Lucent Technologies
Bell Labs Innovations

Optical Translator Release 1

User/Service Manual

365-575-401
Issue 1/1A/1B/1C
March 1998

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Notice

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

Mandatory Customer Information

Interference Information: Part 15 of FCC Rules

NOTE: This equipment is designed to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions manual, may cause interference to radio communications. Operation of this equipment in a residence is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Security

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

Warranty

The terms and conditions of sale will include a five-year warranty on hardware and a one-year warranty on software.

Document Ordering Information

The ordering number for this document is 365-575-401. To order this document, call 1-888-582-3688. RBOC/BOC customers should process document orders or standing order requests through their Company Documentation Coordinator For more ordering information, refer to "How to Order Documents" in the Section "About This Document "

Customer Assistance and Technical Support

The Lucent Technologies Regional Technical Assistance Center (RTAC) provides a technical assistance telephone number which is monitored 24 hours a day. The technical assistance telephone number is also available for customers to provide feedback and enhancement suggestions for improving the Optical Line System. To receive technical assistance or to provide feedback and enhancement suggestions, simply call 1-800-225-RTAC.

Documentation Support

Lucent Technologies provides a telephone number for customers to report errors or to ask questions about the information in this document. The support telephone number is 1-800-334-0404 or 1-910-727-6681

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Document Title: Optical Translator Release 1 User/Service Manual

Document No.: 365-575-401 Issue 1 Date: March 1997

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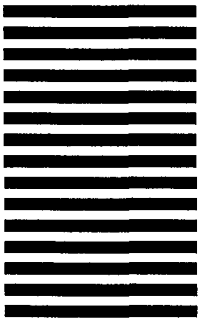

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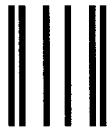

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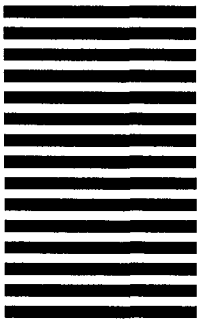

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About This Document

Purpose

This user/service manual provides the following information about the Lucent Technologies Optical Translator:

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

The Optical Translator has a phased release plan. Each phased release provides new sets of features. This user/service manual covers Release 1 and will be updated to cover additional releases as they become available. Release 1 provides the Optical Translator platform and supports wavelength add/drop and other optical networking applications with the Optical Line System.

For more information about the Optical Translator and a complete list of features, refer to 365-575-400, *Optical Translator, Applications, Planning, and Ordering Guide.*

Intended Audiences

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

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 Translator.
- Section 2, "Applications," describes how the Optical Translator operates as a flexible interface into the Optical Line System.
- Section 3, "Platform Description," introduces the Optical Translator equipment packages and provides a more detailed view of the Optical Translator physical design.
- Section 4, "Power," describes the power distribution and dissipation of the Optical Translator.
- Section 5, "Control and Transmission Interfaces," describes the Optical Translator 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 Translator and provides alarm and status information.
- Section 7, "Circuit Pack Descriptions," provides a detailed circuit description of each Optical Translator circuit pack.
- Section 8, "Maintenance Description," defines the "maintenance philosophy" outlining the various features available to monitor and maintain the Optical Translator.
- Section 9, "Technical Specifications," lists the technical specifications for the Optical Translator.
- The "Operation and Maintenance (TOP)" contains specific task oriented procedures for the acceptance, circuit order, and trouble clearing of the Optical Translator.

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 Translator uses 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 Translator 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 Translator 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, technicians should not view the beam with any optical instruments at the signal source or at any downstream lightwave termination/interconnection equipment.

A warning label (Figure 1) is provided on the faceplate of each 41B Optical Translator circuit pack. (The 41B Optical Translator circuit pack is currently the only Optical Translator circuit pack capable of producing laser radiation that exceeds the Class I limits.) The word DANGER and the text of the warning label are in black lettering on a safety yellow background. The label states:

DANGER: INVISIBLE LASER RADIATION WHEN OPEN AND FIBER OPTIC CABLE DISCONNECTED. AVOID DIRECT EXPOSURE TO BEAM.

An additional warning label is provided on the rear cover of each equipment cabinet and miscellaneously mounted shelf. A notice label is also located on the rear cover that states:

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

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) and miscellaneously mounted shelves.

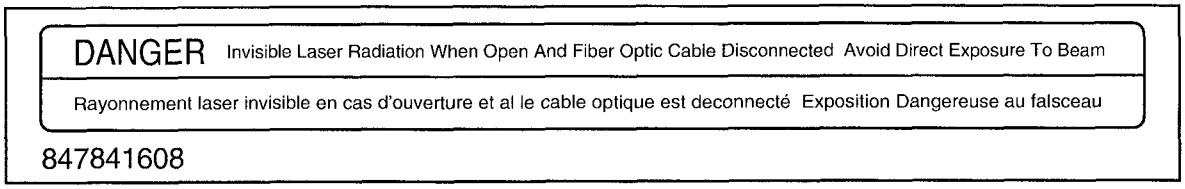

Figure 1. Warning Label

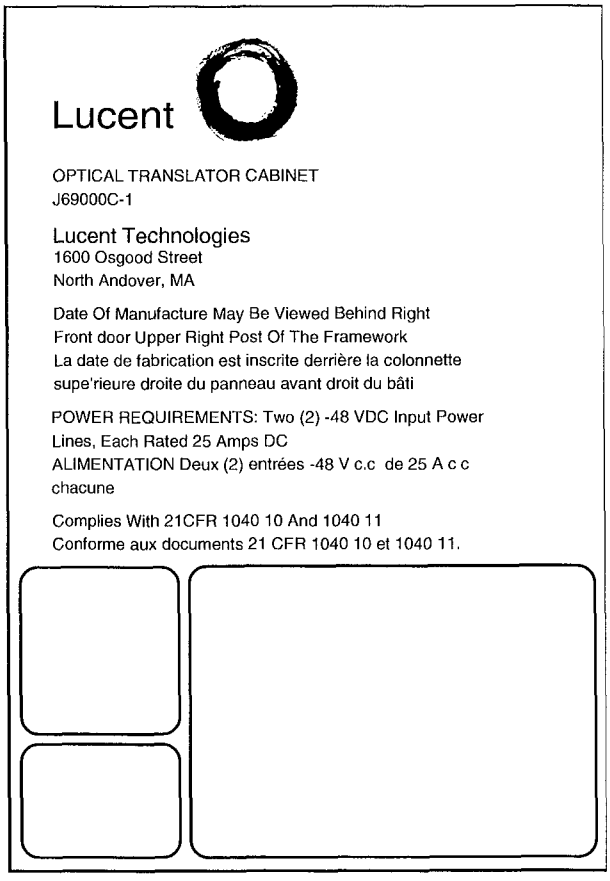

Figure 2. Compliance Label

Safety Precautions for Unenclosed Systems

During service, maintenance, or restoration, the Optical Translator 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 or network bay framework, 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, fuse/power indicating 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.

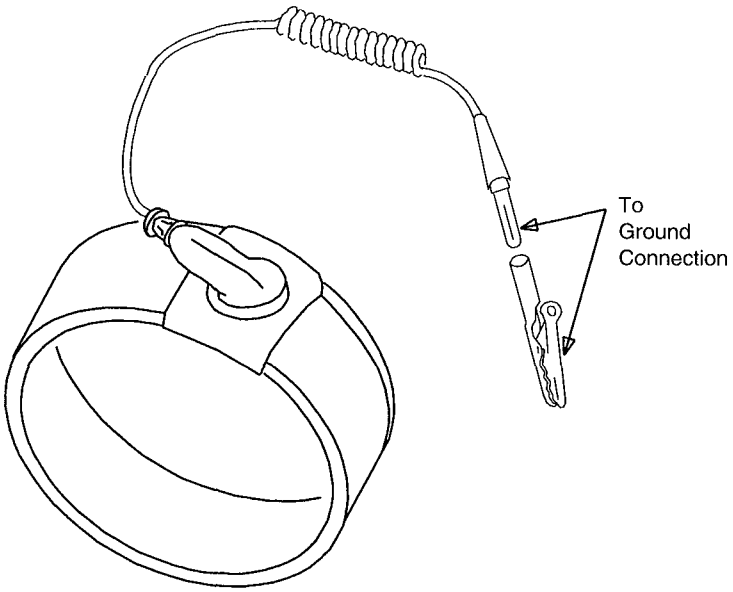

Figure 3. Static Control Wrist Strap

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 365-575-410, *Optical Translator 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 Translator:

- Number: 365-575-400

  Title: *Optical Translator, Applications, Planning, and Ordering Guide*

  Audience: System planners and engineers

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

- Number: 365-575-410

  Title: *Optical Translator, Installation Manual*

  Audience: Customers planning to install and turn up the equipment

  Content: Customer installation instructions

Lucent Technologies Drawings

The following Lucent Technologies drawings provide information about the Optical Translator:

J69000C-1	*Specification for Optical Translator Cabinet*
SD-6G156-01	*Optical Translator System Cabinet Application Schematic Drawing*
T-6G156-30	*Optical Translator System Circuit*
T-6G156-33	*Optical Translator Interconnect Circuit*
ED-7G044-30	*Optical Translator Cabinet Framework*
ED-7G045-20	*Optical Translator Cable Assembly*
ED-7G045-22	*Optical Translator Cable Assembly (Intercabinet Cable)*
ED-7G045-30	*Optical Translator Shelf Assembly*
ED-5D785-70	*5ESS-2000 Switching Equipment Global Single Bay Frame and Cabinet Assembly (Phase II) G1A, G2A*
ED-5D786-70	*5ESS-2000 Switching Equipment End Guard Assembly*
ED-5D779-70	*5ESS-2000 Switching Equipment Line Up Rack Assembly, GX*
FPD-804-604-162-( )	*Optical Translator Cabinet (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*
365-575-300	*Optical Line System (OLS), Applications, Planning, and Ordering Guide*
365-575-301	*Optical Line System (OLS), User/Service Manual*
365-575-310	*Optical Line System (OLS), Installation Manual*
365-575-315*	*Optical Line System (OLS), Software Release Description,*
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*
824-102-176	*Optical Line System (OLS), Operations Systems Engineering Guide*

* The software release descriptions are shipped with the software and are not orderable from the Lucent Technologies Customer Information Center

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: LW2251

  Title: Optical Translator, Applications, Architecture, Equipment Engineering, and Planning

  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, interworking with the Optical Line System), architecture (that is, cabinets, shelves, circuit packs/units), operation, administration, maintenance, and provisioning (OAM&P) features, and equipment cabling specifications for engineering/ordering the Optical Translator

- Number: LW2651

  Title: Optical Translator, Operations and Maintenance

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

  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 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.

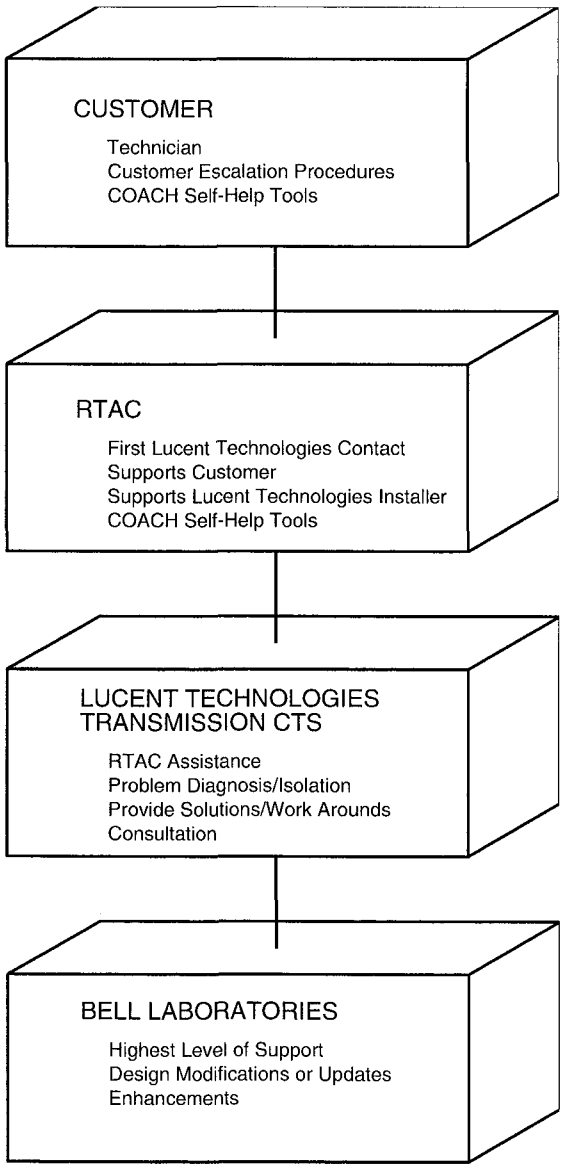

Figure 4. Product Support

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 Translator. 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 Translator.

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.

The following 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**

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System Introduction

1

Contents

System Introduction

1

Overview

This section introduces the next generation of Lucent Technologies transmission products and briefly describes the Optical Translator (OT).

Introduction to Lucent Technologies Transmission Products

Lucent Technologies offers the industry's widest range of high-quality transmission products 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 FT-2000 OC-48 Lightwave System, Optical Line System, and the Optical Translator are flexible, high capacity lightwave systems that may be used to solve customer networking needs.

The FT-2000 OC-48 Lightwave System transports digitally encoded information through single-mode optical fibers at the synchronous optical network (SONET) OC-48 signal level of 2.5 Gb/s (up to 32,256 voice channels).

The Optical Line System uses dense wavelength division multiplexing and optical amplification to transport up to eight different wavelengths of SONET OC-48 signals through standard single-mode or *Truewave*® optical fibers.

What is the Optical Translator?

The Optical Translator is a flexible, high capacity, lightwave system that electrically regenerates up to 32 SONET OC-48 and/or synchronous digital hierarchy (SDH) STM-16 signals and inserts new tone signals.

The Optical Translator provides a flexible interface into the Optical Line System that allows wavelength add/drop and other optical networking applications. The Optical Translator consists of up to 32 SONET OC48/SDH STM16 Optical Translator Unit (OTU) circuit packs. Each OTU circuit pack can receive a single OC-48/STM-16 signal and convert it into an Optical Line System specific wavelength with compatible power and tone signals.

The Optical Translator consists of two equipment packages. These equipment packages include the following:

- Optical Translator Cabinet
- Miscellaneously Mounted Optical Translator.

Different equipment packages enable the Optical Translator to offer flexible features for different applications.

Figure 1-1 shows the Optical Translator Cabinet equipment package. For more information about the Optical Translator Cabinet equipment package and the other equipment package, refer to Section 3, "Platform Description."

In Release 1, there is no downloadable software available. However, the OTU circuit pack firmware enables equipment packages to be upgraded with controller circuit packs and downloadable software when they become available.

The Optical Translator is designed to support optical networking applications that need to grow to accommodate increasing amounts of information. The Optical Translator can be upgraded in-service with up to 32 OTU circuit packs. The Optical Translator is also designed for easy installation and operation.

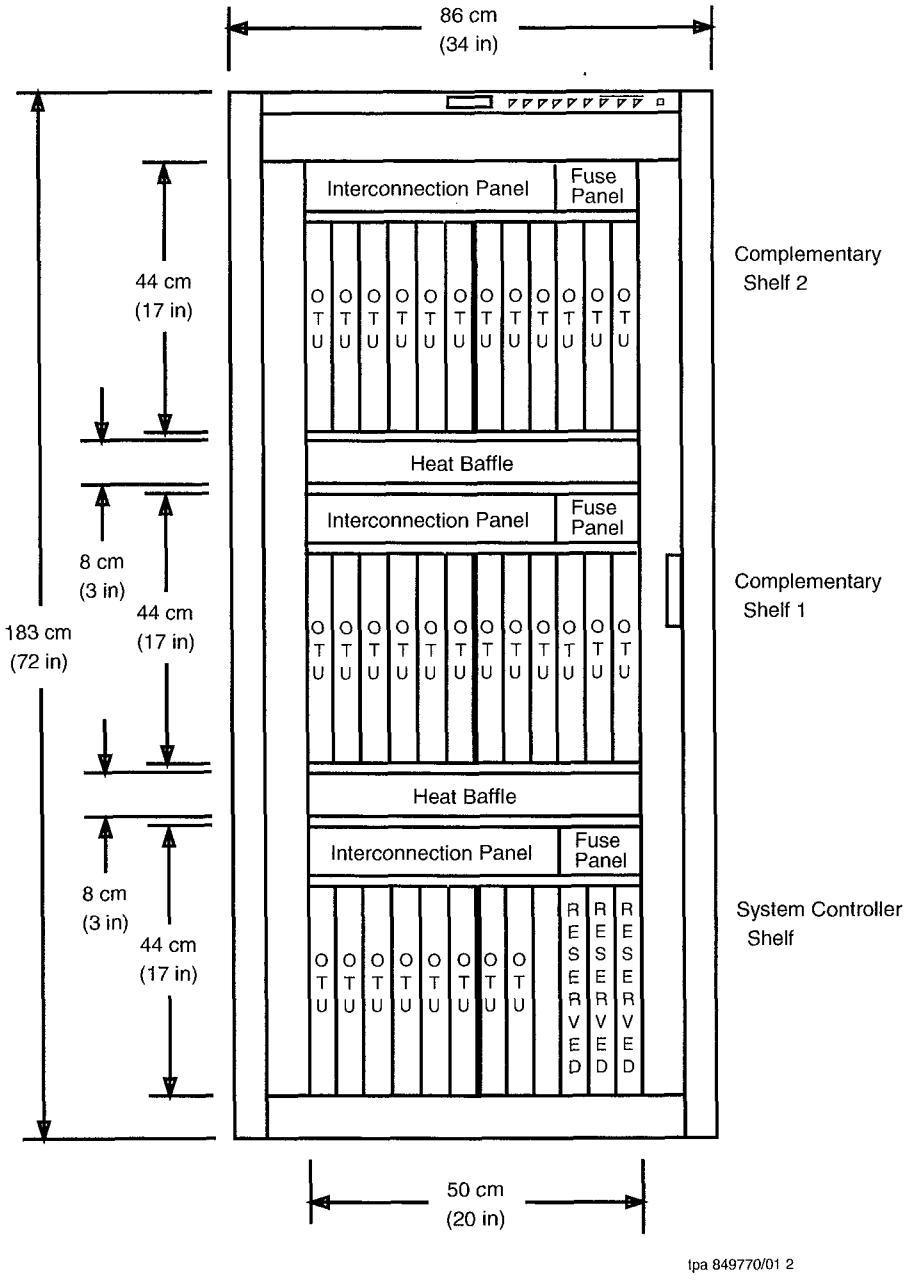


Figure 1-1. Optical Translator Cabinet (Doors Open)

The Optical Translator 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 Release 1 and will be updated to cover additional product releases as they become available. Release 1 provides the Optical Translator platform and supports wavelength add/drop and other optical networking applications.

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

Table 1-1. Major Features of Product Release 1

Major Features	Available in Product Release 1
Applications	
- Wavelength Conversion	X
- Wavelength Add/Drop	X
- Extended Wavelength Distances	X
- Wavelength Interchange	X
High Speed Interfaces	
- 1 5-µm OTU Circuit Packs that Support 8 Wavelengths on Optical Line Systems with Dispersion not Exceeding 6800 ps/nm	X
- 1.5-µm OTU Circuit Packs that Support 8 Wavelengths on Optical Line Systems with Dispersion not Exceeding 10900 ps/nm	X
- 1.3-µm OTU Circuit Pack	X
Administration and Provisioning	
- Firmware Only, Software and Future Feature Ready	X
Maintenance	
- Automatic Fault Detection and Isolation	X
- Outputs to an External Miscellaneous Discrete Unit	X

For more information about the Optical Translator releases and their availability, refer to 365-575-400, *Optical Translator, Applications, Planning, and Ordering Guide*.

Applications

2

Contents

Applications

2

Overview

This section describes how the Optical Translator (OT) operates with the Optical Line System (OLS) and other lightwave systems in the following optical networking applications:

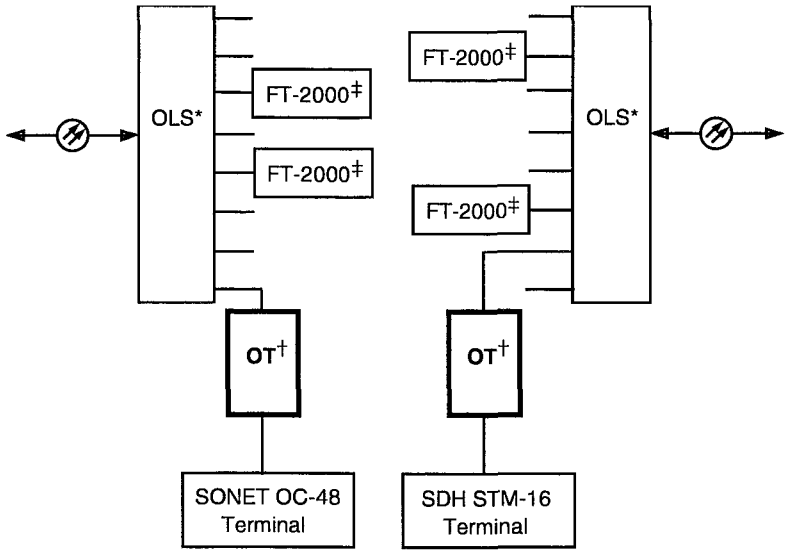
- Wavelength Conversion
- Wavelength Add/Drop
- Wavelength Interchange
- Extended Wavelength Distances.

This section also describes how the Optical Translator meets these with the Optical Translator Cabinet and Miscellaneously Mounted Optical Translator equipment packages.

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

Wavelength Conversion

The Optical Translator 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. Figure 2-1 shows an intermediate office configured with the Optical Translator, Optical Line System End Terminals, FT-2000 OC-48 Large Capacity Terminals, a generic SONET OC-48 terminal, and a generic SDH STM-16 terminal.



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

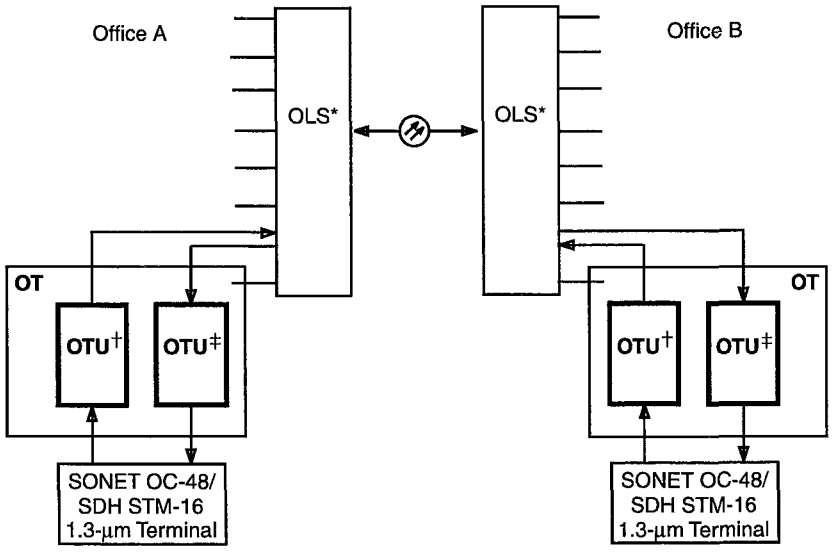
Figure 2-1. Wavelength Conversion Application

The Optical Translator may be equipped with up to 32 SONET OC48/SDH STM16 Optical Translator Unit (OTU) circuit packs. The OTU circuit pack can receive any SONET OC-48/SDH STM-16 wavelength in the 1.3-μm (1280-1335 nm) or 1.5-μm (1480-1580 nm) range. The OTU circuit pack converts the incoming wavelength into a wavelength associated with its circuit pack code. There are 17 circuit pack codes associated with the OTU circuit packs. The following OTU circuit packs are supported in this application:

- **41A(1-8)C OTU**: The 41A(1-8)C OTU circuit packs convert one non-OLS compatible wavelength (1.3- or 1.5-μm range) into an OLS compatible wavelength (1.5-μm range). The 41A(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with fiber dispersion not exceeding 6800 ps/nm.

- **41C(1-8)C OTU**: The 41C(1-8)C OTU circuit packs convert one non-OLS compatible wavelength (1.3- or 1.5-µm range) into an OLS compatible wavelength (1.5-µm range). The 41A(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with fiber dispersion not exceeding 10900 ps/nm.
- **41BB OTU**: The 41BB OTU circuit pack converts one OLS compatible wavelength (1.5-µm range) into a standard SONET OC-48/SDH STM-16 wavelength in the 1.3-µm range.

Figure 2-2 shows two offices equipped with Optical Translators used to convert wavelengths. The Optical Translators are equipped with 41A(1-8)C or 41C(1-8)C and 41BB OTU circuit packs. The 41A(1-8)C and 41C(1-8)C OTU circuit packs convert the 1.3-µm wavelength from the SONET OC-48/SDH STM-16 terminal to an OLS compatible wavelength in the 1.5-µm range. The 41BB OTU circuit pack converts the 1.5-µm wavelength from the Optical Line System to a 1.3-µm wavelength compatible with the SONET OC-48/SDH STM-16 terminal.



* Optical Line System End Terminal
† 41A(1-8)C or 41C(1-8)C OTU Circuit Pack
‡ 41BB OTU Circuit Pack

Figure 2-2. Converting 1.3-µm SONET OC-48/SDH STM-16 Wavelengths

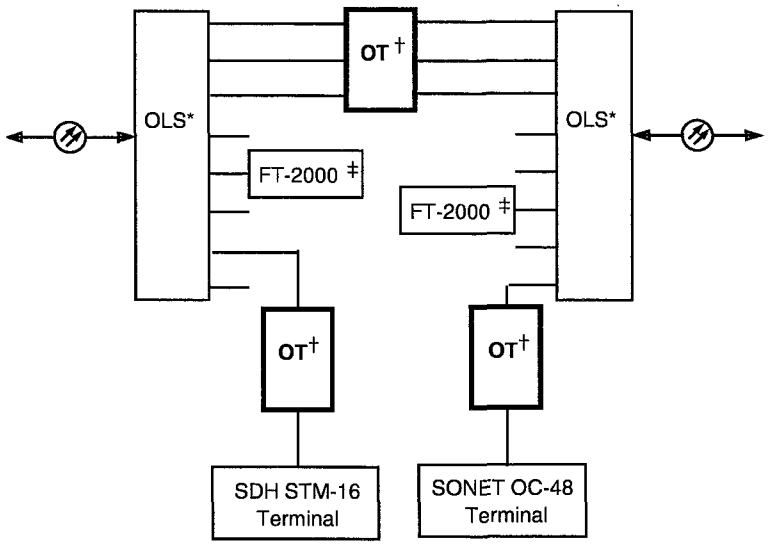
For more information about the OTU circuit pack, refer to Section 7, "Circuit Pack Descriptions."

For more information about the Optical Line System, refer to 365-575-301, *Optical Line System, User/Service Manual.*

Wavelength Add/Drop

Figure 2-3 shows an intermediate office configured with the Optical Line System, the FT-2000 OC-48 Large Capacity Terminal, the Optical Translator, and other SONET OC-48/SDH STM-16 terminals in a wavelength add/drop application. The wavelength add/drop application allows wavelengths to be added/dropped or passed through at intermediate sites. A wavelength can pass through up to 10 intermediate sites with wavelength add/drop, before electrical regeneration and retiming are required by a compatible lightwave terminal (for example, FT-2000 OC-48 Large Capacity Terminal).

Figure 2-3 shows four wavelengths being added/dropped and three wavelengths being passed through. The add/drop wavelengths are routed to FT-2000 OC-48 Large Capacity Terminals or Optical Translators and other SONET OC-48/SDH STM-16 terminals. The through wavelengths are routed to the Optical Translator bypassing the FT-2000 OC-48 Large Capacity Terminals.



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

Figure 2-3. Wavelength Add/Drop Application

The Optical Translator is an economical alternative to through-connected FT-2000 OC-48 Large Capacity Terminals or FT-2000 OC-48 Repeater Bays. By using Optical Translators instead of through connected FT-2000 OC-48 Large Capacity Terminals, the FT-2000 OC-48 Large Capacity Terminals in a ring (up to 16) may be used to maximize traffic. The compact design of the Optical Translator also relieves office congestion.

The Optical Translator may be equipped with up to 32 OTU circuit packs. Each OTU circuit pack receives a single through wavelength. The OTU circuit pack electrically regenerates a single OC-48/STM-16 signal in one direction and inserts a clean tone signal. Two OTU circuit packs are required for a bidirectional OC-48/STM-16 line.

NOTE:
The OTU circuit pack does not change SONET overhead bytes and is not a SONET regenerator.

There are 17 circuit pack codes associated with the OTU circuit packs. The 41A(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with total dispersion not exceeding 6800 ps/nm. The 41C(1-8)C OTU circuit packs support 8 wavelengths on Optical Line Systems with total dispersion not exceeding 10900 ps/nm. The 41BB OTU circuit pack generates a standard SONET OC-48/SDH STM-16 signal in the 1.3-um range for other SONET OC-48/SDH STM-16 receivers. For more information about the OTU circuit pack, refer to Section 7, "Circuit Pack Descriptions."

The Optical Translator also supports intermediate sites that have wavelength add/drop with branching (Figure 2-4).

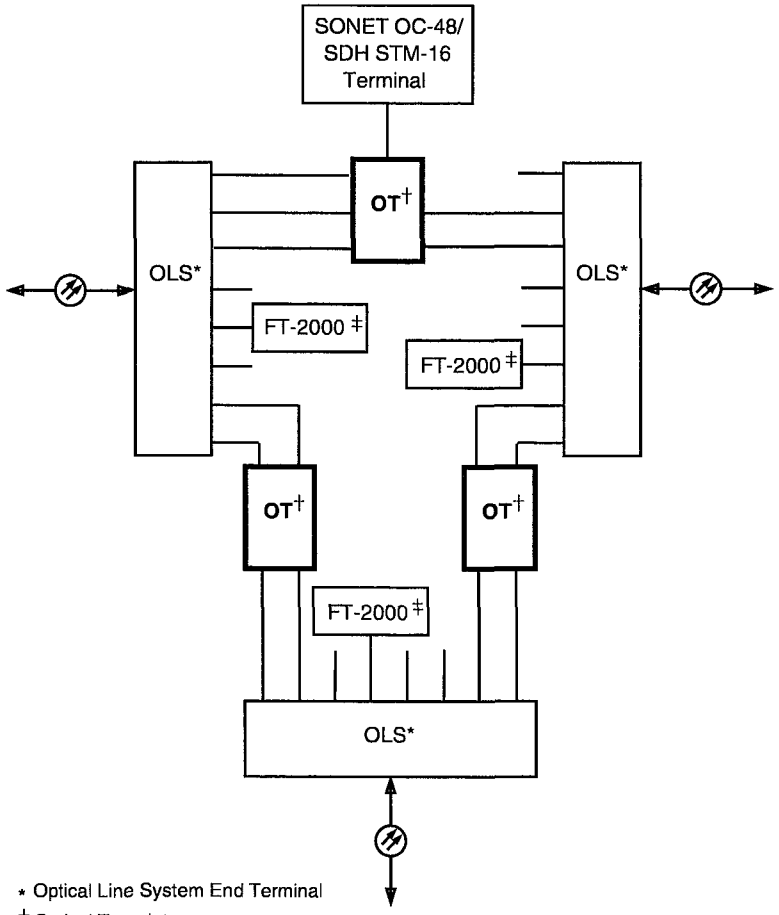


Figure 2-4. Wavelength Add/Drop with Branching

For more information about the FT-2000 OC-48 Large Capacity Terminal, refer to 365-575-201, *FT-2000 OC-48 Large Capacity Terminal, User/Service Manual.* For more information about the Optical Line System, refer to 365-575-301, *Optical Line System, User/Service Manual.*

Wavelength Interchange

At intermediate sites with wavelength add/drop and branching, it is possible for wavelengths to become blocked. The Optical Translator prevents wavelength blocking by allowing one OLS compatible wavelength to be changed to another OLS compatible wavelength. Figure 2-5 shows an intermediate office with wavelength add/drop and branching. The Optical Translator converts wavelengths to allow full wavelength utilization of the Optical Line System.

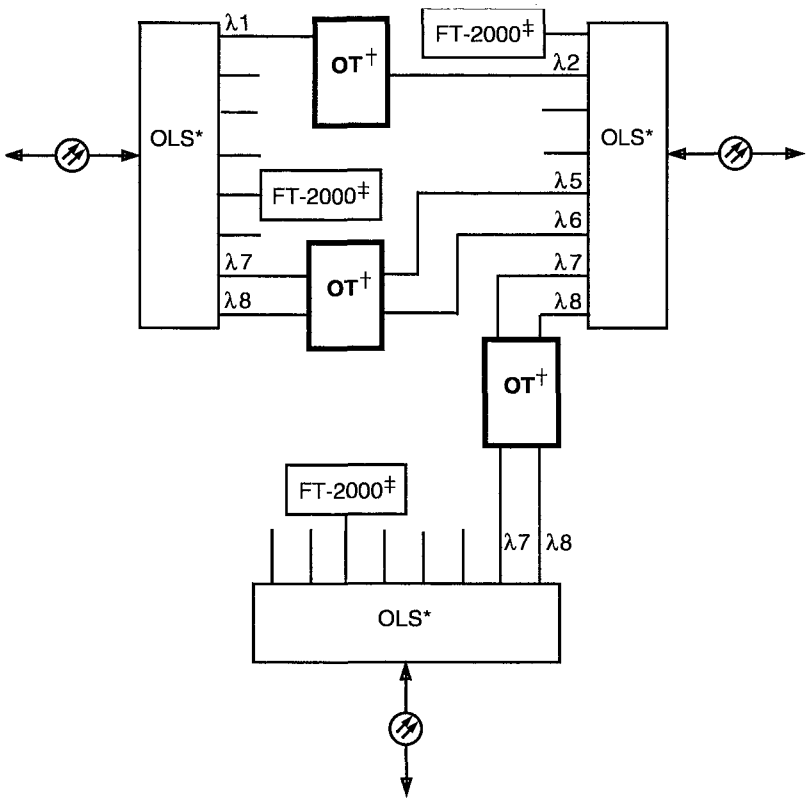


Figure 2-5. Wavelength Interchange Application

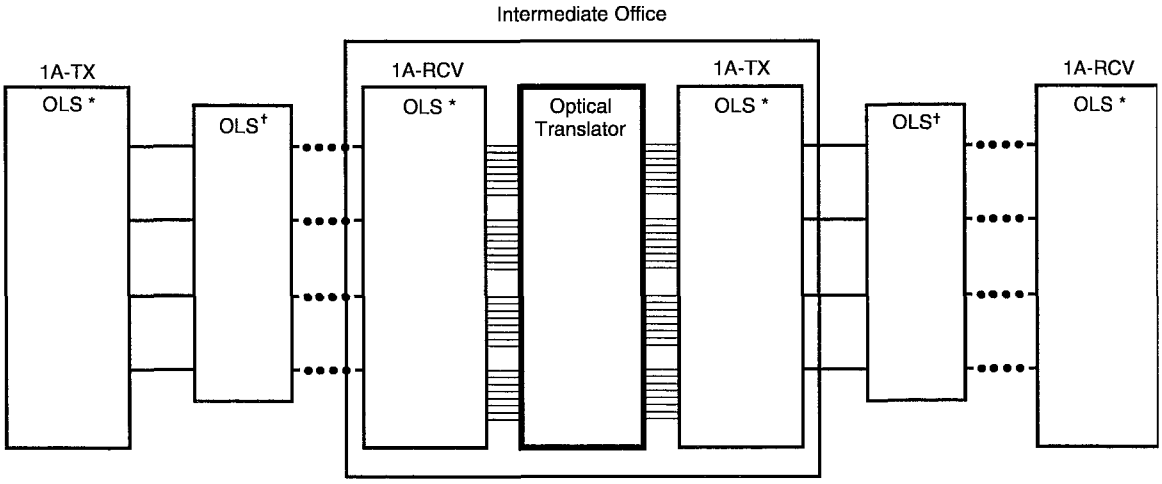
The Optical Translator may be equipped with up to 32 OTU circuit packs. The OTU circuit pack can receive any SONET OC-48/SDH STM-16 wavelength in the 1.3-μm (1280-1335 nm) or 1.5-μm (1480-1580 nm) range. The OTU circuit pack converts the incoming wavelength into a wavelength associated with its circuit pack code.

There are 17 circuit pack codes associated with the OTU circuit packs. The 41A(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with total dispersion not exceeding 6800 ps/nm. The 41C(1-8)C OTU circuit packs support 8 wavelengths on Optical Line Systems with total dispersion not exceeding 10900 ps/nm. The 41BB OC48 OTU circuit pack generates a SONET OC-48/SDH STM-16 signal in the 1.3-um range for other SONET OC-48/SDH STM-16 receivers. For more information about the OTU circuit pack, refer to Section 7, "Circuit Pack Descriptions."

For more information about the Optical Line System, refer to 365-575-301, *Optical Line System, User/Service Manual.*

Extended Wavelength Distances

Figure 2-6 shows an intermediate office configured with Optical Line System End Terminals and the Optical Translator in an extended wavelength distance application. The Optical Translator may be used to concatenate up to 11 Optical Line Systems. Electrical regeneration and retiming are required by a compatible lightwave terminal (for example, FT-2000 OC-48 Large Capacity Terminal) after a wavelength passes through 11 Optical Line Systems.



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

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Figure 2-6. Extended Wavelength Distances

The Optical Translator is an economical alternative to through-connected FT-2000 OC-48 Large Capacity Terminals. By using Optical Translators instead of through connected FT-2000 OC-48 Large Capacity Terminals, the FT-2000 OC-48 Large Capacity Terminals in a ring (up to 16) may be used to maximize traffic. The compact design of the Optical Translator also relieves office congestion.

The Optical Translator may be equipped with up to 32 OTU circuit packs. Each OTU circuit pack receives a single through wavelength. The OTU circuit pack electrically regenerates a single OC-48/STM-16 signal in one direction and inserts a clean tone signal.

NOTE:
The OTU circuit pack does not change SONET overhead bytes and is not a SONET regenerator.

There are 17 circuit pack codes associated with the OTU circuit packs. The 41A(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with total dispersion not exceeding 6800 ps/nm. The 41C(1-8)C OTU circuit packs support 8 wavelengths on Optical Line Systems with total dispersion not exceeding 10900 ps/nm. For more information about the OTU circuit pack, refer to Section 7, "Circuit Pack Descriptions."

For more information about the FT-2000 OC-48 Large Capacity Terminal, refer to 365-575-201, *FT-2000 OC-48 Large Capacity Terminal, User/Service Manual.* For more information about the Optical Line System, refer to 365-575-301, *Optical Line System, User/Service Manual.*

Platform Description

3

Contents

Platform Description

3

Overview

This section introduces the Optical Translator (OT) platform and provides a more detailed view of the Optical Translator physical design.

Introduction

The Optical Translator is a flexible, high capacity, lightwave system that electrically regenerates up to 32 synchronous optical network (SONET) OC-48 and/or synchronous digital hierarchy (SDH) STM-16 signals and inserts new tone signals. The Optical Translator consists of one platform. A platform is a family of equipment and software configurations designed to support a particular set of applications.

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

- Optical Translator Cabinet
- Miscellaneously Mounted Optical Translator

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

Equipment Packages

Optical Translator Cabinet

The J69000C1 Optical Translator Cabinet (Figure 3-1) consists of an indicator strip, a System Controller Shelf, Complementary Shelf 1, Complementary Shelf 2, and two heat baffles mounted in a Lucent Technologies *Newlook 2000* cabinet. In Release 1, there is no downloadable software available. However, the SONET OC48/SDH STM-16 Optical Translator Unit (OTU) circuit pack firmware enables equipment packages to be upgraded with controller circuit packs and downloadable software in a future release.

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 on the side provide access to the craft interface terminal (CIT) port.

The Optical Translator Cabinet can accept up to 32 SONET OC-48/SDH STM-16 signals.

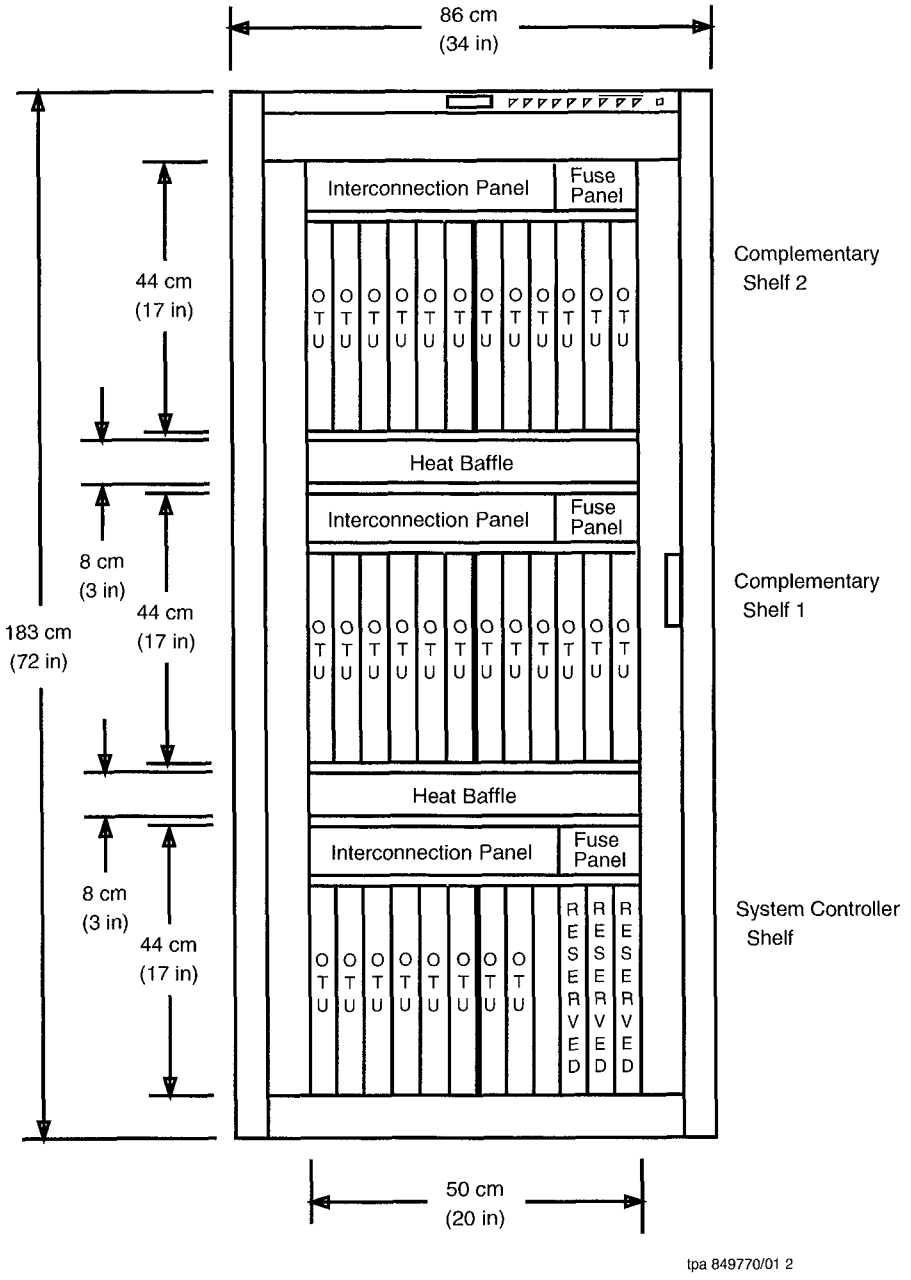

Figure 3-1. Optical Translator Cabinet (Doors Open)

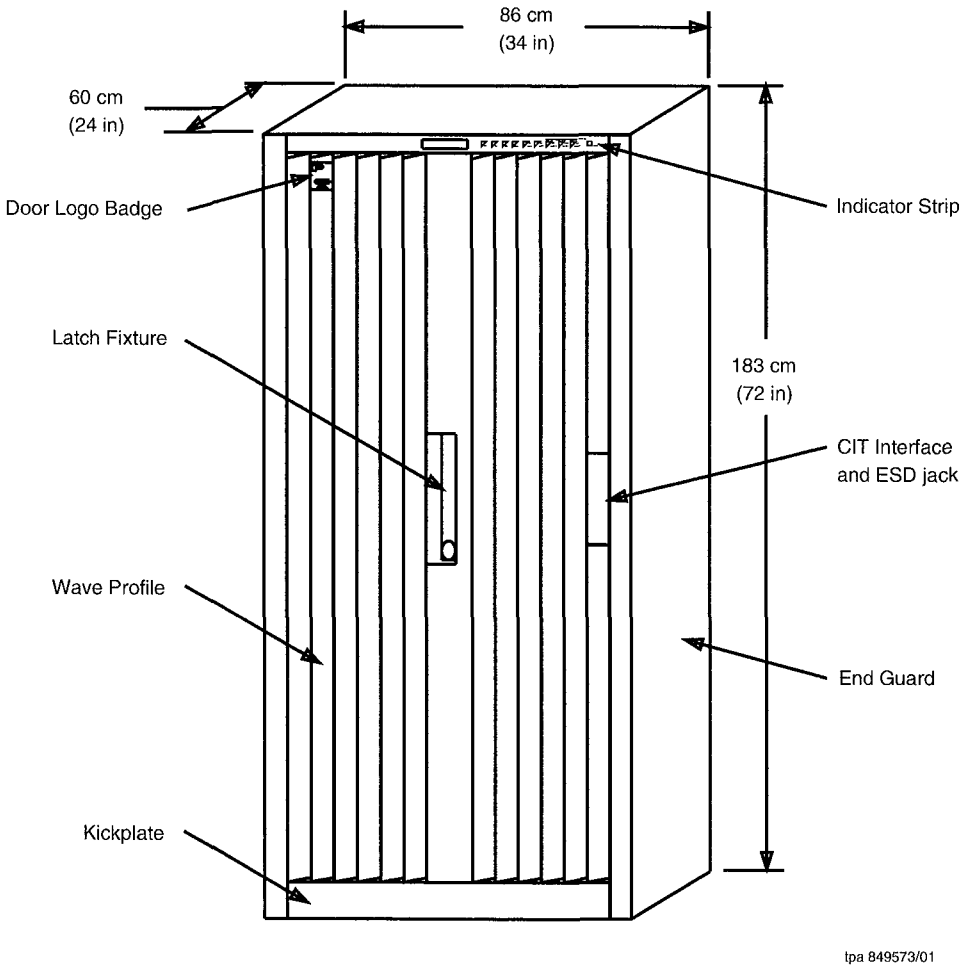

Figure 3-2. Lucent Technologies *Newlook 2000* Cabinet

Miscellaneously Mounted Optical Translator

The Miscellaneously Mounted Optical Translator (Figure 3-3) consists of a System Controller Shelf, Complementary Shelf 1, Complementary Shelf 2, and three heat baffles.

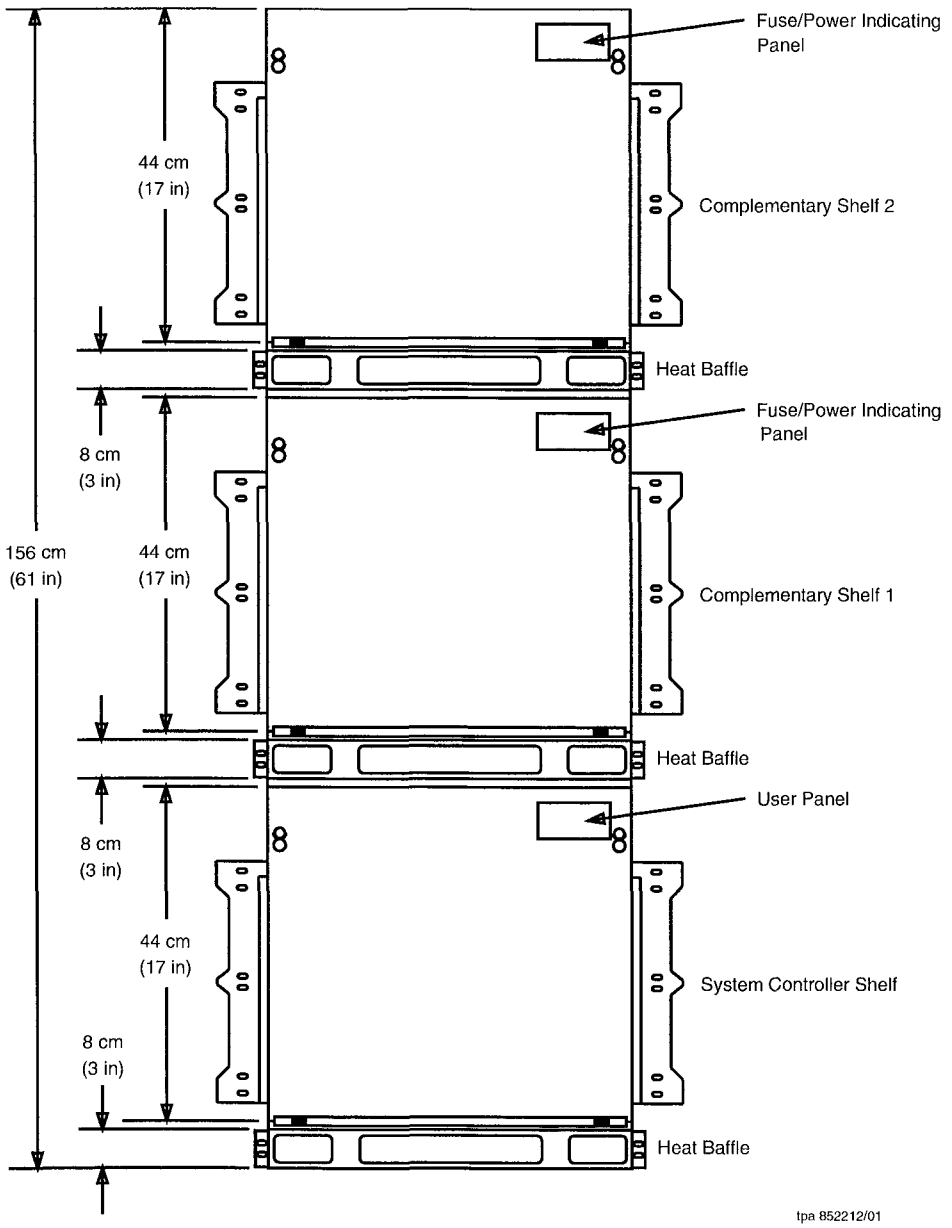

Figure 3-3. Miscellaneously Mounted Optical Translator

In Release 1, there is no downloadable software available. However, the SONET OC48/SDH STM-16 Optical Translator Unit (OTU) circuit pack firmware enables equipment packages to be upgraded with controller circuit packs and downloadable software in a future release.

It is possible to mount the Miscellaneously Mounted Optical Translator in 800- and 801-type network bay frameworks.

The Miscellaneously Mounted Optical Translator can accept up to 32 SONET OC-48/SDH STM-16 signals.

Openings in the shelf covers allow the fuse/power indicating panel and user panel to show through. The user panel provides access to the craft interface terminal (CIT) port. The covers are hinged and can be easily removed for maintenance access.

Indicator Strip

An indicator strip (Figure 3-4) is located at the front of each Optical Translator Cabinet. It provides power on (PWR ON) LEDs and system level information. However, the system level (CR, MJ, MN, ABN, FE ACTY, NE ACTY and ACO) LEDs are not active in Release 1. These system level LEDs will be active in a future release.

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Figure 3-4. Indicator Strip

Shelves

System Controller Shelf

Purpose of System Controller Shelf

The System Controller Shelf can accept up to 8 SONET OC-48/SDH STM-16 signals. The Optical Translator electrically regenerates OC-48/STM-16 signals and inserts clean tone signals. In a future release, the System Controller Shelf will also provide high-level system control functions.

The System Controller Shelf (Figure 3-5) consists of a fully connectorized interconnection panel, a fuse panel or user panel, and 11 circuit pack slots. It measures 17 inches high by 20 inches wide by 11 inches deep. The System Controller Shelf is designed according to European Telecommunications Standard Institute (ETSI) standards documented in European Telecommunications Standard (ETS) 300119-4, January 1994.

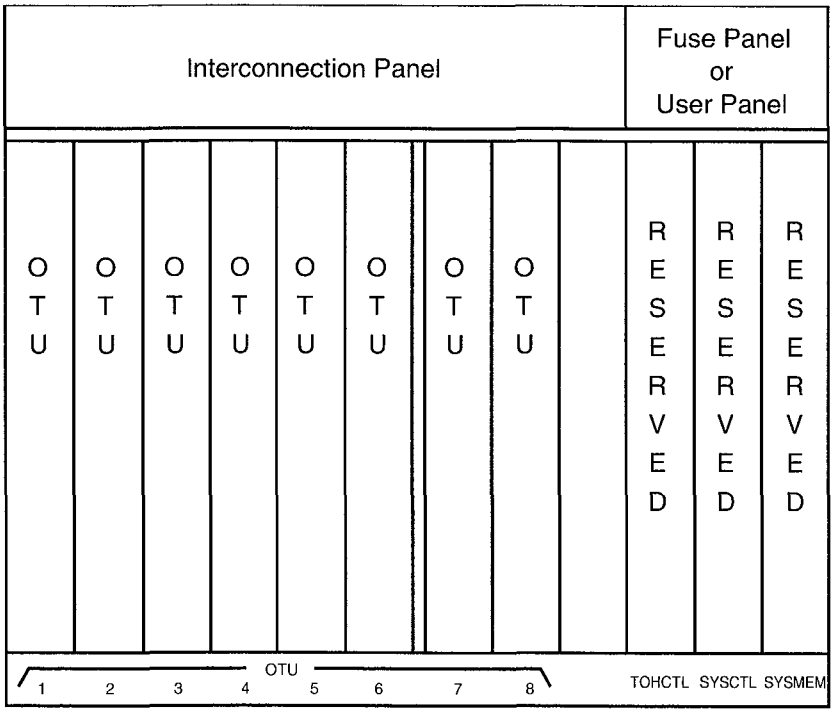

Figure 3-5. System Controller Shelf (Without Covers)

System Controller Shelf Circuit Packs

The System Controller Shelf (Figure 3-5) provides the following circuit pack slots:

- **OTU 1-8**: Eight slots are provided for the following circuit packs:
  - — 41A1C, 41A2C, 41A3C, 41A4C, 41A5C, 41A6C, 41A7C, or 41A8C SONET OC48/SDH STM16 Optical Translator Unit, 1.5µm Wavelength *n* (SONET OC48/SDH STM16 OTU 1.5 W*n*) (*n*=1-8)
  - — 41BB SONET OC48/SDH STM16 Optical Translator Unit, 1.3µm Wavelength (SONET OC48/SDH STM16 OTU 1.3)
  - — 41C1C, 41C2C, 41C3C, 41C4C, 41C5C, 41C6C, 41C7C, or 41C8C SONET OC48/SDH STM16 Optical Translator Unit, 1.5µm Wavelength *n* 640km Dispersion Limit (SONET OC48/SDH STM16 OTU 1.5 W*n* 640km DISP) (*n*=1-8).

  The 41A(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with fiber dispersion not exceeding 6800 ps/nm. The 41C(1-8)C OTU circuit packs support 8 wavelengths on Optical Line Systems with fiber dispersion not exceeding 10900 ps/nm. The 41BB OTU circuit pack generates a standard SONET OC-48/SDH STM-16 signal in the 1.3-um range.
- **TOHCTL**: One slot is reserved for the Tributary - Overhead Controller (TOHCTL) circuit pack in a future release.
- **SYSCTL**: One slot is reserved for the System Controller (SYSCTL) circuit pack in a future release.
- **SYSMEM**: One slot is reserved for the System Memory (SYSMEM) circuit pack in a future release.

Table 3-1 also provides circuit pack slot, circuit pack code, and software compatibility information. In Release 1, the Optical Translator is equipped with only firmware on the OTU circuit packs. Downloadable software and controller circuit packs will be available in a future release.

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

Circuit Pack Slot	Supported Circuit Pack Codes	Compatible Software (Note)
OTU 1 - 8	41A1C 41A2C 41A3C 41A4C 41A5C 41A6C 41A7C 41A8C 41BB 41C1C 41C2C 41C3C 41C4C 41C5C 41C6C 41C7C 41C8C	
TOHCTL	—	
SYSCTL	—	
SYSMEM	—	

Note: In Release 1, the Optical Translator is equipped with only firmware on the OTU circuit packs. Downloadable software and controller circuit packs will be available in a future release.

All circuit packs in 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 compatibility information, refer to Section 7, "Circuit Pack Descriptions."

Complementary Shelf 1

Purpose of Complementary Shelf 1

The Complementary Shelf 1 can accept up to 12 SONET OC-48/SDH STM-16 signals. The Optical Translator electrically regenerates OC-48/STM-16 signals and inserts clean tone signals.

The Complementary Shelf 1 (Figure 3-6) consists of a fully connectorized interconnection panel, a fuse panel, and 12 circuit pack slots. It measures 17 inches high by 20 inches wide by 11 inches deep. The Complementary Shelf 1 is designed according to European Telecommunications Standard Institute (ETSI) standards documented in European Telecommunications Standard (ETS) 300119-4, January 1994.

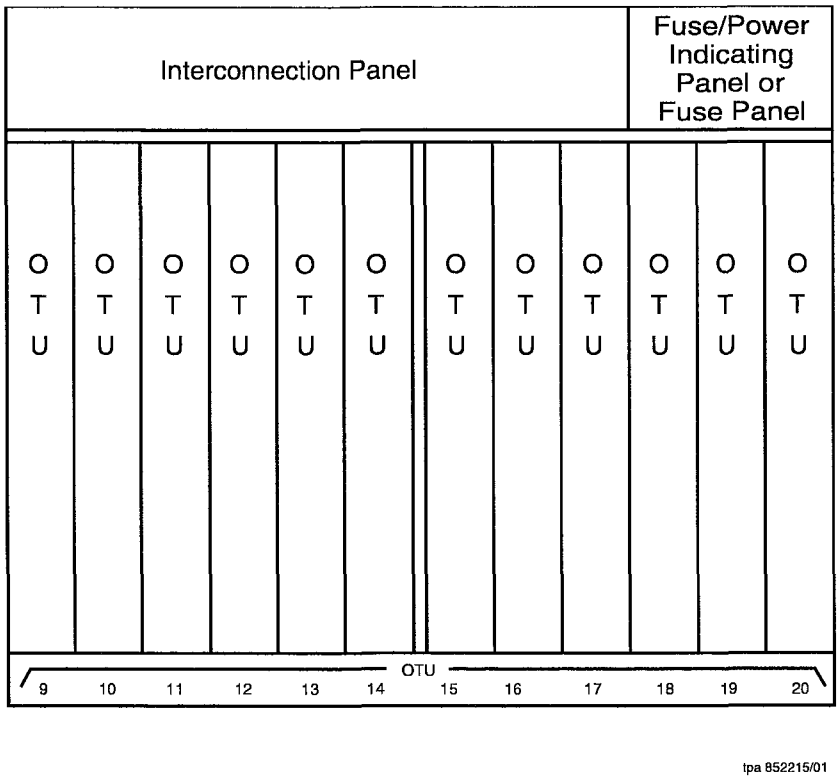

Figure 3-6. Complementary Shelf 1 (Without Covers)

Complementary Shelf 1 Circuit Packs

The Complementary Shelf 1 (Figure 3-6) provides the following circuit pack slots:

- **OTU 9-20**: Twelve slots are provided for the following circuit packs:
  - 41A1C, 41A2C, 41A3C, 41A4C, 41A5C, 41A6C, 41A7C, or 41A8C SONET OC48/SDH STM16 Optical Translator Unit, 1.5µm Wavelength *n* (SONET OC48/SDH STM16 OTU 1.5 W*n*) (*n*=1-8)
  - 41BB SONET OC48/SDH STM16 Optical Translator Unit, 1.3µm Wavelength (SONET OC48/SDH STM16 OTU 1.3)
  - 41C1C, 41C2C, 41C3C, 41C4C, 41C5C, 41C6C, 41C7C, or 41C8C SONET OC48/SDH STM16 Optical Translator Unit, 1.5µm Wavelength *n* 640km Dispersion Limit (SONET OC48/SDH STM16 OTU 1.5 W*n* 640km DISP) (*n*=1-8).

  The 41A(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with fiber dispersion not exceeding 6800 ps/nm. The 41C(1-8)C OTU circuit packs support 8 wavelengths on Optical Line Systems with fiber dispersion not exceeding 10900 ps/nm. The 41BB OTU circuit pack generates a standard SONET OC-48/SDH STM-16 signal in the 1.3-um range.

Table 3-2 also provides circuit pack slot, circuit pack code, and software compatibility information. In Release 1, the Optical Translator is equipped with only firmware on the OTU circuit packs. Downloadable software and controller circuit packs will be available in a future release.

All circuit packs in 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 compatibility information, refer to Section 7, "Circuit Pack Descriptions."

Table 3-2. Complementary Shelf 1 Circuit Pack Slot/Circuit Pack Code/Software Compatibility

Circuit Pack Slot	Supported Circuit Pack Codes	Compatible Software (Note)
OTU 9 - 20	41A1C	
	41A2C	
	41A3C	
	41A4C	
	41A5C	
	41A6C	
	41A7C	
	41A8C	
	41BB	
	41C1C	
	41C2C	
	41C3C	
	41C4C	
	41C5C	
	41C6C	
	41C7C	
	41C8C	

Note: In Release 1, the Optical Translator is equipped with only firmware on the OTU circuit packs. Downloadable software and controller circuit packs will be available in a future release.

Complementary Shelf 2

Purpose of Complementary Shelf 2

The Complementary Shelf 2 can accept up to 12 SONET OC-48/SDH STM-16 signals. The Optical Translator electrically regenerates OC-48/STM-16 signals and inserts clean tone signals.

The Complementary Shelf 2 (Figure 3-7) consists of a fully connectorized interconnection panel, a fuse panel, and 12 circuit pack slots. It measures 17 inches high by 20 inches wide by 11 inches deep. The Complementary Shelf 2 is designed according to European Telecommunications Standard Institute (ETSI) standards documented in European Telecommunications Standard (ETS) 300119-4, January 1994.

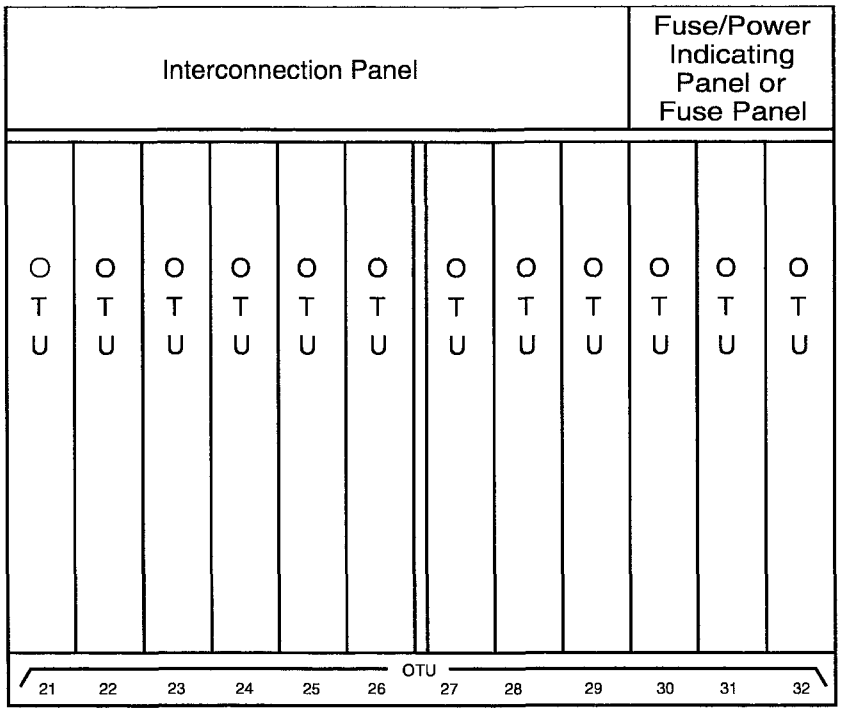

Figure 3-7. Complementary Shelf 2 (Without Covers)

Complementary Shelf 2 Circuit Packs

The Complementary Shelf 2 (Figure 3-7) provides the following circuit pack slots:

- **OTU 21-32**: Twelve slots are provided for the following circuit packs:
  - — 41A1C, 41A2C, 41A3C, 41A4C, 41A5C, 41A6C, 41A7C, or 41A8C SONET OC48/SDH STM16 Optical Translator Unit, 1.5μm Wavelength *n* (SONET OC48/SDH STM16 OTU 1.5 W*n*) (*n*=1-8)
  - — 41BB SONET OC48/SDH STM16 Optical Translator Unit, 1.3μm Wavelength (SONET OC48/SDH STM16 OTU 1.3)
  - — 41C1C, 41C2C, 41C3C, 41C4C, 41C5C, 41C6C, 41C7C, or 41C8C SONET OC48/SDH STM16 Optical Translator Unit, 1.5μm Wavelength *n* 640km Dispersion Limit (SONET OC48/SDH STM16 OTU 1.5 W*n* 640km DISP) (*n*=1-8).

  The 41A(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with fiber dispersion not exceeding 6800 ps/nm. The 41C(1-8)C OTU circuit packs support 8 wavelengths on Optical Line Systems with fiber dispersion not exceeding 10900 ps/nm. The 41BB OTU circuit pack generates a standard SONET OC-48/SDH STM-16 signal in the 1.3-um range.

Table 3-3 also provides circuit pack slot, circuit pack code, and software compatibility information. In Release 1, the Optical Translator is equipped with only firmware on the OTU circuit packs. Downloadable software and controller circuit packs will be available in a future release.

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

Circuit Pack Slot	Supported Circuit Pack Codes	Compatible Software (Note)
OTU 21 - 32	41A1C	
	41A2C	
	41A3C	
	41A4C	
	41A5C	
	41A6C	
	41A7C	
	41A8C	
	41BB	
	41C1C	
	41C2C	
	41C3C	
	41C4C	
	41C5C	
	41C6C	
	41C7C	
	41C8C	

Note: In Release 1, the Optical Translator is equipped with only firmware on the OTU circuit packs. Downloadable software and controller circuit packs will be available in a future release.

All circuit packs in 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 compatibility information, refer to Section 7, "Circuit Pack Descriptions."

Shelf Interfaces

Front access cabling is provided through the interconnection panel. Figure 3-8 shows the interconnection panel of the System Controller Shelf, and Figure 3-9 shows the interconnection panel of the Complementary Shelves. The backplane of each shelf provides the necessary intrashelf connections between the circuit packs in the shelf and the connectors on the interconnection panel.

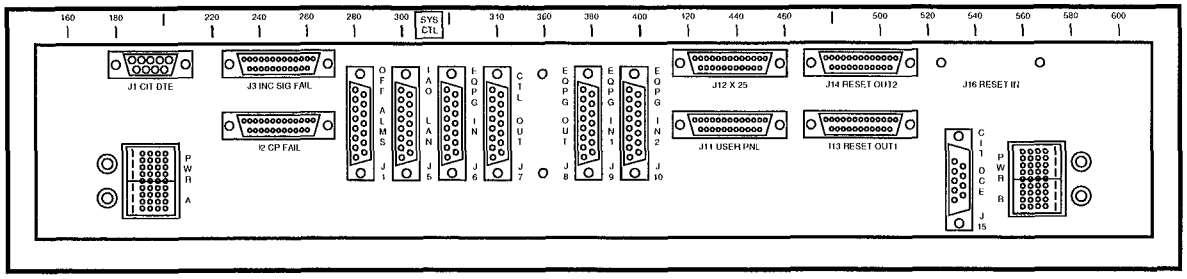

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Figure 3-8. Interconnection Panel (System Controller Shelf)

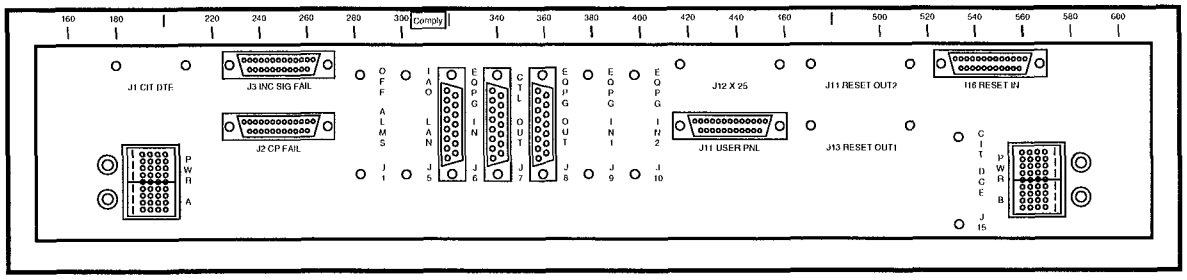

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Figure 3-9. Interconnection Panel (Complementary Shelves)

The interconnection panel provides the following interfaces:

- **CIT (DTE)**: (System Controller Shelf only) This connector provides an interface to a modem that allows dial-up access. This connector is reserved for use in a future release.
- **INC SIG FAIL**: This connector provides an interface to an external miscellaneous discrete unit. This allows a colocated Optical Line System End Terminal to monitor incoming signal failures at the Optical Translator. For more information about the miscellaneous discrete interface, refer to Section 6, "Operations Interfaces." For detailed information about wiring to an external miscellaneous discrete unit, refer to 365-575-410, *Optical Translator, Installation Manual*.
- **CP FAIL**: This connector provides an interface to an external miscellaneous discrete unit. This allows a colocated Optical Line System End Terminal to monitor circuit pack failures at the Optical Translator. For more information about the miscellaneous discrete interface, refer to Section 6, "Operations Interfaces." For detailed information about wiring to an external miscellaneous discrete unit, refer to 365-575-410, *Optical Translator, Installation Manual*.
- **OFFICE ALMS**: (System Controller Shelf only) provides an interface to the local office audible and visible alarms. This connector is reserved for use in a future release.
- **IAO LAN**: (System Controller Shelf only) 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.
- **CTL IN and CTL OUT**: This connector provides shelf-to-shelf local area network connections. This connector is reserved for use in a future release.
- **EQUIP OUT**: (Complementary Shelves only) This connector provides an interface to the System Controller Shelf for equipage information. This connector is reserved for use in a future release.
- **EQUIP IN 1**: (System Controller Shelf only) This connector provides an interface to the Complementary Shelf 1 for equipage information. This connector is reserved for use in a future release.
- **EQUIP IN 2**: (System Controller Shelf only) This connector provides an interface to the Complementary Shelf 2 for equipage information. This connector is reserved for use in a future release.
- **X.25**: (System Controller Shelf only) This connector provides an interface to a message-based operations system that uses X.25 protocol and the transaction language 1 (TL1) message language. This connector is reserved for use in a future release.

- **USER PNL**: 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."
- **RESET OUT 1**: (System Controller Shelf only) This connector provides an interface to the Complementary Shelf 1 for reset information. This connector is reserved for use in a future release.
- **RESET OUT 2**: (System Controller Shelf only) This connector provides an interface to the Complementary Shelf 2 for reset information. This connector is reserved for use in a future release.
- **RESET IN**: (Complementary Shelves only) This connector provides an interface to the System Controller Shelf for reset information. This connector is reserved for use in a future release.
- **CIT (DCE)**: (System Controller Shelf only) 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 Translator Cabinet and on the user panel of the Miscellaneously Mounted System Controller Shelf. This connector is reserved for use in a future release.
- **PWR A and PWR B**: 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 OTU circuit packs.

Fuse Panel

The fuse panel (Figure 3-10) is located on each shelf of the Optical Translator Cabinet. The fuse panel provides –48 V fuses and an electrostatic discharge (ESD) 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. For more information about the fuse panel, refer to Section 6, "Operations Interfaces."

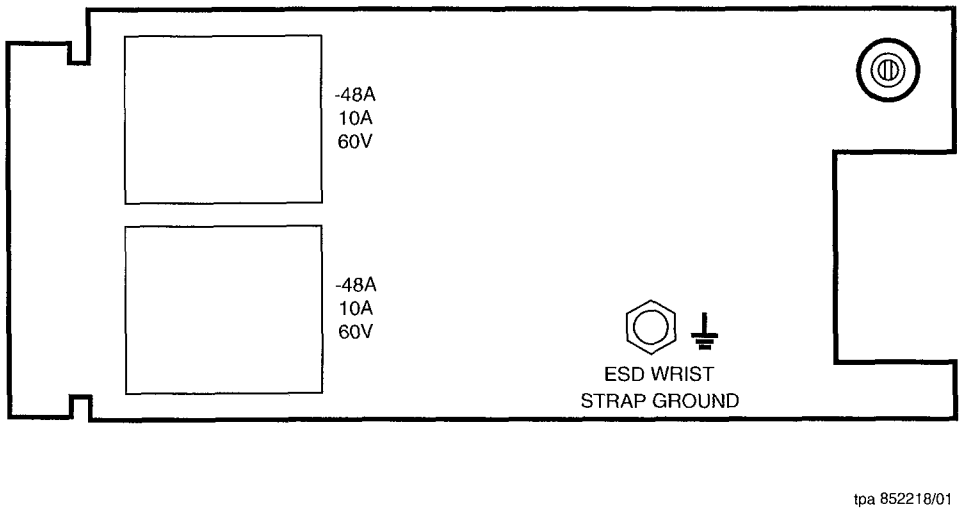

Figure 3-10. Fuse Panel (Optical Translator Cabinet)

Fuse/Power Indicating Panel

The fuse/power indicating panel (Figure 3-11) is located on each Complementary Shelf of the Miscellaneously Mounted Optical Translator. The fuse/power indicating panel provides –48 V fuses, a power on (PWR ON) LED, and an electrostatic discharge (ESD) jack.

In order not to interrupt the power while removing the fuse/power indicating panel, neither the fuses nor the ESD jack are physically attached to the panel. The fuse/power indicating panel can be replaced in the field. For more information about the fuse/power indicating panel, refer to Section 6, "Operations Interfaces."

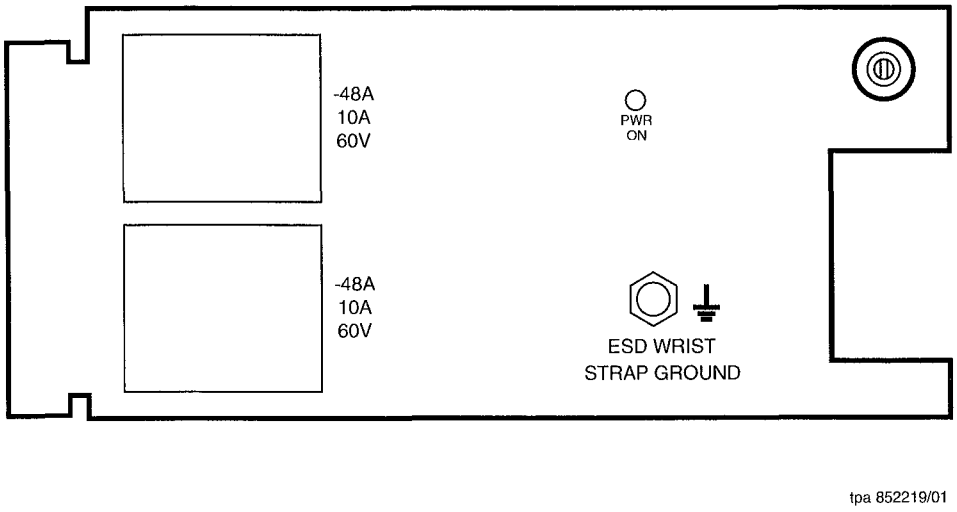

Figure 3-11. Fuse/Power Indicating Panel (Miscellaneously Mounted Optical Translator)

User Panel

The user panel (Figure 3-12) is located on the System Controller Shelf of the Miscellaneously Mounted Optical Translator. The user panel provides –48 V fuses, a power on (PWR ON) LED, an electrostatic discharge (ESD) jack, and system level information. However, the system level (CR, MJ, MN, ABN, FE ACTY, NE ACTY, and ACO) LEDs and the CIT (DCE) port are not active in Release 1. The system level LEDs and CIT (DCE) port will be active in a future release.

In order not to interrupt the power while removing the user panel, neither the fuses nor the ESD jack are physically attached to the panel. The user panel can be replaced in the field. For more information about the user panel, refer to Section 6, "Operations Interfaces."

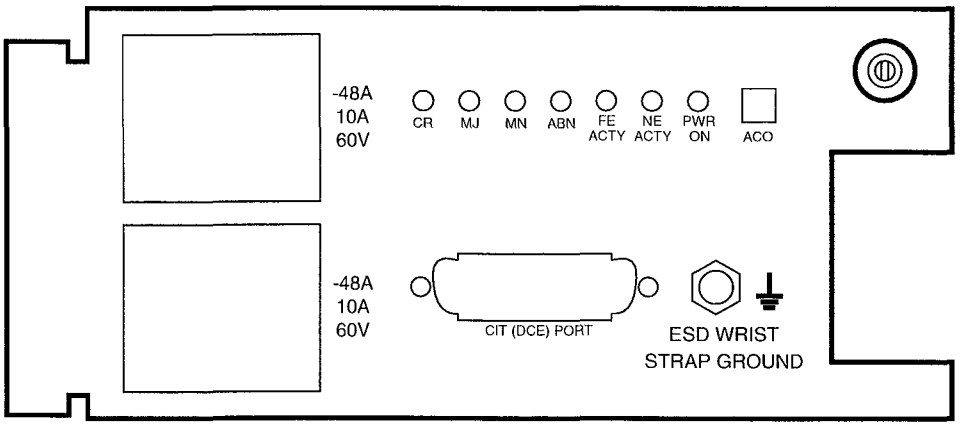

Figure 3-12. User Panel (Miscellaneously Mounted Optical Translator)

Heat Baffle

The heat baffles prevent heat rising from the shelf below from entering the shelf above. Front doors are provided for the Optical Translator Cabinet to satisfy electromagnetic compatibility and *Newlook 2000* cabinet requirements. Front shelf covers are provided for the Miscellaneously Mounted Optical Translator to satisfy electromagnetic compatibility requirements.

Upgrades

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

For more information about the Optical Translator features release plan and the availability of features, refer to 365-575-400, *Optical Translator (OT), Applications, Planning, and Ordering Guide.*

Power

4

Contents

Power

4

Overview

This section describes the power distribution and dissipation of the Optical Translator (OT).

General

The Optical Translator 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 Translator 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 Translator 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 Translator 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.

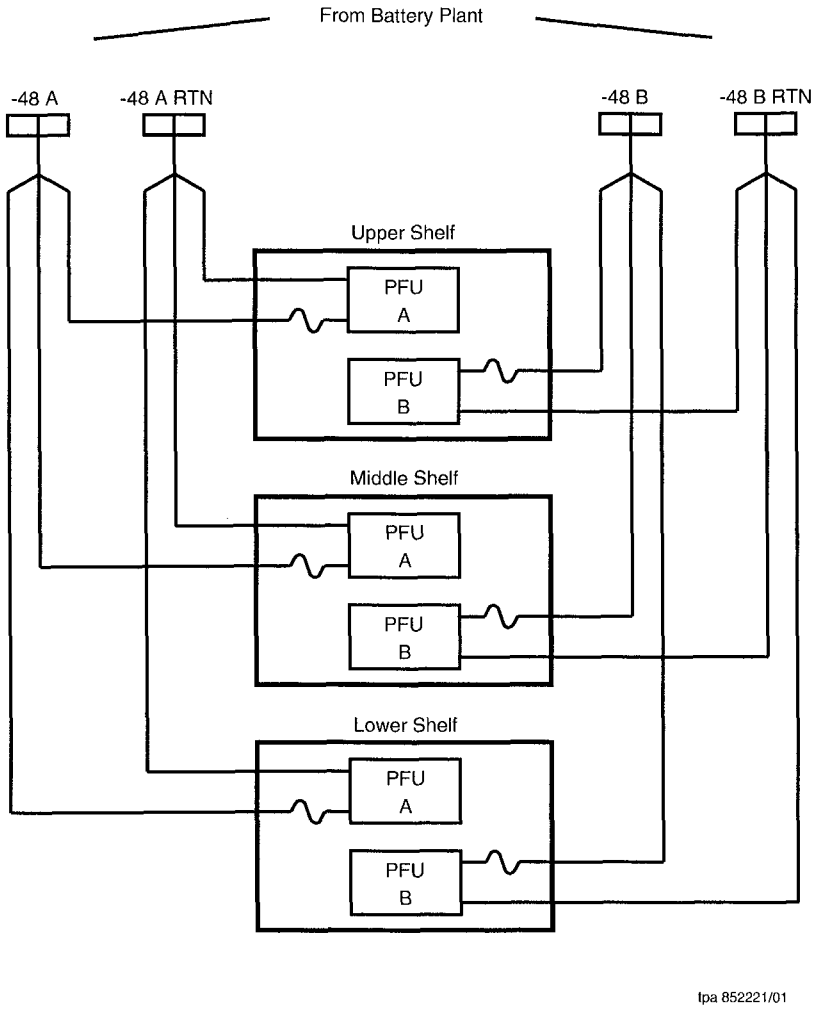

Figure 4-1. Cabinet Power Distribution

The 8-gauge power feeder stubs (power feeder A and power feeder B) enter the top of the cabinet and branch into three 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 individual shelves of the Miscellaneously Mounted Optical Translator. The 8-gauge power feeder stubs are terminated at two 10-gauge power connectors that are connected to the user panel of the System Controller Shelf or the fuse/power indicating panel of the Complementary Shelf.

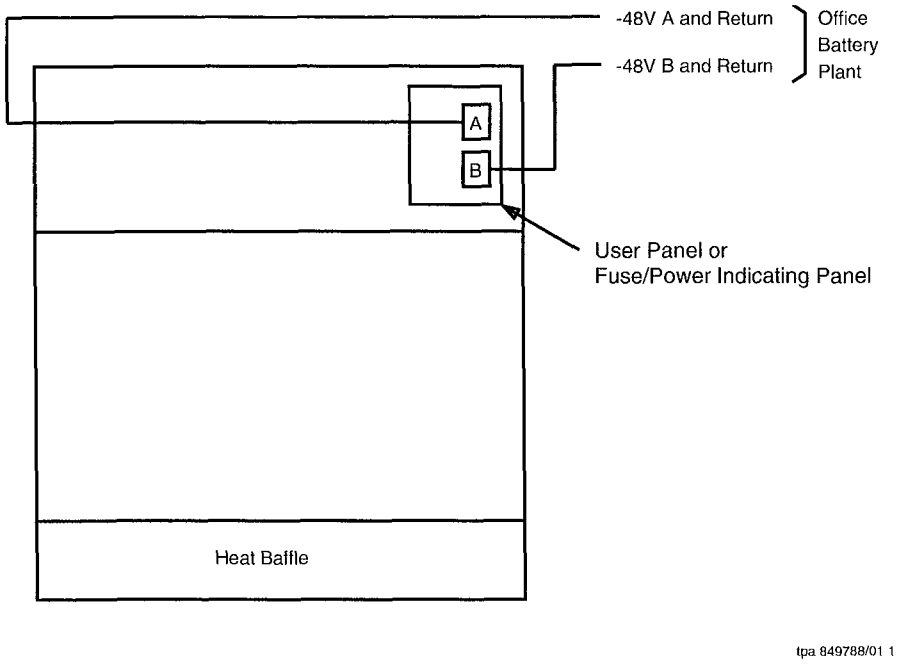

Figure 4-2. Miscellaneously Mounted Shelf Power Distribution

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).

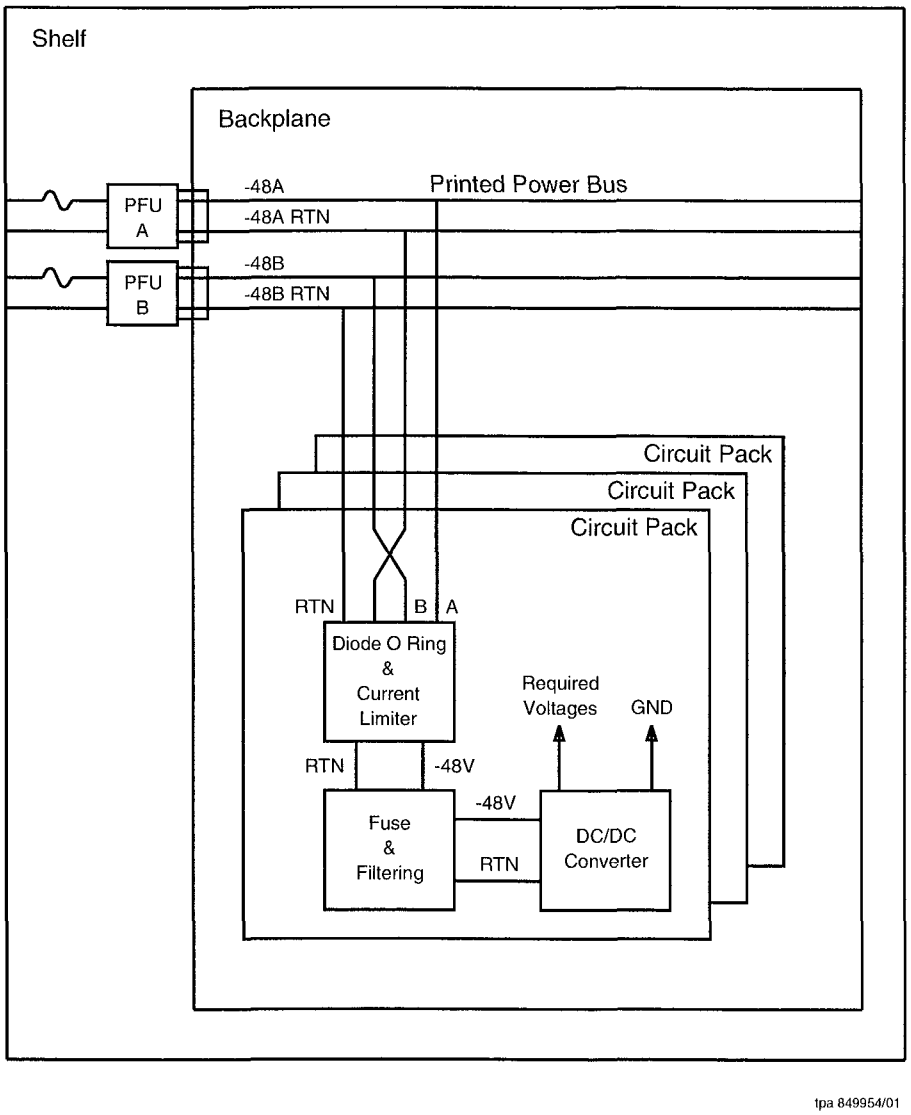

Figure 4-3. Shelf and Circuit Pack Power Distribution

The green PWR ON LED (located on the indicator strip, user panel, and fuse/power indicating 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), user panel (miscellaneously mounted shelf), and fuse/power indicating 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 and can be replaced in the field.

The power filter units also provide a low voltage cutoff feature. This protects the equipment from abnormally low incoming voltage. If the incoming voltage drops below –38 ±1.5V, the power is cut off until the incoming voltage returns to –42.5 ±1.5V. The Optical Translator will sustain no damage if the power fluctuates between –38 ±1.5V and –42.5 ±1.5V.

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 Translator.

NOTE:
Refer to the Floor Plan Data Sheet [FPD 804-604-162-( )] for complete information on power engineering for the Optical Translator.

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 Translator Cabinet (Fully Equipped)	646	51.7	5.9	13.2
System Controller Shelf	182	14.6	1.7	3.7
Complementary Shelf	232	18.6	2.1	4.7

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, user panel, and fuse/power indicating panel) and the circuit pack red FAULT LED (located on the SONET OC48/SDH STM16 Optical Translator Unit circuit pack faceplate) 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; however, the red FAULT LED may not be lighted for some power converter or fuse failures on the OTU circuit pack.

Control and Transmission Interfaces

5

Contents

Control and Transmission Interfaces

5

Overview

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

Control

Figure 5-1 shows the Optical Translator control architecture. In Release 1, the control architecture consists of the board controller located on each SONET OC48/SDH STM16 Optical Translator Unit (OTU) circuit pack. The System Controller (SYSCTL), System Memory (SYSMEM), and Tributary Overhead Controller (TOHCTL) circuit packs will be available in a future release.

The board controller contains a microprocessor and its supporting circuitry. It is responsible for the real-time monitor and control functions of the OTU circuit pack.

The board controller performs the following:

- Performs processor complex self-test
- Monitors and controls the OTU circuit pack
- Isolates faults at the circuit pack level
- Monitors/reports loss of frame (LOF) and loss of signal (LOS)
- Monitors incoming section (B1) coding violations
- Monitors transmitter analog optical parameters
- Monitors receiver analog optical parameters
- Controls the circuit pack FAULT LEDs
- Activates the miscellaneous discrete points
- Maintains a sanity timer
- Provides debugging 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). In a future release, the TOHCTL circuit pack and the system controller complex communicate using the overhead access local area network (OALAN).

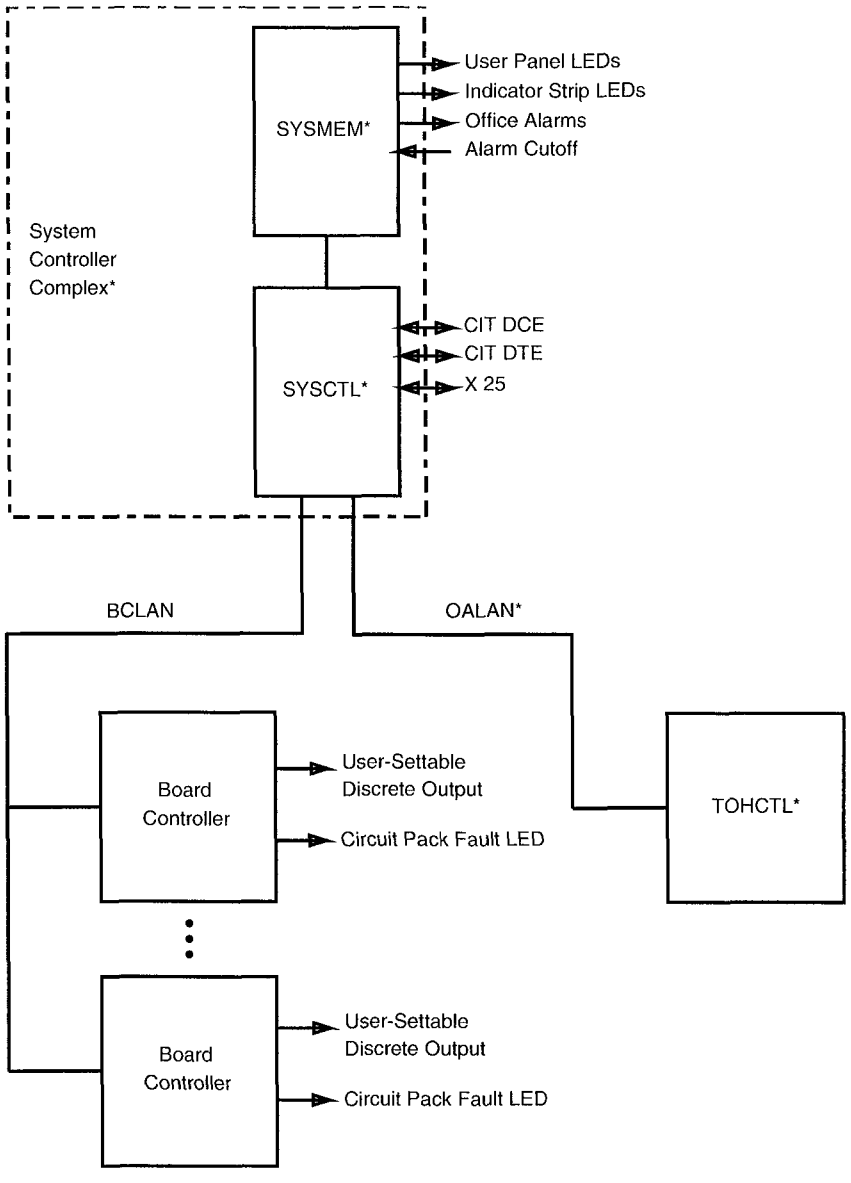

Figure 5-1. System Control Architecture

Transmission

The Optical Translator electrically regenerates up to 32 synchronous optical network (SONET) OC-48 and/or synchronous digital hierarchy (SDH) STM-16 signals and inserts new tone signals. The Optical Translator consists of up to 32 OTU circuit packs. Each OTU circuit pack can receive a single OC-48/STM-16 signal and convert it into an Optical Line System specific wavelength with compatible power and tone signals. Two OTU circuit packs are required for a bidirectional OC-48/STM-16 line.

Figure 5-2 shows a transmission block diagram of the Optical Translator equipped with four OTU circuit packs. Two OTU circuit packs are used for OC-48 line 1 and two OTU circuit packs are used for OC-48 line 2.

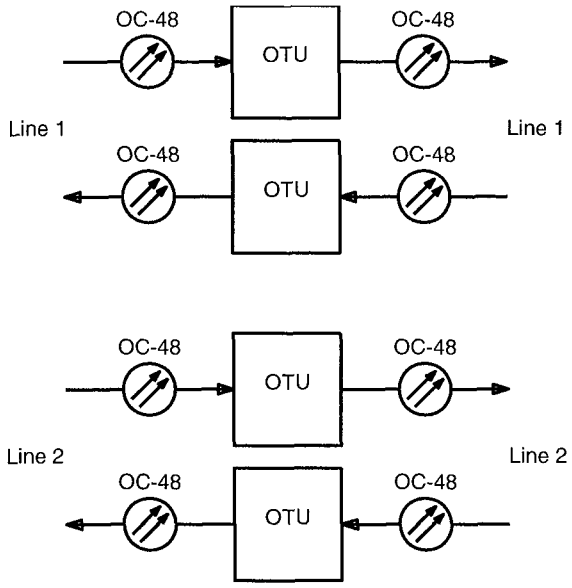

Figure 5-2. Optical Translator Transmission Block Diagram

The OTU circuit pack can receive any SONET OC-48/SDH STM-16 wavelength in the 1.3-μm (1280-1335 nm) or 1.5-μm (1480-1580 nm) range. Internally, the incoming optical OC-48/STM-16 signal is converted to an electrical STS-48 signal. The STS-48 signal is reshaped, retimed, and amplified. The STS-48 signal is then combined with a wavelength specific tone signal and converted back to an optical OC-48/STM-16 signal for transmission. The electrical STS-48 signal is also demultiplexed into sixteen 155.52 Mb/s signals. This allows certain SONET section (B1) overhead bytes to be extracted and monitored.

NOTE:
The OTU circuit pack does not change SONET overhead bytes and is not a SONET regenerator.

The OTU circuit pack transmits the OC-48/STM-16 signal using a wavelength associated with its circuit pack code. The following circuit pack codes are associated with the OTU circuit packs:

- **41A(1-8)C OTU**: The 41A(1-8)C OTU circuit packs accept one non-OLS compatible wavelength (1.3- or 1.5-μm range) and transmit an OLS compatible wavelength (1.5-μm range). The 41A(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with fiber dispersion not exceeding 6800 ps/nm.
- **41C(1-8)C OTU**: The 41C(1-8)C OTU circuit packs accept one non-OLS compatible wavelength (1.3- or 1.5-μm range) and transmit an OLS compatible wavelength (1.5-μm range). The 41C(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with fiber dispersion not exceeding 10900 ps/nm.
- **41BB OTU**: The 41BB OTU circuit pack accepts one OLS compatible wavelength (1.5-μm range) and transmits a standard SONET OC-48/SDH STM-16 wavelength in the 1.3-μm range.

For more information about the OTU circuit pack, refer to Section 7, "Circuit Pack Descriptions."

The Optical Translator provides no optical line protection switching.

Operations Interfaces

6

Contents

Operations Interfaces

6

Overview

This section presents the operations interfaces that allow access to the Optical Translator (OT) and provide alarm and status information. Local operations interfaces include the indicator strip/user panel, fuse/power indicating panel, fuse panel, and the circuit pack faceplate light emitting diode (LED). Other operations interfaces include miscellaneous discrete outputs to an external miscellaneous discrete unit. In future releases, a craft interface terminal (CIT), an office alarms interface, and a message-based operations system interface will be available.

Indicator Strip/User Panel

The indicator strip (Figure 6-1) is located along the header (top) of the Optical Translator cabinets. It runs the full width of the cabinet over the door in the front.

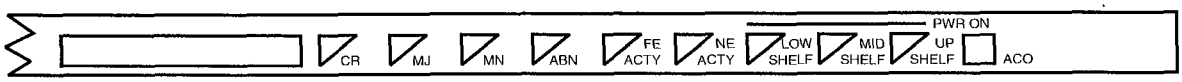

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Figure 6-1. Indicator Strip

The user panel (Figure 6-2) is a factory-installed unit mounted next to the right-hand flange of the miscellaneously mounted System Controller Shelf.

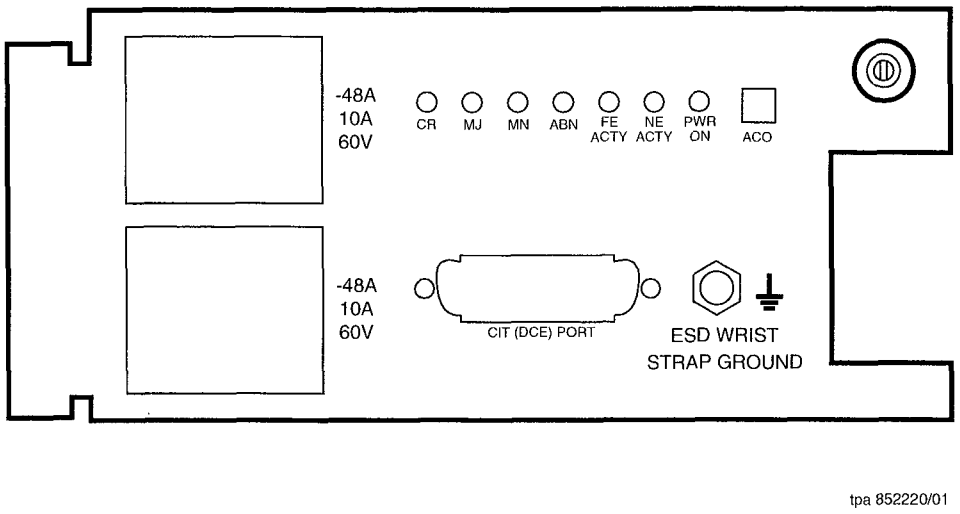

Figure 6-2. User Panel

In Release 1, the indicator strip and user panel provide the green power on (PWR ON) LED. The PWR ON LED is lighted when the shelf is receiving –48 V power. The other system level LEDs (CR, MJ, MN, ABN, FE ACTY, NE ACTY, and ACO) and the CIT (DCE) port (user panel only) will be active in a future release.

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

Fuse/Power Indicating Panel

The fuse/power indicating panel (Figure 6-3) is a factory-installed unit mounted next to the right-hand flange of the miscellaneously mounted Complementary Shelves. The fuse/power indicating panel has two –48 V, 10-amp fuses (one for feeder A and one for feeder B), a green power on (PWR ON) LED, and an electrostatic discharge (ESD) jack. The PWR ON LED is lighted when the shelf is receiving –48 V power.

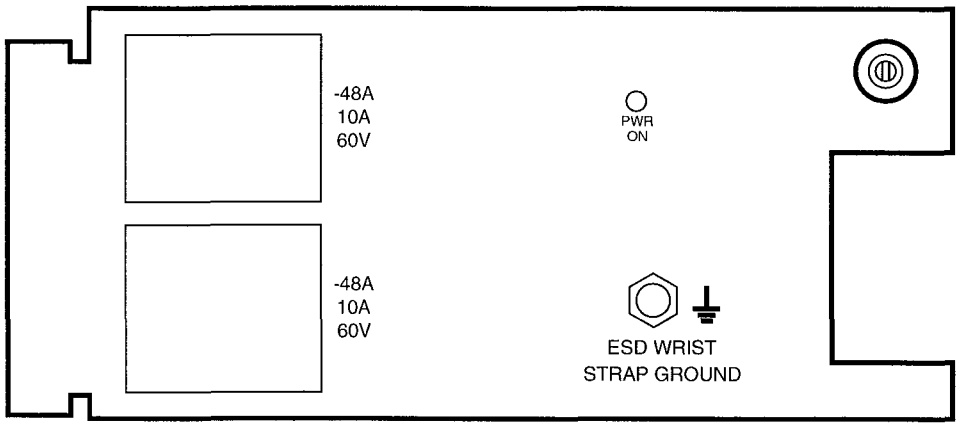

Figure 6-3. Fuse/Power Indicating Panel

Fuse Panel

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

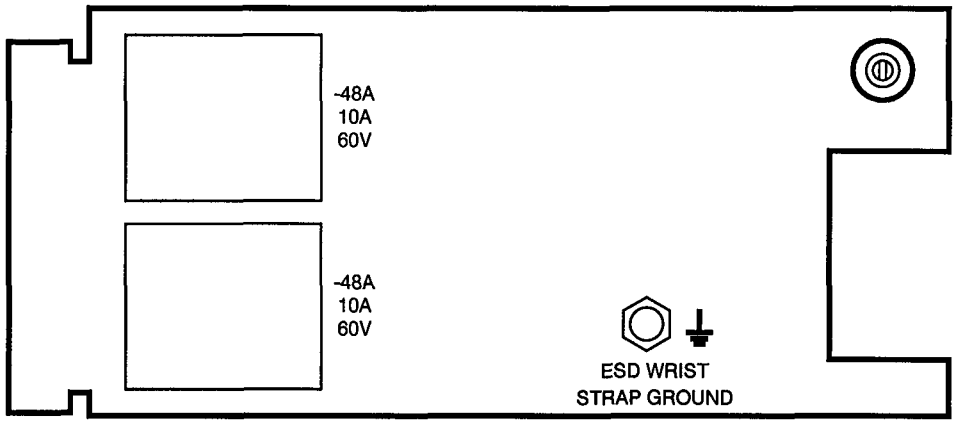

Figure 6-4. Fuse Panel

Circuit Pack Faceplate LED

To supplement the indicator strip/user panel system-level view, each SONET OC48/SDH STM16 Optical Translator Unit (OTU) circuit pack has a red FAULT LED on its faceplate. A continuously lighted FAULT LED shows that the OTU circuit pack has failed, an optical parameter is out of range, or a reset/initialization has occurred. (The FAULT LED is lighted for approximately 15 seconds after a circuit pack is inserted in a shelf.) A continuously flashing FAULT LED shows that the incoming signal to that OTU circuit pack has failed. (The FAULT LED flashes for 20 seconds when an incoming SONET B1 parity error is detected.)

NOTE:
The FAULT LED may not light for certain power converter or fuse failures on the OTU circuit pack.

Miscellaneous Discrete Interface

Each OTU circuit pack provides two miscellaneous discrete outputs to an external miscellaneous discrete unit. The external miscellaneous discrete unit is 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 external miscellaneous discrete unit can be miscellaneously mounted and is connected to the SER TLM 1 port of the Optical Line System (or equivalent) for monitoring. The *DANTEL* external miscellaneous discrete unit can also be wall mounted.

The external miscellaneous discrete unit detects and reports incoming signal failures and OTU circuit pack failures to a colocated Optical Line System (or equivalent). The colocated Optical Line System End Terminal monitors the OTU circuit packs through a set of input contact closures.

* Registered trademark of Dantel Incorporated.

† Registered trademark of Harris Corporation.

Table 6-1 shows the miscellaneous discrete output assignments and the monitored conditions. The miscellaneous discretes are activated for at least 20 seconds.

Table 6-1. Miscellaneous Discrete Output Assignments

Number	Monitored Condition
Miscellaneous Discrete 1 (CP FAIL)	Laser Bias Current (LBC) Out of Range (OOR)
	Optical Power Transmit (OPT) Out of Range (OOR)
	OTU Circuit Pack Internal Defect
	OTU Circuit Pack Power Converter/Fuse Failure
	OTU Circuit Pack Reset/Initialization
	OTU Circuit Pack Insertion
	Single Fuse Failure on a –48 V Feeder
Miscellaneous Discrete 2 (INC SIG FAIL)	Incoming OC-48 Loss of Signal (LOS)
	Incoming OC-48 Loss of Frame (LOF)
	Incoming OC-48 B1 Parity Error

The miscellaneous discrete interfaces (CP FAIL and INC SIG FAIL) are located on the interconnection panel of the System Controller Shelf and the Complementary Shelf. Refer to Section 3, "Platform Description," for more information about the physical location of the miscellaneous discrete interface.

Additional miscellaneous discrete outputs are also provided by the power filters on the System Controller Shelf and each Complementary Shelf. Each power filter (A and B) provides a single miscellaneous discrete output (2 additional miscellaneous discrete outputs per shelf). These miscellaneous discrete outputs report –48 V power failures on the –48 V power feeders from the office battery plant.

For detailed information about wiring from the Optical Translator to the external miscellaneous discrete unit, refer to 365-575-410, *Optical Translator, Installation Manual.* For detailed information about wiring from the Optical Line System to the external miscellaneous discrete unit, refer to 365-575-310, *Optical Line System, Installation Manual.*

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.

Circuit Pack Descriptions

7

Contents

Circuit Pack Descriptions

7

Overview

This section provides a detailed functional description of the Optical Translator circuit packs.

General

The Optical Translator circuit packs are divided into two main categories:

- Control circuit packs (available in a future release)
- Transmission circuit packs
  - — SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 1 (OTU 1.5 W1) 41A1C
  - — SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 2 (OTU 1.5 W2) 41A2C
  - — SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 3 (OTU 1.5 W3) 41A3C
  - — SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 4 (OTU 1.5 W4) 41A4C
  - — SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 5 (OTU 1.5 W5) 41A5C
  - — SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 6 (OTU 1.5 W6) 41A6C

— SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 7 (OTU 1.5 W7) 41A7C

— SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 8 (OTU 1.5 W8) 41A8C

— SONET OC48/SDH STM16 Optical Translator Unit - 1.3µm (OTU 1.3) 41BB

— SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 1 640km Dispersion Limit (OTU 1.5 W1 DISP) 41C1C

— SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 2 640km Dispersion Limit (OTU 1.5 W2 DISP) 41C2C

— SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 3 640km Dispersion Limit (OTU 1.5 W3 DISP) 41C3C

— SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 4 640km Dispersion Limit (OTU 1.5 W4 DISP) 41C4C

— SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 5 640km Dispersion Limit (OTU 1.5 W5 DISP) 41C5C

— SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 6 640km Dispersion Limit (OTU 1.5 W6 DISP) 41C6C

— SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 7 640km Dispersion Limit (OTU 1.5 W7 DISP) 41C7C

— SONET OC48/SDH STM16 Optical Translator Unit - 1.5µm Wavelength 8 640km Dispersion Limit (OTU 1.5 W8 DISP) 41C8C

Circuit Pack and Software Compatibility

Refer to Table 7-1 for information about circuit packs and compatible software. In Release 1, the Optical Translator is equipped with only firmware on the OTU circuit packs. Downloadable software and controller circuit packs will be available in a future release.

Table 7-1. Circuit Packs and Compatible Software

Circuit Pack		Compatible Software (Note)
Code	Name	
41A1C	OTU 1.5 W1	
41A2C	OTU 1.5 W2	
41A3C	OTU 1.5 W3	
41A4C	OTU 1.5 W4	
41A5C	OTU 1.5 W5	
41A6C	OTU 1.5 W6	
41A7C	OTU 1.5 W7	
41A8C	OTU 1.5 W8	
41BB	OTU 1.3	
41C1C	OTU 1.5 W1 DISP	
41C2C	OTU 1.5 W2 DISP	
41C3C	OTU 1.5 W3 DISP	
41C4C	OTU 1.5 W4 DISP	
41C5C	OTU 1.5 W5 DISP	
41C6C	OTU 1.5 W6 DISP	
41C7C	OTU 1.5 W7 DISP	
41C8C	OTU 1.5 W8 DISP	

Note: In Release 1, the Optical Translator is equipped with only firmware on the OTU circuit packs. Downloadable software and controller circuit packs will be available in a future release.

Transmission

OTU (41A_C, 41BB, and 41C_C) Circuit Pack Description

Purpose of Circuit

The SONET OC48/SDH STM16 Optical Translator Unit (OTU) circuit pack electrically regenerates a single OC-48/STM-16 signal in one direction and inserts a clean tone signal.

Faceplate LED

The OTU circuit pack has a red FAULT LED on its faceplate (Figure 7-1). The red FAULT LED is continuously lighted when a circuit pack failure is detected or when the circuit pack loses power.

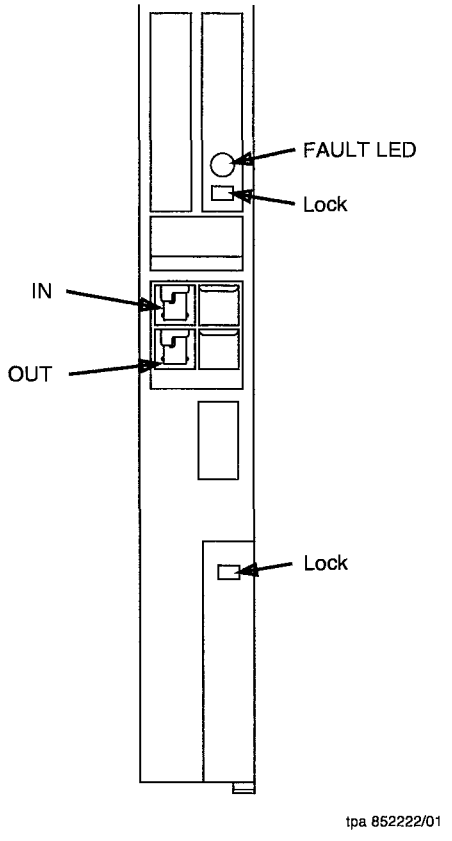

Figure 7-1. OTU Circuit Pack

The board controller on the OTU 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 the incoming OC-48 signal fails, the FAULT LED will flash on and off.

General Description of Operation

The OTU circuit pack accepts any SONET OC-48/SDH STM-16 wavelength in the 1.3-µm (1280-1335 nm) or 1.5-µm (1480-1580 nm) range and converts it to an electrical STS-48 signal. The electrical STS-48 signal is reshaped, retimed, and amplified.

The electrical STS-48 signal is also demultiplexed into sixteen 155.52 Mb/s signals. This allows certain SONET section (B1) overhead bytes to be extracted and monitored.

NOTE:
The OTU circuit pack does not change the SONET overhead bytes and is not considered a SONET regenerator.

The STS-48 signal is then combined with a wavelength specific tone signal and converted back to a specific wavelength OC-48 signal for transmission over a single mode fiber. Table 7-2 shows the specific wavelengths associated with the 41A(1-8)C, 41BB, and 41C(1-8)C OTU circuit packs.

Table 7-2. OTU Circuit Pack Wavelengths

OTU Circuit Pack Code	Wavelength (nm) of Transmitted OC-48 Signal
41_1C	1549.32
41_2C	1550.92
41_3C	1552.52
41_4C	1554.13
41_5C	1555.75
41_6C	1557.37
41_7C	1558.98
41_8C	1560.61
41BB	1310.00

The 41A(1-8)C OTU circuit packs support the 8 wavelengths on Optical Line Systems with total dispersion not exceeding 6800 ps/nm. The 41C(1-8)C OTU circuit packs support 8 wavelengths on Optical Line Systems with total dispersion not exceeding 10900 ps/nm. The 41BB OTU circuit pack generates a SONET OC-48/SDH STM-16 signal in the 1.3-um range for other SONET OC-48/SDH STM-16 receivers.

Detailed Description of Operation

Transmission Circuitry

Figure 7-2 shows an overall block diagram of an OTU circuit pack. The OTU circuit pack accepts one 2.5 Gb/s non-return-to-zero (NRZ) SONET OC-48/SDH STM-16 optical signal.

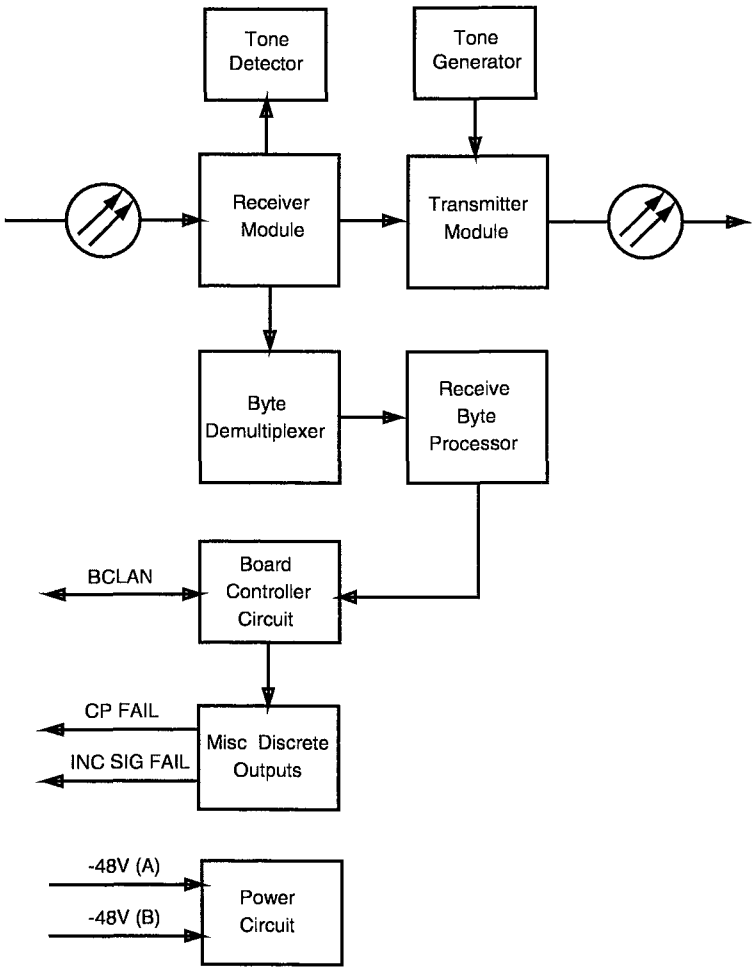

Figure 7-2. OTU Circuit Pack Block Diagram

Fiber access to the OTU circuit pack is via two fixed *ST*-type buildout blocks and removable *ST*-type, FC/PC-type, or SC-type lightguide buildouts on the circuit pack faceplate (labeled IN and OUT). Lightguide buildouts for the IN connector are chosen based on the attenuation desired and the type of connector interface the single-mode lightguide jumper is equipped with.

Lightguide buildouts for the OUT connector are chosen based on the type of connector interface the single-mode lightguide jumper is equipped with. There are three types of lightguide buildouts available for OTU circuit packs: *ST*-type, FC/PC-type, and SC-type. All factory-equipped OTU circuit packs come with a removable *ST*-type 0-dB lightguide buildout on the IN and OUT connectors. 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 receiver module accepts the OC-48/STM-16 signal and converts it to an electrical STS-48 signal. The receiver module also detects loss of signal (LOS). Timing is also extracted and the data is regenerated. This includes signal amplification, retiming, and reshaping. The STS-48 data signal is then passed to the transmitter module. The STS-48 data signal and 2.5 GHz clock signal are also passed to the byte demultiplexer.

The byte demultiplexer receives the STS-48 data signal from the receiver module and demultiplexes the STS-48 data signal to sixteen 155.52 Mb/s signals. The sixteen 155.52 Mb/s data signals and a 155.52 MHz clock signal are sent to the receive byte processor in a parallel format.

The receive byte processor frames on the incoming signals and converts them to 16 byte serial 155.52 Mb/s data signals. The SONET section B1 overhead bytes are also extracted and monitored for errors. The receive byte processor is only used for error monitoring. Its output signals are not used.

The transmitter module combines a wavelength specific tone signal from the tone generator with the STS-48 signal and converts it back to an optical OC-48 signal. A single line distributed feedback laser with driver and control circuits, converts the electrical signal to optical pulses for transmission.

The tone generator circuit generates specific tones based on the wavelength assigned to the OTU circuit pack. Table 7-3 shows the specific tones and the associated wavelengths assigned to the OTU circuit packs.

Table 7-3. Operating Wavelengths and the Associated Tone Frequencies

OTU Circuit Pack Code	Wavelength (nm) of Transmitted Signal	Tone Frequency (Hz)
41_1C	1549.32	5273
41_2C	1550.92	6934
41_3C	1552.52	9277
41_4C	1554.13	11328
41_5C	1555.75	14746
41_6C	1557.37	17285
41_7C	1558.98	19336
41_8C	1560.61	21680

Control Circuitry

The board controller circuit controls all the circuit pack activities. In future releases, the board controller circuit will interface with the System Controller (SYSCTL) circuit pack via the board controller local area network (BCLAN).

The OTU circuit pack reports the status of the circuit pack and the incoming OC-48 signal using the miscellaneous discrete interface and the FAULT LED on the circuit pack faceplate.

Fault Detection Circuitry

Monitoring and Test. The board controller circuit monitors all the activities on the circuit pack. The OTU circuit pack has an in-service and out-of-service built-in test capability. An out-of-service test is performed whenever the OTU circuit pack resets. In-service testing is continuous. The board controller circuit reports failures when they occur via the miscellaneous discrete interface and the circuit pack faceplate FAULT LED. When the OTU circuit pack is inserted in a slot or reset, an out-of-service test is performed.

Performance Monitoring. The OTU circuit pack provides performance-monitoring circuitry for the following performance parameters:

- Received optical power
- Errored frames
- Section (B1) errors
- Laser bias current
- Optical transmit power.

Power Circuitry

The OTU circuit pack receives two sources of –48 volts that are diode OR'd, fused, and filtered. Modular DC-to-DC power converters produce +1.8, +5, –2, and –5.2 volts used on the circuit pack.

The OTU circuit pack monitors the two –48 volt sources to the circuit pack and any failures are reported to the board controller. If the OTU circuit pack detects a loss of power feeder A or power feeder B, the board controller activates miscellaneous discrete 1 and keeps the laser turned on. If the OTU circuit pack detects a failure of the onboard fuse or power converter, the board controller activates miscellaneous discrete 1, turns off the laser, and may light the FAULT LED. The FAULT LED may not light for some fuse or power converter failures on the OTU circuit pack.

Quick Reference Summary

Receive Functions

The OTU circuit pack performs the following receive functions:

(a) Receives a standard SONET OC-48/SDH STM-16 optical signal

(b) Converts the OC-48 signal to an electrical STS-48 signal

(c) Extracts the 2.5 GHz clock signal and regenerates the STS-48 data signal

(d) Demultiplexes the STS-48 signal into sixteen 155.52 Mb/s signals

(e) Monitors the SONET section (B1) overhead bytes.

Transmit Functions

The OTU circuit pack performs the following transmit functions:

(a) Combines a wavelength specific tone signal with the STS-48 signal from the receiver module

(b) Modulates a laser transmitter to produce a SONET standard OC-48 optical signal.

Timing and Control Functions

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

(a) Extracts a 2.5 GHz clock signal from the incoming OC-48 high speed signal

(b) Performs internal fault detection

(c) Controls the circuit pack faceplate FAULT LED

(d) Activates miscellaneous discrete outputs to an external miscellaneous discrete unit

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

Maintenance Description

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Maintenance Description

8

Overview

This section defines the maintenance philosophy and outlines the various features available to monitor and maintain the Optical Translator (OT).

Maintenance Philosophy

The SONET OC48/SDH STM-16 Optical Translator Unit (OTU) circuit pack detects failures, monitors performance degradation, isolates faults, 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.

Maintenance Signals

The OTU circuit pack signals downstream transmission equipment by disabling the circuit pack output OC-48 signal. The OTU circuit pack disables the output OC-48 signal for incoming loss of signal, incoming loss of frame, and circuit pack failures. The OTU circuit pack does not insert line alarm indication signals or other SONET maintenance signals.

Maintenance Reporting

The OTU circuit pack continuously monitors its internal condition and incoming signals. When a trouble condition is detected, the OTU circuit pack employs automatic diagnostics to isolate the fault. Failures are reported to the local technician using the circuit pack FAULT LED and the miscellaneous discrete outputs so that repair decisions can be made.

NOTE:
The miscellaneous discretes outputs can be monitored by a colocated Optical Line System End Terminal via an external miscellaneous discrete unit.

When an incoming signal failure is detected, the OTU circuit pack FAULT LED flashes and the miscellaneous discrete output 2 is activated.

The Optical Translator also 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.

The OTU circuit pack monitors the incoming OC-48/STM-16 signal for SONET B1 parity errors. When an error is detected the OTU circuit pack faceplate FAULT LED flashes at one second intervals for 20 seconds.

Table 8-1 shows the trouble conditions detected and reported by the OTU circuit pack.

Table 8-1. Trouble Condition Reporting

Condition	FAULT LED (Note 1)	Miscellaneous Discretes 1 and 2 (Note 2)	Laser
No failure conditions	Off	1 and 2 Off	On
Incoming OC-48 Loss of Signal (LOS)	Flashing	2 On	Off
Incoming OC-48 Loss of Frame (LOF)	Flashing	2 On	Off
Incoming OC-48 B1 Parity Error	Flashing	2 On	On
Laser Bias Current (LBC) Out of Range (OOR)*	On	1 On	On
Optical Power Transmit (OPT) Out of Range (OOR)*	On	1 On	On
OTU Circuit Pack Internal Defect	On	1 On	Off
OTU Circuit Pack Power Converter/Fuse Failure	On†	1 On	Off
OTU Circuit Pack Insertion	On	1 On	Off‡
OTU Circuit Pack Reset/Initialization	On	1 On	On
Single Fuse Failure on –48 V Feeders§	Off	1 On	On

Notes:

1. The FAULT LED will be active for the period of "defect duration + alarm clear delay."
2. Multiple failures may cause both miscellaneous discretes 1 and 2 to be active.

* Downstream errors may not be detected/reported with this condition; however, the OTU circuit pack can be replaced, if desired.

† The FAULT LED may not be lighted for some power converter or fuse failures on the OTU circuit pack.

‡ When the OTU circuit pack is inserted in a slot, the laser is turned on after the firmware is initialized.

§ For a single fuse failure of a –48 V feeder at the shelf/cabinet, all OTU circuit packs in the shelf/cabinet will report this condition.

For more information about the circuit pack FAULT LED and the miscellaneous discrete interface, refer to Section 6, "Operations Interfaces."

Priority of Trouble Conditions

When multiple failures occur, the OTU circuit pack may activate miscellaneous discretes 1 and 2 simultaneously. When this occurs, observe the following priorities:

1. OTU circuit pack defects
2. incoming OC-48 LOS/LOF
3. incoming OC-48 B1 parity error
4. LBC/OPT OOR conditions and single fuse failures on –48 V feeders.

Technical Specifications

9

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Technical Specifications

9

Overview

This section contains the technical specifications for the Optical Translator (OT). Bellcore General Requirement 253 (GR-253-CORE) is the basis for this information.

Optical Line Interface

Optical Output	2.488 Gb/s
Optical Line Code	Scrambled nonreturn to zero (NRZ)

Optical Connector Interfaces

The SONET OC48/SDH STM16 Optical Translator Unit (OTU) circuit packs use *ST*® lightguide connectors (standard), FC lightguide connectors, or SC lightguide connectors.

Transmission Medium

Single-Mode Fiber
TrueWave® non-zero dispersion shifted fiber

Lightguide Jumpers

Single-mode lightguide jumpers are used for the OC-48/STM-16 signals on the OTU circuit pack.

Optical Safety (CDRH Classification)

Table 9-1 shows the optical safety data for the circuit packs that contain lasers.

Table 9-1. Optical Safety Data on Laser-Containing Circuit Packs

Circuit Pack Code (Note 1)(Note 2)	Bit Rate (Gb/s)	Wavelength (nm)	Maximum Power (dBm)	CDRH Classification (Note 3)
41A1C, 41C1C	2.488	1549.32	–3.3	Class I
41A2C, 41C2C	2.488	1550.92	–4.6	Class I
41A3C, 41C3C	2.488	1552.52	–5.8	Class I
41A4C, 41C4C	2.488	1554.13	–6.5	Class I
41A5C, 41C5C	2.488	1555.75	–7.0	Class I
41A6C, 41C6C	2.488	1557.37	–7.5	Class I
41A7C, 41C7C	2.488	1558.98	–7.3	Class I
41A8C, 41C8C	2.488	1560.61	–5.8	Class I
41BB	2.488	1310.00	2.5	Class IIIb

Notes:

1. All OTU 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.

Operating Wavelengths and Tone Frequencies

Table 9-2 shows the approximate tone frequencies and wavelengths associated with the OTU circuit packs.

Table 9-2. Wavelength Tone Frequencies

Circuit Pack Code	OC-48 Signal Wavelength (nm)	Tone Frequency (Hz)
41_1C	1549.32	5273
41_2C	1550.92	6934
41_3C	1552.52	9277
41_4C	1554.13	11328
41_5C	1555.75	14746
41_6C	1557.37	17285
41_7C	1558.98	19336
41_8C	1560.61	21680

Output Power

The following nominal output powers assume that the OUT connector on the faceplate of the OTU circuit pack is equipped with a 0-dB LBO.

Circuit Pack Code	Nominal Power (dBm)
41_1C	–4.0
41_2C	–5.3
41_3C	–6.5
41_4C	–7.2
41_5C	–7.7
41_6C	–8.2
41_7C	–8.0
41_8C	–6.5
41BB	1.0

Optical Dispersion

The following table shows the maximum chromatic dispersion for the Optical Translator.

Circuit Pack Code	Maximum Chromatic Dispersion
41A(1-8)C	6800 ps/nm
41C(1-8)C	10900 ps/nm
41BB	210 ps/nm

The maximum acceptable peak-to-peak first order polarization mode dispersion (PMD) is 145 ps.

Optical Return Loss

OTU input return loss	>27.0 dB
Required system return loss	>18.0 dB per span for OLS systems up to 3 spans >19.0 dB per span for OLS systems of 4 to 8 spans

Lucent Technologies has a computer tool to determine in-depth return loss characteristics. For assistance in determining return loss limitations, consult your local Account Executive.

Capacity

Each OTU circuit pack has a single OC-48/STM-16 input and a single OC-48/STM-16 output.

Interworking with the Optical Line System

The Optical Translator output powers, wavelengths, tone frequencies, and receiver performance meet all the Optical Line System requirements. When the Optical Translator is used with the Optical Line System, the systems conform to all the specifications given in 365-575-300, *Optical Line System, Applications, Planning, and Ordering Guide.*

The Optical Translator can be used to concatenate multiple Optical Line Systems. Table 9-3 provides engineering rules for Optical Translator/Optical Line System interworking.

Table 9-3. Optical Translator/Optical Line System Engineering Rules

Parameter	Standard Reach	Long Reach	
Per OLS			
Maximum Spans	3	7	8
Maximum Loss per Span	33 dB	25 dB	24 dB
Typical Maximum Distance/Span	120 km	80 km	80 km
Typical Maximum Overall Distance	360 km	560 km	640 km
Per Span			
Maximum OTU Circuit Packs	10	10	10
Maximum WAD Sites	10	10	10
Maximum Number of Spans	33	77	88
Typical Overall Length	3960 km	6160 km	7040 km
Per Subnetwork†			
Maximum Number of Spans	unlimited (at least 250)	unlimited (at least 250)	unlimited (at least 250)

Notes:

* This data applies to standard or *TrueWave* fiber.

† The total number of Optical Line Systems that can be interconnected is only limited by the synchronization considerations of SONET OC-48/SDH STM-16 terminals.

Optical Line Loss Budgets

The Optical Translator is designed to meet the OC-48 loss budget specifications shown in Table 9-4 when used without the Optical Line System.

Table 9-4. OC-48 Loss Budget Specifications

Parameter	OTU Circuit Pack								
	41_1C	41_2C	41_3C	41_4C	41_5C	41_6C	41_7C	41_8C	41BB
Maximum Transmitter Power (P_{Tmax})(dBm)	–3.3	–4.6	–5.8	–6.5	–7.0	–7.5	–7.3	–5.8	2.5
Minimum Transmitter Power (P_{Tmin})*(dBm)	–6.2	–7.5	–8.7	–9.4	–9.9	–10 4	–10.2	–8.7	–2.0
Maximum Received Power (P_{Rmax})†(dBm)	–11.0	–11.0	–11.0	–11.0	–11.0	–11.0	–11.0	–11.0	–10.0
Receiver Sensitivity (P_{Rmin})*†(dBm)	–27.0	–27.0	–27.0	– 27.0	–27.0	–27.0	–27.0	–27.0	–27.0
Minimum System Gain (S-R)(dB)	20.8	19.5	18.3	17.6	17.1	16.6	16.8	18.3	25.0
Optical Path Penalty (P_O)(dB)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0
Maximum Loss Budget (dB)	20.3	19.0	17.8	17.1	16.6	16.1	16.3	17.8	24.0
Minimum Loss Budget (dB)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Typical Maximum Distance‡(km)	81.2	76.0	71.2	68.4	66.4	64.4	65.2	71.2	53.3

* These values include transmitter/receiver connectors @ 0 7 dB each (worst case) and the system margins.

† The receiver sensitivity and maximum received power values are measured at a BER of $1x10^{-10}$

‡ These distances are based on an assumption of 0 25 dB/km loss at 1.5 µm, and 0 45 dB/km at 1 3 µm

Cable Access

- Front for all customer access
- Connectorized cabling with commercially available connectors.

Power Specifications

NOTE:
Consult FPD 804-604-162 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 Translator Cabinet	646 watts (51.7 watts/ft.^{2})
— System Controller Shelf	182 watts (14.6 watts/ft.^{2})
— Complementary Shelf	232 watts (18.6 watts/ft.^{2})
Current Drains per Feeder Cable	
Nominal (List 1*) (@ –48 V DC)	
— Optical Translator Cabinet	5.9 amps
— System Controller Shelf	1.7 amps
— Complementary Shelf	2.1 amps
Maximum (List 2†) (@ –42.75 V DC)	
— Optical Translator Cabinet	13.2 amps
— System Controller Shelf	3.7 amps
— Complementary Shelf	4.7 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).

Low Voltage Cutoff

Low Voltage Cutoff	–38 V DC ±1.5 V (at power filter input)
Restart	–42.5 V DC ±1.5 V (at power filter input)

Cabinet/Shelf Dimensions

Optical Translator Cabinet*	72 inches (183 cm) high 34 inches (86 cm) wide 24 inches (60 cm) deep
System Controller Shelf	17 inches (45 cm) high 20 inches (50 cm) wide 11 inches (28 cm) deep
Complementary Shelf	17 inches (45 cm) high 20 inches (50 cm) wide 11 inches (28 cm) deep
Optical Translator Heat Baffle (Cabinet)	3 inches (8 cm) high 20 inches (50 cm) wide 11 inches (28 cm) deep

Circuit Pack Dimensions

OTU	13.2 inches (33.6 cm) high 1.6 inches (4 cm) wide 9.3 inches (23.6 cm) deep

Floor Loading Specifications

Optical Translator Cabinet (Fully Equipped)	700 lbs (56.0 lbs/ft.^{2})
Miscellaneously Mounted System Controller Shelf (Fully Equipped)	64 lbs
Miscellaneously Mounted Complementary Shelf (Fully Equipped)	74 lbs

* Optical Translator cabinets and miscellaneous shelves are central office white, and the cabinet end guards, cable racks, and lower door frame are central office soft blue.

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 Translator is also designed to meet the electromagnetic compatibility requirements of GR-1089-CORE.

The Optical Translator is *UL*‡ and *CSA*§ certified.

Handling and Transportation Specifications

Handling and Shock Design Criteria	Complies with GR-63-CORE Issue 1, October 1995
Temperature (Transport/Storage)	–40°F to 158°F (–40°C to 70°C)
Relative Humidity (Transport/Storage)	5 to 95 percent
Storage/Shipment Altitude	–200 to 40,000 feet (–61 to 12,133 meters)

* 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.

Reliability Specifications

OC-48 Line Unavailability* (Service line with protection)	2.7×10^{-4} minutes/year/line
Mean Time† Between Maintenance Activities	
— Optical Translator Cabinet (Fully Equipped)	1.8 years
— System Controller Shelf (Fully Equipped; No controller circuit packs)	7.1 years
— Complementary Shelf (Fully Equipped)	4.8 years
Mean Time to Repair	≤ 2 hours (includes dispatch, diagnostics, and repair time)
Silent Failure Unavailability	0
OTU Circuit Pack FIT Rates per Bellcore RPP*	8000
Infant Mortality	≤ 1.6 times the steady state failures/10^9 hours (FIT) as defined in Bellcore TA-418, Issue 2
Product Design Life	25 years

* Based on Method I of the Bellcore, *Reliability Prediction Procedure for Electronic Equipment*, Issue 5, December 1995.

† Based on the Lucent Technologies *Reliability Information Notebook*, 7th Edition, August 1995.

Operation And Maintenance (TOP)

This section supports operation and maintenance of the Optical Translator (OT) product via task oriented practices (TOP) procedures. Use of these procedures should be preceded by a general knowledge and understanding of the OT. The TOP procedures are included in the following four separate tabs:

- Acceptance — Yellow
- Circuit Order — Orange
- Trouble Clearing — Red
- Detailed Level Procedures — Blue.

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 OC-48 channel to an in-service OT.

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-100**, 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

To find the instructions for performing acceptance, circuit order, 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.

   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.
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 **BOLD** font that identifies the lettering designations on panels, shelves, units, and circuit packs. Also, a bold font is used throughout this manual for emphasis.

Optical Translator Installation

The 365-575-410, *Optical Translator (OT), 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. An associated installation manual includes 365-575-310, *Optical Line System*.

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.

Lightguide Safety

A Lucent Technologies lightguide digital transmission system and associated optical test sets use semiconductor laser transmitters. The lasers emit lightwaves, at or near infrared wavelengths, into lightguide fibers. This light is at the red end of the visible spectrum. 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 units and circuit packs contain solid-state electronic components that can be damaged by ESD.
- When handling units and 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 units and 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 units and circuit packs from antistatic packaging until ready to insert them into slots.
- If possible, open all units and circuit packs at a static-safe work position, using properly grounded wrist straps and static-dissipating table mats.
- Always store and transport units and 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 units and circuit packs. On removal from bay, immediately put units and 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 unit or 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 units and 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.

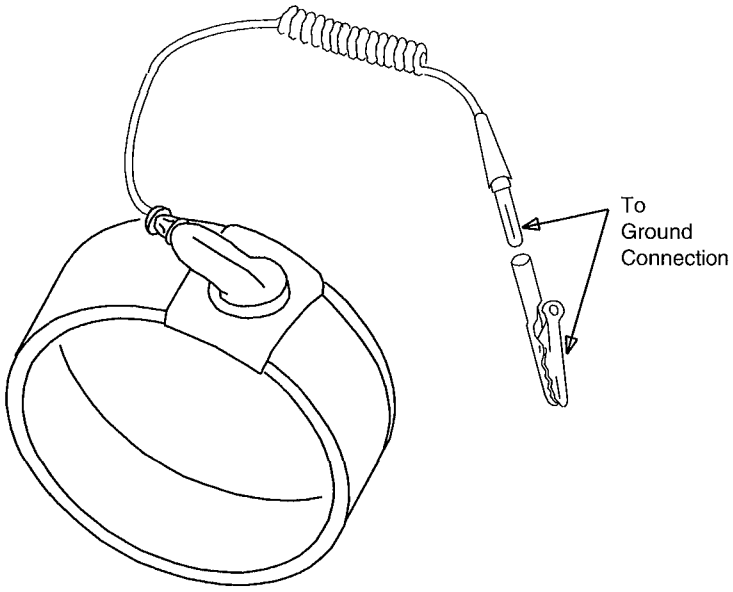


Figure 1. Static Control Wrist Strap

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 Translator (OT)	Acceptance: NTP-002
Add OC-48 Optical Translator Unit (OTU) for Service	Circuit Order: NTP-002
Clear Trouble Report	Trouble Clearing: TAP-104
Delete OC-48 Optical Translator Unit (OTU) from Service	Circuit Order: NTP-003
Restore Optical Translator (OT) Operation After Power Loss	Trouble Clearing: TAD-103
Technical Assistance	Trouble Clearing: TAD-100

Numerical List of Procedures

Acceptance Tab:	
IXL-001	Acceptance Task Index
NTP-002	Accept Optical Translator (OT)
Circuit Order Tab:	
IXL-001	Circuit Order Task Index
NTP-002	Add OC-48 Optical Translator Unit (OTU) for Service
NTP-003	Delete OC-48 Optical Translator Unit (OTU) from Service
Trouble Clearing Tab:	
IXL-001	Trouble Clearing Task Index
TAD-100	Technical Assistance
TAP-101	Clear Fuse/Power Failure (A,B)
TAP-102	Clear Trouble When OTU FAULT LED is Flashing or Lighted
TAP-103	Restore Optical Translator (OT) Operation After Power Loss
TAP-104	Clear Trouble Report
TAP-105	Address Incoming Signal Failure (Flashing FAULT LED)
TAP-106	Address Failure When FAULT LED is Continuously Lighted
Detailed Level Procedures Tab:	
DLP-500	Connect Optical Power Meter for Measurement at OT
DLP-501	Inspect (Repair) Optical Fiber(s)
DLP-502	Replace Fuse in Power Distribution and Fuse Panel or User Panel
DLP-503	Fiber Connections and OTU Locations Used in OT
DLP-504	Clean Optical Fibers and Connectors
DLP-505	Open/Close Cabinet Doors or Install/Remove Shelf Cover
DLP-506	Install/Remove Lightguide Buildout
DLP-507	Test Miscellaneous Discrete (MD) Telemetry
DLP-508	Install/Remove Circuit Pack
DLP-509	Install/Remove Apparatus (Circuit Pack) Blank
DLP-510	Connect/Disconnect Optical Fibers at OTU

Acceptance Task Index

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Accept Optical Translator (OT)

DO ITEMS BELOW IN ORDER LISTED . . . . . FOR DETAILS, GO TO

1. **Overview:** This acceptance procedure is performed from the Optical Translator (OT) which may be connected in an Optical Line System (OLS) network or equivalent network. This procedure is only used if the OT was installed by someone else. If the installation has not been completed, notify the installation personnel or refer to 365-575-410 to complete the installation. *If you completed the installation following the procedures in 365-575-410, do not perform this procedure.*

   Required Test Equipment:
   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, units, or working on an OT to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100.**

   NOTE:
   If at any point in this procedure the OT fails to respond in the indicated way, refer the trouble to installation personnel.

   Verify the green **PWR ON** LED is on at the indicator strip (three shelves per cabinet) or user panel (miscellaneously-mounted shelf). —

OT Arrangement	User Panel	Indicator Strip
Bay-Misc. Mounted Shelf	PWR ON	—
Cabinet-Shelf 2	—	UP SHELF
Cabinet-Shelf 1	—	MID SHELF
Cabinet-Controller Shelf	—	LOW SHELF

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
2. Verify the **FAULT** LED is either flashing or off. If the LED is continuously lighted, then notify the installation personnel of the defective Optical Translator Unit (OTU).	—
3. As required, check miscellaneous discrete telemetry interfaces.	**DLP-507**
4. If required, notify personnel at the remote maintenance site (Operations System center) that the OT is ready for any operational tests they wish to perform using the remote miscellaneous discrete points.	—
5. The OT has passed this acceptance test and is now ready to provide service.	—

```
Acceptance: NTP-002---+---TAD-100
                      |---DLP-507
```

Circuit Order Task Index

FIND YOUR JOB IN THE LIST BELOW . . . . . THEN GO TO

Add OC-48 Optical Translator Unit (OTU) for Service

DO ITEMS BELOW IN ORDER LISTED . . . . . FOR DETAILS, GO TO

1. **Overview:** This procedure adds an optical translator unit (OTU) to an in-service Optical Translator (OT) and may require action at an Optical Line System end terminal in determining the lightguide buildout values.

   Required Test Equipment:
   Wrist Strap
   Optical Power Set or Equivalent

⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs, units, or working on an OT 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 OTU. Two OTUs are required for bidirectional transmission.	—
2.	Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.	**DLP-505**
3.	Locate the assigned slot of the OTU being added.	**DLP-503**
4.	Install an OTU into the assigned slot.	**DLP-508**
5.	Determine and install LBOs, as required.	**DLP-500**
6.	Connect the optical fibers to the OTU circuit pack.	**DLP-510**
7.	Is the OTU **FAULT** LED either flashing or off? If **NO**, then go to **TAP-102**. If **YES**, then continue with Step 8.	—
8.	As required, repeat Steps 3 through 7 for the other direction of transmission.	

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
9. Close the cabinet doors or install the shelf cover, as required.	DLP-505
10. The optical translator unit is now ready for service.	—

```
Circuit Order: NTP-002---+---TAD-100
                         |---TAP-102
                         |---DLP-500
                         |---DLP-503
                         |---DLP-505
                         |---DLP-508
                         |---DLP-510
```

Delete OC-48 Optical Translator Unit (OTU) from Service

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO

1. **Overview:** This procedure removes an optical translator unit (OTU) from an Optical Translator (OT) that is in service.

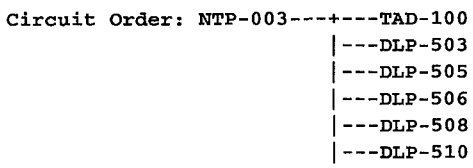
   Required Test Equipment:
   Wrist Strap

⚠ CAUTION:
Use a static ground wrist strap whenever handling units, circuit packs or working on an OT to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100.**

⚠ CAUTION:
Use care in locating the OTU and assigned slots to avoid possible service interruption.

	Obtain the circuit order instructions to delete an OTU and note the assigned slots. Two OTUs are required for bidirectional transmission.	—
2.	Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.	**DLP-505**
3.	Locate the specific slot of the OTU being deleted.	**DLP-503**
4.	Disconnect the optical fibers at the OTU.	**DLP-510**
5.	If required, remove the Lightguide Buildout (LBO) from the OTU.	**DLP-506**

DO ITEMS BELOW IN ORDER LISTED	FOR DETAILS, GO TO
6. Is the OTU to remain in the shelf? If **NO**, then continue with Step 8. If **YES**, then continue with Step 7.	—
7. Disengage the OTU from the shelf, close the latches and gently slide the OTU back until it touches the shelf, and then go to Step 9.	—
8. Remove the OTU from the shelf.	**DLP-508**
9. As required, repeat Steps 2 through 8 for the other direction of transmission.	—
10. Close the cabinet doors or install the shelf cover, as required.	**DLP-505**
11. The OTU has been deleted from service.	—



Trouble Clearing Task Index

FIND YOUR JOB IN THE LIST BELOW	THEN GO TO
Clear Trouble Report	TAP-104
Technical Assistance	TAD-100
Restore Optical Translator (OT) Operation After Power Loss	TAP-103

Technical Assistance

Overview: Technical assistance is built on gathering Optical Translator (OT) information. A local visual inspection of the equipment is made to detect and correct most internal hardware problems.

Trouble Analysis Procedures

The trouble analysis procedures in this document involve replacing faulty units or circuit packs and making visual inspections to determine the status of the OT. 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 OT, 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 OT 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.

Unit and Circuit Pack Failures

Units and circuit pack failures are identified by light-emitting diodes (LEDs) and reported to the user panel or strip indicator.

Units and/or circuit packs are replaced in a specified sequence, but only one unit or circuit pack is replaced at a time. If trouble is not cleared after replacing a unit or circuit pack, the original unit or circuit pack should be reinstalled. This reduces the chances of returning nondefective units or circuit packs for repair.

Electrostatic Discharge (ESD) Considerations

Any integrated circuit on a unit or 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 units or 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 units or circuit packs from their protective antistatic packaging until it is time to insert them into a shelf.

5. Never touch the components, conductors, or connector pins of a unit or circuit pack. Handle all units or circuit packs only by the faceplate or latch or by the top and bottom outermost edges.

6. When handling units or 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 units or circuit packs in static-safe packages. (Shielding is not required unless specified.)

8. When removing a unit or circuit pack from the shelf, immediately put it into a static-safe package.

9. Try to keep relative humidity above 20 percent.

10. OTs 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 or cabinet doors closed at all times. Close the cover immediately after a maintenance procedure such as replacing a unit or circuit pack.

Clear Fuse/Power Failure (A,B)

Overview: This procedure is used to clear a fuse/power failure by replacing a blown fuse (lighted), 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 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 user panel or fuse panel?

   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-502**

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 (including PWR ON LED)?

   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.

   Remove the faceplate to the User Panel or Fuse Panel on the shelf associated with the lighted fuse or power failure.

9. Measure the voltage at the rear of the fuses to determine which power feeder cable is dead and then correct the voltage supply problem at the BDFB or equivalent.

10. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

11. ⚠ CAUTION:
    Steps 11 through 13 require a voltage measurement at the power filter. The filter associated with feeder A is located on the left side of the cabinet frame and the filter associated with feeder B is located on the right side of the cabinet frame.

    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 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 require 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 left mounted filter for that shelf.

    Reference: **DLP-511**

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, or Fuse Panel.

      Reference: **Drawing ED-7G045-30** OT Shelf Assembly
      Reference: **Drawing ED-7G047-30** User/Fuse Panel.

    - If the User Panel on the Switch Fabric shelf No. 1 has any other defective LEDs, replace that panel.

      Reference: **Drawing ED-7G045-30** OT Shelf Assembly
      Reference: **Drawing ED-7G047-30** User/Fuse Panel.

20. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Clear Trouble When OTU FAULT LED is Flashing or Lighted

Overview: This procedure is used to clear a trouble at an Optical Translator Unit (OTU) located in a cabinet or shelf when a flashing or lighted light-emitting diode (LED) is present.

1. Are you restoring power to the cabinet or shelf after a power outage?

   If **YES**, then go to **TAP-103**.
   If **NO**, then continue with Step 2.

2. ⇒ NOTE:
   If at any time during the following procedure you observe that the **PWR ON** LED on the addressed shelf is not lighted, go to **TAP-101** to restore power to the shelf.

   If required, open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.

   Reference: **DLP-505**

3. Is the **FAULT** LED lighted on all OTUs in the shelf or bay?

   If **YES**, then go to **TAP-101**.
   If **NO**, then continue with Step 4.

4. Locate the OTU with a **FAULT** LED condition.

5. Observe the condition of the **FAULT** LED on the OTU and go to the referenced TAP for that condition.

   Table A - OTU Trouble Conditions

Indication	Go To TAP
FAULT LED is flashing	TAP-105
FAULT LED is lighted continuously	TAP-106

6. Close the cabinet doors or install the shelf cover.

   Reference: **DLP-505**

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Restore Optical Translator (OT) Operation After Power Loss

1. Is the green **POWER ON** LED on the fuse/power panel or indicator strip lighted?

   If **NO**, then go to **TAP-101**.

   If **YES**, then continue with Step 2.

2. ⇒ NOTE:
   If any **FAULT** LEDs are lighted during the reset process, they should be ignored during this procedure.

   Wait 2 minutes for all optical translator units (OTUs) to reset.

3. Have all **FAULT** LEDs gone off?

   If **YES**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

   If **NO**, then go to **TAP-102**.

Clear Trouble Report

Overview: This procedure is used to clear a Trouble Report of a suspected defective optical translator unit (OTU). The report originates from a remote operations center or from an environmental alarm at an Optical Line System end terminal.

1. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.

   Reference: **DLP-505**

2. Are any OTU **FAULT** LEDs lighted or flashing?

   If **YES**, then go to **TAP-102**
   If **NO**, then continue with Step 3.

3. Locate the OTU from the Trouble Report. The Trouble Report should indicate the slot of the suspected defective OTU.

   Reference: **DLP-503**

4. Disconnect the optical fibers at the OTU identified in Step 3.

   Reference: **DLP-510**

5. Remove the OTU identified in Step 3 (called the original OTU).

   Reference: **DLP-508**

6. ⚠ **CAUTION:**
   The replacement OTU must have the same circuit pack code or traffic could be interrupted.

   Connect the optical fibers to the replacement OTU.

   Reference: **DLP-510**

7. Install the replacement OTU and wait 1 minute.

   Reference: **DLP-508**

8. ⇒ NOTE:
   Contact must be made with the office that initiated the Trouble Report.

   Did the trouble clear?

   If **YES**, then continue with Step 17.
   If **NO**, then continue with Step 9.

9. ⇒ NOTE:
   OC-48 optical fiber jumpers can be tested by using optical power meters to help locate a fiber bend or cut. Refer to local operating procedures for further guidance in operating the equipment.

   Make a visual inspection of ALL fibers and connections and correct any problem(s) found.

   Reference: **DLP-501**

10. Was a problem found with the fibers or connections.

    If **YES**, then continue with Step 11.
    If **NO**, then continue with Step 13.

11. Contact the office that issued the Trouble Report and notify them that a fiber problem was found and corrected.

12. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

13. Reinstall the original OTU that was removed in Step 5.

    Reference: **DLP-508**

14. Connect the optical fibers to the original OTU.

    Reference: **DLP-510**

15. Return a NO TROUBLE FOUND conclusion to the report (no active local alarms or visual problems).

16. Contact your local maintenance support group for a higher level of technical assistance.

17. Close the cabinet doors or install the shelf cover.

    Reference: **DLP-505**

18. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Address Incoming Signal Failure (Flashing FAULT LED)

Overview: An incoming signal failure such as a loss of signal, a loss of frame, or a B1 parity error will cause a flashing **FAULT** LED. The contacts for miscellaneous discrete 2 (MD2) will close for a minimum of 20 seconds when an incoming signal B1 parity error is detected. During the same 20 seconds, the **FAULT** LED will flash.

1. Make a visual inspection of the incoming signal jumper(s) and connection(s) and correct any problems found.

   Reference: **DLP-501**

2. Did a visual inspection reveal any problems?

   If **YES**, then continue with Step 21.
   If **NO**, then continue with Step 3.

3. Make an optical power measurement on the incoming optical jumper at the OTU.

   Reference: **DLP-500**

4. Was the optical power measurement within the limits?

   If **NO**, then continue with Step 5.
   If **YES**, then continue with Step 9.

5. Clean the incoming fiber jumper.

   Reference: **DLP-504**

6. Connect the incoming fiber jumper to the OTU.

   Reference: **DLP-510**

7. NOTE:
   At this point, it appears that the local optical translator unit (OTU) is operating correctly. The trouble appears to be in the optical fiber jumper, optical 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 fiber jumper carrying the failed incoming signal.

   Reference: **DLP-503**

8. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

9. Locate the OTU with the flashing **FAULT** LED.

10. Disconnect the optical fibers at the OTU.

    Reference: **DLP-510**

11. Remove the OTU from the shelf (called the original OTU).

    Reference: **DLP-508**

12. CAUTION:
    The replacement OTU must have the same circuit pack code or traffic could be interrupted.

    Connect the optical fibers to the replacement OTU.

    Reference: **DLP-510**

13. Install the replacement OTU.

    Reference: **DLP-508**

14. Did the **FAULT** LED stop flashing?

    If **YES**, then continue with Step 21.
    If **NO**, then continue with Step 15.

15. Remove the optical jumpers, clean again, and reconnect to the OTU.

    Reference: **DLP-504**

16. Did the **FAULT** LED stop flashing?

    If **YES**, then continue with Step 21.
    If **NO**, then continue with Step 17.

17. As required, check for bent or broken pins and replace using the BERG MT370 pin kit for the METRAL pins. Refer to Appendix A, *Pin Repair*.

18. Reinstall the original OTU that was removed in Step 11.

    Reference: **DLP-508**

19. Connect the optical fibers to the original OTU.

    Reference: **DLP-510**

20. 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 fiber jumper carrying the failed incoming signal.

    Reference: **DLP-503**

21. Close the cabinet door or install the shelf cover.

    Reference: **DLP-505**

22. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Address Failure When FAULT LED is Continuously Lighted

Overview: A continuously lighted **FAULT** LED is caused from the following:

- Laser bias current out of range
- Optical power transmit out of range
- OC48 OTU circuit pack internal defect
- OC48 OTU circuit pack power converter/fuse failure (Some failures may not cause the LED to light).
- OC48 OTU circuit pack insertion/reset/initialization.

1. Open the cabinet doors or remove the shelf cover. All connections can be accessed from the front.

   Reference: **DLP-505**

2. Locate the OTU with the **FAULT** LED continuously lighted.

3. Disconnect the optical fibers at the OTU identified in Step 2.

   Reference: **DLP-510**

4. Remove the OTU from the shelf (called the original OTU).

   Reference: **DLP-508**

5. ⚠ CAUTION:
   The replacement OTU must have the same circuit pack code or traffic could be interrupted.

   Install the replacement OTU.

   Reference: **DLP-508**

6. Connect the optical fibers to the replacement OTU.

   Reference: **DLP-510**

7. Did the **FAULT** LED go off?

   If **YES**, then continue with Step 13.
   If **NO**, then continue with Step 8.

8. As required, check for bent or broken pins and replace using the BERG MT370 pin kit for the METRAL pins. Refer to Appendix A, *Pin Repair*.

9. Reinstall the original OTU that was removed in Step 4.

   Reference: **DLP-508**

10. Connect the optical fibers to the original OTU.

    Reference: **DLP-510**

11. Did the **FAULT** LED go off?

    If **YES**, then continue with Step 13.
    If **NO**, then continue with Step 12.

12. Contact the appropriate maintenance support organization for further technical assistance in clearing the trouble.

13. Close the cabinet doors or install the shelf cover.

    Reference: **DLP-505**

14. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Connect Optical Power Meter for Measurement at OT

Overview: This procedure provides the correct fiber connections required when making an optical power measurement. Also, a table is provided for determining the correct power level and Lightguide Buildout (LBO) values when an FT-2000 Add/Drop Rings terminal or other vendor equipment is used (Figure 1).

Required Test Equipment:

Wrist Strap
Optical Power Meter

⚠ CAUTION:
Use a static ground wrist strap whenever handling units or circuit packs or working on an Optical Translator (OT) to prevent electrostatic discharge 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-505**

2. Are you adding or trouble clearing an optical translator?

   If **adding**, then continue with Step 3.
   If **trouble clearing**, then continue with Step 10.

3. Is the OT input fiber jumper coming from an OLS, FT-2000 ADR, or other vendor equipment?

   If **OLS**, then continue with Step 8.
   If **FT-2000 ADR (Release 7.2 and later)** with OLS compatible transmitter, then continue with Step 8.
   If **FT-2000 ADR (Release 7.1 and earlier)**, then continue with Step 4.
   If **other vendor**, then continue with Step 4.

4. Remove the protector cap and clean the fiber coming from the FT-2000 ADR or other vendor equipment.

   Reference: **DLP-504**

5. Connect the optical power meter to the fiber coming from the transmit side of the customer provided equipment for the OT signal being added and obtain an optical power measurement.

6. Using the power level reading obtained in Step 5 and Table A, determine the correct LBO for the **IN** connector of the Optical Translator Unit (OTU).

Table A — OT Input Power and LBO Selection

Measured OTU Input Power (dBm)	OTU IN Port LBO
P* < -12 dBm	0
-12 dBm <= P < - 8 dBm	5
- 8 dBm <= P < - 4 dBm	10
- 4 dBm <= P < + 1 dBm	15
+ 1 dBm <= P <	20

* Received power greater than -12 dBm requires a non-zero OTU IN port faceplate LBO.

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

8. Go to Optical Line System, User/Service Manual, 365-575-301, Circuit Order: NTP-004 and perform that procedure.

9. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

10. ⚠ CAUTION:
Make sure the protection tributaries (in 2-fiber) or protection line (in 4-fiber) is available or that the troubled OC-48 on this OT has been manually switched to protection.

Remove the fiber jumper connected to the **IN** connector of the OTU involved in this trouble.

11. Connect the optical power meter to the fiber jumper removed from the **IN** connector of the OTU in Step 10 and obtain an optical power measurement.

12. Is the OT input fiber jumper coming from an OLS, FT-2000 ADR, or other vendor equipment?

    If **OLS**, then continue with Step 15.

    If **FT-2000 ADR (Release 7.2 and later)** with OLS compatible transmitter, then continue with Step 15.

    If **FT-2000 ADR (Release 7.1 and earlier)**, then continue with Step 13.

    If **other vendor**, then continue with Step 13.

13. Using the power level reading obtained in Step 11 and Table B, determine if the power level is within range.

Table B — OT Input Power

Power Level (dBm)	≤ -12 to > -22

14. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

15. Determine the value of the LBO on the ODU **OCHAN() OUT** port for the channel being measured.

16. Add the value of the LBO (determined in Step 15) to the level of the power measured in Step 11 and record the result. [For example, if the value of the LBO was 3 dB and the level of the power was -5 dBm then the calculated power level is 3 + (-5) or -2 dBm.]

17. Which software release is running in the OLS?

    If **Release 1.0 or Release 2 and Nx33 Span System**, then continue with Step 18.

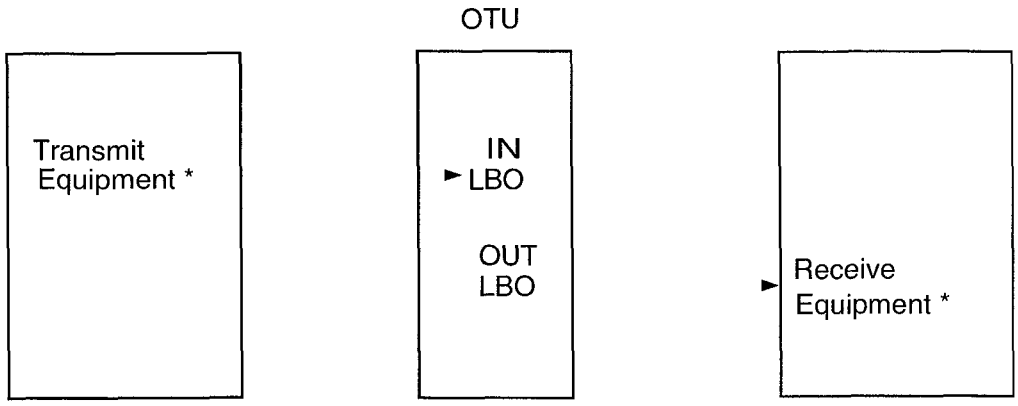
    If **Release 2 and Mx24 or Px25 Span System**, then continue with Step 20.

18. Using the power level calculated in Step 16 and the correct table below, determine if the measured OTU input power is correct and/or if the LBO for the OTU **IN** connector and the ODU **OCHAN() OUT** port are correct.
    - For OCHAN 1 and 2, use Table C for Release 1 and Release 2 Nx33 Span System.
    - For OCHAN 3 through 8, use Table D for Release 1 and Release 2 Nx33 Span System.

19. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

20. Using the power level calculated in Step 16 and the correct Release 2.0 table (Table H or Table I), determine if the measured OTU input power is correct and/or if the LBO for the OTU **IN** connector and the ODU **OCHAN() OUT** port are correct.
    - For OCHAN 1 and 2, use Table E for Release 2 Mx24 and Px25 Span Systems.
    - For OCHAN 3 through 8, use Table F for Release 2 Mx24 and Px25 Span Systems.

21. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**



* OLS, FT-2000 ADR, or other vendors add/drop multiplexers

Figure 1 - Location of LBOs at OTU (One Direction)

Table C — OTU Input and ODU Output LBO Selection Guide for OCHAN 1 and OCHAN 2

Total # of Equipped OLS Channels*	Calculated OTU Input Power (dBm)	Recommended LBO (dB) for 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 D — OTU Input and ODU Output LBO Selection Guide for OCHAN 3 Through 8

Total # of Equipped OLS Channels*	Calculated OTU Input Power (dBm)	Recommended LBO (dB) for 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 D — OTU Input and ODU Output LBO Selection Guide for OCHAN 3 Through 8 (Contd)

Total # of Equipped OLS Channels*	Calculated OTU Input Power (dBm)	Recommended LBO (dB) for OTU IN Input	Recommended LBO (dB) for ODU Output
5	-11 5 < P_{in} ≤ -10 1	5	3
	-10 1 < P_{in} ≤ -8 4	10	0
	-8.4 < P_{in} ≤ -7 1	7	5
	-7 1 < P_{in} ≤ -6 5	10	3
	-6 5 < P_{in} ≤ -5 3	7	7
	-5 3 < P_{in} ≤ -3 7	15	0
	-3 7 < P_{in} ≤ -2 5	10	7
	-2 5 < P_{in} ≤ -0 9	15	3
	-0 9 < P_{in} ≤ -0 1	10	10
	-0 1 < P_{in} ≤ +1 0	15	5
	+1 0 < P_{in} ≤ +3 3	15	7
	+3 3 < P_{in}	15	10
6	-13 3 < P_{in} ≤ -12 0	7	0
	-12 0 < P_{in} ≤ -10.6	5	3
	-10 6 < P_{in} ≤ -8 9	10	0
	-8 9 < P_{in} ≤ -7.6	7	5
	-7 6 < P_{in} ≤ -7.0	10	3
	-7 0 < P_{in} ≤ -5 8	7	7
	-5 8 < P_{in} ≤ -4.2	15	0
	-4 2 < P_{in} ≤ -3 0	10	7
	-3 0 < P_{in} ≤ -1 4	15	3
	-1 4 < P_{in} ≤ -0 6	10	10
	-0 6 < P_{in} ≤ +0 5	15	5
	+0 5 < P_{in} ≤ +2 8	15	7
	+2 8 < P_{in}	15	10
7	-13.5 < P_{in} ≤ -12 5	7	0
	-12.5 < P_{in} ≤ -11 1	5	3
	-11 1 < P_{in} ≤ -9 4	10	0
	-9 4 < P_{in} ≤ -8 1	7	5
	-8 1 < P_{in} ≤ -7 5	10	3
	-7 5 < P_{in} ≤ -6.3	7	7
	-6.3 < P_{in} ≤ -4 7	15	0
	-4 7 < P_{in} ≤ -3.5	10	7
	-3 5 < P_{in} ≤ -1 9	15	3
	-1 9 < P_{in} ≤ -1 1	10	10
	-1 1 < P_{in} ≤ 0 0	15	5
	0 0 < P_{in} ≤ +2 3	15	7
	+2 3 < P_{in}	15	10
8	-13 5 < P_{in} ≤ -12 1	5	3
	-12 1 < P_{in} ≤ -10.4	10	0
	-10 4 < P_{in} ≤ -9 1	7	5
	-9 1 < P_{in} ≤ -8 5	10	3
	-8 5 < P_{in} ≤ -7 3	7	7
	-7 3 < P_{in} ≤ -5 7	15	0
	-5 7 < P_{in} ≤ -4 5	10	7
	-4.5 < P_{in} ≤ -2 9	15	3
	-2.9 < P_{in} ≤ -2 1	10	10
	-2.1 < P_{in} ≤ -1 0	15	5
	-1 0 < P_{in} ≤ +1 3	15	7
	+1.3 < P_{in}	15	10

* See footnote on previous page

Table E — OTU Input and ODU Output LBO Selection Guide for OCHAN 1 in Both Mx24 and Px25 Span Systems

Total # of Equipped OLS Channels*	Calculated OTU Input Power (dBm)	Recommended LBO (dB) for 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 F — 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*	Calculatd OTU Input Power (dBm)	Recommended LBO (dB) for 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.

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 OC-48 fiber or optical line fiber, as appropriate.

1. If required, open the cabinet doors or remove the appropriate shelf cover.

   Reference: **DLP-505**

2. Verify the fibers are properly connected.

3. Visually inspect the fiber, starting at the connector on the local OT and going as far as practical. Also, inspect the transmit end of the fiber at the OLS, FT-2000 ADR, or other vendor's equipment.

4. Correct any problems with the fiber, following local procedures.

5. If required, close the cabinet doors or replace the cover.

6. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

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. ⚠ CAUTION:
   Do not accidentally press non-lighted fuses. This will cause momentary power failure on the power feed of the fuse.

   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.**

Fiber Connections and OTU Locations Used in OT

Overview: This information shows which optical translator units (OTUs) are used in the Optical Translator (OT) and where in the shelf they are located. Detailed information on fiber connections is presented in Chapter 6 of the Installation Manual (365-575-410).

⚠ CAUTION:
Use a static ground wrist strap whenever handling circuit packs or working on an OT to prevent electrostatic discharge damage to sensitive components.

1. Refer to the appropriate figure and table to verify correct fiber connections at the OT. Chapters 2 and 3 of this manual show additional OT applications and physical arrangements.

2. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

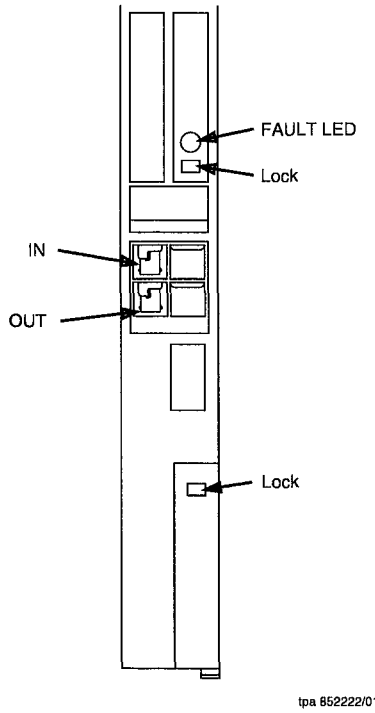


Figure 1 - Optical Translator Unit Faceplate

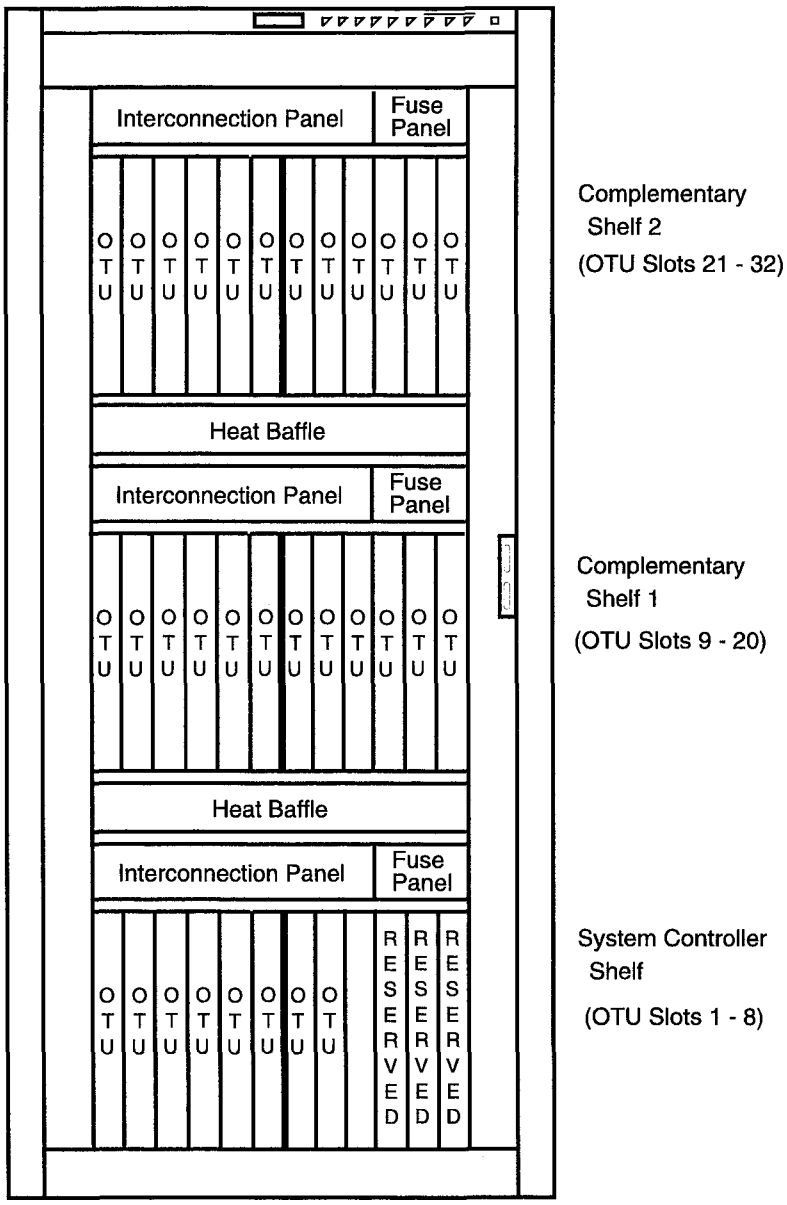


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Figure 2 - Optical Translator Shown in Cabinet with OTU Locations

Table A — Available OTU Codes for Release 1 (Note)

OTU Circuit Pack	
Code	**Name**
41A1C	OTU 1.5 W1
41A2C	OTU 1.5 W2
41A3C	OTU 1.5 W3
41A4C	OTU 1.5 W4
41A5C	OTU 1.5 W5
41A6C	OTU 1.5 W6
41A7C	OTU 1.5 W7
41A8C	OTU 1.5 W8
41BB	OTU 1.3
41C1C	OTU 1.5 W1 DISP
41C2C	OTU 1.5 W2 DISP
41C3C	OTU 1.5 W3 DISP
41C4C	OTU 1.5 W4 DISP
41C5C	OTU 1.5 W5 DISP
41C6C	OTU 1.5 W6 DISP
41C7C	OTU 1.5 W7 DISP
41C8C	OTU 1.5 W8 DISP

* In Release 1, the Optical Translator is equipped with only firmware on the OC48 OTU circuit packs. Downloadable software and controller circuit packs will be available in a future release.

Clean Optical Fibers and Connectors

Overview: This procedure is used to clean the optical connectors for systems with high optical power levels.

Required Equipment:

- CLETOP Reel Type A
- CLETOP stick type
- Optical Quality Tissue
- Isopropyl Alcohol.

1. ⚠ **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, 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

2. Remove (if necessary) optical connector from buildout or remove (if necessary) dust cap from the optical connector.

3. Clean (if necessary) the cylindrical surface of the connector ferrule with a tissue dampened with isopropyl alcohol.

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 (one quarter of a turn).

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-506**

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-506**

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 units or circuit packs or working on an Optical Translator (OT) to prevent electrostatic discharge damage to sensitive components. See "Electrostatic Discharge (ESD) Considerations" in **Trouble Clearing: TAD-100**.

   Is the OT installed in a cabinet 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

1. ⚠ WARNING:
Unterminated optical connectors may emit invisible laser radiation. Eye damage may occur if beam is viewed directly or with improper optical instruments. Avoid direct exposure to beam.

⚠ CAUTION:
Use a static ground wrist strap whenever handling Optical Translator Unit (OTU) circuit packs or working on an Optical Translator (OT) to prevent electrostatic discharge damage to sensitive components.

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, or 4) 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.**

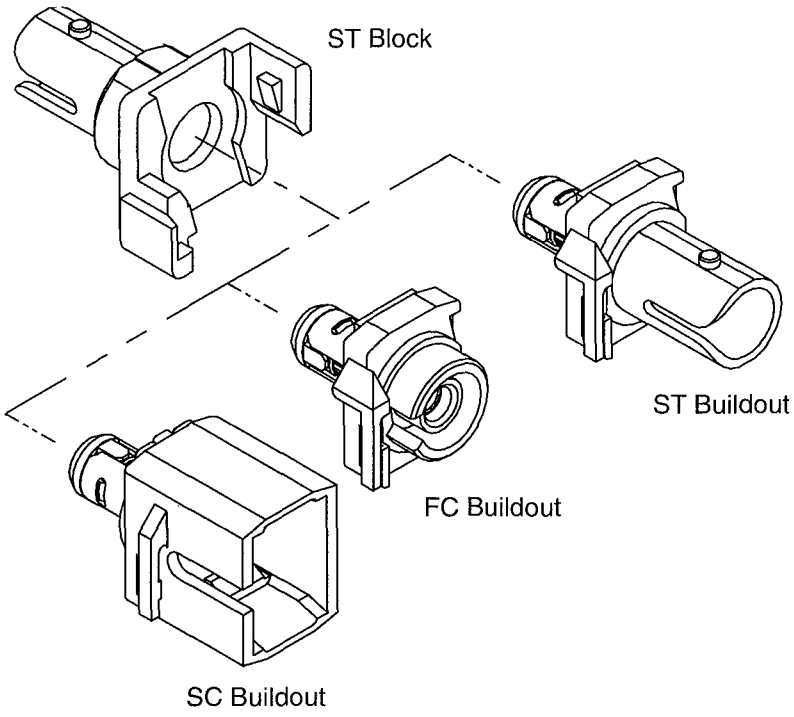

Figure 1 - ST® Block and Buildouts

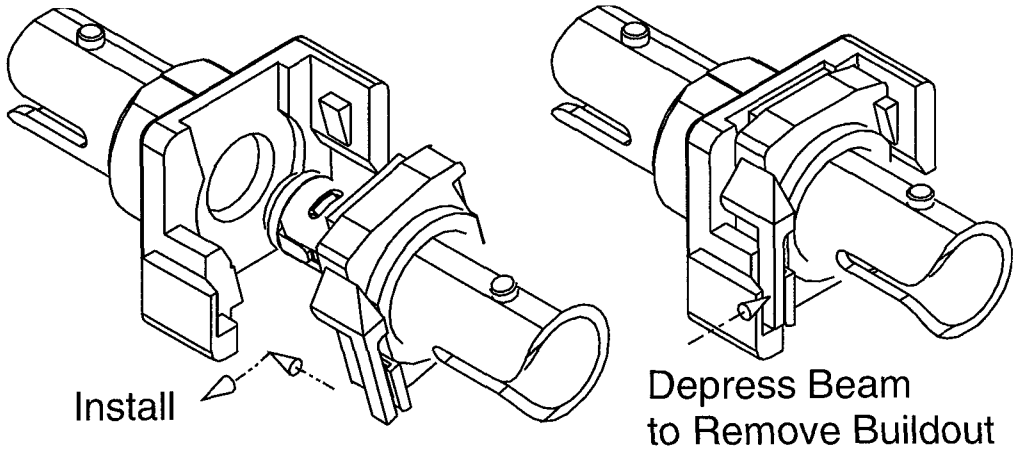

Figure 2 - ST® Block and ST Buildout

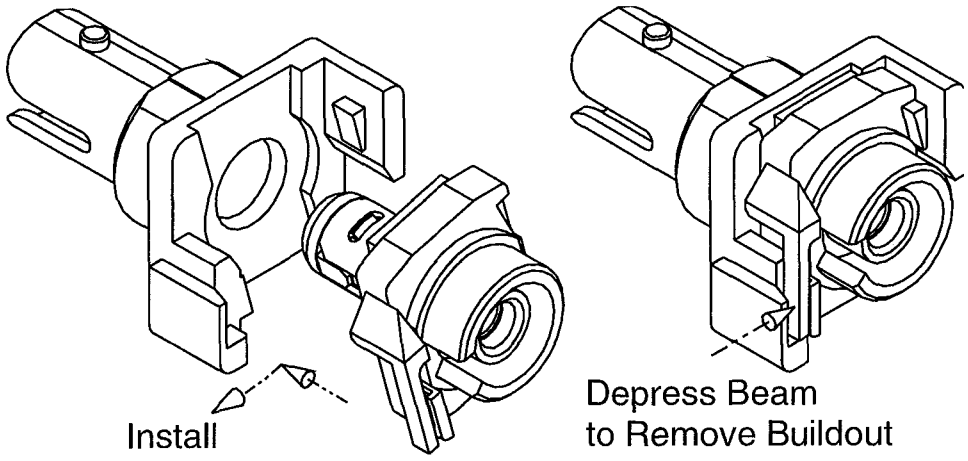

Figure 3 - ST® Block and FC Buildout

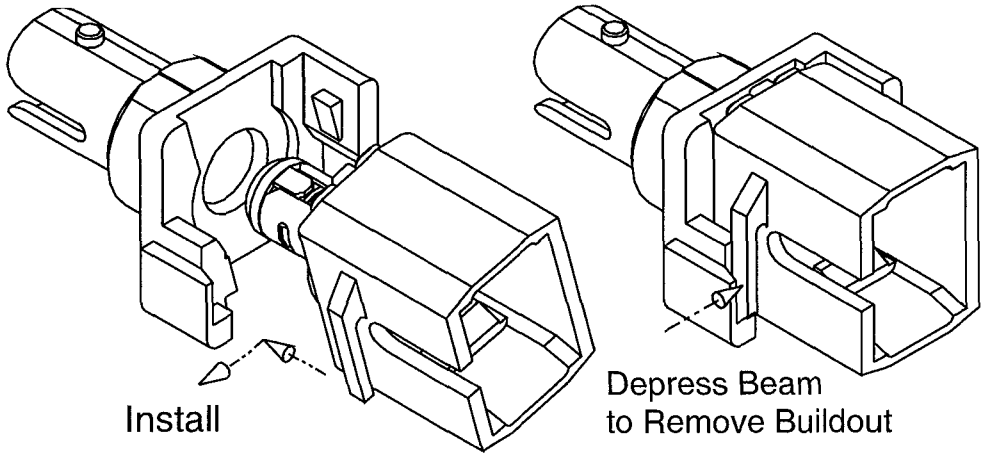

Figure 4 - ST® Block and SC Buildout

Test Miscellaneous Discrete (MD) Telemetry

Overview: This procedure tests the miscellaneous discrete points MD1 and MD2 for the Optical Translator Unit (OTU) under test.

1. Contact the remote operations center and request their help to observe the miscellaneous discrete points during this test.

2. At the remote operations center, disable, if desired, the alarm threshold level for the points being tested.

3. ⇒ NOTE:
   There are two miscellaneous discrete points associated with each OTU. An MD1 closure indicates an OTU circuit pack failure and an MD2 closure indicates an incoming signal failure.

   Obtain and install an OTU in the slot being tested.

4. ⇒ NOTE:
   When an OTU is first inserted, the MD1 point is set and the **FAULT** LED is ON. After about 1 minute, the MD2 point is set and the **FAULT** LED begins FLASHING.

   Observe the **FAULT** LED on the OTU being tested.

5. Was the corresponding environmental point(s) for MD1 and MD2 activated at the remote operations center?

   If **YES**, then continue with Step 6.
   If **NO**, then report the trouble to the installation personnel.

6. Remove the OTU installed in Step 3.

7. Was the corresponding environmental point(s) deactivated at the remote operations center?

   If **YES**, then continue with Step 8.
   If **NO**, then report the trouble to the installation personnel.

8. Repeat Steps 3 through 7 for any remaining OTU slots to be tested.

9. **STOP! YOU HAVE COMPLETED THIS PROCEDURE**.

Install/Remove Circuit Pack

1. ⚠ CAUTION:
   Use a static ground wrist strap whenever handling an Optical Translator Unit (OTU) circuit pack or working on an Optical Translator (OT) to prevent electrostatic discharge (ESD) damage to sensitive components.

   ⇒ NOTE:
   Verify that all fibers are labeled to prevent possible service interruption.

   Are you to remove or install a circuit pack?

   If to **remove**, then continue with Step 2.
   If to **install**, then continue with Step 5.

2. Have the optical fibers already been disconnected from the OTU?

   If **YES**, then continue with Step 3.
   If **NO**, then go to **DLP-510** to remove the fibers.

3. Remove the OTU circuit pack from the shelf as follows:

   a. Push up on the bottom and down on the top metal locking clips to unlock the circuit pack latches.

   b. Unseat the circuit pack by carefully and continuously pulling out equally on the top and bottom latches.

   c. Carefully slide the circuit pack out of the slot guides to remove it from the shelf. DO NOT ROCK THE UNIT OR CIRCUIT PACK BACK AND FORTH.

4. Are you to install another OTU circuit pack in this slot?

   If **YES**, then continue with Step 6.
   If **NO**, then **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

5. If required, remove the apparatus blank from the slot.

   Reference: **DLP-509**

6. ⚠ CAUTION:
The replacement OTU must have the same circuit pack code or traffic could be interrupted.

Install the circuit pack 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 UNIT OR CIRCUIT PACK 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 metal clips are in the locked position).

7. **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 extended protrusion of the apparatus blank bottom 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 spring-clip notch of the apparatus blank 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 bottom edge of the apparatus blank upward and forward.

13. Lift the apparatus blank from the slot.

14. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Connect/Disconnect Optical Fibers at OTU

1. ⚠ CAUTION:
   Use a static ground wrist strap whenever handling an Optical Translator Unit (OTU) circuit pack or working on an Optical Translator (OT) to prevent electrostatic discharge (ESD) damage to sensitive components.

   ⇒ NOTE:
   Verify that all fibers are labeled to prevent possible service interruption.

   Are you to connect or disconnect the optical fibers at the OTU?

   If **connecting**, then continue with Step 8.
   If **disconnecting**, then continue with Step 2.

2. ⚠ 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.

   Disconnect the optical fiber(s) from the Lightguide Buildouts (LBOs) and/or optical connector(s) at the OTU circuit pack.

3. If required, place protector caps over the ends of the optical fibers.

4. If required, remove the LBOs from the connector(s) on the OTU circuit pack.

   Reference: **DLP-506**

5. If required, place plugs in the OTU **IN/OUT** connectors.

6. Remove the optical fiber from the slot guide on the shelf. This is to prevent damage to the fiber when the OTU is removed.

7. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

8. If required, remove the protective caps and/or plugs from the fibers and LBOs.

9. If required, determine the LBO values for the **IN** connector for the OTU circuit pack.

   Reference: **DLP-500**

10. Clean the optical fiber(s) and connector(s).

    Reference: **DLP-504**

11. If required, install an LBO in the **IN** connector.

    Reference: **DLP-506**

12. Connect the optical fiber(s) to the LBOs on the OTU circuit pack. See table below:

Receive fiber ==>	OTU (IN Connector)
Transmit fiber ==>	OTU (OUT Connector)

13. Wait 1 minute for the OTU circuit pack to accept an incoming signal.

14. Place the optical fiber in the shelf guide to prevent damaging it when closing the cabinet doors or replacing the shelf cover.

15. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

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 (left mounted filter is for feeder A and right mounted 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. Gently insert the faceplate bracket and push down into place.

15. Screw in the faceplate screws.

16. **STOP! YOU HAVE COMPLETED THIS PROCEDURE.**

Pin Repair

A

Contents

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 MT370-01 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 Deburring Head
- L115 Drill Bit
- L116 Pin Vise
- AT-7860 D Long Nose Pliers (Insulated)

METRAL Press-Fit Repair Kit

- Repair Tool Kit: BERG MT370-01
- Individual Pins: See Table A-1 on page A-3
- Ordering Information: See Step 7 on page A-7

Pin Designations

Table A-1. FASTECH Pin Codes

PIN ID	Comcode	Pin Type or Commercial Code	FASTECH/ METRAL
B	106918477	1B32SG	FASTECH
E	105672729	1B27SG	FASTECH
H	103624987	1B14SG	FASTECH
I	106918485	1B33SG	FASTECH
J	407423524	1B34SG	FASTECH
O	103180287	1D1SG	FASTECH
Q	106918493	1C5SG	FASTECH
U	105424238	1D4SG	FASTECH
V	105396436	1B21SG	FASTECH
W	105396444	1B22SG	FASTECH
Y	408675594	1C6SG	FASTECH
3	103055943	1B3SG	FASTECH
6	105672711	1B26SG	FASTECH

Table A-2. METRAL Pin Codes

A		88929-102	METRAL
C		88929-119	METRAL
D		88930-101	METRAL
F		88929-106	METRAL
X		88929-120	METRAL

LCT Circuit Pack and Equipment Location

Table A-3. LCT Equipment Location (Switch Fabric Shelf)

Circuit Pack	Backplane Location	
SYSMEM	20-554	Controller Shelf Only
SYSCTL	20-534	Controller Shelf Only
TG1/2	20-504	Backplane Designation Only
USER PNL	43-505	Backplane Designation Only
SWICO (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	20-554	Complimentary Shelf Only

Table A-4. 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	
LS INTFC P1	07-074	
LS INTFC P2	07-080	
SYSCTL	07-172	Backplane Designation Only
SYSMEM	07-178	Backplane Designation Only
TOHCTL	07-100	
PWR A	17-173	Backplane Designation Only
PWR B	15-173	Backplane Designation Only
USER PNL	16-159	Backplane Designation Only

Table A-5. LCT Equipment Location (Enhanced High Speed Shelf)

Circuit Pack	Backplane Location	
SWX	07-126	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	
LNCTLX	07-150	
LNCTLY	07-156	
OHCTLX	07-162	
OHCTLY	07-168	
LOHCTL	07-174	Backplane Designation Only
EQL	07-180	Backplane Designation Only
PWR A	17-173	Backplane Designation Only
PWR B	15-173	Backplane Designation Only
USER PNL	16-159	Backplane Designation Only

OLS Circuit Pack and Equipment Location

Table A-6. OLS Equipment Location

Circuit Pack	Backplane Location	
SYSMEM (LEA2)	20-604	
SYSCTL (LEA1)	20-584	
TOHCTL (LEA5)	20-554	
OA (LEA6/LEA6B)	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-7. OT Equipment Location

Circuit Pack	Backplane Location	
SYSMEM	20-605	
SYSCTL	20-565	
TOHCTL	20-525	
OTU (System Shelf)	20-163 20-203 20-243 20-283 20-323 20-363 20-405 20-445 20-485	Note: Location 20-485 is not populated with any circut pack at this time Its inclusion is for accuracy

Table A-7. OT Equipment Location

Circuit Pack	Backplane Location	
OTU (Complimentary Shelves 1&2)	20-163 20-203 20-243 20-283 20-323 20-363 20-405 20-445 20-485 20-525 20-565 20-605	
PWR A	39-184	
PWR B	39-570	

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 A-1 through A-19 on pages A-8 through A -26) to determine the letter pin code associated with the pin.

(6) Using Table 1, "FASTECH Pin Codes," on page 3, determine the type of pin (either METRAL or FASTECH) and the correct comcode for the replacement pin.

(7) Obtain the correct replacement pin (See the Applications, Planning, and Ordering Guide for ordering information).

(8) If the pin to be replaced is a METRAL type pin, refer to "METRAL Press-Fit Repair Kit MT370-01" 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.

Reference Notes:

(1) 1-Type contacts shall be press fit from the component side.

(2) 1D1 contacts shall be broken off on the component side after insertion.

(3) 1B32, 1B33, 1B34, and 1C6 contacts shall be broken off on the noncomponent side after insertion.

High Speed Shelf notes:

(4) The C847324282 backplane assembly is shown on pages 18 and 19. This was discontinued approximately 12-96. The current backplane assembly is C847779808. It is similar in all respects except that some pin fields are not populated. The List tag on the top of the bay will call out which backplane is used when correlated with the respective J-drawing.

(5) Pin substitutions (for High Speed Shelf only):

The 1B32SG may be used for the 1B26SG.

The 1B34SG may be used for the 1B27SG.

The 1B33SG may be used for the 1B28SG.

Large Capacity Terminal (LCT) - Pin Type Location

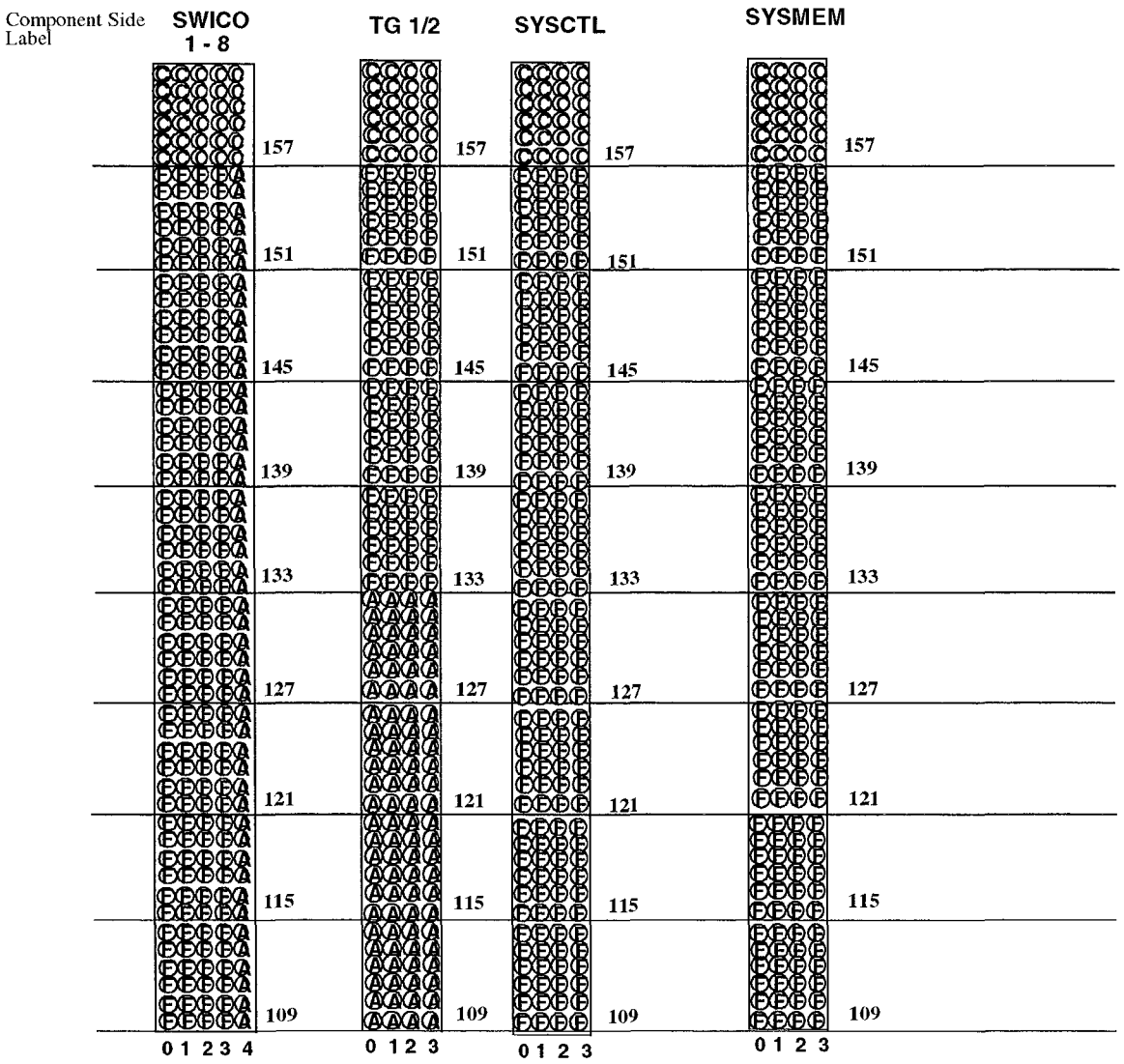

Figure A-1. LCT Switch Fabric Shelf - System Controller (Upper) - Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

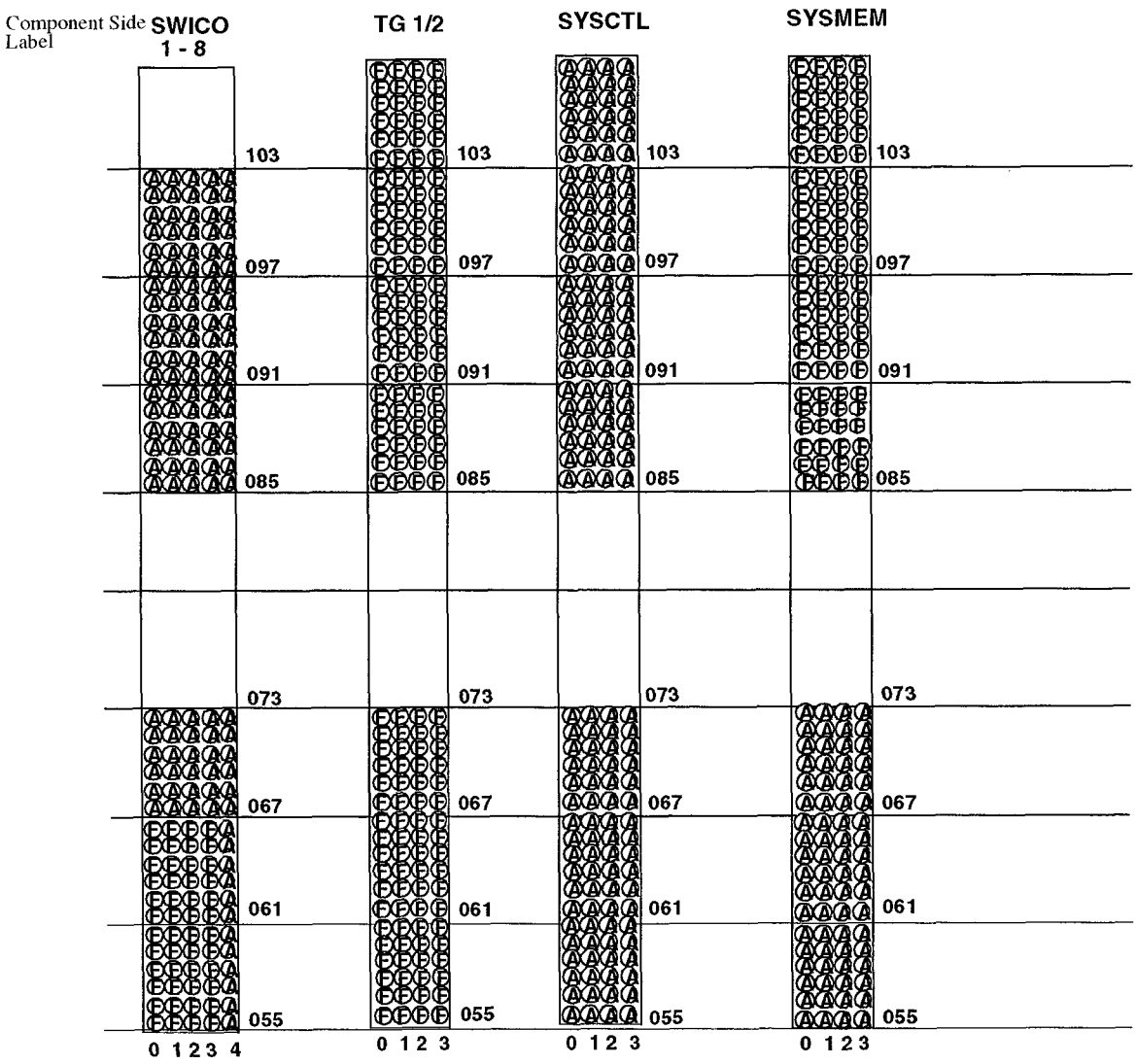

Figure A-2. LCT Switch Fabric Shelf System Controller (Middle) - Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

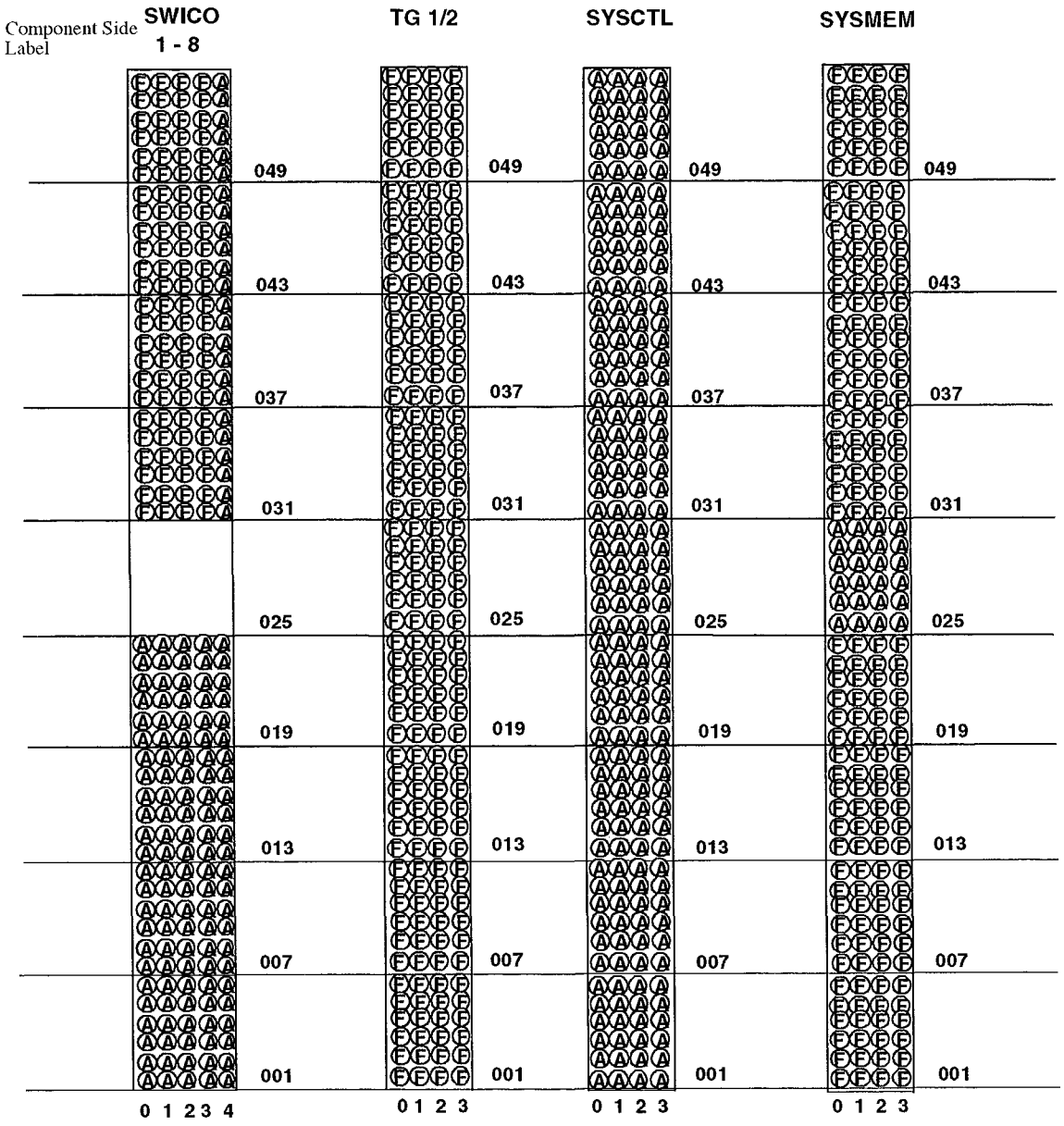

Figure A-3. LCT Switch Fabric Shelf System Controller (Lower) - Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

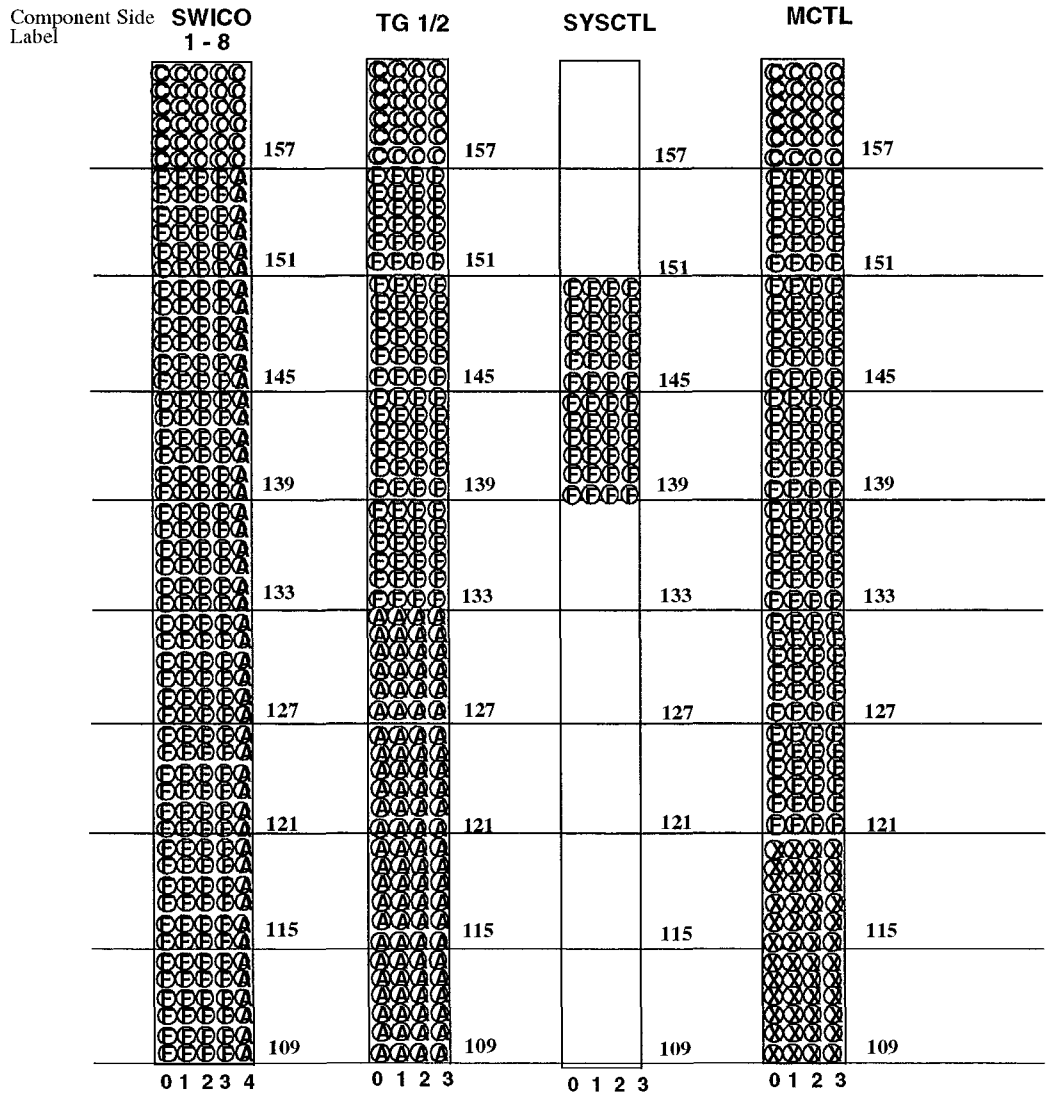

Figure A-4. LCT Switch Fabric Shelf Complementary (Upper) - Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

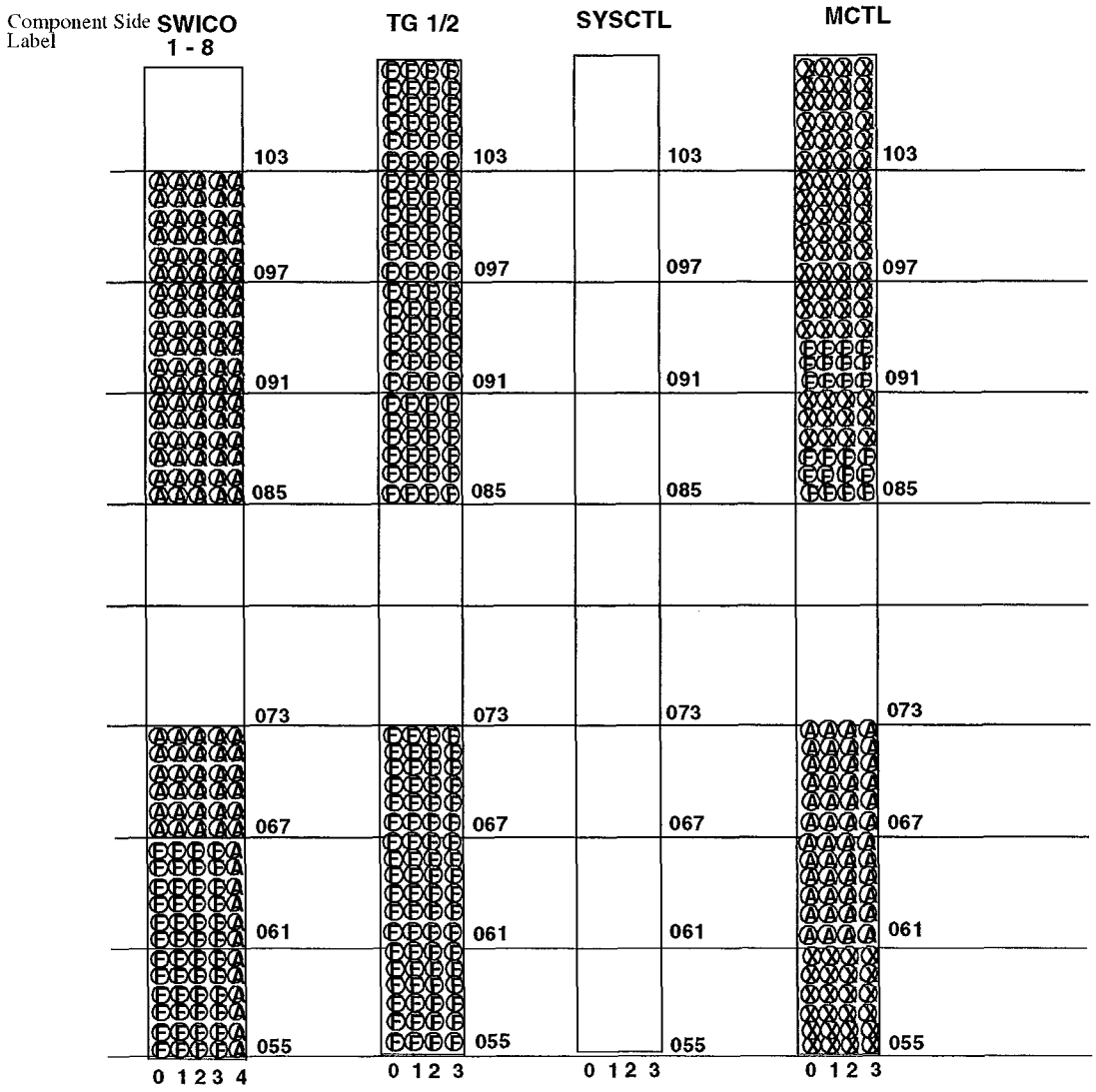

Figure A-5. LCT Switch Fabric Shelf Complementary (Middle) - Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

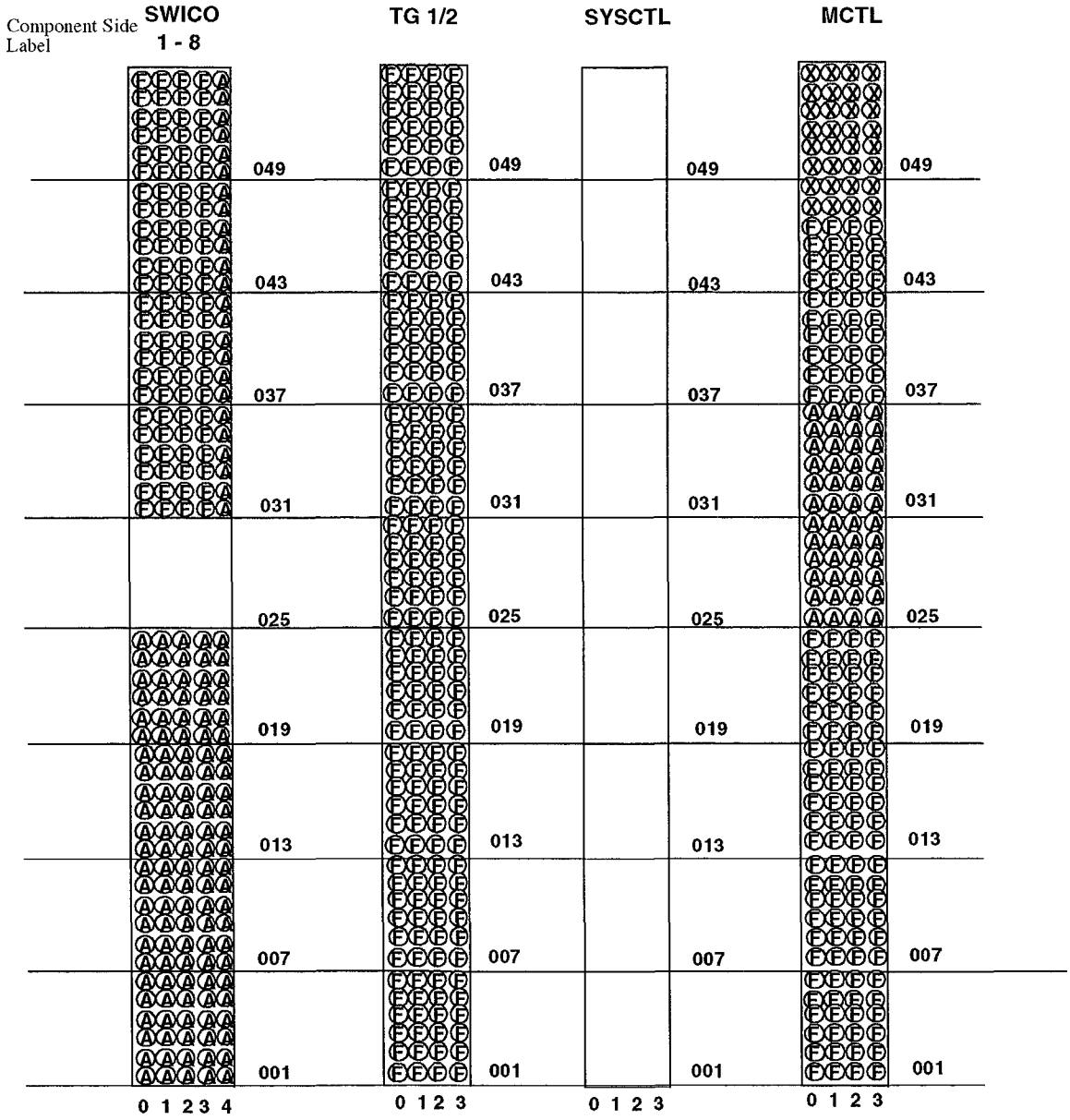

Figure A-6. LCT Switch Fabric Shelf Complementary (Lower) - Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

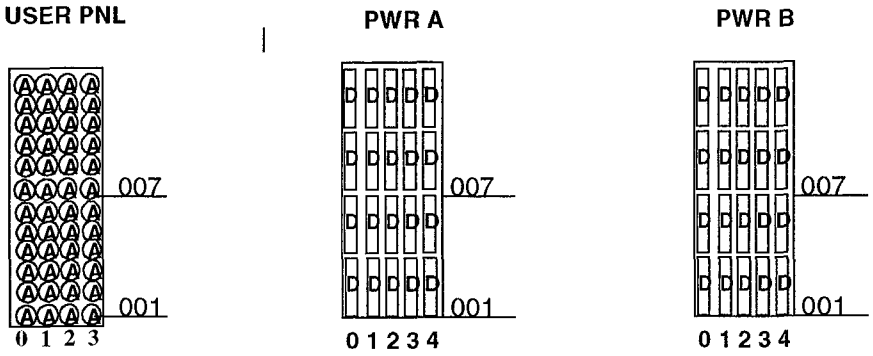

Figure A-7. LCT User and Power Panel - Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

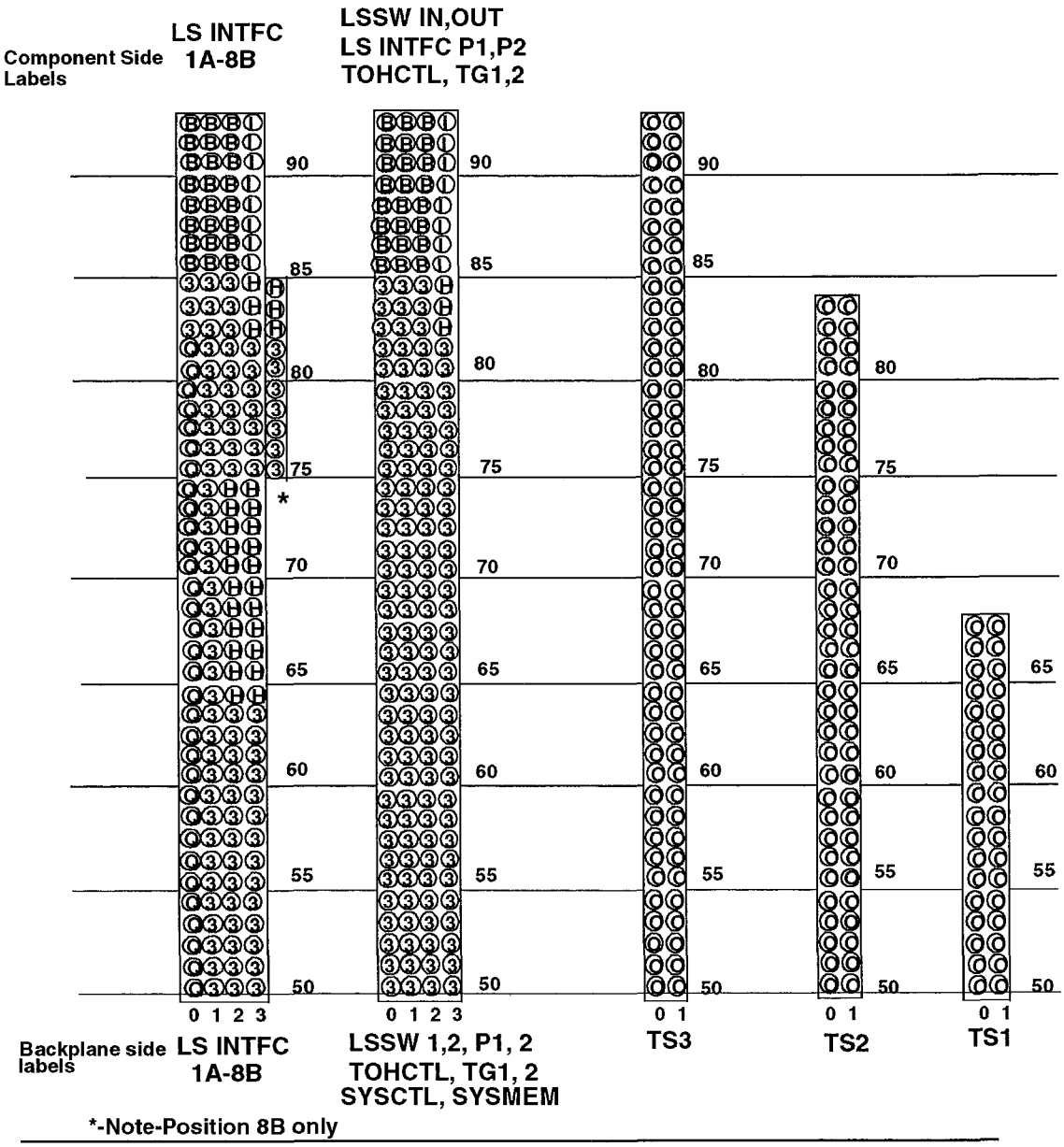

Figure A-8. Low Speed Shelf (Complementary) - Component Side

Large Capacity Terminal (LCT) - Pin Type Location

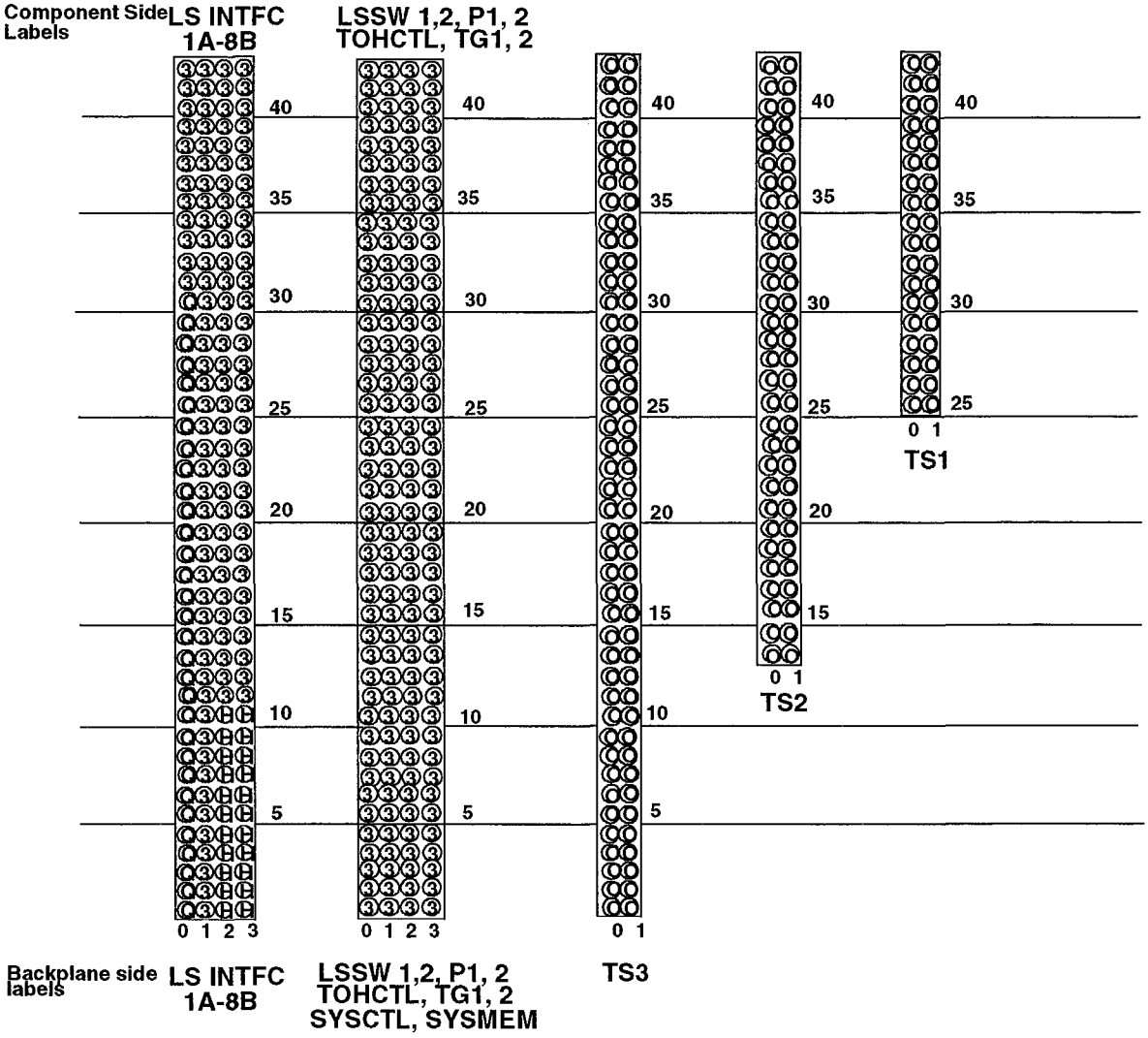

Figure A-9. Low Speed Shelf (Complementary) - Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

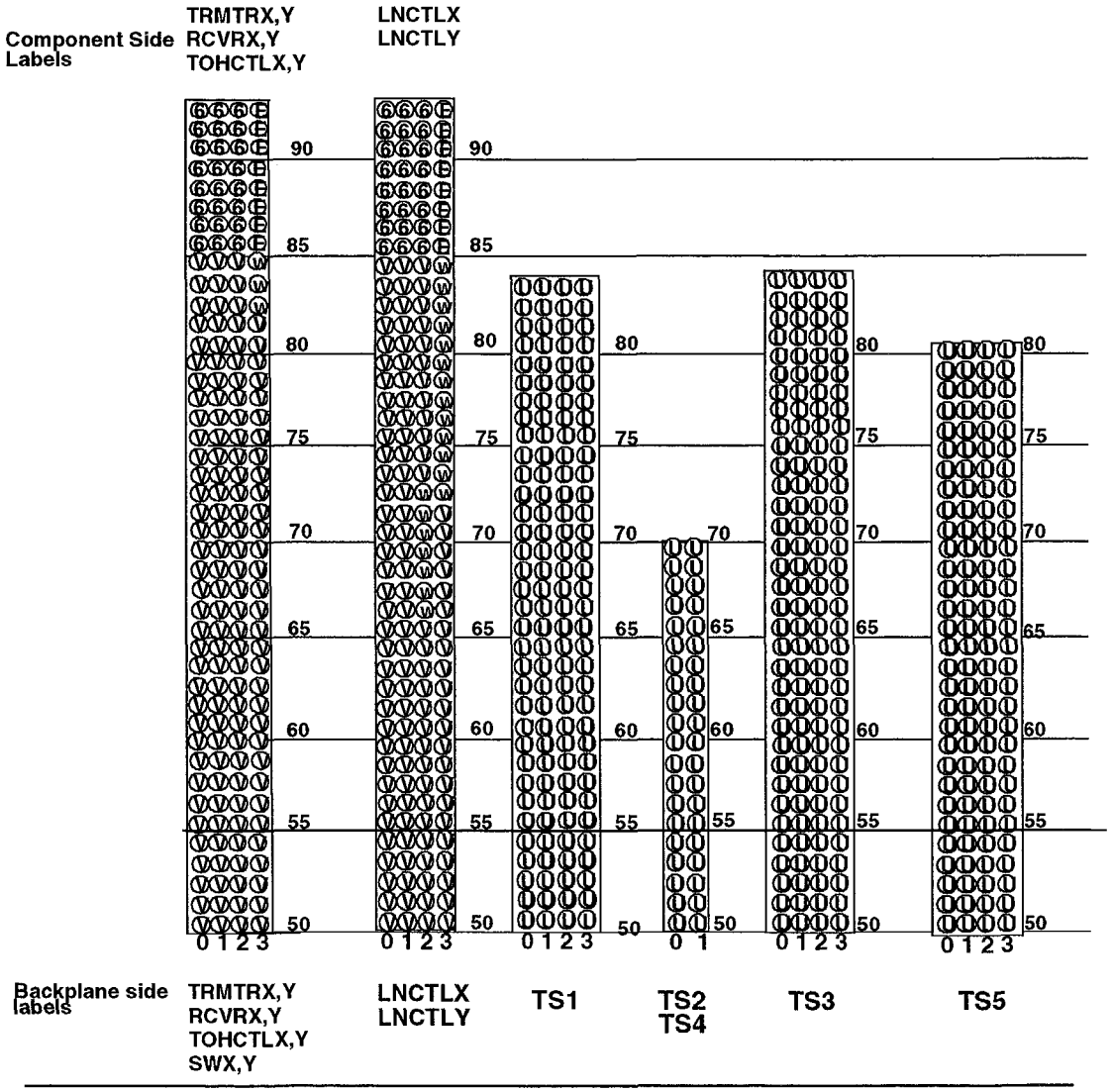

Figure A-10. LCT High Speed Shelf (Upper) - Component Side View

Large Capacity Terminal (LCT) - Pin Type Location

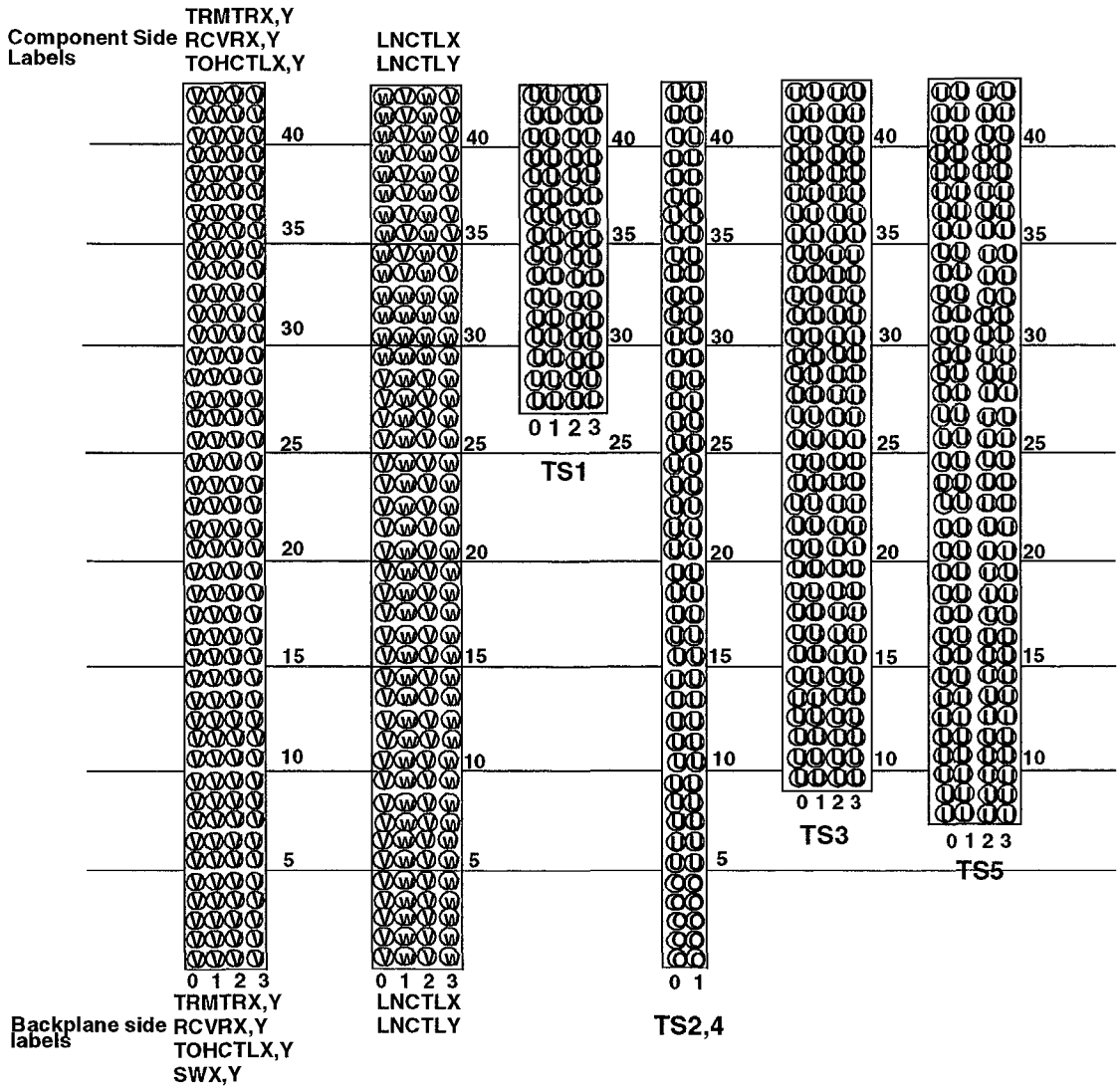

Figure A-11. LCT High Speed Shelf (Lower) - Component Side View

Optical Line System (OLS) - Pin Type Location

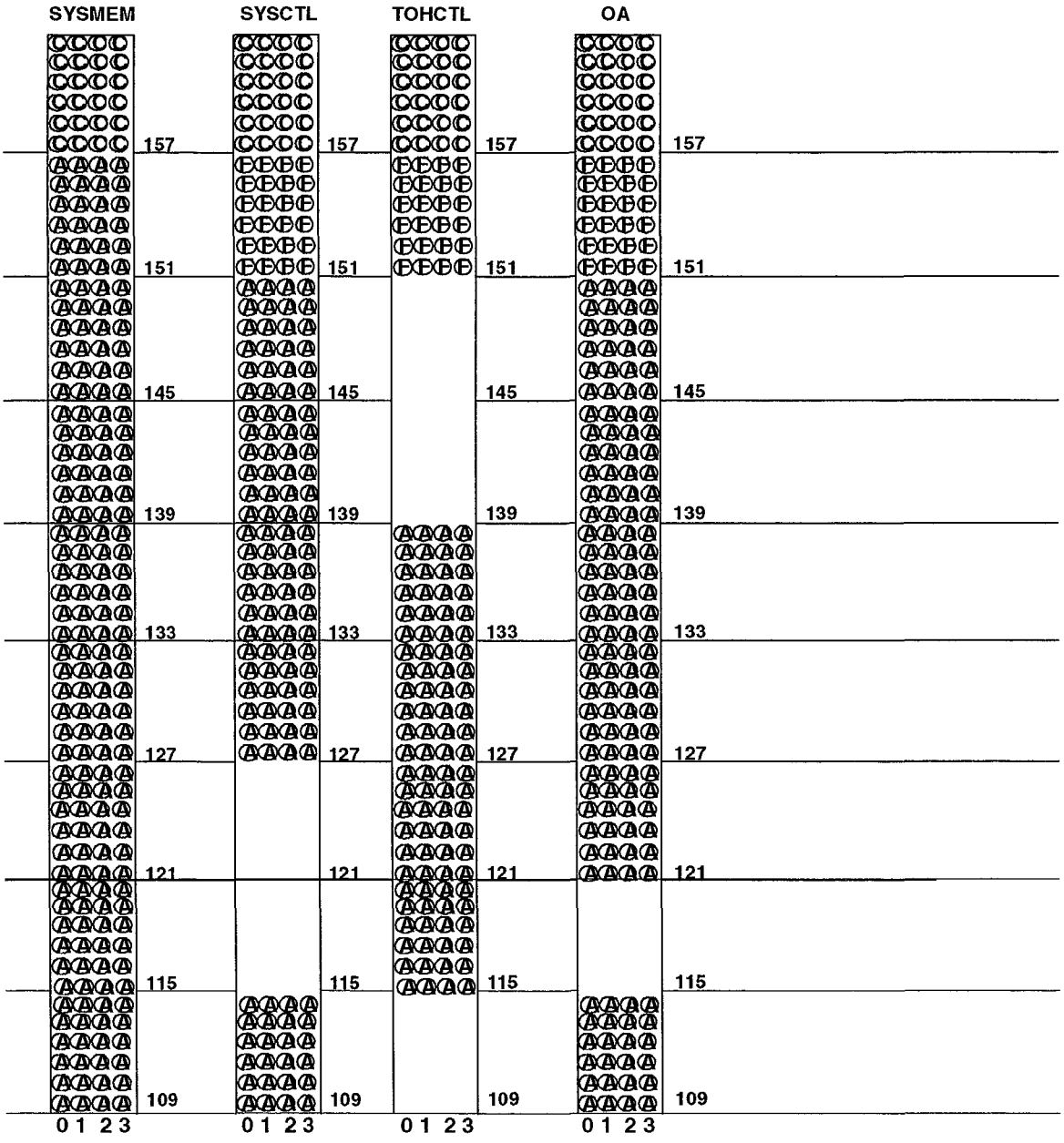

Figure A-12. Optical Line System All Shelves - Component Side View

Optical Line System (OLS)- Pin Type Location

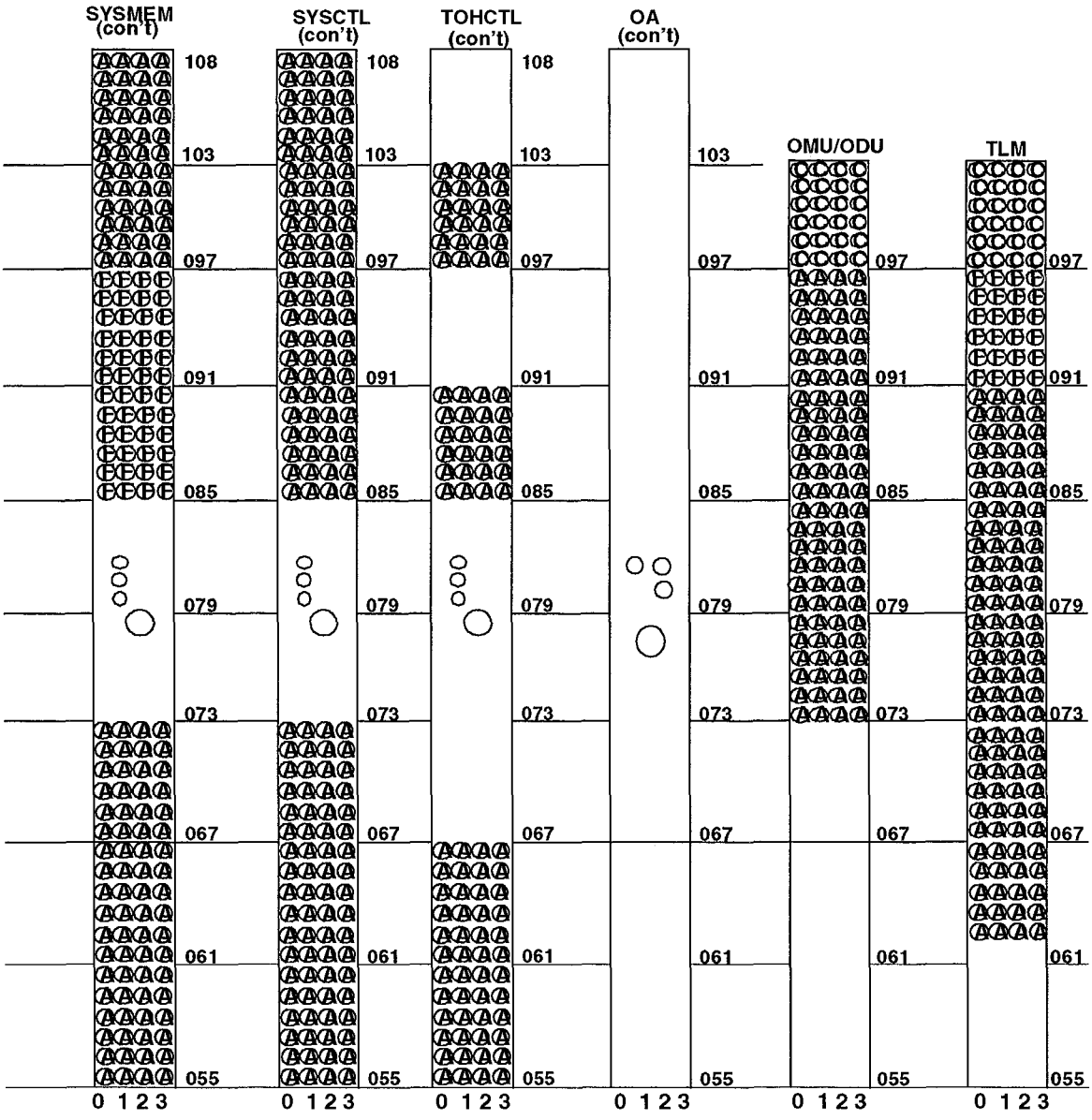

Figure A-13. Optical Line System (Middle) - Component Side View

Optical Line System (OLS) - Pin Type Location

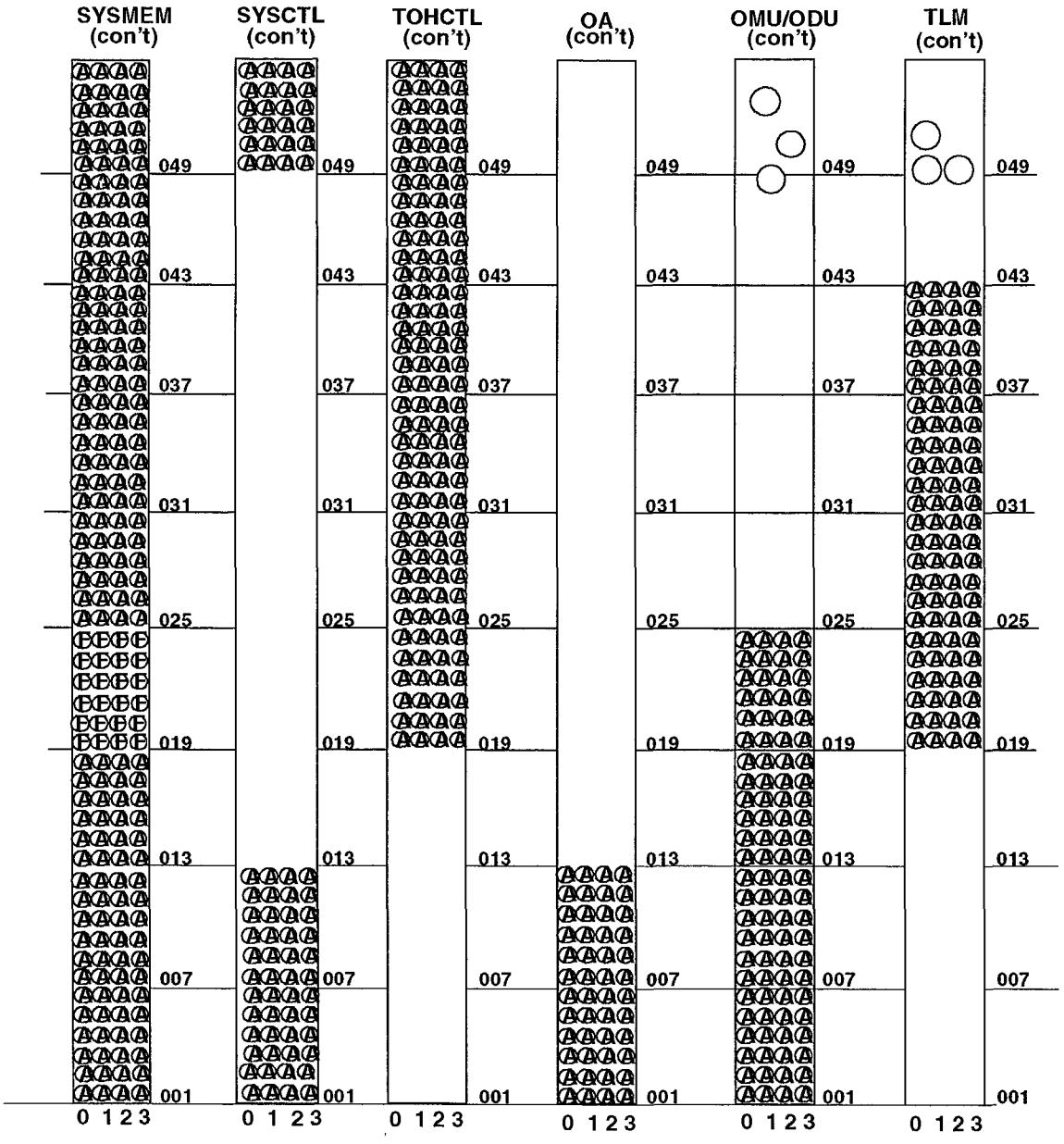

Figure A-14. Optical Line System (Lower) - Component Side View

Optical Line System (OLS) - Pin Type Location

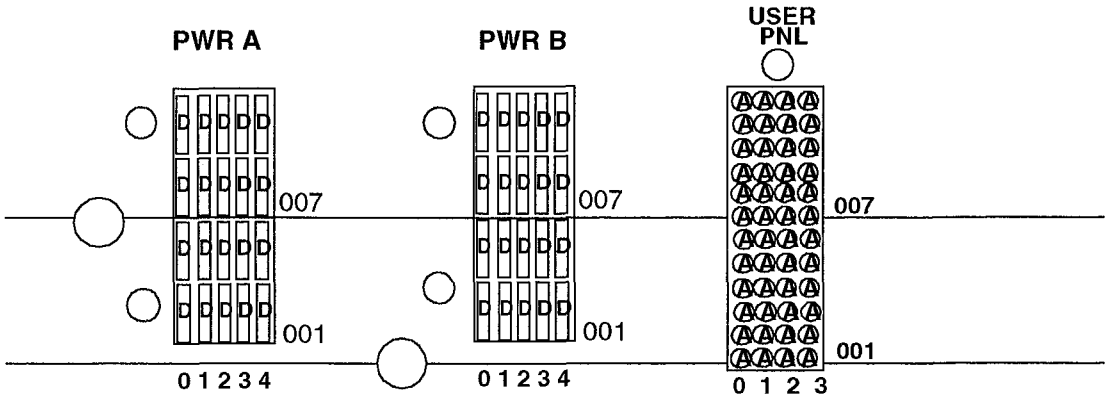

Figure A-15. OLS - Power and User Panel - Component Side View

Optical Translator (OT) - Pin Type Location

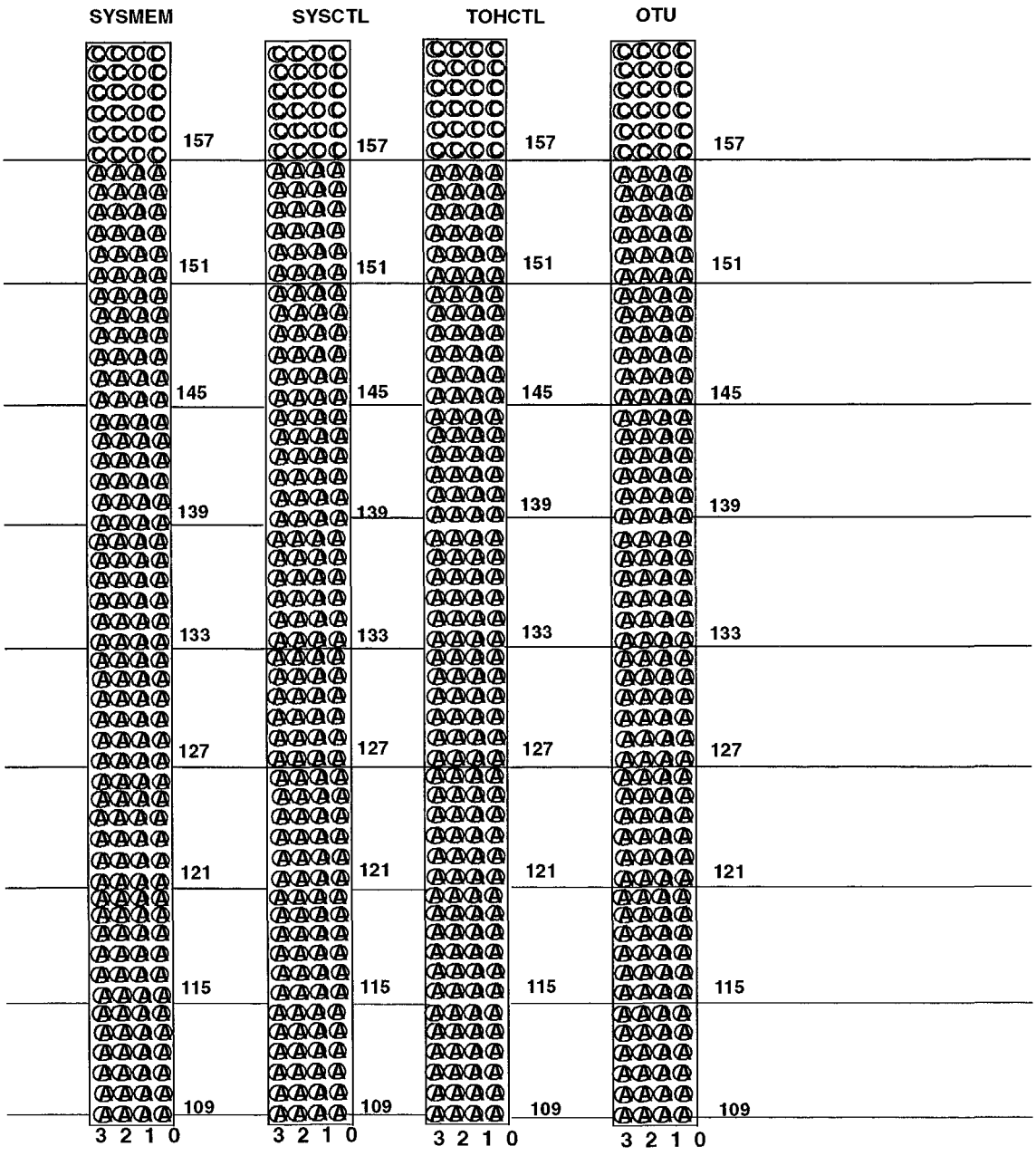

Figure A-16. Optical Translator (Upper) - Component Side View

Optical Translator (OT) - Pin Type Location

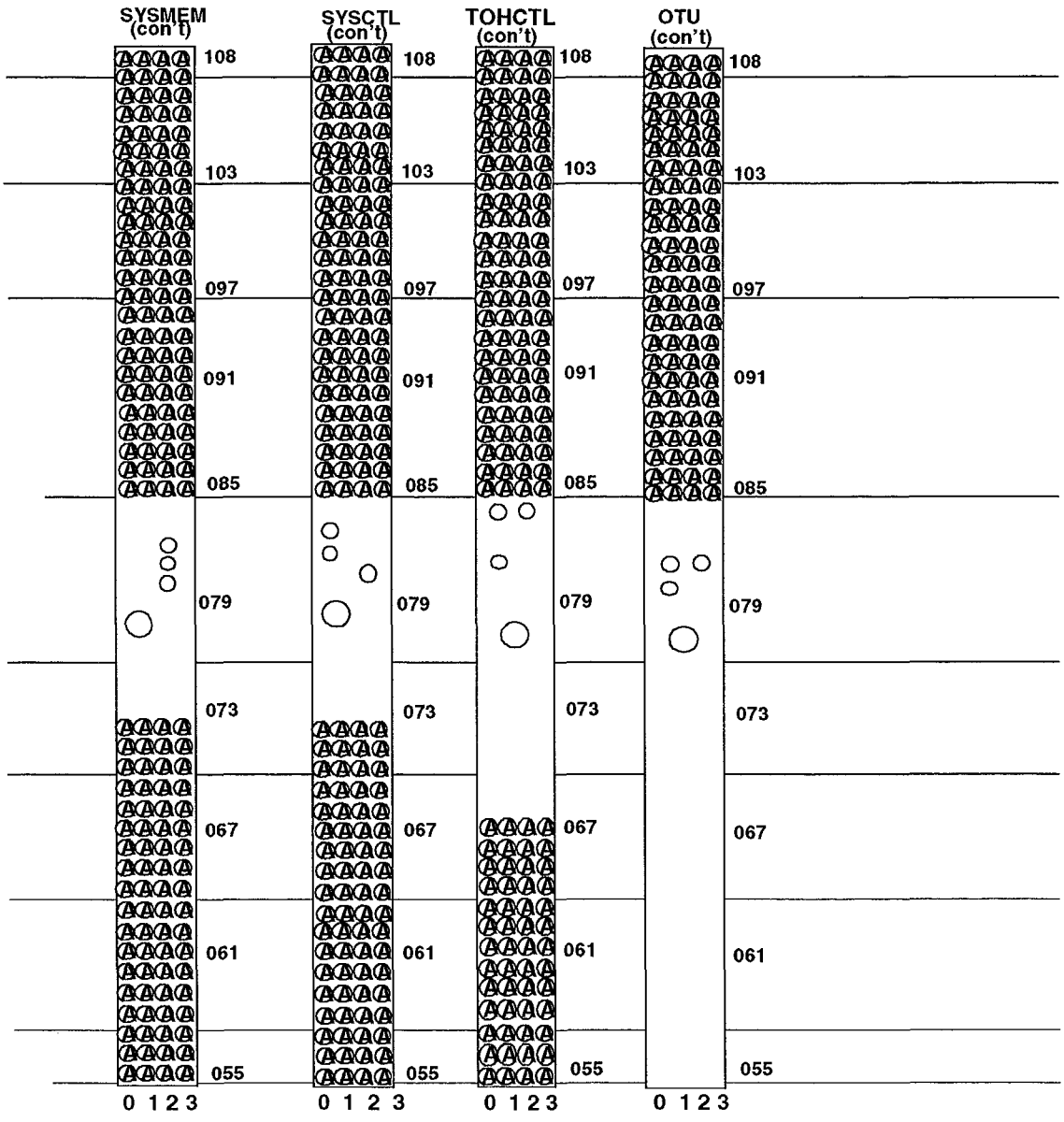

Figure A-17. Optical Translator (Middle) - Component Side View

Optical Translator (OT) - Pin Type Location

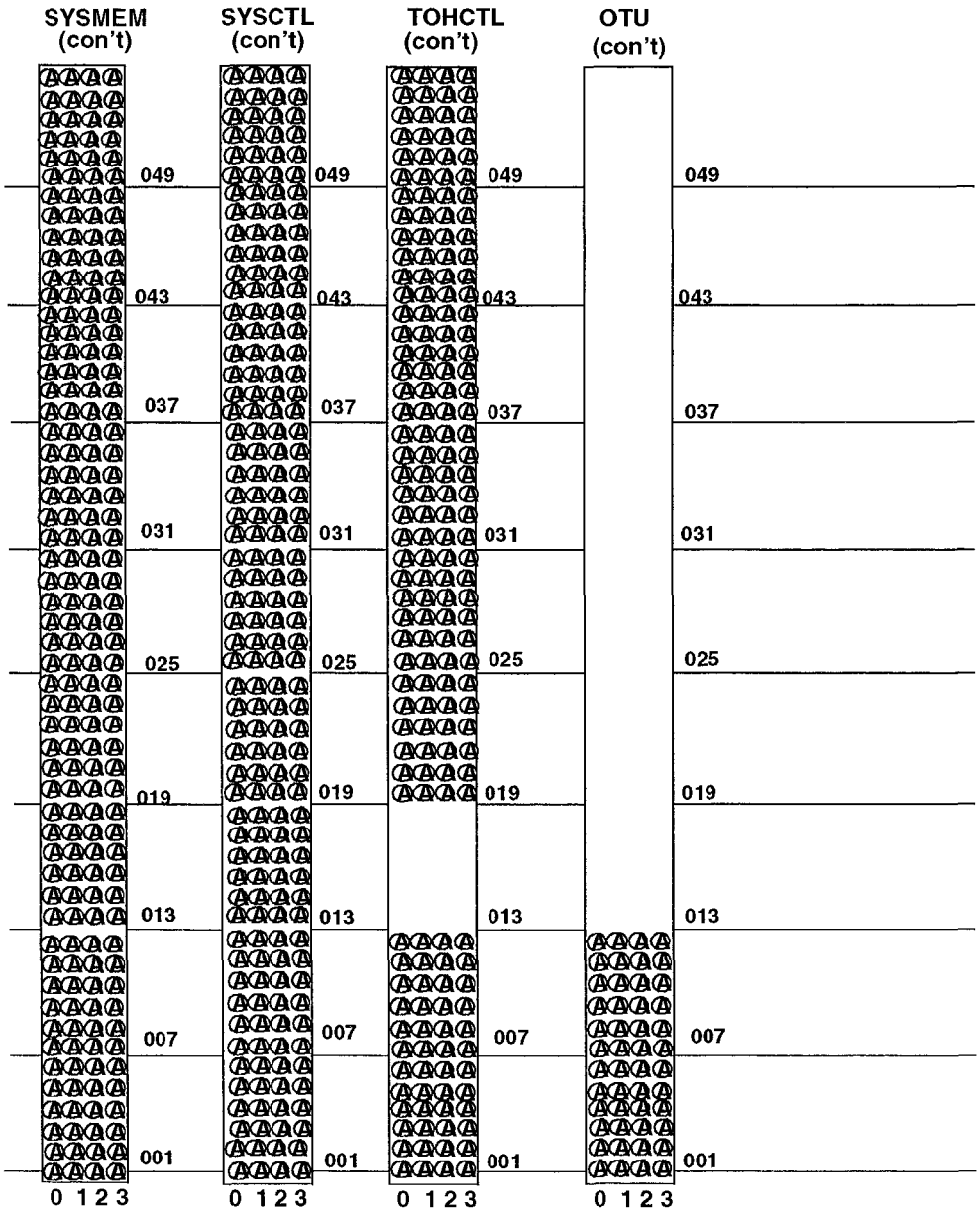

Figure A-18. Optical Translator (Lower) - Component Side View

Optical Translator (OT) - Pin Type Location

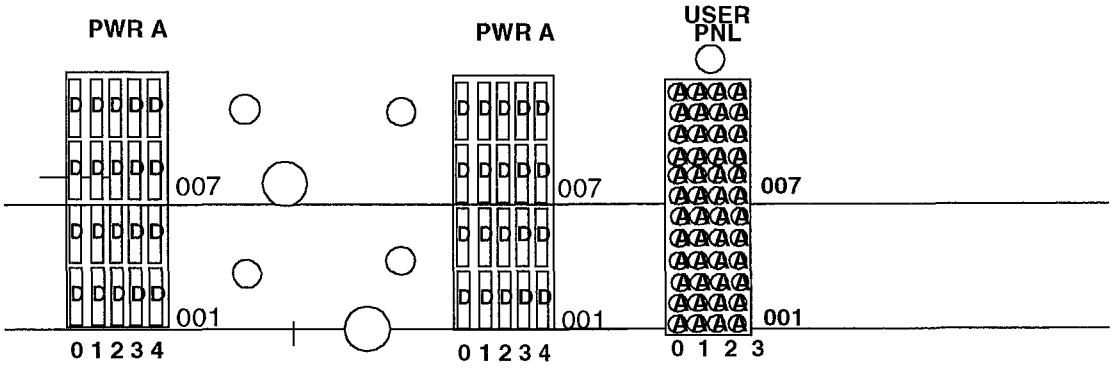

Figure A-19. Optical Translator - Power and User Panel - Component Side View

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.

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. This function will be available in a future release.

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. This function will be available in a future release.

Alarm
A contact closure to the office alarm grid. Office alarms will be available in a future release.

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.

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.

B

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.

Broadband Communications
Voice, data, and/or video communications at rates greater than DS1 rates (1.544 Mb/s).

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

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.

CR
Critical (alarm) This function will be available in a future release.

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.

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.

dB
Decibels — A dimensionless unit used to express the ratio between input and output voltages, powers, currents, or sound intensities.

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. This function will be available in a future release.

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.

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/STM-16 optical signal suitable for transmission over the Optical Line System.

DS3
Digital Signal Level 3 (44.736 M/bs)

DTE
Data Terminating Equipment — The equipment that originates data for transmission and accepts transmitted data. This function will be available in a future release.

DWDM
Dense Wavelength Division Multiplexing — Allows customers to multiplex up to 8 different wavelengths of drop side signals (SONET OC-48/SDH STM-16 signals) 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.

Erbium
A soft rare earth element used in metallurgy and nuclear research.

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).

Express Traffic
All OC-48/STM-16 signals going between two colocated Optical Line System End Terminals in a wavelength add/drop site without going through SONET OC-48/SDH STM-16 terminal.

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. This function will be available in a future release.

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).

G

Gb/s
Gigabits (10^9 bits) per Second

GCNS-2000
Lucent Technologies Gigabit Cell Network Switch.

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

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.

LBFC
Laser Backface Current — A parameter that indicates whether the system optics are working within normal margins.

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 — A 4 fiber SONET OC-48 lightwave terminal with add/drop capability.

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.

Local Traffic
The OC-48/STM-16 signals that are added/dropped through a SONET OC-48/SDH STM-16 terminals at a wavelength add/drop site.

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

MJ
Major (alarm) This function will be available in a future release.

MML
Human-Machine Language

MN
Minor (alarm) This function will be available in a future release.

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 Translator, Optical Line System End Terminal, Optical Line System Repeater, FT-2000 OC-48 Large Capacity Terminal, or other SONET OC-48/SDH STM-16 terminals 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. This function will be available in a future release.

NEBS
Network Equipment-Building System

nm
Nanometer — 10^{-9} meters

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

O

O&M
Operation and Maintenance

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.

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.

OLS End Terminal
The Optical Line System End Terminal consists of an Optical Multiplexer Unit (OMU) and Optical Demultiplexer Unit (ODU) pair, Optical Amplifiers (OA), and Telemetry (TLM) circuit packs.

OLS Repeater
The Optical Line System Repeater consists of a pair of Optical Amplifiers (OA) and the corresponding Telemetry (TLM) packs.

Operations Interface
Any interface that provides information on the system behavior or control. These include the faceplate LEDs, indicator strip/user panel, CIT, office alarms, and the X.25 interface.

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.

Optical Translator
The 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.

Optical Translator Unit
An Optical Translator Unit refers to the Optical Translator Unit (OTU) circuit pack. 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.

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).

OT
Optical Translator — The Optical Translator provides a flexible interface into the Optical Line System. The Optical Translator has 32 Optical Translator Unit (OTU) circuit packs fitted in a cabinet or network bay framework.

OTU
Optical Translator Unit — The Optical Translator Unit 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

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.

Power Divergence
Unequal amplification of incoming OC-48 wavelengths in the OLS Optical Amplifier circuit pack results in power divergence between OC-48 wavelengths. The power divergence will be small enough to fall within the dynamic range of an OLS channel detector and FT-2000 OC-48 Large Capacity Terminal receiver.

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.

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

SDH
Synchronous Digital Hierarchy

SF
Signal Fail — Refers to a condition when an incoming signal 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.

SLM
Single Longitudinal Mode

Software Ready
The firmware that runs on the Optical Translator Unit (OTU) circuit packs will accept, run, boot, and operate normally when future hardware (SYSCTL and SYSMEM circuit packs) and software is installed.

SONET
Synchronous Optical Network — The American National Standards Institute's optical signal standard for broadband transmission.

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.

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 Size
The maximum size of optical sections between OLS End Terminals that are not wavelength add/drop (WAD) sites.

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 will provide the highest level of system control for the Optical Translator in a future release. The System Controller circuit pack provides overall administrative control of the system.

SYSMEM
The System Memory and System Controller circuit packs will provide the highest level of system control for the Optical Translator in a future release. 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

TEC
Thermo-Electric Cooler

THz
Terahertz — 10^{12} Hertz

Tone
An amplitude-modulated signal in the 5- to 30-kHz range that is superimposed on the OC-48 signal by the OTU circuit pack.

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

Upgrade
An upgrade is the addition of new capabilities (features) to an existing platform. This requires new software and may require new hardware.

W

WAD
Wavelength Add/Drop — The capability to add and/or drop OC-48/STM-16 signal wavelengths from an optical line signal.

Wavelength Add/Drop Site
A site containing two or more OLS End Terminals with some OC-48 signals being added and/or dropped locally and other OC-48 signals being expressed through the site.

Wavelength Add/Drop with Branching
A wavelength add/drop site with more than two OLS End Terminals.

Wavelength Interchange
A capability to change the wavelength associated with an OC-48 signal into another wavelength. For example, an OC-48 signal traveling as wavelength 1 could be converted to wavelength 2.

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).

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