Instruction Sheet

Revision Pages For

Optical Translator (OT)
Applications, Planning, and Ordering Guide
Issue 1D, February 1998

The following pages have been revised in Issue 1D. The footer of each page that has been revised will state “Issue 1D February 1998”.

- Title Page and Copyright Page
- Customer Comments Sheet, entitled “We’d Like Your Opinion”
- Contents, pages v through xii
- Figures, pages xiii through xvi
- Tables, pages xvii through xviii
- “About This Document”, pages xv through xvi
- Chapter 1 Contents pages, 1-i through 1-ii
- Chapter 1, pages 1-1 through 1-4
- Chapter 4, pages 4-21 and 4-22
- Chapter 6, pages 6-1 and 6-6
- Chapter 7 Contents pages, 7-i and 7-ii
- Chapter 7, pages 7-1 through 7-30
- Chapter 10, pages 10-1 through 10-6
- Glossary, pages GL-1 and GL-2
- Index, pages IN-1 through IN-6

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Lucent Technologies
Bell Labs Innovations

OPTICAL TRANSLATOR (OT)

Application, Planning, and Ordering Guide

Issue 1D
February 1998
Document Number:
365-575-400

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Applications, Planning, and Ordering Guide

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About This Document

This guide provides information about the features, applications, operation, engineering, support, and ordering of Lucent Technologies' Optical Translator (OT). OT is a flexible, hardware and firmware combination that can be installed quickly in a network. When used in conjunction with Lucent Technologies' Optical Line System (OLS), OT enables Wavelength Add/Drop (WAD) capabilities.

Intended Audiences

This book is written primarily for network planners and engineers. In addition, others who need specific information about the features, applications, operation, engineering, and ordering of OT may also find the information in this book useful.

How to Use This Document

Use the following chart to identify the chapter(s) that contain the specific information that you need. In addition, use the brief summaries of the chapters to clarify any questions you may have about the content of each chapter.

Topic	Chapter
General product and release information	1, 2, 4, and 5
Applications planning information	2, 3, 4, and 6
System engineering information	4, 6 and 10
Ordering information	4, 6, and 7
Maintenance and support information	5 and 8
Reliability and technical specifications	9 and 10

The guide is organized as follows:

- "About This Document"

  This chapter describes the purpose, intended audiences, and the organization of this document. This section also references related documentation and explains how to order and comment on this document.

- Chapter 1 – "Introduction"

  This chapter presents a summary description of OT and related products.

- Chapter 2 – "Features"

  This chapter describes the major features of OT. The features are further described in Chapter 3, "Applications," Chapter 4, "Product Description," and Chapter 5, "Operations and Maintenance."

- Chapter 3 – "Applications"

  This chapter describes how OT enhances the capabilities of OLS when used with FT-2000 OC-48 LCTs, FT-2000 OC-48 Add/Drop-Rings (ADRs), or generic SONET OC-48/SDH STM-16 Add/Drop Multiplexer (ADM) terminals.

- Chapter 4 – “Product Description”

  This chapter describes OT’s physical design, powering, and transmission down to the circuit pack level.

- Chapter 5 – “Operations and Maintenance”

  This chapter discusses the features available for operating, monitoring, and maintaining OT.

- Chapter 6 – “System Planning and Engineering”

  This chapter summarizes applications planning needed before procuring and deploying OT.

- Chapter 7 – “Ordering”

  This chapter contains ordering information for OT equipment, products that operate with OT, and spare circuit packs. Circuit pack compatibility data and package descriptions for OT are also included in Chapter 7.

- Chapter 8 – “Product Support”

  This chapter describes how Lucent Technologies supports OT, including information about engineering and installation services, technical support, documentation, and training.

- Chapter 9 – “Reliability”

  This chapter contains the reliability specifications and warranty information for OT.

- Chapter 10 – “Technical Specifications”

  This chapter lists the technical specifications for OT.

- The Glossary defines many terms and acronyms used in this guide.

Related Documentation for OT

The following documents provide additional information about OT:

- Number: 365-575-401

  Title: *Optical Translator (OT) User/Service Manual*

  Audience: End user maintenance personnel

  Content: Detailed system description, technical specifications, operation and maintenance, and user interface descriptive / tutorial information

- Number: 365-575-410

  Title: *Optical Translator (OT) Installation Manual*

  Audience: Persons in charge of installation

  Content: Customer installation instructions

- Number: 5297TS

  Title: *Optical Line System with Optical Translator Technical Specifications*

  Audience: Engineers responsible for system planning, use, or maintenance

  Content: Technical specifications for the components of both systems

Drawings

The following drawings, which are shipped with the product, provide information about OT and are needed for the product installation process.

Drawing Number	Drawing Title
J69000C-1	Toll System, OT System Specification for Optical Translator Cabinet
ED7G044-30	Toll System, OT System Specification for Optical Translator Cabinet Framework
ED7G045-30	Toll System, OT System Specification for Optical Translator Shelf Assembly
ED7G045-20	OT Cable Assembly
ED7G047-30	User/Power Indicating/Fuse Panel Assembly
ED7G045-22	OT Cable Assembly (Intercabinet cable)
ED5D785-70	5ESS®-2000 Switching Equipment Global Single Bay Frame, Doors and Cabinet Assembly (Phase II)
ED5D779-70	*5ESS-2000* Switching Equipment Specification for Global Cable Rack Assembly and Stocklist (Phase II)
ED5D743-70	*5ESS-2000* Switching Equipment Specification End Guard Assembly and Stocklist
ED5D786-70	*5ESS-2000* Switching Equipment Specification for Phase II End Guard/Stanchion Assembly and Stocklist
SDM6G155-01	Optical Translator Shelf Circuit
T6G155-30	Optical Translator Circuit
T6G155-30	Optical Translator Shelf Circuit

Drawing Number	Drawing Title
SD6G156-01	Toll System, OT System, Optical Translator Cabinet Application Schematic
T6G156-30	Optical Translator Circuit
T6G156-33	Optical Translator Interconnect Circuit

The drawings listed below are available from the Lucent Technologies Customer Information Center (CIC) at 1-888-LUCENT-8. These drawings also contain valuable product information. However, because these drawings are not needed for the product installation process, they are not shipped with the product.

Drawing Number	Drawing Title
T5G276-30	Optical Line System Circuit
T5G273-30	Optical Line System Shelf Circuit
T5G276-33	Optical Line System Interconnect Circuit

Refer to the section “How to Order Documents” in this chapter for more information.

Documentation for Related Equipment and Software

The following Lucent Technologies documentation provides information about related hardware and software.

Document Number	Document Title
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*
824-102-176	*Optical Line System (OLS) Operations Systems Engineering Guide*
5088TS	*Optical Line System (OLS) Technical Specifications*
365-575-200	*FT-2000 OC-48 Large Capacity Terminal (LCT) Applications, Planning, and Ordering Guide*
365-575-201	*FT-2000 OC-48 Large Capacity Terminal (LCT) User/Service Manual*
365-575-211	*FT-2000 OC-48 Large Capacity Terminal (LCT) Integration Manual*
365-575-210	*FT-2000 OC-48 Large Capacity Terminal (LCT) Installation Manual*
824-102-175	*FT-2000 OC-48 Large Capacity Terminal (LCT) Operations Systems Engineering Guide*
5089TS	*FT-2000 OC-48 Large Capacity Terminal (LCT) Technical Specifications*
365-575-212	*FT-2000 OC-48 Large Capacity Terminal (LCT) Implementation Procedures*
365-575-100	*FT-2000 OC-48 Lightwave System Applications, Planning, and Ordering Guide*

Document Number	Document Title
365-575-101	*FT2000 OC-48 Lightwave System Quick Reference Guide*
365-575-102	*FT-2000 OC-48 Lightwave System User/Service Manual*
365-575-115	*FT-2000 OC-48 Lightwave System Installation Manual*
365-099-142TS	*FT-2000 OC-48 Lightwave System Technical Specifications*
824-102-147	*Lucent Technologies 2000 Product Family Operations Interworking Guide*
824-102-148	*2000 Family of Products Operations Systems Engineering Guide*

Electronic Documentation

In addition to the standard document format, documentation for Optical Translator is also available on CD-ROM. Electronic documentation has many advantages over traditional paper documentation, including cost savings, search and retrieve capabilities, and assurance of the most current information.

For ordering status, pricing information, and a list of all documents currently available on CD-ROM, contact your Lucent Technologies Account Executive or the Lucent Technologies Customer Training and Information Products (CTIP) hotline (1-800-334-0404).

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Introduction

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Introduction

1

This chapter introduces and briefly describes Optical Translator (OT).

Introduction to Optical Translator

Lucent Technologies offers the industry's widest range of high-quality transmission systems and related services in order to provide total network solutions. Designed to help telecommunications service providers enter a new century of advanced services and revenue generating capabilities, Optical Translator (OT) enables Wavelength Add/Drop (WAD), and multi-vendor compatibility, as well as extended reach between offices, when combined with Optical Line System (OLS). OLS, a point-to-point Dense Wavelength Division Multiplex (DWDM) optical transmission system, can be used in a variety of network applications.

In addition to OT's WAD capability, OT can also convert generic OC-48/STM-16 1310 nm signals and 1550 nm optical signals to OLS-compatible signals, hence providing a cost-effective way of increasing the bandwidth usage of installed fibers. OT not only extends the functionality of OLS, but also increases the flexibility and cost-effectiveness of OLS, especially for deployment in large ring networks. When used in conjunction with OT, OLS is able to provide a higher transmission capacity per fiber over longer distances than previously possible.

OT serves as an OLS compatible interface between OLS and FT-2000 Add/Drop-Rings Terminal (FT-2000 ADR) Release 7.1 and earlier, and generic SONET OC-48/SDH STM-16 terminals.

The 2000 Product Family, along with the *5ESS*® Switch, provides significant elements of the Lucent Technologies Service Net-2000 Architecture. The Service Net-2000 Architecture furnishes increased network capabilities with standard interfaces, increased bandwidth for end customer services, faster provisioning, and more robust networks.

What is Optical Translator?

OT is a flexible, hardware and firmware combination that can be installed quickly in a network to provide Wavelength Add/Drop (WAD) capabilities, when used in conjunction with OLS. Orderable list numbers for OT Release 1 (R1-OT) include the five main lists that each contain the relevant unequipped shelves and some necessary cabling, and the 17 Optical Translator Unit (OTU) circuit packs.

Optical Translator Units (OTUs)

Each OTU circuit pack provides optical-electrical-optical regeneration of one input OC-48/STM-16 signal. OTUs are available in a total of 17 different codes; two sets of 8 OTU codes, 41A(1-8)C and 41C(1-8)C, for operation with the wavelengths (1550 nm) used in LCT and OLS, and a single code, (41BB), for operation with SONET standard 1310 nm equipment.

OTUs 41A(1-8)C

The first set of 8 codes, OTUs 41A(1-8)C, produce SONET OC-48/SDH STM-16 signals that correspond to the eight wavelengths in standard R1-OLS applications and some long reach R2-OLS applications (up to approximately 360 km).

OTUs 41C(1-8)C

The second set of 8 codes, OTUs 41C(1-8)C, produce SONET OC-48/SDH STM-16 signals that correspond to the eight wavelengths in long reach R2-OLS applications (up to approximately 640 km).

OTU 41BB

OTU 41BB generates a SONET OC-48/SDH STM-16 signal in the 1.3 µm range.

Applications

For R1-OT, all applications are coupled with the OLS End Terminal (ET) platform, where OT provides one or more of the following functions:

- OT as an OLS Compatible Interface
- Signal Regeneration using OT
- Wavelength Add/Drop (WAD)
- Wavelength Interchange

Refer to Chapter 2, "Features," and Chapter 3, "Applications," for detailed explanations of OT's features, benefits and applications.

OT Configurations

OT is offered in the following five orderable configurations:

- The OT Cabinet (L1)
- The Miscellaneously Mounted Application (L10)
- The Miscellaneously Mounted System Controller Shelf (L11)
- The Miscellaneously Mounted Complementary Shelf 1 (L12)
- The Miscellaneously Mounted Complementary Shelf 2 (L13)

Refer to Chapter 7, "Ordering," for a detailed description of each configuration.

OT Shelves

Both the OT Cabinet (L1) and the Miscellaneously Mounted Application (L10) can provide up to 32 OTUs within a single cabinet or bay, respectively. These OT configurations both consist of two Complementary Shelves and one System Controller Shelf. The Miscellaneously Mounted Complementary Shelves (L12 and L13) can provide up to 12 OTUs per list. The Miscellaneously Mounted System Controller Shelf (L11) can provide up to 8 OTUs.

Complementary Shelf

Each Complementary Shelf is equipped with twelve OTU slots, an interconnection panel, a designation label strip, and a fuse panel (L1) or a fuse / power indicating panel (L10, L12 and L13) as depicted in Figure 1-1.

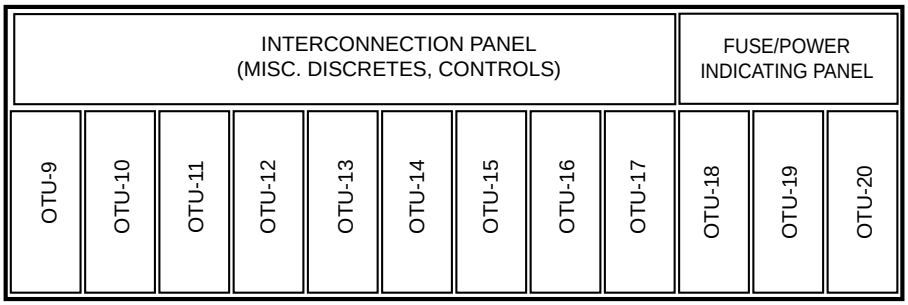

Figure 1-1. Complementary Shelf 1 (12 OTUs)

System Controller Shelf

Each System Controller Shelf is equipped with slots for 8 OTUs, three of the four empty slots designated for future controller installation, an interconnection panel, a designation label strip, and a fuse panel (L1) or a user panel (L10 and L11) as shown in Figure 1-2.

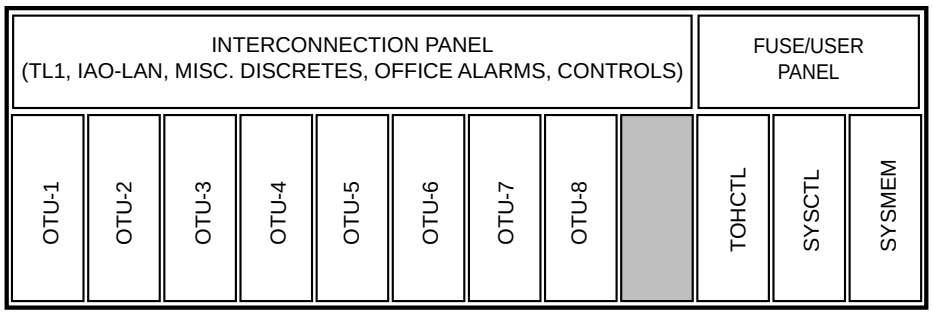

Figure 1-2. System Controller Shelf (8 OTUs)

Refer to Chapter 4, "Product Description," for complete descriptions of the shelves and figures illustrating the configurations of the OT Cabinet (L1), the Miscellaneously Mounted Application (L10), the Miscellaneously Mounted System Controller Shelf (L11), the Miscellaneously Mounted Complementary Shelf 1 (L12), and the Miscellaneously Mounted Complementary Shelf 2 (L13).

Future Options

The OT platform is designed to accommodate future features via the additions of new OTU codes, controller circuit packs and / or software upgrades. No components will be replaced or removed to upgrade; new components will simply be added to the existing configurations to provide additional features.

Features

2

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Features

2

This chapter summarizes the main features of Optical Translator (OT).

Functions and Benefits of OT

When used with OLS, OT provides additional benefits by performing the following functions:

- Supports Wavelength Add/Drop (WAD)
  - — relieves the ring node constraint introduced by numerous through-connected SONET/SDH ADM terminals
  - — provides less equipment-intensive growth
- Enables long span transmission between SONET/SDH ADM terminals
  - — permits the long distances that large rings require between terminals
- Provides multi-vendor interface for SONET OC-48/SDH STM-16 signals
- Supports Wavelength Interchange
  - — allows full bandwidth utilization between subnetwork interfaces

- Provides regeneration of OC-48 signals
  - — reduces cost and the need for floor-space when used instead of an FT-2000 LCT equipped as a Regenerating Tandem Terminal (RTT)

OT also provides

- — versatility in a variety of topologies, such as point-to-point and ring configurations
- — performance monitoring, fault isolation, and preventive maintenance

OLS and OT Topologies

Optical Line System (OLS) is a point-to-point system that is used with a variety of network topologies. OLS supports a wide range of high capacity loop, inter-office, outstate, and long haul applications with maximum economy and efficiency.

The variety of topologies is further increased by use of Optical Translator (OT), which enables Wavelength Add/Drop (WAD). By acting as an interface between OLS and generic SONET OC-48/SDH STM-16 terminals or FT-2000 ADR (Release 7.1 and earlier), OT enables WAD. OT also electrically regenerates the signal, permitting it to use express wavelength routes that bypass intermediate offices and terminals. The availability of WAD provides significant equipment savings as well as decreased office congestion.

Although OT electrically regenerates signals, it does not perform SONET overhead processing on the outgoing frame. Therefore, OT is not a true SONET regenerator.

When used with OT, OLS is able to transmit other SONET/SDH signals because OT serves as an interface between FT-2000 ADR (Release 7.1 and earlier) or generic SONET OC-48/SDH STM-16 ADMs and OLS.

Maintenance Features

OT provides multiple maintenance features that are similar to and compatible with those of other Lucent Technologies 2000 family products. The following sections summarize the major features. Chapter 5, "Operations and Maintenance," describes these features in more detail.

R1-OT provides a limited range of maintenance features. Subsequent upgrades will provide a wider range of system information and control, from summary-level status information to detailed reporting.

Indicator Strip, Fuse/Power Indicating Panel, and User Panel

The indicator strip at the top of the OT Cabinet (L1) provides system-level alarm and status information. The user panel and fuse / power indicating panel provide the same information for the Miscellaneously Mounted Application (L10), the Miscellaneously Mounted System Controller Shelf (L11), and the Miscellaneously Mounted Complementary Shelves (L12 and L13).

The following green Power On (PWR ON) LEDs on the indicator strip are active in R1-OT:

- PWR ON: LOW SHELF
- PWR ON: MID SHELF
- PWR ON: UP SHELF

On miscellaneously mounted shelves, (L10, L11, L12, and L13), these PWR ON LEDs are actually located on the fuse / power indicating panel and the user panel. Each shelf is equipped with one Power On (PWR ON) LED. (Because the LEDs are actually on the shelves, it is not necessary to identify the LED as LOW, MID or UP.)

Each LED illuminates to indicate that the respective shelf is receiving -48 V power.

For further information regarding the indicator strip, fuse / power indicating panel, or user panel, refer to Chapter 4, "Product Description," and Chapter 5, "Operations and Maintenance."

Fault LEDs on OTUs

Each OTU is equipped with a red Fault LED that either flashes, indicating that the pack has detected conditions involving an incoming signal, or is continuously lit, indicating that the pack has detected a hardware condition involving itself.

Refer to Chapter 5, "Operations and Maintenance," for a detailed explanation of the Fault LED.

Miscellaneous Discretes

Two miscellaneous discrete output points are provided for monitoring purposes; one for equipment failures and one for signal failures (for example, Loss of Signal [LOS], Loss of Frame [LOF] or B_1 parity errors). These points can be connected to an External Miscellaneous Discrete Unit (EMDU) controlled by a co-located OLS NE or an equivalent discrete monitoring unit to provide remote Operations Systems (OS) monitoring.

Refer to Chapter 5, "Operations and Maintenance," for a detailed explanation of the miscellaneous discretes.

OLS/OT Interworking

OT can be used to concatenate multiple OLS systems.

In a WAD configuration, OTs can be used to express wavelengths between two or more standard or long reach OLS systems. A standard reach OLS system (3x33 dB) carries up to eight wavelengths on an optical line comprised of one, two, or three spans of 33 dB (120 km) each. A long reach OLS system (8x24 dB) transmits up to eight wavelengths on a fiber pair over up to eight spans, with each span having a maximum loss of 24 dB (80 km).

If the distance between offices exceeds the reach of a single OLS system, OT can be used to concatenate two or more OLS systems. By concatenating of up to 11 OLS systems of any kind, OT can extend a wavelength section into thousands of kilometers.

There can be 10 OTs between SONET ADMs. In most cases, this implies that an express wavelength can go through 11 offices.

Future Enhancements

The following features are not available on OT-R1 but they are planned as future enhancements. OT is designed to accommodate future features via the addition of new OTU codes, controller circuit packs and software. No components will be replaced or removed to upgrade; new components will simply be added to the existing configurations to provide additional features.

Craft Interface Terminal (CIT)

The Craft Interface Terminal (CIT) will be used to retrieve detailed reports about performance monitoring, alarms and status, and system configuration. The CIT terminals may be used as remote or local terminals.

Operations Interfaces

OT will offer a several choices of operations interfaces to meet the needs of evolving Operations System (OS) networks, including Office Alarms, X.25 and IAO LAN links.

Operations Interworking

Operations interworking will allow the control of an access domain (or subnetwork) from a single access point.

Access Domains

OT Network Elements (NEs) will be able to communicate with other NEs via the IAO LAN interface. The set of NEs that can communicate together via a collection of SONET DCC and / or IAO LAN links is called the access domain. NEs must be members of the same access domain for operations interworking features to work.

Features

Operations interworking may include the following features:

- Directory Service Network Element (DS-NE)
- Gateway Network Element (GNE) - remote TL1 operations system access
- Remote login
- Remote NE status (remote alarming, alarm groups, Alarm Gateway Network Element, status of remote alarms, and remote office alarms)

Inventorying Capabilities

In the future, OT will be able to provide automatic version recognition of all hardware and software installed in the system. Circuit pack types, circuit pack CLEI[1] codes, and serial numbers will be accessible via the CIT and operations interworking interfaces. These capabilities greatly simplify troubleshooting, dispatch decisions, and inventory audits.

Continuous Performance Monitoring

Continuous performance monitoring will allow OT to detect system problems before they affect service. OT monitors analog performance on its RCVR and TRMTR components and digital performance information on its input OC-48/STM-16 signal. Thresholds for each parameter can be provisioned, depending on customer needs.

Security

OT will provide security against unauthorized access to the CIT and OS functions (for example, provisioning). The tiers of security may include Port Security, Network Element Login Security, and User Login Security.

1. COMMON LANGUAGE is a registered trademark and CLEI, CLLI, CLCI, and CLFI are trademarks of Bell Communications Research, Inc.

Physical Features

OT's configurations are designed to be easily installed and adaptable to a variety of network applications. For more details, see Chapter 4, "Product Description."

OT Configurations

In R1-OT, the OT Cabinet (L1) and the Miscellaneously Mounted Application (L10), share the same basic shelving arrangement. The bottom shelf, System Controller Shelf, contains 8 OTU slots and three of the four empty slots are designated for the future installation of controller circuit packs. The middle and top shelves, Complementary Shelf 1 and 2, both contain 12 OTU slots.

Additionally, each of the three shelves may be ordered as individual miscellaneously mounted shelves (L11, L12 and L13). These individual shelves are identical to the three shelves in the Miscellaneously Mounted Application (L10).

Figure 2-1 and Figure 2-2 illustrate the basic layout of a fully-equipped OT Cabinet and Miscellaneously Mounted Application, respectively.

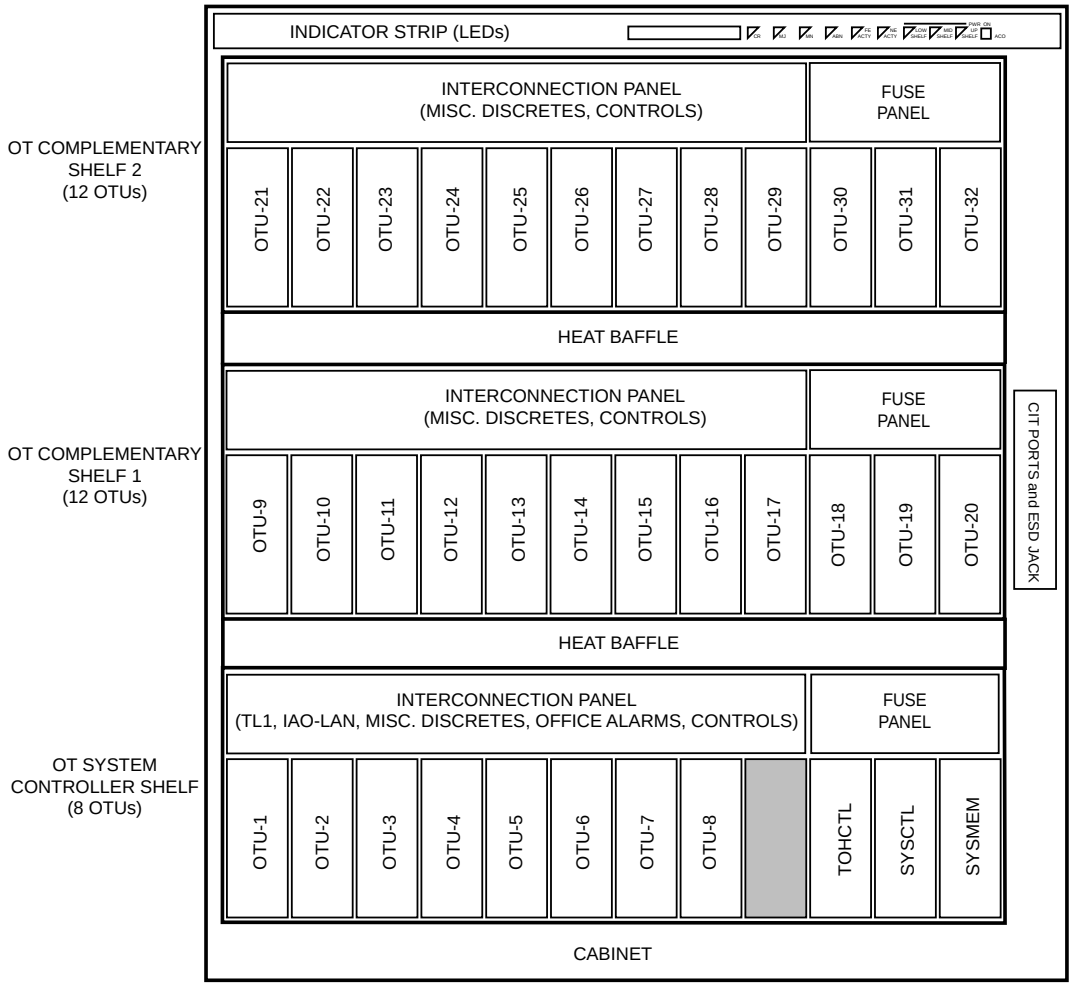

Figure 2-1. Shelving Configuration for the OT Cabinet (L1)

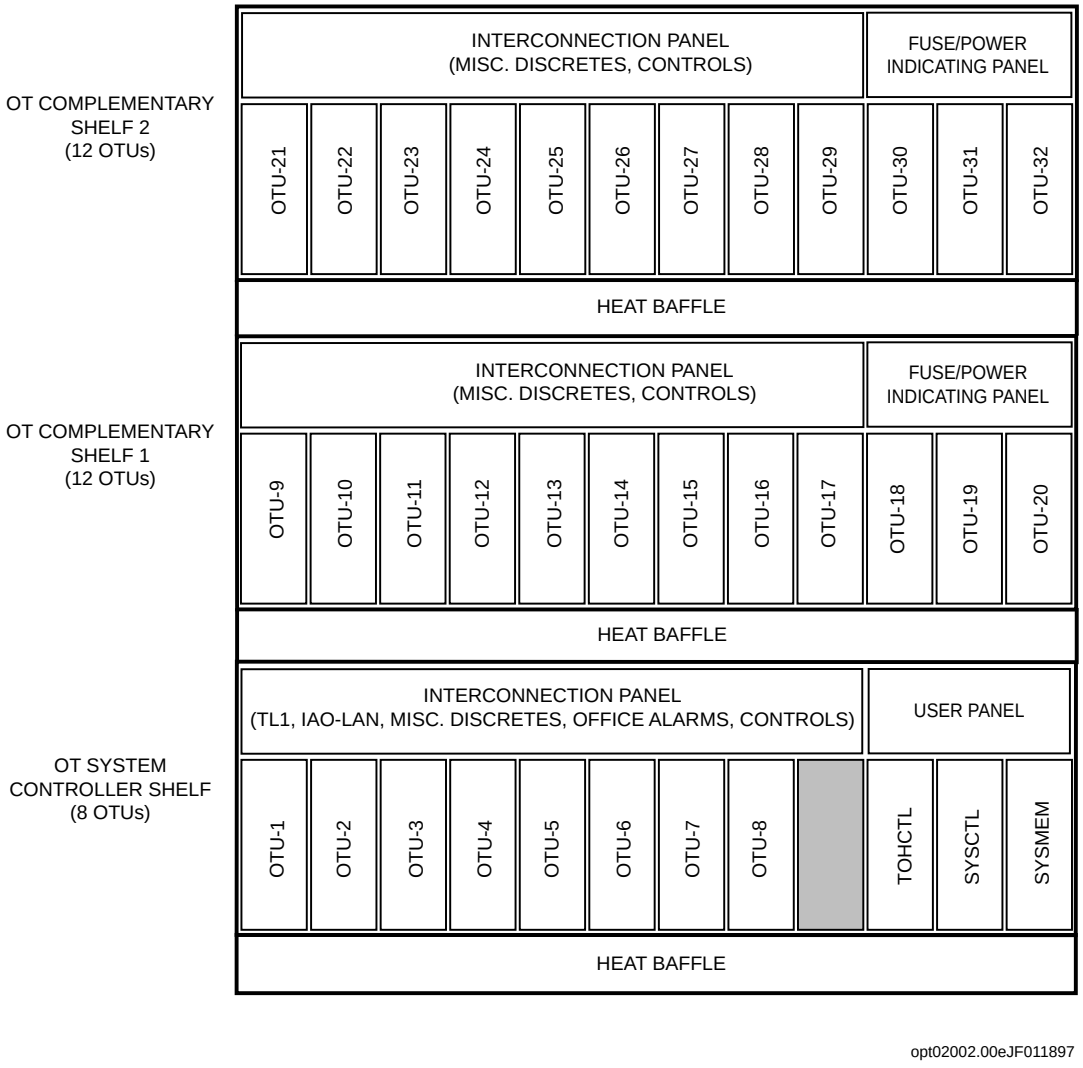

Figure 2-2. Shelving Configuration for the Miscellaneously Mounted Application (L10)

Dimensions of OT Equipment

All shelves adhere to the European Telecommunications Standard Institute (ETSI) Rack standard depth of 280 mm. OTUs are a new design with a 40 mm wide faceplate. Each faceplate contains plugs for two optical fibers, and there are cut-outs on the lip of each shelf for routing fibers outside of the shelf (one cut-out per slot). The total shelf width (outer dimension) is 500 mm. Each shelf is 450 mm high including the interconnection panel and the circuit pack slots. The heat baffles are each 75 mm high. A fully-equipped OT cabinet is 1830 mm high. (Note that the overall dimensions of the miscellaneously mounted configurations will vary depending on the size of the bays.)

Compatibility

OT is designed to be compatible with ED-800 and ED-801 Network Bay Frame installations (North American Applications), ETSI Rack installations (Europe) and the same *5ESS*-2000 Cabinet arrangement as the OLS platform.

Upgrades

To simplify future upgrades, OT provides all the external LEDs and connectors (on the cabinet, interconnection panel, fuse panel, fuse/power indicating panel, user panel) that will be necessary for future features. Chapter 4, “Product Description,” and Chapter 5, “Operations and Maintenance,” describe in detail which LEDs and connectors are active in R1-OT, and which are provided for future releases.

Front Access

All operation, maintenance, and installation activities are accessible from the front of OT. Front access provides greater flexibility, permitting placement of the equipment in physically restricted locations.

Convection Cooled

OT is a free-convection cooled system.

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Applications

3

This chapter describes Optical Translator (OT) applications. These applications use OT to enhance OLS capabilities when used with SONET OC-48/SDH STM-16 terminals. Each function is first illustrated individually, and then at the system level in versatile applications that show how each function operates on a larger scale when combined with other functions.

OT and OLS Systems

Designed for use with OLS, OT offers tremendous flexibility in building applications. OT enables and provides the following functions:

- OT as an OLS Compatible Interface
- Signal Regeneration using OT
- Wavelength Add/Drop (WAD)
- Wavelength Interchange

OT as an OLS Compatible Interface

OT can serve as an OLS compatible interface between either FT-2000 ADRs (Release 7.1 and earlier) or generic SONET OC-48 / SDH STM-16 ADMs / TMs and OLS. Without OT, FT-2000 ADR (7.1 and earlier) and generic SONET OC-48 / SDH STM-16 ADMs are not compatible with OLS optics.

OT's transmission circuit packs, Optical Translator Units (OTUs), can receive any SONET OC-48 / SDH STM-16 wavelength in either the 1.3 µm (1280-1335 nm) or 1.5 µm (1480-1580 nm) range. OTUs then convert the incoming wavelength into an OLS compatible wavelength (1.5 µm) or a generic OC-48 / SDH STM-16 wavelength (1.3 µm). The type of wavelength conversion is dependent on the OTU pack code. FT-2000 ADR, Release 7.2 and FT-2000 LCT offer optional OLS compatible optics. Therefore, with these systems, using OTUs as an OLS interface becomes redundant.

OT can serve as an interface between OLS and SONET OC-48 / SDH STM-16 terminals, as shown in Figure 3-1.

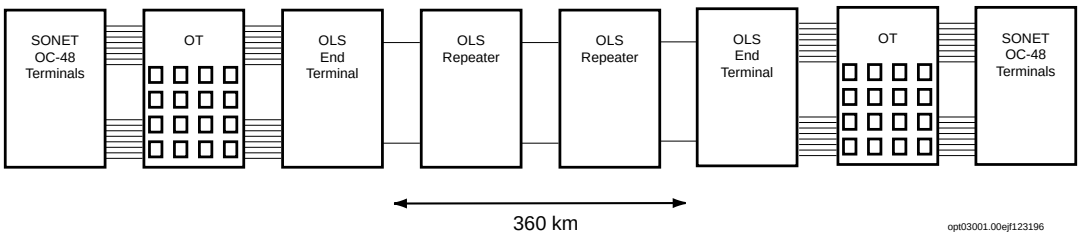

Figure 3-1. OT as Interface between OLS and SONET OC-48/SDH STM-16 Terminals

Signal Regeneration using OT

OT enables the concatenation of multiple OLS systems which economically extends a wavelength section to thousands of kilometers and reduces office congestion. OTUs electrically regenerate incoming OC-48 signals, thus enabling the concatenation of up to 11 OLS systems.

Figure 3-2 shows OLS transmission with OT performing signal regeneration.

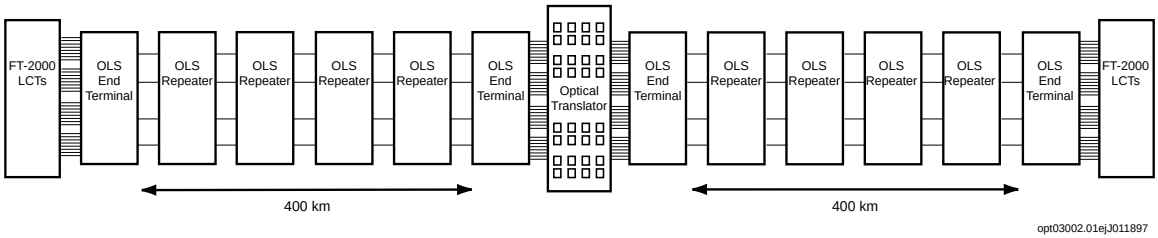

Figure 3-2. R2-OLS Transmission with OT's Regeneration Function

Wavelength Add/Drop (WAD)

OT enables Wavelength Add / Drop (WAD) at Central Offices (COs) that contain two or more OLS End Terminals. WAD is the capability of adding and / or dropping some OC-48 wavelengths from an optical line signal at a CO, while other wavelengths are expressed through the office.

Figure 3-3 shows how OT enables WAD at a CO.

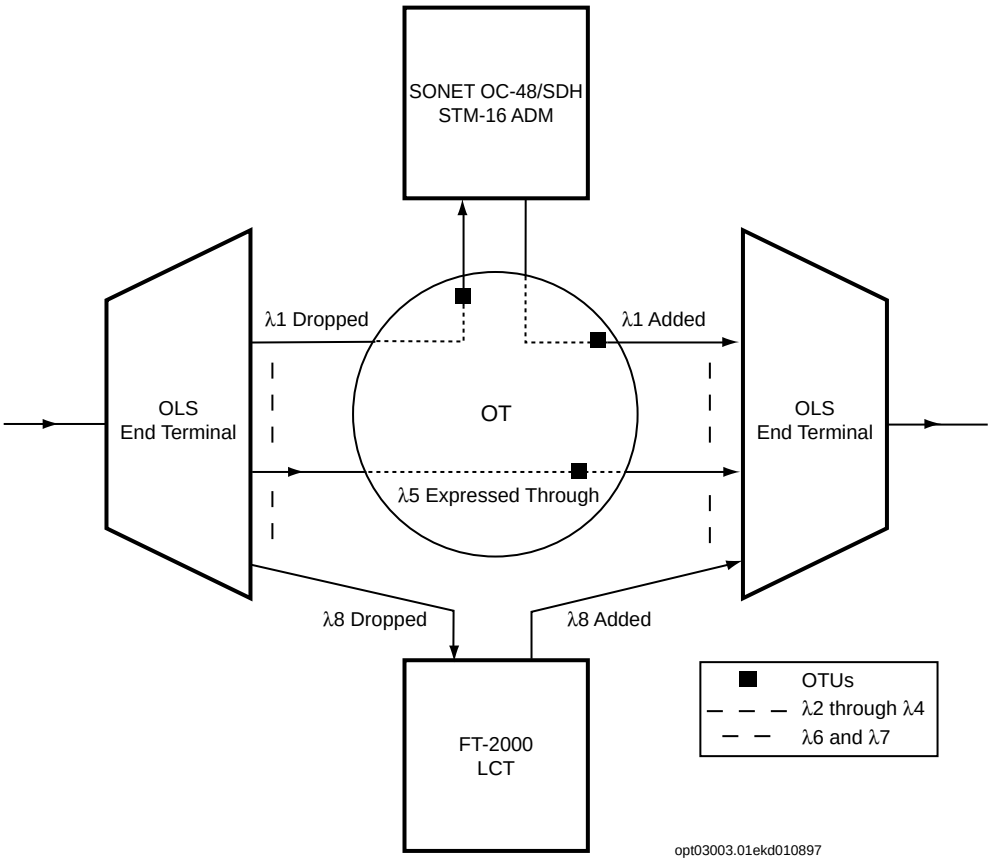

Figure 3-3. Wavelength/Add Drop (WAD) (One Direction Transmission of One Line)

Wavelength Interchange

OT performs Wavelength Interchange, thus solving wavelength blocking in routes with branching. Because a WAD site with branching has at least three OLS End Terminals (ETs), wavelengths could be blocked without Wavelength Interchange. Wavelength Interchange is the conversion of a signal from one wavelength to another. OT can change one OLS compatible wavelength to another OLS compatible wavelength (for example, λ1 to λ2).

In Figure 3-4, λ1 is expressed through from ET1 to ET2, and λ2 is expressed through from ET1 to ET3. Because OLS ETs are only capable of receiving one of each of the eight available wavelengths, now λ1 is unusable at ET2, and λ2 is unusable at ET3. OT must perform Wavelength Interchange in order to enable full wavelength utilization. Through Wavelength Interchange, OT changes λ2 into λ1 and λ1 into λ2, therefore, the intended ETs are able to accept the wavelengths. Thus, OT enables more express wavelength connections at co-located OLS ETs and wavelength blocking is resolved.

Figure 3-4 shows OT's Wavelength Interchange capability.

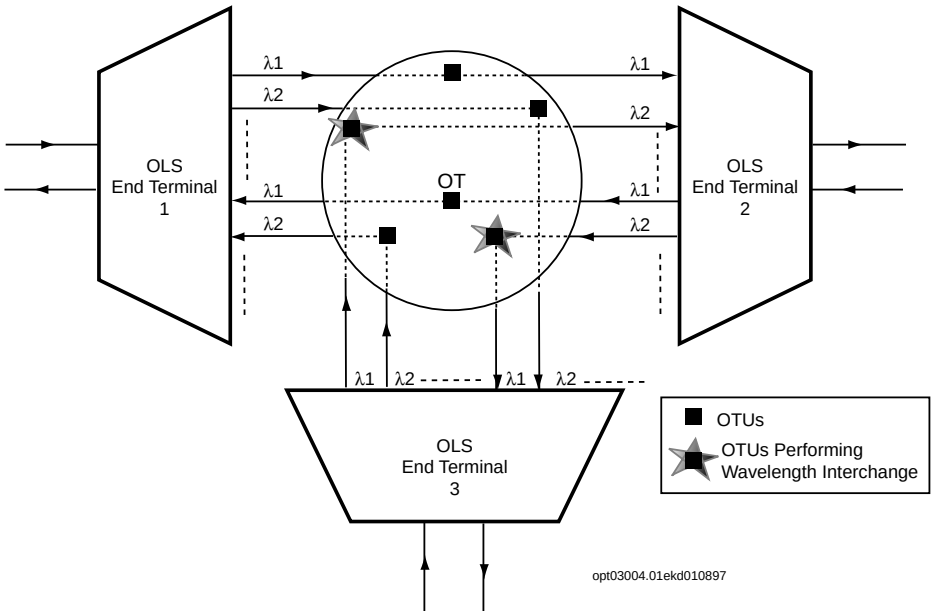

Figure 3-4. Wavelength Interchange with Branching (Bidirectional Transmission on the Same Wavelength)

Flexible Network Applications

OT's capabilities described earlier in this chapter enable the following large applications.

SONET OC-48/SDH STM-16 Point-to-Point Applications

When used with OLS, OT performs the following functions in SONET OC-48/SDH STM-16 point-to-point applications. OT

- Provides OLS compatible interfaces between OLS and FT-2000 ADR (Release 7.1 and earlier) or between OLS and generic SONET OC-48/SDH STM-16 ADMs and OLS
- Extends distances between OC-48/STM-16 terminals to thousands of kilometers
- Supports the construction of mesh networks through WAD with branching
- Enables multiple point-to-point system overlays on the same fiber through WAD, allowing flexible and economical utilization of OLS's full capacity while reducing office congestion

SONET OC-48/SDH STM-16 Ring Applications

Multiple SONET/SDH ring overlays in the same OLS/OT based physical ring may connect fibers between any number of offices[1]. Each SONET/SDH ring can add/drop at up to 16 offices.

This concept can be extended to include offices that are partially shared between rings or even between rings and point-to-point systems. WAD on rings allows the flexible, yet economical utilization, of OLS's full capacity, while reducing office congestion.

Figure 3-5 illustrates a combination of OT's capabilities, creating a flexible, large ring application with multiple ring overlays. In this application, OTs enable and perform

- OLS compatible interfaces
- Signal regeneration
- WAD
- Wavelength Interchange

Figure 3-5 shows a hypothetical large ring application with generic SONET OC-48/SDH STM-16 ADMs, FT-2000 LCTs, OTs and OLS systems (Release 1). It shows multiple ring overlays on the same fiber with wavelengths terminating at different offices. Rings 1, 2, and 3 are completely shown. Rings 4, 5, and 6 are partially shown where they share offices with Rings 1, 2, and 3.

The Central Offices that have three OLS ETs, (CO 2, CO 5, CO 8, and CO 10), illustrate branching. Wavelength Interchange may be utilized at these offices.

The distances between CO 10 and CO 11, and CO 11 and CO 12, are extended by using fully through-connected OLS ETs at an intermediate office where OTs perform regeneration.

In Ring 3 of Figure 3-5, OTs provide OLS compatible interfaces for all generic SONET OC-48/SDH STM-16 ADMs at the transmit and receive ends.

Note that Figure 3-5 is not drawn to scale.

1. The number of offices may be limited by protection switching times.

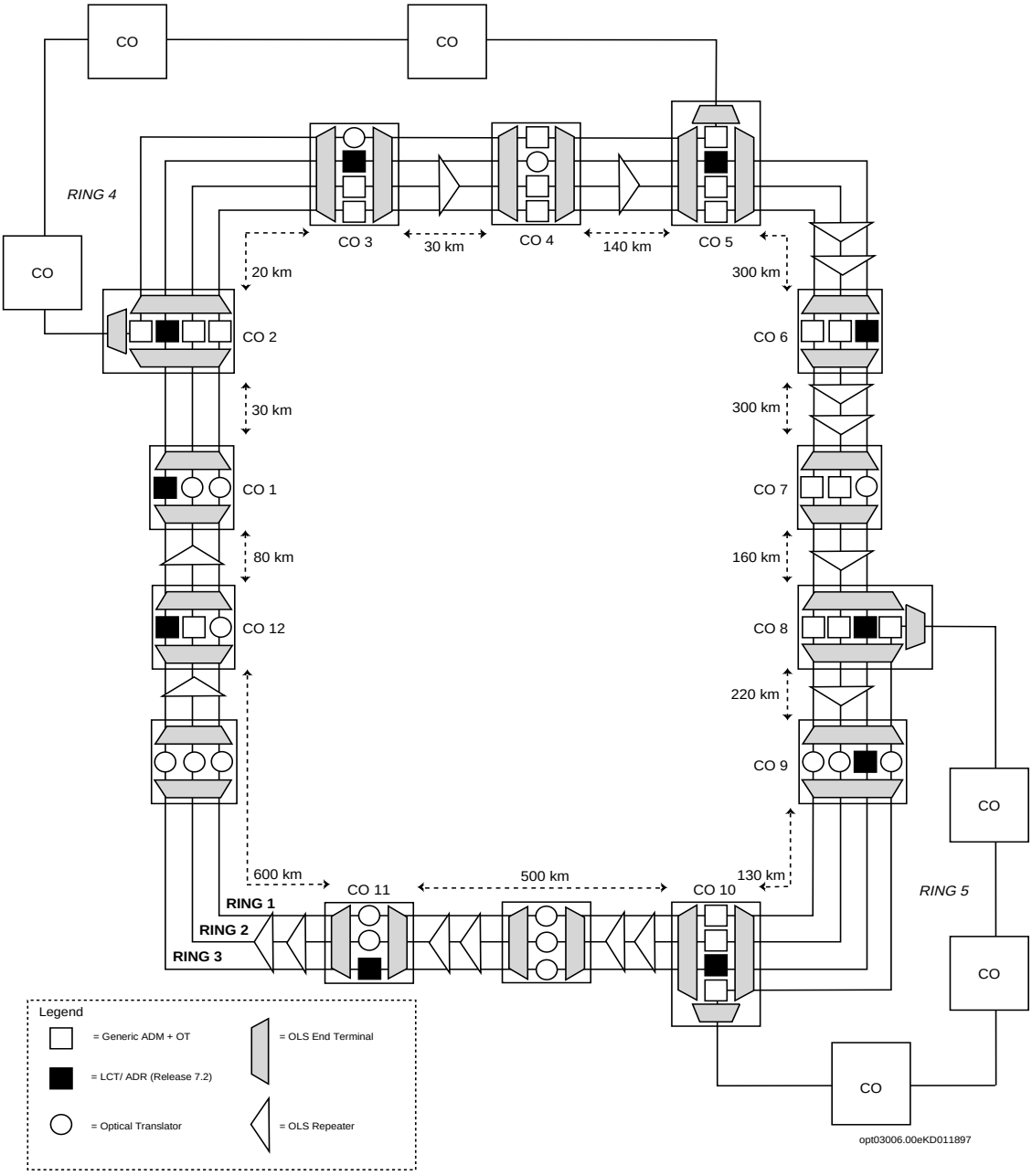

Figure 3-5. Large Ring Application Using Optical Translators

Table 3-1 explains the traffic activities at the 12 Central Offices (COs) in the hypothetical large ring network illustrated in Figure 3-5.

In each ring, traffic is added / dropped (A / D) at the specified Central Offices (CO 1-12) while the wavelength is expressed through the remainder of the COs (–) without going through SONET OC-48 / SDH STM-16 ADMs at the specified offices.

Table 3-1. WAD in Figure 3-5

Ring*	CO 1	CO 2	CO 3	CO 4	CO 5	CO 6	CO 7	CO 8	CO 9	CO 10	CO 11	CO 12
1	–	A / D	A / D	–	A / D	A / D	A / D	A / D	–	A / D	–	–
2	–	A / D	A / D	–	A / D	A / D	A / D	A / D	–	A / D	–	A / D
3	A / D	A / D	A / D	A / D	A / D	A / D	–	A / D	A / D	A / D	A / D	A / D
4	*NA*	A / D	–	A / D	A / D	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*
5	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	A / D	–	*A/D*	*NA*	*NA*

* Rings 4 and 5 (not completely shown in Figure 3-5) share some Central Offices with Rings 1, 2, and 3. Rings 4 and 5 carry traffic between CO 2 and CO 5, and CO 8 and CO 10, respectively.

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Product Description

4

This chapter describes and illustrates the physical design and powering of Optical Translator (OT) down to the circuit pack level and the configurations of the OT applications.

Physical Design

OT shelves are designed to be housed in Lucent Technologies Newlook 2000 cabinets / 5ESS cabinets, mounted in European Telecommunications Standard Institute (ETSI) compatible racks, or mounted in a Network System Bay Framework (ED-800 or ED-801 type).

OT is available in the following applications:

- OT Cabinet (L1)
- Miscellaneously Mounted Application (L10)
- Miscellaneously Mounted System Controller Shelf (L11)
- Miscellaneously Mounted Complementary Shelf 1 (L12)
- Miscellaneously Mounted Complementary Shelf 2 (L13)

Refer to Chapter 7, “Ordering,” for the detailed components and ordering information for the five applications.

The shelving configuration for both the OT Cabinet (L1) and the Miscellaneously Mounted Application (L10) consists of two Complementary Shelves (Complementary Shelf 1 and Complementary Shelf 2) and one System Controller Shelf, thus allowing for a total of 32 Optical Translator Units (OTUs). These configurations allow for the future addition of the controller circuit packs into the System Controller Shelf's designated open slots.

The three shelves used in the Miscellaneously Mounted Application (L10) may also be ordered individually as the Miscellaneously Mounted System Controller Shelf (L11), the Miscellaneously Mounted Complementary Shelf 1 (L12), and the Miscellaneously Mounted Complementary Shelf 2 (L13).

All OT cabling is completely connectorized (no wire-wrap or solder is required) using industry standard electrical and optical connectors with *ST* as the standard optical connector.

OT offers complete front access. All maintenance operations, installation activities, and upgrade procedures take place from the front of the equipment.

OT Cabinet (L1)

Each cabinet is designed to house three OT shelves:

- Complementary Shelf 2
- Complementary Shelf 1
- System Controller Shelf

Each shelf contains circuit pack slots, a designation label strip, an interconnection panel, and a fuse panel.

Each shelf is designed according to the ETSI standards as documented in ETS 300 119-4, January 1994.

The dimensions of the cabinet used for OT (L1) are

- 183 cm (6 ft) high
- 86 cm (34 in) wide
- 60 cm (24 in) deep

One heat baffle is located between each of the adjoining shelves in the cabinet.

Each cabinet uses two -48 V 8 Gauge (Ga) power cables (feeders A and B) that branch into three 10 Ga power cables (one for each shelf). These power cables terminate directly onto the shelves. Each branch connects to an overcurrent limiter located on the shelves.

All three shelves use power filter units with A and B feeds.

OT shelves, circuit packs, and cable treatments are designed to satisfy the requirements of Bellcore TA-NWT-00189, Issue 2, 1993. OT is also designed to meet the electromagnetic compatibility requirements of FCC Title 47, Part 15, Subpart J for Class A equipment. An Electrostatic Discharge (ESD) jack on the cabinet is connected to the frame ground. The cabinet contains no floating metal piece parts.

Figure 4-1 shows the OT cabinet with its doors closed.

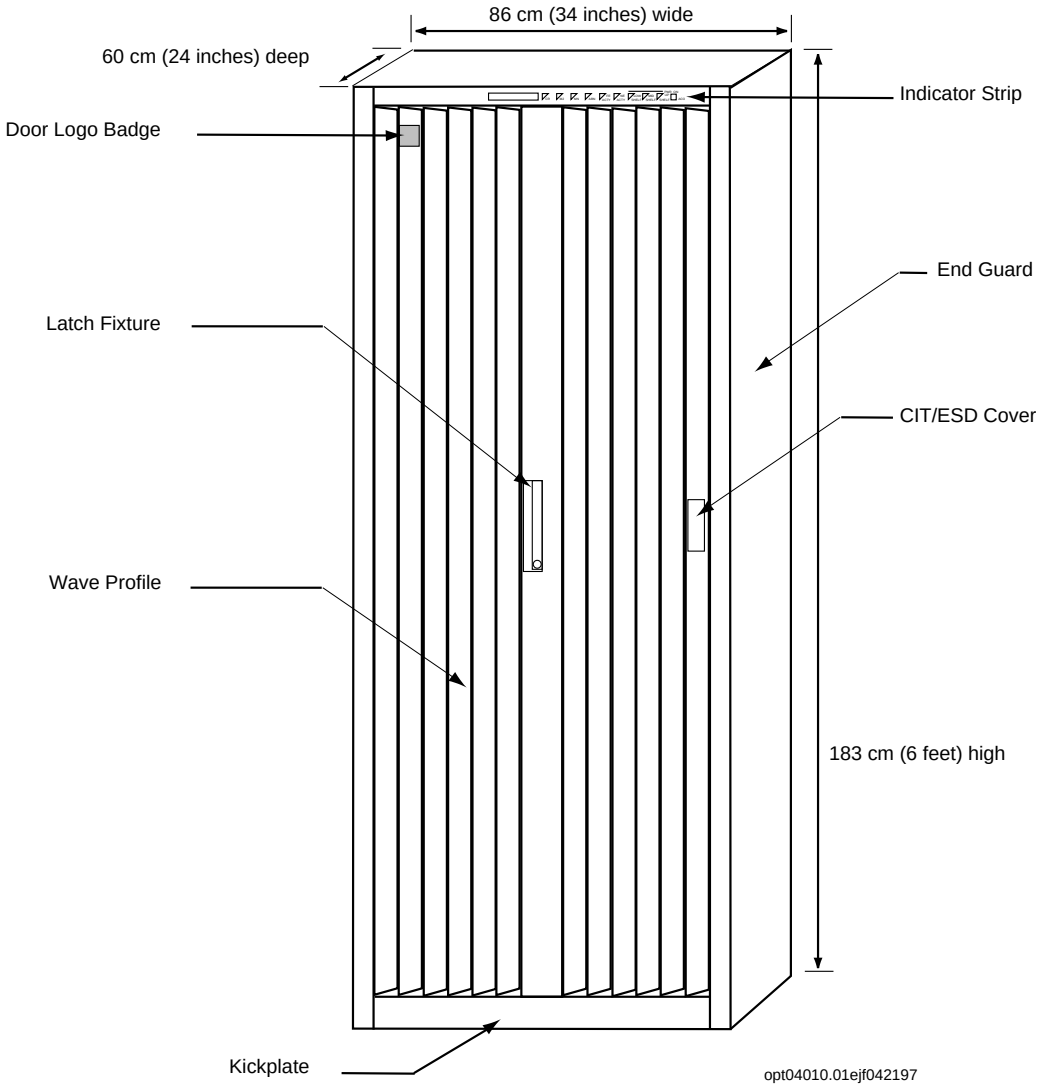


Figure 4-1. OT Cabinet

Indicator Strip

Each OT cabinet is equipped with an indicator strip located at the top front of the cabinet (Figure 4-1). Refer to Table 4-1 for a list and description of the indicators. Connectorized cabling connects the shelves to the indicator strip.

opt05001.00ejf123096

Figure 4-2. Indicator Strip for the OT Cabinet

Although Table 4-1 lists all the indicators that appear on the indicator strip, only the three Power On (PWR ON) LEDs are active in Release 1 (R1-OT). To make upgrading in future releases easier, the other LEDs are also provided now. No components will be replaced or removed to upgrade; new components will simply be added to the existing configurations to provide additional features.

Table 4-1. Indicator Strip LEDs for OT

Indicator Name	Abbrev.	Color	Description
Power On*	PWR	Green	Indicates that the respective shelf is receiving -48 V power
Critical	CR	Red	Indicates critical active alarm level
Major	MJ	Red	Indicates major active alarm level
Minor	MN	Yellow	Indicates minor active alarm level
Near End Activity	NE ACTY	Yellow	Indicates alarm or status conditions at the local equipment
Far End Activity	FE ACTY	Yellow	Indicates alarm or status conditions at the remote equipment
Alarm Cut-off†	ACO	Green	When depressed, silences active audible alarms
Abnormal	ABN	Yellow	Indicates an abnormal condition

* The indicator panel has three PWR LEDs representing the three shelves installed in the cabinet. The three LEDs are designated as Lower Shelf (LOW SHELF) (System Controller Shelf), Middle Shelf (MID SHELF) (Complementary Shelf 1), and Upper (UP SHELF) (Complementary Shelf 2).
† The ACO switch is only available after controller circuit packs are installed in the System Controller Shelf (future upgrade).

Shelves in the OT Cabinet

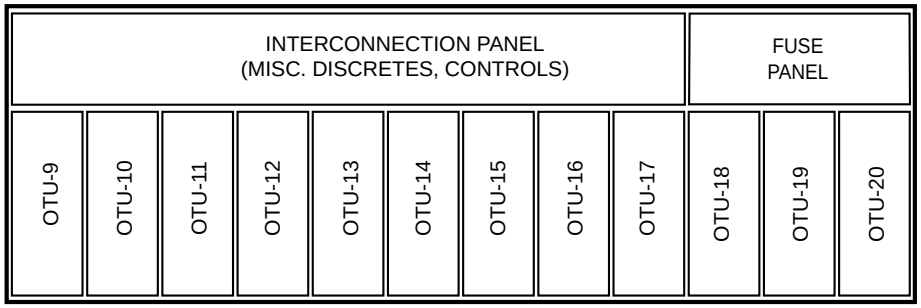
The OT cabinet shelves are

- Complementary Shelf 2
- Complementary Shelf 1
- System Controller Shelf

Complementary Shelf 1 and 2

Each Complementary Shelf consists of 12 OTU circuit pack slots, a designation label strip, an interconnection panel, and a fuse panel.

Figure 4-3 shows the OT Cabinet Complementary Shelf 1. Complementary Shelf 2 is identical to Complementary Shelf 1, except that the OTUs are numbered from 21 to 32. Refer to the "Designation Label Strips" section for illustrations of the labels.



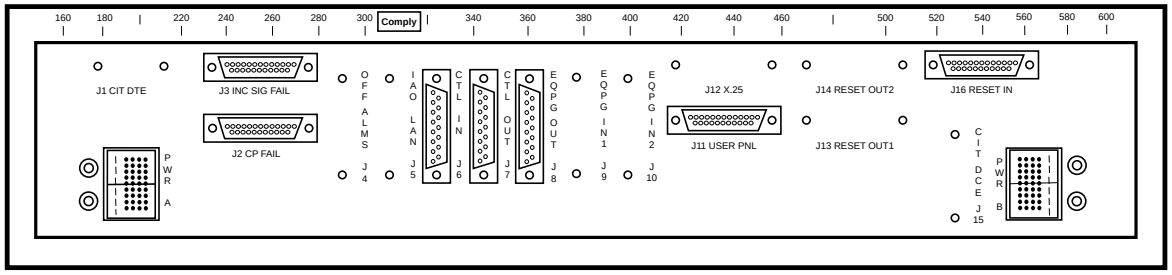
opt04002.00eJF120196

Figure 4-3. OT Cabinet Complementary Shelf 1 (12 OTUs)

Interconnection Panel for the Complementary Shelves

Each OT shelf is a single nest construction with a built-in interconnection area at the top for internal control and operations interface connections. The backplane for each shelf provides intrashelf connections between all the circuit packs used in the shelf. The interconnection panel also provides connections from the top of each shelf to the various circuit pack connector pins on the backplane. All access to the connectors is from the front.

Figure 4-4 shows a diagram of the interconnection panel on the Complementary Shelves as seen from the front of the shelf.



opt04014.00ejf123196

Figure 4-4. Interconnection Panel – Complementary Shelves

System Controller Shelf

The System Controller Shelf consists of 8 OTU circuit pack slots, three of the four empty circuit pack slots for the future installation of a SYSCTL, SYSMEM and TOHCTL circuit pack, a designation label strip, an interconnection panel, and a fuse panel.

Figure 4-5 shows the OT Cabinet System Controller Shelf.

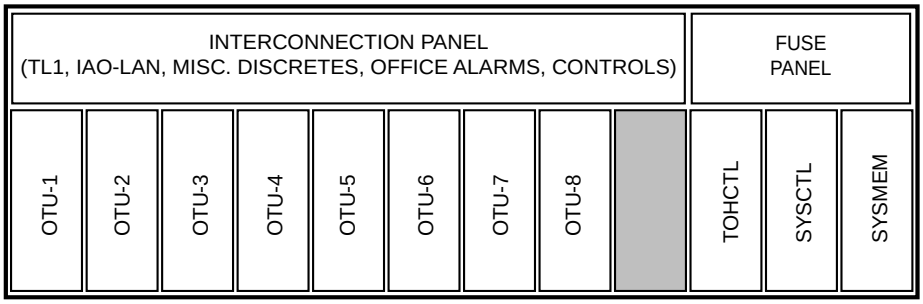
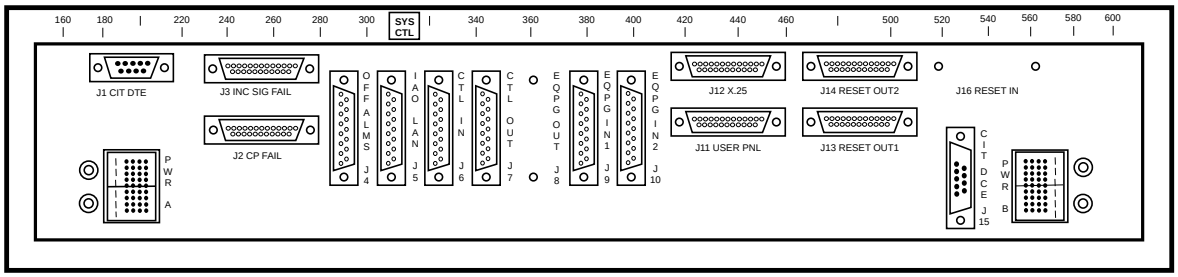


Figure 4-5. OT Cabinet System Controller Shelf (8 OTUs)

Interconnection Panel for the System Controller Shelf

Figure 4-6 shows a diagram of the interconnection panel on the System Controller Shelf as seen from the front of the shelf. Refer to the section "Interconnection Panel for the Complementary Shelves" for a description of the interconnection panel's functions.



opt04007.00ejf123196

Figure 4-6. Interconnection Panel – System Controller Shelf

Fuse Panel for all Shelves in the OT Cabinet

The fuse panel provides

- Fuse indicators for overcurrent protection (A and B feeds)

To avoid the interruption of power when removing the fuse panel, the fuses are not physically attached to the fuse panel. Therefore, the fuse panel can be replaced in the field.

Figure 4-7 shows a diagram of the fuse panel.

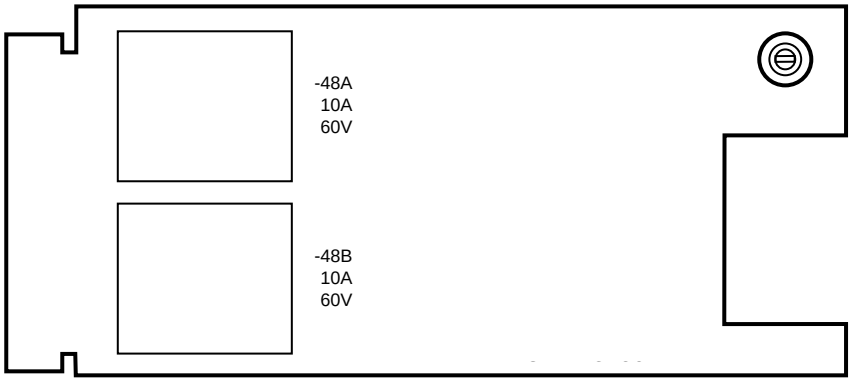


Figure 4-7. Fuse Panel

Shelving Configuration of the OT Cabinet

Figure 4-8 shows the configuration of the three shelves as they are mounted in a cabinet.

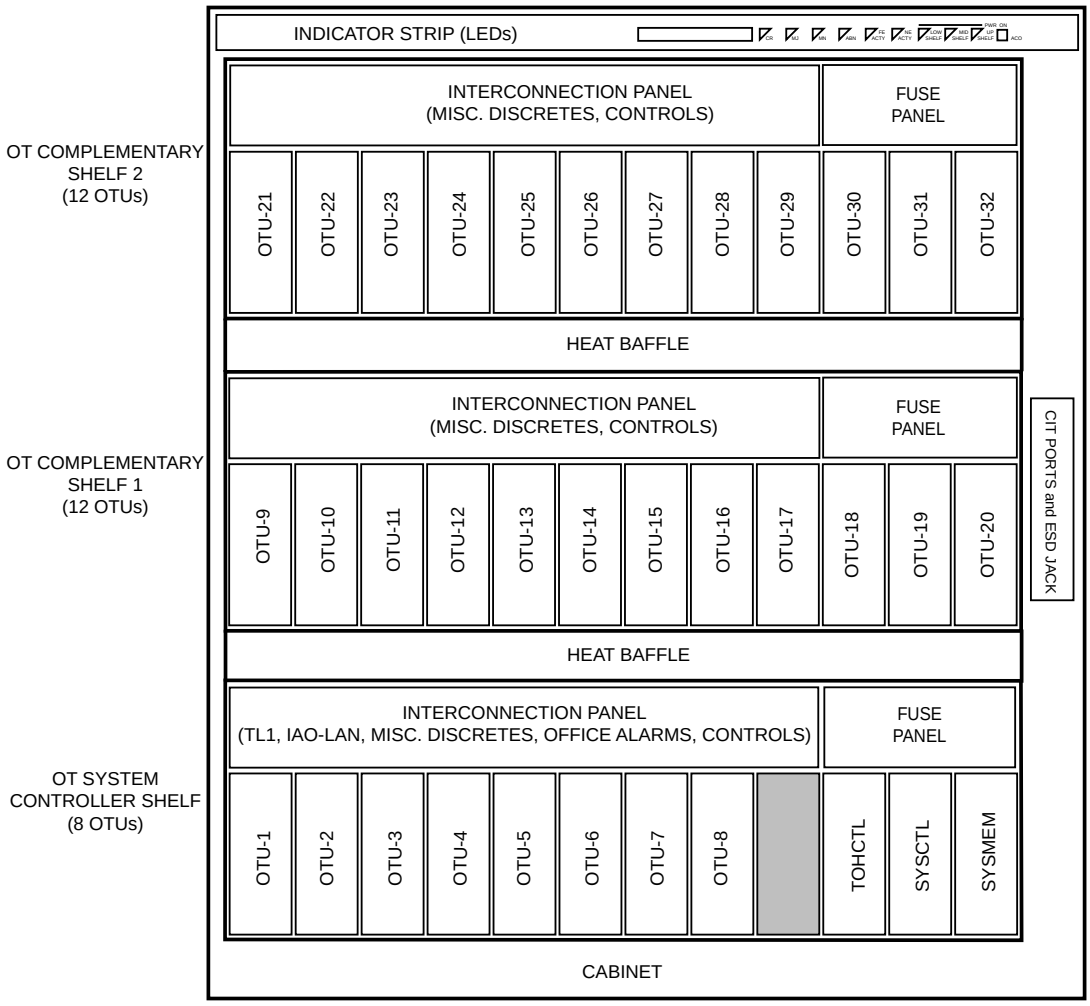


Figure 4-8. Shelving Configuration of the OT Cabinet

Miscellaneously Mounted Shelves

OT shelves can be mounted in an ETSI-compatible, ED-800 type, or ED-801 type frame. Shelves used for any application other than mounting in an OT cabinet must be ordered miscellaneously.

Miscellaneously mounted shelves may be ordered as:

- The Miscellaneously Mounted Application (L10) which consists of three shelves: Complementary Shelf 2, Complementary Shelf 1, and System Controller Shelf.
- The Miscellaneously Mounted System Controller Shelf (L11)
- The Miscellaneously Mounted Complementary Shelf 1 (L12)
- The Miscellaneously Mounted Complementary Shelf 2 (L13)

All miscellaneously mounted OT shelves are identical to those used in OT cabinets, except that each miscellaneously mounted shelf (L10 - L13) also includes:

- One front shelf cover
- An attached heat baffle
- A fuse / power indicating panel for Complementary Shelf 1 and 2
- A user panel for the System Controller Shelf

Because the individual miscellaneously mounted shelves (L11 - L13) comprise the Miscellaneously Mounted Application (L10), all information and illustrations about miscellaneous configurations apply to all relevant miscellaneously mounted shelves in L10, L11, L12 and L13.

Figure 4-9 shows a diagram of the Miscellaneously Mounted Application (L10) with front covers.

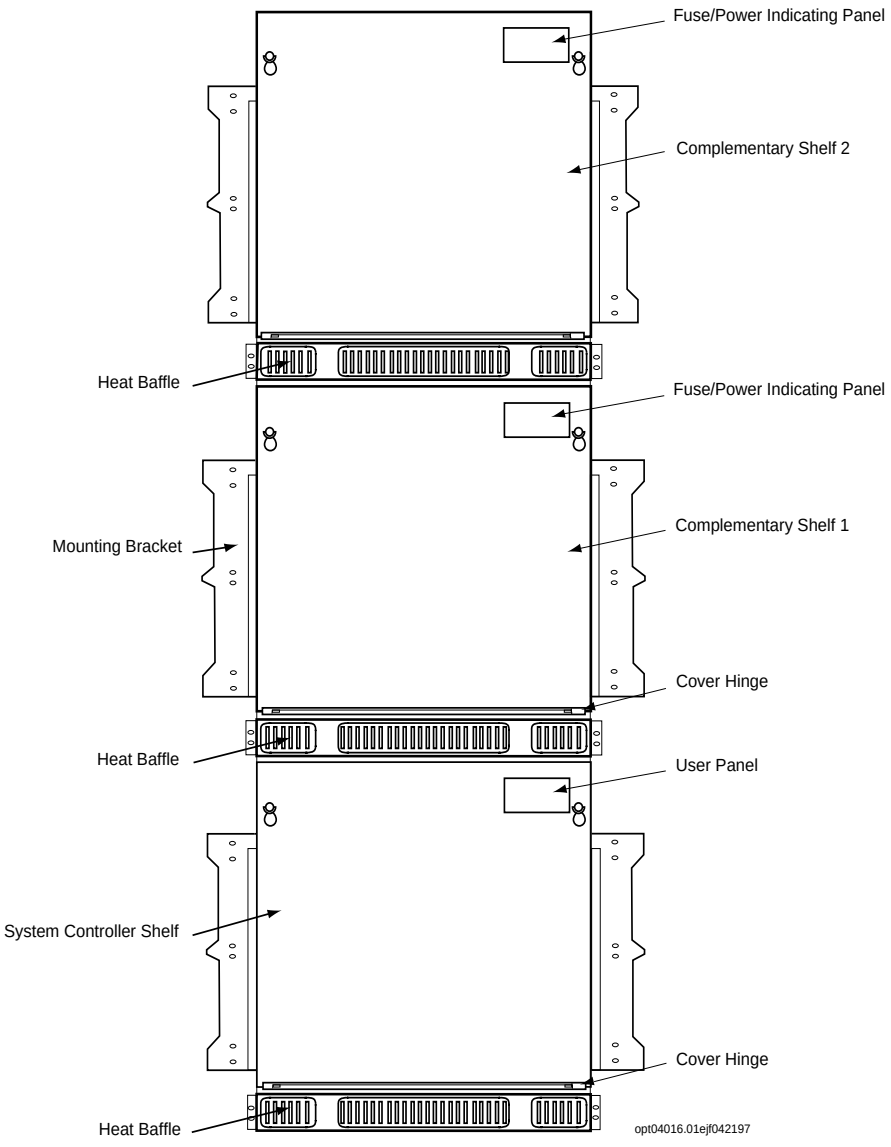


Figure 4-9. Miscellaneously Mounted Application (L10) with Front Covers

Complementary Shelves 1 and 2

Each miscellaneously mounted Complementary Shelf (in L10, L12 and L13) consists of 12 OTU circuit pack slots, an interconnection panel, and a fuse / power indicating panel, a designation label strip, an attached heat baffle, power filters, cables, and a front and rear cover.

Because miscellaneously mounted shelves are not mounted in a cabinet with an indicator strip, the indicators must be placed on the individual shelves. The Complementary Shelves each have a fuse / power indicating panel that displays a green Power On (PWR ON) LED. The PWR ON LED illuminates to indicate that the respective shelf is receiving -48 V power.

Figure 4-10 shows a Miscellaneously Mounted Complementary Shelf 1 (L 12) without the front shelf cover. Complementary Shelf 2 is identical to Complementary Shelf 1 except that the OTUs are numbered from 21 to 32. Refer to the “Designation Label Strips” section for illustrations of the labels.

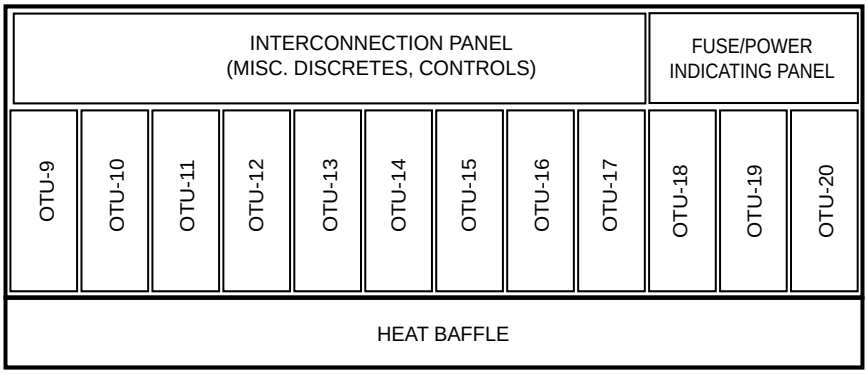


Figure 4-10. Miscellaneously Mounted Complementary Shelf 1 (L12) (12 OTUs)

Interconnection Panel for the Complementary Shelves

The interconnection panel of the miscellaneously mounted Complementary Shelves is identical to the interconnection panel of the OT Cabinet Complementary Shelves.

Refer to Figure 4-4 for a diagram and a description of a Complementary Shelf’s interconnection panel as seen from the front of a Complementary Shelf.

Fuse/Power Indicating Panel

In miscellaneously mounted configurations (L10, L12, and L13), both Complementary Shelf 1 and 2 are equipped with a fuse / power indicating panel. Each panel provides

- Fuse indicators for overcurrent protection (A and B feeds)
- An Electrostatic Discharge (ESD) jack that is connected to a frame ground
- One green Power On (PWR ON) LED that illuminates to indicate that the respective shelf is receiving -48 V power

To avoid the interruption of power when removing the fuse / power indicating panel, the fuses are not physically attached to the fuse / power indicating panel. Therefore, the panel can be replaced in the field.

Figure 4-11 shows a diagram of the fuse / power indicating panel.

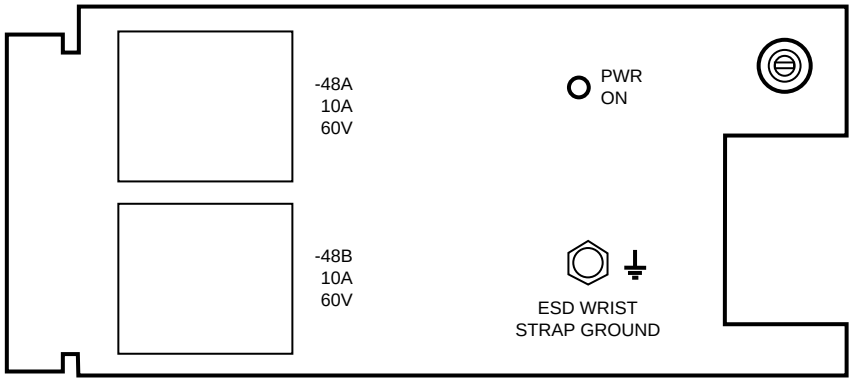


Figure 4-11. Fuse/Power Indicating Panel

System Controller Shelf

Each miscellaneously mounted System Controller Shelf (L10 and L11) consists of 8 OTU circuit pack slots, three of the four empty slots identified for the future installation of a SYSCTL, SYSMEM and TOHCTL circuit pack, an interconnection panel, a user panel, a designation label strip, an attached heat baffle, power filters, cables, and a front and rear cover.

Figure 4-12 shows Miscellaneously Mounted System Controller Shelf (L11) without the front shelf cover.

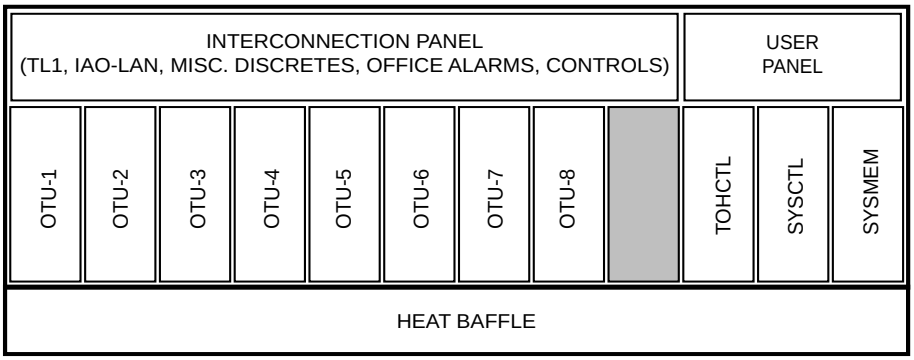


Figure 4-12. Miscellaneously Mounted System Controller Shelf (L11) (8 OTUs)

Interconnection Panel for the System Controller Shelf

The interconnection panel of a miscellaneously mounted System Controller Shelf is identical to the interconnection panel of an OT Cabinet System Controller Shelf.

Refer to Figure 4-6 for the diagram of a System Controller Shelf's interconnection panel as seen from the front of the shelf.

User Panel

The user panel on a miscellaneously mounted System Controller Shelf, (L10 and L11), is located in the same area as the fuse panel in the cabinet-based shelves. However, the user panel not only functions as a fuse panel, but also displays the same alarm LEDs and power indicators for the shelves as the indicator strip on the cabinet configuration (Figure 4-2).

Each user panel provides the following items that are active in R1-OT:

- Fuse indicators for overcurrent protection (A and B feeds)
- An Electrostatic Discharge (ESD) jack that is connected to a frame ground
- One green Power On (PWR ON) LED that illuminates to indicate that the shelf is receiving -48 V power

To avoid the interruption of power when removing the user panel, the fuses are not physically attached to the user panel. Therefore, the panel can be replaced in the field.

Figure 4-13 shows a diagram of the user panel for a Miscellaneously Mounted System Controller Shelf (L10 and L11). Refer to Table 4-2 for a list and description of the indicators present on the user panel.

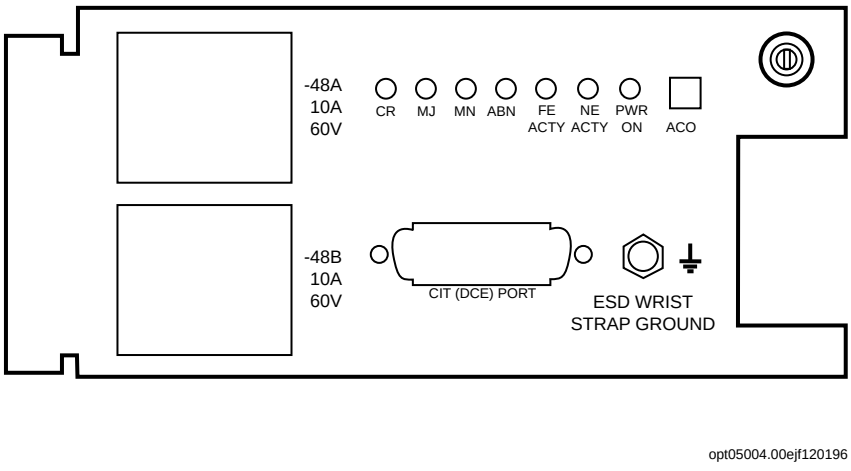


Figure 4-13. User Panel

Although Table 4-2 lists all the indicators that appear on the user panel, only the green Power On (PWR ON) LED is active in Release 1. The other LEDs are provided now, to make upgrading in future releases easier. No components will be replaced or removed to upgrade; new components will simply be added to the existing configurations to provide additional features.

Table 4-2. Indicators Present on the User Panel (L10 and L11)

Indicator Name	Abbrev.	Color	Description
Power On	PWR	Green	Indicates that the shelf is receiving -48 V power
Critical	CR	Red	Indicates critical active alarm level
Major	MJ	Red	Indicates major active alarm level
Minor	MN	Yellow	Indicates minor active alarm level
Near End Activity	NE ACTY	Yellow	Indicates alarm or status conditions at the local equipment
Far End Activity	FE ACTY	Yellow	Indicates alarm or status conditions at the remote equipment
Alarm Cut-off*	ACO	Green	When depressed, silences active audible alarms
Abnormal	ABN	Yellow	Indicates an abnormal condition

* The ACO switch is only active after SYSCTL and SYSMEM circuit packs are installed in the System Controller Shelf (future upgrade).

Shelving Configuration of the Miscellaneously Mounted Application (L10)

Like the OT Cabinet, the Miscellaneously Mounted Application also has three shelves. Because miscellaneously mounted shelves are free-standing, the customer is able to mount the shelves in any appropriate frame at the desired location. However, because of cable lengths provided in this list, all three shelves must be mounted together, as shown in Figure 4-14. If you need individual miscellaneously mounted shelves, they may be ordered as L11, L12, or L13.

Figure 4-14 shows the Miscellaneously Mounted Application (L10) shelving configuration without the front shelf covers.

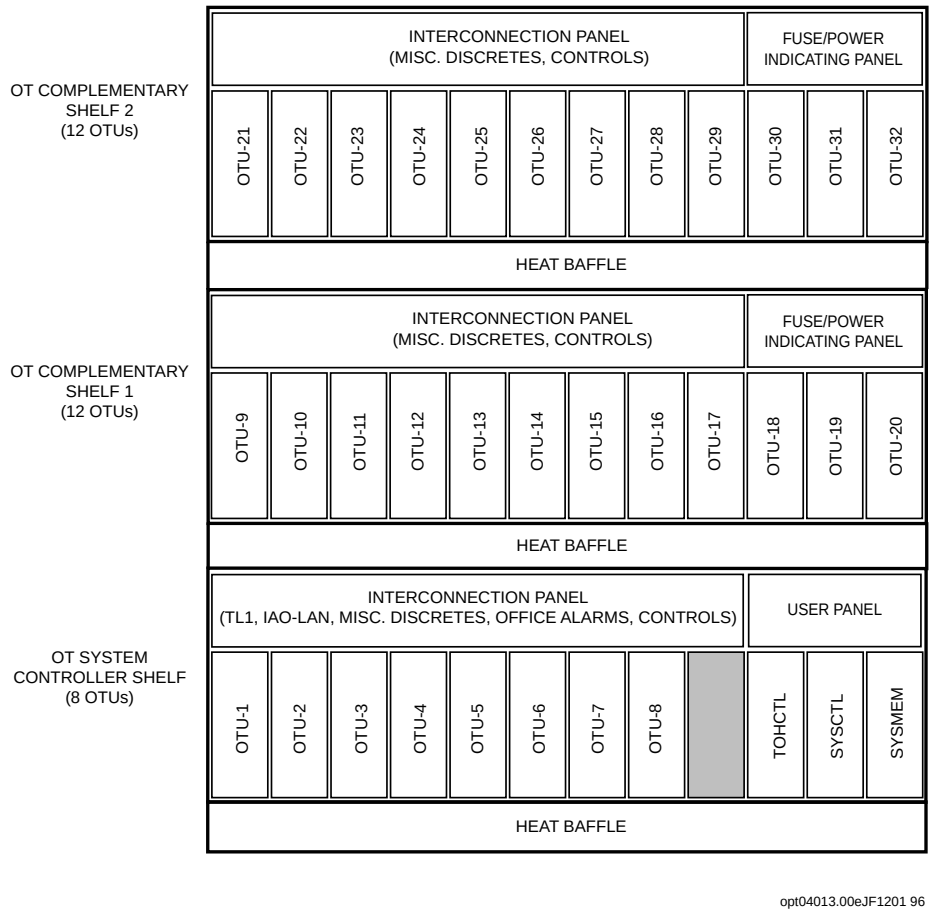


Figure 4-14. Miscellaneously Mounted Application (L10) Shelving Configuration

Circuit Packs

The OT circuit packs each use two latch assemblies (top and bottom). All circuit pack assemblies connect to the backplane. All optical connections in and out of the circuit packs are through faceplate-mounted optical connectors.

Transmission Circuit Packs

OT's transmission circuit packs are the Optical Translator Units (OTUs).

Optical Translator Unit (OTU)

The OTU circuit pack reshapes an OC-48 optical signal by

- Converting the signal from optical to electrical format
- Demultiplexing the signal and monitoring it for errors
- Converting the signal back into an OC-48 optical signal suitable for interfacing with OLS (OTU 41A / C (1-8)C) or a standard SONET / SDH ADM terminal (OTU 41BB)

Each OTU is equipped with a board controller that is responsible for

- Device initialization
- Error monitoring (LOS, LOF, B_1 Parity)
- Fault detection
- Operation of the miscellaneous discrete outputs and the circuit pack Fault LED
- Firmware storage

Control Circuit Packs

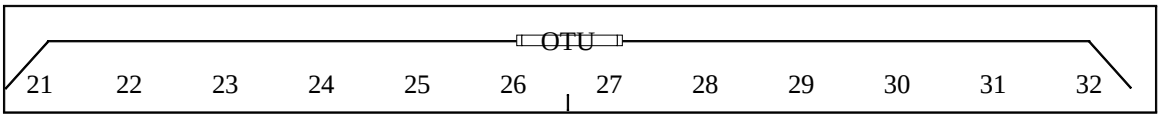
The following control circuit packs are not available in R1-OT, but they will be available in future upgrades:

- System Controller (SYSCTL)
- System Memory (SYSMEM)
- Tributary Overhead Controller (TOHCTL)

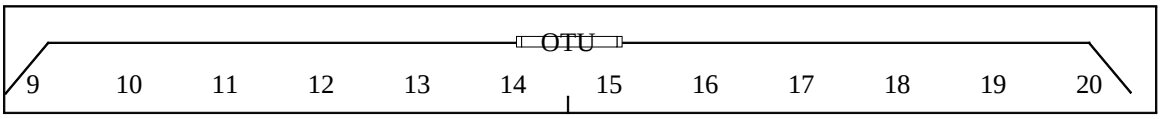
Designation Label Strips

Each OT shelf is equipped with a designation label strip to aid the user during installation, operation, upgrades, and maintenance. Each strip, attached below the plugged-in circuit packs, identifies the placement of each pack in the shelf. The following three label strips identify shelf slot designations for the circuit packs in all five OT configurations (L1, L10, L11, L12, and L13). The slots identified by the labels TOHCTL, SYSCTL, and SYSMEM are currently empty, but they are provided now to simplify upgrading the product in future releases.

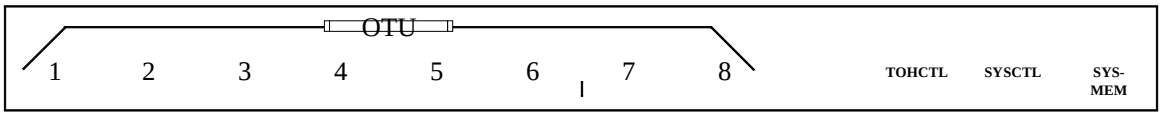
- Complementary Shelf 2



- Complementary Shelf 1



- System Controller Shelf



Power

The OT 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 required voltages, improving system reliability by dissipating heat uniformly across the system, avoiding "hot spots."

OT is powered by -48 V DC. The voltage range for all the components is -42.75 to -60 V DC. Power filtering and fusing are performed at the shelf level. DC-to-DC on-board power converters convert power on individual circuit packs.

Low Voltage Cut-off

To protect the equipment from abnormally low incoming voltage, the power filters provide a low voltage cut-off feature. If the incoming voltage drops below -38 V (±1.5 V), the power is cut-off until the incoming voltage returns to the acceptable level of -42.5 V (±1.5 V). The power filters automatically restart when the input voltage reaches -42.5 V (±1.5 V). OT sustains no damage if the power fluctuates between the acceptable level and the low voltage cut-off level.

Cable Dressing

To keep power feeder A and B cables in separate places, the cables are dressed on different sides of the shelves. Access for feeder A is from the upper left shelf cut-out and access for feeder B is from the upper right shelf cut-out. These power feeders terminate directly onto the power connectors mounted on their respective sides.

The non-transmission cables access each shelf from two cut-outs located on the upper left and right shelf side-plates near the interconnection panel area.The cables may access the shelf from either cut-out, depending upon ease of access.

The fiber cables access the shelf from cut-outs located on the lower left and right shelf side-plates. The placement of the OTUs in the shelf determines which side the fiber cables access that shelf.

Figure 4-15 shows a diagram of the OT shelf fiber/cable dressing and EMC/ESD design.

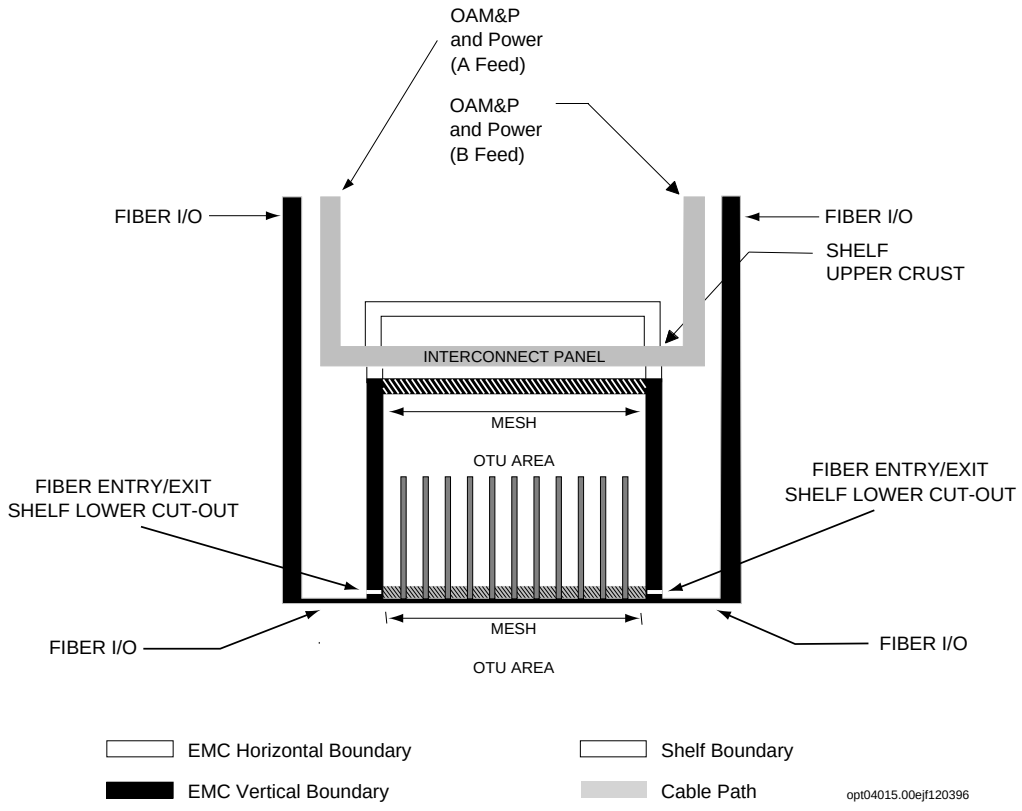


Figure 4-15. OT Shelf Fiber/Cable Dressing and EMC/ESD Design

Power Distribution for OT

Dual -48 V feeders (feeders A and B) provide redundant power. Each application uses two 8 Gauge (Ga) power cables. Each 8 Ga cable branches into N[1] 10 Ga power cables (one for each shelf). These power cables terminate directly onto the shelves. Each branch connects to an overcurrent limiter located on the shelves.

Figure 4-16 shows the overall cabinet power distribution.

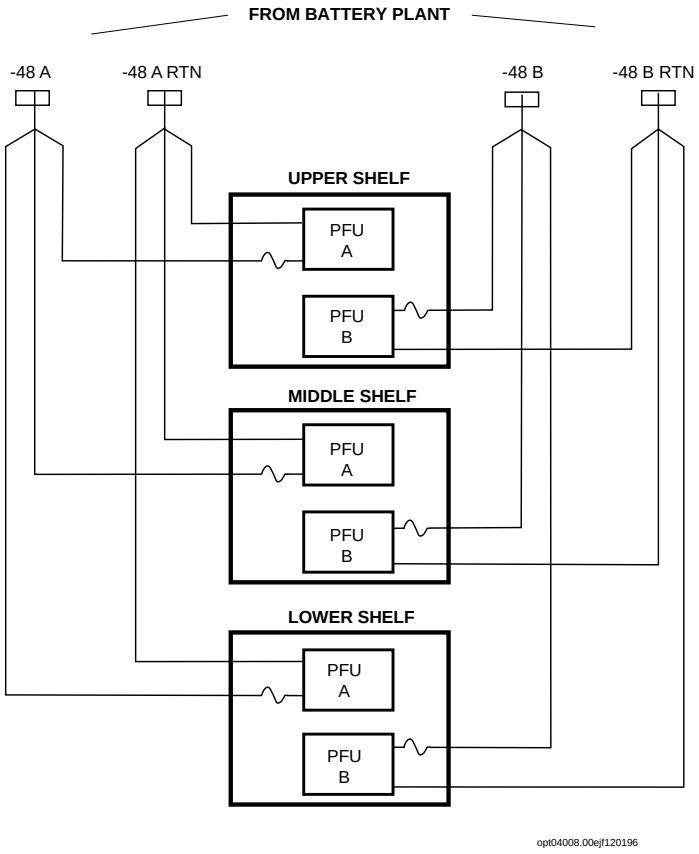


Figure 4-16. OT Overall Power Distribution in L1 or L10

1. *N* is equal to the number of shelves in the application. In the OT Cabinet (L1) and the Miscellaneously Mounted Application (L10), each cable would branch into three 10 Ga cables, one for each shelf. However, when powering an individual miscellaneously mounted shelf (L11, L12 and L13), each cable would branch into one 10 Ga cable.

Power Filtering

Two units provide power filtering for the -48 V DC power feeds (A and B). One unit per feed is used, allowing replacement without interrupting the power supply to the shelf. These units are physically attached to the shelf by removable fasteners. The power filter units can be replaced in the field. A miscellaneous discrete contact is provided with each filter so a fuse failure or low voltage cutoff may be reported independently for each power source.

Shelf-Level Power Distribution

Figure 4-17 shows a block diagram of the OT power distribution at the shelf level.

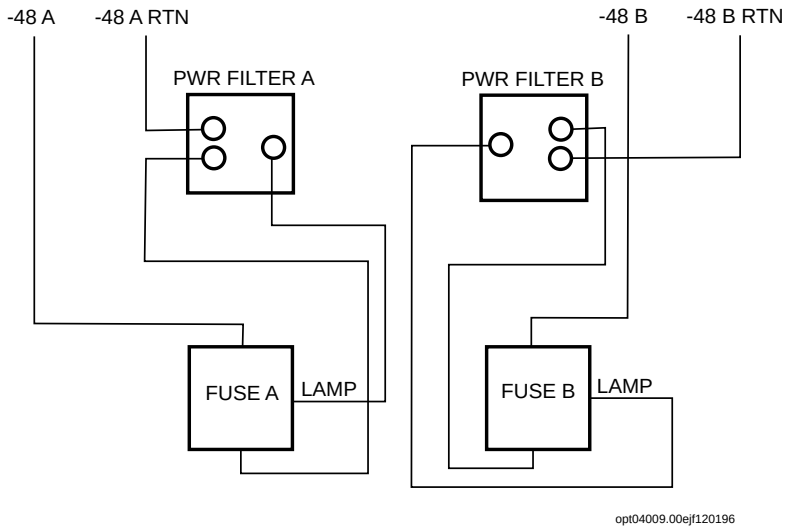


Figure 4-17. OT Shelf Level Power Distribution

Shelf-Level Filtering

The filters (one for each feeder) smooth the input current to the shelf. They plug directly into the backplane via a connector. The backplane distributes -48 V power to all the circuit packs by means of a printed power bus that spans the entire width of the panel.

If a fuse blows, a light illuminates on the fuse cap to indicate which power feeder has opened.

Power Cables

The power feed cables use stranded, color coded, and keyed connectors.

Table 4-3 shows the color codes used for power cabling.

Table 4-3. Power Cable Color Codes

Description	Color
-48 V A	Red
-48 V A RTN	Black
-48 V B	Slate
-48 V B RTN	Slate / Black

Backplane and Circuit Pack Interface

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.

Operations and Maintenance

5

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Operations and Maintenance

5

This chapter describes the various features available to operate and maintain Release 1 of Optical Translator (OT). User administration and provisioning of Optical Translator is not available in Release 1. Some additional user interfaces are also described that are not available in Release 1, but will be available in future releases.

Operations

This section describes the hardware and firmware user interfaces that control the maintenance of OT. OT supports basic fault location and maintenance capabilities through the miscellaneous discretes and the Fault LEDs on the Optical Translator Units (OTUs). The indicator strip (OT Cabinet) or user panel and fuse / power indicating panel (Miscellaneously Mounted Application) and the circuit pack faceplate Fault LED provide visible alarm information. However, only the Power On (PWR ON) LEDs on the indicator strip, fuse / power indicating panel, and user panel are active in Release 1.

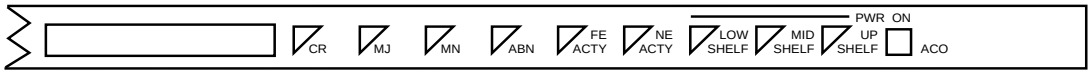
OT Cabinet

The OT Cabinet consists of three shelves mounted in a *5ESS-2000* Cabinet. An indicator strip is mounted at the top of the cabinet and each shelf is equipped with a fuse panel.

Indicator Strip

The OT cabinet is equipped with a LED indicator strip, located on the cabinet header. The indicator strip provides local system-level information.

Figure 5-1 shows the indicator as it appears at the top of the OT Cabinet.



opt05001.00ejf123096

Figure 5-1. Indicator Strip (OT Cabinet)

The following LEDs are active in R1-OT.

- The green Power On LEDs (PWR ON: LOW SHELF, MID SHELF, UP SHELF) indicate that the respective shelves are receiving -48 V power.

The following items are present on the indicator strip but are not active in R1-OT.

- The red LEDs indicate Critical (CR) and Major (MJ) alarms.
- The yellow LED indicates Minor (MN) alarms.
- The yellow Abnormal (ABN) LED indicates that a temporary condition, potentially affecting transmission, exists.
- The yellow Far-End Activity (FE ACTY) LED indicates that an alarm or status condition exists at any remote terminal.
- The yellow Near-End Activity (NE ACTY) LED indicates that an alarm or status condition exists at the local terminal.
- The green Alarm Cut-Off (ACO) push-button, with a built-in lamp, activates the alarm cut-off function and lights the lamp.

Fuse Panel

Each shelf (Complementary Shelf 1, Complementary Shelf 2 and the System Controller Shelf) in the OT Cabinet is equipped with an identical fuse panel. Each fuse panel provides

- Two 10 amp indicator fuses (-48A and -48B), one for each -48V DC power feeder (power feeder A and power feeder B)

Figure 5-2 shows the fuse panel of the three shelves in the OT Cabinet.

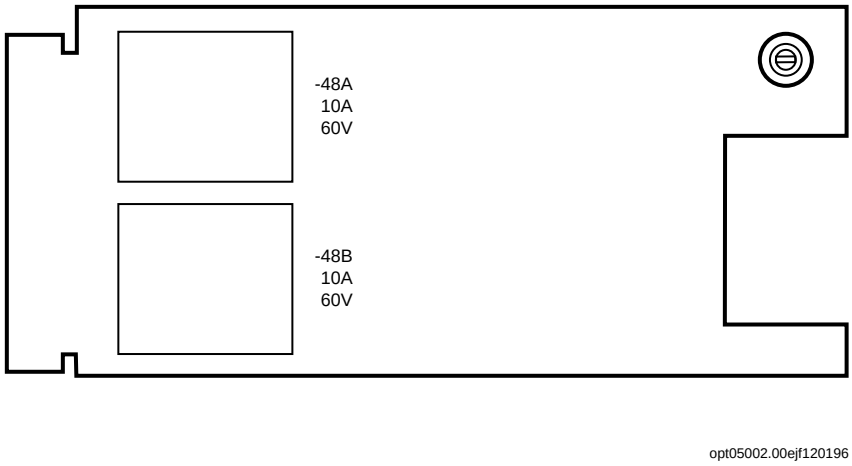


Figure 5-2. Fuse Panel (OT Cabinet)

Miscellaneously Mounted Shelves

Because the miscellaneously mounted shelves are mounted in a Network Bay Frame and not in a cabinet, the Miscellaneously Mounted Application (L10) and the individual miscellaneously mounted shelves (L11, L12 and L13) are not equipped with an indicator strip like the OT Cabinet. The LEDs that are provided on the indicator strip (OT Cabinet) are distributed on the fuse / power indicating panel (Complementary Shelves) and the user panel (System Controller Shelves).

Fuse/Power Indicating Panel

In miscellaneously mounted applications (L10, L12 and L13), both Complementary Shelf 1 and Complementary Shelf 2 are equipped with a fuse / power indicating panel that provides

- Two 10 amp indicator fuses (-48A and -48B), one for each -48 V DC power feeder (power feeder A and power feeder B)
- One ESD wrist strap ground
- One Power On (PWR ON) LED on each Complementary Shelf

Figure 5-3 shows the fuse / power indicating panel on the miscellaneously mounted Complementary Shelf 1 and Complementary Shelf 2 (L10, L12 and L13).

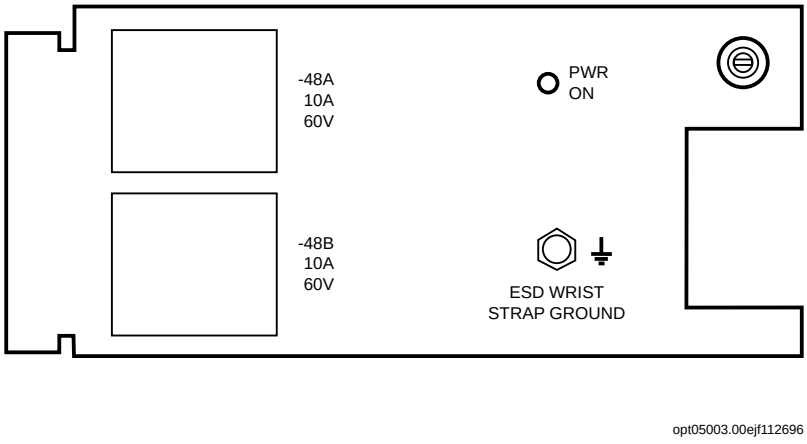


Figure 5-3. Fuse/Power Indicating Panel (L10, L12 and L13)

User Panel

A miscellaneously mounted System Controller Shelf (L10 and L11) is equipped with a user panel instead of a fuse/power indicating panel. In miscellaneously mounted configurations, the user panel not only functions like the fuse/power indicating panel, but also provides local system-level information, like the OT Cabinet's indicator strip.

Figure 5-4 shows the user panel on the miscellaneously mounted System Controller Shelf (L10 and L11).

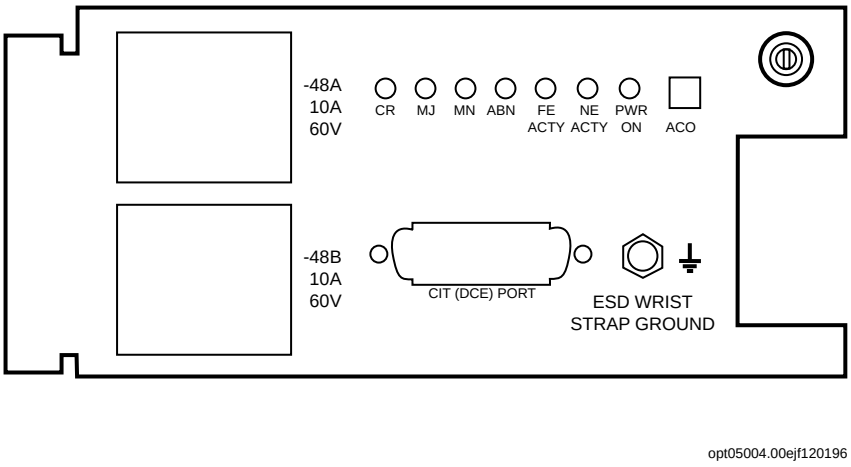


Figure 5-4. User Panel (L10 and L11)

The following user panel items are active in R1-OT:

- Two 10 amp indicator fuses (-48A and -48B), one for each -48 V DC power feeder (power feeder A and power feeder B)
- One ESD wrist strap ground
- One PWR ON (Power On) LED for the System Controller Shelf

The following items are present on the user panel but are not active in R1-OT:

- The red LEDs indicate Critical (CR) and Major (MJ) alarms.
- The yellow LED indicates Minor (MN) alarms.
- The yellow Abnormal (ABN) LED indicates that a temporary condition, potentially affecting transmission, exists.
- The yellow Far-End Activity (FE ACTY) LED indicates that an alarm or status condition exists at any remote terminal.
- The yellow Near-End Activity (NE ACTY) LED indicates that an alarm or status condition exists at the local terminal.
- The green Alarm Cut-Off (ACO) push-button, with a built-in lamp, activates the alarm cut-off function and lights the lamp.
- The CIT (DCE) port is available to connect a CIT-PC to the system.

Maintenance

OT maintenance detects failures, monitors incoming signal performance degradation, and isolates faults to specific circuit packs. Release 1 reports incoming signal and hardware conditions via miscellaneous discretes and circuit pack Fault LEDs. In R1-OT, maintenance consists of reactive and proactive maintenance. Future releases will provide for CIT, message-based OS interface, office alarms and operations interworking.

Reactive Maintenance

Reactive maintenance features identify failures after they occur. Reactive maintenance conditions detected by R1-OT are

- Loss of Frame (LOF)
- Loss of Signal (LOS)
- Equipment failures

Proactive Maintenance

Proactive maintenance refers to the process of detecting degrading conditions not severe enough to initiate alarming, but indicative of degradations that may lead to hard failures. Proactive maintenance conditions detected by R1-OT are

- B_1 parity errors
- Out of Range (OOR) on Laser Bias Current (LBC) and Optical Power Transmit (OPT)
- Single fuse failure on a -48 V feeders

To avoid service-affecting failures if a proactive maintenance condition is detected, maintenance activities should be scheduled to isolated and correct the condition.

OTU Circuit Packs

In both the OT Cabinet and the Miscellaneously Mounted Application, the OTU circuit packs are each equipped with miscellaneous discrete control points and a Fault LED. For a list of R1-OT maintenance conditions detected and reported by both the Fault LED and the two miscellaneous discretes, refer to Table 5-1. As shown in Table 5-1, some conditions cause the OTU laser output to be shut-off, which signals failures to downstream equipment.

OTU Faceplate

Each OTU is equipped with a red Fault LED on its faceplate. Operation of the Fault LED indicates that the OTU has detected a failure condition associated with that circuit pack.

Figure 5-5 shows the OTU faceplate with its Fault LED.

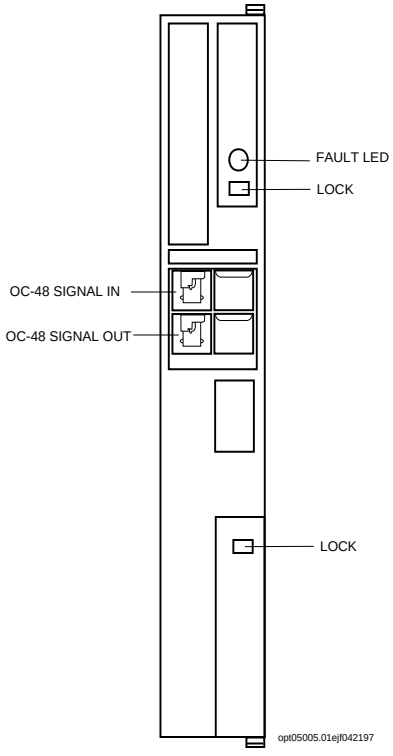


Figure 5-5. OTU Faceplate

Fault LEDs on OTUs

The red Fault LED on the transmission circuit pack (OTU) indicates conditions involving an incoming signal or that circuit pack. The Fault LED operates as stated when the following conditions are detected.

Conditions involving an incoming signal:

- **Incoming signal LOS/LOF**: the Fault LED flashes at one second intervals until the condition is cleared.
- **Incoming signal B_1 parity error**[1]**:** the Fault LED flashes at one second intervals for 20 seconds. If an additional error is detected while the Fault LED is still flashing from a previous error, then the 20 second duration restarts from the initial detection of the second error. For example, if the first error is detected at 11:00:00 and the second error is detected at 11:00:07, the Fault LED will flash until 11:00:27. (The LED would flash for a total of 27 seconds, not 40).

Conditions involving the OTU circuit pack:

- **Hardware problem**: the Fault LED is continuously lit until the condition is cleared.
- **OTU initialization:** the Fault LED is continuously lit for approximately 35 seconds after the circuit pack is inserted into a shelf. However, if a LOS/LOF condition is already present, the LED will be continuously lit for approximately 15 seconds and then the LED will begin flashing, indicating the existing LOS/LOF.

Note: An OTU's red Fault LED may not go on for certain failure conditions, such as a power failure.

1. Although each OTU monitors incoming signal B_1 parity errors, it does not recalculate the B_1 byte in the outgoing SONET frame.

Miscellaneous Discretes

In addition to the red Fault LED, each OTU is also equipped with two miscellaneous discrete control points. These control points can be connected to an External Miscellaneous Discrete Unit (EMDU) controlled by a co-located OLS NE or equivalent discrete monitoring unit via incoming signal failure and OTU circuit pack failure cables. For applications with OLS, it is possible to associate the miscellaneous discretes of an OTU with the OLS in the direction of transmission to simplify fault correlation.

Refer to Figure 4-4 and Figure 4-6 in Chapter 4, "Product Description," to see the placement of the miscellaneous discrete control point connectors on the interconnection panel of the OT Cabinet's System Controller Shelf and Complementary Shelves. (The interconnection panels shown in Figure 4-4 and Figure 4-6 also apply to the four miscellaneously mounted configurations, (L10, L11, L12 and L13). The type of interconnection panel is determined by the type of shelf, not the type of application.

The miscellaneous discrete points are defined as follows:

- **Miscellaneous Discrete 1 (MD1) – Circuit Pack Failure:** MD1 is closed during equipment failures, Out of Range (OOR) on Laser Bias Current (LBC) or Optical Power Transmit (OPT), and for approximately 35 seconds after circuit pack insertion.
- **Miscellaneous Discrete 2 (MD2) – Incoming Signal Failure:** MD2 is closed when incoming signal LOS/LOF is detected until the condition is cleared. MD2 is also closed for 20 seconds when an incoming signal B_1 parity error is detected. If an additional error is detected while MD2 is closed from a previous error, then the 20 second duration restarts from the initial detection of the second error. For example, if the first error is detected at 11:00:00 and the second error is detected at 11:00:07, MD2 will be closed until 11:00:27. (MD2 will be closed for 27 seconds, not 40).

Note: Active miscellaneous discretes will be closed for at least 20 seconds to allow for detection by an EMDU or an equivalent discrete monitoring unit. When no conditions are detected, both MD1 and MD2 are open.

Summary of OTU Maintenance Conditions

Table 5-1 summarizes the maintenance conditions detected and reported by the OTU's Fault LED and the two miscellaneous discrete control points (MD1 and MD2). The status of the laser, On / Off, during the reported conditions is also provided. Refer to the sections "Fault LEDs on OTUs" and "Miscellaneous Discretes" previously in this chapter for detailed descriptions about the detection and reporting of maintenance conditions.

Table 5-1. R1-OTU Maintenance Conditions

Condition	Fault LED	MD1	MD2	Laser
No Failures*	Off	Open	Open	On
Incoming Signal OC-48 LOS / LOF	Flashing	Open	Closed	Off
Incoming Signal B_1 parity error	Flashing	Open	Closed	On
Out of Range (OOR) on Laser Bias Current (LBC) or Optical Power Transmit (OPT)	On	Closed	Open	On
Internal defect on OTU	On	Closed	Open	Off
Power converter / fuse failure on OTU	On†	Closed	Open	Off
Single fuse failure on a -48 V feeder	On‡	Closed	Open	On
OTU reset / initialization	On	Closed	Open	On
OTU pack insertion**	On	Closed	Open	Off

* Multiple failures may cause both MD1 and MD2 to be closed.
† If a power converter / fuse fails, the MD1 will close and the laser will be turned off, but it is possible that the Fault LED may not go on.
‡ A single fuse failure in a shelf will cause all the Fault LEDS to be on and all MD1s to be closed in that shelf or bay.
** After an OTU is inserted into a slot, the laser remains off only until the firmware is up and running, as long as no other failure conditions are present.

System Planning and Engineering

6

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- Protection Switching 6-2
- Optical Line-Loss Budgets 6-2
- Capacity 6-2
- Engineering Rules 6-2
  - OLS/OT Interworking 6-3
  - Optical Dispersion 6-4
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- Environmental Considerations 6-10
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System Planning and Engineering

6

This chapter summarizes information needed for applications planning before procuring and deploying Optical Translator (OT).

Planning Considerations

There are several considerations to keep in mind when planning a network. Projected customer requirements determine the initial capacity needed, as well as growth. Both the location and intended use of the network determine its physical installation considerations.

Before ordering or installing the equipment, you need to develop an overall plan and select or construct the building that is to serve as a terminal office or repeater site. This plan should take into consideration the eventual system size and include the following:

- Capacity
- Engineering rules
- Floor plan layout
- Equipment interconnection
- Cabling
- Environmental considerations
- Power planning

Lucent Technologies offers engineering and installation services for planning and installing OT. For more information about Lucent Technologies engineering and installation services, refer to Chapter 8, "Product Support."

Protection Switching

All protection switching occurs on the associated LCT or ADM. There is no facility for protection switching in OT.

Optical Line-Loss Budgets

See Chapter 10, "Technical Specifications," for loss budgets for 41A (1-8)C, 41C (1-8)C, and 41BB OTUs.

Capacity

The number of OTUs in a single fully-equipped NE is adequate to support eight bidirectional, service and protection OC-48/STM-16 lines. Refer to Chapter 10, "Technical Specifications," for more information on capacity planning.

Engineering Rules

The Lightguide Build-Outs (LBOs) on the OTU receiver input must be selected by the user at installation to provide the correct optical attenuation for the measured input power. However, the LBOs on the transmit side should not be changed by the user; they are equipped during manufacturing with a set pre-emphasis. Detailed LBO selection guidelines are provided in the *Optical Translator (OT) Installation Manual, 365-575-410*.

OLS/OT Interworking

The OT can be used to concatenate multiple OLS systems.

The rules for concatenating systems are presented in Table 6-1

Table 6-1. Engineering Rules for OLS/OT Interworking

Per OLS*	Standard Reach	Long Reach
Maximum Spans	3	8
Maximum Loss per Span	33 dB	24 dB
Typical Maximum Distance per Span	120 km	80 km
Typical Maximum Overall Distance	360 km	640 km
Per Wavelength		
Maximum OTUs	10	10
Maximum WAD Sites	10	10
Maximum Number of Spans	33	88
Typical Overall Length	3960 km	7040 km
Per Subnetwork†		
Maximum Number of Spans	unlimited (at least 250)	unlimited (at least 250)

* The following data is applicable using either conventional or TrueWave fiber.

† The total number of OLS systems that can be interconnected is limited only by the timing considerations of SONET/SDH ADMs.

In a WAD configuration, OTs can be used to express wavelengths between two or more standard or long reach OLS systems. A standard reach OLS system (3x33 dB) carries eight up to wavelengths on an optical line comprised of one, two, or three spans of 33 dB (120 km) each. A long reach OLS system (8x24 dB) transmits up to eight wavelengths on a fiber pair over up to eight spans, with each span having a maximum loss of 24 dB (80 km).

If the distance to the next office exceeds the reach of a single OLS system, OT can be used to concatenate two or more OLS systems. Through concatenation of up to 11 OLS systems of any kind, the OT can extend a wavelength section into thousands of kilometers. Hence, OT can extend the distance between SONET terminals to 3960 km (3x33) or 7040 km (8x24).[1]

There can be 10 OTs between SONET ADMs. In most cases, this implies an express wavelength can go through 11 offices.

Optical Dispersion

Refer to the "Optical Dispersion" section in Chapter 10, "Technical Specifications," for the dispersion characteristics of OTUs 41A(1-8)C, 41C(1-8)C, and 41BB. To determine the maximum distance between OTs, use the dispersion information and the typical fiber characteristics of the network. For example, if the dispersion is 19 ps/nm-km then OTU 41A(1-8)C is capable of reaching 360 km.

1. Note that in constructing rings with large circumferences (for example, 10,000 km circumference or larger), there are adverse impacts on protection switching due to propagation delay.

Floor Plan Layout

Figure 6-1 shows a typical floor plan layout for OT in a central office. OT is a front access system. The rear aisle space of 2 feet is recommended to allow the rear doors to be fully opened. If floor space is limited, the rear aisle can be reduced to no less than 4 inches. Refer to the floor plan data sheets [804-604-162-001] for explicit details.

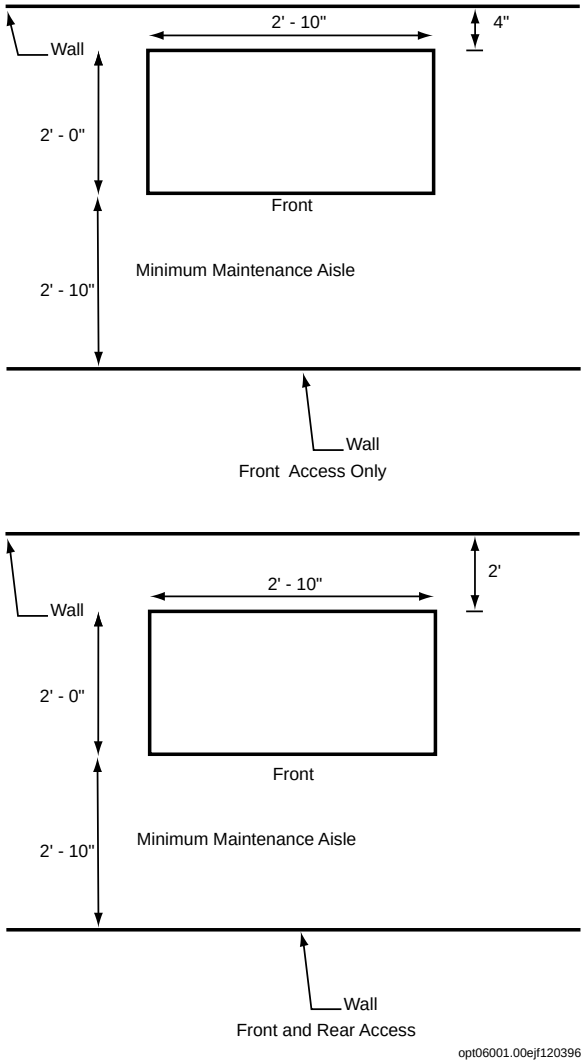


Figure 6-1. Floor Plan Layout

Equipment Interconnection

OT is designed as a front access product; all cable and fiber connections can be made from the front of the system. This feature allows planners to design networks with OT in controlled environment vaults, concrete huts, or other locations, where space is limited and equipment must be placed close to the wall.

All external interconnection cabling uses industry standard connectors.

Cabling

The following are major classes of signals cabled to OT:

- OC-48 optical signals
- OAM&P electrical signals

The OTUs are designed to provide connections through front mounted connector systems. The connector system supports the use of three different types of connectors for OTUs:

- *ST* type LBO
- FC type LBO
- SC type LBO

If required, the connector system also provides optical attenuation via Lightguide Build-Outs (LBOs). All OTUs (41A(1-8)C, 41C(1-8)C, and 41BB) are factory-equipped with *ST*-type connectors. In addition, a kit with LBO values from 3 dB to 10 dB may be ordered for each OTU. The correct input LBO value must be chosen during system installation.

Figure 6-3 shows the build-out block with *ST*-type LBOs.

Figure 6-4 shows the build-out block with FC-type LBOs.

Figure 6-5 shows the build-out block with SC-type LBOs.

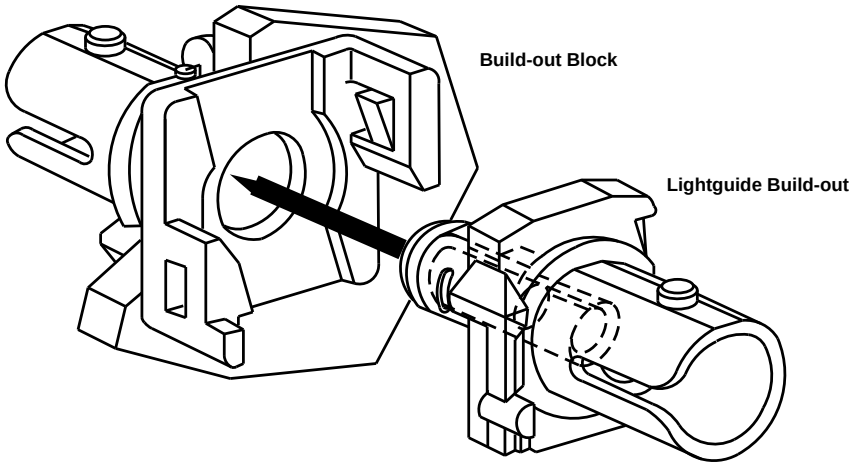


Figure 6-2. *ST*-Type Build-Out Assembly

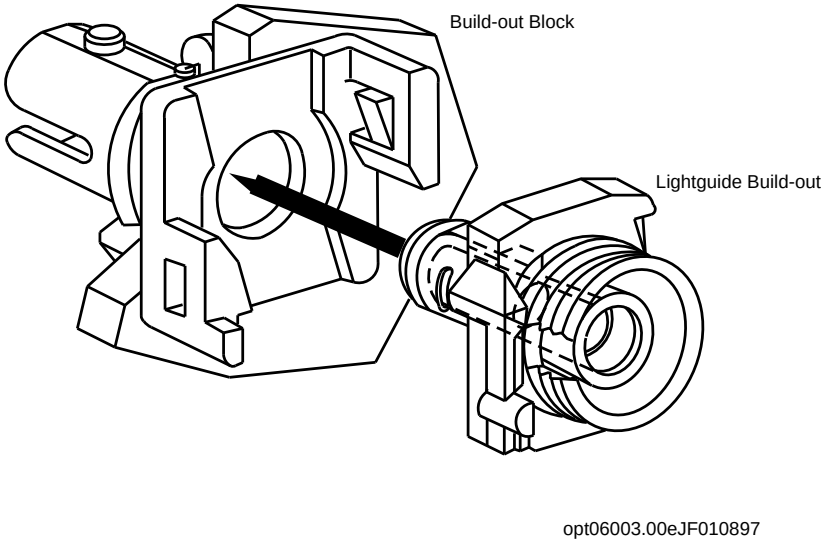


Figure 6-3. FC-Type Build-Out Assembly

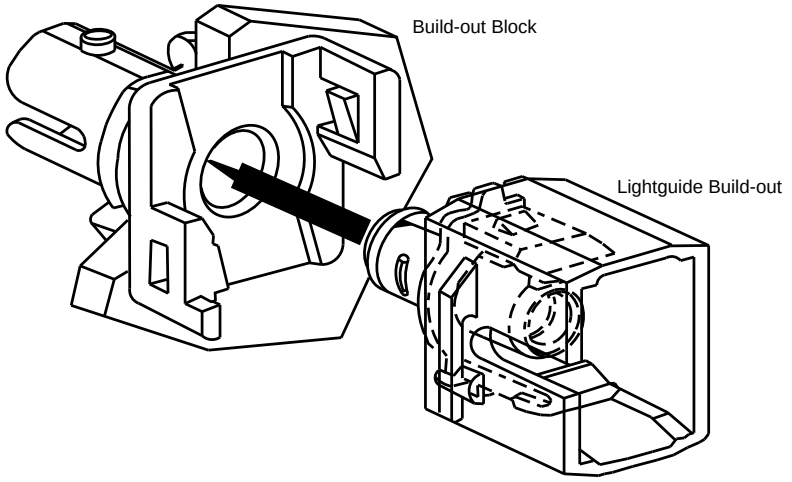


Figure 6-4. SC-Type Build-Out Assembly

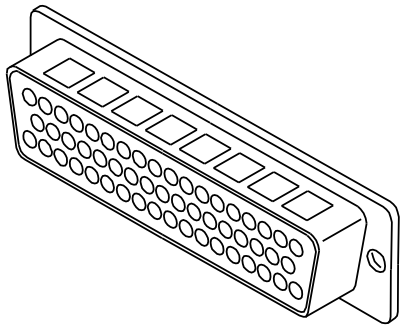
All fiber jumpers between OLS and OTUs or an external LBO cross-connect panel and OTUs must use single-mode fiber. The intrashelf fiber jumpers and the optical line I/O fiber must also use single-mode fiber.

When *ST,* FC, or SC connectors are used together, hybrid jumpers must be used. A hybrid jumper has a different type of connector at each end. The connectors at both ends of the jumper must match the panel-mounted connectors. *ST* connectors are available for use with the LBO cross-connect panel and can be installed when OT is installed.

The OAM&P cables are terminated with industry-standard D-subminiature connectors (Figure 6-5).

The length of the power feeds are individually engineered and are sized to handle the maximum current drain the equipment can experience.

For more information about cabling, refer to Chapter 7, “Ordering.”



opt06002.00eJF010897

Figure 6-5. D-Subminiature Connector

Environmental Considerations

OT shelves and cabinets comply with the environmental compatibility requirements in documents GR-63-CORE, Issue 1, October 1995 and GR-1089-CORE.

Perforated metal meshes are used as part of the shelf construction to cover the top and bottom areas of the shelf in order to form an electromagnetic enclosure for all circuit packs in the shelf. OT shelves, circuit packs (CPs), and cable treatments are designed to satisfy the requirements of Bellcore TA-NWT-001089, Issue 2, 1993. OT is also designed to meet the electromagnetic compatibility requirements of GR-1089-CORE.

OT complies with the IEC 801-2 Electrostatic Discharge (ESD) recommendation for exchange carriers. The shelves are grounded to the cabinet by the shelf mounting hardware. An ESD jack is provided on the right front of the cabinet, on the fuse panel, fuse / power indicating panel and user panel, for grounding straps.

Power Dissipation

OT's power dissipation is 182 watts per shelf for the Complementary Shelves, 232 watts per shelf for the System Controller Shelves, and 646 watts for a fully-equipped OT cabinet. Because OT dissipates heat by natural convection cooling, it does not require a cooling fan. Refer to Chapter 10, "Technical Specifications," for additional information about power dissipation and current drains for OT configurations.

Power Planning

Two -48.0 to -60.0 volt power feeders and returns (feeders A and B) should be used to power each OT cabinet. Redundant power feeders are used to ensure maximum system reliability. All power feeders should be sized to carry the maximum cabinet power consumption.

Each feeder is equipped with a filter to reduce any switching noise that may be present on the input current. For additional information, refer to Chapter 10, "Technical Specifications."

Ordering

7

- How to Order Optical Translator Equipment 7-1
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Ordering

7

This chapter provides information about

- Ordering Optical Translator (OT) equipment
- Ordering equipment for products that operate with OT
- Determining circuit pack compatibility
- Ordering spare circuit packs

How to Order Optical Translator Equipment

OT may be ordered in five different applications:

- OT Cabinet (L1)
- Miscellaneously Mounted Application (L10)
- Miscellaneously Mounted System Controller Shelf (L11)
- Miscellaneously Mounted Complementary Shelf 1 (L12)
- Miscellaneously Mounted Complementary Shelf 2 (L13)

All the applications include the main equipment with the appropriate unequipped shelf or shelves and some of the required cables. All the additional equipment necessary to form the different applications is grouped together into J-drawing specifications and list numbers. Information for ordering related documentation and spare equipment is also included.

Worksheets

This section provides worksheets for putting together complete OT applications.

The worksheets list the circuit packs that you need to form a complete system. The worksheets also show other equipment needed to complete the system such as installer cables and LBOs.

Step 1 Use the worksheet(s) appropriate to the application(s) that you wish to order.

OT Cabinet Worksheet	Table 7-1
Miscellaneously Mounted Application Worksheet	Table 7-2
Miscellaneously Mounted System Controller Shelf Worksheet	Table 7-3
Miscellaneously Mounted Complementary Shelf 1 Worksheet	Table 7-4
Miscellaneously Mounted Complementary Shelf 2 Worksheet	Table 7-5

Step 2 Use the tables following the worksheets to select the circuit packs necessary for your configuration (based on the number of OC-48 signals that you need regenerated by OTUs). For example, you need to order 4 OTUs to support bidirectional traffic on the service and protection lines of one OLS wavelength.

Step 3 Select the type and number of cables and Lightguide Build-Outs (LBOs) that you need.

You may photocopy the worksheets to make as many copies as you need.

Table 7-1. OT Cabinet Worksheet (J69000C-1)

Description	Choice	List/Group	Reference
Optical Translator Cabinet	Quantity _____	L1	Package Descriptions
Circuit Packs (J69000C-1)			
OTU 41A1C	Quantity _____	L401	Table 7-13, Table 7-15, and Circuit Pack Descriptions
OTU 41A2C	Quantity _____	L402	
OTU 41A3C	Quantity _____	L403	
OTU 41A4C	Quantity _____	L404	
OTU 41A5C	Quantity _____	L405	
OTU 41A6C	Quantity _____	L406	
OTU 41A7C	Quantity _____	L407	
OTU 41A8C	Quantity _____	L408	
OTU 41BB	Quantity _____	L229	
OTU 41C1C	Quantity _____	L451	
OTU 41C2C	Quantity _____	L452	
OTU 41C3C	Quantity _____	L453	
OTU 41C4C	Quantity _____	L454	
OTU 41C5C	Quantity _____	L455	
OTU 41C6C	Quantity _____	L456	
OTU 41C7C	Quantity _____	L457	
OTU 41C8C	Quantity _____	L458	

(Sheet 1 of 3)

Table 7-1. OT Cabinet Worksheet (J69000C-1) — *Continued*

Description	Choice	List/Group	Reference
Non-transmission Cables (ED7G045-22)			
Office Alarm cable	Quantity _____ (For future use, 1 per cabinet)	G1 or G2	Table 7-6 and Cable Descriptions
X.25 interface cable	Quantity _____ (For future use, 1 per cabinet)	G6 or G7 or G9 or G10	
CIT (DTE) cable	Quantity _____ (For future use, 1 per cabinet)	G14 or G15	
Incoming Signal Failure Cable	Quantity _____ (1 per shelf required)	G3 or G4	
OTU Circuit Pack Failure Cable	Quantity _____ (1 per shelf required)	G3 or G4	
Documentation			
Applications, Planning, and Ordering Guide	Quantity _____ (Optional)	Document Number: 365-575-400	None
User/Service Manual	Quantity _____ (Optional)	Document Number: 365-575-401	
Installation Manual	Quantity _____ (Optional)	Document Number: 365-575-410	

(Sheet 2 of 3)

Table 7-1. OT Cabinet Worksheet (J69000C-1) — *Continued*

Description	Choice	List/Group	Reference
LBO Kits (J69000C-1)			
ST LBO kit	Yes / No _____ (1 per OTU optional)	L111	LBO Kit Descriptions
FC LBO kit	Yes / No _____ (1 per OTU optional)	L121	
SC LBO kit	Yes / No _____ (1 per OTU optional)	L131	

(Sheet 3 of 3)

Table 7-2. Miscellaneously Mounted Application Worksheet (J69000C-1)

Description	Choice	List/Group	Reference
Miscellaneously Mounted Application	Quantity _____	L10	Package Descriptions
Circuit Packs (J69000C-1)			
OTU 41A1C	Quantity _____	L401	Table 7-13, Table 7-15, and Circuit Pack Descriptions
OTU 41A2C	Quantity _____	L402	
OTU 41A3C	Quantity _____	L403	
OTU 41A4C	Quantity _____	L404	
OTU 41A5C	Quantity _____	L405	
OTU 41A6C	Quantity _____	L406	
OTU 41A7C	Quantity _____	L407	
OTU 41A8C	Quantity _____	L408	
OTU 41BB	Quantity _____	L229	
OTU 41C1C	Quantity _____	L451	
OTU 41C2C	Quantity _____	L452	
OTU 41C3C	Quantity _____	L453	
OTU 41C4C	Quantity _____	L454	
OTU 41C5C	Quantity _____	L455	
OTU 41C6C	Quantity _____	L456	
OTU 41C7C	Quantity _____	L457	
OTU 41C8C	Quantity _____	L458	

(Sheet 1 of 2)

Table 7-2. Miscellaneously Mounted Application Worksheet (J69000C-1)

Description	Choice	List/Group	Reference
Non-transmission Cables (ED7G045-22)			
Incoming Signal Failure Cable	Quantity _____ (1 per shelf required)	G3 or G4	Table 7-6 and Cable Descriptions
OTU Circuit Pack Failure Cable	Quantity _____ (1 per shelf required)	G3 or G4	
Documentation			
Applications, Planning, and Ordering Guide	Quantity _____ (Optional)	Document Number: 365-575-400	None
User / Service Manual	Quantity _____ (Optional)	Document Number: 365-575-401	
Installation Manual	Quantity _____ (Optional)	Document Number: 365-575-410	
LBO Kits (J69000C-1)			
ST LBO kit	Yes / No _____ (1 per OTU optional)	L111	LBO Kit Descriptions
FC LBO kit	Yes / No _____ (1 per OTU optional)	L121	
SC LBO kit	Yes / No _____ (1 per OTU optional)	L131	

(Sheet 2 of 2)

Table 7-3. Miscellaneously Mounted System Controller Shelf Worksheet (J69000C-1)

Description	Choice	List/Group	Reference
Miscellaneously Mounted System Controller Shelf	Quantity _____	L11	Package Descriptions
Circuit Packs (J69000C-1)			
OTU 41A1C	Quantity _____	L401	Table 7-13, Table 7-15, and Circuit Pack Descriptions
OTU 41A2C	Quantity _____	L402	
OTU 41A3C	Quantity _____	L403	
OTU 41A4C	Quantity _____	L404	
OTU 41A5C	Quantity _____	L405	
OTU 41A6C	Quantity _____	L406	
OTU 41A7C	Quantity _____	L407	
OTU 41A8C	Quantity _____	L408	
OTU 41BB	Quantity _____	L229	
OTU 41C1C	Quantity _____	L451	
OTU 41C2C	Quantity _____	L452	
OTU 41C3C	Quantity _____	L453	
OTU 41C4C	Quantity _____	L454	
OTU 41C5C	Quantity _____	L455	
OTU 41C6C	Quantity _____	L456	
OTU 41C7C	Quantity _____	L457	
OTU 41C8C	Quantity _____	L458	

(Sheet 1 of 2)

Table 7-3. Miscellaneously Mounted System Controller Shelf Worksheet (J69000C-1)

Description	Choice	List/Group	Reference
Non-transmission Cables (ED7G045-22)			
Incoming Signal Failure Cable	Quantity _____ (1 per shelf required)	G3 or G4	Table 7-6 and Cable Descriptions
OTU Circuit Pack Failure Cable	Quantity _____ (1 per shelf required)	G3 or G4	
Documentation			
Applications, Planning, and Ordering Guide	Quantity _____ (Optional)	Document Number: 365-575-400	None
User / Service Manual	Quantity _____ (Optional)	Document Number: 365-575-401	
Installation Manual	Quantity _____ (Optional)	Document Number: 365-575-410	
LBO Kits (J69000C-1)			
ST LBO kit	Yes / No _____ (1 per OTU optional)	L111	LBO Kit Descriptions
FC LBO kit	Yes / No _____ (1 per OTU optional)	L121	
SC LBO kit	Yes / No _____ (1 per OTU optional)	L131	

(Sheet 2 of 2)

Table 7-4. Miscellaneously Mounted Complementary Shelf 1 Worksheet (J69000C-1)

Description	Choice	List/Group	Reference
Miscellaneously Mounted Complementary Shelf 1	Quantity _____	L12	Package Descriptions
Circuit Packs (J69000C-1)			
OTU 41A1C	Quantity _____	L401	Table 7-13, Table 7-15, and Circuit Pack Descriptions
OTU 41A2C	Quantity _____	L402	
OTU 41A3C	Quantity _____	L403	
OTU 41A4C	Quantity _____	L404	
OTU 41A5C	Quantity _____	L405	
OTU 41A6C	Quantity _____	L406	
OTU 41A7C	Quantity _____	L407	
OTU 41A8C	Quantity _____	L408	
OTU 41BB	Quantity _____	L229	
OTU 41C1C	Quantity _____	L451	
OTU 41C2C	Quantity _____	L452	
OTU 41C3C	Quantity _____	L453	
OTU 41C4C	Quantity _____	L454	
OTU 41C5C	Quantity _____	L455	
OTU 41C6C	Quantity _____	L456	
OTU 41C7C	Quantity _____	L457	
OTU 41C8C	Quantity _____	L458	

(Sheet 1 of 2)

Table 7-4. Miscellaneously Mounted Complementary Shelf 1 Worksheet (J69000C-1) —

Description	Choice	List/Group	Reference
Non-transmission Cables (ED7G045-22)			
Incoming Signal Failure Cable	Quantity _____ (1 per shelf required)	G3 or G4	Table 7-6 and Cable Descriptions
OTU Circuit Pack Failure Cable	Quantity _____ (1 per shelf required)	G3 or G4	
Documentation			
Applications, Planning, and Ordering Guide	Quantity _____ (Optional)	Document Number: 365-575-400	None
User / Service Manual	Quantity _____ (Optional)	Document Number: 365-575-401	
Installation Manual	Quantity _____ (Optional)	Document Number: 365-575-410	
LBO Kits (J69000C-1)			
ST LBO kit	Yes / No _____ (1 per OTU optional)	L111	LBO Kit Descriptions
FC LBO kit	Yes / No _____ (1 per OTU optional)	L121	
SC LBO kit	Yes / No _____ (1 per OTU optional)	L131	

(Sheet 2 of 2)

Table 7-5. Miscellaneously Mounted Complementary Shelf 2 Worksheet (J69000C-1)

Description	Choice	List/Group	Reference
Miscellaneously Mounted System Controller Shelf	Quantity _____	L13	Package Descriptions
Circuit Packs (J69000C-1)			
OTU 41A1C	Quantity _____	L401	Table 7-13, Table 7-15, and Circuit Pack Descriptions
OTU 41A2C	Quantity _____	L402	
OTU 41A3C	Quantity _____	L403	
OTU 41A4C	Quantity _____	L404	
OTU 41A5C	Quantity _____	L405	
OTU 41A6C	Quantity _____	L406	
OTU 41A7C	Quantity _____	L407	
OTU 41A8C	Quantity _____	L408	
OTU 41BB	Quantity _____	L229	
OTU 41C1C	Quantity _____	L451	
OTU 41C2C	Quantity _____	L452	
OTU 41C3C	Quantity _____	L453	
OTU 41C4C	Quantity _____	L454	
OTU 41C5C	Quantity _____	L455	
OTU 41C6C	Quantity _____	L456	
OTU 41C7C	Quantity _____	L457	
OTU 41C8C	Quantity _____	L458	

(Sheet 1 of 2)

Table 7-5. Miscellaneously Mounted Complementary Shelf 2 Worksheet (J69000C-1) —

Description	Choice	List/Group	Reference
Non-transmission Cables (ED7G045-22)			
Incoming Signal Failure Cable	Quantity _____ (1 per shelf required)	G3 or G4	Table 7-6 and Cable Descriptions
OTU Circuit Pack Failure Cable	Quantity _____ (1 per shelf required)	G3 or G4	
Documentation			
Applications, Planning, and Ordering Guide	Quantity _____ (Optional)	Document Number: 365-575-400	None
User / Service Manual	Quantity _____ (Optional)	Document Number: 365-575-401	
Installation Manual	Quantity _____ (Optional)	Document Number: 365-575-410	
LBO Kits (J69000C-1)			
ST LBO kit	Yes / No _____ (1 per OTU optional)	L111	LBO Kit Descriptions
FC LBO kit	Yes / No _____ (1 per OTU optional)	L121	
SC LBO kit	Yes / No _____ (1 per OTU optional)	L131	

(Sheet 2 of 2)

Ordering Guidelines

This section provides the following aids for ordering complete OT packages:

- Package, circuit pack, and LBO kit descriptions
- Ordering tables for additional/spare circuit packs and cables

Package Descriptions

OT Cabinet (L1) Package Description: The OT Cabinet Package provides a cabinet with three unequipped shelves, two heat baffles, fuse panels, power filters, indicator strip, designation label strips, cables, rear cover, and doors.

Miscellaneously Mounted Application (L10) Package Description: The Miscellaneously Mounted Application Package provides three unequipped miscellaneously mounted shelves. Each shelf is equipped with an interconnection panel, a user panel or a fuse/power indicating panel, a designation label strip, an attached heat baffle, power filters, cables, and a front and rear cover.

Miscellaneously Mounted System Controller Shelf (L11) Package Description: The Miscellaneously Mounted System Controller Shelf Package provides one System Controller Shelf equipped with an interconnection panel, a user panel, a designation label strip, an attached heat baffle, power filters, cables, and a front and rear cover.

Miscellaneously Mounted Complementary Shelf 1 (L12) Package Description: The Miscellaneously Mounted Complementary Shelf 1 Package provides one Complementary Shelf 1 equipped with an interconnection panel, a fuse/power indicating panel, a designation label strip, an attached heat baffle, power filters, cables, and a front and rear cover. This shelf should only be ordered to upgrade a system that contains L11.

Miscellaneously Mounted Complementary Shelf 2 (L13) Package Description: The Miscellaneously Mounted Complementary Shelf 2 Package provides one Complementary Shelf 2 equipped with an interconnection panel, a fuse/power indicating panel, a designation label strip, an attached heat baffle, power filters, cables, and a front and rear cover. This shelf should only be ordered to upgrade a system that contains L11 and L12.

Circuit Pack Descriptions

OTU 41A(1-8)C (L401-L408): Each of these Optical Translator Unit (OTU) circuit packs electrically regenerates a single input OC-48/STM-16 optical signal and inserts the tone required by OLS onto that signal. These eight OTU codes support the eight wavelengths on OLS systems with total dispersion not exceeding 6800 ps/nm.

OTU 41BB (L229): This Optical Translator Unit (OTU) circuit pack electrically regenerates a single input OC-48/STM-16 optical signal and inserts a clean tone onto the signal. The 41BB OTU code regenerates OC-48/STM-16 signals in the 1.3 µm range for other SONET OC-48/SDH STM-16 receivers.

OTU 41C(1-8)C (L451-L458): Each of these Optical Translator Unit (OTU) circuit packs electrically regenerates a single input OC-48/STM-16 optical signal and inserts the tone required by OLS onto that signal. These eight OTU codes support the eight wavelengths on OLS systems with total dispersion not exceeding 10,880 ps/nm.

LBO Kit Descriptions

***ST* LBO (L111) Kit Description**: Each ST lightguide build-out kit provides a kit of lightguide build-outs with ST connectors for one OTU circuit pack.

FC LBO (L121) Kit Description: Each FC lightguide build-out kit provides a kit of lightguide build-outs with FC connectors for one OTU circuit pack.

SC LBO (L131) Kit Description: Each SC lightguide build-out kit provides a kit of lightguide build-outs with SC connectors for one OTU circuit pack.

Cables

Table 7-6 contains information about the cables required for all five OT applications.

Table 7-6. Intraoffice Electrical Non-transmission Cables (Associated with OT)

Application	T6G156-33 Figure	ED7G045-22		Remarks
		Group	Length	
Office Alarm Cable	5	G1	as required	
		G2	150 ft.	
X.25 Interface Cable (plug to connector)	9	G6	as required	300 ft. maximum
		G7	150 ft.	
X.25 Interface Cable (plug to plug)	9	G9	as required	300 ft. maximum
		G10	150 ft.	
CIT (DTE) Cable	8	G14	as required	300 ft. maximum
		G15	150 ft.	
System Controller Shelf Incoming Signal Failure Cable	6	G3	as required	4000 ft. maximum
		G4	150 ft.	
System Controller Shelf OTU Circuit Pack Failure Cable	7	G3	as required	4000 ft. maximum
		G4	150 ft.	
Complementary Shelf 1 Incoming Signal Failure Cable	12	G3	as required	4000 ft. maximum
		G4	150 ft.	

(Sheet 1 of 2)

Table 7-6. Intraoffice Electrical Non-transmission Cables (Associated with OT) — *Continued*

Application	T6G156-33 Figure	ED7G045-22		Remarks
		Group	Length	
Complementary Shelf 1 OTU Circuit Pack Failure Cable	13	G3	as required	4000 ft. maximum
		G4	150 ft.	
Complementary Shelf 2 Incoming Signal Failure Cable	12	G3	as required	4000 ft. maximum
		G4	150 ft.	
Complementary Shelf 2 OTU Circuit Pack Failure Cable	13	G3	as required	4000 ft. maximum
		G4	150 ft.	

(Sheet 2 of 2)

Cable Descriptions

The X.25, office alarm, and CIT (DTE) cables may be ordered now to pre-provision a system for future upgrades, but they are not required for R1-OT.

X.25 Cable: X.25 cable provides access to an OS interface.

Office Alarm Cable: Office alarm cable connects OT to the office alarms.

CIT (DTE) Cable: Craft Interface Terminal (CIT) Data Terminating Equipment (DTE) cable provides a remote interface to a co-located OLS that is functionally similar to the CIT Data Communications Equipment (DCE) port. The port may be used to perform system diagnostics.

The incoming signal failure and circuit pack failure cables are required for R1-OT.

Incoming Signal Failure Cable: One incoming signal failure cable connects from the interconnection panel on each shelf to the External Miscellaneous Discrete Unit (EMDU). The cable relays any incoming signal LOS/LOF or B_1 parity errors detected by a Miscellaneous Discrete 2 (MD2) on an OTU to the EMDU.

Circuit Pack Failure Cable: One OTU circuit pack failure cable connects from the interconnection panel on each shelf to the External Miscellaneous Discrete Unit (EMDU). The cable relays any circuit pack failure conditions detected by a Miscellaneous Discrete 1 (MD1) on an OTU to the EMDU.

The cable groups in Table 7-7 provide the assembly and wiring cables required for one 8 Ga, -48 V power feeder. These cables are provided with the specified main equipment list numbers.

Table 7-7. Power Cables

Description	T5G156-33 Figure	ED9C103-22		Provided with
		Group	Length	
-48 V (A) power feeder	1	5	15 feet	List 1 and List 10
-48 V (B) power feeder	1	6	15 feet	
-48 V (A) power feeder	1	15	as required	
-48 V (B) power feeder	1	16	as required	
-48 V (A) power feeder	2	7	15 feet	List 11, List 12, and List 13
-48 V (B) power feeder	2	9	15 feet	
-48 V (A) power feeder	2	8	as required	
-48 V (B) power feeder	2	10	as required	

Related Framework

This section is provided for your convenience, as an overview to OT cabinet hardware and framework. To order framework for the Miscellaneously Mounted Application, or any of the individual miscellaneously mounted shelves (L10, L11, L12, and L13), use the *Seismic Network Bay Frame Application, Planning and Ordering Guide* (065-215-200).

OT provides front access for all office and user interfaces. All interoffice cables and fiber connections are possible from the front of the system.

For future releases, 120 V AC power is needed near the cabinet to power a PC or to charge a portable PC.

Table 7-8 provides the information necessary to order the recommended cable racking systems and end guards for OT.

Table 7-8. Related Cabinet Hardware

Framework	Number	Group
Cable Rack	ED5D779-70	G1B G2
End Guards (2 required for left and right sides)	ED5D786-70	G1A

Related Products

Table 7-9 lists the miscellaneous discrete interface units available from DANTEL, Inc.® and HARRIS Corporation®. These External Miscellaneous Discrete Units (EMDUs) detect and report incoming signal failures and OTU circuit pack failures as described in Chapter 5, "Operations and Maintenance." The EMDUs may be miscellaneously mounted in co-located equipment, such as a bay frame.

Table 7-9 provides the information needed to order either a HARRIS or DANTEL EMDU directly from the respective company or from Lucent Technologies.

OT shelves are connected to an EMDU via the incoming signal failure and circuit pack failure cables, which originate on the interconnection panel located on each shelf. To connect OLS to an EMDU, you must use serial telemetry cable (TBOS Protocol) ED7G028-22, G201, G251, or G261. These cables may be ordered from the *Optical Line System (OLS) Application, Planning, and Ordering Guide, 365-575-300.*

Table 7-9. Ordering Information for an EMDU

Manufacturer's Name	Manufacturer's Model Name	Manufacturer's Order Number	Lucent Comcode Number
DANTEL*	Alarm and Control Block	46220-00	407567924
DANTEL	Mounting Bar	A25-00508-01	406863621
HARRIS†	C-1000 Centurion	594-T043	407567932
HARRIS	Terminal Strip‡	620-T030	407532217

* Dantel, Inc., 2991 N. Argyle Ave., Fresno, CA 93727-1321.
† Harris Corporation, Controls Division, Network Support Products, 1850 N. Greenview Ave., M/S/ 184, Richardson, TX 75081.
‡ Note: Eight Terminal Strips are required for a Harris EMDU.

Ordering METRAL Backplane Replacement Pins

Backplane pins sometimes bend or break from incorrect circuit pack insertion and removal. Table 7-10 through Table 7-12 provide information on pin types and pin replacement kits for OT. Order these materials directly from **Berg Electronics** at **1-717-938-6711**.

Table 7-10. METRAL Pin Ordering Information

Pin Type (Device Code)	Minimum Order Quantity	Pin Length (mm)
88929-102	25	5.75 / 4.3
88929-106	25	5.75 / 13.6
88929-119	25	8.00 / 4.3
88930-101	25	Blade

Table 7-11. OT Equipment Locations and Pin Types*

Circuit Pack	Backplane Location	Rows Using Pin Type 88929-102	Rows Using Pin Type 88929-106	Rows Using Pin Type 88929-119	Rows Using Pin Type 88930-101
OT Equipment					
OTCTL (SYSMEM)†	20 - 605	1 - 72 85 - 156		157 - 162	
OTCTL (SYSCTL)*	20 - 565	1 - 72 85 - 156		157 - 162	
OTCTL (TOHCTL)*	20 - 525	1 - 12 19 - 66 85 - 156		157 - 162	

Table 7-11. OT Equipment Locations and Pin Types* — *Continued*

Circuit Pack	Backplane Location	Rows Using Pin Type 88929-102	Rows Using Pin Type 88929-106	Rows Using Pin Type 88929-119	Rows Using Pin Type 88930-101
OTU (System Controller Shelf)	20 - 163 20 - 203 20 - 243 20 - 283 20 - 323 20 - 363 20 - 405 20 - 445 20 - 485‡	1 - 12 85 - 156		157 - 162	
OTU (Complementary Shelf 1 and 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	1 - 12 85 - 156		157 - 162	
PWR A	39 - 184				1 - 12
PWR B	39 - 570				1 - 12

* Pin type numbers in the table heading represent METRAL device codes (Berg Electronics)
† The OTCTL circuit pack occupies the SYSCTL, SYSMEM, and TOHCTL slots in the backplane.
‡ This slot is intentionally left blank.

Table 7-12. Ordering METRAL Pin Kit/Pin Tool Kit

Product Name	Supplier's Order Number *
METRAL pin replacement tool kit	MT-370-01

* Order from Berg Electronics, 825 Old Trail Road, Etters, PA. 17319
Tel: 1-717-938-6711

Circuit Pack Compatibility

The figures in Table 7-13 apply to the specified shelves in all five OT applications, (L1, L10, L11, L12, and L13).

Table 7-13. OT Slot/Circuit Pack Compatibility

Shelf	Slot	Supported Pack Codes	R1-OT Quantity
System Controller Shelf	OTU (1-8)	41A(1-8)C, 41BB, 41C(1-8)C	0 to 8
Complementary Shelf 1	OTU (9-20)	41A(1-8)C, 41BB, 41C(1-8)C	0 to 12
Complementary Shelf 2	OTU (21-32)	41A(1-8)C, 41BB, 41C(1-8)C	0 to 12

Circuit Pack Sparing Guidelines

This section provides two different methods for obtaining circuit pack sparing information for OT. The “Sparing Table” section provides a table the contains the information needed to order the appropriate number of spare circuit packs for 1, 2, 3, 5, 10 and 64-day lead times. The “Sparing Graphs” section provides two graphs that contain the information needed to order the appropriate number of spare circuit packs for 10-day and 64-day lead times. An example using the graphs is also included.

Lead Time

Lead time, also known as turnaround time, is defined as the elapsed time between a known circuit pack failure at a given service location and the arrival of a repaired (or new) circuit pack at the location where spare circuit packs are stocked (centralized or local) to maintain a spare circuit pack level consistent with the circuit pack population in service.

Lead time should not be confused with Mean Time to Repair (typically, 2 to 4 hours), which is the elapsed time between a known in-service circuit pack failure and when a spare circuit pack replacement is put into service.

Sparing Table

Table 7-14 provides the number of OTU spares to keep on hand, depending on the number of OTUs in service and the lead time in days. The number of spare circuit packs for each OTU code must be determined and maintained separately, based on that code's in-service population at each given location.

Table 7-14. OTU Sparing Information

Lead Time	Number of OTUs in Service			
	1 — 50	51 — 100	101 — 500	501 — 1000
1-Day	1	1	2	3
2-Day	1	1	3	3
3-Day	1	2	3	4
5-Day	2	2	4	4
10-Day	2	3	4	6
64-Day	4	5	10	14

Ordering Spare Circuit Packs

Table 7-15 provides comcodes for ordering spare circuit packs. Table 7-16 provides the FIT rates for OTUs.

Table 7-15. OTU Circuit Pack Comcodes

Circuit Packs	List	Code	Comcodes	CLEI Code
OTU	L401	41A1C	108187949	SNOTABAA
OTU	L402	41A2C	108187956	SNOTACAA
OTU	L403	41A3C	108187964	SNOTADAA
OTU	L404	41A4C	108187972	SNOTAEAA
OTU	L405	41A5C	108187980	SNOTAFAA
OTU	L406	41A6C	108187998	SNOTAGAA
OTU	L407	41A7C	108188004	SNOTAHAA
OTU	L408	41A8C	108188012	SNOTAJAA
OTU	L229	41BB	108128737	SNP2V0XD
OTU	L451	41C1C	108188111	SNOTBBAA
OTU	L452	41C2C	108188129	SNOTBCAA
OTU	L453	41C3C	108188137	SNOTBDAA
OTU	L454	41C4C	108188145	SNOTBEAA
OTU	L455	41C5C	108188152	SNOTBFAA
OTU	L456	41C6C	108188160	SNOTBGAA
OTU	L457	41C7C	108188178	SNOTBHAA
OTU	L458	41C8C	108188186	SNOTBJAA

For descriptions of OTUs 41A (1-8)C, 41BB, and 41C (1-8)C, refer to "Circuit Pack Descriptions."

Table 7-16. OTU FIT Rates

Description	Code	FIT*
OTU	41A(1-8)C, 41BB, 41C(1-8)C	2000

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

Table 7-17 provides the comcode for ordering the power fuse.

Table 7-17. Ordering Information For Power Fuse

Item	Fuse Capacity	Comcode
Fuse	10 Amperes	405749920
Fuse Cap*		40741179
Fuse Holder		407604388

* 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

Sparing Graphs

This section provides guidelines and a procedure to help you determine how many spare OTU circuit packs to order for OT. The number of spare circuit packs for each OTU code must be determined and maintained separately, based on that code's in-service population at each given location.

Note the total number of spares needed for each OTU code and include those figures in your order.

The steps listed below show how to use Table 7-16, Figure 7-1, and Figure 7-2 to determine how many spare circuit packs to order to maintain 99.9% service continuity, given either a 10-day or 64-day lead time.

1. Refer to Table 7-16 and determine the circuit pack FIT rate.

2. Select the correct figure for your lead time:
   - 10-day lead time – Figure 7-1
   - 64-day lead time – Figure 7-2

3. Refer to the appropriate graph and select the curve that represents the nearest circuit pack FIT rate.

4. Follow the curve to the intersection with the vertical line that represents the number of circuit packs in service at a given location.

5. Refer to the horizontal line immediately above the intersection. The number associated with this line is the minimum number of spare circuit packs recommended for that location.

For example, suppose that there are 30 41A2C circuit packs in service at a given location, the FIT rate is 2000, and the lead time is 64 days (see Figure 7-2). In this case, you would need to order and stock 3 spare 41A2C circuit packs for that location.

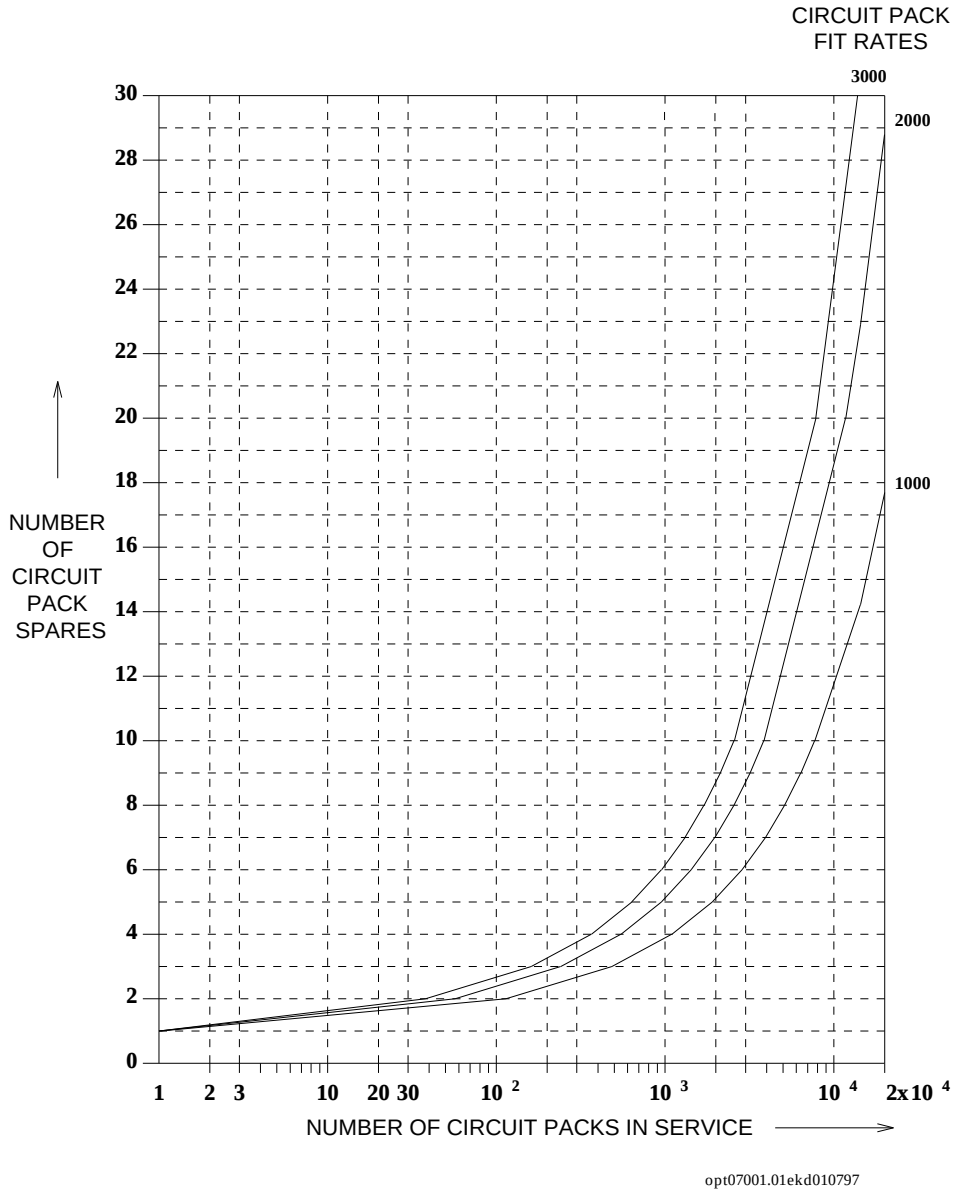

Figure 7-1. Circuit Pack Sparing Graph — 10-Day Lead Time

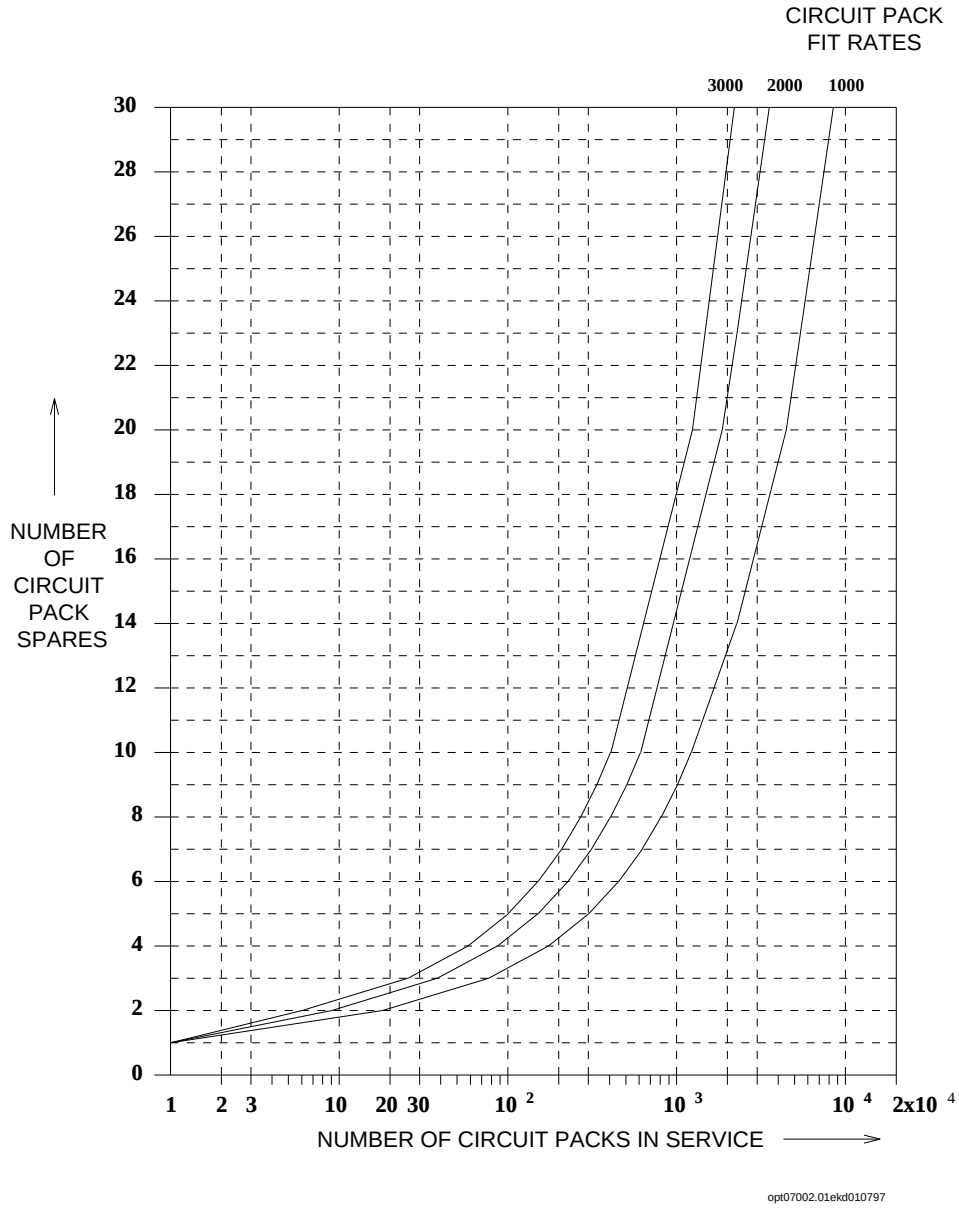

Figure 7-2. Circuit Pack Sparing Graph — 64-Day Lead Time

Product Support

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Product Support

8

This chapter describes how Lucent Technologies supports Optical Translator (OT). Support includes engineering and installation services, technical support, documentation support, and training.

Engineering and Installation Services

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

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

installation, creating and maintaining job records, installing the equipment, and testing and turning over a working system.

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

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

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

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

Technical Support

Assistance in maintaining your installed system is available through the Regional Technical Assistance Center (RTAC) and Customer Technical Support (CTS). As shown in Figure 8-1, your single point of contact is the RTAC. RTAC personnel troubleshoot field problems 24 hours a day over the phone and, if necessary, on site. For technical assistance, simply call **1-800-225-RTAC (7822)**. One call guarantees support. You can also call this number to provide comments on OT or to suggest enhancements.

RTACs are supported by CTS for transmission products. CTS maintains a close relationship with Bell Laboratories 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.

CTS 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, seven days a week. For information about how to access COACH, contact your local Account Executive.

Many transmission products are currently supported by COACH, including OT. However, because of the close relationship between OT and OLS, information about the OT is included with OLS information.

Once connected to COACH, you can specify which product to access and COACH grants the appropriate combination of tools and commands. You can reach each one of these tools through a centralized, menu-driven computer program. Every screen provides help in making appropriate menu selections. COACH helps you achieve proficiency quickly because of the consistency of menu selections among products.

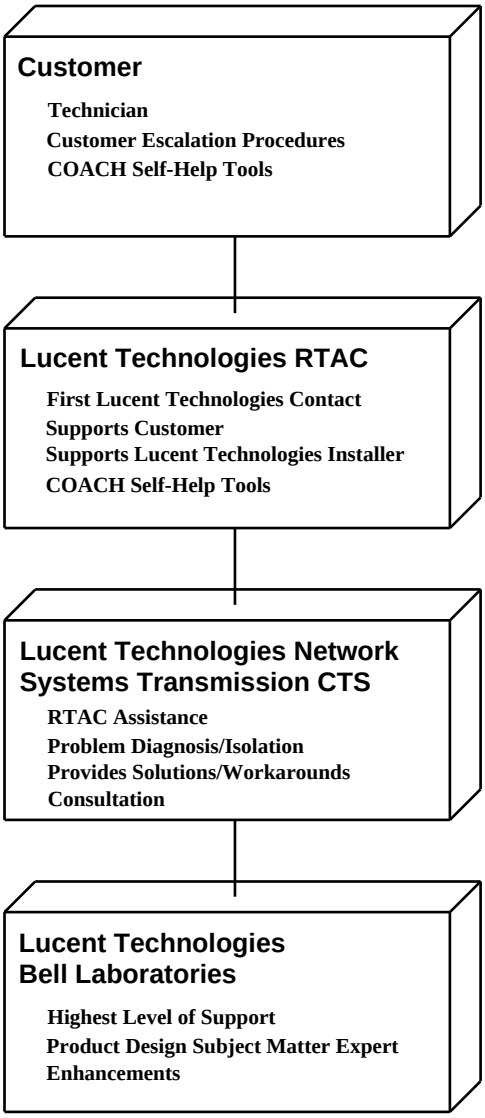

Figure 8-1. Product Support

The following COACH tools are available to you:

COACH Tool	Description
Diagnostic dictionary	The diagnostic dictionary contains histories of previously encountered problems and the descriptions of their solutions or workarounds. Your support staff can use this tool when published documentation or standard diagnostic procedures fail to address a problem. Your support staff is allowed to enter problems and solutions into the customer input area of the diagnostic dictionary. CTS personnel evaluate the data daily and, when appropriate, the data is moved to the general area.
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 generics are issued. The compatibility data tools permit users to view the correct hardware configuration associated with a specific software generic. The user simply enters the appropriate software generic number and COACH responds with page-formatted lists of circuit packs compatible with the selected software generic.
Ordering guides	With the COACH ordering guide tool, users can obtain an electronic copy of the latest version of the ordering guide for selected products served by COACH tools. This eliminates the time-consuming delays experienced in distributing printed 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.

CTS strives to provide proactive and responsive technical customer support for all its products. Through the combined efforts of the individual customer support groups and through COACH tools, CTS provides you with the best possible technical support.

Documentation Support

The Lucent Technologies Customer Training and Information Products organization provides a customer comment form in the front of this guide. Please use the form to report errors or make suggestions about the document. If the form is missing, please send or fax your comments to

Lucent Technologies
Customer Training and Information Products
Building 21, Room 3A-06
1600 Osgood Street
North Andover, MA 01845

Fax Number: (508) 960-6835

Training

No product offering is complete without a formal training package. Suitcasing of these courses is also available. Contact your Account Executive to enroll in training classes or to arrange suitcase sessions.

The OT courses are designed to be taken in conjunction with the OLS course set. The following courses are provided:

- Number: LW2251

  Title: OT Applications, Architecture, Planning, and Ordering

  Audience: Facility planners, account executives, line engineers, central office equipment engineers, and private network design engineers

  Content: Applications (for example, Wavelength Add/Drop, and OLS extended range); architecture (cabinets, shelves, circuit packs); operation, administration, and maintenance considerations; equipment and cabling specifications for engineering and ordering OT

- Number: LW2451V

  Title: OT Installation

  Audience: Technicians, installers, maintenance engineers, technical support personnel, product evaluators, and anyone desiring installation information about OT

  Content: Instructional videos covering the installation of OT's cabinet and miscellaneously mounted arrangements

- Number: LW2651

  Title: OT Operations and Maintenance

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

  Content: Description of initial turnup and day-to-day operations and maintenance tasks, emphasis on developing skills using the *Optical Translator User/Service Manual (365-575-401)*

Reliability

9

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Reliability

9

Overview

Reliability is a key ingredient of a product's life cycle, beginning at the earliest planning stage and continuing into product architecture, design and simulation, documentation, prototyping, testing, design change control, manufacturing and product testing (which includes 100% screening), product quality assurance, product field performance, and product field return management. Each stage of the product's life cycle relies on people and processes that contribute to product reliability growth with customer satisfaction as the primary goal.

Using critical elements to ensure the product's reliability, product development requires strict adherence to

- Design standards
- Design and test practices
- Comprehensive qualification programs
- System-level reliability integration
- Reliability audits and predictions
- Development of assurance standards for the manufactured product

During manufacturing and field deployment, OT's reliability is further enhanced by

- Premanufacturing
- Qualification
- Accelerated product testing
- Production screening
- Product quality tracking
- Failure mode analysis
- Feedback and corrective actions

Independent Quality Representatives are also present at manufacturing locations to ensure Shipped Product Quality.

Reliability Specifications

Table 9-1. OT Reliability Specifications

Description	Values
OC-48 Line Unavailability* (min / year / line) Service line with protection redundancy	2.7 X 10^{-4}
Mean Time† Between Maintenance Activities Fully Equipped Complementary Shelf	4.8 years
Mean Time† Between Maintenance Activities Fully Equipped System Controller Shelf (no controller packs)	7.1 years
Mean Time† Between Maintenance Activities Fully Equipped OT Cabinet (3 Shelves)	1.8 years
Mean Time to Repair Assumption‡	ð2 hours
Silent Failure Unavailability for the OT System	0
OTU Circuit Packs FIT Rates per Bellcore RPP*	8000
Product Design Life	25 years
Infant Mortality	ð1.6 times the steady state failure rate

* Based on Method 1, *Reliability Prediction Procedure for Electronic Equipment*, Issue 5, December 1995.

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

‡ Includes dispatch, diagnostic and repair time.

Maintainability Specifications

OT requires no periodic maintenance. Continuous performance monitoring allows OT to detect problems before they become service-affecting.

Warranty

The terms and conditions of sale include a five-year warranty on OT hardware and a one-year warranty on applicable software (if any used).

Technical Specifications

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Technical Specifications

10

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

Transmission Medium

Standard single-mode non-dispersion shifted fiber

TrueWave® non-zero dispersion shifted fiber

Optical Connector Interfaces

Each OTU may be equipped with either ST® Lightguide Build-Out (LBOs) connectors, FC lightguide build-out connectors, or SC lightguide build-out connectors.

Lightguide Jumpers

Single-mode lightguide jumpers are used on all OT optical interfaces.

OTU Bit Rate

2.5 Gb/s

Capacity

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

Operating Wavelengths and Tone Frequencies

OTU Code	Center Wavelength* (nm)†	Nominal Output Power‡ (dBm)	Approximate Tone Frequency (kHz)
41A1C, 41C1C	1549.43	-4.0	5
41A2C, 41C2C	1551.03	-5.3	7
41A3C, 41C3C	1552.64	-6.5	9
41A4C, 41C4C	1554.25	-7.2	11
41A5C, 41C5C	1555.86	-7.7	15
41A6C, 41C6C	1557.47	-8.2	17
41A7C, 41C7C	1559.10	-8.0	19
41A8C, 41C8C	1560.72	-6.5	21
41BB	1310.00	1.0	NA

* The center wavelength for 41A(1-8)C and 41C(1-8)C varies ±0.26 nm. The center wavelength for 41BB varies ±20 nm.
† The 20 dB spectral width is <0.01 nm for 41A(1-8)C and 41C(1-8)C and <1.0 nm for 41BB.
‡ The output power for 41A(1-8)C and 41C(1-8)C varies ±0.7 dB. The output power 41BB varies ±1.0 dB.

Optical Dispersion

Code	Maximum Chromatic Dispersion (ps/nm)
OTU 41A (1-8)C	6800
OTU 41C (1-8)C	10,880
OTU 41BB	210

For all OTU codes, the maximum acceptable peak-to-peak first order Polarization Mode Dispersion (PMD) is 145 ps.

Optical Safety (CDRH Classification)

OT Output Class 1

Optical Return Loss

OTU input return loss	>27 dB
Required system return loss	>18.0 dB per span for OLS systems of 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. If you are concerned about return loss limitations and need assistance, contact your local Account Executive.

Interworking with OLS

Because OT is designed for use with Optical Line System (OLS), OT's transmitter wavelengths, tones and powers, and receiver performance meet all the OLS requirements. When OT is used in conjunction with OLS, the systems conform to all the specifications given in the *Optical Line System (OLS) Application, Planning, and Ordering Guide (365-575-300).*

Optical Line Loss Budgets

The following loss budgets and approximate transmission distances are given for OT when used without OLS.

Parameter	OTU Codes								
	41A1C 41C1C	41A2C 41C2C	41A3C 41C3C	41A4C 41C4C	41A5C 41C5C	41A6C 41C6C	41A7C 41C7C	41A8C 41C8C	41BB (1.3 µm)
Maximum Transmitter Output Power* (P_{Tmax})	-3.3	-4.6	-5.8	-6.5	-7.0	-7.5	-7.3	-5.8	2.5
Minimum Transmitter Output Power)* (P_{Tmin})†	-6.2	-7.5	-8.7	-9.4	-9.9	-10.4	-10.2	-8.7	-2.0
Maximum Received Power* (P_{Rmax})‡	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-11.0	-10.0
Receiver Sensitivity* (P_{Rmin})‡	-27.0	-27.0	-27.0	-27.0	-27.0	-27.0	-27.0	-27.0	-27.0
Minimum System Gain** (S-R)	20.8	19.5	18.3	17.6	17.1	16.6	16.8	18.3	25.0
Optical Path Penalty**(P_O)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.0
Maximum Loss Budget**	20.3	19.0	17.8	17.1	16.6	16.1	16.3	17.8	24.0
Minimum Loss Budget**	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Typical Maximum Span Length†† (km)	81.2	76.0	71.2	68.4	66.4	64.4	65.2	71.2	53.3

* These values are measured in dBm.

† These values include the 0.7 dB for transmitter / receiver connectors and the 0.8 dB for system temperature and aging margin.

‡ The receiver sensitivity and maximum received power values are measured at a BER of $1X10^{-10}$.

** These values are measured in dB

†† Assumes attenuation of 0.25 dB / km 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

J69000C-1 Equipment Package	Maximum Power Dissipation		Current Drains per Feeder*	
	Watts	Watts per Square Foot	Nominal at -48 V (List 1†)	Maximum (List 2‡)
OT System Controller Shelf	182	14.6	1.7	3.7
OT Complementary Shelf	232	18.6	2.1	4.7
Fully-equipped OT Cabinet (3 Shelves)	646	51.7	5.9	13.2

* Nominally both feeders share the current equally for the cabinet or shelf. If one feeder fails, the remaining feeder carries the total load for the cabinet (feeder A + feeder B current).

† In power engineering, List 1 refers to the 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.

‡ In power engineering, List 2 refers to the current drains used to size feeder cables and fuses. 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.

Power Supply

Voltage Range, all components	-43.75 to -60.0 V DC
Power Feeders	Two -48 V power feeders (“A” and “B”)
Fuse Size (per shelf)	10.0 amps

Low Voltage Cut-off

Cut-off	Power filter input of -38 V DC ±1.5 V
Restart	Power filter input of -42.5 V DC ±1.5 V

Dimensions

Equipment	Height	Width	Depth
OT Cabinet	72.0 inches (183.0 cm)	34.0 inches (86.0 cm)	24.0 inches (61.0 cm)
OT Shelf (Cabinet)	17.7 inches (45.0 cm)	19.6 inches (50.0 cm)	11.0 inches (28.0 cm)
OT Shelf (Miscellaneous)	20.7 inches (52.5 cm)	19.6 inches (50.0 cm)	11.0 inches (28.0 cm)
OT Heat Baffle (Cabinet)	3.0 inches (7.5 cm)	19.6 inches (50.0 cm)	11.0 inches (28.0 cm)
OTUs 41A(1-8)C, 41C(1-8)C and 41BB	13.2 inches (33.6 cm)	1.6 inches (4.0 cm)	9.3 inches (23.6 cm)

Floor Loading Specifications

Configuration	Weight (lbs)	Weight per Square Foot (lbs/sq. ft.)
Fully-equipped OT Cabinet	700	56.0
Fully-equipped Miscellaneously Mounted System Controller Shelf	64	NA
Fully-equipped Miscellaneously Mounted Complementary Shelf	74	NA

Environmental Specifications

Normal Operating Temperature	5°C to 40°C (41°F to 104°F
Short-term* Operating Temperature	-5°C to 50°C (23°F to 122°F)
Normal Operating Humidity†	5% to 85%
Short-term* Operating Humidity†	5% to 90%
Max. Operating Temperature Change Rate for Normal and Short Term Conditions	1.0°C / min. (1.8°F / min.)

* Short-term refers to a period of up to 96 consecutive hours and a total of 15 days in one year.
† Noncondensing.

Earthquake and vibration, fire resistance, and airborne contaminant requirements meet the standards of GR-63-CORE Issue 1, October 1995.

Electrostatic, electromagnetic, electrical grounding, and safety requirements meet standards of GR-63-CORE Issue 1, October 1995.

OT meets the Electromagnetic Compatibility Requirements (EMC) of GR-1089-CORE.

OT is UL[1] listed and CSA[2] certified.

Handling and Transportation

Vibration & Shock Design Criteria	Complies with GR-63-CORE, Issue 1, October 1995
Temperature (Transport / Storage)	-40°C to 70°C (-40°F to 158°F)
Relative Humidity (Transport / Storage)	5% to 95%
Storage / Shipment (Altitude)	-200 ft to 40,000 ft (-61 m to 12,133 m)

1. Registered trademark of Underwriters Laboratories, Inc.
2. Registered trademark of Canadian Standards Association.

Reliability Specifications

Description	Values
OC-48 Line Unavailability* (min / year / line) Service line with protection redundancy	2.7 X 10^{-4}
Mean Time† Between Maintenance Activities Fully Equipped Complementary Shelf	4.8 years
Mean Time† Between Maintenance Activities Fully Equipped System Controller Shelf (no controller packs)	7.1 years
Mean Time† Between Maintenance Activities Fully Equipped OT Cabinet (3 Shelves)	1.8 years
Mean Time to Repair Assumption‡	ð2 hours
Silent Failure Unavailability for the OT System	0
OTU Circuit Packs FIT Rates per Bellcore RPP*	8000
Product Design Life	25 years
Infant Mortality	ð1.6 times the steady state failure rate

* Based on Method 1, *Reliability Prediction Procedure for Electronic Equipment*, Issue 5, December 1995.
† Based on the Lucent Technologies *Reliability Information Notebook*, 7th Edition, August 1995.
‡ Includes dispatch, diagnostic and repair time.

Engineering Rules

Detailed engineering rules are provided in the *Optical Translator (OT) Installation Manual* (365-575-410).

Network Topologies

OT can be used to concatenate multiple OLS systems. The engineering rules for OLS/OT interworking permit the following topologies:

Per OLS*	Standard Reach	Long Reach
Maximum Spans	3	8
Maximum Loss per Span	33 dB	24 dB
Typical Maximum Distance per Span	120 km	80 km
Typical Maximum Overall Distance	360 km	640 km
Per Wavelength		
Maximum OTUs	10	10
Maximum WAD Sites	10	10
Maximum Number of Spans	33	88
Typical Overall Length	3960 km	7040 km
Per Subnetwork†		
Maximum Number of Spans	unlimited (at least 250)	unlimited (at least 250)

* The following data is applicable using either conventional or TrueWave fiber.

† The total number of OLS systems that can be interconnected is limited only by the timing considerations of SONET/SDH ADMs.

Glossary

Numerics

3x33 dB System
An Optical Line System (OLS) subnetwork that consists of OLS End Terminals separated by up to three optical sections, with 33 dB of loss per optical section. Each optical line signal can travel up to three consecutive optical sections before electrical regeneration is required.

8x24 dB System
An Optical Line System (OLS) subnetwork that consists of OLS End Terminals separated by up to eight optical sections, with 24 dB of loss per optical section. Each optical line signal can travel up to eight consecutive optical sections before re-equalization or electrical regeneration is required.

41A(1-8)C (OTU)
Eight of the 17 different OTU codes are designated as 41A(1-8)C. These eight codes support the eight wavelengths on OLS systems with total dispersion not exceeding 6800 ps/nm. The codes 41A(1-8)C are used with OLS R1; distances between OTs/LCTs must not exceed 360 km per span.

41BB (OTU)
One of the 17 different OTU codes is designated as 41BB. Unlike 41A(1-8)C and 41C(1-8)C, OTU 41BB is used to regenerate a SONET OC-48 signal in the 1.3 µm range for SONET OC-48/SDH STM-16 receivers (other than LCT).

41C(1-8)C (OTU)
Eight of the 17 different OTU codes are designated as 41C(1-8)C. These eight codes support the eight wavelengths on OLS systems with total dispersion not exceeding 10,880 ps/nm. The codes 41C(1-8)C are used with OLS R1 and R2; distances between OTs/LCTs must not exceed 640 km per span.

5ESS-2000
Fifth Electronic Switching System for the year 2000. Lucent Technologies primary switching product.

A

ABN
Abnormal (condition). The ABN LED, located on the indicator strip and the user panel, illuminates when a temporary condition is detected that may possibly affect transmission. (Functional in a future release).

Access Domain
An access domain is the set of NEs that can communicate together via a collection of DCC and IAO LAN links.

ACO
Alarm Cutoff — A push-button switch, located on the indicator strip and the user panel, that can be used to retire an audible office alarm. (Functional in a future release).

ADM
Add/Drop Multiplexer

ADR
ADR (Add/Drop Ring) is Lucent Technologies' 2-fiber OC-48 ring terminal.

AID
Access Identifier — A unique identifier used to address equipment slots and ports, as well as facility tributaries, that are defined for the OLS architecture.

ANSI
The American National Standards Institute is an organization that is controlled by production, consumer, and general interest groups that establishes the procedures by which accredited organizations create and maintain voluntary industry standards in the United States.

APOG
The Applications, Planning, and Ordering Guide, part of the documentation set for a given product, provides specific information about the features, applications, operation, maintenance, engineering, support, and ordering of the product.

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 is a new technology based on a simple, fixed-length packet (or cell) format that allows the integrated networking of voice, data and video traffic.

AUTO
Automatic — One possible state of a port or slot. When a port is in the AUTO state and the presence of a good signal is detected, the port is automatically placed in the IS (in-service) state. When a slot is in the AUTO state and the presence of a circuit pack is detected, the slot is automatically placed in the EQ (equipped) state.

B

B_1
Byte-Interleaved Parity Byte #1 covers the Regenerator Section payload of the SONET frame format.

B_2
Byte-Interleaved Parity Byte #2 covers the Multiplex Section payload of the SONET frame format.

BCLAN
Board Controller Local Area Network — The internal local area network that provides communications between the Line Controller circuit pack and board controllers on the circuit packs associated with a high speed line.

BER
The Bit Error Rate is the ratio of bits received in error to bits sent.

BIP
Bit Interleaved Parity is a method of error monitoring over a specified number of bits (BIP-3 or BIP-8).

Branching
Branching indicates a WAD site that has three or more OLS End Terminals.

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 is an international advisory committee under United Nations sponsorship that has composed and recommended for adoption worldwide standards for international communications. CCIT has recently been renamed to the International Telecommunications Union (ITU), Telecommunications Standardization Sector (TSS).

CIC
Customer Information Center is a source for locating and obtaining delivery of customer information products.

CIT
A Craft Interface Terminal is a personal computer that meets OT minimum requirements and has Interface-2000 software installed.

CO
A Central Office is a telephone company building where switching and/or transmission equipment is located.

Condition
Conditions exist when there is something abnormal about a system.

CR
Critical (alarm). (Functional in a future release).

CS&O
The Customer Support and Operations organization provides quality product support services in engineering, installation, normal system maintenance and disaster recovery.

CP
Circuit pack

COACH
COACH is a system of on-line support tools that provide product news and bulletins, diagnostic services, compatibility information, and on-line documents.

Complementary Shelf
The Complementary Shelf and the System Controller Shelf are the two types of shelves available for OT configurations. In Release 1, the Complementary Shelf provides twelve OTU circuit pack slots.

CTIP
Customer Training and Information Products develops and provides information and training about Lucent Technologies' products and services to customers worldwide.

CTS
Customer Technical Support is a Lucent Technologies organization, (formerly, CTSI) assists the RTACs by supporting transmission products and by maintaining an on-line technical support medium known as the COACH customer support tools.

CTSI
Customer Training Support and Information is Lucent Technologies

CV
Coding Violation

D

dB
Decibels are dimensionless units that are used to express the ratio between input and output voltages, powers, currents, or sound intensities.

DC
Direct current

DCC
The Data Communications Channel is the embedded overhead communications channel in the SONET line used for end-to-end communications and maintenance. It carries alarm, control, and status information between network elements in a SONET network.

DCE
Data Communications Equipment is 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. (Functional in a future release).

Demultiplexing
Demultiplexing is a process applied to a multiplexed signal for recovering signals combined within it and for restoring the distinct individual channels of these signals.

DTE
The Data Terminating Equipment is the equipment that originates data for transmission and accepts transmitted data.

DWDM
Dense Wavelength Division Multiplexing

E

EEPROM
Electrically Erasable Programmable Read-Only Memory

EIA
The Electronic Industries Association is a trade association of the electronic industry that establishes electrical and functional standards.

EMC
Electromagnetic Compatibility

EMDU
An External Miscellaneous Discrete Unit supports the extended miscellaneous discrete feature of R2-OLS.

EMI
Electromagnetic Interference is high-energy, electrically induced magnetic fields that cause data corruption in cables passing through the fields.

EPROM
Erasable Programmable Read-Only Memory is readable memory that is nonvolatile in nature, erasable by exposure to intense ultaviolet light, and programmable externally from the processor that uses it.

EQ
Equipped is a memory administrative state for circuit pack slots.

ES
Errored Seconds is performance monitoring parameter.

ESD
Electrostatic Discharge is the discharge of static electricity into equipment that may potentially cause component damage and / or logic errors.

ET
The End Terminal is part of OLS that terminates optical line signals.

ETSI
European Telecommunications Standard Institute

Express Traffic
All OC-48 signals going between two OLS ETs that pass through a Wavelength Add / Drop site without passing through a SONET OC-48 / SDH STM-16 ADM.

F

Fault LED
Located on each OTU, the red FAULT LED either flashes, indicating that the pack has detected conditions involving an incoming signal, or is continuously lit, indicating that the pack has detected a hardware condition involving itself

FE ACTY
The Far-End Activity (alarm) LED, located on the indicator strip and the user panel, illuminates when an alarm or status condition exists at a remote network element. (Functional in a future release).

FIT
Failures in Time - Circuit pack failure rates per 10^9 hours

Flash EPROM
A new technology that combines the non-volatility of EPROM with the in-circuit reprogramability of EEPROM (electrically-erasable PROM).

Flash Memory
Flash Memory is non-volatile storage media with random read access, controlled erase and write access.

FT-2000 OC-48 Lightwave System (ADR)
Lucent Technologies' FT-2000 OC-48 Lightwave System (ADR) is a flexible, high-capacity lightwave system that transmits digitally encoded information through single-mode optical fibers at the SONET OC-48 rate of 2.5 Gb/s.

FT Series G
The FT Series G is Lucent Technologies' 1.7 Gb/s point-to-point fiber optic transmission system.

Fuse Panel
The three shelves in the OT Cabinet are equipped with a fuse panel that provides fuse indicators and an ESD jack.

Fuse/Power Indicating Panel
The two Complementary Shelves in the Miscellaneously Mounted Application are equipped with a fuse/power indicating panel that provides fuse indicators, and ESD jack, and a PWR ON LED for the respective shelf.

G

Ga
Gauge

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

GHz
Gigahertz (10^9 cycles per second)

GNE
Gateway Network Element

H

Hardware Ready
The shelf, connectors, and backplane have been designed to accept additional hardware (for example, circuit packs) that is not currently available. However, additional cables may be required.

I

I^2C
I^2C (also known as IIC) is a serial data bus for providing extra processor controls.

IAO LAN
IntrA-Office Local Area Network (10BaseT LAN for operations interworking)

IEC
International Electrotechnology Commission or Interexchange Carrier

IIC
IIC (also known as I^2C) is a serial data bus for providing extra processor controls.

Indicator Strip
The indicator strip is located on the top front of the OT cabinet. The indicator strip is equipped with LEDs that provide system-level information for the system.

Installation Manual
The Installation Manual, part of the documentation set for a given product, provides detailed customer installation and procedural instructions for the product.

Interconnection Panel
An interconnection panel, located at the top of each OT shelf, provides various long transmission cable connections. The interconnection panels for the Complementary Shelves and the System Controller Shelf provide different connections.

I/O
Input/Output

IR
Intermediate Reach

IS
In Service — A memory administrative state for ports. IS refers to a port that is fully monitored and alarmed.

ITU
The International Telecommunications Union is an advisory committee under United Nations sponsorship that has composed and recommended for adoption worldwide standards for international communications. Also refer to CCITT.

J

Jitter
Jitter is defined as short-term variations of the significant instants of a digital signal from their ideal positions in time.

K

Kb/s
Kilobits per second

L

LAN
Local Area Network

LBC
Laser Bias Current is a parameter that indicates whether or not the system's optics are working within normal margins.

LBFC
Laser Backface Current is a parameter that indicates whether or not the system's optics are working within normal margins.

LBO
A Lightguide Build-Out is an equalizer network that guarantees the proper signal level.

LCT
Lucent Technologies' FT-2000 OC-48 Large Capacity System (LCT) supports a variety of point-to-point and 4-fiber ring applications and can be used with OLS to increase the transport capacity of an existing fiber installation.

Lead time
The lead time is the amount of time between placing an order for a product and receiving the product.

LED
Light-Emitting Diode

Line
An 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
Local traffic refers to the OC-48 signals that are added/dropped through a SONET OC-48/SDH STM-16 ADM at a Wavelength Add/Drop site.

LOF
Loss of Frame (alarm) is the failure to sychronize to an incoming signal.

LOS
Loss of Signal (alarm) is the absence of an adequate incoming signal.

LRMS
Laser Root Mean Square

M

μm
Micrometer (10^{-6} meters)

Mb/s
Megabits per second

Midspan Meet
The capability to interface between two lightwave terminals of different vendors. This applies to high speed optical interfaces.

Miscellaneous Discretes
Miscellaneous discretes are user settable interfaces which allow an OS to monitor and control equipment external to OT such as open doors or fire alarms.

Miscellaneously Mounted Shelf
An OLS End Terminal or Repeater shelf which is not mounted in the OLS cabinet. It is equipped with its own user panel.

MJ
The Major (alarm) LED is located on the indicator strip and the user panel. (Functional in a future release).

MN
The Minor (alarm) LED is located on the indicator strip and the user panel. (Functional 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

NE
Network Element refers to OT, an OLS End Terminal, an OLS Repeater, or LCT in a network.

NE ACTY
The Near-End Activity (alarm) LED, located on the indicator strip and the user panel, illuminates when an alarm or status condition is detected at the local network element. (Functional in a future release).

NGLN
The Next Generation Lightwave Network is Lucent Technologies' network intended to replace the existing FT Series G point-to-point transmissions network.

nm
Nanometer (10^{-9} meters)

NMON
Not Monitored is a memory administrative state for ports.

NRZ
Nonreturn to Zero

NSA
Non-Service Affecting

NSAP
Network Service Access Point

O

OA
Optical Amplifier

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. N is the number of 51.84 Mb/s signals multiplexed into the optical signal.

ODU
Optical Demultiplexer is a circuit pack that takes an OLS optical signal and separates it into the 8 OC-48 signals.

OLS
Optical Line System is Lucent Technologies' 8 wavelength DWDM system. OLS is a flexible high capacity lightwave system that multiplexes digitally encoded information contained in up to eight wavelengths, transmits the resulting combined signal through optical fibers, and then demultiplexes the information at the other end.

OLS End Terminal
The OLS End Terminal consists of an OMU and ODU pair, Optical Amplifiers (OAs), and the corresponding Telemetry (TLM) circuit packs.

OLS Repeater
The OLS Repeater consists of a pair of Optical Amplifiers (OAs) and the corresponding Telemetry (TLM) circuit packs.

OMU
Optical Multiplexer is a circuit pack in OLS that takes up to 8 OC-48 signals and combines them into 1 optical signal.

OOF
Out-of-Frame (alarm)

Operations Interface
Any interface providing you with information on the system behavior or control. These include the equipment LEDs, interface strip, CIT, office alarms, and all telemetry interfaces.

Operations Interworking
The capability to access, operate, provision, and administer remote systems through craft interface access from any site in a SONET network or from a centralized operations system.

OPRH
Optical Power High

OPRL
Optical Power Low

Optical Channel
A single OC-48 signal within the optical line signal. There are 8 channels in one line signal for OLS.

Optical Line Signal
An optical line signal is a wavelength division multiplexed optical signal that consists of up to eight optical channels and one supervisory channel.

Optical Section
An optical section is the part of the optical line that exists between adjacent End Terminal and Repeater sites or between adjacent Repeater sites. Optical sections are also referred to as spans.

Original Value Provisioning
The original values are preprogrammed at the factory. These values can be overridden using local or remote provisioning.

OS
An Operations System is a central computer-based system used to provide operations, administration, and maintenance functions.

OT
Optical Translator is Lucent Technologies' hardware platform that is designed to work with OLS to provide fully flexible WAD capabilities, such as optical chaining and bridging and increased span length.

OTU
The Optical Translator Unit is a circuit pack that performs optical-electrical-optical regeneration and monitoring of SONET OC-48/SDH STM-16 signals in the 1.5 µm and 1.3 µm ranges.

Outside Planet Loss
The optical power loss (in dB) due to the fiber span between sites.

P

Platform
A platform is a family of equipment and software configurations designed to support a particular operation.

PM
Performance Monitoring measures the quality of service and identifies degrading or marginally operating systems (before an alarm would be generated).

Preprovisioning
Preprovisioning is the capability to provision a slot before installing a circuit pack.

Proactive Maintenance
Proactive maintenance is 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
Provisioning is assigning a value to a system parameter.

PWR ON
A Power On (LED) illuminates to indicate that the respective shelf is receiving -48 V power.

R

R1
Release 1 of a product

R2
Release 2 of a product

RCVR
High speed receiver circuit pack or module

Reactive Maintenance
Reactive maintenance is the process of detecting defects / failures and clearing them.

Reflectance
Reflectance is the ratio of reflected optical power to the incident optical power at a reflection point or form a component.

Repeater Site
A Repeater site is the location of the OLS equipment that optically amplifies the optical line signals.

RPP
Reliability Prediction Procedure

RTAC
The Regional Technical Assistance Center is responsible for troubleshooting problems in the field 24 hours a day.

RTEMP
Receiver Temperature

RTT
Regenerating Tandem Terminal

RZ
Return to Zero

S

SA
Service Affecting

SD
Signal Degrade

SDH
Synchronous Digital Hierarchy

SEFS
Severely Errored Frame Seconds is a performance-monitoring parameter.

SES
Severely Errored Seconds is a performance-monitoring parameter.

SESP
P-bit Severely Errored Seconds is a performance-monitoring parameter.

SF
Signal Fail is a condition when an incoming signal's bit error rate exceeds a fixed value.

Single-Ended Operations
Single-ended operations refers to the capability to perform operations, administration, maintenance, and provisioning of remote network elements on a centralized basis.

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

Standard Fiber
Single-mode fiber in the 1.5 µm range with normal dispersion of 18 ps / nm-km and optical loss of less than 0.25 dB / km.

STM, STM-n
Synchronous Transport Module is the basic logical building block SDH signal.

STS, STS-n
Synchronous Transport Signal is the basic logical building block SONET signal.

Subnetwork
A group of interconnected / interrelated network elements (NEs). The most common connotation is a SONET network in which the NEs have data communications channel (DCC) connectivity.

Subnetwork Size
Subnetwork size is the maximum size of optical sections between OLS End Terminals that are not Wavelength Add / Drop sites.

Synchronize
Synchronous refers to network elements that are times from references traceable from a single timing source.

SYSCTL
The System Controller circuit pack and the System Memory circuit pack provide the highest level of system control for a system. The System Controller circuit pack provides overall administrative control for a system.

SYSMEM
The System Memory circuit pack and the System Controller circuit pack provide the highest level of system control for a system. The System Memory circuit pack provides memory support for the SYSCTL.

System Controller Shelf
The System Controller Shelf and the Complementary Shelf are the two types of shelves available for OT configurations. In Release 1, the System Controller Shelf provides eight OTU circuit pack slots and three of its four empty designated for the future addition of controller circuit packs.

T

TCA
Threshold-Crossing Alert — A condition set when a counter exceeds a user-selected high or low threshold. A TCA does not generate an alarm but is available on demand through the CIT.

Technical Specifications
Technical Specifications, part of the documentation set for a given product, provide technical specifications for the hardware and software (if applicable) for the product.

TID
Terminal Identifier

TL1
Transaction Language 1

TLM
Telemetry Controller circuit pack (part of OLS)

TM
Terminal Multiplexer

TOHCTL
Tributary Overhead Controller is a circuit pack that provides control in a system.

Tone
Tone is an AM signal in the 5 to 30 kHz range that is superimposed on the drop side signal for power measurements.

TR
Technical Reference

TRMTR
High speed transmitter circuit pack or module

Truewave® Fiber
Truewave fiber, previously referred to as DEB fiber, is single-mode fiber in the 1.5µm range with normal dispersion of 1 to 5 ps/nm-km and optical loss of less than 0.25 dB/km.

TSO
Technical Support Organization (see CTS).

U

UAS
Unavailable Seconds (alarm)

Upgrade
An upgrade is the addition of new capabilities (features) that requires additional hardware and/or software.

User Panel
The System Controller Shelf in the Miscellaneously Mounted Application is equipped with a user panel that provides the same LEDs as the indicator strip on the OT cabinet, fuse indicators, and an ESD jack.

User/Service Manual
The User/Service Manual, part of the documentation set for a given product, provides detailed system descriptions, technical specifications, operational and maintenance instructions, and user interface descriptive/tutorial information for the product.

V

V
Volt

Value
A number, text string, or other menu selection associated with a parameter.

VAPD
Avalanche Photo-Diode bias voltage

W

WAD
Wavelength Add/Drop is the capability to add and/or drop OC-48 signal wavelengths from an optical line signal.

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

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

Wavelength Interchange

Wavelength Interchange is the capability of changing the wavelength associated with an OC-48 signal into another wavelength. For example, an OC-48 signal travelling as wavelength 1 could be converted to wavelength 2.

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