interface Terminal (CIT)
Wrist Strap
Optical Power Meter

⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an OLS network element to prevent electrostatic discharge (ESD) damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100.**

1. If necessary, open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.

   Reference: **DLP-511**

2. Are you adding or trouble clearing an optical line, optical channel, supervisory channel, customer maintenance (CM) signal, or replacing an end terminal OA?

   If **optical line**, then continue with Step 3.
   If **optical channel**, then continue with Step 9.
   If **replacing end terminal receive OA**, then continue with Step 16.
   If **CM signal**, then continue with Step 39.
   If **supervisory channel**, then continue with Step 45.

3. Remove the protector caps and clean receive optical fiber.

   Reference: **DLP-510**

4. Connect receive optical fiber to optical power meter and obtain optical power measurement.

5. Using the power level measurement obtained in Step 4 and the correct table as listed below, determine the correct LBO for the receive OA circuit pack or the correct OA input power.

   References to LBO Tables for LEA6 and LEA7

Software Release		OA	System Config.	Number of Spans	Use Table
R1	R2				
x	x	LEA6	Nx33	1 to 3	A
	x	LEA7	Nx33	1	B1
	x			2	B2
	x			3	B3
	x		Px25 or Mx24	4	C
	x			5	C
	x			6	C
	x			7	D
	x			8	D

6. Install the LBO at the **IN** connector of the receive OA circuit pack.

   Reference: **DLP-512**

7. Close the cabinet door or install the shelf cover.

   Reference: **DLP-511**

8. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

9. Are you making connections to an OMU or ODU?

   If **OMU**, then continue with Step 10.
   If **ODU**, then continue with Step 16.

10. Remove the protector cap and clean the fiber coming from the LCT transmitter or OTU circuit pack for the channel being added.

    Reference: **DLP-510**

11. Connect the optical power meter to the fiber coming from the LCT transmitter or OTU circuit pack for the channel being added and obtain an optical power measurement.

Table A — LEA6 OA Input LBO Selection Guide for Nx33 Span System

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
0-2	$P_{in} < -22.0$ $-22.0 \le P_{in} \le -9.0$ $-9.0 < P_{in} \le -4.5$ $-4.5 < P_{in} \le -0.5$ $-0.5 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -0.5 dBm, some attenuation must be added to the outside plant fiber.
3	$P_{in} < -20.0$ $-20.0 \le P_{in} \le -8.0$ $-8.0 < P_{in} \le -3.5$ $-3.5 < P_{in} \le +0.5$ $+0.5 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than +0.5 dBm, some attenuation must be added to the outside plant fiber.
4	$P_{in} < -19.2$ $-19.2 \le P_{in} \le -7.0$ $-7.0 < P_{in} \le -2.5$ $-2.5 < P_{in} \le +1.5$ $+1.5 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than +1.5 dBm, some attenuation must be added to the outside plant fiber.
5	$P_{in} < -18.5$ $-18.5 \le P_{in} \le -6.5$ $-6.5 < P_{in} \le -2.0$ $-2.0 < P_{in} \le +2.0$ $+2.0 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than +2.0 dBm, some attenuation must be added to the outside plant fiber.
6	$P_{in} < -18.0$ $-18.0 \le P_{in} \le -6.0$ $-6.0 < P_{in} \le -1.5$ $-1.5 < P_{in} \le +2.5$ $+2.5 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than +2.5 dBm, some attenuation must be added to the outside plant fiber.
7-8	$P_{in} < -17.4$ $-17.4 \le P_{in} \le -5.0$ $-5.0 < P_{in} \le -0.5$ $-0.5 < P_{in} \le +3.5$ $+3.5 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than +3.5 dBm, some attenuation must be added to the outside plant fiber.

Table B1 — LEA7 OA Input LBO Selection Guide for One Span Nx33 System

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
0	$P_{in} < -23.5$ $-23.5 \le P_{in} \le -12.0$ $-12.0 < P_{in} \le -8.0$ $-8.0 < P_{in} \le -3.7$ $-3.7 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -3.7 dBm, some attenuation must be added to the outside plant fiber.
1-2	$P_{in} < -21.1$ $-21.1 \le P_{in} \le -9.6$ $-9.6 < P_{in} \le -5.5$ $-5.5 < P_{in} \le -1.3$ $-1.3 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -1.3 dBm, some attenuation must be added to the outside plant fiber.
3	$P_{in} < -19.8$ $-19.8 \le P_{in} \le -8.3$ $-8.3 < P_{in} \le -4.2$ $-4.2 < P_{in} \le 0.0$ $0.0 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 0.0 dBm, some attenuation must be added to the outside plant fiber.
4	$P_{in} < -19.0$ $-19.0 \le P_{in} \le -7.5$ $-7.5 < P_{in} \le -3.4$ $-3.4 < P_{in} \le 0.8$ $0.8 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 0.8 dBm, some attenuation must be added to the outside plant fiber.

Table B1 (Contd) — LEA7 OA Input LBO Selection Guide for One Span Nx33 System

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
5	$P_{in} < -18.3$ $-18.3 \leq P_{in} \leq -6.8$ $-6.8 < P_{in} \leq -2.7$ $-2.7 < P_{in} \leq 1.5$ $1.5 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 1.5 dBm, some attenuation must be added to the outside plant fiber.
6	$P_{in} < -17.8$ $-17.8 \leq P_{in} \leq -6.3$ $-6.3 < P_{in} \leq -2.2$ $-2.2 < P_{in} \leq 2.0$ $2.0 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 2.0 dBm, some attenuation must be added to the outside plant fiber.
7-8	$P_{in} < -17.0$ $-17.0 \leq P_{in} \leq -5.5$ $-5.5 < P_{in} \leq -1.4$ $-1.4 < P_{in} \leq 2.8$ $2.8 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 2.8 dBm, some attenuation must be added to the outside plant fiber.

Table B2 — LEA7 OA Input LBO Selection Guide for Two Span Nx33 System

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
0	$P_{in} < -20.5$ $-20.5 \le P_{in} \le -12.0$ $-12.0 < P_{in} \le -8.0$ $-8.0 < P_{in} \le -3.7$ $-3.7 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -3.7 dBm, some attenuation must be added to the outside plant fiber.
1-2	$P_{in} < -18.1$ $-18.1 \le P_{in} \le -9.6$ $-9.6 < P_{in} \le -5.5$ $-5.5 < P_{in} \le -1.3$ $-1.3 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -1.3 dBm, some attenuation must be added to the outside plant fiber.
3	$P_{in} < -16.8$ $-16.8 \le P_{in} \le -8.3$ $-8.3 < P_{in} \le -4.2$ $-4.2 < P_{in} \le 0.0$ $0.0 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 0.0 dBm, some attenuation must be added to the outside plant fiber.
4	$P_{in} < -16.0$ $-16.0 \le P_{in} \le -7.5$ $-7.5 < P_{in} \le -3.4$ $-3.4 < P_{in} \le 0.8$ $0.8 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 0.8 dBm, some attenuation must be added to the outside plant fiber.

Table B2 (Contd) — LEA7 OA Input LBO Selection Guide for Two Span Nx33 System

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
5	$P_{in} < -15.3$ $-15.3 \leq P_{in} \leq -6.8$ $-6.8 < P_{in} \leq -2.7$ $-2.7 < P_{in} \leq 1.5$ $1.5 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 1.5 dBm, some attenuation must be added to the outside plant fiber.
6	$P_{in} < -14.8$ $-14.8 \leq P_{in} \leq -6.3$ $-6.3 < P_{in} \leq -2.2$ $-2.2 < P_{in} \leq 2.0$ $2.0 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 2.0 dBm, some attenuation must be added to the outside plant fiber.
7-8	$P_{in} < -14.0$ $-14.0 \leq P_{in} \leq -5.5$ $-5.5 < P_{in} \leq -1.4$ $-1.4 < P_{in} \leq 2.8$ $2.8 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 2.8 dBm, some attenuation must be added to the outside plant fiber.

Table B3 — LEA7 OA Input LBO Selection Guide for Three Span Nx33 System

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
0	$P_{in} < -18.5$ $-18.5 \leq P_{in} \leq -12.0$ $-12.0 < P_{in} \leq -8.0$ $-8.0 < P_{in} \leq -3.7$ $-3.7 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -3.7 dBm, some attenuation must be added to the outside plant fiber.
1-2	$P_{in} < -16.1$ $-21.1 \leq P_{in} \leq -9.6$ $-9.6 < P_{in} \leq -5.5$ $-5.5 < P_{in} \leq -1.3$ $-1.3 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -1.3 dBm, some attenuation must be added to the outside plant fiber.
3	$P_{in} < -14.8$ $-14.8 \leq P_{in} \leq -8.3$ $-8.3 < P_{in} \leq -4.2$ $-4.2 < P_{in} \leq 0.0$ $0.0 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 0.0 dBm, some attenuation must be added to the outside plant fiber.
4	$P_{in} < -14.0$ $-14.0 \leq P_{in} \leq -7.5$ $-7.5 < P_{in} \leq -3.4$ $-3.4 < P_{in} \leq 0.8$ $0.8 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 0.8 dBm, some attenuation must be added to the outside plant fiber.

Table B3 (Contd) — LEA7 OA Input LBO Selection Guide for Three Span Nx33 System

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
5	$P_{in} < -13.3$ $-13.3 \leq P_{in} \leq -6.8$ $-6.8 < P_{in} \leq -2.7$ $-2.7 < P_{in} \leq 1.5$ $1.5 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 1.5 dBm, some attenuation must be added to the outside plant fiber.
6	$P_{in} < -12.8$ $-12.8 \leq P_{in} \leq -6.3$ $-6.3 < P_{in} \leq -2.2$ $-2.2 < P_{in} \leq 2.0$ $2.0 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 2.0 dBm, some attenuation must be added to the outside plant fiber.
7-8	$P_{in} < -12.0$ $-12.0 \leq P_{in} \leq -5.5$ $-5.5 < P_{in} \leq -1.4$ $-1.4 < P_{in} \leq 2.8$ $2.8 < P_{in}$	Span Loss Too High 0 5 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 2.8 dBm, some attenuation must be added to the outside plant fiber.

Table C — LEA7 OA Input LBO Selection Guide for 4, 5, and 6 Span System (Px25 or Mx24)

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
0	$P_{in} < -20.7$ $-20.7 \leq P_{in} \leq -15.0$ $-15.0 < P_{in} \leq -12.0$ $-12.0 < P_{in} \leq -9.8$ $-9.8 < P_{in} \leq -6.7$ $-6.7 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -6.7 dBm, some attenuation must be added to the outside plant fiber.
1	$P_{in} < -18.1$ $-18.1 \leq P_{in} \leq -12.4$ $-12.4 < P_{in} \leq -9.4$ $-9.4 < P_{in} \leq -7.2$ $-7.2 < P_{in} \leq -4.1$ $-4.1 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -4.1 dBm, some attenuation must be added to the outside plant fiber.
2	$P_{in} < -17.6$ $-17.6 \leq P_{in} \leq -11.9$ $-11.9 < P_{in} \leq -8.9$ $-8.9 < P_{in} \leq -6.7$ $-6.7 < P_{in} \leq -3.6$ $-3.6 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -3.6 dBm, some attenuation must be added to the outside plant fiber.
3	$P_{in} < -15.9$ $-15.9 \leq P_{in} \leq -10.2$ $-10.2 < P_{in} \leq -7.2$ $-7.2 < P_{in} \leq -5.0$ $-5.0 < P_{in} \leq -1.9$ $-1.9 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -1.9 dBm, some attenuation must be added to the outside plant fiber.

Table C (Contd) — LEA7 OA Input LBO Selection Guide for 4, 5, and 6 Span System (Px25 or Mx24)

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
4	$P_{in} < -14.9$ $-14.9 \le P_{in} \le -9.2$ $-9.2 < P_{in} \le -6.2$ $-6.2 < P_{in} \le -4.0$ $-4.0 < P_{in} \le -0.9$ $-0.9 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -0.9 dBm, some attenuation must be added to the outside plant fiber.
5	$P_{in} < -14.0$ $-14.0 \le P_{in} \le -8.3$ $-8.3 < P_{in} \le -5.3$ $-5.3 < P_{in} \le -3.1$ $-3.1 < P_{in} \le 0.0$ $0.0 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 0.0 dBm, some attenuation must be added to the outside plant fiber.
6	$P_{in} < -13.4$ $-13.4 \le P_{in} \le -7.7$ $-7.7 < P_{in} \le -4.7$ $-4.7 < P_{in} \le -2.5$ $-2.5 < P_{in} \le 0.6$ $0.6 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 0.6 dBm, some attenuation must be added to the outside plant fiber.
7	$P_{in} < -12.8$ $-12.8 \le P_{in} \le -7.1$ $-7.1 < P_{in} \le -4.1$ $-4.1 < P_{in} \le -1.9$ $-1.9 < P_{in} \le 1.2$ $1.2 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 1.2 dBm, some attenuation must be added to the outside plant fiber.
8	$P_{in} < -12.6$ $-12.6 \le P_{in} \le -6.9$ $-6.9 < P_{in} \le -3.9$ $-3.9 < P_{in} \le -1.7$ $-1.7 < P_{in} \le 1.4$ $1.4 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 1.4 dBm, some attenuation must be added to the outside plant fiber.

Table D — LEA7 OA Input LBO Selection Guide for 7 and 8 Span System (Px25 or Mx24)

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
0	$P_{in} < -19.7$ $-19.7 \leq P_{in} \leq -14.0$ $-14.0 < P_{in} \leq -11.0$ $-11.0 < P_{in} \leq -8.8$ $-8.8 < P_{in} \leq -5.7$ $-5.7 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -5.7 dBm, some attenuation must be added to the outside plant fiber.
1	$P_{in} < -17.1$ $-17.1 \leq P_{in} \leq -11.4$ $-11.4 < P_{in} \leq -8.4$ $-8.4 < P_{in} \leq -6.2$ $-6.2 < P_{in} \leq -3.1$ $-3.1 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -3.1 dBm, some attenuation must be added to the outside plant fiber.
2	$P_{in} < -16.6$ $-16.6 \leq P_{in} \leq -10.9$ $-10.9 < P_{in} \leq -7.9$ $-7.9 < P_{in} \leq -5.7$ $-5.7 < P_{in} \leq -2.6$ $-2.6 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -2.6 dBm, some attenuation must be added to the outside plant fiber.
3	$P_{in} < -14.9$ $-14.9 \leq P_{in} \leq -9.2$ $-9.2 < P_{in} \leq -6.2$ $-6.2 < P_{in} \leq -4.0$ $-4.0 < P_{in} \leq -0.9$ $-0.9 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than -0.9 dBm, some attenuation must be added to the outside plant fiber.

Table D (Contd) — LEA7 OA Input LBO Selection Guide for 7 and 8 Span System (Px25 or Mx24)

Total # of Equipped Channels	Measured OA Input Power (dBm)	Recommended OA Input LBO (dB)
4	$P_{in} < -13.9$ $-13.9 \le P_{in} \le -8.2$ $-8.2 < P_{in} \le -5.2$ $-5.2 < P_{in} \le -3.0$ $-3.0 < P_{in} \le 0.1$ $0.1 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 0.1 dBm, some attenuation must be added to the outside plant fiber.
5	$P_{in} < -13.0$ $-13.0 \le P_{in} \le -7.3$ $-7.3 < P_{in} \le -4.3$ $-4.3 < P_{in} \le -2.1$ $-2.1 < P_{in} \le 1.0$ $1.0 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 1.0 dBm, some attenuation must be added to the outside plant fiber.
6	$P_{in} < -12.4$ $-12.4 \le P_{in} \le -6.7$ $-6.7 < P_{in} \le -3.7$ $-3.7 < P_{in} \le -1.5$ $-1.5 < P_{in} \le 1.6$ $1.6 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 1.6 dBm, some attenuation must be added to the outside plant fiber.
7	$P_{in} < -11.8$ $-11.8 \le P_{in} \le -6.1$ $-6.1 < P_{in} \le -3.1$ $-3.1 < P_{in} \le -0.9$ $-0.9 < P_{in} \le 2.2$ $2.2 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 2.2 dBm, some attenuation must be added to the outside plant fiber.
8	$P_{in} < -11.6$ $-11.6 \le P_{in} \le -5.9$ $-5.9 < P_{in} \le -2.9$ $-2.9 < P_{in} \le -0.7$ $-0.7 < P_{in} \le 2.4$ $2.4 < P_{in}$	Span Loss Too High 0 5 7 10 Put 10 dB LBO in output of upstream OA and re-measure input power. If input power is still greater than 2.4 dBm, some attenuation must be added to the outside plant fiber.

12. Compare the optical power measurement obtained in Step 11 with the requirement listed in Table E for the channel being added.

Table E — OMU Input Power

Channel	Input Power (dBm)
1	-4.0 ± 1.0
2	-5.3 ± 1.0
3	-6.5 ± 1.0
4	-7.2 ± 1.0
5	-7.7 ± 1.0
6	-8.2 ± 1.0
7	-8.0 ± 1.0
8	-6.5 ± 1.0

13. Does the power measurement meet the requirements?

    If **NO**, then continue with Step 14.
    If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

14. Measure the LCT TRMTR or OTU output (for that channel) and compare the results with Table F. If in specification, investigate fiber and connections between LCT and OLS. If out of specification, replace the LCT TRMTR or OTU circuit pack.

Table F — Transmitter Output Power

LCT TRMTR	OTU OUT	Channel Number	Output Power (dBm)
739D1, 739F1	41A1, 41C1	1	-4.0 ± 0.7
739D2, 739F2	41A1, 41C1	2	-5.3 ± 0.7
739D3, 739F3	41A1, 41C1	3	-6.5 ± 0.7
739D4, 739F4	41A1, 41C1	4	-7.2 ± 0.7
739D5, 739F5	41A1, 41C1	5	-7.7 ± 0.7
739D6, 739F6	41A1, 41C1	6	-8.2 ± 0.7
739D7, 739F7	41A1, 41C1	7	-8.0 ± 0.7
739D8, 739F8	41A1, 41C1	8	-6.5 ± 0.7
—	41B	1-8	+1.0

15. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

16. Are you adding an optical channel or replacing an end terminal receive OA circuit pack?

    If **adding an optical channel**, then continue with Step 17.
    If **replacing an end terminal receive OA**, then continue with Step 24.

17. At the LCT or OTU, remove the protector caps at the **RCVR IN** or **IN** connector, respectively, and clean the fiber coming from the ODU for the channel being added.

    Reference: **DLP-510**

18. At the LCT or OTU, connect the optical power meter to the fiber coming from the ODU and obtain an optical power measurement.

19. Which software release is running in the OLS?

    If **Release 1.0 or Release 2 and Nx33 Span System**, then continue with Step 20.
    If **Release 2 and Mx24 or Px25 Span System**, then continue with Step 22.

20. Using the power level measurement from Step 18 and the correct table below, determine the correct LBO for the LCT **RCVR IN** or OTU **IN** connector and the ODU **OCHAN() OUT** port.
    - For OCHAN 1 and 2, use Table G for Release 1 and Release 2 Nx33 Span System.
    - For OCHAN 3 through 8, use Table H for Release 1 and Release 2 Nx33 Span System.

21. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Table G — RCVR Input and ODU Output LBO Selection Guide for OCHAN 1 and OCHAN 2

Total # of Equipped OLS Channels*	Measured LCT RCVR/OTU IN Input Power (dBm) with 0-db LBO at ODU Output	Recommended LBO (dB) for LCT RCVR/OTU IN Input	Recommended LBO (dB) for ODU Output
1	-3.3 to -2.0	7	5
	-2.0 to -1.2	10	3
	-1.2 to -0.2	7	7
	-0.2 to +1.5	15	0
	+1.5 to +2.6	10	7
	+2.6 to +4.3	15	3
	+4.3 to +4.9	10	10
	+4.9 to +6.2	15	5
	> +6.2	15	7
2	-11.1 to -9.4	10	0
	-9.4 to -8.1	7	5
	-8.1 to -7.5	10	3
	-7.5 to -6.3	7	7
	-6.3 to -4.7	15	0
	-4.7 to -3.5	10	7
	-3.5 to -1.9	15	3
	-1.9 to -1.1	10	10
	> -1.1	15	5
3	-12.1 to -10.4	10	0
	-10.4 to -9.1	7	5
	-9.1 to -8.5	10	3
	-8.5 to -7.3	7	7
	-7.3 to -5.7	15	0
	-5.7 to -4.5	10	7
	-4.5 to -2.9	15	3
	-2.9 to -2.1	10	10
	> -2.1	15	5
4-8	-14.5 to -13.1	5	3
	-13.1 to -11.4	10	0
	-11.4 to -10.1	7	5
	-10.1 to -9.5	10	3
	-9.5 to -8.3	7	7
	-8.3 to -6.7	15	0
	-6.7 to -5.5	10	7
	-5.5 to -3.9	15	3
	-3.9 to -3.1	10	10
	> -3.1	15	5

* Note that this column states the total number of optical channels that are equipped in the OLS and NOT the OCHAN() number. Optical channels may be installed in any order.

Table H — RCVR Input and ODU Output LBO Selection Guide for OCHAN 3 Through 8

Total # of Equipped OLS Channels*	Measured LCT RCVR/OTU IN Input Power (dBm) with 0-db LBO at ODU Output	Recommended LBO (dB) for LCT RCVR/OTU IN Input	Recommended LBO (dB) for ODU Output
1	$-2.6 < P_{in} \leq -2.0$	10	3
	$-2.0 < P_{in} \leq -0.8$	7	7
	$-0.8 < P_{in} \leq +0.8$	15	0
	$+0.8 < P_{in} \leq +2.0$	10	7
	$+2.0 < P_{in} \leq +3.6$	15	3
	$+3.6 < P_{in} \leq +4.4$	10	10
	$+4.4 < P_{in} \leq +5.5$	15	5
	$+5.5 < P_{in}$	15	7
2	$-5.6 < P_{in} \leq -5.0$	10	3
	$-5.0 < P_{in} \leq -3.8$	7	7
	$-3.8 < P_{in} \leq -2.2$	15	0
	$-2.2 < P_{in} \leq -1.0$	10	7
	$-1.0 < P_{in} \leq +0.6$	15	3
	$+0.6 < P_{in} \leq +1.4$	10	10
	$+1.4 < P_{in} \leq +2.5$	15	5
	$+2.5 < P_{in} \leq +4.8$	15	7
	$+4.8 < P_{in}$	15	10
3	$-7.4 < P_{in} \leq -6.1$	7	5
	$-6.1 < P_{in} \leq -5.5$	10	3
	$-5.5 < P_{in} \leq -4.3$	7	7
	$-4.3 < P_{in} \leq -2.7$	15	0
	$-2.7 < P_{in} \leq -1.5$	10	7
	$-1.5 < P_{in} \leq +0.1$	15	3
	$+0.1 < P_{in} \leq +0.9$	10	10
	$+0.9 < P_{in} \leq +2.0$	15	5
	$+2.0 < P_{in} \leq +4.3$	15	7
	$+4.3 < P_{in}$	15	10
4	$-9.6 < P_{in} \leq -7.9$	10	0
	$-7.9 < P_{in} \leq -6.6$	7	5
	$-6.6 < P_{in} \leq -6.0$	10	3
	$-6.0 < P_{in} \leq -4.8$	7	7
	$-4.8 < P_{in} \leq -3.2$	15	0
	$-3.2 < P_{in} \leq -2.0$	10	7
	$-2.0 < P_{in} \leq -0.4$	15	3
	$-0.4 < P_{in} \leq +0.4$	10	10
	$+0.4 < P_{in} \leq +1.5$	15	5
	$+1.5 < P_{in} \leq +3.8$	15	7
	$+3.8 < P_{in}$	15	10

* Note that this column states the total number of optical channels that are equipped in the OLS and NOT the OCHAN() number. Optical channels may be installed in any order.

Table H — RCVR Input and ODU Output LBO Selection Guide for OCHAN 3 Through 8 (Contd)

Total # of Equipped OLS Channels*	Measured LCT RCVR/OTU IN Input Power (dBm) with 0-db LBO at ODU Output	Recommended LBO (dB) for LCT RCVR/OTU IN Input	Recommended LBO (dB) for ODU Output
5	$-11.5 < P_{in} \leq -10.1$	5	3
	$-10.1 < P_{in} \leq -8.4$	10	0
	$-8.4 < P_{in} \leq -7.1$	7	5
	$-7.1 < P_{in} \leq -6.5$	10	3
	$-6.5 < P_{in} \leq -5.3$	7	7
	$-5.3 < P_{in} \leq -3.7$	15	0
	$-3.7 < P_{in} \leq -2.5$	10	7
	$-2.5 < P_{in} \leq -0.9$	15	3
	$-0.9 < P_{in} \leq -0.1$	10	10
	$-0.1 < P_{in} \leq +1.0$	15	5
	$+1.0 < P_{in} \leq +3.3$	15	7
	$+3.3 < P_{in}$	15	10
6	$-13.3 < P_{in} \leq -12.0$	7	0
	$-12.0 < P_{in} \leq -10.6$	5	3
	$-10.6 < P_{in} \leq -8.9$	10	0
	$-8.9 < P_{in} \leq -7.6$	7	5
	$-7.6 < P_{in} \leq -7.0$	10	3
	$-7.0 < P_{in} \leq -5.8$	7	7
	$-5.8 < P_{in} \leq -4.2$	15	0
	$-4.2 < P_{in} \leq -3.0$	10	7
	$-3.0 < P_{in} \leq -1.4$	15	3
	$-1.4 < P_{in} \leq -0.6$	10	10
	$-0.6 < P_{in} \leq +0.5$	15	5
	$+0.5 < P_{in} \leq +2.8$	15	7
	$+2.8 < P_{in}$	15	10
7	$-13.5 < P_{in} \leq -12.5$	7	0
	$-12.5 < P_{in} \leq -11.1$	5	3
	$-11.1 < P_{in} \leq -9.4$	10	0
	$-9.4 < P_{in} \leq -8.1$	7	5
	$-8.1 < P_{in} \leq -7.5$	10	3
	$-7.5 < P_{in} \leq -6.3$	7	7
	$-6.3 < P_{in} \leq -4.7$	15	0
	$-4.7 < P_{in} \leq -3.5$	10	7
	$-3.5 < P_{in} \leq -1.9$	15	3
	$-1.9 < P_{in} \leq -1.1$	10	10
	$-1.1 < P_{in} \leq 0.0$	15	5
	$0.0 < P_{in} \leq +2.3$	15	7
	$+2.3 < P_{in}$	15	10
8	$-13.5 < P_{in} \leq -12.1$	5	3
	$-12.1 < P_{in} \leq -10.4$	10	0
	$-10.4 < P_{in} \leq -9.1$	7	5
	$-9.1 < P_{in} \leq -8.5$	10	3
	$-8.5 < P_{in} \leq -7.3$	7	7
	$-7.3 < P_{in} \leq -5.7$	15	0
	$-5.7 < P_{in} \leq -4.5$	10	7
	$-4.5 < P_{in} \leq -2.9$	15	3
	$-2.9 < P_{in} \leq -2.1$	10	10
	$-2.1 < P_{in} \leq -1.0$	15	5
	$-1.0 < P_{in} \leq +1.3$	15	7
	$+1.3 < P_{in}$	15	10

* See footnote on previous page.

22. Using the power level measurement from Step 18 and the correct Release 2.0 table (Table I or Table J), determine the correct LBO for the LCT **RCVR IN** or OTU **IN** connector and ODU **OCHAN() OUT** port.
    - For OCHAN 1, use Table I for Release 2 Mx24 and Px25 Span Systems.
    - For OCHAN 2 through 8, use Table J for Release 2 Mx24 and Px25 Span Systems.

23. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

24. ⚠ CAUTION:
    Make sure the optical signals assigned to this optical line are switched to the protection line, if necessary.

    At the ODU, disconnect all fiber jumpers at the **OCHAN() OUT** ports.

25. At the ODU, remove all LBOs at the **OCHAN() OUT** ports.

    Reference: **DLP-512**

26. At the ODU, clean and install 0dB LBOs in all **OCHAN() OUT** ports.

    References: **DLP-510, DLP-512**

27. Clean and reconnect the fiber jumpers at the **OCHAN() OUT** ports (removed in Step 24).

28. At the LCT or OT, remove the fiber from the **IN** port of the RCVR or OTU circuit pack for the line being measured.

29. At the LCT or OTU, connect the optical power meter to the fiber coming from the ODU and obtain an optical power measurement.

30. Which software release is running in the OLS?

    If **Release 1.0 or Release 2 and Nx33 Span System**, then continue with Step 31.

    If **Release 2 and Mx24 or Px25 Span System**, then continue with Step 35.

31. Using the power level measured in Step 29 and the correct table below, determine the correct LBO for the LCT **RCVR IN** or OTU **IN** connector and the ODU **OCHAN() OUT** port.
    - For OCHAN 1 and 2, use Table G for Release 1 and Release 2 Nx33 Span System.
    - For OCHAN 3 through 8, use Table H for Release 1 and Release 2 Nx33 Span System.

32. Install correct LBOs at appropriate LCT **RCVR IN** port and ODU **OCHAN() OUT** port.

33. Repeat Steps 24 through 32 for each channel equipped on the ODU for the OA circuit pack that was replaced.

34. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

35. Using the power level measured in Step 29 and the correct Release 2.0 table (Table I or Table J), determine the correct LBO for the LCT **RCVR IN** or OTU **IN** connector and the ODU **OCHAN() OUT** port.
    - For OCHAN 1, use Table I for Release 2 Mx24 and Px25 Span Systems.
    - For OCHAN 2 through 8, use Table J for Release 2 Mx24 and Px25 Span Systems.

36. Install correct LBOs at appropriate LCT **RCVR IN** port and ODU **OCHAN() OUT** port.

37. Repeat Steps 24 through 29 and Steps 35 and 36 for each channel equipped on the ODU for the OA circuit pack that was replaced.

38. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Table I — RCVR/OTU Input and ODU Output LBO Selection Guide for OCHAN 1 in Both Mx24 and Px25 Span Systems

Total # of Equipped OLS Channels*	Measured LCT RCVR/OTU IN Input Power (dBm) with 0-db LBO at ODU Output	Recommended LBO (dB) for LCT RCVR/OTU IN Input	Recommended LBO (dB) for ODU Output
1	-6.5 to -5.0	5	3
	-5.0 to -3.4	10	0
	-3.4 to -2.1	7	5
	-2.1 to -1.5	10	3
	-1.5 to -0.3	7	7
	-0.3 to +1.3	15	0
	+1.3 to +1.8	10	7
	+1.8 to +4.1	15	3
	> +4.1	10	10
2-8	-17.0 to -15.3	5	0
	-15.3 to -14.0	7	0
	-14.0 to -12.6	5	3
	-12.6 to -10.9	10	0
	-10.9 to -9.6	17	5
	-9.6 to -9.0	10	3
	-9.0 to -7.8	7	7
	-7.8 to -6.2	15	0
	-6.2 to -5.0	10	7
	-5.0 to -3.4	15	3
	-3.4 to -2.6	10	10
	-2.6 to -1.5	15	5
	> -1.5	15	7

* Note that this column states the total number of optical channels that are equipped in the OLS and NOT the OCHAN() number. Optical channels may be installed in any order.

Table J — RCVR/OTU Input and ODU Output LBO Selection Guide for OCHAN 2 Through 8 in Both Mx24 and Px25 Span Systems

Total # of Equipped OLS Channels*	Measured LCT RCVR/OTU IN Input Power (dBm) with 0-db LBO at ODU Output	Recommended LBO (dB) for LCT RCVR/OTU IN Input	Recommended LBO (dB) for ODU Output
1	$-7.0 < P_{in} \leq -5.5$	5	3
	$-5.5 < P_{in} \leq -3.9$	10	0
	$-3.9 < P_{in} \leq -2.6$	7	5
	-2.6 to -2.0	10	3
	-2.0 to -0.8	7	7
	-0.8 to +0.8	15	0
	+0.8 to +2.0	10	7
	+2.0 to +3.6	15	3
	> +3.6	10	10
2-8	-15.0 to -13.3	5	0
	-13.3 to -12.0	7	0
	-12.0 to -10.6	5	3
	-10.6 to -8.9	10	0
	-8.9 to -7.6	17	5
	-7.6 to -7.0	10	3
	-7.0 to -5.8	7	7
	-5.8 to -4.2	15	0
	-4.2 to -3.0	10	7
	-3.0 to -1.4	15	3
	-1.4 to -0.6	10	10
	-0.6 to +0.5	15	5
	+0.5 to +2.8	15	5
	> +2.8	15	7

* Note that this column states the total number of optical channels that are equipped in the OLS and NOT the OCHAN() number. Optical channels may be installed in any order.

39. At the OLS, remove the protector cap and clean the **CM IN** port for the CM signal being added. Install a 0 dB LBO at the **CM IN** port.

    Reference: **DLP-510**

40. Remove the protector cap and clean the fiber coming from the customer provided equipment.

    Reference: **DLP-510**

41. Connect the optical power meter to the fiber coming from the transmit side of the customer provided equipment for the CM signal being added and obtain an optical power measurement.

42. Using the power level reading obtained in Step 41 and Table K, determine the correct customer equipment/test set attenuation needed for the correct **CM IN** power level.

Table K — CM Input Power

CM Input Power (dBm)	Transmit Side LBO (dB)
≤ -14 and > -30	0
> -14	Select an LBO that results in the CM input power being between -14 and -30 dBm.
≤ -30	Decrease the LBO until the CM input power is between -14 and -30 dBm.

43. Close the cabinet door or install the shelf cover.

    Reference: **DLP-511**

44. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

45. Remove fiber from the **IN** connector of the TLM circuit pack being tested.

46. Connect the optical power meter to the fiber coming from the OA circuit pack and obtain an optical power measurement.

    Reference: **DLP-503**

47. Using the power level reading obtained in Step 46 and Table L, determine if the power level was correct.

Table L — TLM Circuit Pack Input Power

Maximum Power (dBm)	Minimum Power (dBm)
-10.5	-30.0

48. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

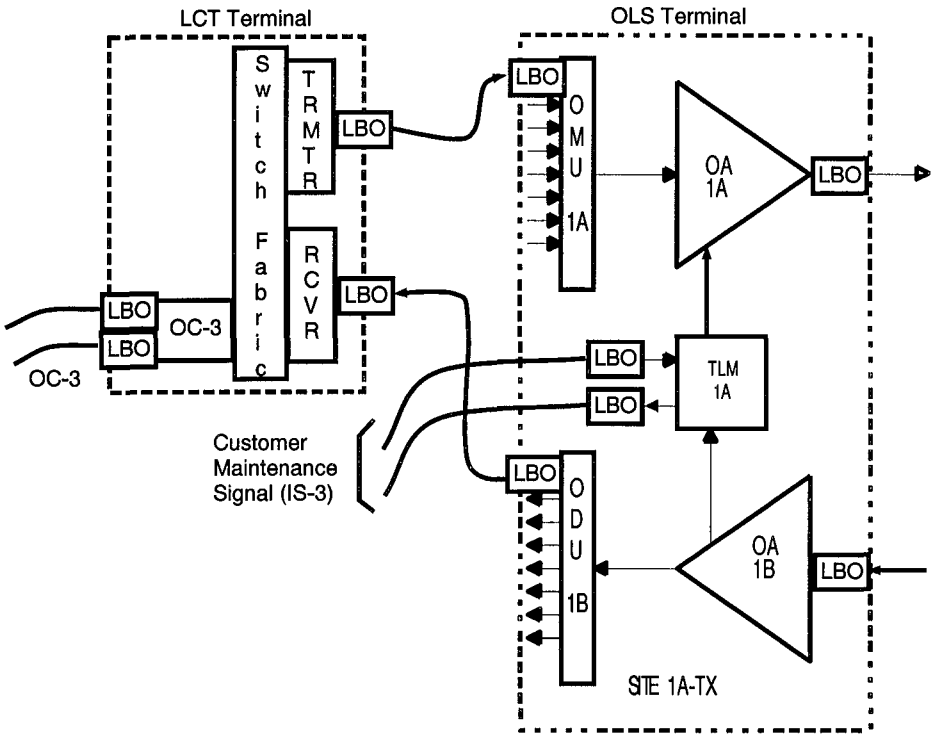


Figure 1 - Location of Lightguide Buildouts (LBOs)

Connect and Condition Craft Interface Terminal (CIT)

Overview: This procedure provides instructions to verify the CIT [a personal computer (PC) running OLS CIT-PC software] is properly connected, powered, and has software installed. If you are unfamiliar with the PC, an "Introduction to the PC" is provided in DLP-516.

1. ⇒ NOTE:
   The PC must meet the minimum requirements as stated in the "Craft Interface Terminal" part of Section 6, "Operations Interfaces."

   Verify the PC is safely positioned on a cart or table.

2. Verify the cable connections at the PC.

   Reference: 365-575-310, *Optical Line System, Installation Manual.* To summarize, check the following:

   - The appropriate 9-pin or 25-pin cable or equivalent interface cable is connected between the **CIT (DCE)** female connector on the user panel and a serial male connector on the PC.
   - If required, a printer with the appropriate printer cable is connected to the CIT per the instructions provided with the printer.
   - If required, a modem (internal or external) is connected per the instructions provided with the modem. Many modem configurations exist and operate over the public switched network or a data communications network (*Datakit*® network).

     Reference: **DLP-520** (Establish modem or *Datakit* network access.)

3. Turn the PC power switch to "on."

4. Verify the PC prompt is displayed (typically ***C:\>***).

   Reference: **DLP-516**

5. Is the OLS CIT-PC software loaded on the PC?

   If **YES**, then continue with Step 9.
   If **NO**, then go to **Operation: NTP-002**.
   If **DON'T KNOW**, then continue with Step 6.

6. If necessary, change your current directory to the directory where the CIT-PC software should be installed.

7. Enter "`dir`" and press the ENTER key.

8. Was the "`CIT  EXE`" file displayed (also known as `CIT.EXE`)?

   If **YES**, then continue with Step 10.
   If **NO**, then go to **Operation: NTP-002** (software is not loaded).

9. If necessary, change your current directory to the directory where the CIT-PC software is installed.

10. Execute the OLS CIT-PC software by entering "**cit expert**" (without the quotes) and pressing the ENTER key. Use factory installed login: ***ATT01*** and password: ***FT-2000*** or other valid login and password with user authorization level of expert. Then, follow the instructions displayed on the screen to log in to the network element. If you encounter difficulty in logging in or the connection attempt fails, the wrong COM port may have been specified in the SET-UP menu. A CIT tutorial is available in Section 11, "Craft Interface Terminal Usage."

    Nice to Know: Memory-resident programs (also called TSRs) run in the background and may compete for the same random access memory (RAM) as the CIT-PC program. If this is the situation, disable all memory resident programs currently running in the PC unless modified to run with the CIT-PC program. The easiest way to do this is to replace the AUTOEXEC.BAT and CONFIG.SYS files, with the sample files provided in the directory where the CIT-PC program is loaded. For help, contact your next level of technical support or refer to the appropriate software release description as listed in Operation: NTP-002.

11. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Test LEDs on Front Panel and Circuit Packs

1. Open the cabinet doors or remove shelf cover. All LEDs are visible from the front.

   Reference: **DLP-511**

2. At the CIT, select `FAULT-Test-LED` command.

   Requirement: All LEDs are lighted for 10 seconds, off for 10 seconds, then they return to their normal condition.

3. Did the LED(s) of interest operate as indicated above?

   If **YES**, then continue with Step 4.

   If **NO**, then continue with Step 6.

4. ⇒ NOTE:
   The LED operation appears to be normal.

   Close the cabinet doors or install the shelf cover.

   Reference: **DLP-511**

5. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

6. Notify the installation personnel to correct the LED trouble before returning to this procedure.

7. Close the cabinet doors or install the shelf cover.

   Reference: **DLP-511**

8. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Fiber Connections and Circuit Pack Locations Used in OLS

Overview: This information shows which circuit packs are used in the OLS end terminal and the OLS repeater and where in the shelf they are located. Detailed information on fiber connections is presented in Chapters 7, 8, and 9 of the Installation Manual (365-575-310).

CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an OLS network element to prevent electrostatic discharge damage to sensitive components.

1. Refer to the appropriate figure and table to verify correct fiber connections and circuit packs for the 1A-TX end terminal, 1A-RCV end terminal, and/or repeater.

2. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

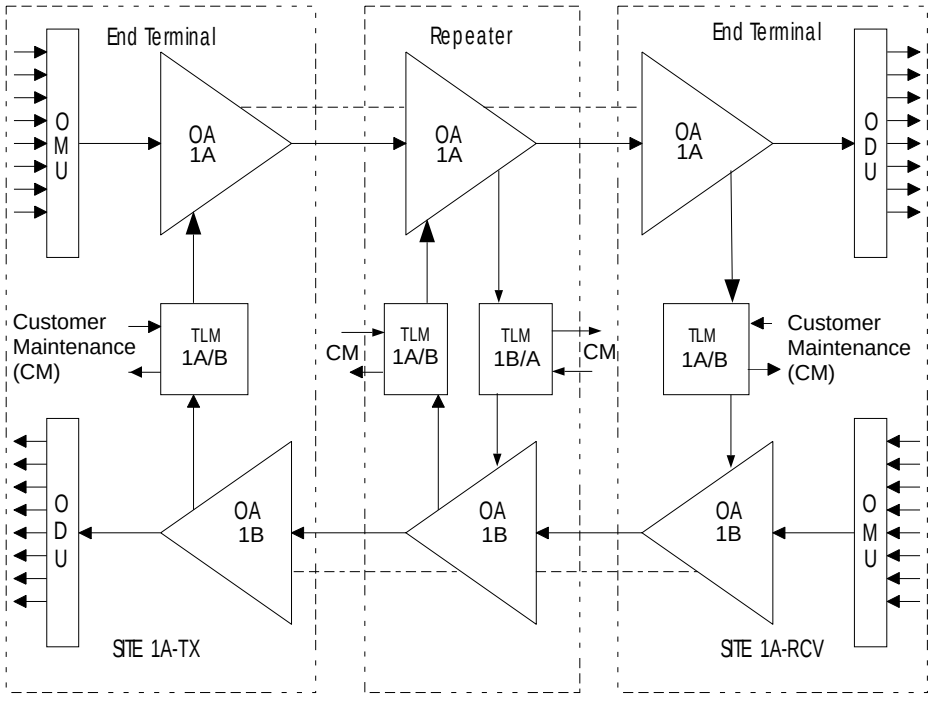


Figure 1 - Optical Line System Shown With One Repeater

Table A - Circuit Packs for OLS 1A-TX End Terminal

Shelf 1	**Line 1**	**CP**	OA	OA	TLM	—	OMU	ODU	SYSCTL	SYSMEM	TOHCTL
		Slot	1A	1B	1A	1B	1A	1B	SYSCTL	SYSMEM	TOHCTL
	Line 2	**CP**	OA	OA	TLM	—	OMU	ODU	—	—	—
		Slot	2A	2B	2A	2B	2A	2B	—	—	—
Shelf 2	**Line 3**	**CP**	OA	OA	TLM	—	OMU	ODU	—	—	—
		Slot	3A	3B	3A	3B	3A	3B	—	—	—
	Line 4	**CP**	OA	OA	TLM	—	OMU	ODU	—	—	—
		Slot	4A	4B	4A	4B	4A	4B	—	—	—

Table B - Circuit Packs for OLS 1A-RCV End Terminal

Shelf 1	**Line 1**	**CP**	OA	OA	TLM	—	ODU	OMU	SYSCTL	SYSMEM	TOHCTL
		Slot	1A	1B	1A	1B	1A	1B	SYSCTL	SYSMEM	TOHCTL
	Line 2	**CP**	OA	OA	TLM	—	ODU	OMU	—	—	—
		Slot	2A	2B	2A	2B	2A	2B	—	—	—
Shelf 2	**Line 3**	**CP**	OA	OA	TLM	—	ODU	OMU	—	—	—
		Slot	3A	3B	3A	3B	3A	3B	—	—	—
	Line 4	**CP**	OA	OA	TLM	—	ODU	OMU	—	—	—
		Slot	4A	4B	4A	4B	4A	4B	—	—	—

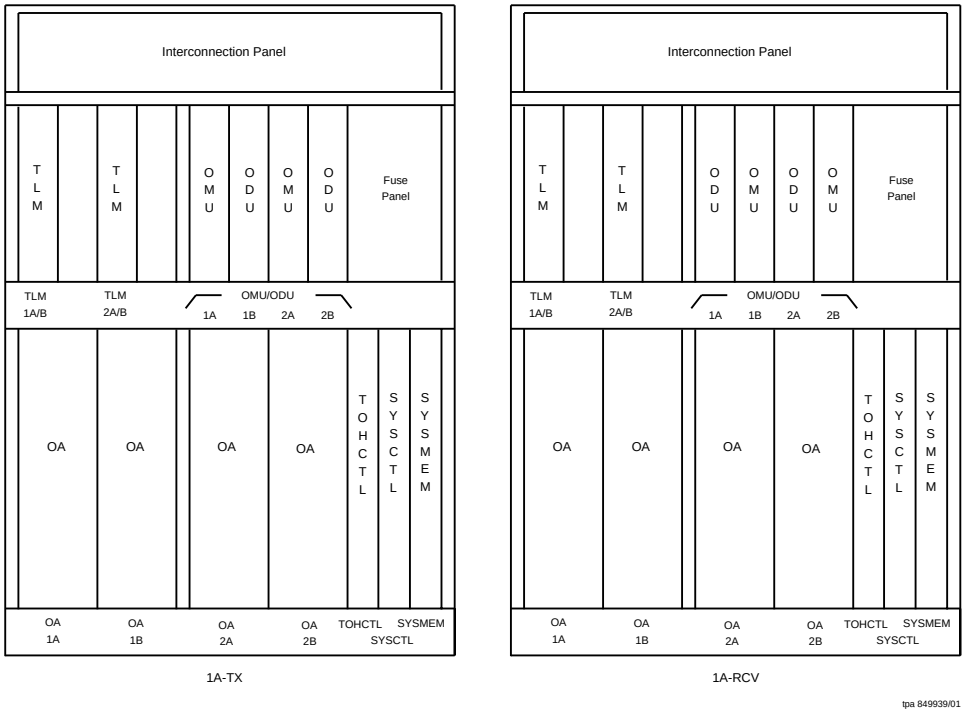


Figure 2 - 1A-TX and 1A-RCV End Terminal (Shelf 1)

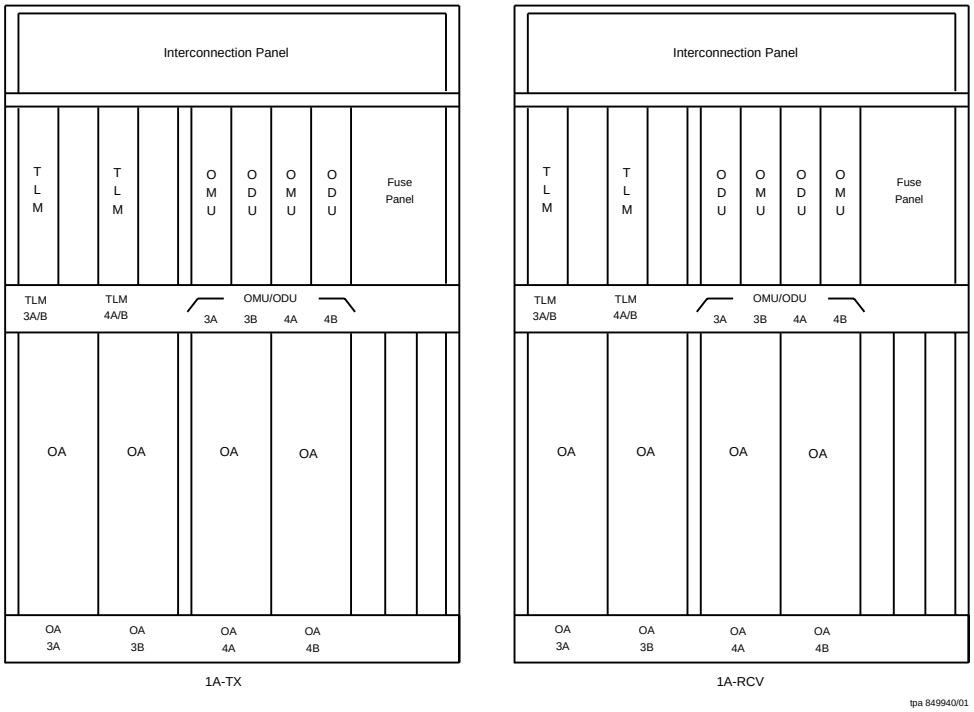


Figure 3 - 1A-TX and 1A-RCV End Terminal (Shelf 2)

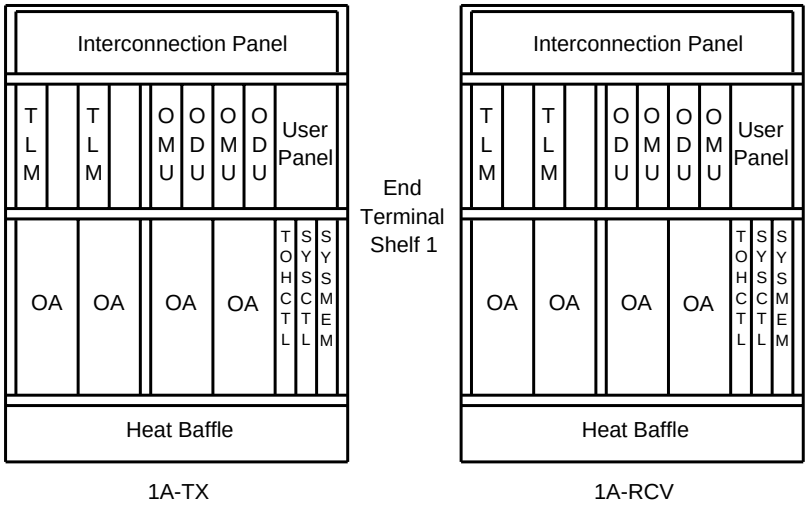


Figure 4 - 1A-TX and 1A-RCV Miscellaneously Mounted OLS End Terminal Shelves (Covers Removed)

Table C - Source Addresses and Associated Shelves

Source Address	Associated Shelf		
	End Terminal	Shelf No.	Repeater
oline-{1a,1b,2a,2b}	Yes	Shelf 1	Yes
ochan-{1a,1b,2a,2b}-{1-8}	Yes		No
oa-{1a,1b,2a,2b}	Yes		Yes
cms-{1a,2a}	Yes		No
cms-{1a,1b,2a,2b}	No		Yes
tohctl	Yes		Yes
tlm-{1a,2a}	Yes		No
tlm-{1a,1b,2a,2b}	No		Yes
supr-{1a,2a}	Yes		No
supr-{1a,1b,2a,2b}	No		Yes
sysctl	Yes		Yes
sysmem	Yes		Yes
oline-{3a,3b,4a,4b}	Yes	Shelf 2	Yes
ochan-{3a,3b,4a,4b}-{1-8}	Yes		No
oa-{3a,3b,4a,4b}	Yes		Yes
cms-{3a,4a}	Yes		No
cms-{3a,3b,4a,4b}	No		Yes
tlm-{3a,4a}	Yes		No
tlm-{3a,3b,4a,4b}	No		Yes
supr-{3a,4a}	Yes		No
supr-{3a,3b,4a,4b}	No		Yes

Table D — Circuit Packs for OLS Repeater

Shelf 1	**Line 1**	**CP**	0A	0A	TLM	TLM	TLM	TLM	SYSCTL	SYSMEM	TOHCTL
		Slot	1A	1B	1A	1B	1B	1A	SYSCTL	SYSMEM	TOHCTL
	Line 2	**CP**	0A	0A	TLM	TLM	TLM	TLM	—	—	—
		Slot	2A	2B	2A	2B	2B	2A	—	—	—
Shelf 2	**Line 3**	**CP**	0A	0A	TLM	TLM	TLM	TLM	—	—	—
		Slot	3A	3B	3A	3B	3B	3A	—	—	—
	Line 4	**CP**	0A	0A	TLM	TLM	TLM	TLM	—	—	—
		Slot	4A	4B	4A	4B	4B	4A	—	—	—

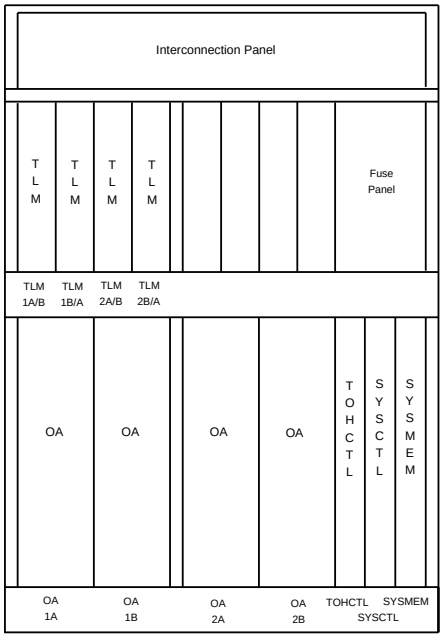


Figure 5 - OLS Repeater (Shelf 1)

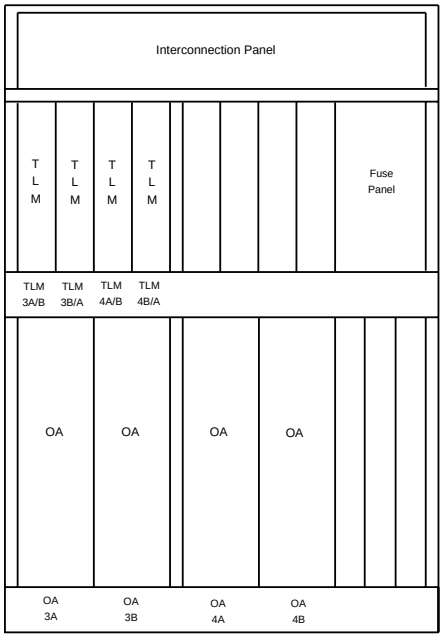


Figure 6 - OLS Repeater (Shelf 2)

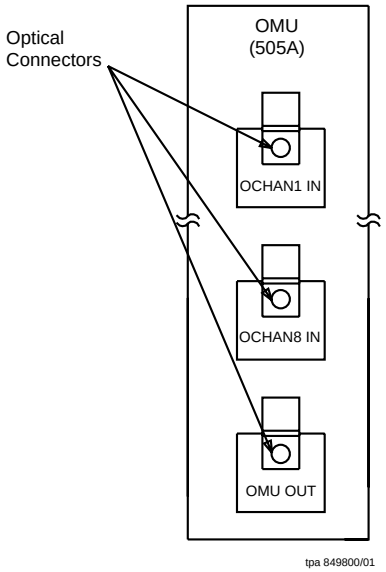


Figure 7 - OMU 505A

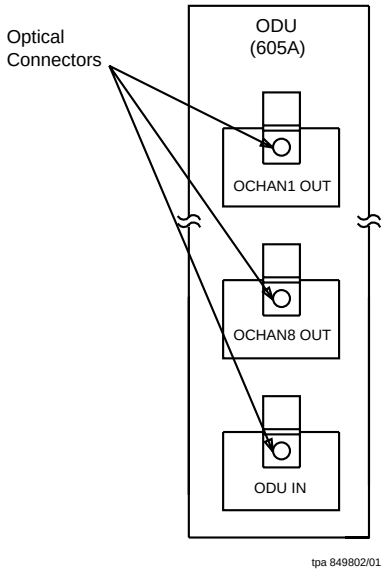


Figure 8 - ODU 506A

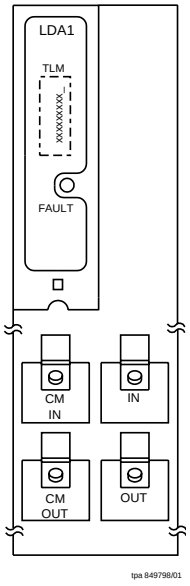


Figure 9 - TLM (LDA1) Circuit Pack

Test Office Alarm Operation

1. At the CIT, select `FAULT-Test-Alarm` and `Mode: All` with `Repeat: 1`.

2. Verify the **CR**, **MJ**, and **MN** visual LEDs are sequentially *lighted* for 4 seconds and then remain *off* per the sequence chart below. The **NE ACTY** LED will be lighted for the duration of the test. The **FE ACTY** and **ABN** LEDs are not lighted during this test. Also, the office audible alarms should be activated during this test.

Step*	Alarm LEDs at User Panel					
	CR	**MJ**	**MN**	**NE ACTY**	**ABN**	**FE ACTY**
1	off	off	off	**on**	off	off
2	**on**	off	off	**on**	off	off
3	off	**on**	off	**on**	off	off
4	off	off	**on**	**on**	off	off
5	off	off	off	**on**	off	off
6	off	off	off	off	off	off

* Each step has a 4-second duration.

3. Did the office alarms operate as described?

   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

   If **NO**, then refer problem to the group that installed the equipment.

Perform Provisioning

1. ⇒ NOTE 1:
   The OLS does not have any manual or switch-settable options on its circuit packs or units.

   ⇒ NOTE 2:
   Information about OLS provisioning is provided in Section 8, "Administration and Provisioning," of this manual. Other helpful information is the CIT tutorial and command tables (by release), which are located in Section 11 of this manual.

   365-575-302, *Optical Line System Provisioning Job Aid*
   365-575-303, *OLS Threshold-Crossing Alert (TCA) Parameters Provisioning Job Aid*

   At the CIT, select `CONFIGURATION`, `PERFORMANCE`, `FAULT`, or `SECURITY` category and the appropriate inputs [verb and modifier(s)]. Inputs are also referred to as commands.

2. ⇒ NOTE:
   Table 11-3 lists the reports and how to obtain them. For example, the System Alarm Attributes Report is obtained by using `CONFIGURATION-Retrieve-Attribute-Alarm`. Another example is the Supervisory Channel Provisioning Report that is obtained by using `CONFIGURATION-Retrieve-Supr`.

   Did the appropriate report show that provisioning has been done?

   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

   If **NO**, then (1) refer the problem to the group that did the original provisioning, and/or (2) compare the report with the original work order and correct the provisioning discrepancy. Provisioning job aids are available; see Step 1 for the specific equipment references.

Verify OLS Network Elements Are Connected

Overview: This procedure is used to verify that all network elements are connected in an OLS (Figure 1).

1. ⇒ NOTE:
   CIT-PC reports are used to verify OLS connectivity. Chapter 11 provides additional details about the reports.

   At the CIT, select `FAULT-Retrieve-Alarm (and Status):All` command to obtain an Active Alarm and Status Report. This report indicates if any trouble conditions are present on the local OLS network element.

2. Are there any trouble conditions listed in the `Descriptive` column of the report?

   If **NO**, then continue with Step 3.

   If **YES**, then notify the installation personnel to correct the trouble condition before proceeding.

3. At the CIT, select `FAULT-Retrieve-Network Alarms` command to obtain a Network Alarm Report for the OLS. This report indicates if any conditions are present in the OLS.

4. Are there any alarms listed in the `System Alarm` column of the report?

   If **NO**, then continue with Step 5.

   If **YES**, then notify the installation personnel to correct the trouble condition before proceeding.

5. At the CIT, select `CONFIGURATION-Retrieve-Map-Ring` command to obtain a Ring Map Report.

6. Verify the TID's, DSNE, DCC Status, and Fiber Connections from the report agree with the engineered documentation.

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

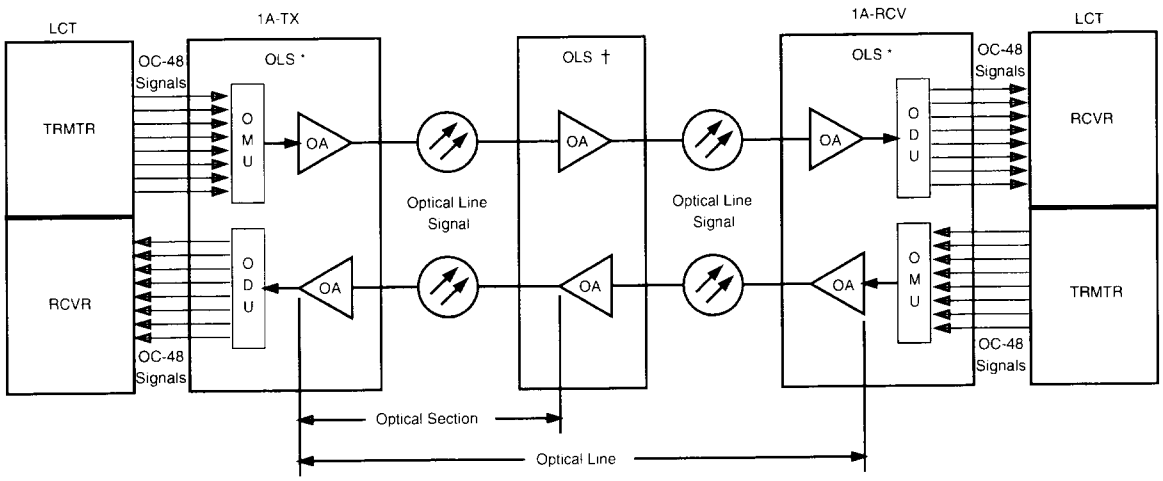


Figure 1 - Optical Line System Shown With One Repeater

Identify Source of Incoming Signal

Overview: You were sent to this procedure to identify the signal source associated with an incoming signal condition so that you can issue a Trouble Report to the personnel at that location. Refer to Figure 1.

1. Find the condition to be reported in the table below and continue with the indicated step.

For This Condition	Go To
Incoming CMS SD (signal degrade)	Step 2
Incoming CMS SF (signal failure)	Step 2
Incoming optical channel LOS (loss of signal)	Step 4
Incoming optical line LOS (loss of signal)	Step 6
Incoming supr chnl fail	Step 6
Incoming supr chnl SD (signal degrade)	Step 6
Incoming supr chnl SF (signal failure)	Step 6

2. ⇒ NOTE:
   The source of the incoming signal condition is the upstream customer provided equipment in the direction of the incoming signal (or the other end terminal if this is a point-to-point network).

   From office records, determine the location of the customer provided equipment and send a Trouble Report to the personnel responsible for maintaining that site.

3. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

4. ⇒ NOTE:
   The source of the incoming signal condition is the LCT network element.

   From office records, determine the location of the LCT network element for this channel and send a Trouble Report to the personnel responsible for maintaining that site.

5. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

6. ⇒ NOTE:
   The source of the incoming signal condition is the next network element in the direction of the incoming signal.

   From office records, determine the location of the next network element and send a Trouble Report to the personnel responsible for maintaining that site.

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

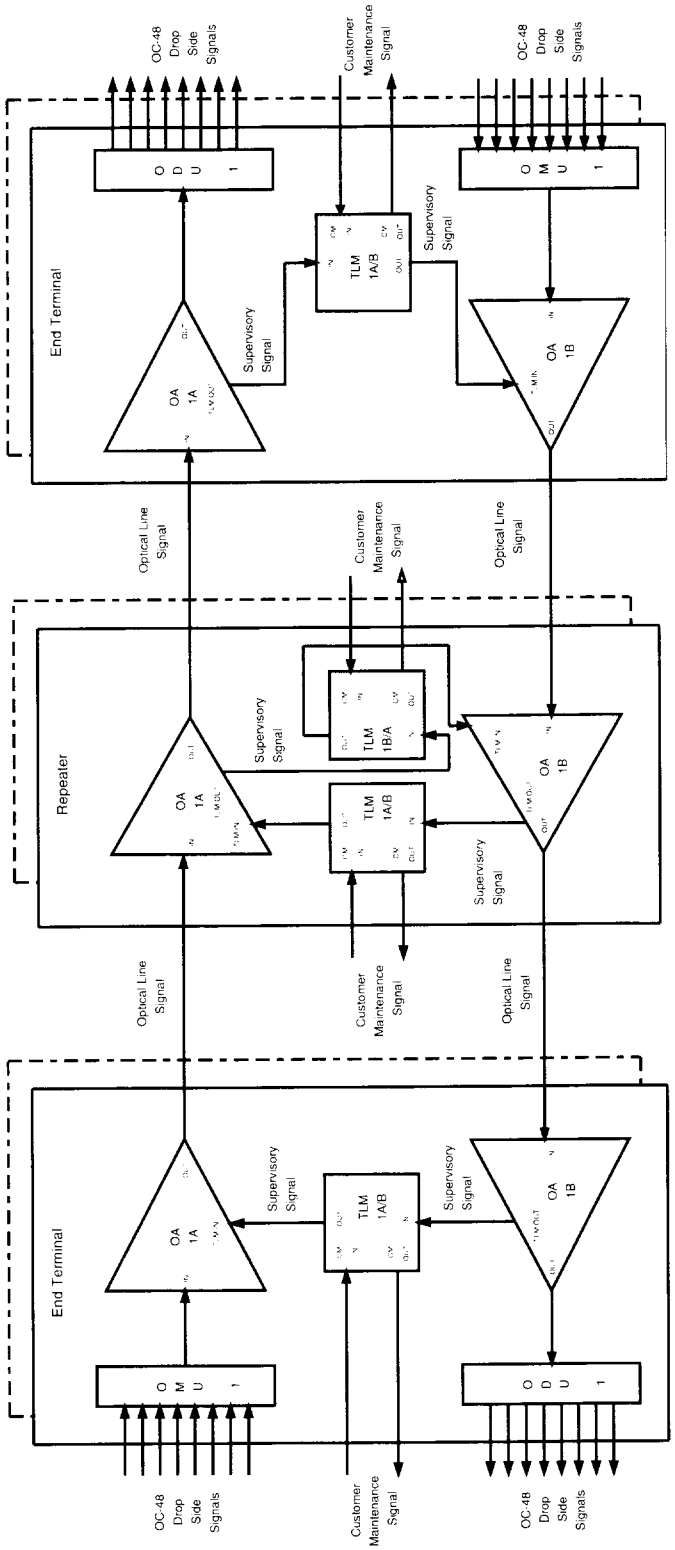


Figure 1. Example of OLS with One Repeater

Test Parallel Telemetry

Overview: This procedure is used to test all the parallel telemetry points for proper operation. This procedure is performed during the acceptance of the OLS network elements when they are out of service and is performed only during this time. For additional information, refer to the "Parallel Telemetry Interface" part in Section 6, "Operations Interfaces."

1. Contact the remote operations center and request their assistance in monitoring the parallel telemetry points during this test.

2. At the remote operations center, disable the alarm threshold level for the telemetry points being tested.

3. At the local CIT, select `FAULT-Test-Telemetry-Parallel` and `Mode: All` with `Repeat: 1`.

   Response: All parallel telemetry points are simultaneously turned on for 20 seconds, then off for 20 seconds before reverting to normal operation.

4. Does the test pass as monitored from the remote operations center.

   If **YES**, then continue to Step 5.

   If **NO**, then refer to the Installation Manual to correct the problem or contact the group who did the installation.

5. At the remote operations center, enable the alarm threshold level for the points being tested, if disabled in Step 2.

6. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Install/Remove Apparatus (Circuit Pack) Blank

1. Is an apparatus blank to be installed or removed?

   To be **installed**, then continue with Step 2.

   To be **removed**, then continue with Step 7.

2. Position the apparatus blank vertically with its white painted surface towards you and its two extended protrusions away from you and on the right side.

3. Insert the apparatus blank's bottom extended protrusion into the bottom of the circuit pack slot and snap its spring-clip notch over the bottom shelf cross-support channel.

4. Carefully bend the apparatus blank so that it is slightly bowed towards you in the middle, insert its top protrusion into the top of the circuit pack slot, and snap its spring-clip notch over the top shelf cross-support channel.

5. Push the center of the apparatus blank inwards to fully seat it and to eliminate any residual bowing.

6. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

7. Is there a vacant slot adjacent to the apparatus blank to be removed?

   If **YES**, then continue with Step 8.

   If **NO**, then continue with Step 12.

8. Carefully bend the apparatus blank so that it is slightly bowed towards you in the middle, unsnap its spring-clip notch from the top shelf cross-support channel, and remove its top protrusion from the top of the circuit pack slot.

9. Unsnap the apparatus blank's spring-clip notch from the bottom shelf cross-support channel and remove its bottom extended protrusion from the bottom of the circuit pack slot.

10. Lift the apparatus blank from the slot.

11. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

12. Use a flat-bladed screwdriver against the bottom shelf cross-support channel to pry the apparatus blank's bottom edge upward and forward.

13. Lift the apparatus blank from the slot.

14. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clean Optical Fibers and Connectors

Overview: This procedure is used to clean the optical connectors used in an optical line system. Proper cleaning will eliminate exposure to dirt that may cause permanent damage to the connector. Once a connector has been permanently damaged, no amount of cleaning will rectify it. A damaged connector is suspected, despite rigorous cleaning, when power remains low in the system. Therefore, proper cleaning is especially critical in high-power systems. In the event that the connector is damaged, it must be replaced by installing a new jumper cable.

Required Equipment:

- CLETOP Reel Type A
- CLETOP stick type
- Optical Quality Tissue
- Isopropyl Alcohol (>91% 2-propanol + water).

WARNING:
Disconnected or separated optical connectors may emit invisible laser radiation. Do not view the lightwave beam with an optical instrument. Avoid direct exposure to the beam.

NOTE 1:
All optical fiber connectors (*ST*®, FC/PC, LC, and SC types), lightguide buildouts, and buildout blocks or equivalents should be cleaned before making initial connections or reconnections per the following instructions. Only the components being assembled at this particular time should be cleaned.

NOTE 2:
Important Information: To prevent contamination, keep all dust caps and plugs in place until time to make connections.

Cleaning Optical Jumpers and Pigtails

1. Remove (if necessary) optical connector from buildout or remove (if necessary) dust cap from the optical connector.

2. Clean (if necessary) the cylindrical surface of the connector ferrule with a tissue dampened with isopropyl alcohol.

3. Are you cleaning an LC-type connector?

   If **NO**, then continue with Step 4.
   If **YES**, then blow dry with clean dry air and **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

4. Hold the CLETOP Reel Type A cleaner in the palm of your left hand.

5. Press the lever all the way down and hold, do not release the lever.

6. While keeping the lever held down, press the optical ferrule endface against the cleaning cloth in the left slot and drag it toward you.

7. Rotate the connector 90 degrees.

8. Press the ferrule endface against the cleaning cloth in the right slot and drag it toward you.

9. Release the lever and allow it to return to its initial position.

Cleaning Optical Connectors Inside the Faceplate

10. ⇶ **NOTE:**
    To prevent contamination, keep the optical ports covered with a dust cap when not in use.

    Remove (if necessary) the line buildout from buildout block.

    Reference: **DLP-512**

11. Carefully wipe the cleaning cloth on the tip of CLETOP stick type against the ferrule endface.

12. Replace the line buildout into the buildout block.

    Reference: **DLP-512**

13. **STOP! YOU HAVE COMPLETED THIS PROCEDURE**.

Open/Close Cabinet Doors or Install/Remove Shelf Cover

1. ⚠ CAUTION:
   Use a static ground wrist strap whenever handling circuit packs or working on an OLS network element to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100**.

   Is the network element cabinet installed or miscellaneously mounted?

   If **cabinet installed**, then continue with Step 10.
   If **miscellaneously mounted**, then continue with Step 2.

2. Locate the appropriate shelf cover.

   Reference: **DLP-503**

3. Is the cover being installed or removed?

   If **Removed**, then continue with Step 4.
   If **Installed**, then continue with Step 7.

Remove Cover

4. At the top of each cover, locate a latch at each corner.

5. Unlatch the cover, swing toward you three inches and lift the cover from the shelf frame.

6. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Install Cover

7. Place the cover bottom into the shelf frame.

8. Close the cover until both top corners latch.

9. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

10. Locate the appropriate cabinet.

    Reference: **DLP-503**

11. Are the doors being opened or closed?

    If **opened**, then continue with Step 12.

    If **closed**, then continue with Step 15.

Open Cabinet Doors

12. At the center of the right door, locate the latch release push button and press in and release. The latch handle will pop out.

13. Grasp the latch handle and open the door, now the left-hand door can be opened.

14. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Close Cabinet Doors

15. Close the left-hand door first.

16. Close the right-hand door and press down on the latch handle.

17. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Install/Remove Lightguide Buildout

WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to beam.

CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an OLS network element to prevent electrostatic discharge damage to sensitive components.

NOTE:
Table A lists the color and values of LBOs. The green LBOs must be used when adding channels because of their finer granularity. If yellow LBOs are already installed, you do not need to go back and replace with green LBOs.

1. Is the buildout being installed or removed (see Figure 1)?
   To **Install**, then continue with Step 2.
   To **Remove**, then continue with Step 5.

Install Buildout

2. Remove the protector caps and plugs (if equipped) from the buildout and buildout block and store them in a clean container.

3. Align the buildout with the slot in the buildout block, push in, and rotate clockwise until locked into position. Refer to the appropriate figure (2, 3, 4, or 5) for the specific buildout type.

4. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Remove Buildout

5. **CAUTION:**
   Locking beam must only be pushed along a line perpendicular to buildout body in direction towards the buildout in order to avoid damage to the locking beam.

   Depress the locking beam on the buildout, rotate counterclockwise, and separate from the buildout block by sliding apart. Refer to the appropriate figure (2, 3, or 4) for the specific buildout type.

6. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

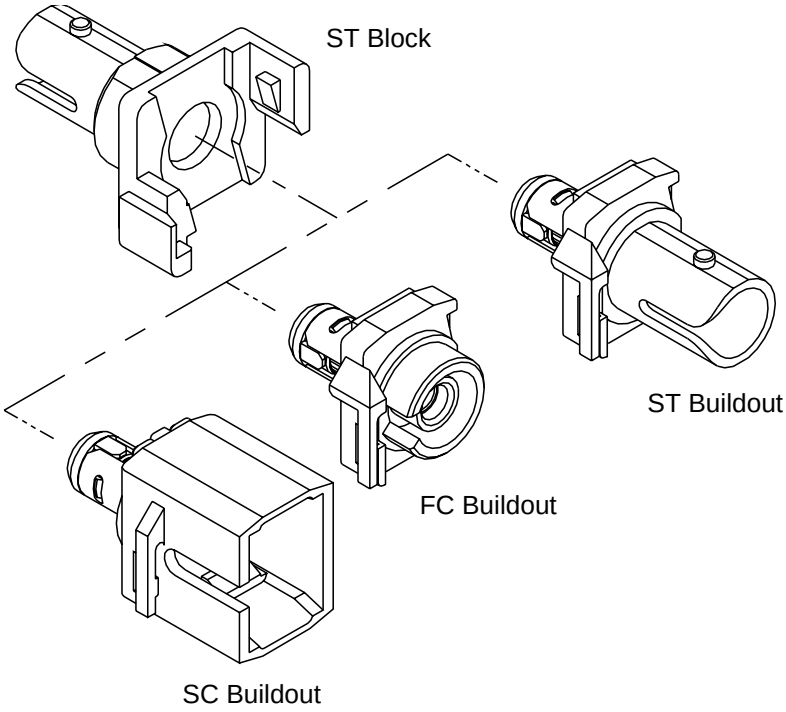


Figure 1 - ST® Block and Buildouts

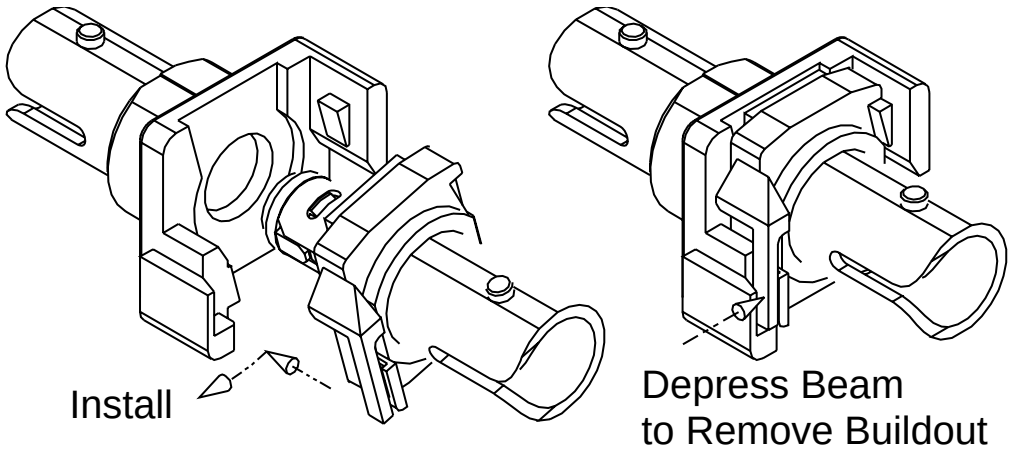


Figure 2 - ST® Block and ST Buildout

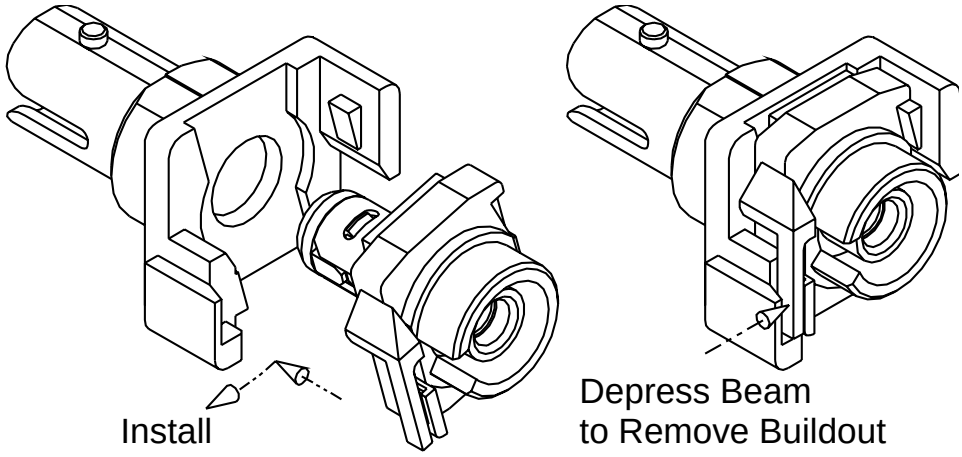


Figure 3 - ST® Block and FC Buildout

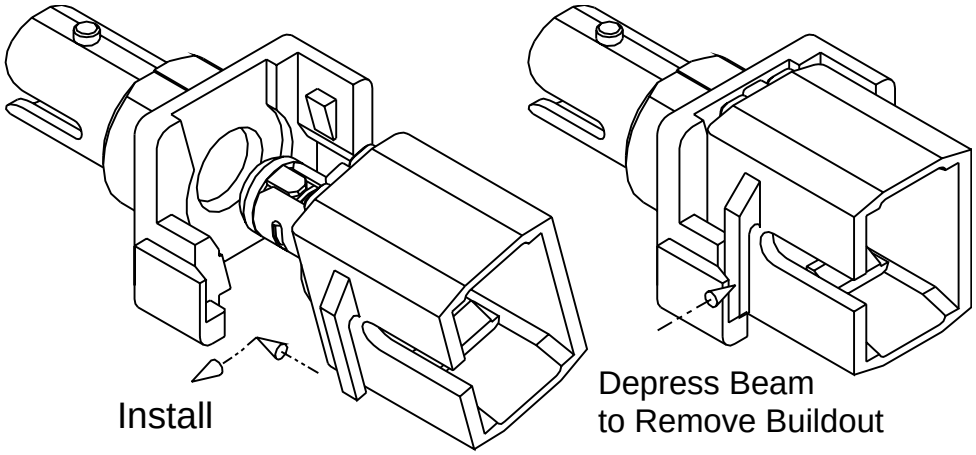


Figure 4 - ST® Block and SC Buildout

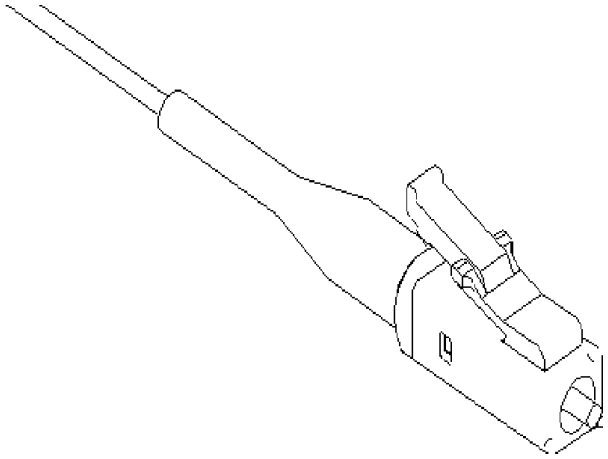


Figure 5 - LC Connector

Table A — LBO Types (Maximum Reflectance = –30 dB)

LBO Color	Fiber Use *	Attenuation Values (dB)	Connectors Supported	Wavelength at Nominal Attenuation (nm)	Attenuator Element (dB)	Optical Power Limits (dBm) †
White	SM-SM SM-MM MM-MM	0	ST and FC	No Restriction	---	Connector Limited
	MM-MM	5,10,15,17.5	ST	1310	Clear for 5	≤20
					Tinted for 10,15,17.5	≤5
Blue	SM-SM SM-MM MM-MM	0	SC	No Restriction	---	Connector Limited
	MM-MM	5,10,15,17.5	SC	1310	Clear for 5	≤20
					Tinted for 10,15,17.5	≤5
Yellow	SM-SM	3,5,7,10, 15,20	ST, FC, and SC	1310 to 1550 ‡	Clear for ≤10	≤20
					Tinted for ≥15	≤5
Green §	SM-SM	3,3.5,4, 4.5,5,5.5,6, 6.5,7,7.5, 8,8.5,9,9.5, 10,10.5,11, 11.5,12,12.5, 13,13.5,14, 14.5,15, 16,18,20	ST and FC	1550	Clear	≤20
		3,3.5,4,4.5,5, 5.5,6,6.5,7, 7.5,8,8.5,9, 9.5,10	SC	1550	Clear	≤20
Gray	SM-MM	5,7,10,12, 15,17,20	ST and FC	1550	Tinted	≤5

* SM = Single-mode fiber, MM = Multi-mode fiber.

† These optical power values are conservative estimates.

‡ The yellow LBOs have nominal values appropriate to both 1310 and 1550 nm. Worst case tolerance on attenuation is ± 15% of nominal attenuation.

§ Green LBOs are highly recommended for 16 wavelength systems due to their finer granularity. These LBOs have nominal values appropriate to 1550 nm. Tolerance is ± 0.3 dB of nominal attenuation for 3 to 15 dB values, ± 0.5 dB for the 16 dB value, and ± 1 dB for 18 or 20 dB values.

Test Miscellaneous Discrete Telemetry

Overview: This procedure tests the user settable miscellaneous discrete environmental (input) points and control (output) points.

1. Contact the remote operations center and request their help to observe the environmental points and to activate the control points during this test.

2. At the remote operations center, disable, if desired, the alarm threshold level for the points being tested.

3. ⇒ NOTE:
   When an external device connected to the OLS network element causes a contact closure to appear as an environmental input to the network element, a corresponding environmental point is activated at the remote operations center.

   Operate the first external device connected to the OLS network element in such a way as to cause a closed contact to appear at the network element's environmental input.

4. Was the corresponding environmental point activated at the remote operations center?

   If **YES**, then continue with Step 5.
   If **NO**, then report the trouble to the installation personnel.

5. Operate the first external device connected to the OLS network element in such a way as to cause an open contact to appear at the network element's environmental input.

6. Was the corresponding environmental point deactivated at the remote operations center?

   If **YES**, then continue with Step 7.
   If **NO**, then report the trouble to the installation personnel.

7. Repeat Steps 3 through 6 for any remaining environmental points to be tested.

8. ⇒ NOTE:
   When a control point is activated at the remote operations center, it results in a contact closure at the corresponding control output of the OLS network element which, in turn, can operate an external device connected to the network element.

   Ask the personnel at the remote operations center to activate the first control point being tested.

9. Was the corresponding external device connected to the network element operated correctly? (For example, was it turned on?)

   If **YES**, then continue with Step 10.
   If **NO**, then report the trouble to the installation personnel.

10. Ask the personnel at the remote operations center to deactivate the first control point being tested.

11. Was the corresponding external device connected to the network element operated correctly? (For example, was it shut off?)

    If **YES**, then continue with Step 12.
    If **NO**, then report the trouble to the installation personnel.

12. Repeat Steps 8 through 11 for any remaining control points to be tested.

13. At the remote operations center, enable the alarm threshold level for the points being tested, if disabled in Step 2.

14. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Install/Remove Circuit Pack

1. ⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an OLS network element to prevent electrostatic discharge damage to sensitive components.

⚠ CAUTION:
Do not remove the SYSCTL circuit pack unless instructed to by the procedure that sent you here. If the SYSCTL circuit pack is removed, provisioning data could be lost.

⇒ NOTE 1:
Verify that all fibers are labeled to prevent possible service interruption.

⇒ NOTE 2:
Refer to Figures 1 through 4 throughout this procedure, as needed.

Are you to remove or install a circuit pack?

If to **remove**, then continue with Step 2.
If to **install**, then continue with Step 18.

2. What type of circuit pack is being removed?

If **OA circuit pack**, then continue with Step 3.
If **TLM circuit pack**, then continue with Step 11.
If **TOHCTL circuit pack**, then continue with Step 16.
If **SYSMEM circuit pack**, then continue with Step 16.
If **SYSCTL circuit pack**, then continue with Step 16.

3. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

Remove any optical fibers from the guide below the shelf for the circuit pack being removed.

4. ⚠ CAUTION:
   The OA circuit pack must be unseated from the backplane before removing the output optical connector.

   Disengage the OA circuit pack from the shelf.

5. Remove the incoming fiber from the **IN** optical connectors of the OA circuit pack and install a protector cap on the fiber.

6. Remove the outgoing fiber from the **OUT** optical connectors of the OA circuit pack and install a protector cap on the fiber.

7. Remove the optical fibers from the **TLM IN** and/or **TLM OUT** connectors of the OA circuit pack and install protector caps on the fibers.

8. Remove any buildouts from the OA circuit pack for future use.

   Reference: **DLP-512**

9. Remove the circuit pack from the shelf by carefully sliding the circuit pack out of the slot guides to remove it from the shelf. DO NOT ROCK THE CIRCUIT PACK BACK AND FORTH.

10. Are you to install another circuit pack in this slot?

    If **YES**, then continue with Step 19.
    If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

11. Remove the optical fibers from the slot guide on the shelf. This is to prevent damage to the fiber when the circuit pack is removed.

12. Remove the outgoing fiber from the **OUT** optical connectors of the TLM circuit pack and install a protector cap on the fiber.

13. Remove the incoming fiber from the **IN** optical connectors of the TLM circuit pack and install a protector cap on the fiber.

14. Remove the optical fibers from the **CM IN** and **CM OUT** connectors of the TLM circuit pack and install protector caps on the fibers.

15. Remove any LBOs from the TLM circuit pack for future use.

    Reference: **DLP-512**

16. Remove the circuit pack from the shelf as follows:

    a. Push up on the locking clip to unlock the circuit pack latch.

    b. Unseat the circuit pack by carefully and continuously pulling out on the circuit pack latch.

    c. Carefully slide the circuit pack out of the slot guides to remove it from the shelf. DO NOT ROCK THE CIRCUIT PACK BACK AND FORTH.

17. Are you to install another circuit pack in this slot?

    If **YES**, then continue with Step 19.
    If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

18. If applicable, remove the apparatus (circuit pack) blank from the slot.

    Reference: **DLP-533**

19. What type of circuit pack is being installed?

    If **OA circuit pack**, then continue with Step 21.
    If **TLM circuit pack**, then continue with Step 39.
    If **TOHCTL circuit pack**, then continue with Step 20.
    If **SYSMEM circuit pack**, then continue with Step 20.
    If **SYSCTL circuit pack**, then continue with Step 20.

20. Install the circuit pack into the slot as follows:

    a. If necessary, close both latches on the circuit pack.

    b. Place the circuit pack into the slot guides and slowly slide it into the shelf until the latches touch the shelf. DO NOT ROCK THE CIRCUIT PACK OR UNIT BACK AND FORTH.

c. Open the latches and push the circuit pack until it engages the connector pins.

d. With a thumb on each latch, continue sliding the circuit pack with one firm, continuous motion until the latches are fully engaged (the clips are in the locked position).

e. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

21. ⇒ NOTE:
For the 1A-TX site of an OLS, the 1B OA circuit pack is the receive OA circuit pack and for the 1A-RCV site, the 1A OA circuit pack is the receive OA circuit pack.

Is the circuit pack being installed an end terminal receive OA circuit pack?

If **NO**, then continue with Step 32.
If **YES**, then continue with Step 22.

22. If required, clean and install the lightguide buildout to the **IN** connector of the receive OA circuit pack.

Reference: **DLP-512**

23. Clean the incoming optical line fiber and connector and make the connection.

Reference: **DLP-510**

24. Install the circuit pack into the slot as follows:

a. If necessary, close both latches on the circuit pack.

b. Place the circuit pack into the slot guides and slowly slide it into the shelf until the latches touch the shelf. DO NOT ROCK THE CIRCUIT PACK OR UNIT BACK AND FORTH.

25. Connect the remaining optical fibers to their proper locations.

26. Seat the receive OA circuit pack into the shelf as follows:

    a. Open the latches and push the circuit pack until it engages the connector pins.

    b. With a thumb on each latch, continue sliding the circuit pack with one firm, continuous motion until the latches are fully engaged (the clips are in the locked position).

27. Wait 15 minutes for the ODU temperature to stabilize.

28. At the LCT, measure the receive power for each optical channel and install LBOs (new values as required) at the LCT **IN** and ODU **OUT** connectors as required.

    Reference: **DLP-500**

29. Clean the optical fiber(s) and connector(s).

    Reference: **DLP-510**

30. Connect the optical fibers to the lightguide buildouts (LBOs) on the ODU **OCHAN() OUT**.

31. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

32. Install the circuit pack into the slot as follows:

    a. If necessary, close both latches on the circuit pack.

    b. Place the circuit pack into the slot guides and slowly slide it into the shelf until the latches touch the shelf. DO NOT ROCK THE CIRCUIT PACK OR UNIT BACK AND FORTH.

33. If required, install the LBO at the **IN** and **OUT** connectors of the OA circuit pack.

    Reference: **DLP-512**

34. Clean the optical fiber and connector.

    Reference: **DLP-510**

35. Connect the optical fibers to the LBOs and/or optical connectors at the OA circuit pack.

36. Connect the remaining optical fiber(s) to their proper location(s).

37. Seat the OA circuit pack into the shelf as follows:

    a. Open the latches and push the circuit pack until it engages the connector pins.

    b. With a thumb on each latch, continue sliding the circuit pack with one firm, continuous motion until the latches are fully engaged (the clips are in the locked position).

38. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

39. Install the circuit pack as follows:

    a. Open the latch on the circuit pack.

    b. Place the circuit pack into the slot guides and slowly slide it into the shelf until latch engages the shelf.

    c. With a thumb on the latch, continue sliding the circuit pack with one firm, continuous motion until latch is fully engaged (locking clip is in locked position.)

40. If required, install LBOs at the **CM IN** and **CM OUT** connectors of the TLM circuit pack.

    Reference: **DLP-512**

41. Clean the optical fibers and connectors.

    Reference: **DLP-510**

42. Connect the optical fibers to the LBOs and/or optical connectors at the TLM circuit pack.

43. Connect the remaining optical fibers to their proper locations.

44. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

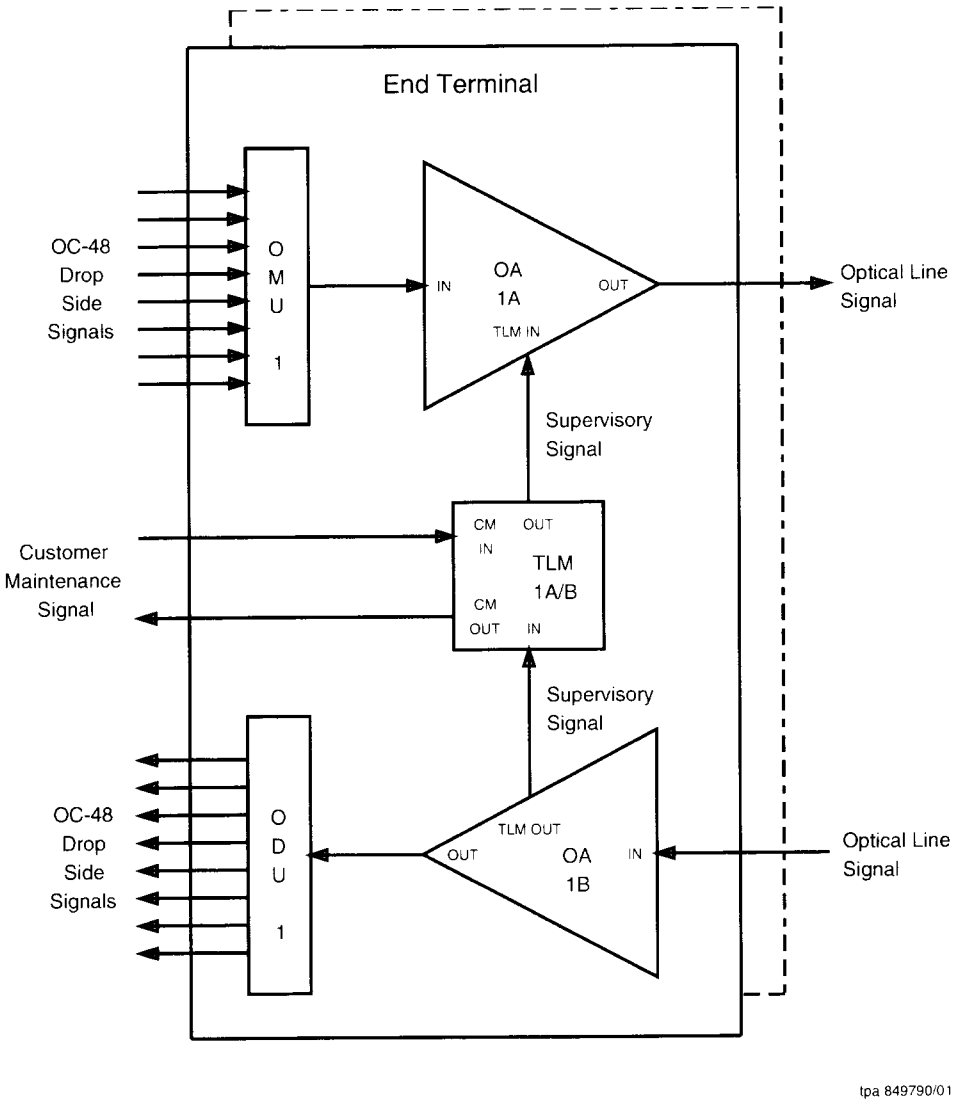


Figure 1 - Fiber Connections at 1A-TX OLS End Terminal

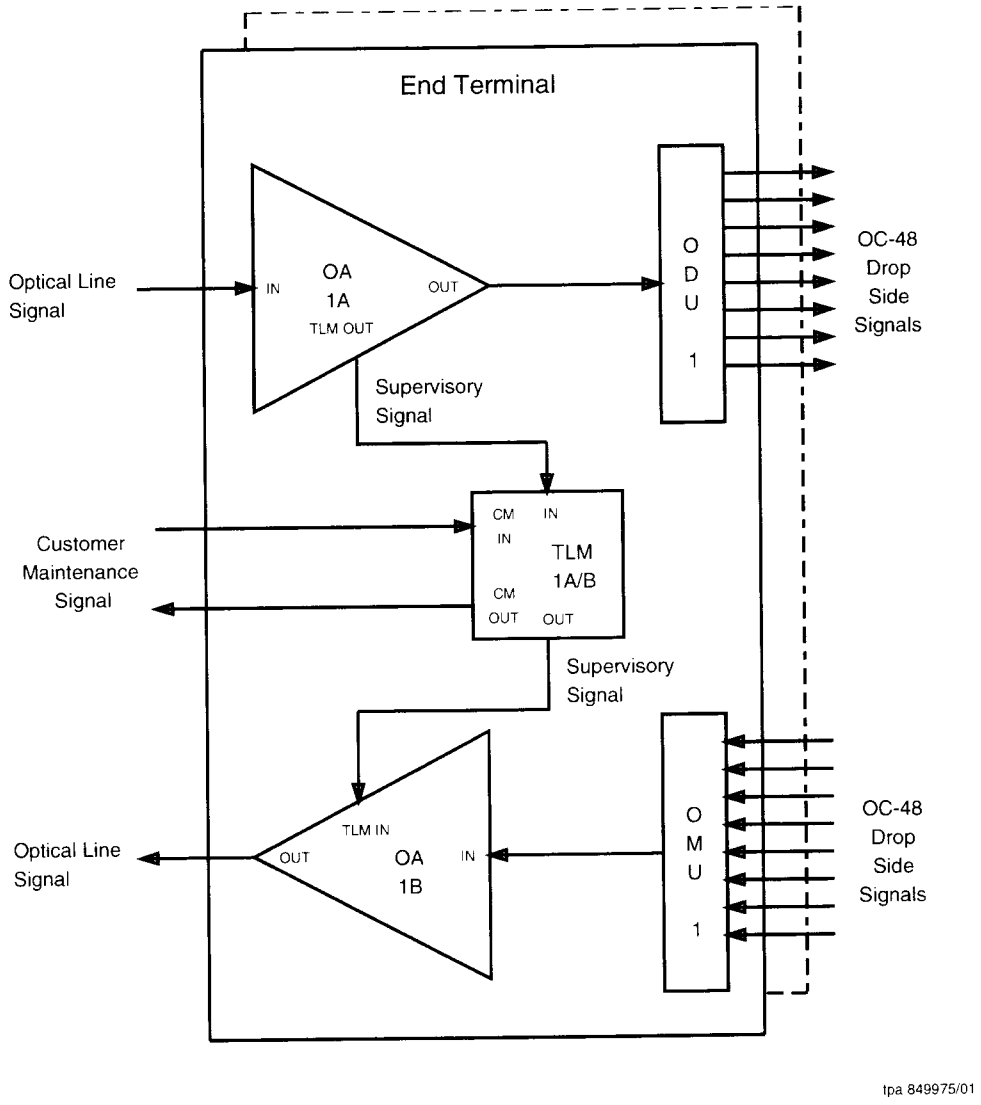
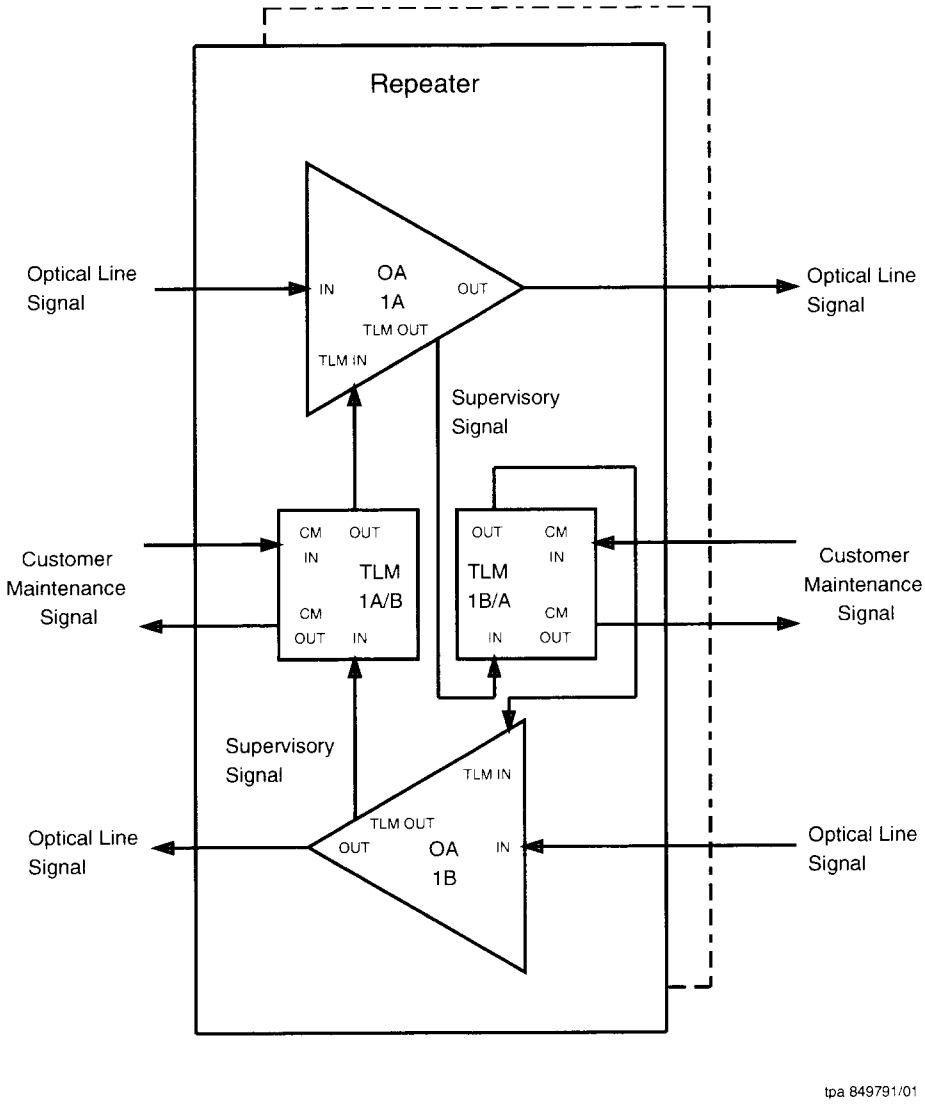


Figure 2 - Fiber Connections at 1A-RCV OLS End Terminal



tpa 849791/01

Figure 3 - Fiber Connections at OLS Repeater (Only Line 1 Shown)

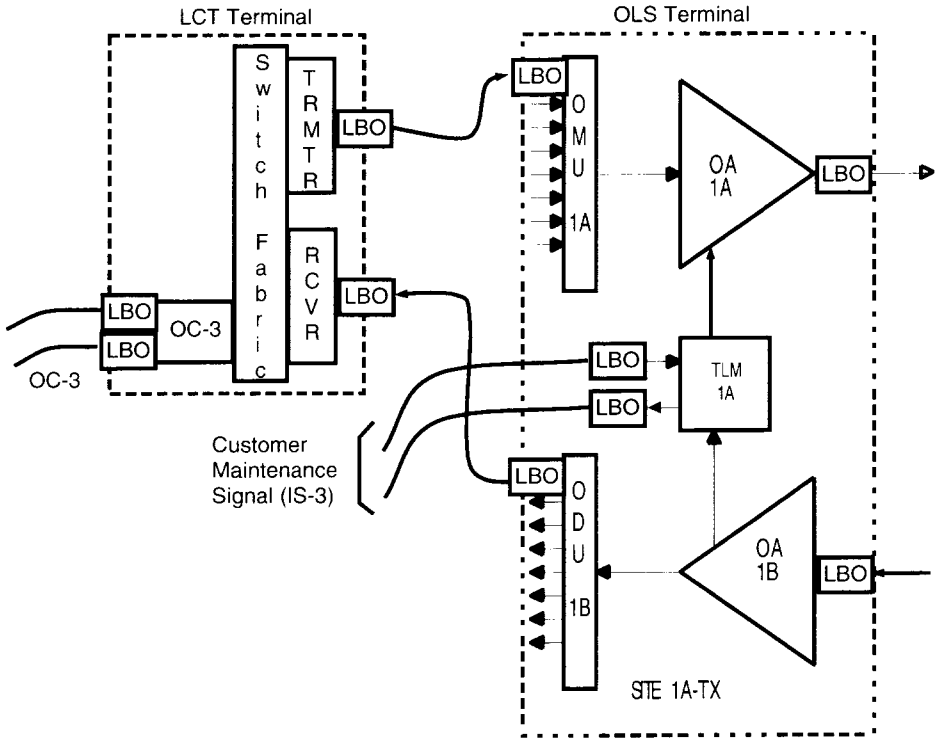


Figure 4 - Location of LBOs

Replace Fuse in Power Distribution and Fuse Panel or User Panel

Overview: This procedure is used to replace a blown 10A fuse (red lamp is lighted) in the power distribution and fuse panel or in the user panel.

1. Obtain a replacement 10A fuse (Comcode 405749920).

2. Unsnap and lift the latch (from bottom to top) that is around the red lens cap.

3. Push in and down at the top of the red lens cap. Release slowly because the lens cap/fuse should spring forward.

4. Remove the lens cap/fuse from the fuse socket.

5. Remove the blown 10A fuse from the lens cap/fuse and replace with the replacement 10A fuse.

6. ⇒ NOTE:
   The fuse cap lamp is a fuse status indicator. The cap lamp works correctly when it is fully engaged and the fuse retainer is locked in place. If the lamp lights in any other position, it may incorrectly indicate a bad fuse.

   Install the lens cap/fuse into the fuse socket by pushing in and up at the bottom of the lens cap.

7. Lower the latch (from top to bottom) around the red lens cap and snap into place.

8. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Introduction to the Personal Computer (PC)

Overview: This DLP provides a brief introduction to the PC. It includes proper handling and storage of diskettes and some of the important procedures you should follow when working with your PC. This DLP is a brief review of PC concepts. Refer to your PC user's guide for a complete description.

Parts of a PC

PCs vary in physical appearance and size. Most *IBM** compatible PCs consist of three basic parts — a main unit, a monitor, and a keyboard. Note that some PCs, particularly portables, integrate the keyboard, monitor, and main unit into a briefcase-size package. The OLS generic program may be installed on either a desktop PC or a portable PC. The diskettes used are 3-½ inch floppy disks.

Main Unit

The main unit of the PC contains the central processing unit (CPU), disk drive(s), and memory, among other things. All main units have some common features which include:

- ON/OFF Switch — This switch is used to switch the PC **ON** or **OFF**. Newer PCs have the switch located on the front. In older models, the switch is located on the back of the PC, near where the AC power cord plugs in to the PC.
- Serial Port — A port which the PC uses to communicate with the customer equipment. When using the PC to install a new generic program, either COM1 or COM2 port must be used. Some PCs have both COM ports. Refer to your PC documentation to determine which port is being used. There are two types of serial port connectors:

  — 25-pin RS-232 connector (male)

  — 9-pin connector (male).

If your PC has the 9-pin connector, you will need a serial port adapter which converts the 9-pin connector to a 25-pin connector. This is a cable which has a 9-pin connector on one end and a 25-pin male connector on the other end.

- Parallel Port — This port is used to connect to some printers.

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- Disk Drives — PCs come in several basic types, such as:
  - — Single floppy disk with hard disk — This type PC has a single floppy disk drive and a hard disk drive, which can typically store 10 or more megabytes of data. The single floppy disk drive is referred to as drive **A:**, and the hard disk is usually referred to as drive **C:**.
  - — Multimedia PC — This type PC contains the above features along with a sound card and a CD-ROM drive. The CD-ROM drive is usually referred to as drive **D:**.

Other combinations of floppy and hard drives are possible, but all that is required is a single floppy drive as a minimum. The procedures in this manual for installing a new generic program indicate using drive **A**.

Monitor
The monitor, sometimes called a display screen, may be either monochrome or color. The higher the resolution, the better the monitor.

Keyboard
The keyboard is used to enter commands. This section reviews some of the features of the keyboard and points out some of the special keys.

The keyboard is divided into three different sections:

- *Typewriter section* — This area has the alphanumeric keys that resemble the layout of a typewriter. In particular, you should locate the **ENTER** key (sometimes referred to as **RETURN**). This key is located on the right side of the typewriter section. It may have the word **ENTER** or **RETURN** printed on the key or a bent arrow. When you are asked to select **<ENTER>**, you should momentarily depress that key, or equivalent.
- *Function Keys* — The keyboard normally has 10 or 12 function keys. These keys can be set up (programmed) to perform different functions. Refer to your PC documentation to determine how to set up these keys.
- *Special Keys* — The keyboard has many special keys which are interpreted differently by various software packages. Locate the **CANCEL** or **DELETE** key.

Mouse
A mouse is normally used to select commands or items from menus of a graphical user interface. A mouse pointer appears on the screen and one of the mouse buttons is depress to make the selection.

Rebooting the PC

Occasionally, you may have to reboot the PC. There are three ways to accomplish this:

- Power **ON/OFF** switch — If the PC is **OFF**, you should set the **ON/OFF** switch to the **ON** position. If the PC is already **ON**, it is preferable to reset it using one of the following two methods:
- **RESET** button — Not all PCs have a **RESET** button, but if yours does, it provides an easy way to reset the PC (also known as a hard reset). Alternatively, the following method may work.
- Hold down the**CTRL**, **ALT**, and **DELETE** keys all at the same time (also known as a soft reset).

If **RESET** or **CTRL**, **ALT**, and **DEL** keys are not effective, turn **OFF** the PC, wait a few seconds, and turn it back **ON**. Rebooting the PC clears all data you had in random access memory. If the time of day clock is not indicating the current time and date, set the time of day clock.

Diskettes — Care and Handling

Diskettes are sometimes called floppy disks, or floppies for short. Diskettes are similar to cassette tapes—magnetically encoded information is stored on the diskette for later retrieval. By adhering to the following guidelines you will increase the useful life of your diskettes:

DO:

— Keep the diskette in a protective case, if available, when not in use.

— Keep the diskette in a dry place.

— Keep the diskettes away from magnetic fields or objects (for example, magnetic screwdriver.)

DO NOT:

— Touch any of the exposed surfaces of the diskette itself. Very tiny scratches, fingerprints, or dust can ruin a diskette.

— Bend a diskette.

— Write on a diskette label with a ball point pen or pencil. Use a felt-tipped pen instead. Write the label before applying it to the diskette if possible.

— Erase the diskette label with a pencil eraser. The dust may destroy the diskette. Instead, place a new label over the old one.

Inserting Diskettes

You should ***never*** remove or insert a diskette while the disk drive indicator light is on. (The computer turns the indicator light on to let you know that it is reading or writing from the disk.) Always wait for the indicator light to go off before opening the disk drive door. Failure to do this may result in damaging the diskette or loss of data on the diskette. Insert a diskette into a disk drive as follows:

1. Gently insert the diskette with the label facing up (an arrow is on the top left).

2. ⚠ CAUTION:
   Do not attempt to force the diskette into the drive.

   Slide the diskette in as far as it will go, but do not force it. You may hear a click when the diskette is all the way in.

   If resistance is felt or it does not slide in easily, remove the diskette and insert it again.

Removing Diskettes

Wait for the indicator light on the disk drive to go off. Then, depress the eject button. (This is similar to ejecting a cassette from a cassette recorder.) The diskette may pop out for easy removal. After the diskette has been removed, place it into its protective case, if provided, or other storage facility.

Inspect (Repair) Optical Fiber(s)

Overview: You were sent here from a trouble clearing procedure. This procedure is used to correct an input or output fiber problem such as a damaged or disconnected fiber. This procedure uses fiber in a general sense to refer to the IS-3 fiber, OC-48 fiber, or optical line fiber, as appropriate.

1. If required, open the cabinet doors or remove the appropriate shelf cover as follows:
   - Interconnection panel cover for low-speed (IS3) fibers.
   - Upper shelf cover for IS3 and OC-48 fibers
   - Lower shelf cover for optical line fibers.

2. Verify the fibers are properly connected.

3. Visually inspect the fiber, starting at the connector on the local network element and going as far as practical (usually to an interconnection bay or to a cross-connect panel).

4. Correct any problems with the fiber, following local procedures.

5. Close the cabinet doors or replace the cover that was removed in Step 1.

6. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Establish or Disconnect Remote Login Using CIT

Overview: This procedure is used to gain access to a remote OLS network element (NE) over the data communications channel (DCC).

1. Are you to establish remote login or disconnect from remote login?

   To **establish**, then continue with Step 2.
   To **disconnect**, then continue with Step 8.

Establish Remote Login

2. If required, connect and condition the craft interface terminal (CIT).

   Reference: **DLP-501**

3. ⇒ NOTE:
   The CIT connection state is indicated in the upper right-hand corner of the CIT screen only as `LOCAL ONLY`, `REMOTE`, or `LOCAL`.

   `LOCAL ONLY` - CIT is only connected to local network element.
   `REMOTE` - CIT is connected to remote network element from local network element.
   `LOCAL` - CIT is connected to remote network element but it is toggled back to local network element.

   Press the **F2** function key labeled `REMOTE` followed by the enter or return key to display the `Destination:` prompt window.

4. ⇒ NOTE:
   Typing a question mark (?) in response to the Destination (TID) prompt will display a point-and-shoot list of available addresses in the network(s).

   Enter the target identification (TID) obtained from the office records (or report) for the remote network element.

5. ⇒ NOTE:
   If your login on the local network element is also a valid login on the remote network element, you will be logged in automatically. Otherwise, you must log in at this time.

   If necessary, enter the login and password for the remote OLS NE. If unable to log in to the network element, check your login and password with the office records and/or supervisor.

6. ⇒ NOTE 1:
   If remotely logged in, REMOTE is now flashing in the upper right-hand corner.

   ⇒ NOTE 2:
   The remote OLS NE will now respond to any inputs from the CIT just as if you were physically connected to it.

   ⇒ NOTE 3:
   If you have remotely logged in, then **F2** is now labeled LOCAL and acts as a toggle back to the local OLS NE. LOCAL is now displayed in the upper right-hand corner of the CIT screen.

   Perform any required work such as obtaining reports or provisioning.

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Disconnect Remote Login

8. Is LOCAL or REMOTE displayed in the upper right-hand corner of the CIT screen?

   If LOCAL, then continue with Step 9.
   If REMOTE, then continue with Step 10.

9. ⇒ NOTE:
   The F2 key is the toggle between local and remote.

   Press **F2** function key labeled REMOTE to toggle back to the remote network element.

10. ⇒ NOTE:
    If LOGOUT is selected while connected to the remote network element, the remote connection is dropped but the CIT continues to operate with the local network element. If LOGOUT is selected at the local network element, both the remote and local connections are dropped.

    Press **F4** function key, labeled LOGOUT, to log out of the remote network element. The CIT is still logged into the local network element.

11. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Change, Delete, or Enter a User's Login

Overview: This procedure covers login aging and password aging in addition to changing, deleting, or entering a user's login.

1. ⚠ CAUTION:
   These tasks can only be performed by one of two privileged users. Privileged users cannot change their own login.

   NOTE:
   Additional information about security and aging is provided in Section 8, "Administration and Provisioning."

   If required, connect and condition the craft interface terminal (CIT).

   Reference: **DLP-501**

2. What do you want to do to a user's login?

   If to **change a user's login**, continue with Step 3.
   If to **delete a user's login**, continue with Step 7.
   If to **enter a new user's login**, continue with Step 10.
   If to **enable/disable login aging**, continue with Step 16.
   If to **enable/disable password aging**, continue with Step 16.

Change Login

3. At the CIT, select `SECURITY-Set-Login-Change:` for the specified user's login to be changed.

4. Select the appropriate input parameter (new login, password, verify password, user privilege, and visitor login), make the change, and press function key **F9** to execute the change(s).

5. At the CIT, select `SECURITY-Retrieve-Login:` to obtain the Login Provisioning Report and verify that the user's login has been changed.

6. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Delete Login

7. At the CIT, select `SECURITY-Set-Login-Delete:` for the specified user's login to be deleted and press function key **F9** to execute the deletion.

8. At the CIT, select `SECURITY-Retrieve-Login:` to obtain the Login Provisioning Report and verify that the user's login has been deleted.

9. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Enter Login

10. ⇒ NOTE:
    Each OLS network element may have up to 98 nonprivileged users with software Release 1.0.0 and later.

    At the CIT, select `SECURITY-Set-Login-Enter` and enter the new user login (up to 10 alphanumeric characters) and an initial password (from 6 to 10 characters with 1 number and with 1 symbolic character except the @, #, and =).

11. When prompted, reenter the initial password to verify your intended password. Passwords are not displayed.

12. Assign either security level (Reports Only or General) to the user's login. Also, at this time, a visitor's login along with an expiration date may be entered. Press function key **F9** to execute.

13. At the CIT, select `SECURITY-Retrieve-Login:` to obtain the Login Provisioning Report and verify that the user's login has been entered.

14. The login and initial password may be given to the person working on the OLS network element.

15. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Enable/Disable Login Aging and/or Password Aging

16. At the CIT, select the `SECURITY-Set-Security-Network Element:` command to gain access to the global security parameters for the system.

17. Select the appropriate input parameter, enter a value, and press function key **F9**.

    `Logins Allowed=` <Yes, No> If No, all nonPrivileged users will be immediately disconnected.

    `Password Aging=` <0, 7 through 999> A 0 (zero) will disable.

    `Login Aging=` <0, 7 through 999> A 0 (zero) will disable.

18. At the CIT, select `SECURITY-Retrieve-Security-Network Element:` to obtain the Access Security Global Configuration Report and verify the correct parameter value(s).

19. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Establish Modem or *Datakit*® Network Access

Overview: This procedure is used to access a distant OLS network element (NE) from a local craft interface terminal (CIT). Some of the more common CIT access configurations are shown in Figures 1 through 4. Other configurations exist with access gained through local company procedures. Once access is gained, the OLS network element responds to any CIT selections just as if you were physically connected to it.

1. Are you using the public switched network (via modem) or the *Datakit* network?

   If **public switched network**, then continue with Step 2.
   If ***Datakit* network**, then continue with Step 25.

Quick Check for Compatible Modems (Both Locations)

2. ⇒ NOTE 1:
   Modems at the CIT and OLS NE locations must be compatible. Quick check/setup of the modem parameters and connections are given in this procedure for the OLS NE location first, then for the CIT location.

   ⇒ NOTE 2:
   The manufacturer's manuals may be referred to for specific instructions on setting the modem parameters. For example, when using a *Penril** modem, the speed conversion parameter must be set to off.

   ⇒ NOTE 3:
   Additional information on using a modem for remote access is available in Section 6, "Operations Interface." Also, refer to 365-575-310, *Optical Line System, Installation Manual* or 365-575-311, *FT-2000 OC-48 Large Capacity Terminal, LCT Integration Manual.*

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* Registered trademark of Penril Corporation

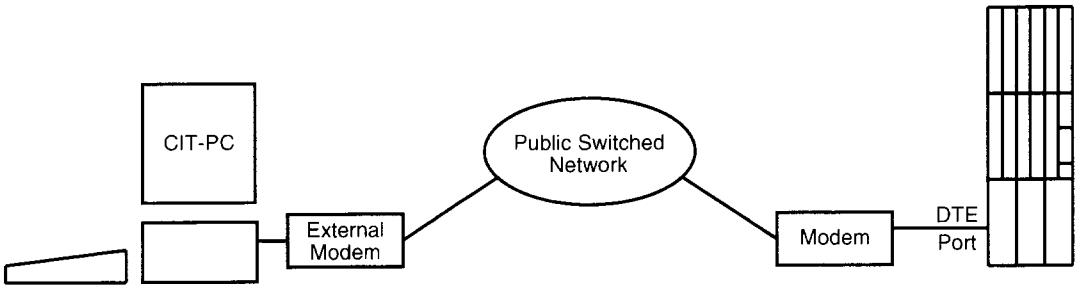


Figure 1 - External Modem Configuration

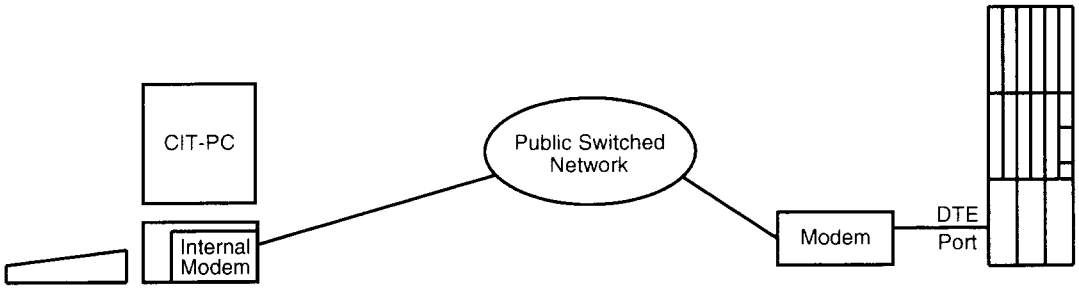


Figure 2 - Internal Modem Configuration

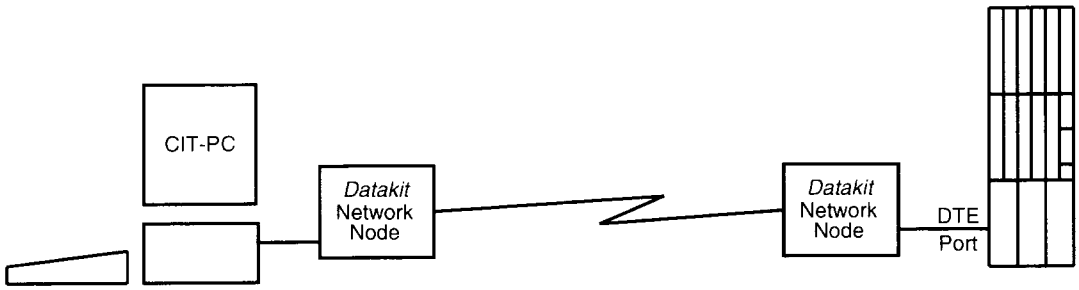


Figure 3 - *Datakit* Network Configuration

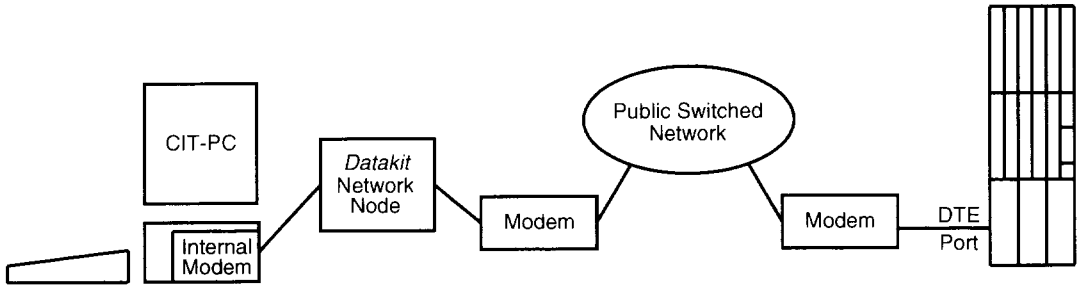


Figure 4 - Hybrid Network Configuration

Verify the generic parameters of the modem are set to the following:

- Modem baud rate (AT&T 4024 or AT&T 2224 CEO modems at 2400, AT&T 2292 modem at 9600) for CIT (DCE) port. This port and the CIT automatically select the highest usable baud rate up to 9600.
- Full duplex
- 8 data bits
- No parity bits
- 1 start bit
- 1 stop bit
- No flow control.

OLS Network Element Location (Refer to Figures 1 and 2)

3. ⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an OLS network element to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge Considerations" in **Trouble Clearing: TAD-100**.

Set the modem to answer incoming calls. For example, if you are using an AT&T 2224 CEO modem, do the following to program the modem:

a. ⇒ NOTE:
It is assumed the PC and modem ("AT" command compatible) are powered, and the PC is loaded with communications software.

Set all front panel switches to DOWN (factory default) for AT command mode.

b. Connect PC serial port to the modem RS-232C port using modem cable (Table A) or using a null modem adapter (Figure 5).

c. Establish communications between the PC and modem using the communications software set for the generic parameters in Step 2.

d. At the prompt, enter the following "AT" commands.

PC	Response	Comment
ATH	OK	#hang-up (on-hook)
AT&F	OK	#resets to factory defaults
AT&C1	OK	#data carrier is present when on
ATS0=2	OK	answer on 2 rings
AT&W	OK	wait for second dial tone

e. Remove the connector at the PC serial port and plug into the CIT (DTE) connector at the interconnection panel (Low Speed Shelf - System Controller) of the OLS network element. Dial-up access to the network element via a 2400 baud modem is now ready. See Figures 1 and 2 for the DTE port connection.

4. Verify the telephone line is plugged into the modem.

5. This completes the quick check/setup for the modem at the OLS NE location. Continue with the next step (modem at CIT-PC location).

CIT-PC Location

6. Is the modem installed internally (card) or a stand-alone (external).

   If **internal modem (Figure 2)**, then continue with Step 7.
   If **external modem (Figure 1)**, then continue with Step 8.

7. Verify the telephone line is plugged into the internal modem of the CIT-PC. Continue by going to Step 11.

8. Verify the external modem is connected to the CIT-PC, using the appropriate modem cable. Tables B and C list the pins for the DB-25 connector and DB-9 connector, respectively.

9. Verify the telephone line is plugged into the external modem and the modem is powered.

10. This completes the quick check/setup for the external modem at the CIT-PC location. Continue with Step 11 (CIT dial feature).

Using CIT DIAL Feature (CIT-PC Location)

11. Do you want to use the DIAL feature (function key **F3**) in the OLS CIT-PC software?

    If **YES**, then continue with Step 15.
    If **NO**, then continue with Step 12.

12. Dial the remote OLS network element by entering the telephone number. A personal computer communications software package is very helpful in accessing the remote OLS network element. Many packages exist, so use the one you are familiar with which may be *ProComm Plus**, CTRM, QMODEM, SimTerm, *Terranova*®, etc.

13. After the remote modem answers, press the [ENTER] key or space bar until communication between the two is established. Some locations may use a server switch at the OLS network element which requires entering an additional login, password, and a port assignment in order to connect to the OLS network element.

14. Once communication has been established to the remote OLS network element, escape to *MS-DOS*† (at the CIT), enter "`cit expert`", and press the [ENTER] key. The OLS CIT-PC software should start and display the logo/copyright screen. Continue with Step 22.

15. At the CIT with an *MS-DOS* prompt, change directory to where the CIT-PC software is installed and enter "cit expert" without the quotes and press [ENTER]. To clear the Network Systems screen, press [ENTER].

16. Press the **F6** key for the CIT *terminal* SETUP. Select the desired communication port, baud rate to match the modem, and monitor and press **F6**, then press the [ENTER] key twice (to SAVE and EXIT).

17. Press the **F3** key, labeled `DIAL`.

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* Registered trademark of Datastorm Technologies, Inc.

† Registered trademark of Microsoft Corporation.

18. This step is optional and is only used if you wish to change the previous *modem* parameter settings. You may change the parameters by pressing the **F6** key, labeled SETUP, then select the desired PORT and BAUD rate and press the ENTER key twice (to SAVE and EXIT).

19. For an external modem, press the ENTER key several times until the dial response appears on the screen. For an internal modem, enter the dial string "atdt xxx-xxxxx" (phone number of the OLS network element) and press the ENTER key.

20. Type the desired telephone number and press the ENTER key.

21. After the connection is confirmed, press function key **F9**, labeled CONT (to continue).

22. Press the ENTER key to select OLS, then type your login and password.

23. After completing your work, log out of the OLS network element by pressing function key **F4**, labeled LOGOUT, or exit the software by pressing function key **F5**, labeled EXIT. At this time, you may press **F3** again to establish a new connection to a different OLS network element.

24. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Quick Check for Typical *Datakit* Network

25. ⇒ NOTE 1:
The *Datakit* network supports many configuration parameters. Some parameters are changeable by the user; others are set by the network administrator. The user should consult local procedures in determining how to configure their network. The manufacturer's manuals may be referred to for specific instructions on setting the parameters.

⇒ NOTE 2:
The DB25 to RJ11 (or what ever connector is used with your *Datakit* port) converter plug is required for the DTE port connection.

⇒ NOTE 3:
The provisioned state (parameter settings) of the *Datakit* port to which the user is connected may interfere with the successful interaction of the CIT-PC and the OLS NE. This procedure allows the connection to be made independently of the provisioned state of the *Datakit* port.

Press the [ENTER] key and momentarily wait for the response `DESTINATION:`.

26. Did you get the `DESTINATION:` prompt?

    If **YES**, then continue with Step 34.
    If **NO**, then continue with Step 27.

27. ⇒ NOTE:
    The *Datakit* port (to which the PC is connected) is NOT supporting the *Datakit* command mode. Perform the following steps to allow the connection to be made independently of the provisioned state of the *Datakit* port. This allows a method to connect to the CIT (DTE) port of an OLS NE via a *Datakit* network.

    Put the PC into a terminal emulation mode and send the "attention sequence" which is usually provisioned to be two BREAK characters. [Check with the *Datakit* network administrator for the local attention sequence character(s).]

28. Did the *Datakit* port respond with `Command:`?

    If **YES**, then continue with Step 31.
    If **NO**, then continue with Step 29.

29. ⇒ NOTE:
Assistance is required from your *Datakit* network administrator. The administrator must verify or provision the following parameters for the *Datakit* port you're using.

Verify the generic parameters of the *Datakit* network port are set to the following:

- Full duplex, asynchronous
- 8 data bits per serial data byte with 1 start bit and 1 stop bit
- No parity bits
- Additional Datakit settings are required at the `COMMAND` prompt.
  - — **set attn none** (sets the attention sequence to none)
  - — **set fc none** (sets the flow control by device to none)
  - — **set nwkfc none** (sets the flow control by network to none)

30. After verifying or provisioning the parameters, continue with Step 34.

31. At the `Command:` prompt, type SET ATTN NONE and press the ENTER key.

32. Type CONT and press the ENTER key. (The `Destination:` prompt should appear on the screen.)

33. This completes the provisioning state of the *Datakit* port. Continue with the next step.

Using *Datakit* Network (Figures 3 and 4)

34. Establish the connection to the DTE port.

35. Type the desired *Datakit* network number and press the ENTER key.

36. Press the **F4** key, labeled CHECK, to verify connectivity between the CIT and the network element. A notice frame appears on the screen, "The OLS NE is communicating with the CIT-PC."

37. What does the notice frame indicate?

    If the **NE is communicating**, then continue with Step 38.

    If the **NE is not responding**, then you may wish to (a) double check the *Datakit* port parameters (Step 29) and (b) seek the next level of *Datakit* network help.

38. Press the **ESC** key to clear the notice frame.

39. Press the **F9** key, labeled CONT, to continue the CIT-PC software program.

40. Press the ENTER key to select OLS, then type your login and password.

41. After completing your work, log out of the OLS network element by pressing function key **F4**, labeled LOGOUT, or exit the software by pressing function key **F5**, labeled EXIT. At this time, you may press **F3** again to establish a new connection to a different OLS network element.

42. **STOP. YOU HAVE COMPLETED THIS PROCEDURE.**

Table A. Pin Connections at CIT (DTE) Connector

CIT (DTE) Connector (Note)	OLS Network Element
Pin 1 - Protective Ground	Protective frame ground.
Pin 2 - Transmit Data	Transmits data to the modem.
Pin 3 - Receive Data	Receives data from the modem.
Pin 4 - Request to Send	OLS network element notifies the modem that it is ready to send data.
Pin 5 - Clear to Send	Modem notifies the OLS network element that it is clear to send its data.
Pin 6 - Data Set Ready	Modem notifies the OLS network element that the modem is connected and ready to receive data.
Pin 7 - Signal Ground	Signal ground.
Pin 8 - Receive Line Signal Detected	This modem has detected carrier from the remote modem.
Pin 20 - Data Terminal Ready	OLS network element notifies the modem that it is connected.

Note: All remaining pins are not connected.

Table B. Pin Connections for Modem Using DB-25 Cable

PC DB-25 Connector (Note)	CIT
Pin 1 - Protective Ground	Protective frame ground.
Pin 2 - Transmit Data	Transmits data to the modem
Pin 3 - Receive Data	Receives data from modem
Pin 4 - Request to Send	CIT is requesting clearance from the modem so it can send data.
Pin 5 - Clear to Send	Modem notifies the CIT that it is clear to send data.
Pin 6 - Data Set Ready	Modem notifies the CIT that the modem is connected.
Pin 7 - Signal Ground	Signal ground
Pin 8 - Carrier Detect	This modem detects carrier from the remote modem.
Pin 20 - Data Terminal Ready	CIT notifies the modem that it is connected.

Note: All remaining pins are not connected.

Table C. Pin Connections for Modem Using DB-9 Cable

PC DB-9 Connector	CIT
Pin 1 - Carrier Detect	This modem detects carrier from the remote modem.
Pin 2 - Receive Data	Receives data from modem
Pin 3 - Transmit Data	Transmits data to the modem
Pin 4 - Data Terminal Ready	CIT notifies the modem that it is connected
Pin 5 - Signal ground	Signal ground
Pin 6 - Data Set Ready	Modem notifies the CIT that the modem is connected and ready to receive data.
Pin 7 - Request to Send	CIT is requesting clearance from the modem so it can send data.
Pin 8 - Clear to Send	Modem notifies the CIT that it is clear to send.
Pin 9 - Ring indicator	Modem notifies the CIT that ring signal is present when the modem is in an auto-answer mode.

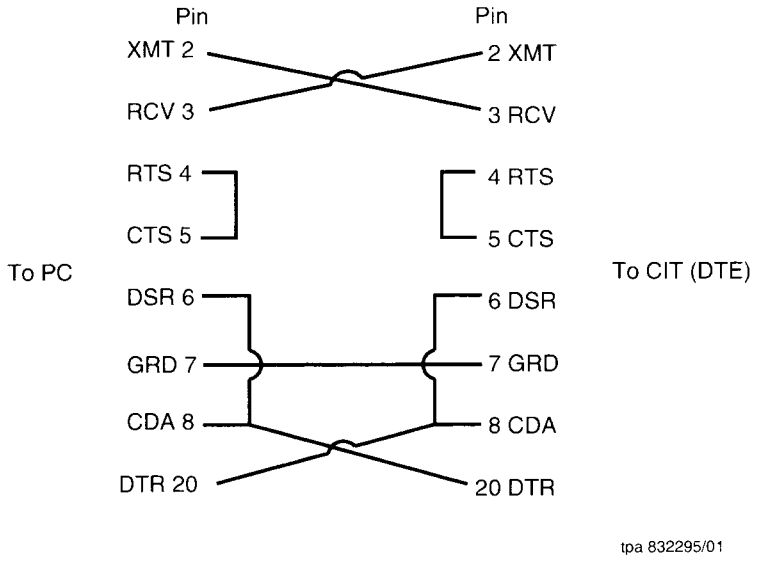


Figure 5 - Null Modem Internal Wiring Connections

Remove and/or Install OMU or ODU

1. ⚠ CAUTION:
This procedure has the potential to affect transmission and should be performed only under the direction of the maintenance support organization.

⚠ CAUTION:
Use a static ground wrist strap whenever handling units or working on an OLS network element to prevent electrostatic discharge damage to sensitive components.

Are you to remove or install an OMU/ODU?

If to **remove**, then continue with Step 2.
If to **install**, then continue with Step 7.

2. Remove the OMU/ODU optical fibers from the slot guide on the shelf. This is to prevent damage to the fiber when the unit is removed.

3. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to the beam.

NOTE:
Verify that all fibers are labeled to prevent mix-ups.

Remove one optical fiber at a time and install a protector cap on the fiber.

4. Remove any LBOs from the OMU/ODU and install protector caps and/or plugs.

Reference: **DLP-512**

5. Remove the OMU/ODU from the shelf as follows:

a. Using a Phillips* screwdriver, extract the top and bottom screws holding the unit to the shelf, (see Figure 1).

---

* Registered trademark of Phillips Screw Company.

b. Unseat the OMU/ODU from the shelf by continuously pulling out on the unit.

c. Carefully slide the OMU/ODU out of the slot guides to remove it completely from the shelf. DO NOT ROCK THE UNIT BACK AND FORTH.

6. Are you to install another unit in this slot?

   If **YES**, then continue with Step 7.
   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

7. Install an OMU/ODU as follows:

   a. Verify that the top and bottom screws have not been placed back in the shelf, (see Figure 1).

   b. Place the OMU/ODU into the slot guides and slowly slide it into the shelf until it meets the rear shelf connectors.

   c. Continue sliding the OMU/ODU with one firm and continuous motion until the OMU/ODU is fully engaged.

8. Use a *Phillips* screwdriver to install the top and bottom OMU/ODU screws to mount the unit to the shelf, (see Figure 1).

9. Install any required LBOs at the OMU/ODU connectors.

   Reference: **DLP-512**

10. Clean the optical fibers and connectors.

    Reference: **DLP-510**

11. Connect the optical fibers to the LBOs and/or optical connectors at the OMU/ODU.

12. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

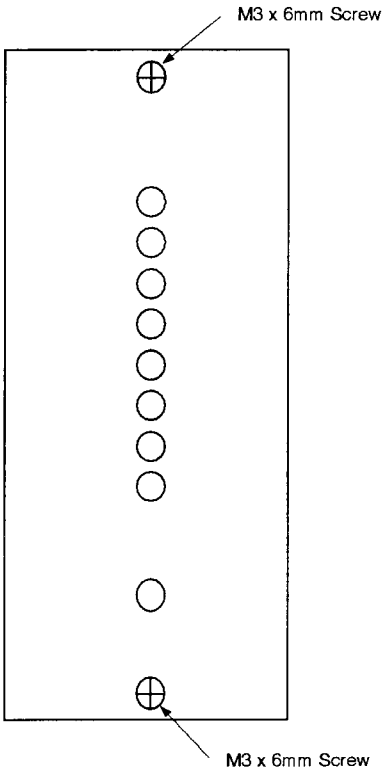


Figure 1 - Location of Screws for OMU/ODU

Replace Power Line Filter

WARNING:
DO NOT ALLOW the metal portion of the red or gray lead to touch any metal part of the bay.

CAUTION:
DO NOT ALLOW the screws to fall in the bay.

1. Remove the two plastic snap-on fuse guards.

2. Remove the screws from the faceplate of the User Panel or Fuse Panel using a flat-bladed screwdriver.

3. Gently push up and remove the bracket that's for mounting the bottom of the faceplate.

4. Look at the back of the panel and identify the correct power filter to be removed (top filter is for feeder A and bottom filter is for feeder B).

5. Make a voltage measurement from the rear of the appropriate fuse, if desired.
   - Fuse A — measure between red wire and chassis
   - Fuse B — measure between gray wire and chassis.

   Requirement: Voltage between -42.75 V DC and -60 V DC.

6. Remove any cabling tie down or slide up out of the way, if required.

7. Label and remove the three power leads connected to the power line filter.

8. Loosen the screw holding the filter in place.

9. Remove the defective filter by gently pulling and sliding the filter.

10. Orient and insert the new filter.

11. Tighten the screw holding the filter in place.

12. Reconnect the three power leads that were removed in Step 7.

Power Connections for Filter A		
black wire	red wire	-48A
	black wire	-48AR

Power Connections for Filter B		
black wire	gray wire	-48B
	slate wire	-48BR

13. Attach a cabling tie down on the power leads or slide tie down, if required.

14. **NOTE:**
Both power line filters should be replaced when replacing one filter.

Repeat Steps 6 through 13 for the other filter.

15. Gently insert the faceplate bracket and push down into place.

16. Screw in the faceplate screws.

17. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Pin Repair

A

Contents

- General A-1
- Tool Kit Descriptions A-1
- Pin Designations A-2
- LCT Circuit Pack and Equipment Location A-3
- OLS Circuit Pack and Equipment Location A-5
- OT Circuit Pack and Equipment Location A-6
- Procedures for Pin Replacement A-6

List of Tables Specifications

- FASTECH/METRAL Pin Codes A-2
- LCT Equipment Location (Switch Fabric Shelf) A-3
- LCT Equipment Location (Low Speed Shelf) A-4
- LCT Equipment Location (High Speed Shelf) A-4
- OLS Equipment Location A-5
- OT Equipment Location A-6

List Of Figures

- 1. LCT Switch Fabric Shelf (Upper) A-9
- 2. LCT Switch Fabric Shelf (Middle) A-10
- 3. LCT Switch Fabric Shelf (Lower) A-11
- 4. LCT User and Power Panels A-12
- 5. OC-48 Enhanced High Speed (Upper) A-13
- 6. OC-48 Enhanced High Speed Shelf (Lower) A-14
- 7. LCT Low Speed Shelf (Upper) A-15
- 8. LCT Low Speed Shelf (Lower) A-16
- 9. Optical Line System - All Shelves A-17
- 10. Optical Line System (Middle) A-18
- 11. Optical Line Ssystem (Lower) A-19
- 12. OLS - Power and User Panel A-20
- 13. Optical Translator (OT) A-21
- 14. Optical Translator (OT) (Middle) A-22
- 15. Optical Translator (OT) (Lower) A-23
- 16. Optical Translator - Power and User Panel A-24

Pin Repair

A

General

This section describes the procedures for terminal repair in FASTECH and METRAL technology using the KS-22876, L6 Pin Repair Kit for the FASTECH technology and the BERG MT330It Tool Kit for the METRAL technology. The tools were designed to remove and replace pins in MLPWB (Multilayer Printed Wiring Board) backplane areas equipped with or without spacer aligners.

Tool Kit Descriptions

KS-22876 L6 Pin Replacement Kit - Comcode 406984641

- L101 Handle Assembly
- L102 Extension Rod
- L103 Head No. 1 (inserts pins in spacer aligner areas from circuit pack side)
- L104 Head No. 2W (inserts pins in areas without spacer aligners from circuit pack side)
- L105 Head No. 3 (removes pins from wiring side)
- L106 Head No. 4 (removes stub of broken pins from wiring side)
- L107 Head No. 5 ((removes pins from circuit pack side)

- L110 Pin Gauge
- L112 Case
- L113 Instructions
- L114 Debarring Head
- L115 Drill Bit
- L116 Pin Vise
- AT-7860 D Long Nose Pliers (Insulated)

METRAL Press-Fit Repair Kit

- Cutter Tool - EPL 194439-1
- Push-out Tool - EPL 194400-01
- Insertion Tool - EPL 194405-01

Pin Designations

Table A-1 FASTECH/METRAL Pin Codes

PIN ID	Comcode	Pin Type	FASTECH/ METRAL
A	106816077		METRAL
B	106918477	1B32	FASTECH
C	107473811		METRAL
D	106817182		METRAL
E	105672729	1B27	FASTECH
F	106816119		METRAL
H	103624987	1B14	FASTECH
I	106918485	1B33	FASTECH
O	103180287	1D1	FASTECH
Q	106918493	1C5	FASTECH

Table A-1 FASTECH/METRAL Pin Codes

PIN ID	Comcode	Pin Type	FASTECH/ METRAL
U	105424238	1D4	FASTECH
V	105396436	1B21	FASTECH
W	105396444	1B22	FASTECH
X	107473829		METRAL
3	103055943	1B3	FASTECH
6	105672711	1B26	FASTECH

LCT Circuit Pack and Equipment Location

Table A-2 LCT Equipment Location (Switch Fabric Shelf)

Circuit Pack	Backplane Location	
SYSMEM (LEA2)	20-554	Controller Shelf Only
SYSCTL (LEA1)	20-534	Controller Shelf Only
TG1/2	20-504	Backplane Designation Only
USER PNL	43-505	Backplane Designation Only
SWICO (LEB1) (1-8)	20-123, 173, 223,273,323, 377,427, 477	
PWR A	44-551	Backplane Designation Only
PWR B	39-551	Backplane Designation Only
MCTL (LEA3)	20-554	Complimentary Shelf Only

Table A-3 LCT Equipment Location (Low Speed Shelf)

Circuit Pack	Backplane Location	
LSINTFC 1A-8B	07-026, 032, 038, 044, 050, 056, 062, 068, 122, 128, 134, 140, 146, 152, 158, 164	
LSSWIN	07-086	
LSSWOUT	07-092	
TG1	07-108	
TG2	07-116	
P1	07-074	
P2	07-080	
SYSCTL	07-172	Backplane Designation Only
SYSMEM	07-178	Backplane Designation Only
TOHCTL	07-100	

Table A-4 LCT Equipment Location (Enhanced High Speed Shelf)

Circuit Pack	Backplane Location	
SWX	07-026	Backplane Designation Only
TS1	07-041	Backplane Designation Only
TRMTRX	07-062	
TS2	07-072	Backplane Designation Only
RCVRX	07-080	
SWY	07-088	Backplane Designation Only
TS3	07-105	Backplane Designation Only
TRMTRY	07-126	
TS4	07-132	Backplane Designation Only
TS5	07-137	Backplane Designation Only
RCVRY	07-144	

Table A-4 LCT Equipment Location (Enhanced High Speed Shelf)

Circuit Pack	Backplane Location	
LNCTLX	07-150	
LNCTLY	07-156	
OHCTLX	07-162	
OHCTLY	07-168	
LOHCTL	07-174	Backplane Designation Only
EQL	07-180	Backplane Designation Only

OLS Circuit Pack and Equipment Location

Table A-5 OLS Equipment Location

Circuit Pack	Backplane Location	
SYSMEM (LEA2)	20-604	
SYSCTL (LEA1)	20-534	
TOHCTL (LEA5)	20-554	
OA (LEA6)	20-534, 20-434, 20-330,20-230	
TLM (LDA1)	52-180, 52-230 52-280, 52-330	
OMU/ODU (505A/605A)	52-382, 52-430 52-478, 52-526	
USER PNL	45-557	Backplane Designation Only
PWR A	50-597	
PWR B	44-597	

OT Circuit Pack and Equipment Location

Table A-6

Circuit Pack	Backplane Designation	
SYSMEM	OTU/SYSMEM	
SYSCTL	OTU/SYSCTL	
TOHCTL	OTU/TOHCTL	
OTU	OTU	

Procedures for Pin Replacement

CAUTION:
This procedure must been done with the shelf out of service and powered down to insure no further damage to the equipment or to the person doing the pin replacement.

CAUTION:
Proper ESD precautions must be used.

(1) Determine if the bent or broken pin is in an OLS, OT or an LCT Bay.

(2) Determine the shelf in which the bent or broken pin resides (ex. Switch Fabric Shelf).

(3) Determine the circuit pack slot in which the pin resides.

(4) Determine the number and column location of the pin.

(5) Refer to the correct figure (Figures 1-16 on pages 11 - 24) to determine the letter pin code associated with the pin.

(6) Using Table 1, "FASTECH/METRAL Pin Codes," on page 2, determine the type of pin (either METRAL or Fastek) and the correct comcode for the replacement pin.

(7) Obtain the correct replacement pin from the pin kit.

(8) If the pin to be replaced is a METRAL type pin, refer to "METRAL Press-Fit Repair Kit MT-330" documentation for proper procedures to remove and replace the bent or broken pin.

(9) If the pin to be replaced is a FASTECH type pin, refer to "KS-22876 L513 Instruction Pin replacement for FASTECH Technology Using the KS-22876 L6 Pin Kit" documentation for proper procedures to remove and replace the bent or broken pin.

Large Capacity Terminal (LCT) - Pin Type Location

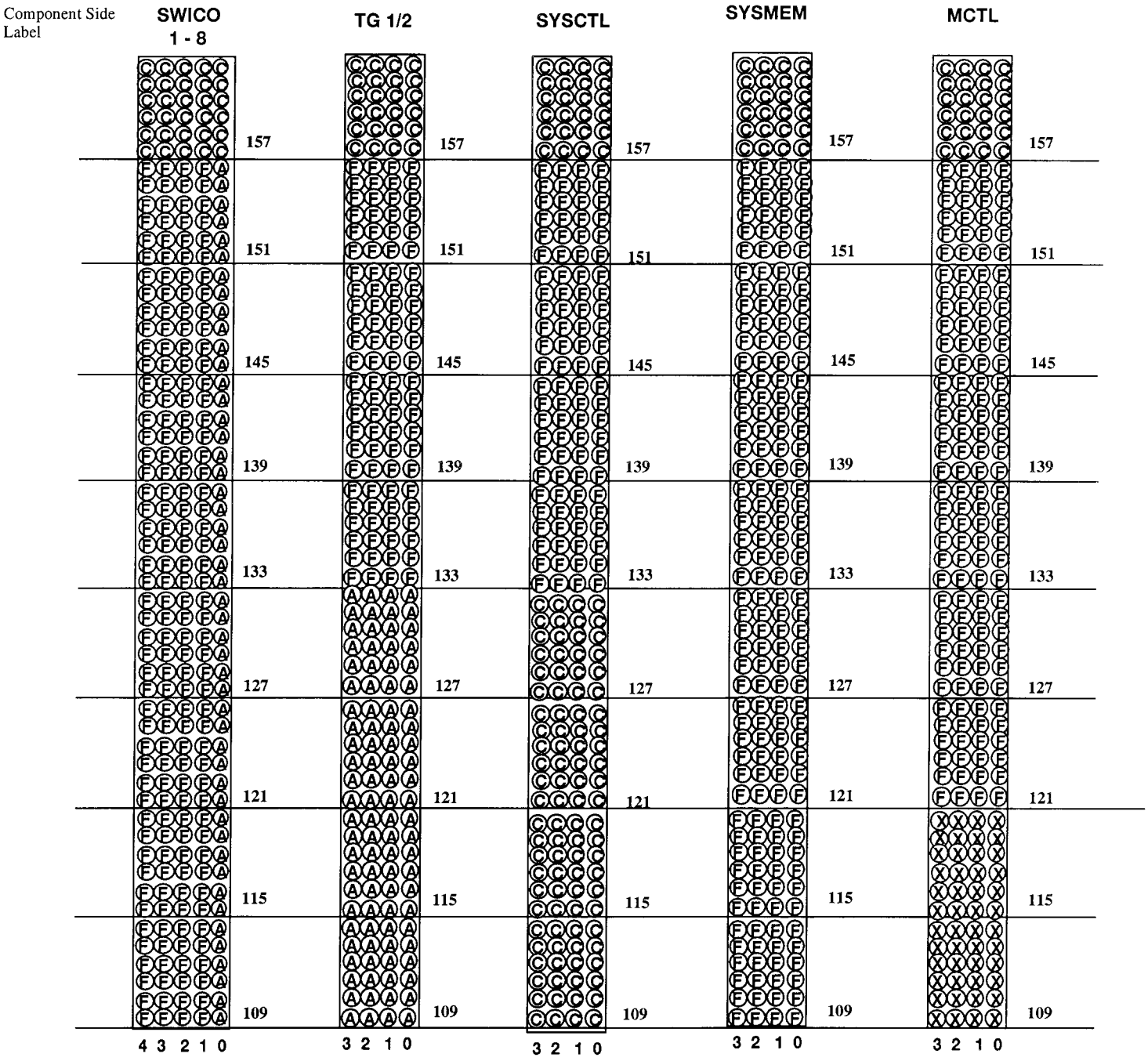


Figure A-1. LCT Switch Fabric Shelf (Upper)

Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

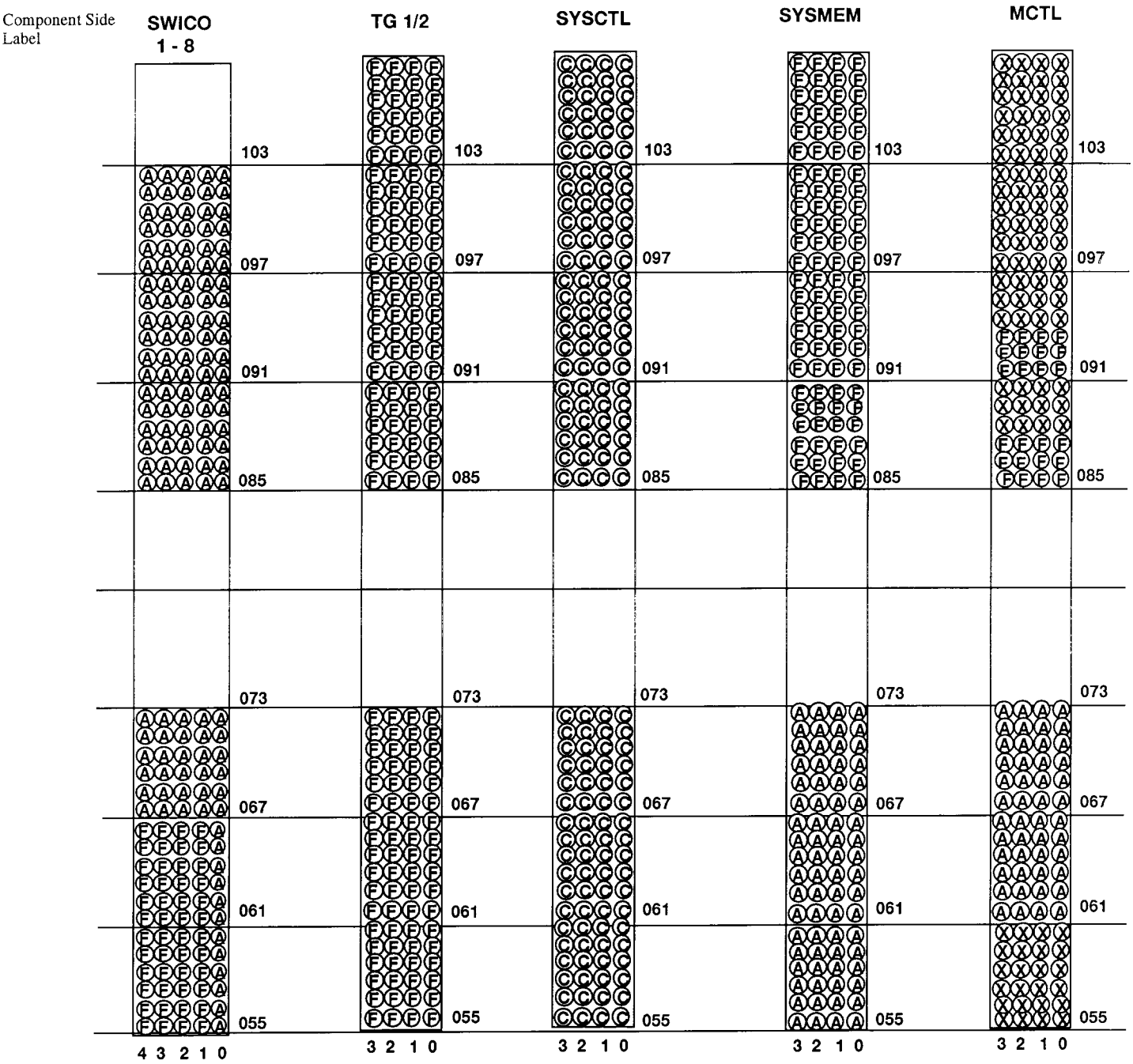


Figure A-2. LCT Switch Fabric Shelf (Middle)

Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

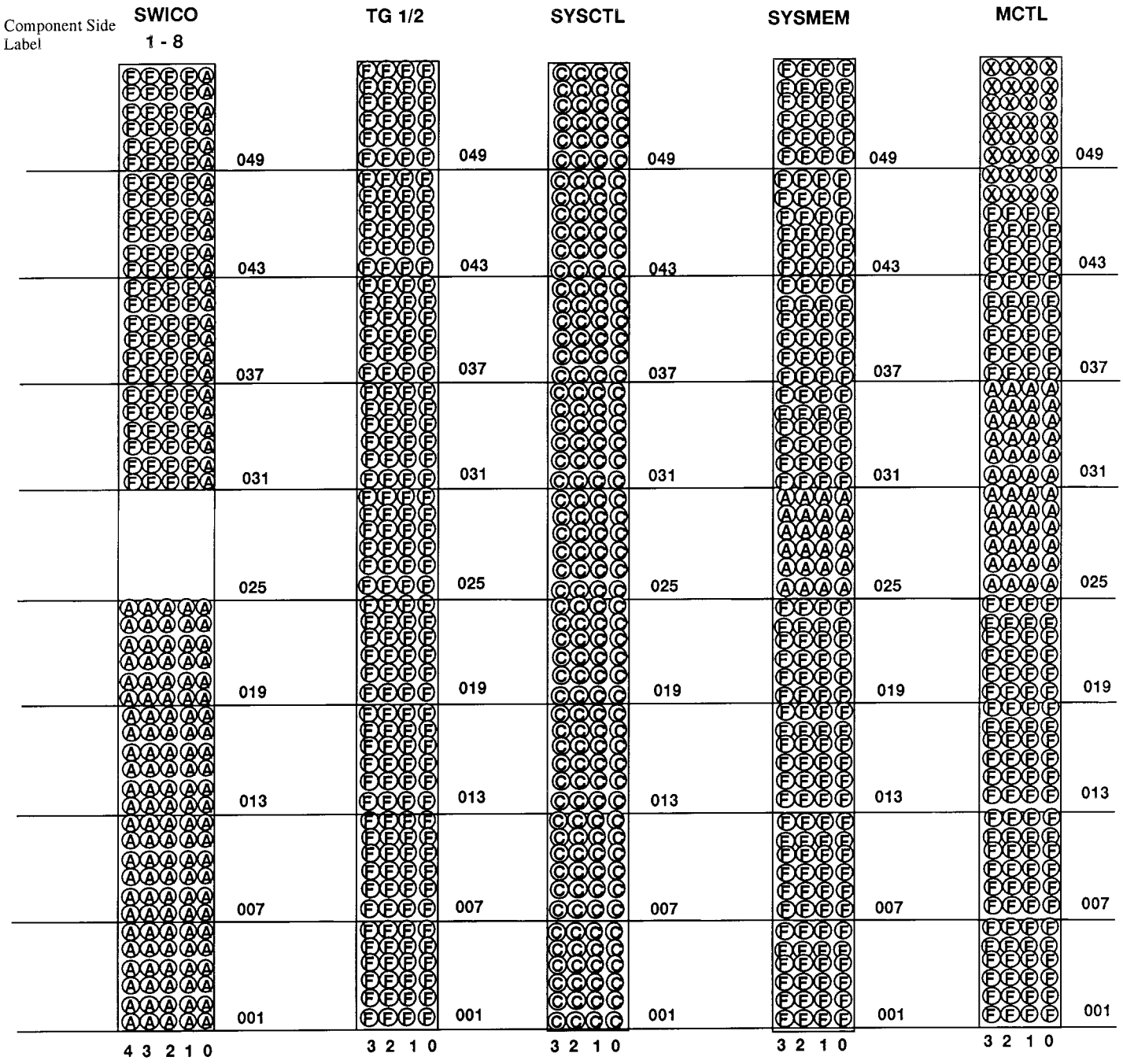


Figure A-3. LCT Switch Fabric Shelf (Lower)

Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

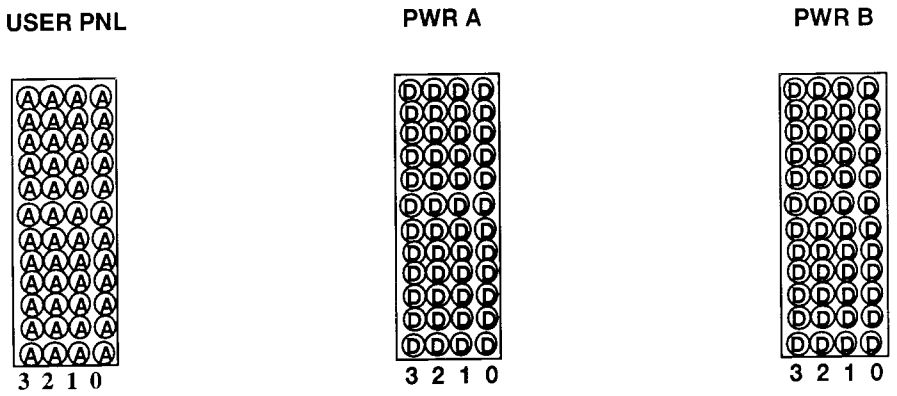


Figure A-4. LCT User and Power Panels

Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

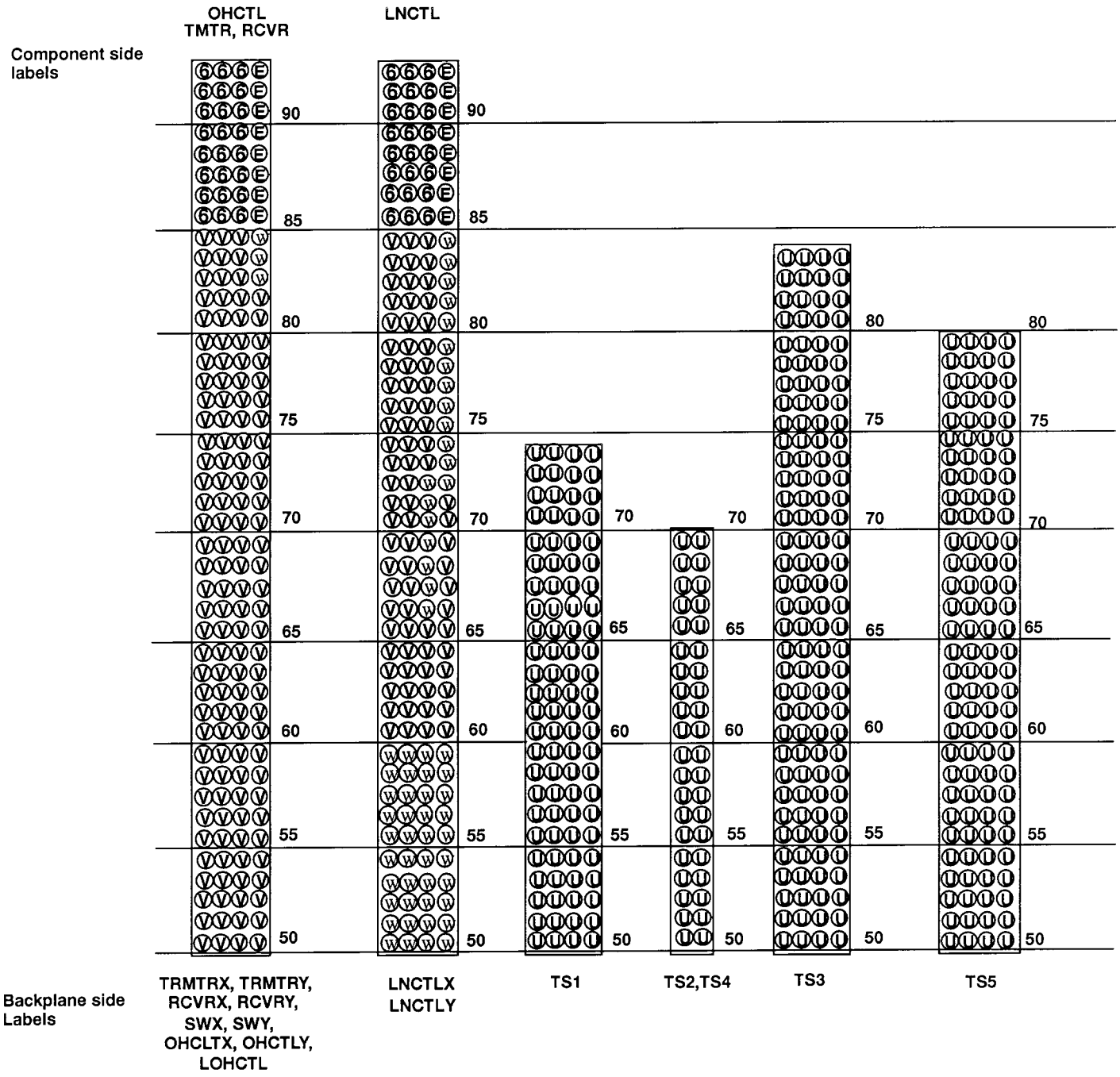


Figure A- 5 OC-48 Enhanced High Speed (Upper) Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

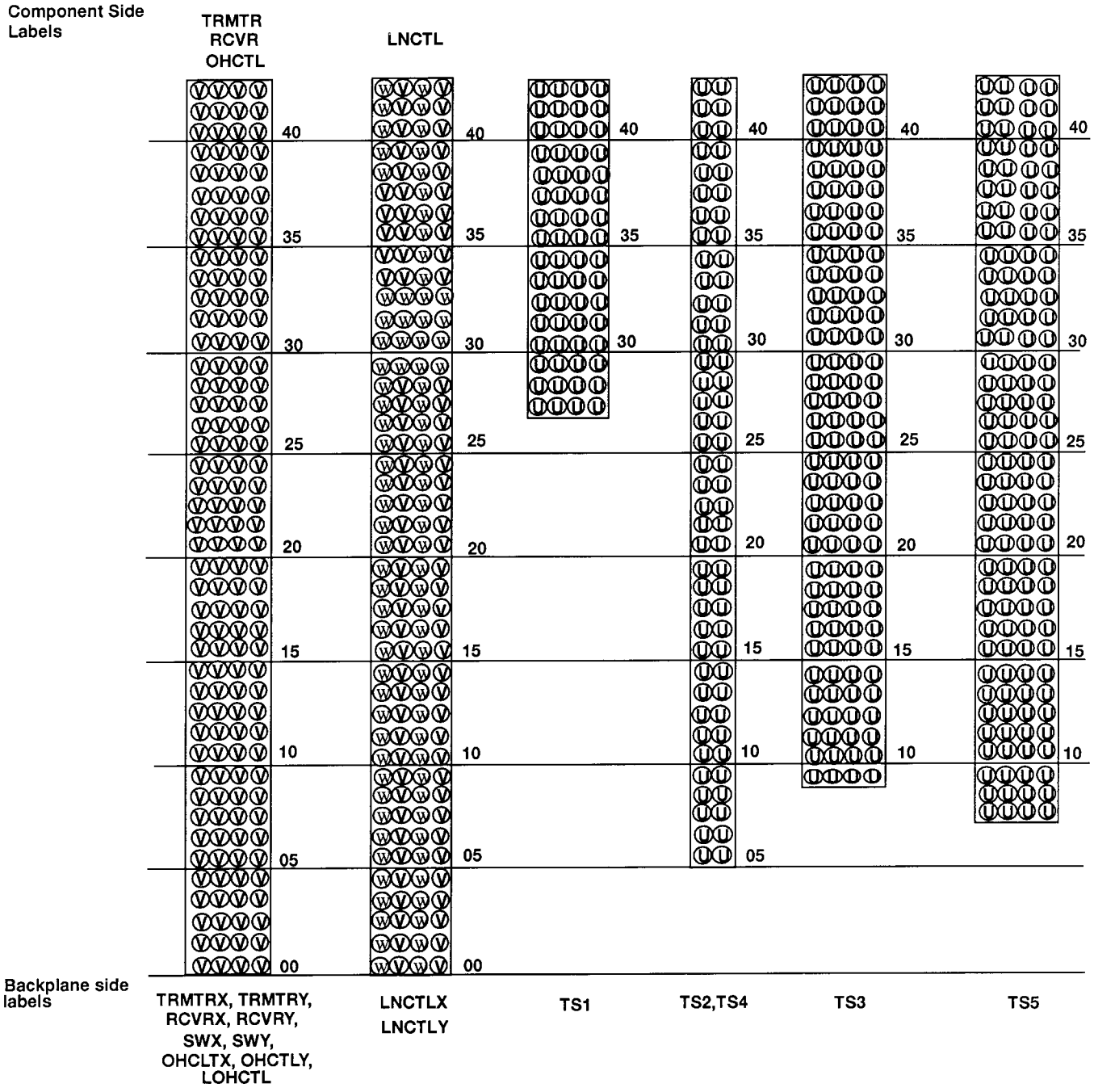


Figure A- 6 OC-48 Enhanced High Speed Shelf (Lower) Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

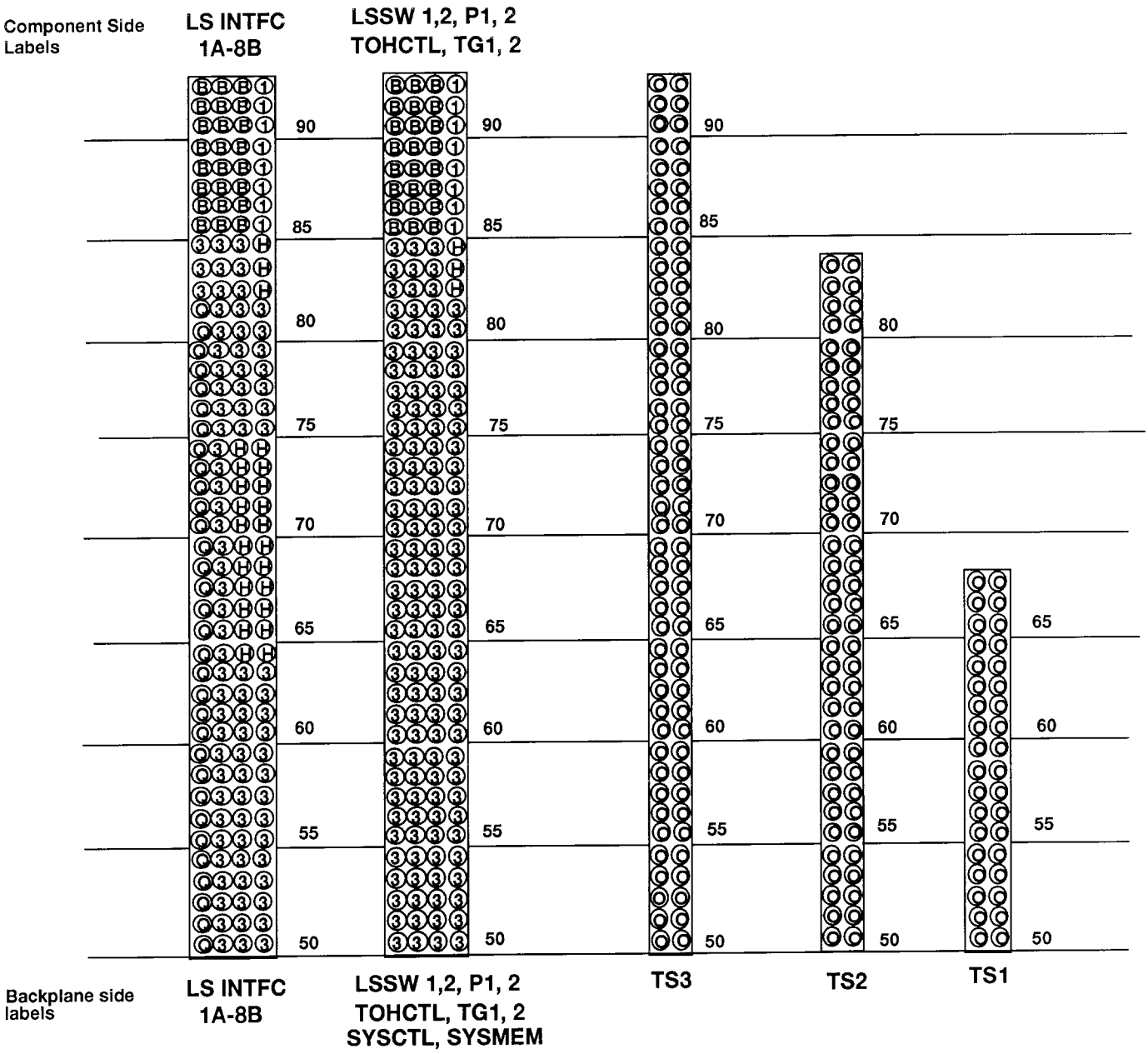


Figure A- 7 LCT Low Speed Shelf (Upper)
Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

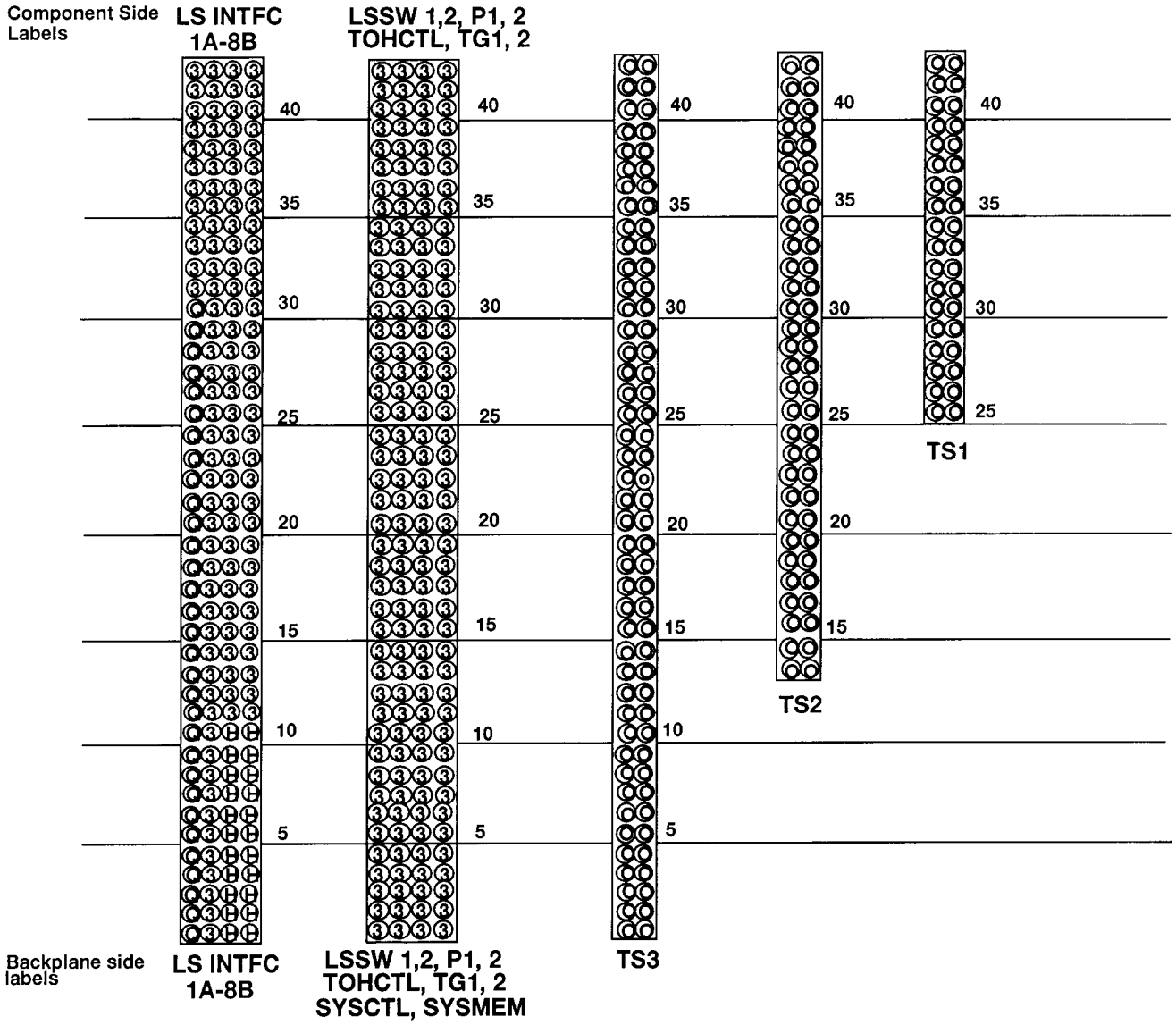


Figure A- 8 LCT Low Speed Shelf (Lower) Component Side View

Optical Line System (OLS) - Pin Type Location

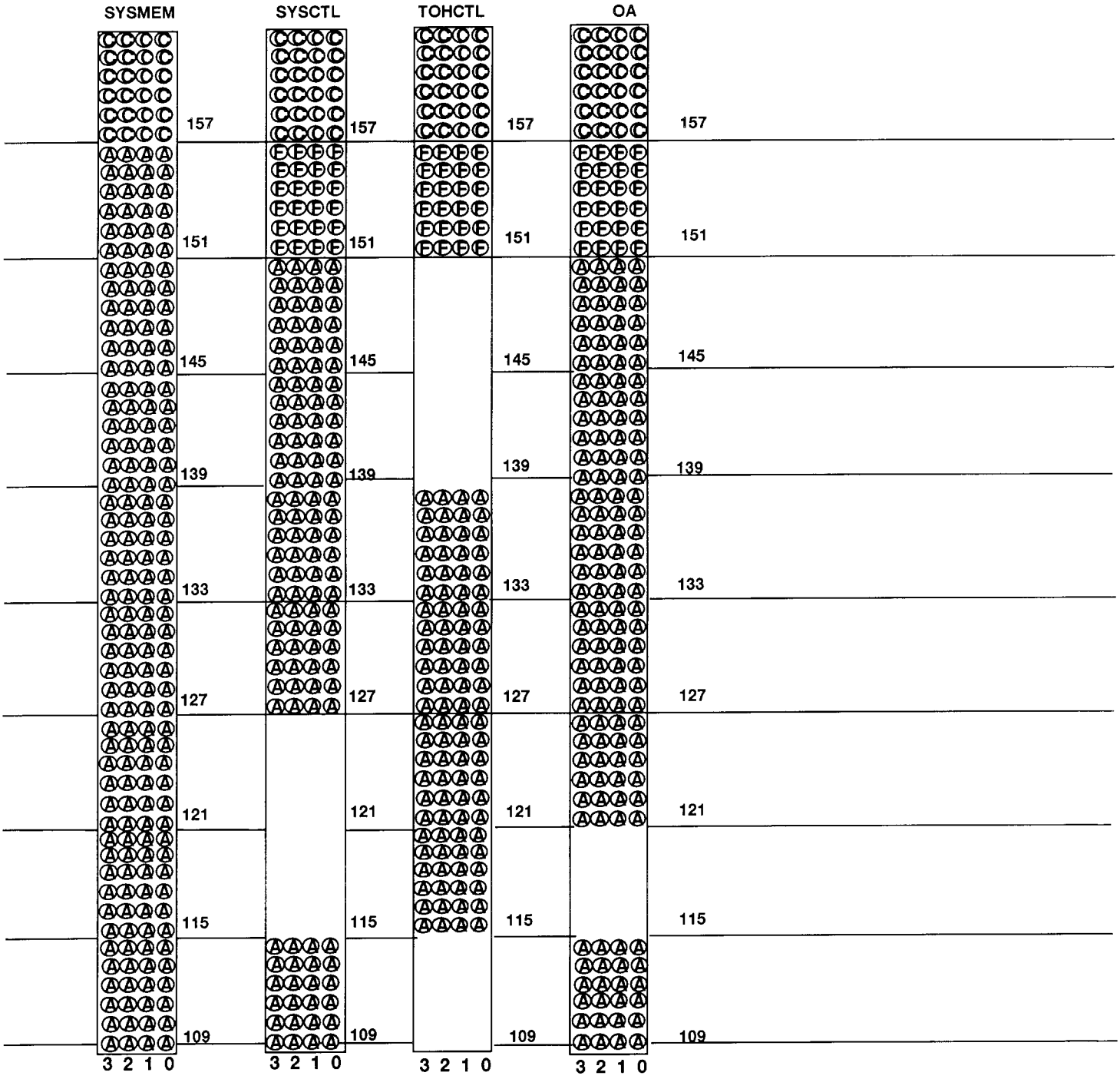


Figure A- 9. Optical Line System - All Shelves Componet Side View

Optical Line System (OLS)- Pin Type Location

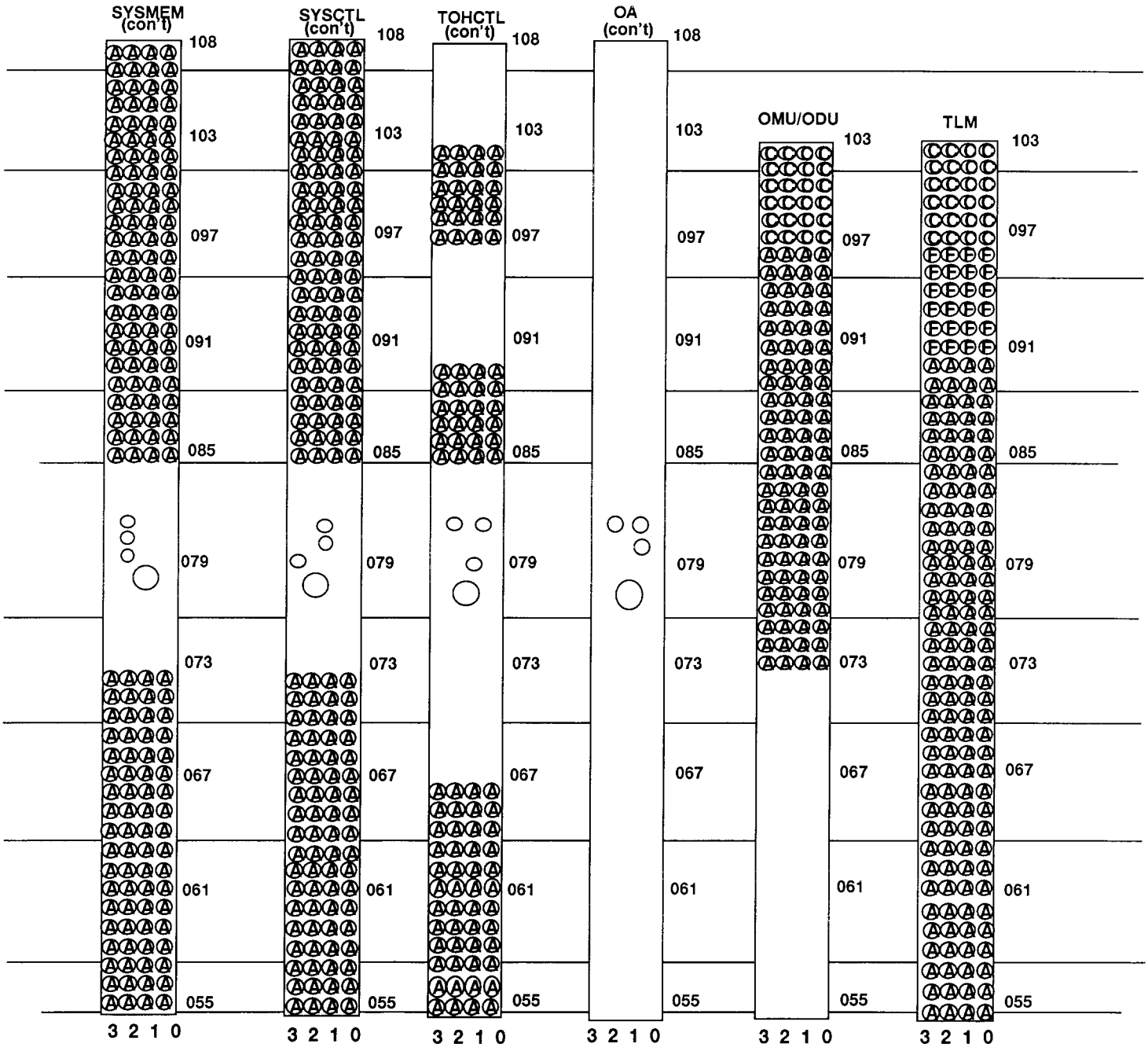


Figure A- 10 Optical Line System (Middle)
Component Side View

Optical Line System (OLS) - Pin Type Location

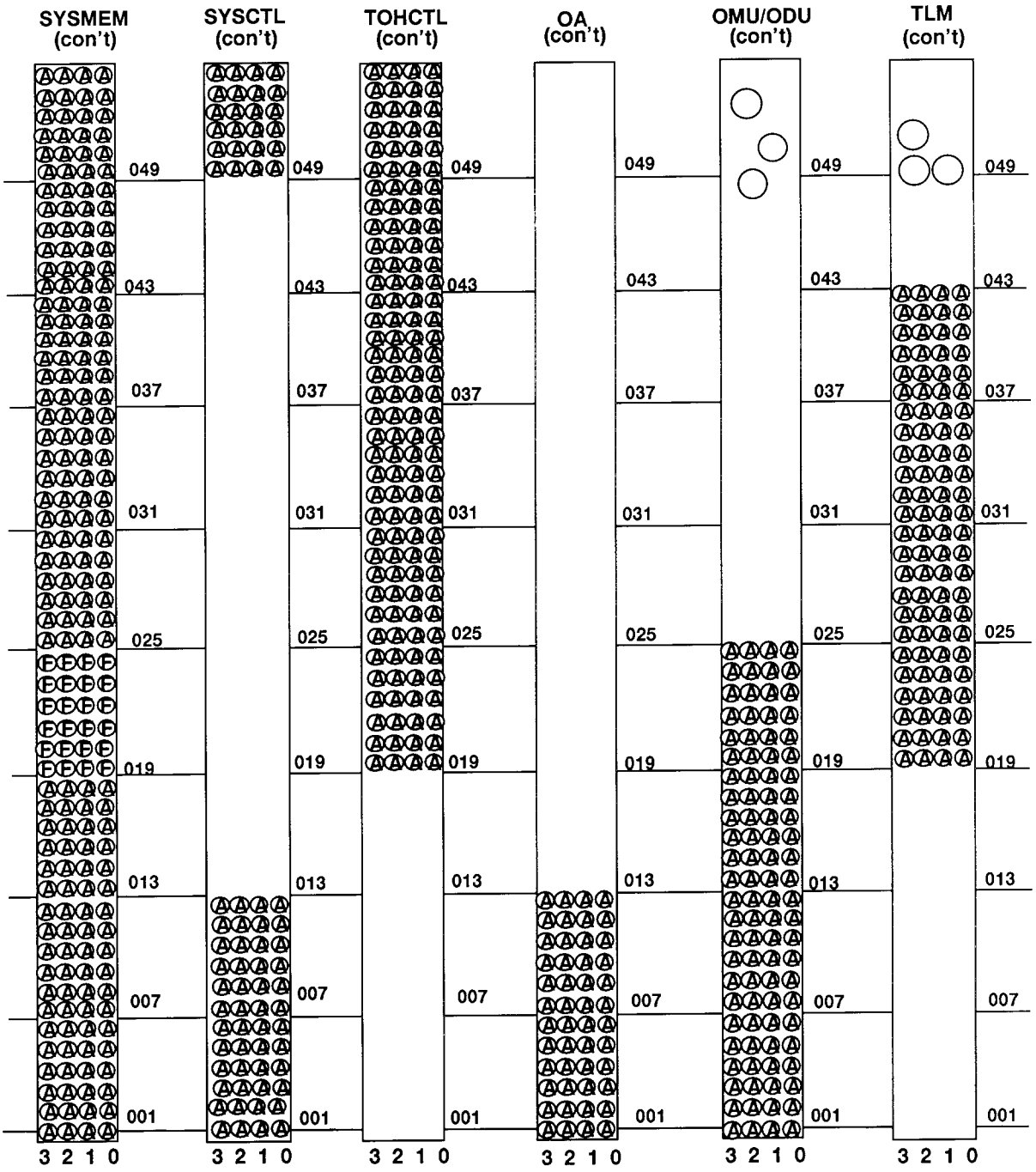


Figure A- 11 Optical Line System (Lower) Component Side View

Optical Line System (OLS) - Pin Type Location

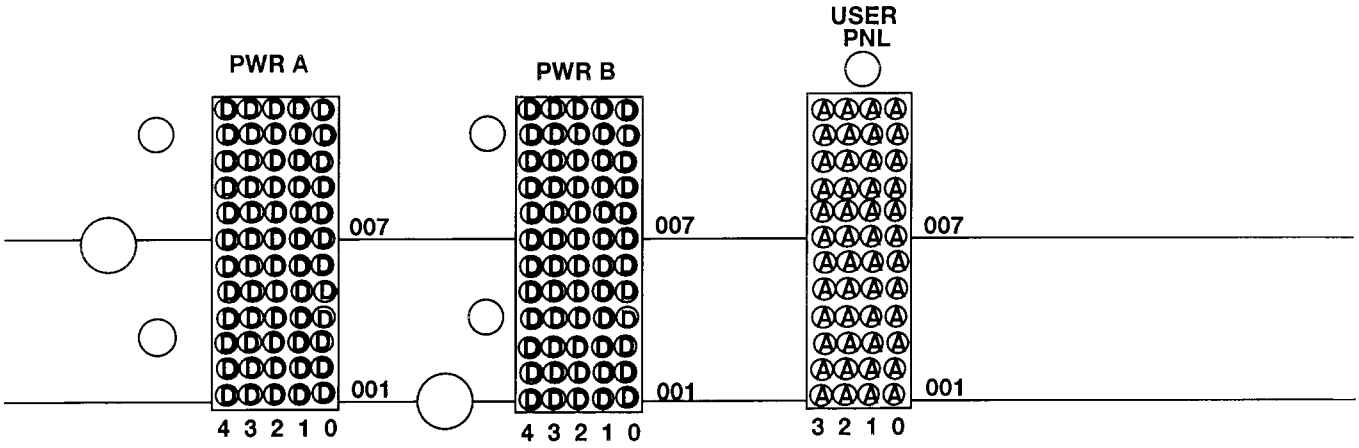


Figure A- 12 OLS - Power and User Panel Component Side View

Optical Translator (OT) - Pin Type Location

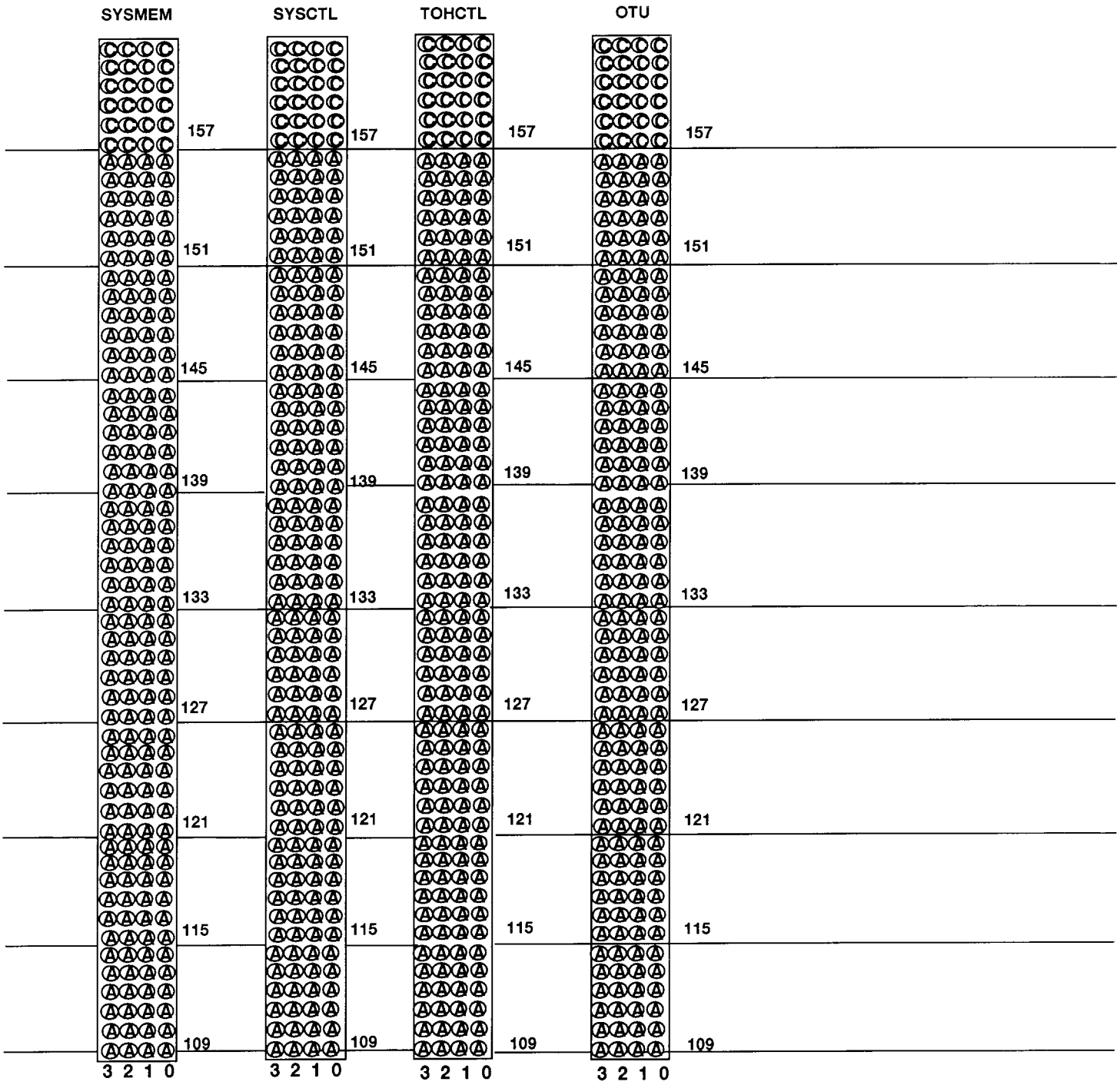


Figure A- 13 Optical Translator (OT) - All Shelves Componet Side View

Optical Translator (OT) - Pin Type Location

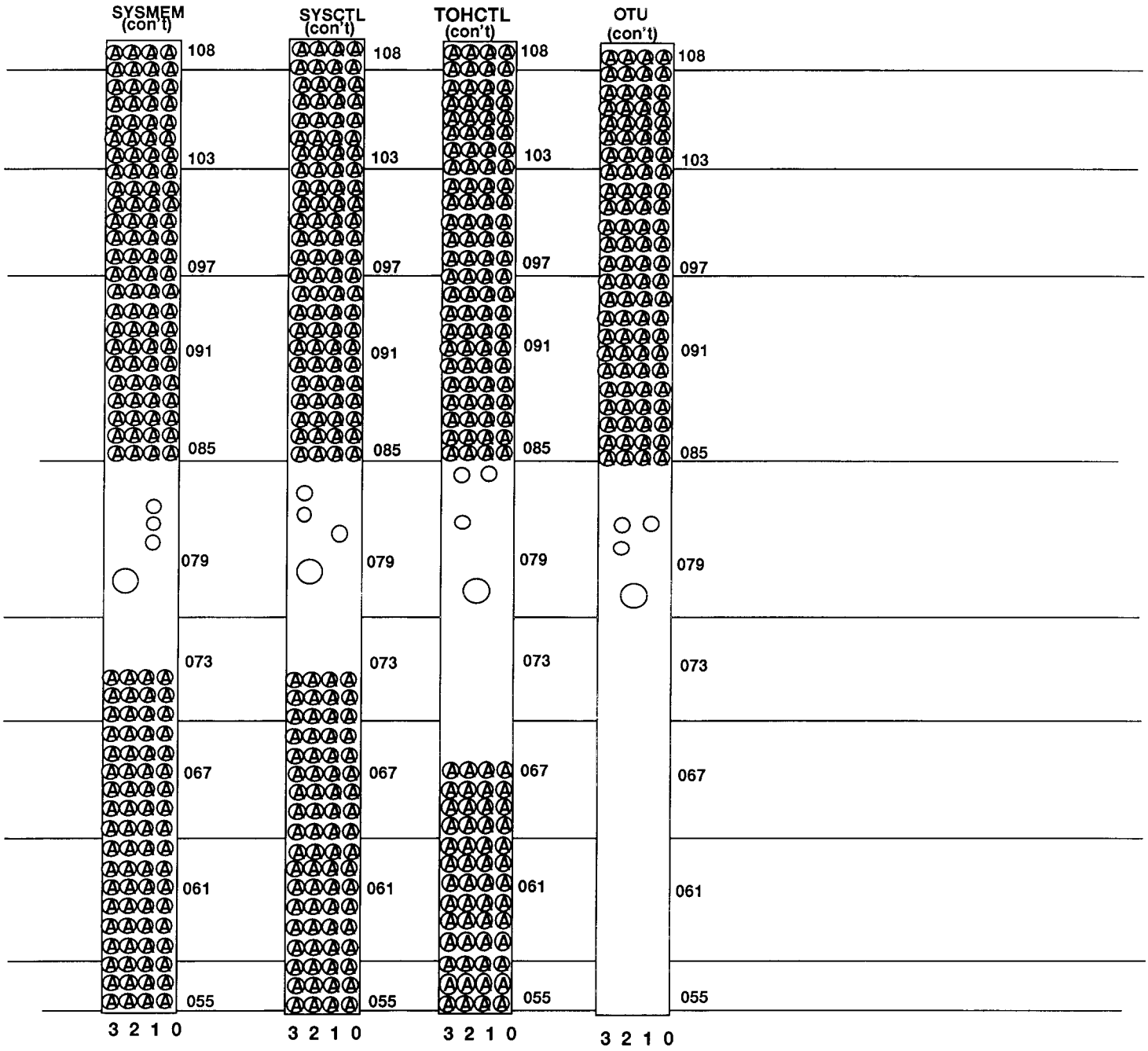


Figure A- 14 Optical Translator (Middle)
Component Side View

OPTICAL TRANSLATOR (OT) - Pin Type Location

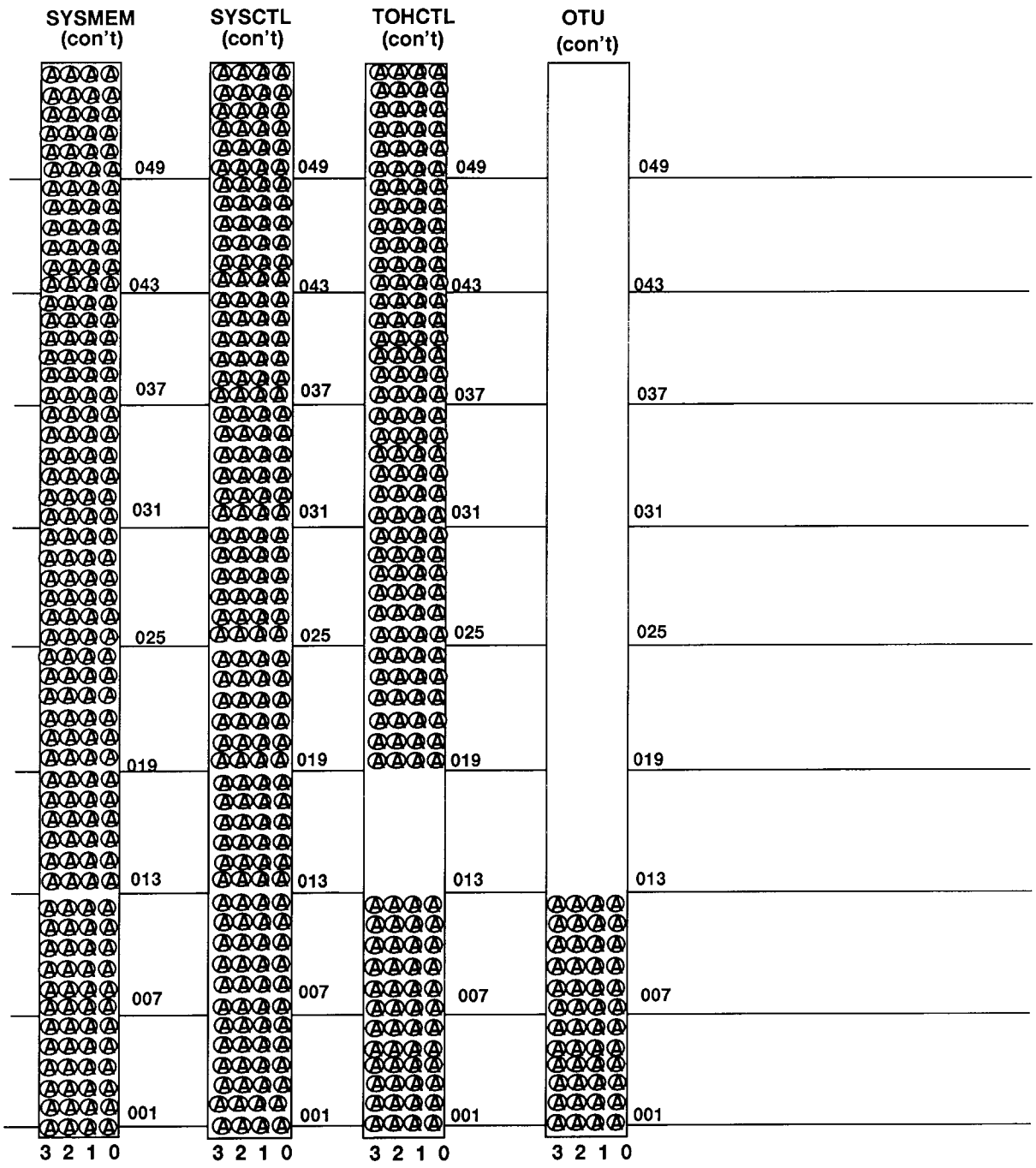


Figure A- 15 Optical Translator (Lower)
Component Side View

OPTICAL TRANSLATOR SYSTEM (OT) - Pin Type Location

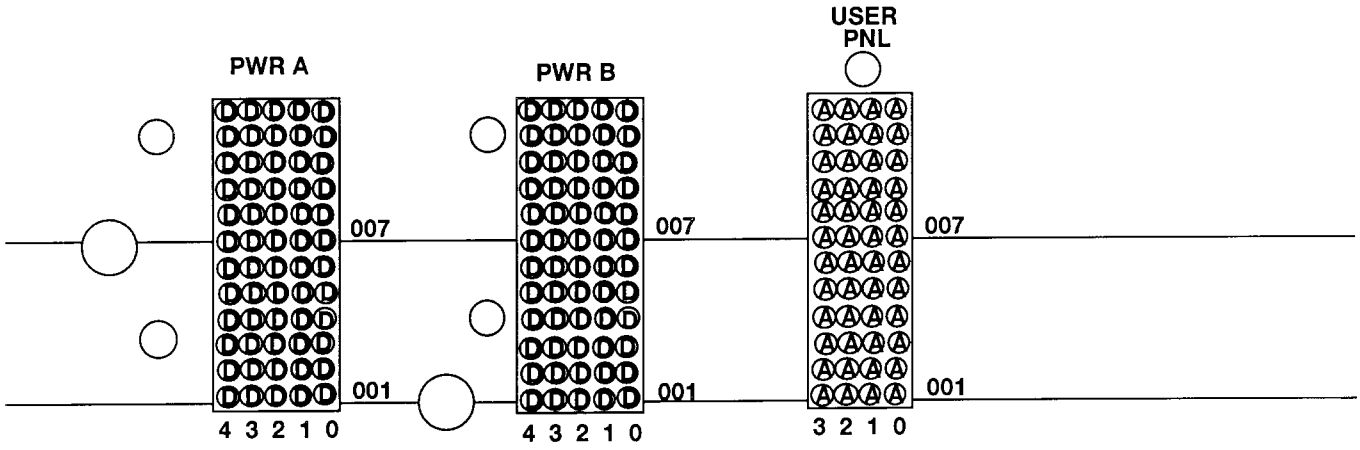


Figure A- 16 Optical Translator - Power and User Panel Component Side View

Glossary

0x1 Line Operation
A 0x1 protection system has one service line and no protection line.

1+1 Line Protection
A 1+1 protection system has two bidirectional lines. The transmitting terminal transmits the same signal on two lines. The receiving terminal monitors two lines independently and chooses one line as the active line and the other line as the standby line. When a protection switch occurs, the receiving terminal selects the signal from the standby line which causes the standby line to be the new active line. The original active line becomes the standby line. This status remains the same (nonrevertive) after the fault clears. Also see Nonrevertive Switching.

1x1 Line Protection
A 1x1 protection system has two OC-48 high speed lines. One line is designated as the service line, and the other line is designated as the protection line. The service line normally carries traffic. When a protection switch occurs, the protection line is selected to carry traffic. When the fault clears, the original service line is selected (revertive). Also see Revertive Switching.

1A-TX
1A-Transmit — When the direction parameter of an Optical Line System end terminal is provisioned 1A-TX using the **SECURITY-Network Element** input, the "A" optical lines are used in the transmit direction.

1A-RCV
1A-Receive — When the direction parameter of an Optical Line System end terminal is provisioned 1A-RCV, using the **SECURITY-Network Element** input, the "A" optical lines are used in the receive direction.

3x33-dB System
An Optical Line System (OLS) subnetwork consisting of two OLS End Terminals separated by up to 3 optical sections, with 33 dB of loss per optical section. Each optical line signal can travel up to 3 consecutive optical sections before electrical regeneration is required.

7x25-dB System
An Optical Line System (OLS) subnetwork consisting of two OLS End Terminals separated by up to 7 optical sections, with 25 dB of loss per optical section. Each optical line signal can travel up to 7 consecutive optical sections before electrical regeneration is required.

8x24-dB System
An Optical Line System (OLS) subnetwork consisting of two OLS End Terminals separated by up to 8 optical sections, with 24 dB of loss per optical section. Each optical line signal can travel up to 8 consecutive optical sections before electrical regeneration is required.

A

ABN
Abnormal — An LED on the indicator strip and user panel that is lighted when a temporary condition potentially affecting transmission exists.

ACO
Alarm Cutoff — A pushbutton switch on the indicator strip and user panel that can be used to retire the active audible office alarm. If another alarmable condition occurs while the ACO is active, the highest level audible alarm is activated. The alarm cutoff function is also available from the CIT and from an operations system.

AGNE
Alarm Gateway Network Element — A network element that receives remote network element status information from other network elements in an alarm group and rebroadcasts the information to all network elements in the alarm group. Using AGNEs makes it unnecessary for each network element in the alarm group to communicate directly with all other network elements in the alarm group.

AID
Access Identifier — A unique identifier used to address circuit pack slots, ports, and tributaries.

AIM
Alarm Indication Message — A maintenance message transmitted downstream in a digital network that shows that an upstream failure has been detected and alarmed by some upstream equipment, if the upstream alarm has not been suppressed.

Alarm
A contact closure to the office alarm grid.

Alarm Group
A group of network elements that share remote alarm information through an alarm gateway network element (AGNE). Also refer to AGNE.

ANSI
American National Standards Institute — An organization consisting of producer, consumer, and general interest groups that establishes the procedures by which accredited organizations create and maintain voluntary industry standards in the United States.

APD
Avalanche Photodiode — A highly sensitive optical detector.

AS&C
Alarm, Status, and Control

ASCII
American Standard Code for Information Interchange — A standard 8-bit code used for exchanging information among data processing systems and associated equipment.

Asynchronous
Refers to network elements that are not timed from references traceable to a single timing source.

ATM
Asynchronous Transfer Mode — A new technology based on a simple, fixed-length packet (or cell) format that allows integrated networking of voice, data, and video traffic. The packet length is set at 53 bytes. The first 5 bytes are reserved for address and control fields, and the remaining 48 bytes carry data.

AUTO
Automatic — One possible state of a slot, customer maintenance signal (CMS) port, or optical channel. When a CMS port or optical channel is in the automatic state and the presence of a good signal is detected, the port or optical channel is automatically placed in the IS (in service) state. When a slot is in the automatic state and the presence of a circuit pack is detected, the slot is automatically placed in the EQ (equipped) state.

Autonomous Indicators
Autonomous indicators are those indicators that are subject to incoming signal alarm delay. These include office alarm outputs, parallel telemetry outputs, TL1 autonomous messages, the alarm LEDs (CR, MJ, and MN) on the indicator strip/user panel, and the network element status field in the upper left-hand corner of the CIT.

B

BCLAN
Board Controller Local Area Network — The internal local area network that provides communications between the Line Controller circuit pack and board controllers on the circuit packs associated with an optical line.

BDFB
Battery Distribution and Fuse Bay

BER
Bit Error Rate — The ratio of bits received in error to bits sent.

Bidirectional Switching
Protection switching that is performed in the transmit and receive directions.

BIP
Bit Interleaved Parity — A method of error monitoring over a specified number of bits (BIP-3 or BIP-8).

BIP-N
Bit Interleaved Parity - N — A method of error monitoring. With even parity, an N-bit code is generated by the transmitting equipment over a specified portion of the signal in such a way that the first bit of the code provides even parity over the first bit of all N-bit sequences in the covered portion of the signal. The second bit provides even parity over the second bits of all the N-bit sequences within the specified portion, etc. Even parity is generated by setting the BIP-N bits so that there are an even number of ones in each of all the N-bit sequences including the BIP-N.

BITS
Building Integrated Timing Supply — A single clock that provides all the DS1 and DS0 synchronization references required by clocks in a building.

BOC
Bell Operating Company

Broadband Communications
Voice, data, and/or video communications at rates greater than DS1 rates (1.544 Mb/s).

BRT
Business Remote Terminal

C

CCITT
International Telephone and Telegraph Consultative Committee — An international advisory committee under United Nations sponsorship that has composed and recommended for adoption worldwide standards for international communications. Recently changed to the International Telecommunications Union (ITU) Telecommunication Standardization Sector (TSS).

CDRH
Center for Devices and Radiological Health

CEV
Controlled Environment Vault

CIT
Craft Interface Terminal — A personal computer that meets Optical Line System minimum requirements loaded with the CIT-PC software.

CO
Central Office — A telephone company building where switching and/or transmission system equipment is located.

Condition
Conditions persist in time and indicate that there is something abnormal about the system. Conditions appear in the `Local Active Alarms and Status Report` and the `Network Alarms Report`.

CMS
Customer Maintenance Signal — The 155-Mb/s optical signal originating from the customer supplied equipment. It is carried as part of the supervisory signal. Also see "Supervisory Signal."

CR
Critical (alarm)

CTS
Customer Technical Support — A Lucent Technologies organization (formerly CTSI) that helps customers maintain installed systems.

CTSI
Customer Technical Support and Information — A Lucent Technologies organization that helps customers maintain installed systems.

Current Value
The value currently assigned to a provisionable parameter.

CV-L
Coding Violation — A performance-monitoring parameter. The coding violations are monitored for the supervisory channel of the optical line.

D

DACS
Digital Access and Cross-Connect System

DACS III-2000
One of Lucent Technologies SONET-compatible Digital Access and Cross-Connect Systems.

DACS IV-2000
One of Lucent Technologies SONET-compatible Digital Access and Cross-Connect Systems.

Dark Fiber
Fiber that has been installed but is not carrying any optical signals.

Data
A collection of system parameters and their associated values.

dB
Decibels — A dimensionless unit used to express the ratio between input and output voltages, powers, currents, or sound intensities.

DCC
Data Communications Channel — The embedded overhead communications channel in the optical line. This is used for end-to-end communications and maintenance. It carries alarm, control, and status information between network elements in a SONET network.

DCC Link
Data Communications Channel Link — A bidirectional point-to-point fiber connection that has the DCC bytes terminated at both ends.

DCE
Data Circuit Equipment — The equipment that provides the signal conversion and coding between the data terminating equipment and the line. The DCE may be separate equipment or a part of the data terminating equipment.

DCMS
Design Change Management System — The Design Change Management System is used to issue product change notifications (PCNs) to customers.

DDM-2000 Multiplexers
Lucent Technologies SONET-ready network multiplexers that can function as a lightwave terminal. It is designed primarily for loop feeder and interoffice applications that will work in existing asynchronous as well as the emerging SONET networks.

DDM-FiberReach
The DDM-2000 FiberReach Multiplexer is an OC-1 low density access product offering DS0 and DS1 services for business carrier access, fiber-in-the-loop, or private network applications. DDM-2000 FiberReach is hosted by the DDM-2000 OC-3 or OC-12 Multiplexer or the *SLC*-2000 Access System with a single- or dual-homed ring or star topology.

Demultiplexing
A process applied to a multiplexed signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

DFB
Distributed Feedback

Directivity (Near-End Crosstalk)
The ratio (in dB) of the optical power reflected back to any input port, to the total power into all other input ports

Dispersion
A broadening of transmitted light pulses.

DM
Degraded Minutes — A performance-monitoring parameter.

DMA
Direct Memory Access — A data transfer technique that uses a control circuit to move data between a device and memory.

Doping
The addition of impurities in a substance to achieve desired properties.

DRAM
Dynamic Random Access Memory — Semiconductor random-access memory that requires short interval refreshing to retain its contents.

Drop Side Signal
An OC-48 optical signal suitable for transmission over the Optical Line System.

DS3
Digital Signal Level 3 (44.736 M/bs)

DS-NE
Directory Service Network Element — The single reference point in an Optical Line System network. The Directory Service Network Element stores the IDs of the other network elements and updates the other network elements after configuration changes. The Directory Service Network Element is responsible for administering a database that maps network element names (TIDs) to addresses (NSAPs). Also see NSAP and TID.

DTE
Data Terminating Equipment — The equipment that originates data for transmission and accepts transmitted data.

DWDM
Dense Wavelength Division Multiplexing — Allows customers to multiplex up to 8 different wavelengths of drop side signals (OC-48 signals from FT-2000 OC-48 Large Capacity Terminals) onto a single fiber.

E

EC, EC-n
Electrical Carrier — The basic logical building block signal with a rate of 51.840 Mb/s for an EC-1 signal and a rate of n times 51.840 Mb/s for an EC-n signal.

EC-1
An STS-1 signal that has been shaped and encoded for transmission over electrical media. This refers to the actual physical representation of an electrical signal with an EC-1 format at a manual or electronic cross-connect interface. This signal is typically carried by coaxial cables from one equipment location to another. The term EC-1 not only refers to the organization and data rate of a signal but also to the voltage template the signal must conform to and the impedances for which the voltage template is valid.

ECI
Equipment Catalog Item

EDFA
Erbium Doped Fiber Amplifier — A form of optical amplification in which an optical signal passes through a section of erbium doped fiber and is amplified by a laser pump diode.

EEPROM
Electrically Erasable Programmable Read-Only Memory — Readable memory that is nonvolatile in nature, erased electrically, and programmed externally from the processor that uses it.

EIA
Electronic Industries Association — A trade association of the electronics industry that establishes electrical and functional standards.

EMC
Electromagnetic Compatibility

EMDU
External Miscellaneous Discrete Unit — An external unit manufactured by *DANTEL** Incorporated and *HARRIS*† Corporation that supports the extended miscellaneous discrete feature in Release 2 of the Optical Line System. The EMDU can be miscellaneously mounted and is connected to the SER TLM 1 port of the Optical Line System (or equivalent) for monitoring. The *DANTEL* EMDU can also be wall mounted. The EMDU detects and reports incoming signal failures and OTU circuit pack failures to the Optical Line System (or equivalent).

EMI
Electromagnetic Interference — High-energy, electrically induced magnetic fields that cause data corruption in cables passing through the fields.

End Terminal Site
The location of the Optical Line System equipment that terminates the optical line signals.

EPROM
Erasable Programmable Read-Only Memory — Readable memory that is nonvolatile in nature, erased by exposure to intense ultraviolet light, and programmed externally from the processor that uses it.

EQ
Equipped — A memory administrative state for OA and TLM circuit pack slots. EQ refers to an OA or TLM circuit pack slot that is fully monitored and alarmed.

Erbium
A soft rare earth element used in metallurgy and nuclear research.

ES-L
Errored Seconds — A second in which one or more coding violations are detected. Errored seconds are monitored for supervisory channel of the optical line.

ESD
Electrostatic Discharge — The discharge of static electricity into equipment that potentially causes component damage and logic errors.

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* Registered trademark of Dantel Incorporated.

† Registered trademark of Harris Corporation.

Event
Events happen at a particular time (do not persist in time) and appear in the `Maintenance History Report`.

Executable Code
The "program" that controls the operation of the system.

F

FDA
Food and Drug Administration

FE ACTY
Far-End Activity — An LED on the indicator strip and user panel that is lighted when an alarm or status condition exists at a remote network element.

FIT
Failures in Time — Circuit pack failure rates per 10^9 hours

Flash EPROM
A new technology that combines the nonvolatility of EPROM with the in-circuit reprogrammability of EEPROM (electrically-erasable PROM).

FLS
Frame Loss Seconds

Folded Rings
Folded (collapsed) rings are ring networks without fiber diversity. The terminology derives from the image of folding a ring into a linear segment.

G

Gb/s
Gigabits (10^9 bits) per Second

GCNS-2000
Lucent Technologies Gigabit Cell Network Switch.

GNE
Gateway Network Element — A network element that serves as a single interface to the local X.25 message-based operations system for all the Optical Line System End Terminals and Repeaters in a network.

H

Hardware Ready
The shelf, connector, and backplane have been designed to accept hardware (circuit packs) that is not available yet. Additional cables may be required.

I

I/O
Input/Output

IR
Intermediate Reach

IS
In Service — A memory administrative state for CMS ports and optical channels. IS refers to a CMS port or optical channel that is fully monitored and alarmed.

Insertion Loss
The ratio of the incident (input) optical power to the transmitted (output) optical power (in dBs).

ITU
International Telecommunications Union — An international advisory committee under United Nations sponsorship that has composed and recommended for adoption worldwide standards for international communications. Also refer to CCITT.

J

Jitter
Timing jitter is defined as short-term variations of the significant instants of a digital signal from their ideal positions in time.

L

LAN
Local Area Network

LBC
Laser Bias Current — A parameter that indicates whether the system optics are working within normal margins. The laser bias current is monitored for pump 1 and pump 2 of the optical line.

LBFC
Laser Backface Current — A parameter that indicates whether the system optics are working within normal margins. The laser backface current is monitored for pump 1 and pump 2 of the optical line.

LBO
Line Buildout — An equalizer network that guarantees the proper signal level. Also see optical line buildout.

LCT
FT-2000 OC-48 Large Capacity Terminal

LED
Light-Emitting Diode

Length of a Wavelength Route
The number of spans in the Optical Line System that constitutes a wavelength route. The length of a wavelength route is bounded by the engineering rules.

Line
A bidirectional optical transmission line. In T1/Bellcore terminology, "line" refers to a transmission medium, together with the associated high speed equipment, required to provide the means of transporting information between two consecutive Network Elements, one of which originates the line signal and the other terminates the line signal.

LOF
Loss of Frame — A failure to synchronize to an incoming signal.

LOS
Loss of Signal — The absence of an adequate incoming signal.

M

µm
Micrometer — 10^{-6} meters

Menu
A set of possible values for a parameter.

MJ
Major (alarm)

MML
Human-Machine Language

MN
Minor (alarm)

MTBF
Mean Time Between Failures

MTBMA
Mean Time Between Maintenance Activities

Multiplexing
The process of combining several distinct digital signals into a single composite digital signal.

N

NCDRH
National Center for Devices and Radiological Health

NE
Network Element — Refers to an Optical Line System End Terminal or Optical Line System Repeater in a network.

NE ACTY
Near-End Activity — An LED on the indicator strip and user panel that is lighted when an alarm or status condition exists at the local network element.

NEBS
Network Equipment-Building System

nm
Nanometer — 10^{-9} meters

NMA
Network Monitoring and Analysis System — Bellcore's alarm surveillance operations system.

NMON
Not Monitored — A memory administrative state for CMS ports and optical channels. This refers to a CMS port or optical channel that is not monitored and will not transition to the IS state if a good signal is detected.

Nonautonomous Indicators
The nonautonomous indicators are those indicators that are not subject to incoming signal alarm delay. These indicators include the circuit pack FAULT LEDs, all CIT reports, TL1 command response messages, and the LEDs on the indicator strip and user panel (except CR, MJ, and MN).

Nonrevertive Switching
In nonrevertive switching, there is an active and standby line, circuit pack, etc. When a protection switch occurs, the standby line, circuit pack, etc., is selected causing the old standby line, circuit pack, etc., to become the new active line, circuit pack, etc. The original active line, circuit pack, etc., becomes the standby line, circuit pack, etc. This status remains in effect when the fault clears. Therefore, this protection scheme is "nonrevertive" in that there is no switch back to the original status in effect before the fault occurred. Also see 1+1 Line Protection.

NRZ
Nonreturn to Zero

NSA
Non-Service Affecting

NSAP
Network Services Access Point — An automatically assigned number (address) that uniquely identifies a network element for the purposes of routing data communications channel messages.

Null Modem
A null modem cable allows a CIT local access to the Optical Line System via the DTE port on the interconnection panel of the End Terminal and Repeater Shelves.

O

O&M
Operation and Maintenance

OA
The Optical Line System Optical Amplifier circuit pack optically amplifies an optical line signal and provides an add/drop function for the supervisory signal.

OALAN
Overhead Access Local Area Network — The internal local area network that provides communications between the System Controller circuit pack and the Overhead Controller - Tributary circuit pack.

OAM&P
Operations, Administration, Maintenance, and Provisioning

OC, OC-n
Optical Carrier — The optical signal that results from an optical conversion of an STS signal; that is, OC-1 from STS-1 and OC-n from STS-n.

ODU
The Optical Line System Optical Demultiplexing Unit provides an interface between an incoming wavelength division multiplexed optical line signal and up to 8 outgoing OC-48 drop side signals.

OLS
Optical Line System — The Optical Line System is a flexible, high capacity, analog lightwave system that transports digitally encoded information contained in up to eight different wavelengths of SONET OC-48 signals (up to 32,256 voice channels each) through standard single-mode or *Truewave*™ optical fibers.

OMU
The Optical Line System Optical Multiplexing Unit provides an interface between up to 8 incoming OC-48 drop side signals and an outgoing wavelength division multiplexed optical line signal.

Operations Interface
Any interface that provides information on the system behavior or control. These include the equipment LEDs, indicator strip/user panel, CIT, office alarms, and all telemetry interfaces.

Operations Interworking
The capability to access, operate, provision, and administer remote systems through CIT access from any site in a SONET network or from a centralized operations system.

Optical Bandpass
The maximum range of wavelengths over which the insertion loss and wavelength isolation requirements are met.

Optical Channel
A single OC-48 signal within the optical line signal. There are eight optical channels (OC-48 signals) within one optical line signal.

Optical Line Buildout
An equalizer network between the Optical Line System and the lightguide cross-connect panel (or equivalent). It guarantees the proper received signal level at the Optical Amplifier circuit pack.

Optical Line ID
The part of the supervisory signal that identifies optical lines to prevent misconnections between sites.

Optical Line Signal
A wavelength division multiplexed optical signal that consists of up to eight optical channels and one supervisory channel.

Optical Section
The part of the optical line that exists between adjacent end terminal and repeater sites or between adjacent repeater sites. Optical sections are sometimes referred to as spans.

Original Value
The value given to a CIT provisionable parameter at the factory.

Original Value Provisioning
The original values are the values given to CIT provisionable parameters at the factory. At system startup, the original values are copied and become the current values. These current values can be changed using local or remote provisioning. The original values can never be changed.

OS
Operations System — A central computer-based system used to provide operations, administration, and maintenance functions.

OSI
Open Systems Interconnection — Referring to the OSI reference model, a logical structure for network operations standardized by the International Standards Organization (ISO).

Orderwire
The part of the supervisory signal that is used for communications between sites.

OT
Optical Translator — Provides a flexible interface into the Optical Line System. The Optical Translator has 32 OTU circuit packs fitted in a cabinet or network bay framework.

OTU
Optical Translator Unit — The OTU circuit pack electrically regenerates any incoming OC-48/STM-16 wavelength in 1.3- or 1.5-μm range into a specific outgoing OC-48 wavelength.

OTDR
Optical Time Domain Reflectometer

Outside Plant Loss
The optical power loss (in dB) due to the fiber span between sites.

P

Parameter
A characteristic of the system that affects its operation.

PC
Personal Computer

PCN
Product Change Notification — Product change notifications are issued to notify customers that in-service product changes are required to correct an existing or potential problem. Product change notifications are issued through the Design Change Management System.

PFU
Power Filter Unit

Platform
In the Optical Line System, a platform is a family of equipment and software configurations designed to support a particular set of applications.

PM
Performance Monitoring — Measures the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated).

POH
Path Overhead — Overhead assigned to and transported with the payload until the payload is demultiplexed. It is used for functions that are necessary to transport the payload.

Polarization Dependent Loss
The difference between the maximum and minimum insertion loss, as the polarization state of the incident optical signal is varied over all orientations.

Preprovisioning
The capability to provision a slot before installing a circuit pack.

Proactive Maintenance
Refers to the process of detecting degraded conditions not severe enough to initiate protection switching or alarming, but indicative of an impending signal fail or signal degrade defect.

Provisioning
Assigning a value to a parameter in memory.

PWR
Power

R

Reactive Maintenance
Refers to detecting defects/failures and clearing them.

Reflectance
The ratio of reflected optical power to the incident optical power at a reflection point or from a component.

Repeater Site
The location of the Optical Line System equipment that optically amplifies the optical line signals.

Revertive Switching
In revertive switching, there is a service and protection high speed line, DCC, etc. When a protection switch occurs, the protection line, DCC, etc., is selected. When the fault clears, service "reverts" back to the original service line. Also see 1x1 Line Protection.

Reset
The **FAULT-Reset** input copies the current values from the SYSCTL circuit pack to the SYSMEM circuit pack and the executable code from the SYSMEM circuit pack to the SYSCTL circuit pack. The executable code in the SYSCTL circuit pack is then restarted and the current values in the SYSMEM circuit pack are reformatted to work with the new executable code.

RF
Radio Frequency

RMS
Root Mean Square

RPP
Reliability Prediction Procedure

RTAC
Regional Technical Assistance Center — A Lucent Technologies organization that helps customers maintain installed systems.

RZ
Return to Zero

S

SA
Service Affecting

SD
Signal Degrade — A provisionable parameter for the incoming supervisory signal (from the optical line signal) that determines the threshold at which a signal degrade condition is declared.

SDH
Synchronous Digital Hierarchy

SES-L
Severely Errored Seconds — A second in which the coding violations detected reach a fixed threshold. The severely errored seconds are monitored for the supervisory channels of the optical line.

SF
Signal Fail — Refers to a condition when an incoming signal's bit error rate exceeds a fixed value.

Single-Ended Operations
The capability to perform operations, administration, maintenance, and provisioning of remote network elements on a centralized basis.

Site Address
The unique address of each end terminal and repeater site in an optical line.

SLM
Single Longitudinal Mode

Software Ready
The software that runs on the Optical Line System will accept, run, boot, and operate normally when future hardware (circuit packs) is installed.

SONET
Synchronous Optical Network — The American National Standards Institute's optical signal standard for broadband transmission.

SPR-C
Signal Power Received - Channel — This parameter is the measurement of the signal power per optical channel.

SPR-SU
Signal Power Received - Supervisory — This parameter is the measurement of the supervisory channel signal power.

Standard Fiber
Single mode fiber in the 1550-µm range with nominal dispersion of 18 ps/nm-km and optical loss of less than 0.25 dB/km.

Status
Status means a condition that does not raise an alarm.

STM, STM-n
Synchronous Transport Module — The basic logical building block SDH signal with a rate of 155.52 Mb/s for an STM-1 signal and a rate of n times 155.52 Mb/s for an STS-n signal.

STS, STS-n
Synchronous Transport Signal — The basic logical building block SONET signal with a rate of 51.840 Mb/s for an STS-1 signal and a rate of n times 51.840 Mb/s for an STS-n signal.

Subnetwork
SONET networks with data communications channel connectivity.

Supervisory Channel
A single 155-Mb/s channel within the optical line signal.

Supervisory Signal
An optical signal originating at the Telemetry Controller circuit pack that is used to communicate maintenance information. The supervisory signal consists of the supervisory overhead and the customer maintenance payload. The supervisory signal is wavelength division multiplexed onto the optical line by the Optical Amplifier circuit pack.

SVC
Switched Virtual Circuit

Synchronous
Refers to network elements that are timed from references traceable to a single timing source.

Synchronous Network
The synchronization of synchronous transmission systems with synchronous payloads to a master (network clock that can be traced to a single reference clock).

SYSCTL
The System Controller and System Memory circuit packs provide the highest level of system control for the Optical Line System. The System Controller circuit pack provides overall administrative control of the system.

SYSMEM
The System Memory and System Controller circuit packs provide the highest level of system control for the Optical Line System. The System Memory circuit pack provides memory support for the SYSCTL circuit pack.

T

T1X1 and T1M1
The ANSI committees responsible for telecommunications standards.

TA
Technical Advisory

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.

TEC
Thermo-Electric Cooler

THz
Terahertz — 10^{12} Hertz

TID
Target Identifier — A provisionable parameter used to identify an Optical Line System network element.

TIE
Time Interval Error — The variation of time delay of a given timing signal with respect to an ideal timing signal over a particular period of time.

TL1
Transaction Language 1 — A machine-to-machine communications language that is a subset of ITU-T's human-machine language.

TLM
The Optical Line System Telemetry Controller circuit pack provides a bidirectional interface between an IS-3 customer maintenance signal and the supervisory signal. The TLM circuit pack also performs maintenance functions that are used to monitor the performance of the optical line.

TOHCTL
The Optical Line System Overhead Controller - Tributary circuit pack provides user access to the data communications channel (DCC) bytes.

Tone
An amplitude-modulated signal in the 5- to 30-kHz range that is superimposed on the drop side signal at the end terminal site.

TOPR-OL
Total Optical Power Received — The total power for all the optical channels of the optical line.

TR
Technical Reference

Truewave Fiber
Single mode fiber in the 1550-µm range with nominal dispersion of 1 to 5 ps/nm-km and optical loss of less than 0.25 dB/km.

TSO
Technical Support Organization — See CTSI.

U

UAS-L
Unavailable Seconds — A second during which the supervisory channel of the optical line is unavailable.

Update
The **`CONFIGURATION-Update`** input updates the state of all the automatically provisioned parameters based on what circuit packs are present and the condition of the incoming signals. Refer to "Provisionable Parameters and Original Values" in this section for more information about automatically provisioned parameters.

Upgrade
An upgrade is the addition of new capabilities (features) to an existing platform. This requires new software and may require new hardware.

V

Value
A number, text string, or other menu selection associated with a parameter.

W

Wavelength Isolation (Far-End Crosstalk)
The ability of wavelength division multiplexing to isolate light signals in the desired optical channel from the unwanted optical channel. Wavelength isolation is the ratio of light in the bandpass of the transmission channel to the light within the bandpass of the other blocked channel, at any given WDM port.

Wideband Communications
Voice, data, and/or video communications from the DS0 rate (64 kb/s) to the DS1 rate (1.544 Mb/s).

Index

155 Mb/s customer maintenance signal, 5-4, 5-8
1x1 end terminal application, 2-8
505A OMU block diagram, 7-27
6-hour autonomous report, 9-25
8 wavelength ready, 1-2

A

Access IDs, 8-10
Active alarms and status report, 9-24
Additional miscellaneous discretes, 3-33, 6-16, 7-6
Additional TL1 messages, 6-19
Administration
  Access IDs, 8-10
  memory administration, 8-1
  security, 8-4
  software upgrades, 8-9
  version recognition, 8-4
Admonishments used in this user/service manual, xxx
AGNE, 8-28
AIDs, 8-10
Alarm and status report, 9-24
Alarm gateway network element (AGNE) support, 8-28
Alarm group, 8-27
Alarm test, 9-17
Applications,
  1x1 end terminal application, 2-8
  dual 1x1 end terminal application, 2-9
  optical transmission elements, 2-2
  overview, 2-1
  ring applications, 2-11
Applications with the Optical Translator, 2-5, 2-11
Applications, point-to-point, 2-8
ASCII-based (dumb) terminal minimum requirements, 6-6, 10-13
ASCII-based terminal, 6-6
Auto and CIT provisioning, 8-11
Auto provisioning, 8-11
Auto provisioning date/time, 8-31
Auto provisioning states, 8-32
Auto turnup tests, 9-11, 9-12
Automatic diagnostics, 9-4
Automatic fault detection and isolation, 9-4
Automatic provisioning, 8-31
Automatic provisioning on circuit pack replacement, 8-31

B

Baselining optical parameters, 9-22
Board controller, 5-1

C

Cabinet, 10-10
Cabinet weights, 10-11
Cable access, 10-8
Capacity, 2-15, 10-6
Categories, 7-1
Circuit pack faceplate LED, 6-14
Circuit pack power, 4-4
Circuit pack slot states, 8-32
Circuit pack/unit, 10-10
Circuit pack/unit and compatible software, 7-2
Circuit pack/unit descriptions,
  compatible software, 7-2
  introduction, 7-1
  OA, 7-32
  ODU, 7-29
  OMU, 7-26
  SYSCTL, 7-3
  SYSMEM, 7-8
  TLM, 7-18
  TOHCTL, 7-14
  automatic provisioning, 8-31
  categories, 7-1
CIT,
  ASCII-based terminal, 6-6
  compatible PCs, 6-3
  dial-up access, 6-7
  dumb terminal, 6-6
  functions, 6-2
  general, 6-1
  local access, 6-7
  modem requirements, 6-8, 10-13
  null modem adapter, 6-7, 6-9
  PC with CIT-PC software, 6-2
  remote access using supervisory signal DCC, 6-9

CIT (Continued)
security, 6-2
CIT (craft interface terminal), 6-1
CIT (DCE) port, 6-7
CIT (DTE) port, 6-7
modem requirements, 6-8
CIT function keys, 11-3
CIT functions, 6-2
CIT provisioning, 8-11
CIT requirements,
PC with CIT-PC software, 6-3
CIT security, 6-2
CIT specifications, 10-12, 10-13
ASCII-based (dumb) terminal, 10-13
personal computer, 10-12
CIT tutorial using CIT-PC software, 11-55
CMS port states, 8-32
COACH, xlvii
COACH user's guide, xlix
Commands (inputs), 11-2
Compatibility data, xlix
Compatible PCs, 6-3
Compatible personal computers, 6-3
Compatible software, 7-2
Context sensitive help, 11-3
Control architecture, 5-1
Control circuit packs,
SYSCTL, 7-3
SYSMEM, 7-8
TOHCTL, 7-14
Control circuitry, 7-4, 7-15, 7-21, 7-28, 7-31, 7-35
OA, 7-35
ODU, 7-31
OMU, 7-28
SYSCTL, 7-4
TLM, 7-21
TOHCTL, 7-15
Conventions used in this user/service manual, xxix
Copy-Program, 8-3
Craft interface,
circuit pack faceplate LED, 6-14
craft interface terminal, 6-1
fuse panel, 6-13
indicator strip, 6-10
message-based operations system interface, 6-18
miscellaneous discrete interface, 6-16
office alarms, 6-14
orderwire, 6-24
Craft interface (Continued)
parallel telemetry, 6-15
TL1 messages, 6-19
user panel, 6-10
Craft interface terminal, 6-1
Current drains, 10-9
Customer maintenance signal IS-3 access, 10-7
Customer maintenance signal synchronization, 5-10

D

Data storage, 9-21
Data storage and reports, 9-21
Day bin start time provisioning, 8-20, 9-22
Dense wavelength division multiplexing, 1-2
Detailed description, 7-4, 7-9, 7-15, 7-19, 7-27, 7-30, 7-34
OA, 7-34
ODU, 7-30
OMU, 7-27
SYSCTL, 7-4
SYSMEM, 7-9
TLM, 7-19
TOHCTL, 7-15
Diagnostic dictionary, xlix
Dial-up access, 6-7
Dimensions,
cabinet, 10-10
circuit pack/unit, 10-10
shelf, 10-10
Direction (DIRN) parameter, 8-28
Directory service network element, 8-27
Document ordering, l
one-time orders, l
standing orders, l
Documentation,
electronic, li
Documentation support, l
Documents, xxxix, xl
Double-pumped optical amplifiers, 1-2
Drawings, xlii
Drop side input power, 10-4
DSNE, 8-27
Dual 1x1 end terminal application, 2-9
Dumb terminal, 6-6

E

Electrostatic Discharge, xxxv
EMDU, 6-16
Enable/disable TCAs for a single parameter, 9-19–9-21
End terminal shelf,
  block diagram, 5-4
  transmission interfaces, 5-4
End Terminal Shelf 1, 3-20
  Circuit packs/units, 3-21
  Purpose, 3-20
End Terminal Shelf 2, 3-24
  Circuit packs/units, 3-25
  Purpose, 3-24
End terminal shelf block diagram, 5-4
End terminal shelf transmission interfaces, 5-4
Environmental specifications, 10-11
Equipment packages, 3-2
  OLS Dual End Terminal, 3-8
  OLS Dual Repeater, 3-11
  OLS End Terminal and Repeater, 3-13
  OLS End Terminal for 4 Bidirectional Optical Lines, 3-2
  OLS End Terminal Shelf (Miscellaneously Mounted), 3-15
  OLS Repeater for 4 Bidirectional Optical Lines, 3-6
  OLS Repeater Shelf (Miscellaneously Mounted), 3-18
Erbium-doped fiber amplifiers, 1-2
ESD considerations, xxxv
ESD wrist strap, xxxvi
Examples of reports, 11-15
Expert/privileged logins, 8-6
External miscellaneous discrete unit, 6-16

F

Faceplate LED, 7-3, 7-8, 7-14, 7-18, 7-26, 7-29, 7-32
  OA, 7-32
  ODU, 7-29
  OMU, 7-26
  SYSMEM, 7-8
  TLM, 7-18
Faceplate LED (Continued)
  TOHCTL, 7-14
Fault detection, 9-4
Fault detection circuitry, 7-22, 7-36
  OA, 7-36
  TLM, 7-22
Fault isolation, 9-4
FAULT LED, 4-7
Fault reporting, 9-4
Floor loading specifications, 10-11
Frequencies, tone, 10-3
Functions, 6-2
Fuse panel, 3-34, 6-13
Fuses, 4-3

G

General circuit pack/unit description, 7-4, 7-9, 7-15, 7-19, 7-27, 7-30, 7-33
  OA, 7-33
  ODU, 7-30
  OMU, 7-27
  SYSCTL, 7-4
  SYSMEM, 7-9
  TLM, 7-19
  TOHCTL, 7-15
General laser information, xxx
General logins, 8-6
General philosophy, 4-1
Ground strap, xxxvi
Growth, line, 2-15

H

Handling and transportation specifications, 10-12
Heat baffle, 3-36
How to comment on this document, li
How to order documents, l
How to request standing orders for documents, l
How to use this user/service manual, xxviii

I

Inactivity timers, 8-5
Indicator strip, 3-19, 6-10
Initializing optical parameters, 9-22
Initializing pm registers, 9-21
Input (commands), 11-2
Input (commands) menu, 11-5
Input definitions, 11-9
Input power, 10-4
Inputs that generate reports, 11-13
Intended audience of user/service manual, xxviii
Interface circuitry, 7-5, 7-16
  SYSCTL, 7-5
  TOHCTL, 7-16
Interfaces,
  control, 5-1
  synchronization, 5-10
  transmission, 5-4
Introduction, 7-1
Introduction to equipment packages, 3-1
Introduction to platform, 3-1
IS-3 access, 10-7

L

Laser and eye damage, xxxi
Laser backface current for pump 1, 9-19
Laser backface current for pump 2, 9-19
Laser bias current, 9-20
Laser bias current for pump 1, 9-19
Laser bias current for pump 2, 9-19
Laser classifications, xxxi
Laser safety precautions, xxxi
LEA7 Optical Amplifier circuit pack, 7-32, 7-35, 8-28
LED test, 9-17
LEDs, 4-7
Lightwave safety, xxx
  general laser information, xxx
  laser and eye damage, xxxi
  laser classifications, xxxi
  safety precautions, xxxi
Line,
  capacity, 2-15
Line (B2) CV, 9-20
Line (B2) ES, 9-20
Line (B2) SES, 9-20
Line (B2) UAS, 9-21
Local access, 6-7
Local alarms and status report, 9-24
Local provisioning, 8-17
Local self-tests, 9-12
Login aging, 8-7
Login ID and password, 8-6
Login/password aging, 8-7
Logins,
  general logins, 8-6
  privileged logins, 8-6
  privileged/expert logins, 8-6
  reports only logins, 8-6
  Visitor logins, 8-6
Loopbacks, 9-11
Lucent Technologies Modification Implementation Procedures, xl
Lucent Technologies practices, xxxix
Lucent Technologies transmission products, 1-1

M

Maintenance,
  auto turnup tests, 9-12
  automatic diagnostics, 9-4
  fault detection, 9-4
  fault isolation, 9-4
  fault reporting, 9-4
  loopbacks, 9-11
  maintenance signals, 9-2
  performance monitoring, 9-18
  protection switching, 9-10
  provisioning consistency audits, 9-17
  remote maintenance philosophy, 9-1
  reports, 9-24
  supervisory signal DCC protection, 9-10
  terminal self-tests, 9-12
  tests, 9-11
  thresholds, 9-23
Maintenance philosophy, 9-1
Maintenance signal, customer, 10-7
Maintenance signals, 9-2
Major Product Release Features, 1-4
Manual, 9-16
Manual tests, 9-16
Maximum power specifications, 10-8
Memory, 7-16

Memory administration, 8-1
Copy-Program, 8-3
reset, 8-3
update, 8-3
Message-based operations system interface, 6-18
Message-based OS interface, 6-18
Minimum modem requirements, 6-8, 10-13
Miscellaneous discrete interface, 6-16
Modem requirements, 6-8, 10-13
Monitoring and testing, 7-22, 7-36
OA, 7-36
TLM, 7-22
Multi-level security, 8-4

N

Network element login security, 8-7
News and bulletins, xlix
Notice frames and confirmation requests, 11-2
Null modem adapter, 6-7, 6-9

O

OA, 7-32–7-38
block diagram, 7-34
control circuitry, 7-35
detailed description, 7-34
faceplate LED, 7-32
fault detection circuitry, 7-36
general description, 7-33
monitoring and testing, 7-36
performance monitoring, 7-37
power circuitry, 7-37
purpose of circuit, 7-32
quick reference summary, 7-38
transmission circuitry, 7-34
OC-48 Drop Side Signal Wavelengths, 5-6
ODU, 7-29–7-31
block diagram, 7-30
control circuitry, 7-31
detailed description, 7-30
faceplate LED, 7-29
general description, 7-30
purpose of circuit, 7-29
quick reference summary, 7-31
ODU (Continued)
transmission circuitry, 7-30
Office alarms, 6-14
OLS CIT-PC software introduction, 11-1
OLS Dual End Terminal, 3-8
OLS Dual Repeater, 3-11
OLS End Terminal and Repeater, 3-13
OLS End Terminal for 4 Bidirectional Optical Lines, 3-2
OLS End Terminal Shelf (Miscellaneously Mounted), 3-15
OLS lightguide jumpers, 10-2
OLS optical reflections tolerance, 10-5
OLS optical return loss, 10-5
OLS Repeater for 4 Bidirectional Optical Lines, 3-6
OLS Repeater Shelf (Miscellaneously Mounted), 3-18
OMU, 7-26–7-28
505A OMU block diagram, 7-27
control circuitry, 7-28
detailed description, 7-27
faceplate LED, 7-26
general description, 7-27
purpose of circuit, 7-26
quick reference summary, 7-28
transmission circuitry, 7-27
One-time document orders, I
One-time orders, I
Operating wavelength, 10-3
Operations interface tests, 9-17
alarm test, 9-17
LED test, 9-17
parallel telemetry test, 9-17
Operations interfaces,
circuit pack faceplate LED, 6-14
craft interface terminal, 6-1
fuse panel, 6-13
indicator strip, 6-10
message-based OS interface, 6-18
miscellaneous discrete interface, 6-16
office alarms, 6-14
orderwire, 6-24
parallel, 6-15
TL1 messages, 6-19
user panel, 6-10
Operations system interface specifications, 10-14
Optical Amplifier optical safety, 10-2
Optical amplifier output power (Mx24-dB/Px25-dB systems), 10-5

Optical amplifier output power (Nx33 dB systems), 10-4
Optical channel parameters, 9-20
signal power received, 9-20
Optical channel states, 8-33
Optical connector interfaces, 10-1
Optical dispersion, 10-5
Optical line ID, 9-2
Optical line parameters, 9-19
laser backface current for pump 1, 9-19
laser backface current for pump 2, 9-19
laser bias current for pump 1, 9-19
laser bias current for pump 2, 9-19
total optical power received, 9-19
Optical Line System equipment packages, 1-2
Optical Line System features release plan, 1-4
Optical Line System overview, 1-2
Optical signal performance monitoring, 9-18
Optical transmission elements, 2-2
Optically amplified transmission, 1-2
Orderwire, 6-24
Original values, 8-11
Outputs, 11-14
Outside plant loss, 10-6
Overhead controller circuitry, 7-22
TLM, 7-22
Overview of dense wavelength division multiplexing, 1-2
Overview of Optical Line System, 1-2

P

Parallel telemetry interface, 6-15
Parallel telemetry test, 9-17
Parameters, 9-18
Password aging, 8-8
PC Screen Header Line, 11-4
PC with CIT-PC software, 6-2, 6-3
PCNs, lii
Performance monitoring, 7-23, 7-37, 9-18
data storage and reports, 9-21
day bin start time provisioning, 9-22
during failed conditions, 9-22
initializing optical parameters, 9-22
initializing pm registers, 9-21
OA, 7-37
optical channel parameters, 9-20
optical line parameters, 9-19
parameters, 9-18
Performance monitoring (Continued)
supervisory channel parameters, 9-20
Performance Monitoring,
TCAs, 9-23
Performance monitoring,
thresholds, 9-23
TLM, 7-23
Performance monitoring day bin start time provisioning, 8-20, 9-22
Performance monitoring reports, 9-25
Performance status report, 9-25
Personal computer, 10-12
Personal computer minimum requirements, 6-3
Platform description,
equipment packages, 3-2
fuse panel, 3-34
heat baffle, 3-36
indicator strip, 3-19
introduction to equipment packages, 3-1
introduction to platform, 3-1
overview, 3-1
shelf interfaces, 3-31
shelves, 3-20
upgrades, 3-36
user panel, 3-35
PM reports, 9-25
PM thresholds, 9-23
Point-to-point applications, 2-8
Port security, 8-5
Port states, 8-32
Port status, 8-5
Power,
circuit pack power, 4-4
FAULT LED, 4-7
fuses, 4-3
general philosophy, 4-1
LEDs, 4-7
power dissipation, 4-6
power distribution to cabinets, 4-2
power distribution to miscellaneously mounted shelves, 4-3
power feeder stubs, 4-2
PWR ON LED, 4-4, 4-7
shelf power, 4-4
voltage range, 4-1
Power circuitry, 7-6, 7-12, 7-17, 7-23, 7-37
OA, 7-37
SYSCTL, 7-6
SYSMEM, 7-12
TLM, 7-23
TOHCTL, 7-17

Power dissipation, 4-6
Power distribution to cabinets, 4-2
Power distribution to miscellaneously mounted shelves, 4-3
Power feeder stubs, 4-2
Power feeders, 4-2
Power filter units, 4-4
Power specifications (maximum), 10-8
Power, input, 10-4
Preprovisioning, 8-31
Privileged logins, 8-6
Privileged/expert logins, 8-6
Product change notifications, lii
Product description,
  overview, 3-1
Product support,
  documentation support, l
  technical, xlvii
Protection switching, 9-10
  supervisory signal DCC protection, 9-10
Provisionable parameters, 8-12
Provisionable port status, 8-5
Provisioning,
  auto provisioning date/time, 8-31
  automatic on circuit pack replacement, 8-31
  local provisioning, 8-17
  original values, 8-11
  preprovisioning, 8-31
  provisionable parameters, 8-12
Provisioning consistency audits, 9-17
Provisioning reports, 9-25
Provisioning the DIRN parameter, 8-28
Provisioning the system type parameter, 8-28
Pump performance monitoring, 9-18
Purpose, 3-20, 3-24, 3-27, 3-29
Purpose of circuit, 7-3, 7-8, 7-14, 7-18, 7-26, 7-29, 7-32
  OA, 7-32
  ODU, 7-29
  OMU, 7-26
  SYSMEM, 7-8
  TLM, 7-18
  TOHCTL, 7-14
Purpose of user/service manual, xxvii
PWR ON LED, 4-4, 4-7

Q

Quick reference summary, 7-7, 7-13, 7-17, 7-24, 7-28, 7-31, 7-38
  OA, 7-38
  ODU, 7-31
  OMU, 7-28
  SYSCTL, 7-7
  SYSMEM, 7-13
  TLM, 7-24
  TOHCTL, 7-17

R

Reason for reissue, xxviii
Related documentation, xxxix
  drawings, xlii
  Lucent Technologies Modification Implementation Procedures, xl
  Lucent Technologies practices, xxxix
  related equipment, xliii
Related equipment, xliii
Release 1 features, 1-4
  155 Mb/s customer maintenance signal, 5-4, 5-8
  8 wavelength ready, 1-2
  Alarm gateway network element (AGNE) support, 8-28
  Auto and CIT provisioning, 8-11
  Automatic fault detection and isolation, 9-4
  craft interface terminal, 6-1
  double-pumped optical amplifiers, 1-2
  Login/password aging, 8-7
  Multi-level security, 8-4
  Optical signal performance monitoring, 9-18
  orderwire, 6-24
  parallel telemetry, 6-15
  Pump performance monitoring, 9-18
  support for up to four bidirectional optical lines, 2-2
  Threshold crossing alert (TCA) reporting, 9-23
  TL1 gateway network element (GNE) operation, 6-18
  TL1 operations system interface, 6-18
  User software downloads, 8-9

Release 2,
Enable/disable TCAs for a single parameter, 9-20, 9-21
Release 2 features, 1-4, 8-16
additional miscellaneous discretes, 3-33, 6-16, 7-6
additional TL1 messages, 6-19
applications with the Optical Translator, 2-5, 2-11
enable/disable TCAs for a single parameter, 9-19
LEA7 Optical Amplifier circuit pack, 7-32, 7-35, 8-28
Reliability specifications, 10-15
Remote access using supervisory signal DCC, 6-9
Remote maintenance philosophy, 9-1
Remote software downloads (in-service software generic copy), 8-9
Repeater shelf,
block diagram, 5-8
transmission interfaces, 5-8
Repeater Shelf 1, 3-27
Circuit packs, 3-28
Purpose, 3-27, 3-29
Repeater Shelf 2, 3-29
Circuit packs, 3-30
Repeater shelf block diagram, 5-8
Repeater shelf transmission interfaces, 5-8
Reports, 9-24
6-hour autonomous report, 9-25
active alarms and status report, 9-24
performance monitoring reports, 9-25
provisioning reports, 9-25
state report, 9-26
version/equipment list report, 9-26
Reports only logins, 8-6
Reset, 8-3
Ring applications, 2-11
RTAC, xlvii

S

Safety instructions, xxx
ESD considerations, xxxv
Lightwave safety, xxx
safety labels, xxx
Safety labels, xxx
Safety precautions, xxxi
Safety precautions (enclosed systems), xxxii
Safety precautions (unenclosed systems), xxxiv
Security, xxxix, 6-2, 8-4
general logins, 8-6
inactivity timers, 8-5
login aging, 8-7
login ID and password, 8-6
network element login security, 8-7
password aging, 8-8
port security, 8-5
privileged logins, 8-6
privileged/expert logins, 8-6
provisionable port status, 8-5
reports only logins, 8-6
temporary visitor logins, 8-6
user login security, 8-6
Self tests, 9-11
Shelf, 10-10
Shelf descriptions,
End Terminal Shelf 1, 3-20
End Terminal Shelf 2, 3-24
Repeater Shelf 1, 3-27
Repeater Shelf 2, 3-29
Shelf interfaces, 3-31
Shelf power, 4-4
Shelf power distribution, 4-5
Shelves, 3-20
Signal power received, 9-20
Signal, customer maintenance, 10-7
Signal-to-noise ratio performance, 10-7
Slot and port auto provisioning states, 8-32
Slot states, 8-32
Software upgrades, 8-9
Specifications, 10-1
Standing order document orders, I
Standing orders, I
State report, 9-26
Supervisory channel (B2) CV, 9-20
Supervisory channel (B2) ES, 9-20
Supervisory channel (B2) SES, 9-20
Supervisory channel (B2) UAS, 9-21
Supervisory channel laser bias current, 9-20
Supervisory channel parameters, 9-20
laser bias current, 9-20
line (B2) CV, 9-20
line (B2) ES, 9-20
line (B2) SES, 9-20
line (B2) UAS, 9-21
signal power received, 9-20
Supervisory signal, 9-2
Supervisory signal DCC protection, 9-10

Support,
COACH, xlvii
documentation support, l
documents, xxxix, xl
drawings, xlii
RTAC, xlvii
technical, xlvii
training courses, xliv
Support for up to four bidirectional optical lines, 2-2
Support for up to three spans, 2-2
Synchronization, 5-10
Synchronization architecture, 5-10
SYSCTL, 7-3–7-7
block diagram, 7-5
control circuitry, 7-4
detailed description, 7-4
faceplate LED, 7-3
general description, 7-4
interface circuitry, 7-5
power circuitry, 7-6
purpose of circuit, 7-3
quick reference summary, 7-7
SYSMEM, 7-8, 7-9, 7-12, 7-13
block diagram, 7-10
detailed description, 7-9
faceplate LED, 7-8
general description, 7-9
power circuitry, 7-12
purpose of circuit, 7-8
quick reference summary, 7-13
System control architecture, 5-1
board controller, 5-1
system controller complex, 5-3
System controller complex, 5-3
System type parameter, 8-28

T

TCAs, 9-23
Technical, xlvii
Technical specifications, 10-1
Technical support,
COACH, xlvii
COACH user's guide, xlix
compatibility data, xlix
diagnostic dictionary, xlix
news and bulletins, xlix
RTAC, xlvii
Telemetry,
parallel, 6-15
Temporary visitor logins, 8-6
Terminal self-tests, 9-12
Tests, 9-11
alarm test, 9-17
auto turnup tests, 9-11
LED test, 9-17
manual, 9-16
operations interface tests, 9-17
parallel telemetry test, 9-17
Threshold crossing alert, 9-23
Threshold crossing alert (TCA) reporting, 9-23
Thresholds, 9-23
Timing circuitry, 7-22
TLM, 7-22
TL1 commands through CIT(DCE) and CIT(DTE), 6-6
TL1 gateway network element (GNE) operation, 6-18
TL1 Messages, 6-19
TL1 messages, 6-19
TL1 operations system interface, 6-18
TLM, 7-18, 7-19, 7-21–7-24
block diagram, 7-20
control circuitry, 7-21
detailed description, 7-19
faceplate LED, 7-18
fault detection circuitry, 7-22
general description, 7-19
monitoring and testing, 7-22
overhead controller circuitry, 7-22
performance monitoring, 7-23
power circuitry, 7-23
purpose of circuit, 7-18
quick reference summary, 7-24
timing circuitry, 7-22
transmission circuitry, 7-19
TLM IS-3 access, 10-7
TOHCTL, 7-14–7-17
block diagram, 7-15
control circuitry, 7-15
detailed description, 7-15
faceplate LED, 7-14
general description, 7-15
interface circuitry, 7-16
memory, 7-16
power circuitry, 7-17
purpose of circuit, 7-14
quick reference summary, 7-17
Tone, 9-2

Tone frequencies, 10-3
Tone trace, 9-2
Total optical power received, 9-19
Training courses, xliv
Transmission, 5-4
Transmission architecture, 5-4
Transmission characteristics, 10-6
Transmission circuit packs/units,
  OA, 7-32
  ODU, 7-29
  OMU, 7-26
  TLM, 7-18
Transmission circuitry, 7-19, 7-27, 7-30, 7-34
  OA, 7-34
  ODU, 7-30
  OMU, 7-27
  TLM, 7-19
Transmission delay, 10-6
Transmission interfaces, 5-4, 5-8
Transmission medium, 10-1
Transmission products, 1-1

U

Update, 8-3
Upgrades, 3-36
User login security, 8-6
User panel, 3-35, 6-10
User software downloads, 8-9

V

Version recognition, 8-4
Version/equipment list report, 9-26
Visitor logins, 8-6
Voltage range, 4-1

W

Weights, 10-11
What is the Optical Line System, 1-2
Wrist strap, xxxvi