



# **WaveStar® TDM 2.5G/10G (2-Fiber) Release 6.0.5/6.1.5**

## **User Operations Guide**

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# About this information product

---

## **Purpose**

This document provides the following information about the WaveStar® TDM 2.5G/10G 2-Fiber system:

- Detailed descriptive information to the circuit pack level
- Acceptance, Circuit Order/Provisioning, and Operation tasks
- WaveStar craft interface terminal (WaveStar CIT) usage.

The WaveStar TDM 2.5G/10G system has a phased product release plan. This user operations guide covers all product releases up to Release 6. For more information about the WaveStar TDM 2.5G/10G product releases and a complete list of features, refer to *Chapter 1, Introduction to the WaveStar TDM 2.5G/10G (2-Fiber) System*.

## **Reason for reissue**

This document is reissued to update existing information and provide information about Release 6.0.5/6.1.5 features.

**Safety labels** For more information please read *Appendix D, Safety*. The following safety labels are used through this document:



**DANGER**

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



**WARNING**

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



**CAUTION**

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

**Intended audience** This document is primarily for operating and maintaining the Advanced Services Operations System system. It may be used by anyone desiring specific operation and maintenance information.

## How to use this information product

The following table briefly describes the type of information in each chapter.

| Chapter  | Title                                | Description                                                                                                                                                                 |
|----------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|          | About this information product       | Describes the purpose of the document, the intended audience, organization of the document, references related documentation, and explains how to comment on this document. |
| Part I   | Acceptance Tasks                     | Provides procedures to accept the hardware after installation by someone else.                                                                                              |
| Part II  | Operation Tasks                      | Provides procedures that can be used in day-to-day operations                                                                                                               |
| Part III | Circuit Order/<br>Provisioning Tasks | Provides procedures that are used when adding or deleting work order items.                                                                                                 |
| Part IV  | Supporting Tasks                     | Provides procedures for all supporting tasks you may have to perform using ASOS.                                                                                            |
| 1        | System Introduction                  | Provides a high-level overview of the product, describes the product family, and introduces the Advanced Services Operations System system and the WaveStar CIT.            |
| 2        | Network Topologies                   | Describes the applications for the Advanced Services Operations System system, including technical details and configuration information for each application.              |
| 3        | Product Description                  | Describes the shelves designed to support each particular application set available for Advanced Services Operations System system.                                         |
| 4        | Operations Interfaces                | Describes the operations interfaces that provide voice, data, alarm, and status information on service and equipment                                                        |
| 5        | Circuit Pack/Port Unit Descriptions  | Describes the purpose and functions for each circuit pack and port unit.                                                                                                    |

| Chapter | Title                                                 | Description                                                                                                                                                                                                 |
|---------|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6       | Control, Transmission, and Synchronization Interfaces | Describes system control architecture, signal transmission, and synchronization. Introduces the synchronization tasks and provides supporting (noncritical) synchronization information.                    |
| 7       | Provisioning, Security and Administration             | Describes the administration and provisioning features of the Advanced Services Operations System system. Introduces the provisioning tasks and provides supporting (noncritical) provisioning information. |
| 8       | Performance Monitoring                                | Provides information about the various reports and relevant information-gathering mechanisms used in routine (non-trouble-clearing) equipment management and maintenance.                                   |
| A       | WaveStar CIT Tutorial                                 | Introduction to the WaveStar Craft Interface Terminal (CIT).                                                                                                                                                |
| B       | Technical Specifications                              | Technical specifications for the product.                                                                                                                                                                   |
| C       | Task Lists                                            | Provides an alphabetical and numerical list of tasks.                                                                                                                                                       |
| D       | Safety                                                | Provides important safety instructions.                                                                                                                                                                     |

### How to use the task parts

This part provides information about how to use the task parts of this document. The tutorial in Appendix A will familiarize you with the interactions of the WaveStar CIT and the network element.

**Important!** For your convenience, The WaveStar BandWidth Manager and WaveStar TDM 2.5G/10G User Operations Guide maintain consistent task numbers for a given task. If a task does not apply to a certain product, it is purposely omitted from the document.

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

## How to find instructions

To find the instructions for performing tasks, proceed as follows:

1. Find your job in the appropriate task index (for example, acceptance, circuit order/provisioning, or operation) and go to the referenced task; for example, *T 201, Change (Your Own) Password*.
2. Tasks contained in the acceptance, circuit order/provisioning, and operation task indexes are classified as “task elements”. Task elements contain step-by-step instructions to accomplish a distinct user task. All task elements are listed in numerical order but are not used in numerical order.
3. Perform all steps in the task element in the suggested order unless it sends you to another task element or a “supporting element”. Supporting elements contain details necessary to complete the step it supports on the task. Supporting elements allow new or infrequent users access to detailed information not needed by experienced users. After you have completed a task element, you have finished the task.
4. **IMPORTANT:** When you complete a supporting element, you *MUST* return to the task element that sent you there.
5. **IMPORTANT:** Unless otherwise instructed, if one task element sends you to another task element, you should return to the first task element after you complete the second.
6. Sometimes you will be asked to verify that actions have occurred. This may take the form of a formal statement of the expected response. At other times, the instructions will merely state *verify that...* If the expected response is not observed and a specific trouble-clearing reference is not made, refer to the *Trouble Clearing Task Index* in *Advanced Services Operations System Alarm Messages and Trouble Clearing Guide* to start trouble clearing.
7. If you need help in clearing a trouble after completing all the applicable trouble-clearing procedures, contact your local or regional maintenance assistance group. Then, the group may contact the Lucent Technologies Regional Local Support at **1-866-LUCENT8 (582-3688): Prompt 1** in accordance with local procedures.

### **Faulty equipment return**

Faulty equipment should be returned to the following address for repair:

Lucent Technologies Network Systems  
Returned Goods Department  
Dept. 11MV287122  
1600 Osgood Street  
North Andover, MA 01845

**Conventions used** The tasks in this manual use a **MONOSPACE** font to identify text on a screen or a response displayed from the network. A **BOLD** font identifies the lettering designations on panels, shelves, and circuit packs.

**Task numbering** Each group of tasks is numbered according to task category. The numbering system indicates only the group to which a task belongs. A task number does not express the priority of tasks, the privilege required for tasks, or the sequence in which tasks should be performed.

The task numbering conventions for the respective task groups are as follows:

- Acceptance (100-199)
- Operation (200-299)
- Circuit Order/Provisioning (300-399)
- Supporting (700-799)

For example, a task numbered 102 is an acceptance task. A task numbered 306 is a circuit order/provisioning task.



## **WaveStar TDM 2.5G/10G documentation set**

The Lucent Technologies documents listed in this section provide additional information about the Advanced Services Operations System system.

### **Document list**

The following table list the documents included in the WaveStar TDM 2.5G/10G documentation set.

| Document Number            | Title                                                                                          |
|----------------------------|------------------------------------------------------------------------------------------------|
| 365-371-527<br>CC109205054 | <i>WaveStar TDM 2.5G/10G<br/>Applications and Planning Guide (APG)</i>                         |
| 365-371-528<br>CC109205062 | <i>WaveStar TDM 2.5G/10G<br/>User Operations Guide (UOG)</i>                                   |
| 365-371-529<br>CC109205070 | <i>WaveStar TDM 2.5G/10G<br/>Alarm Messages and Trouble Clearing Guide<br/>(AMTCG)</i>         |
| 365-371-206<br>CC109151738 | <i>WaveStar TDM 2.5G/10G<br/>Installation Manual and Turn-up Services<br/>(IMSTS)</i>          |
| 365-371-530<br>CC109205088 | <i>WaveStar TDM 2.5G/10G<br/>Operations Systems Engineering Guide<br/>(OSEG)</i>               |
| CC109166835*               | <i>WaveStar TDM 2.5G/10G, Release 6<br/>Software Release Description (SRD)</i>                 |
| CC109205096*               | <i>WaveStar TDM 2.5G/10G, Release 6,<br/>Documentation CD-ROM (Contains UOG and<br/>AMTCG)</i> |

\* These items are shipped initially with the software. Contact Software Manufacturing for ordering information.

**Description of  
documentation set**

This section briefly describes the documents that are included in the Advanced Services Operations System documentation set.

**Installation Manual and System Turn-Up Services (IMSTS)**

The *Advanced Services Operations System Installation Manual and Turn-Up Services* is a step-by-step guide to system installation and setup. It also includes information needed for pre-installation site planning and post-installation acceptance testing

**Applications and Planning Guide (APG)**

The *Advanced Services Operations System Applications and Planning Guide (APG)* is for use by network planners, analysts and managers. It is also for use by the Lucent Account Team. It presents a detailed overview of the system, describes its applications, gives planning requirements, engineering rules, ordering information, and technical specifications.

**User Operations Guide (UOG)**

The *ASOS User Operations Guide* provides step-by-step information for use in daily system operations. The manual demonstrates how to perform system provisioning, operation, and administrative tasks.

**Alarm Messages and Trouble Clearing Guide (AMTCG)**

The *ASOS Alarm Messages and Trouble Clearing Guide* provides detailed information on maintenance and trouble clearing, a list of the systems's alarm messages, and procedures for routine maintenance, troubleshooting, diagnostics, and component replacement.

**Operations Systems Engineering Guide (OSEG)**

The *Advanced Services Operations System Operations Systems Engineering Guide* provides detailed information on TL1 commands, messages, and error codes.

**Software Release Description (SRD)**

The *Advanced Services Operations System Software Release Description* provides software installation information and describes release-specific software details.

## Available drawings

The following table lists drawings available from the Customer Information Center (CIC). These drawings provide valuable product information.

| Drawing number | Title                                                                                    |
|----------------|------------------------------------------------------------------------------------------|
| ED8C789-10     | <i>Typical Bay Arrangement, Ordering Information, Cabling and Floor Plan Data Sheets</i> |
| ED8C789-30     | <i>WaveStar TDM 2.5G Shelf Assembly</i>                                                  |
| ED8C789-31     | <i>WaveStar TDM 10G Shelf Assembly</i>                                                   |
| ED8C789-32     | <i>WaveStar TDM 2.5G/10G (2-Fiber) Circuit Pack Ordering</i>                             |
| ED8C789-33     | <i>WaveStar TDM 2.5G/10G (2-Fiber) Bay Closing Details</i>                               |
| ED9C280-31     | <i>DS3 Connector Panel (External Mount)</i>                                              |
| ED8C789-34     | <i>DS3 Kit [DS3 Connector Panel (Internal Mount and Rear Mount)]</i>                     |
| ED8C789-35     | <i>WaveStar TDM 2.5G/ 10G (2-Fiber) Bay</i>                                              |
|                | <i>Software Ordering Guide (Release 4 and later)</i>                                     |

## Technical support services

This part describes the technical support services available for the WaveStar TDM 2.5G/10G (2-Fiber) system.

### Technical Support Services Groups

Technical support services are available through the following:

- Regional Local Support
- Product Support for Optical Networking Products

Lucent Technologies technical support services groups are committed to providing customers with high quality product support services. The technical support services organizations regard customers as their highest priority and understand customers' obligation to maintain quality services.

## **Contacting Regional Local Support**

Lucent Technologies Regional Local Support is the first point of contact for technical support services. Regional Local Support personnel troubleshoot field problems 24 hours a day over the phone and on site (if necessary).

For technical assistance, call **1-866-LUCENT8 (582-3688): Prompt 1.**

**Important!** International customers, please contact your Account Executive for your local technical support services number.

## **Regional Local Support Services**

Regional local support personnel provides the following technical support services:

- Tracks and maintains visible ownership of all reported customer assistance requests, from inception through resolution
- Analyzes and diagnoses reported problems
- Communicates actions, plans, and problem status to the reporting customer
- Provides restoration and recovery services
- Provides preventative and/or circumvention measures
- Initiates action to establish modifications requests (MRs) for design issues
- Writes technical bulletins
- Provides technical assistance to installers

Regional Local Support personnel are supported by Lucent Technologies Product Support for Optical Networking Products.

## **Product Support for Optical Networking Products**

The Product Support for Optical Networking Products organization provides quality product support services and regards the customer as its highest priority. The Product Support for Optical Networking Products organization maintains direct contact with development and manufacturing organizations of Lucent Technologies to assure prompt resolution of all customer assistance requests.

The Product Support for Optical Networking Products organization provides the following technical support services:

- Manages customer assistance requests
- Supports first service applications, customer lab evaluations, and initial customer applications
- Develops software release descriptions, installation manuals, engineering change procedures (ECPs), method of procedures (MOPS), modification implementation procedures (MIPs)
- Provides installation and Local Regional training

#### **A technical support platform**

The Product Support for Optical Networking Products organization provides an online system, the Customer Assistance Request Entry System (CARES), to track all customer assistance requests. The CARES system communicates details about assistance requests, product bulletins, and other critical information to customer sites. The CARES web site is available at <http://www.lucent.com/support/>. To obtain a login, please call 1-866-236-4448.

#### **Training**

The Lucent Learning Services organization offers a formal training package to complement your product needs. On-site training is available for all WaveStar TDM 2.5G/10G training courses.

To enroll in a training class at one of Lucent's corporate training centers or to arrange an on-site training session at your facility, please call *1-888-LUCENT8 (582-3688): Prompt 2*.

#### **TR9203 Synchronous Optical Network (SONET) Overview**

##### *Content:*

This course provides personnel with a basic description of the SONET standard and addresses the following key points:

- SONET-- its evolution and advantages
- Layers
- Format, rates, and mappings
- Overhead
- Pointers and dynamic alignment
- Virtual tributaries
- STS multiplexing
- Automatic protection switching

- Maintenance signals
- Network elements

*Audience:*

Telecommunications professionals, engineers, project managers, account executives, and other sales personnel who need to understand the Synchronous Optical Network.

*Course Length:* 1 day

**LW2262 WaveStar TDM 2.5G/10G (2-Fiber) Applications, Architecture, and Planning Course**

*Content:*

The ASOS Applications, Architecture, and Planning Course (LW2262) provides a detailed introduction to ASOS, covering the features and benefits of the network solutions, equipment functions and requirements, and network planning.

*Audience:*

Network planners and engineers, and Lucent marketing/sales personnel, product managers, technical consultants, and account representatives.

*Course Length:* 2 days

**LW2661 WaveStar TDM 2.5G/10G (2-Fiber) Operations and Maintenance Course**

*Content:*

The ASOS Operations and Maintenance Course enables technicians to properly operate and maintain a ASOS. The course covers the physical equipment and the new graphical user interface (GUI)-based WaveStar Craft Interface Terminal (CIT) that is used to provision equipment, make cross-connections, perform administrative functions, and do manual protection switching. This course is based on the ASOS User Operations Guide (UOG), and Alarm Messages and Trouble Clearing Guide (AMTCG).

*Audience:*

Technicians responsible for the operations and maintenance of the equipment. This course will also be helpful to technical support personnel and anyone needing working knowledge of the equipment.

*Course Length:* 4 days

**How to comment**

Because customer satisfaction is extremely important to Lucent Technologies, every attempt is made to encourage feedback from customers about our information products.

**Customer comment form**

A customer comment form is located immediately after the title page of this document. Please fill out the form and fax it to the number provided on the form.

If the customer comment form is missing, send or fax comments about this information product to:

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

**Fax: 1-978-960-6835**

**How to order**

This section describes how to order documentation, drawings, and electronic documentation (CD-ROMS).

To order documents, specify the document or CD-ROM that you need and the information for commercial customers to order documentation and drawings or request placement on the standing order list (for reissues of any document). You can order by mail, internet, telephone, or fax.

Lucent Technologies Inc  
Customer Information Center  
Attention: Order Entry Section  
2855 N. Franklin Road  
P.O. Box 19901  
Indianapolis, IN 46219

Internet Address:  
www.lucentdocs.com

Telephone/Fax Numbers

From U.S.A:  
Telephone: 1-888Lucent-8  
(1-888-582-3688)  
Fax: 1-800-566-9568

From Canada, North American Region  
Telephone: 1-317-322-6615  
Fax: 1-317-322-6699  
Email: *intlhaorders@lucent.com*

From Europe/Middle East/Africa (EMEA); Asia/Pacific Region and  
China; Caribbean/Latin America Region (CALA)  
Telephone: 1-317-322-6416  
Fax: 1-317-322-6699  
Email: *intlhaorders@lucent.com*

For orders totaling \$1,000 or less, a major credit card is required.  
Prepayment by check is also acceptable. For orders totaling over  
\$1,000, credit card, check, or invoice upon receipt of a purchase order.  
Purchase orders may be faxed or mailed.

Documentation for WaveStar TDM 2.5G/10G is available on  
CD-ROM. If you wish to order an annual subscription, obtain pricing  
information, or obtain a list of documents available on CD-ROM,  
contact your account executive or Lucent Technologies Customer  
Information Center.

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





# Part I

---

## Acceptance Tasks



## Task 100: Accept a WaveStar TDM 2.5G (2-Fiber) System

---

**Purpose** Use this procedure to test an out-of-service WaveStar TDM 2.5G (2-Fiber) system for a 2-fiber ring network in a stand-alone state. Each WaveStar TDM 2.5G (2-Fiber) system (node) in the 2-fiber ring network should be tested individually.

This procedure is only used if the WaveStar TDM 2.5G (2-Fiber) system was installed by someone else.

**If you completed the installation following the procedures in 365-371-106 (Releases 2 and 3) or 365-371-206 (Release 4 and later releases), do not perform this procedure.**

If the installation has not been completed (including circuit pack installation), notify the installation personnel or refer to one of the following to complete installation:

- 365-371-106, *WaveStar TDM 2.5G Installation Manual (Releases 2 and 3)*
- 365-371-206, *WaveStar TDM 2.5G/10G Installation Manual and Turn-Up Services (Release 4 and later releases)*

**Important!** It is assumed that installation of the WaveStar TDM 2.5G (2-Fiber) system has been completed (including circuit pack installation) for the engineered configuration. It is further assumed that the WaveStar TDM 2.5G (2-Fiber) system is powered and running. *If at any point in this procedure the WaveStar TDM 2.5G (2-Fiber) system fails to respond in the indicated way, refer the trouble to installation personnel.*

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist strap
- Minimum of two optical loopback jumpers with 20-dB lightguide buildout
- Minimum of two electrical coax jumpers
- DS3 test set
- DS3EC1/8 port units

**Safety precautions**

To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G (2-Fiber) system, it is imperative to review and understand these warnings and precautions prior to performing this task.

**WARNING**

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

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G (2-Fiber) system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in “Appendix D, Safety.”*

**Related information**

For related information, see:

- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial*
- *Appendix D, Safety*

# Instructions

---

**Before you begin** Before you begin this task, verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G (2-Fiber) system.

**Task** Complete the following steps to accept an **out-of-service** WaveStar TDM 2.5G (2-Fiber) system for a 2-fiber ring in a standalone state.

---

**Important!** Ignore the LEDs at the user panel during this test.

- 1** If required, remove the WaveStar TDM 2.5G (2-Fiber) shelf cover.

**Reference:** *Supporting Task 705, Remove/Replace Shelf Cover*

- 
- 2** Inspect the WaveStar TDM 2.5G (2-Fiber) system for obvious damage.

---

**Important!** All connections to other equipment must be removed.

- 3** At the DSX-3 and/or LGX<sup>®</sup> cross-connect panel or equivalent, remove all DS3, OC-3, and/or OC-12 connections to the WaveStar TDM 2.5G system. Make a record of these disconnections so they can be replaced after the test.

- 
- 4** Loop back all OC-48 lines (so that the **PORT 1 OUT** connector is connected to the **PORT 1 IN** connector on the same OC48/STM16 port unit) using optical jumpers and 20-dB lightguide buildouts.

**Reference:** *Supporting Task 708, Make Manual Optical Loopback*

- 
- 5** At the WaveStar CIT, select **Fault>NE Alarm List...**, or click on **Alarm List** to view the *NE Alarm List*. Make note of any alarms that appear in the report. Report these conditions to installation personnel if any failures occur during the following tests.

- 
- 6** Perform the LED test to verify the LEDs are operating properly.

**Reference:** *SE 100-1: Perform LED Test*

---

- 7** Perform alarm test to verify that alarm equipment is connected.

**Reference:** *SE 100-2: Perform Alarm Test*

---

- 8** Perform cable in and out reversal test to verify that the electrical input and output cables are not reversed.

**Reference:** *SE 100-3: Perform Cable In/Out Reversal Test*

---

- 9** Reconnect all OC-48 lines (removed in Step 4).
- 

- 10** Reconnect all DS3, OC-3, and/or OC-12 connections (recorded and removed in Step 3) at the DSX-3 and/or LGX cross-connect panel or equivalent.
- 

- 11** The WaveStar TDM 2.5G (2-Fiber) system has passed the acceptance tests. After testing all of the WaveStar TDM 2.5G (2-Fiber) systems individually the WaveStar TDM 2.5G (2-Fiber) ring network will be ready for the acceptance test.

**Reference:** *Acceptance Task T 101, Accept a WaveStar TDM 2.5G (2-Fiber) Ring Network*

---

END OF STEPS

---



## SE 100-1: Perform LED Test

---

**Procedure** Complete the following steps to verify the LEDs are operating properly.

---

**1** At the WaveStar CIT, select **Fault>Test>LED**.

---

**2** Highlight the required shelf and click on **Select**.

---

**3** Verify the shelf AID on the *Test LED* screen, enter the Number of Iterations (2 iterations are recommended) and click on **Start**.

**Result:** A dialog box appears noting that each test iteration causes the LEDs to cycle on and off 3 seconds. Each test iteration takes approximately 40 seconds. Click on **Yes**.

All labeled LEDs on the User Panel turn on for 2 seconds, then off for 2 seconds. Then all labeled LEDs on the circuit packs turn on for 2 seconds, then off for 2 seconds. This will repeat three times the number of test iterations chosen.

---

**4**

| IF the LEDs . . .        | THEN . . .                                                   |
|--------------------------|--------------------------------------------------------------|
| operate properly,        | <b>STOP! End of Supporting Element.</b>                      |
| do not operate properly, | refer the problem to the group that installed the equipment. |

---

END OF STEPS



## SE 100-2: Perform Alarm Test

---

**Procedure** Complete the following steps to verify that alarm equipment is connected.

- 1 Notify alarm monitoring personnel that the test will be performed.
- 2 At the WaveStar CIT, select **Fault>Test>Office Alarm**.
- 3 Highlight the required shelf and click on **Select**.
- 4 Verify the shelf AID on the *Test Office Alarm* screen, enter the Number of Iterations (2 iterations are recommended), and click on **Start**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**.

The office alarms connected to the shelf turn on for 5 seconds in the following order: Critical, Major, Minor.

The sequence will repeat for the number of iterations.

5

| IF the Office Alarms . . . | THEN . . .                                                   |
|----------------------------|--------------------------------------------------------------|
| operate properly,          | <b>STOP! End of Supporting Element.</b>                      |
| do not operate properly,   | refer the problem to the group that installed the equipment. |

END OF STEPS





## SE 100-3: Perform Cable In and Out Reversal Test

---

**Procedure** Complete the following steps to verify that the electrical input and output cables are not reversed.

---

**1** Insert DS3EC1/8 port units into the shelf (if necessary) starting with the lower numbered slots.

---

**2** Connect the output of port 1-1 to the input of the DS3 test set.

---

**3** Verify that an AIS or Idle signal is received.

---

**4**

| IF the AIS or Idle signal is . . . | THEN . . .                                                  |
|------------------------------------|-------------------------------------------------------------|
| received,                          | go to Step 5.                                               |
| not received,                      | refer the problem to the group that installed the equipment |

---

**5** Disconnect the output of the port being tested from the input of the DS3 test set and connect the output of the next port to the input of the DS3 test set.

---

**6** Repeat Step 3 through Step 6 for all ports.

---

END OF STEPS





# Task 101: Accept a WaveStar TDM 2.5G (2-Fiber) Ring Network

---

**Purpose** Use this procedure to test a *WaveStar*® TDM 2.5G (2-Fiber) ring network. This acceptance procedure can be performed from any WaveStar TDM 2.5G (2-Fiber) system in the network. This acceptance procedure is performed after all of the WaveStar TDM 2.5G (2-Fiber) systems in the network have been individually acceptance tested. This procedure is used only if the WaveStar TDM 2.5G (2-Fiber) ring network was installed by someone else.

**If you completed the installation following the procedures in 365-371-106 (Release 2 and 3) or 365-371-206 (Release 4 and later), do not perform this procedure.**

If the installation has not been completed, notify the installation personnel or refer to the one of the following to complete installation:

- *WaveStar TDM 2.5G Installation Manual 365-371-106* (Releases 2 and 3)
- *WaveStar TDM 2.5G/10G Installation Manual and Turn-Up Services 365-371-206* (Release 4 and later releases).

**Important!** Each WaveStar TDM 2.5G (2-Fiber) system should have been individually acceptance tested. If this has not been done, refer to Acceptance Task 100. *If at any point in this procedure any WaveStar TDM 2.5G (2-Fiber) system fails to respond in the indicated way, refer the trouble to installation personnel.*

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (CIT)
- Wrist strap.

**Safety precautions**

To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G (2-Fiber) system, it is imperative to review and understand these warnings and precautions prior to performing this task.

**WARNING**

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

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G (2-Fiber) system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in Appendix D, “Safety”.*

**Related information**

For related information, see:

- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial*
- *Appendix D, Safety.*

**Before you begin**

Before you begin this task:

- Obtain engineering data for the 2-fiber ring network.
- Verify that the engineering data shows the ring ID, protection group ID, node TIDs, and fiber connections.
- Verify that a WaveStar CIT is connected and logged in to a WaveStar TDM 2.5G (2-Fiber) system within the 2-fiber ring network.

**Task**

Complete the following steps to accept a WaveStar TDM 2.5G (2-Fiber) ring network.

- .....
- 1** At the WaveStar CIT, select **Fault>NE Alarm List...**, or click on **Alarm List** to obtain an *NE Alarm List*.

.....

**2**

| IF there are...   | THEN...                                                                              |
|-------------------|--------------------------------------------------------------------------------------|
| no alarms listed, | go to Step 3.                                                                        |
| alarms listed,    | notify the installation personnel to correct the alarms before proceeding to Step 3. |

- .....
- 3** Verify that the WaveStar TDM 2.5G (2-Fiber) systems are connected in a 2-fiber ring network.

**Reference:** *SE 101-1: Verify WaveStar TDM 2.5G (2-Fiber) Systems are Connected*

- .....
- 4** Verify the WaveStar TDM 2.5G (2-Fiber) system information.

**Reference:** *SE 101-2: Verify WaveStar TDM 2.5G (2-Fiber) System Information*

- .....
- 5** Log in to the WaveStar TDM 2.5G (2-Fiber) system to the east.

- .....
- 6** At the WaveStar CIT, select **Fault>NE Alarm List...**, or click on **Alarm List** to obtain an *NE Alarm List*.

7

| IF there are...   | THEN...                                                                              |
|-------------------|--------------------------------------------------------------------------------------|
| no alarms listed, | go to Step 8.                                                                        |
| alarms listed,    | notify the installation personnel to correct the alarms before proceeding to Step 8. |

8 Verify the WaveStar TDM 2.5G (2-Fiber) system information.

**Reference:** *SE 101-2: Verify WaveStar TDM 2.5G (2-Fiber) System Information*

9 Terminate the log in.

10 Repeat Step 5 through Step 9 for each of the remaining WaveStar TDM 2.5G (2-Fiber) systems in the network.

11 The WaveStar TDM 2.5G (2-Fiber) ring network has passed this acceptance test and is now ready to provide service.

END OF STEPS



## SE 101-1: Verify WaveStar TDM 2.5G (2-Fiber) Systems are Connected

---

**Task** Perform the following steps to verify that all the WaveStar TDM 2.5G (2-Fiber) systems are connected in a 2-fiber ring network.

---

- 1** At the WaveStar CIT, select **View>Rings>Ring Map....**
  - 2** Expand the tree to view rings (if required), highlight the required ring, and click on **Select**.
  - 3** Verify that the Node NE Names and Fiber Connections from the screen agree with the engineering data, and click on **Close**.
- 

**Important!** Click on **Display Ring Map Graph** to view a ring diagram.

---

END OF STEPS

---



## SE 101-2: Verify WaveStar TDM 2.5G (2-Fiber) System Information

---

**Task** Perform the following steps to verify the WaveStar TDM 2.5G (2-Fiber) system information.

- .....  
**1** At the WaveStar CIT, select **View>View Equipment Details....**  
.....
- 2** Enter **system** in the Enter AID: field and click on **Select**, or click on **WaveStar 2F 2.5G/10G** and **Select** to view the *View System Details* screen.  
.....
- 3** Verify that the value of the TID parameter agrees with the engineering data, and click on **Close**.  
.....
- 4** Select **View>Timing/Sync....**  
.....
- 5** Verify that the synchronization information agrees with the engineering data, and click on **Close**.

.....  
E N D O F S T E P S  
.....





## Task 102: Accept New Optical Fibers to a Port

---

**Purpose** Use this procedure to test new optical fibers between a port and the corresponding lightguide cross-connect panel or other terminating equipment.

This procedure is only used if the new optical fibers were installed and not tested.

**If you completed the installation following the procedures in 365-371-106 (Releases 2 and 3) or 365-371-206 (Release 4 and later releases), do not perform this procedure.**

If the installation has not been completed (including associated port unit installation), notify the installation personnel or refer to one of the following to complete installation:

- *WaveStar TDM 2.5G Installation Manual* 365-371-106 (Releases 2 and 3)
- *WaveStar TDM 10G Installation Manual* 365-371-306 (Release 1)
- *WaveStar TDM 2.5G/10G Installation Manual and Turn-Up Services* 365-371-206 (Release 4 and later releases).

**Important!** It is assumed that installation of the new optical fibers has been completed (including associated port unit installation) for the engineered configuration and that the WaveStar TDM 2.5G/10G system is in service. *If at any point in this procedure the WaveStar TDM 2.5G/10G system fails to respond in the indicated way, refer the trouble to installation personnel.*

**Required equipment** The following equipment is required to perform this task:

- *WaveStar* Craft Interface Terminal (CIT)
- Wrist strap.

## Safety precautions

To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### WARNING

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



### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in Appendix D, “Safety”.*



### CAUTION

*If an optical connection is broken during this procedure, clean the fibers and connectors. Refer to Supporting Task 703: Clean Optical Fibers and Connectors.*

## Related information

For related information, see the following sections in this document:

- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Supporting Task 703: Clean Optical Fibers and Connectors*
- *Appendix A, CIT Tutorial*
- *Appendix D, Safety.*

**Before you begin** Before you begin this task, verify that a WaveStar CIT is connected and logged in to the WaveStar 2.5G/10G system.

**Task** Complete the following steps to accept a new optical fiber to a port.

.....

**1** At the WaveStar CIT, select **Fault>NE Alarm List...** or click on **Alarm List** to obtain an *NE Alarm List*, and verify that there are no active alarms.

.....

**2** Perform a cross-connect loopback on the circuit(s) associated with the new fiber for testing.

**Reference:** *Operation Task 203: Loop Back Circuit(s) for Testing*

.....

**3** Release the cross-connect loopback on the circuit(s).

**Reference:** *Operation Task 209: Release Looped Back Circuit(s)*

.....

**4** Select **Fault>NE Alarm List...** or click on **Alarm List** to obtain an *NE Alarm List* and verify that there are no active alarms.

.....

**5** The new optical fibers have passed the acceptance tests and are ready for service.

.....

END OF STEPS





## Task 103: Accept New Electrical Cables to a Port

---

**When to use** Use this procedure to test new electrical cables between a port and the corresponding cross-connect panel or other terminating equipment. This procedure is only used if the new electrical cables were installed and not tested.

**If you completed the installation following the procedures in 365-371-106 (Releases 2 and 3) or 365-371-206 (Release 4 and later releases), do not perform this procedure.**

If the installation has not been completed (including associated port unit installation), notify the installation personnel or refer to one of the following to complete installation:

- 365-371-106, *WaveStar TDM 2.5G Installation Manual (Releases 2 and 3)*
- 365-371-306, *WaveStar TDM 10G Installation Manual (Release 1)*
- 365-371-206, *WaveStar TDM 2.5G/10G Installation Manual Turn-Up Services (Release 4 and later releases)*

**Important!** It is assumed that installation of the new electrical cables has been completed (including associated port unit installation) for the engineered configuration and that the WaveStar TDM 2.5G/10G system is in service. *If at any point in this procedure the WaveStar TDM 2.5G/10G system fails to respond in the indicated way, refer the trouble to installation personnel.*

**Required Equipment** The following equipment is required to perform this task.

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist strap



**Safety precautions** To assure both personal safety and the proper functioning of the Advanced Services Operations System system, it is imperative to review and understand these warnings and precautions prior to performing this task.



**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in “Appendix D, Safety.”*

**Related information** For related information, see the following sections in this document:

- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial*
- *Appendix D, Safety*

# Instructions

---

**Before you begin** Before you begin this task, verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to accept a new electrical cable to a port

---

**1** At the WaveStar CIT, select **Fault>NE Alarm List...** or click on **Alarm List** to obtain an *NE Alarm List* and verify that there are no active alarms.

---

**2** Perform a cross-connect loopback on the circuit(s) associated with the new cable for testing.

**Reference:** *Operation Task 203: Loop Back Circuit(s) for Testing*

---

**3** Release the cross-connect loopback on the circuit(s)

**Reference:** *Operation Task 209: Release Looped Back Circuit(s)*

---

**4** Select **Fault>NE Alarm List...** or click on **Alarm List** to obtain an *NE Alarm List* and verify that there are no active alarms.

---

**5** The new electrical cables have passed the acceptance tests and are ready for service.

---

END OF STEPS

---





## Task 104: Accept a WaveStar TDM 10G (2-Fiber) System

---

**When to use** Use this procedure to test an out-of-service WaveStar TDM 10G (2-Fiber) system for a 2-fiber ring network in a stand-alone state. Each WaveStar TDM 10G (2-Fiber) system (node) in the 2-fiber ring network should be tested individually.

This procedure is only used if the WaveStar TDM 10G (2-Fiber) system was installed by someone else.

**If you completed the installation following the procedures in 365-371-306 (Release 1) or 365-371-206 (Release 4 and later), do not perform this procedure.**

If the installation has not been completed (including circuit pack installation), notify the installation personnel or refer to one of the following to complete installation:

- 365-371-306, *WaveStar TDM 10G Installation Manual (Release 1)*
- 365-371-206, *WaveStar TDM 2.5G/10G Installation Manual and Turn-Up Services (Release 4 and later releases)*.

**Important!** It is assumed that installation of the WaveStar TDM 10G (2-Fiber) system has been completed (including circuit pack installation) for the engineered configuration. It is further assumed that the WaveStar TDM 10G (2-Fiber) system is powered and running. *If at any point in this procedure the WaveStar TDM 10G (2-Fiber) system fails to respond in the indicated way, refer the trouble to installation personnel.*



**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist strap
- Minimum of two optical loopback jumpers with 15-dB lightguide buildouts
- Minimum of two electrical coax jumpers
- DS3 test set
- DS3EC1/8 port units.

**Safety precautions**

To assure both personal safety and the proper functioning of the WaveStar TDM 10G (2-Fiber) system, it is imperative to review and understand these warnings and precautions prior to performing this task.

**WARNING**

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

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 10G (2-Fiber) system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in Appendix D, Safety.”*

**Related information**

For related information, see:

- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial*
- *Appendix D, Safety.*

# Instructions

---

**Before you begin** Before you begin this task, verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 10G (2-Fiber) system.

**Task** Complete the following steps to accept an **out-of-service** WaveStar TDM 10G (2-Fiber) system for a 2-fiber ring in a standalone state.

---

**Important!** Ignore the LEDs at the user panel during this test.

- 1** If required, remove the WaveStar TDM 10G (2-Fiber) shelf covers.

**Reference:** *Supporting Task 705: Remove/Replace Shelf Cover*

- 
- 2** Inspect the WaveStar TDM 10G (2-Fiber) system for obvious damage.

---

**Important!** All connections to other equipment must be removed.

- 3** At the DSX-3 and/or LGX<sup>®</sup> cross-connect panel or equivalent, remove all DS3, OC-3, OC-12, and/or OC-48 connections to the WaveStar TDM 10G (2-Fiber) system. Make a record of these disconnections so they can be replaced after the test.

- 
- 4** Loop back all OC-192 lines (so that the **PORT 1 OUT** connector is connected to the **PORT 1 IN** connector on the same OC192/STM64 port unit) using optical jumpers and 15-dB lightguide buildouts.

**Reference:** *Supporting Task 708: Make a Manual Optical Loopback*

- 
- 5** At the WaveStar CIT, select **Fault>NE Alarm List...**, or click on **Alarm List** to view the *NE Alarm List*. Make note of any alarms that appear in the report. Report these conditions to installation personnel if any failures occur during the following tests.

- 
- 6** Perform the LED test for each shelf to verify the LEDs are operating properly.

**Reference:** *SE 104-1: Perform LED Test*

---

- 7** Perform alarm test for each shelf to verify that alarm equipment is connected.

**Reference:** *SE 104-2: Perform Alarm Test*

---

- 8** Perform cable in and out reversal test to verify that the electrical input and output cables are not reversed.

**Reference:** *SE 104-3: Perform Cable In and Out Reversal Test*

---

- 9** Reconnect all OC-192 lines (removed in Step 4).
- 

- 10** Reconnect all DS3, OC-3, OC-12, and/or OC-48 connections (recorded and removed in Step 3) at the DSX-3 and/or LGX cross-connect panel or equivalent.
- 

- 11** The WaveStar TDM 10G (2-Fiber) system has passed the acceptance tests. After testing all of the WaveStar TDM 10G (2-Fiber) systems individually, the WaveStar TDM 10G (2-Fiber) ring network will be ready for the acceptance test.

**Reference:** *Acceptance Task 105: Accept a WaveStar TDM 10G (2-Fiber) Ring Network*

---

END OF STEPS

---



## SE 104-1: Perform LED Test

---

**Procedure** Complete the following steps to verify the LEDs are operating properly.

- 1 At the WaveStar CIT, select **Fault>Test>LED**.
- 2 Highlight the required shelf and click on **Select**.
- 3 Verify the shelf AID on the *Test LED* screen, enter the Number of Iterations (2 iterations are recommended) and click on **Start**.

**Result:** A dialog box appears noting that each test iteration causes the LEDs to cycle on and off 3 seconds. Each test iteration takes approximately 40 seconds. Click on **Yes**.

All labeled LEDs on the User Panel turn on for 2 seconds, then off for 2 seconds. Then all labeled LEDs on the circuit packs turn on for 2 seconds, then off for 2 seconds. This will repeat three times the number of test iterations chosen.

4

| IF the LEDS . . .        | THEN . . .                                                  |
|--------------------------|-------------------------------------------------------------|
| operate properly,        | <b>STOP! End of Supporting Element.</b>                     |
| do not operate properly, | refer the problem to the group that installed the equipment |

END OF STEPS



## SE 104-2: Perform Alarm Test

---

**Procedure** Complete the following steps to verify that alarm equipment is connected.

- 1 Notify alarm monitoring personnel that the test will be performed.
- 2 At the WaveStar CIT, select **Fault>Test>Office Alarm**.
- 3 Highlight the required shelf and click on **Select**.
- 4 Verify the shelf AID on the *Test Office Alarm* screen, enter the Number of Iterations (2 iterations are recommended), and click on **Start**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**.

The office alarms connected to the shelf turn on for 5 seconds in the following order: Critical, Major, Minor.

The sequence will repeat for the number of iterations.

5

| IF the Office Alarms . . . | THEN . . .                                                   |
|----------------------------|--------------------------------------------------------------|
| operate properly,          | <b>STOP! End of Supporting Element.</b>                      |
| do not operate properly,   | refer the problem to the group that installed the equipment. |

END OF STEPS



## SE 104-3: Perform Cable In and Out Reversal Test

---

**Procedure** Complete the following steps to verify that the electrical input and output cables are not reversed.

---

**1** Insert DS3EC1/8 port units into the shelf (if necessary) starting with the lower numbered slots.

---

**2** Connect the output of port 1-1 to the input of the DS3 test set.

---

**3** Verify that an AIS or Idle signal is received.

---

**4**

| IF the AIS or Idle signal is | THEN . . .                                                   |
|------------------------------|--------------------------------------------------------------|
| received,                    | go to Step 5.                                                |
| not received,                | refer the problem to the group that installed the equipment. |

---

**5** Disconnect the output of the port being tested from the input of the DS3 test set and connect the output of the next port to the input of the DS3 test set.

---

**6** Repeat Step 3 through Step 6 for all ports.

---

END OF STEPS

---





## Task 105: Accept a WaveStar TDM 10G (2-Fiber) Ring Network

---

**When to use** Use this procedure to test a WaveStar TDM 10G (2-Fiber) ring network. This acceptance procedure can be performed from any WaveStar TDM 10G (2-Fiber) system in the network. This acceptance procedure is performed after all of the WaveStar TDM 10G (2-Fiber) systems in the network have been individually acceptance tested. This procedure is only used if the WaveStar TDM 10G (2-Fiber) ring network was installed by someone else.

**If you completed the installation following the procedures in 365-371-306 (Release 1) or 365-371-206 (Release 4 and later), do not perform this procedure.**

If the installation has not been completed, notify the installation personnel or refer to one of the following to complete installation:

- 365-371-306, *WaveStar TDM 10G Installation Manual (Release 1)*
- 365-371-206, *WaveStar TDM 2.5G/10G Installation Manual and Turn-Up Services (Release 4 and later releases)*

**Important!** Each WaveStar TDM 10G (2-Fiber) system should have been individually acceptance tested. If this has not been done, refer to Acceptance Task 104. *If at any point in this procedure any WaveStar TDM 10G (2-Fiber) system fails to respond in the indicated way, refer the trouble to installation personnel.*

**Required equipment** The following equipment is required to test a WaveStar TDM 10G (2-Fiber) Ring Network.

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist strap.



**Safety precautions**

To assure both personal safety and the proper functioning of the WaveStar TDM 10G (2-Fiber) system, it is imperative to review and understand these warnings and precautions prior to performing this task.

**WARNING**

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

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 10G (2-Fiber) system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in Appendix D, Safety.”*

**Related information**

For related information, see the following sections in this document:

- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial*
- *Appendix D, Safety*

# Instructions

---

## Before you begin

Before you begin this task:

- Obtain engineering data for the 2-fiber ring network
- Verify that the engineering data shows the ring ID, protection group ID, node TIDs, and fiber connections.
- Verify that a WaveStar CIT is connected and logged in to a WaveStar TDM 10G (2-Fiber) system within the 2-fiber ring network.

## Task

Complete the following steps to accept a WaveStar TDM 10G (2-Fiber) ring network.

- 
- 1** At the WaveStar CIT, select **Fault>NE Alarm List...** or click on **Alarm List** to obtain the *NE Alarm List*.
- 

**2**

| IF there are...   | THEN...                                                                              |
|-------------------|--------------------------------------------------------------------------------------|
| no alarms listed, | go to Step 3                                                                         |
| alarms listed,    | notify the installation personnel to correct the alarms before proceeding to Step 3. |

---

- 3** Verify that the WaveStar TDM 10G (2-Fiber) systems are connected in a 2-fiber ring network.

**Reference:** *SE 105-1: Verify WaveStar TDM 10G (2-Fiber) Systems are Connected*

---

- 4** Verify the WaveStar TDM 10G (2-Fiber) system information.

**Reference:** *SE 105-2: Verify WaveStar TDM 10G (2-Fiber) System Information*

---

**5** Log in to the WaveStar TDM 10G (2-Fiber) system to the east.

---

**6** At the WaveStar CIT, select **Fault>NE Alarm List...** or click on **Alarm List** to obtain the *NE Alarm List*.

---

**7**

| IF there are...   | THEN...                                                                              |
|-------------------|--------------------------------------------------------------------------------------|
| no alarms listed, | go to Step 8.                                                                        |
| alarms listed,    | notify the installation personnel to correct the alarms before proceeding to Step 8. |

---

**8** Verify the WaveStar TDM 10G (2-Fiber) system information.

**Reference:** *SE 105-2: Verify WaveStar TDM 10G (2-Fiber) System Information*

---

**9** Terminate the log in.

---

**10** Repeat Step 5 through Step 9 for each of the remaining WaveStar TDM 10G (2-Fiber) systems in the network.

---

**11** The WaveStar TDM 10G (2-Fiber) ring network has passed this acceptance test and is now ready to provide service.

END OF STEPS

---



## SE 105-1: Verify WaveStar TDM 10G (2-Fiber) Systems are Connected

---

**Procedure** Perform the following steps to verify that all the WaveStar TDM 10G (2-Fiber) systems are connected in a 2-fiber ring network.

---

- 1** At the WaveStar CIT, select **View>Rings>Ring Map...**

---
- 2** Expand the tree to view rings (if required), highlight the required ring, and click on **Select**.

---
- 3** Verify that the Node NE Names and Fiber Connections from the screen agree with the engineering data and click on Close.

**Important!** Click on **Display Ring Map Graph** to view a ring diagram.

---

END OF STEPS

---



## SE 105-2: Verify WaveStar TDM 10G (2-Fiber) System Information

---

**Procedure** Perform the following steps to verify the WaveStar TDM 10G (2-Fiber) system information.

- .....  
**1** At the WaveStar CIT, select **View>View Equipment Details. . .**  
.....
- 2** Enter **system** in the Enter AID: field and click on **Select**, or click on **WaveStar 2F 2.5G/10G** and **Select** to view the *View System Details* screen.  
.....
- 3** Verify that the value of the TID parameter agrees with the engineering data and click on **Close**.  
.....
- 4** Select **View>Timing/Sync....**  
.....
- 5** Verify that the synchronization information agrees with the engineering data and click on **Close**.

.....  
E N D O F S T E P S  
.....



## Task 106: Accept Dual Ring Interworking (DRI) Connections

---

**When to use** Use this procedure to verify path integrity where the path enters and/or leaves the local WaveStar TDM 2.5G/10G ring network via DRI connections.

**Important!** If you must make DRI connections to an existing WaveStar TDM 2.5G/10G system, refer to Operation Task 219.

It is assumed that acceptance testing of the local WaveStar TDM 2.5G/10G system and WaveStar TDM 2.5G/10G 2-fiber ring network has passed. *If at any point in this procedure the local WaveStar 2.5G/10G 2-fiber ring network fails to respond in the indicated way, refer the trouble to installation personnel.*

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist strap
- Microwave Logic's ST-112 SONET Test Transmission Analyzer, or Tektronix CTS-710 SONET Transmission Analyzer, or Tberd 310 SONET Transmission Analyzer, or Cerjac 156 SONET Transmission Analyzer, or equivalent.



**Safety precautions**

To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.

**WARNING**

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

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G (2-Fiber) system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in Appendix D, Safety.”*

**Related information**

For related information, see:

- *Chapter 2, Network Topologies*
- *Chapter 7, Provisioning, Security, and Administration*
- *Operation Task 219, Establish Dual Ring Interworking (DRI) Connections*
- *Operation Task 220, Disconnect Dual Ring Interworking (DRI) Connections*
- *Appendix A, CIT Tutorial*
- *Appendix D, Safety*



# Instructions

---

## Before you begin

Before you begin this task,

- Obtain office records and verify the path protection group AID of the DRI connections to be tested at the primary node in the local WaveStar TDM 2.5G/10G ring.
- Verify the port and tributary AIDs of the path to be tested at the secondary and terminating node (if required) in the local WaveStar TDM 2.5G/10G ring.
- Obtain assistance at the test sets when connected directly to the local WaveStar TDM 2.5G/10G ring.
- Verify that a WaveStar CIT is connected and logged in to the local WaveStar TDM 2.5G/10G system.

## Task

Complete the following steps to verify path integrity where the path enter or leaves the local WaveStar TDM 2.5G/10G ring via DRI connections.

---

**Important!** The path being tested can have either one or two DRI connections as it enters and/or leaves the local ring network. It is imperative that the working and protection paths are known.

- 1 Determine the number of DRI connections in the path to be tested from office records.

**Reference:** *SE 106-1: DRI Test Configurations*

## 2

| IF there is . . .               | THEN go to . . . |
|---------------------------------|------------------|
| One DRI connection in the path  | Step 3.          |
| Two DRI connections in the path | Step 10.         |

---

**Important!** Path testing should be accomplished by using an end-to-end test arrangement with test sets at the primary, secondary, and terminating nodes. However, due to equipment availability, a loopback test arrangement may be used at the primary and secondary nodes.

- 3** The local WaveStar TDM 2.5G/10G ring has one DRI connection to the outside. Connect the test sets to the primary, secondary, and terminating nodes to generate/monitor test signals on the path to be tested.

**Reference:** *SE 106-2: Test Set Connections at the Primary and Secondary Nodes*

---

- 4** Verify that there are no alarms in the ring.
- 

- 5** Test the path integrity of each path being tested.

**Reference:** *SE 106-3: Test Path Integrity*

---

- 6** At the primary node P, execute a manual path protection switch for each path being tested. Use the **Fault>Protection Switch** command for the appropriate tributary(s).
- 

- 7** Test the path integrity of each path being tested.

**Reference:** *SE 106-3: Test Path Integrity*

---

- 8** At the primary node P, clear the manual path protection switch for each path being tested. Use the **Fault>Protection Switch** command for the appropriate tributary(s).
- 

- 9** Verify that there are no alarms in the ring. This completes testing path integrity in a ring with one DRI connection to the outside.
-

---

**Important!** Path testing should be accomplished by using an end-to-end test arrangement with test sets at the primary and secondary nodes. However, due to equipment availability, a loopback test arrangement may be used at the primary and secondary nodes.

- 10** The local WaveStar 2.5G/10G ring has two DRI connections to the outside. Connect the test sets to both primary and secondary nodes to generate/monitor test signals on the paths to be tested.

**Reference:** *SE 106-2: Test Set Connections at the Primary and Secondary Nodes*

---

- 11** Verify that there are no alarms in the ring.
- 

- 12** Test the path integrity of each path being tested.

**Reference:** *SE 106-3: Test Path Integrity*

---

- 13** At the primary node P, execute a manual path protection switch for each path being tested. Use the **Fault>Protection Switch** command for the appropriate tributary(s).
- 

- 14** Test the path integrity of each path being tested.

**Reference:** *SE 106-3: Test Path Integrity*

---

**Important!** DO NOT CLEAR the manual path protection switch at primary node P at this time.

- 15** At primary node P1, execute a manual path protection switch for each path being tested. Use the **Fault-Protection Switch** command for the appropriate tributary(s).

---

**16** Test the path integrity of each path being tested.

**Reference:** *SE 106-3: Test Path Integrity*

---

**17** At the primary node P, clear the manual path protection switch for each path being tested. Use the **Fault>Protection Switch** command for the appropriate tributary(s).

---

**18** Test the path integrity of each path being tested.

**Reference:** *SE 106-3: Test Path Integrity*

---

**19** At the primary node P1, clear the manual path protection switch for each path being tested. Use the **Fault>Protection Switch** command for the appropriate tributary(s).

---

**20** Verify that there are no alarms in the ring. This completes testing path integrity in a ring with two DRI connections to the outside.

**STOP! End of Task.**

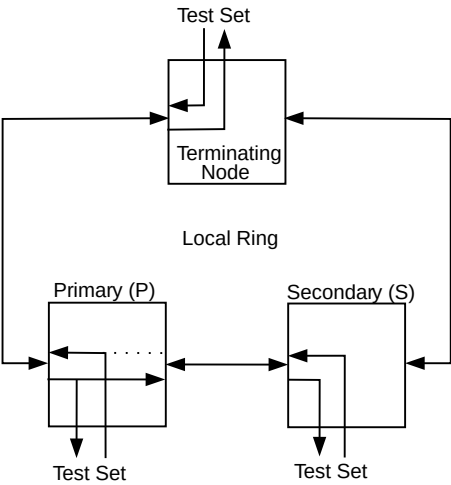
END OF STEPS

---

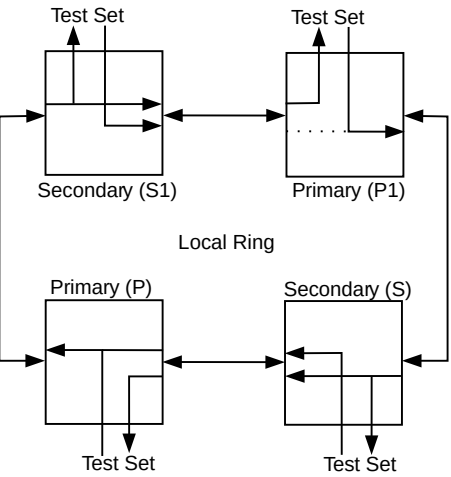


# SE 106-1: DRI Test Configurations

## Examples of local rings with one and two DRI connections



1. Local Ring With One DRI Connection



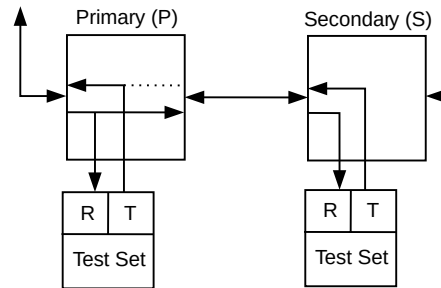
2. Local Ring With Two DRI Connections

NC-USM-205

## SE 106-2: Test Set Connections at the Primary and Secondary Nodes

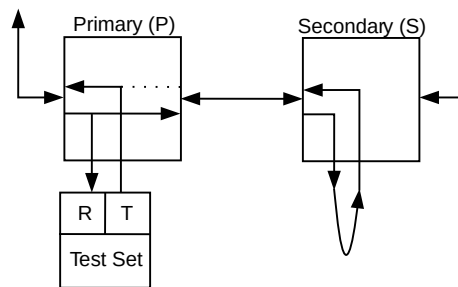
---

**End-to-end test  
arrangement at primary  
and secondary nodes**



NC-USM-2

**Loopback test arrangement  
at primary and secondary  
nodes**



NC-USM-206



## SE 106-3: Test Path Integrity

---

**Procedure** Complete the following steps to test path integrity.

- .....  
**1** At the transmit test set, insert a verifiable signal for each path being tested.  
.....
- 2** At the receive test set, verify the detection of the inserted signal on each path being tested.  
.....
- 3** To test path integrity for 2-way paths, repeat Steps 1 and 2 from opposite ends of each path.

.....  
E N D O F S T E P S  
.....







# Part II

---

## Operation Tasks



## Task 200: Modify, Delete, or Add a User's Login Parameters

---

- Purpose** Use this procedure to:
- Modify an existing user's login parameters. This includes the following:
    - Password
    - User class
    - Password aging interval (Release 4 and later)
    - Inactivity timeout (Release 4 and later)
    - User type and privilege codes
    - Priority levels
    - Notification registration list
    - Initialization observability
  - Delete an existing user's login parameters
  - Add a new user's login parameters.

This task is for administrators only. To modify your own password, refer to *Operations Task 201, Change (Your Own) Password*.

If the user has super user privilege, super user logins (including your own) cannot be modified or deleted.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 4, Operations Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Operations Task 201, Change (Your Own) Password*
- *Operations Task 216, Change (Your Own) Notification Registration List*
- *Appendix A, CIT Tutorial*

**Before you begin**

Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the user's login and any user security parameters that must be provisioned.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task**

Complete the following steps to modify, delete, or add a user's login parameters:

- 
- 1** At the WaveStar CIT, select **Administration>Security>User Provisioning....**

**Result:** The *User Provisioning* screen appears.

---

**2**

| IF you want to ...                 | THEN go to... |
|------------------------------------|---------------|
| modify a user's login parameters,  | Step 3.       |
| delete a user's login parameters,  | Step 5.       |
| add a new user's login parameters, | Step 7.       |

- 
- 3** Select the existing user's login to be modified, change the appropriate parameter(s), and click on **Modify**.

**Result:** A dialog box appears asking you to confirm the change(s).

- 
- 4** Select **Administration>Security>View User Logins...** and verify that the user's login parameters have been modified.

**STOP! End of Task.**

- 
- 5** Select the existing user's login to be deleted and click on **Delete**.

**Result:** A dialog box appears asking you to confirm deleting the user login.

- 
- 6** Select **Administration>Security>View User Logins...** and verify that the user's login has been deleted.

**STOP! End of Task.**

---

- 7** Enter the specified parameters for the new user's login and click on **Add**.

**Result:** Dialog boxes appear asking you to confirm adding a new user's login and saving the new user's login in the CIT security database. After the dialog boxes appear, close the *User Provisioning* screen.

---

- 8** Select **Administration>Security>View User Logins...**, and verify that the new user's login has been added.

---

END OF STEPS

---





## Task 201: Change (Your Own) Password

---

**Purpose** Use this procedure to change the password for your current user login. To administer passwords and other login parameters for other users, refer to *Operation Task 200, Modify, Delete, or Add a User's Login Parameters*.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 4, Operations Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Operations Task 200, Modify, Delete, or Add a User's Login Parameters*
- *Appendix A, CIT Tutorial*

**Before you begin** Before you begin this task:

- Verify that the new password has not been used previously. The new password cannot be a password used for this login in the past.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to change your own password:

- 
- 1** At the WaveStar CIT *System View*, select **Administration>Change Password....**

**Result:** The *Change Password* screen appears.

- 
- 2** Enter the *Old Password*, *New Password*, and *Confirm Password* as needed and click on **OK**.

**Result:** A dialog box appears asking you to confirm the password change. Click on **Yes** and another dialog box appears asking if you want to save the password change in the CIT security database. Click on **Yes**.

Your CIT and local NE password is now changed. To change your password at another NE, repeat this procedure at the NE.

---

END OF STEPS





# Task 202: Install Software (Initial Installation/Upgrade/Change) into WaveStar CIT and Network Element

---

- Purpose** Use this procedure to:
- Install the WaveStar TDM 2.5G/10G and WaveStar CIT software into a new system.
  - Upgrade/change an existing WaveStar TDM 2.5G/10G system and WaveStar CIT.

- Required equipment** The following equipment is required to perform this task:
- WaveStar Craft Interface Terminal (CIT)
  - Wrist strap.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



## CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in Appendix D, Safety.*

- Related information** For related information, see:
- *Chapter 7, Provisioning, Security, and Administration*
  - *WaveStar TDM 2.5G/10G, Release 6.0.1/6.1.1, Software Release Description*
  - *WaveStar TDM 2.5G/10G, Release 5.0.3/5.1.3, Software Release Description*
  - *WaveStar TDM 2.5G/10G, Release 5.0.2/5.1.2, Software Release Description*

- *WaveStar TDM 2.5G/10G, Release 5.0.1/5.1.1, Software Release Description*
- *WaveStar TDM 2.5G/10G, Release 4.1.3/4.0.3, Software Release Description*
- *WaveStar TDM 2.5G/10G, Release 4.1.2/4.0.2, Software Release Description*
- *WaveStar TDM 2.5G/10G, Release 4.1.1/4.0.1, Software Release Description*
- *WaveStar TDM 2.5G/10G, Release 4.0.0 (Controlled Introduction), Software Release Description*
- *WaveStar TDM 2.5G, Release 3.0.2, Software Release Description*
- *WaveStar TDM 2.5G, Release 3.0.1, Software Release Description*
- *WaveStar TDM 2.5G, Release 3.0.0, Software Release Description*
- *WaveStar TDM 2.5G, Release 2.0.2, Software Release Description*
- *WaveStar TDM 10G, Release 1.0.2, Software Release Description*

**Task** Complete the following steps to install software onto a WaveStar CIT and WaveStar TDM 2.5G/10G system.

---

- 1** Verify that the software packages consist of two CD-ROMs and the appropriate software release description:
    - *WaveStar TDM 2.5G/10G, Release 6.0.1/6.1.1, Software Release Description (109166838)*
    - *WaveStar TDM 2.5G/10G, Release 5.0.3/5.1.3, Software Release Description (109150797)*
    - *WaveStar TDM 2.5G/10G, Release 5.0.2/5.1.2, Software Release Description (109122523)*
    - *WaveStar TDM 2.5G/10G, Release 5.0.1/5.1.1, Software Release Description (109072611)*
    - *WaveStar TDM 2.5G/10G, Release 4.0.3/4.1.3, Software Release Description (C109096685)*
    - *WaveStar TDM 2.5G/10G, Release 4.0.2/4.1.2, Software Release Description (C109025072)*
    - *WaveStar TDM 2.5G/10G, Release 4.0.1/4.1.1, Software Release Description (C108908989)*
    - *WaveStar TDM 2.5G/10G, Release 4.0.0 Controlled Introduction, Software Release Description (C108847146)*
-

- *WaveStar TDM 2.5G, Release 3.0.2, Software Release Description (C108764473)*
- *WaveStar TDM 2.5G, Release 3.0.1, Software Release Description (C108719931)*
- *WaveStar TDM 2.5G, Release 3.0.0, Software Release Description (C108686981)*
- *WaveStar TDM 2.5G, Release 2.0.2, Software Release Description (C108665894)*
- *WaveStar TDM 10G, Release 1.0.2, Software Release Description (C108764481).*

- 
- 2** Refer to and perform the appropriate software procedure (initial installation/upgrade/change) per the software release description.

END OF STEPS

---





## Task 203: Loop Back Circuit(s) for Testing

---

**Purpose** Use this procedure to perform a cross-connect loopback on the following out-of-service circuits in an in-service WaveStar TDM 2.5G/10G system:

- DS3 and EC-1
- OC-3
- OC-12
- OC-48
- OC-192.

Each new circuit in the network must be looped back individually.

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (CIT)
- Wrist strap
- SONET transmission Test Set.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### CAUTION

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

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components.*

**CAUTION**

*Comply with the proper transmission levels at the local cross-connect before applying a test signal.*

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Operation Task 209, Release Looped Back Circuit(s)*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task and note the assigned addresses (AIDs).
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to perform a cross-connect loopback on an *out-of-service* circuit in an *in-service* WaveStar TDM 2.5G/10G system.

- 
- 1** At the WaveStar CIT, select **Fault>Analysis>Cross-Connect Loopback...**

**Result:** The *Crossconnect Loopback* screen appears.

- 
- 2** Open the shelf, circuit pack, port, and tributary details by clicking on the plus (+) sign next to each entity.



#### CAUTION

*Traffic and service interruption can occur to other tributaries if they are accidentally looped back. Recheck the address (AID) of the tributary being looped back. Do not perform cross-connect loopbacks on tributaries with existing cross-connections.*

- 3 Highlight the required tributary and click on **Select**.

**Result:** The *Cross Connect Loopback* screen appears.

---

**Important!** A cross-connect loopback remains in effect until deactivated.

- 4 Select the *Loopback Rate*, verify the information on the screen, and click on **Operate**.

**Result:** A dialog box appears asking you to confirm executing this command.

- 
- 5 Repeat Step 1 through Step 4 for any remaining tributaries.

- 
- 6 The tributary(ies) is now looped back. To verify, select **View>Loopback...**, highlight the tributary AID, and click on **Select**.



#### CAUTION

*Comply with the proper transmission levels at the local cross-connect before applying a test signal.*

**Important!** If any optical connections are broken, clean the fiber connectors before reconnecting. Refer to *Supporting Task 703, Clean Optical Optical Fiber and Connectors*.

- 7 To confirm the loopback, connect a test set to the line at the local cross-connect. Transmit the appropriate interface signal to the **IN** port for the selected tributary and measure the interface signal received from the **OUT** port. Confirmation occurs when the test set shows error free transmission.

END OF STEPS

---





## Task 205: Manually Back Up Database to WaveStar CIT

---

**Purpose** Use this procedure to develop a detailed method of procedure per local operating instructions to manually back up the network element database (current NE data) to the WaveStar CIT:

- Before/after major provisioning data changes
- Periodically according to local policy.

**Important!** Changes to the network element software generic and database are covered in the applicable Software Release Description document for the current software generic. This document should be reviewed prior to doing this task for any detailed procedures or cautions that may apply to software management of the generic running on your system.

**Required privilege codes** A privilege code of at least S4 is required to back up the network element database. A privilege code of at least S1 is required to view the *Database Info* screen.

**Required equipment** The WaveStar CIT is required to perform this task.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components.*

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Operations Task 206, Manually Restore Database From WaveStar CIT*
- *Appendix A, CIT Tutorial.*

## Before you begin

Before you begin this task:

- Obtain the work instructions for this task.
- Review the applicable software release description for any detailed procedures or cautions that may apply to software management of the generic running on your system.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to manually back up the network element database (current NE data) to the WaveStar CIT.

1

| IF the network element software is ... | THEN go to... |
|----------------------------------------|---------------|
| Release 4 and later,                   | Step 2.       |
| Release 3 and earlier,                 | Step 7.       |

2 At the WaveStar CIT, select **Configuration>Software>Remote Backup...**

**Result:** The *Backup Database* screen appears.

3 Verify that **CIT** appears in the **Backup to/Via:** field, record the destination path /folder name (YYMMDDHHMMSS), and click on **Backup**.

**Result:** A dialog box appears asking you to confirm backing up the primary database (PRI) to *Drive:\\Program Files\\Lucent Technologies\\WavestarCIT\\backups\\TID\\Release#\\YYMMDDHHMMSS*. Click on **Yes**.

If the provisioned maximum number of backups to the CIT is reached, a dialog box appears informing you that the maximum number of backups to the CIT has been reached and asking you to confirm overwriting the last backup folder. Click on **Yes** and the *Progress Indicator* screen appears.

4 When the *Progress Indicator* screen disappears and the backup is complete, select **View>NE Data...**

**Result:** The *Select Database* screen appears.

- 
- 5 Verify that the network element target identifier (TID) appears in the **Look In:** field, and click on **Open**.

**Result:** The *Database Info* screen appears.

---

- 6 Verify that the *Last Backup Time* and *Last Backup Location* parameters in the *Running* row are correct. (If necessary, scroll right to view the parameters.) Click on **Close**.

**STOP! End of Task.**

---

- 7 At the WaveStar CIT, select **Configuration>Software>Remote Backup**.

**Result:** A dialog box appears showing that the PRI database will back up to *Drive:\\Program Files\\Lucent Technologies\\Wavestar CIT\\backups\\TID\\Release#\\YYMMDDHHMMSS* and asking if you wish to continue.

---

- 8 Record the path/destination of the backup folder and click on **Yes**.

**Result:** The *NE Data Backup in Progress* screen appears.

---

- 9 When the *NE Data Backup in Progress* screen disappears and the backup is complete, select **View>NE Data...**

**Result:** The *Select Database* screen appears.

---

- 10 Verify that the network element TID appears in the **Look In:** field and click on **OK**.

**Result:** The *Database Info* screen appears.

- 
- 11** Verify that the *Last Backup Time* and *Last Backup Destination* parameters are correct and click on **Close**.

**STOP! End of Task.**

---

END OF STEPS



## Task 206: Manually Restore Database From WaveStar CIT

---

**Purpose** Use this procedure to develop a detailed method of procedure per local operating instructions to manually restore the network element database (NE data) after a known or suspected database corruption.

**Important!** Changes to the network element software generic and database are covered in the applicable Software Release Description document for the current software generic. This document should be reviewed prior to doing this task for any detailed procedures or cautions that may apply to software management of the generic running on your system.

**Required privilege codes** A privilege code of at least S4 is required to restore the network element database. A privilege code of at least S1 is required to view the *Database Info* screen.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Safety precautions**

To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these precautions prior to performing this task.

**CAUTION**

*Restoring the database can be service-affecting. If provisioning changes were made after the last backup files were created, examine the history log and use the appropriate WaveStar CIT commands to manually apply the recent provisioning changes to the just-restored database.*

**CAUTION**

*Depending on the number of database changes that have occurred since the last backup, manually applying recent changes after a restore can be a time-intensive process. Make absolutely sure that a restore is necessary before performing this task.*

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components.*

**Related information**

For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Operation Task 205, Manually Backup Database to WaveStar CIT*
- *Appendix A, CIT Tutorial*

**Before you begin**

Before you begin this task:

- Review the applicable software release description for any detailed procedures or cautions that may apply to software management of the generic running on your system.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task**

Complete the following to manually restore the network element database (NE data) from the WaveStar CIT to primary memory:

1

| IF the current version of network element software is... | THEN go to... |
|----------------------------------------------------------|---------------|
| Release 4 and later,                                     | Step 4.       |
| Release 3 and earlier,                                   | Step 2.       |

2

At the WaveStar CIT, select **Fault>Enter/Exit Maintenance Condition...**

**Result:** The *Enter/Exit Maintenance Condition* screen appears.

3

| IF the current maintenance condition is... | THEN...                                                                                                                                                              |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| on,                                        | click on <b>Close</b> , and go to Step 5.                                                                                                                            |
| off,                                       | click on <b>Enter Maintenance Condition</b> , and go to Step 5.<br><br><b>Result:</b> A dialog box appears asking you to confirm entering the Maintenance Condition. |

4

At the Wavestar CIT, select **Fault>Enter/Exit Maintenance Condition>Enter Maintenance Condition...** to enter the maintenance condition.

**Result:** A dialog box appears asking you to confirm entering the maintenance condition. Click on **Yes**.

- 
- 5 Select **Configuration>Software>Remote Restore...**

**Result:** The *Restore Database* screen appears.

---



**CAUTION**

*Be careful to select the correct backup folder to restore to network element. The WaveStar CIT compares the target identifier (TID) of the selected backup folder with the network element TID. If the TIDs do not match, the WaveStar CIT displays an error message and the restore command is denied.*

- 6 Verify that **CIT** appears in the **Restore From/Via:** field and double-click on the the *most recent backup folder* in the **Name** column.

**Result:** A dialog box appears asking if you wish to continue. Click on **Yes** and the *Progress Indicator* screen appears. The database is copied into the *previous* folder of primary memory.

After the *Progress Indicator* screen disappears, one or more *Communication Failure* dialog boxes appear informing you that communication with the network element is lost. (After a successful restore, the system resets and automatically disconnects the WaveStar CIT). Click on **OK**. The system performs a reset (after a delay of 1 to 2 minutes), and the database is copied into the *current* folder of primary memory and becomes active.

- 
- 7 When the system reset is complete, log in to the WaveStar TDM 2.5G/10G system.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

---

- 8 Select **View>NE Data...**

**Result:** The *Select Database* screen appears.



- 
- 9** Verify that the network element target identifier (TID) appears in the **Look In:** field and click on **Open**.

**Result:** The *Database Info* screen appears.

---

- 10** Verify that the *Last Restore Time* and *Last Restore Source* parameters in the *Running* row are correct. (If necessary, scroll right to view the parameters.) Click on **Close**.

---

END OF STEPS

---





## Task 207: Replace Fan Filter

---

- Purpose** Use this procedure:
- Every 6 months, as part of routine fan maintenance
  - When instructed to do so as part of a trouble-clearing task.



### CAUTION

*If you are performing this task in response to an alarm, you MUST start from the trouble-clearing task associated with that alarm. Though performing this task may be referenced as part of the trouble-clearing process, there will be other information in the trouble-clearing task that is specific and CRITICAL to clearing the trouble.*

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components.*

**Related information** For related information, see the following sections in this document:

- *Chapter 3, Platform Description*
- *Chapter 4, Operations Interfaces*

**Task** Complete the following steps to replace a fan filter.

.....

**1** Obtain a replacement fan filter.

.....

**2** If required, remove the shelf cover.

**Reference:** *Supporting Task 705, Remove/Replace Shelf Cover*

.....

**3** Remove the fan filter by grasping the two pull tabs and pulling the fan filter out of the shelf.

.....

**4** Insert the replacement fan filter into the shelf so that the two pull tabs are positioned at the front of the shelf.

.....

**5** Replace the shelf cover.

**Reference:** *Supporting Task 705, Remove/Replace Shelf Cover*

.....

**6** Discard the dirty fan filter.

.....

END OF STEPS



## Task 208: Verify Receive Path Trace

---

**Purpose** Use this procedure as part of the routine (preventive) maintenance of a system. The frequency of performing this task is left to the discretion of the user, based on the particular system being maintained. The purpose of this task is to ensure that the receive path traces for a tributary match the expected path trace (as defined in the work instructions/office records).

**Important!** Discrepancies between the receive path trace and the work instructions do not necessarily indicate an immediate problem. However, the importance of following the work instructions for path traces lies in distributing network traffic evenly. Noncompliance with work instructions can result in poor utilization of system resources and affect quality of service.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Safety precautions** In order to assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand all warnings and precautions prior to performing this task.



### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components.*

**Related information** For related information, see *Chapter 2, Maintenance/Trouble Clearing*, in 365-371-211, *WaveStar TDM 2.5G/10G (2-Fiber), Alarm Messages and Troubleclearing Guide*, and the following sections in this document:

- *Chapter 4, Operations Interfaces*
- *Circuit Order/Provisioning Task 314, Provision Path Trace*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task, and note the assigned addresses (AIDs) and provisioned path trace character string.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to verify the provisioned path trace(s).

- .....
- 1** From the work instructions/office records, determine the path trace character string to be observed for each path to be verified. (Path is between the source and destination network elements.)

.....

**2**

| IF the assigned AID is a...              | THEN retrieve the provisioned path trace character string for the...                                                                |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| DS3 or EC-1 port,                        | port.<br><b>Reference:</b> <i>SE 208-1: Retrieve the Provisioned Path Trace for a DS3 or EC-1 Port</i>                              |
| OC-3, OC-12, OC-48, or OC-192 tributary, | tributary.<br><b>Reference:</b> <i>SE 208-2: Retrieve the Provisioned Path Trace for an OC-3, OC-12, OC-48, or OC-192 Tributary</i> |

- .....
- 3** Compare the **STS Path Trace (J1 Byte)** character string (obtained in the previous step) with the path trace character string from the work instructions/office records, and make a note of any differences.

4

| IF...                                   | THEN...                                              |
|-----------------------------------------|------------------------------------------------------|
| additional paths are to be verified,    | click on <b>Close</b> and go to Step 1.              |
| no additional paths are to be verified, | click on <b>Close</b> .<br><b>STOP! End of Task.</b> |

END OF STEPS



## SE 208-1: Retrieve the Provisioned Path Trace for a DS3 or EC-1 Port

---

**Procedure** Perform the following steps to retrieve the provisioned value of the path trace character string for a DS3 or EC-1 port.

---

- 1** At the WaveStar CIT, select **Fault>Analysis>View Current DS3 Maintenance Signal...**
  - 2** Open the shelf, circuit pack, and port details by clicking on the plus (+) sign next to each entity.
  - 3** Highlight the required DS3 or EC-1 port and click on **Select**.  
**Result:** The *View Current DS3 Maintenance Signal* screen appears.
  - 4** Observe the **STS Path Trace (J1 Byte)** character string.
- 

END OF STEPS

---





## SE 208-2: Retrieve the Provisioned Path Trace for an OC-3, OC-12, OC-48, or OC-192 Tributary

---

**Procedure** Perform the following steps to retrieve the provisioned value of the path trace character string for an OC-3, OC-12, OC-48, or OC-192 tributary.

---

**1** At the WaveStar CIT, select **Fault>Analysis>View Current Optical Maintenance Signal...**

---

**2** Open the shelf, circuit pack, port, and tributary details by clicking on the plus (+) sign next to each entity.

---

**3** Highlight the required tributary and click on **Select**.

**Result:** The *View Current Optical Maintenance Signal* screen appears.

---

**4** Observe the **STS Path Trace (J1 Byte)** character string.

---

END OF STEPS

---





## Task 209: Release Looped Back Circuit(s)

---

**Purpose** Use this procedure to release a cross-connect loopback on the following out-of-service circuits in an in-service WaveStar TDM 2.5G/10G system:

- DS3
- EC-1
- OC-3
- OC-12
- OC-48
- OC-192.

Each looped back circuit in the network must be released individually.

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (CIT)
- Wrist strap.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components.*

- Related information** For related information, see the following sections in this document:
- *Chapter 7, Provisioning, Security, and Administration*
  - *Operations Task 203, Loop Back Circuit(s) for Testing*
  - *Appendix A, CIT Tutorial.*

- Before you begin** Before you begin this task:
- Obtain the work instructions for this task, and note the assigned addresses (AIDs).
  - Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to release a cross-connect loopback on a circuit(s).

- 
- 1** At the WaveStar CIT, select **Fault>Analysis>Cross-Connect Loopback....**

**Result:** The *Cross-Connect Loopback* screen appears.

---

- 2** Open the bay, shelf, circuit pack, port, and tributary details by clicking on the plus (+) sign next to each entity.
- 

- 3** Highlight the required tributary and click on **Select**.

**Result:** The *Cross-Connect Loopback* screen appears.

---

- 4** Verify the information on the screen (*Tributary AID, Port Type/Rate, Loopback Rate, Cross-Connect Status, Cross-Connect Loopback Status, and the Test Access Status*) and click on **Release**.

**Important!** Pay particular attention to the Tributary AID, Cross-Connect Status, and the Test Access Status.

---

- 5** Repeat Step 1 through Step 4 for any remaining tributaries.

- 
- 6** The tributary(ies) is released from the looped back condition. To verify, select **View>Loopback...**, highlight the tributary AID, and click on **Select**.

---

END OF STEPS

---





## Task 216: Change (Your Own) Notification Registration List

---

- Purpose** Use this procedure to:
- Delete notification types from your own notification registration list.
  - Add notification types (that you previously deleted) to your own notification registration list.

**Important!** To change the notification registration list for other users, refer to *Operation Task 200, Modify, Delete, or Add a User's Login Parameters*.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

- Related information** For related information, see the following sections in this document:
- *Chapter 7, Provisioning, Security, and Administration*
  - *Operation Task 200, Modify, Delete, or Add a User's Login Parameters*
  - *Appendix A, CIT Tutorial*

**Before you begin** Before you begin this task, verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to change your own notification registration list:

- 
- 1** At the WaveStar CIT (*System View*), select **Administration>Change Notifications....**

**Result:** The *Change Notification* screen appears.

- 
- 2** Change the notification registration list as required, and click on **OK**.

---

END OF STEPS

---







## Task 217: Log Out Other User Session(s)

---

**Purpose** Use this procedure to log out:

- An active user session
- All active user sessions.

**Important!** This task is for administrators only.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain a list of the user(s) to be logged out.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to log out other user session(s):

- 
- 1** At the WaveStar CIT *System View*, select **Administration>Security>Logout NE User....**

**Result:** The *Log Out User* screen appears.

---

- 2**

| IF logging out... | THEN...                                                   |
|-------------------|-----------------------------------------------------------|
| one user,         | select the desired user, and click on <b>Logout One</b> . |
| all users,        | click on <b>Logout All</b> .                              |

- 
- 3** Select **Administration>Security>View Logged-In Users...** to obtain a list of logged-in users and verify that the desired user(s) have been logged out.

---

END OF STEPS



## Task 218: Change Network Element Security Parameters

---

**Purpose** Use this procedure to change the value of the:

- User ID Lockout parameters
- User ID Aging parameters.

**Important!** This task is for administrators only.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the network element security parameter(s) to be changed and the new value(s).
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to change the network element security parameter(s):

- 
- 1** At the WaveStar CIT *System View*, select **Administration>Security>Security Provisioning....**

**Result:** The *Provision NE Security* screen appears.

- 
- 2** Change the network element security parameter(s) according to the work instructions, and click on **OK**.

**Result:** A dialog box appears asking you to confirm changing the network element security parameters.

END OF STEPS

---



## Task 219: Establish Dual Ring Interworking (DRI) Connections

---

**Purpose** Use this procedure to establish the necessary cross-connections at the primary and secondary nodes of ring network. These cross-connections are necessary to support dual ring interworking (DRI) operation with another ring network. This procedure can be performed from any node in the local ring network.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### **CAUTION**

*Cross-connections made to the wrong tributaries can cause service interruptions.*

**Related information** For related information, see the following sections in this document:

- *Chapter 2, Network Topologies*
- *Chapter 7, Provisioning, Security, and Administration*
- *Acceptance Task 106, Accept Dual Ring Interworking (DRI) Connections*
- *Operation Task 220, Disconnect Dual Ring Interworking (DRI) Connections*
- *Appendix A, CIT Tutorial*

**Before you begin**

Before you begin this task:

- Obtain operation instructions (work order) that show the required cross-connections.
- From the operation instructions, identify and record the target identifier (TID) of the primary node. The primary node normally carries traffic via the 1-way path-protected cross-connection.
- From the operation instructions, identify and record the TID of the secondary node. The secondary node carries traffic only if the primary node is unable to carry traffic.

**Task**

Complete the following steps to establish the necessary cross-connections at the primary and secondary nodes of a ring network.

- 
- 1** Log in to the secondary node identified in the operation instructions.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

---

**Important!** A secondary node normally has a 2-way cross-connection; however, a 1-way cross-connection is used for half-duplex transmission.

- 2** View the cross-connections at the secondary node.

**Reference:** *SE 219-1: View Cross-Connections*

- 
- 3** Compare the cross-connections with the operation instructions and record any cross-connections to be added and/or deleted at the secondary node.



**CAUTION**

*The cross-connections to be deleted MUST NOT be carrying traffic; otherwise, service interruptions will occur.*

- 4 Delete any unnecessary cross-connection(s) associated with the tributaries to be cross-connected. Use the **Configuration>Cross Connections...** command to delete a cross-connection.

**Reference:** *Circuit Order/Provisioning Task 304, Modify/Delete/Roll Cross-Connection*

---



**CAUTION**

*An incorrectly provisioned source node TID and/or destination node TID can result in a service outage under certain multiple failure conditions.*

- 5 Enter the required cross-connection(s) as necessary. Use the **Configuration>Cross Connections...** command to create a new cross-connection.

**Reference:** *Circuit Order/Provisioning Task 303, Create New Cross-Connection*

---

- 6 View the cross-connections at the secondary node.

**Reference:** *SE 219-1: View Cross-Connections*

---

- 7 Verify that the cross-connections match those in the operation instructions.
- 

- 8 Terminate the login at the secondary node.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

- 
- 9 Log in to the primary node identified in the operation instructions.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

---

**Important!** A primary node normally has cross-connections for 2-way traffic that consists of a *1-way path-protected* cross-connection and a *1-way drop* cross-connection with a *1-way through* cross-connection coming from the same tributary (also referred to as a *drop-and-continue* cross-connection).

- 10 View the cross-connections at the primary node.

**Reference:** *SE 219-1: View Cross-Connections*

---

- 11 Compare the cross-connections with the operation instructions, and record any cross-connections to be added and/or deleted at the primary node.
- 



**CAUTION**

*The cross-connections to be deleted MUST NOT be carrying traffic; otherwise, service interruptions will occur.*

- 12 Delete any unnecessary cross-connection(s) associated with the tributaries to be cross-connected. Use the **Configuration>Cross Connections...** command to delete a cross-connection.

**Reference:** *Circuit Order/Provisioning Task 304, Modify/Delete/Roll Cross-Connection*





#### CAUTION

*An incorrectly provisioned source node TID and/or destination node TID can result in a service outage under certain multiple failure conditions.*

- 13** Enter the required cross-connection(s) as necessary. Use the **Configuration>Cross Connections...** command to create a new cross-connection.

**Reference:** *Circuit Order/Provisioning Task 303, Create New Cross-Connection*

- 
- 14** View the cross-connections at the primary node.

**Reference:** *SE 219-1: View Cross-Connections*

- 
- 15** Verify that the cross-connections match those in the operation instructions.

---

**Important!** This step is optional and applies only if there are no low-speed connections to an external network.

- 16** Test DRI cross-connections for path integrity.

**Reference:** *Acceptance Task 106, Accept Dual Ring Interworking (DRI) Connections*

- 
- 17** Terminate the login at the primary node.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

- 
- 18** The necessary cross-connections have been made in the primary and secondary nodes, and they are ready to support DRI operation with another ring network. Make any other cross-connections at other nodes in the local ring network.

**Reference:** *Circuit Order/Provisioning Task 303, Create New Cross-Connection*

---

END OF STEPS



## SE 219-1: View Cross-Connections

---

**Procedure** Perform the following steps to view cross-connections at the network element:

- 
- 1 At the WaveStar CIT, select **View>Cross Connections....**

**Result:** The *View Cross Connections* screen appears.

---

- 2 Highlight the required shelf, and click on **Select**.

**Result:** The *View Cross Connections for TID* screen appears showing the cross-connections on the shelf.

---

END OF STEPS

---





## Task 220: Disconnect Dual Ring Interworking (DRI) Connections

---

**Purpose** Use this procedure to disconnect the cross-connections at the primary and secondary nodes of a ring network. These cross-connections were necessary to support dual ring interworking (DRI) operation with another ring network. This procedure can be performed from any node in the local ring network.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### **CAUTION**

*Cross-connections deleted from the wrong tributaries can cause service interruptions.*

**Related information** For related information, see the following sections in this document:

- *Chapter 2, Network Topologies*
- *Chapter 7, Provisioning, Security, and Administration*
- *Acceptance Task 106 Accept Dual Ring Interworking (DRI) Connections*
- *Operation Task 219 Establish Dual Ring Interworking (DRI) Connections*
- *Appendix A, CIT Tutorial*

**Before you begin** Before you begin this task:

- Obtain operation instructions (work order) that show the cross-connections to be deleted.
- From the operation instructions, identify and record the target identifier (TID) of the primary node. The primary node normally carries traffic via the 1-way path-protected cross-connection.
- From the operation instructions, identify and record the TID of the secondary node. The secondary node carries traffic only if the primary node is unable to carry traffic.

**Task** Complete the following steps to delete the cross-connections at the primary and secondary nodes of a ring network.

- 
- 1** Log in to the secondary node identified in the operation instructions.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

---

**Important!** A secondary node normally has a 2-way cross-connection; however, a 1-way cross-connection is used for half-duplex transmission.

- 2** View the cross-connections at the secondary node.

**Reference:** *SE 220-1: View Cross-Connections*

- 
- 3** Compare the cross-connections with the operation instructions, and record any cross-connections to be deleted at the secondary node.



#### CAUTION

*The cross-connections to be deleted MUST NOT be carrying traffic; otherwise, service interruptions will occur.*

- 4 Delete the cross-connections identified in Step 3. Use the **Configuration>Cross Connections...** command to delete a cross-connection.

**Reference:** *Circuit Order/Provisioning Task 304, Modify/Delete/Roll Cross-Connection*

---

- 5 View the cross-connections at the secondary node.

**Reference:** *SE 220-1: View Cross-Connections*

---

- 6 Verify that the cross-connection(s) match those in the operation instructions.
- 

- 7 Terminate the login at the secondary node.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

---

- 8 Log in to the primary node identified in the operation instructions.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

---

**Important!** A primary node normally has cross-connections for 2-way traffic that consists of a *1-way path-protected* cross-connection and a *1-way drop* cross-connection with a *1-way through* cross-connection coming from the same tributary (also referred to as a *drop-and-continue* cross-connection).

- 9 View the cross-connections at the primary node.

**Reference:** *SE 220-1: View Cross-Connections*

- 
- 10** Compare the cross-connections with the operation instructions, and record any cross-connections to be deleted at the primary node.
- 



**CAUTION**

*The cross-connections to be deleted MUST NOT be carrying traffic; otherwise, service interruptions will occur.*

- 11** Delete the cross-connections identified in Step 10. Use the **Configuration>Cross Connections...** command to delete a cross-connection.

**Reference:** *Circuit Order/Provisioning Task 304, Modify/Delete/Roll Cross-Connection*

---

- 12** View the cross-connections at the primary node.

**Reference:** *SE 220-1: View Cross-Connections*

---

- 13** Verify that the cross-connections match those in the operation instructions.
- 

- 14** Terminate the login at the primary node.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

---

- 15** The necessary cross-connections have been disconnected in the primary and secondary nodes. The primary and secondary nodes no longer support DRI operation with another ring network. Delete any other cross-connections at other nodes in the local ring network.

**Reference:** *Circuit Order/Provisioning Task 304, Modify/Delete/Roll Cross-Connection*

---

END OF STEPS

---





## SE 220-1: View Cross-Connections

---

**Procedure** Perform the following steps to view cross-connections at the network element:

- 
- 1 At the WaveStar CIT, select **View>Cross Connections....**

**Result:** The *View Cross Connections* screen appears.

---

- 2 Highlight the required shelf and click on **Select**.

**Result:** The *View Cross Connections for TID* screen appears showing the cross-connections on the shelf.

END OF STEPS

---





## Task 221: Enable or Disable User Login(s)

---

- Purpose** Use this procedure to:
- Disable a user's login
  - Disable all user logins
  - Enable a user's login that was previously disabled
  - Enable all user logins.

**Important!** This task is for administrators only.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain a list of the user login(s) to be enabled or disabled.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to enable or disable user login(s):

---

**1**

| IF the user login(s) are to be... | THEN go to... |
|-----------------------------------|---------------|
| enabled,                          | Step 2.       |
| disabled,                         | Step 4.       |

---

**2** At the WaveStar CIT *System View*, select  
**Administration>Security>Enable User Login...**

**Result:** The *Enable User Login* screen appears.

3

| IF enabling...   | THEN...                                                                                                                                                                                                                                                    |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| one user login,  | <p>select the user login, and click on <b>Enable only the selected user login</b>. Then click on <b>OK</b>.</p> <p><b>Result:</b> A dialog box appears asking you to confirm enabling the login. Click on <b>Yes</b>.</p> <p><b>STOP! End of Task.</b></p> |
| all user logins, | <p>click on <b>Enable all the user logins</b>. Then click on <b>OK</b>.</p> <p><b>Result:</b> A dialog box appears asking you to confirm enabling the logins. Click on <b>Yes</b>.</p> <p><b>STOP! End of Task.</b></p>                                    |

4 At the WaveStar CIT *System View*, select  
**Administration>Security>Disable User Login....**

**Result:** The *Disable User Login* screen appears.

5

| IF disabling...  | THEN...                                                                                                                                                                                                                                                      |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| one user login,  | <p>select the user login, and click on <b>Disable only the selected user login</b>. Then click on <b>OK</b>.</p> <p><b>Result:</b> A dialog box appears asking you to confirm disabling the login. Click on <b>Yes</b>.</p> <p><b>STOP! End of Task.</b></p> |
| all user logins, | <p>click on <b>Disable all the user logins</b>. Then click on <b>OK</b>.</p> <p><b>Result:</b> A dialog box appears asking you to confirm disabling the logins. Click on <b>Yes</b>.</p> <p><b>STOP! End of Task.</b></p>                                    |

END OF STEPS



## Task 223: Log In/Log Out of Network Element

---

- Purpose** Use this procedure to:
- Log in to a network element
  - Log out of a network element

- Required equipment** The following equipment is required to perform this task:
- Personal computer (PC) with WaveStar Craft Interface Terminal (CIT) software installed
  - 10BaseT ethernet cable

**Important!** The PC must meet the minimum requirements stated in the *WaveStar TDM 2.5G/10G Software Release Description*.

- Related information** For related information, see the following sections in this document:
- *Chapter 4, Operations Interfaces*
  - *Chapter 7, Provisioning, Security, and Administration*
  - *Appendix A, CIT Tutorial*

- Before you begin** Before you begin this task:
- If logging in to a network element, obtain a valid login and password for the WaveStar CIT and network element.
  - If logging in to a network element, obtain the target identifier (TID) of the desired network element.

- Task** Complete the following steps to log in or log out of a network element.
- 

**1**

| IF...                             | THEN...       |
|-----------------------------------|---------------|
| logging in to a network element,  | go to Step 2. |
| logging out of a network element, | go to Step 9. |

---

**Important!** If you encounter difficulty in the following steps, refer to *Appendix A, CIT Tutorial*.

- 2 Verify that the WaveStar CIT is safely positioned on the PC tray or safely secured on a cart or table.

- 
- 3 If necessary, connect the WaveStar CIT to the network element using a 10BaseT ethernet cable from the PC LAN card to the CIT connector on the User Panel.

- 
- 4 If necessary, turn the PC power switch to ON.

- 
- 5 Double click on the WaveStar CIT icon (on the PC desktop).

**Result:** The *Login to WaveStar CIT* dialog box appears.

---

**Important!** The WaveStar CIT default login is **LUC01**, and the default password is **LUC+01**.

- 6 Enter a valid login and password, and click on **OK**.

**Result:** The *WaveStar CIT* screen appears with the *Legal Notice* dialog box. Read the legal notice and click **OK**.

---

**Important!** The WaveStar CIT attempts to log in to the network element using the same login ID and password that was used to log in to the WaveStar CIT. If the network element login/password and the WaveStar CIT login/password are different, the WaveStar CIT prompts for the network element login and password. The network element default login is **LUC01** and the default password is **LUC+01**.

- 7 Enter a valid target identifier (TID) in the **TID** field, and click on **System**. Then click on **Connect**.

**Result:** The network element *Legal Notice* dialog box appears.

- 
- 8** Read the network element legal notice (note the user privilege codes) and click on **OK**.

**Result:** The network element *System View* screen appears.

**STOP! End of Task.**

- 
- 9** At the WaveStar CIT *System View* screen, select **File>NE Disconnect**.

**Result:** A dialog box appears asking you to confirm disconnecting the WaveStar CIT from the network element. Click on **Yes**.

---

END OF STEPS







## Task 224: Change Network Element Date/Time

---

**Purpose** Use this procedure to change the following network element parameters:

- Date
- Time

**Required privilege code(s)** A privilege code of at least M1+S4+P3+PM3 is required to change the date and/or time parameter(s). A privilege code of at least M1+P1+S1+PM1 is required to view the date and/or time parameters.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the parameter(s) to be changed and the new value(s).
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to change the network element date and/or time parameter(s):

---

**1** At the WaveStar CIT, select **Configuration>Provision...**

**Result:** The *Provision Parameters for Protection Group or Equipment* screen appears.

---

**2** Enter *System* in the **Enter AID:** field or click on **WaveStar 2F 2.5G/10G**. Then click on **Provision**.

**Result:** The system-level parameters appear.

- 
- 3 Change the network element date and/or time parameter(s) according to the work instructions, and click on **Apply**.

**Result:** A dialog box appears asking you to confirm executing the command. Click on **Yes**.

---

- 4 Click on **Close** to exit the *Provision Parameters for Protection Group or Equipment* screen.
- 

- 5 Select **View>View Equipment Details....**

**Result:** The *View Equipment Details* screen appears.

---

- 6 Enter *System* in the **Enter AID:** field or click on **WaveStar 2F 2.5G/10G**. Then click on **Select**.

**Result:** The system-level parameters appear.

---

- 7 Verify that the network element date and/or time parameter(s) was provisioned correctly, and click on **Close**.

---

END OF STEPS

---





## Task 226: Loop Back Line(s) for Testing

---

**Purpose** Use this procedure to perform a nearside or farside facility loopback on the following **out-of-service** lines in an in-service WaveStar TDM 2.5G/10G system:

- DS3
- EC-1
- OC-3
- OC-12
- OC-48

**Important!** Nearside facility loopbacks loop the incoming line (at the port) back to the local cross-connect panel. Farside facility loopbacks loop the line from the system switch fabric (at the port) back to the system switch fabric. Simultaneous loopbacks in both directions are not possible.

**Required privilege code(s)** A privilege code of at least M3+S1+P1 is required to loopback a line(s). A privilege code of at least M1+P1+S1 is required to view the port loopback status.

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist strap
- SONET transmission test set

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.

**WARNING**

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

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system, to prevent electrostatic discharge damage to sensitive components.*

**CAUTION**

*Comply with the proper transmission levels at the local cross-connect before applying a test signal.*

**Related information**

For related information, see *Chapter 2, Maintenance/Trouble Clearing* in 365-371-211, *WaveStar TDM 2.5G/10G, Alarm Messages and Troubleclearing Guide*, and the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Operation Task 227, Release Looped Back Line(s)*
- *Appendix A, CIT Tutorial*

**Before you begin**

Before you begin this task:

- Obtain the work instructions for this task and note the assigned addresses (AIDs).
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task**

Complete the following steps to perform a facility loopback on an out-of-service line in an in-service WaveStar TDM 2.5G/10G system.

- 
- 1 At the WaveStar CIT, select **Fault>Analysis>Facility Loopback...**

**Result:** The *Facility Loopback* screen appears

---

- 2 Open the shelf, circuit pack, and port details by clicking on the plus ((+)) sign next to each entity.
- 

**CAUTION**

*Traffic and service interruption can occur to other lines if they are accidentally looped back. Recheck the address (AID) of the line being looped back. Do not perform facility loopbacks on lines with existing cross-connections.*

- 3 Highlight the required port and click on **Select**.

**Result:** The *Facility Loopback* screen appears.

---

**Important!** A facility loopback remains in effect until released (deactivated).

- 4 Select the **Facility Loopback Type**, verify the information on the screen, and click on **Force**.

**Result:** A dialog boxes appear asking you to confirm executing this command. Click on **Yes**.

---

- 5 Repeat Step 1 through Step 4 for any remaining lines.

- 
- 6 The line(s) is now looped back. To verify, select **View>Loopback...**, highlight the port AID, and click on **Select**.
- 



**CAUTION**

*Comply with the proper transmission levels at the local cross-connect before applying a test signal.*

**Important!** If any optical connections are broken, clean the fiber connectors before reconnecting. Refer to *Supporting Task 703, Clean Optical Fibers and Connectors*.

- 7 To confirm the loopback, connect a test set to the line at the local cross-connect. Transmit the appropriate interface signal to the IN port for the selected line and measure the interface signal received from the OUT port. Confirmation occurs when the test set shows error free transmission.

---

END OF STEPS

---



## Task 227: Release Looped Back Line(s)

---

**Purpose** Use this procedure to release a nearside or farside facility loopback on the following out-of-service line in an in-service system:

- DS3
- EC-1
- OC-3
- OC-12
- OC-48

Each looped back line in the network must be released individually.

**Important!** Nearside facility loopbacks loop the incoming line (at the port) back to the local cross-connect panel. Farside facility loopbacks loop the line from the system switch fabric (at the port) back to the system switch fabric. Simultaneous loopbacks in both directions are not possible.

**Required Privilege Code(s)** A privilege code of at least M3+S1+P1 is required to release a looped back line(s). A privilege code of at least M1+P1+S1 is required to view the port loopback status.

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist strap

**Safety precautions**

To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.

**WARNING**

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

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system, to prevent electrostatic discharge damage to sensitive components.*

**Related information**

For related information, see *Chapter 2, Maintenance/Trouble Clearing* in 365-371-211, *WaveStar TDM 2.5G/10G Alarm Messages and Troubleclearing Guide*, and the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Operation Task 226, Loop Back Line(s) for Testing*
- *Appendix A, CIT Tutorial*



**Before you begin**

Before you begin this task:

- Obtain the work instructions for this task.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to release a facility loopback on a line(s).

.....

**1** At the WaveStar CIT, select **Fault>Analysis>Facility Loopback...**

**Result:** The *Facility Loopback* screen appears.

.....

**2** Open the shelf, circuit pack, and port details by clicking on the plus (+) sign next to each entity.

.....

**3** Highlight the required port and click on **Select**.

**Result:** The *Facility Loopback* screen appears.

.....

**4** Verify the information on the screen (*Port AID*, *Port Type/Rate*, and *Facility Loopback Status*) and click on **Release**.

.....

**5** Repeat Step 1 through Step 4 for any remaining lines.

.....

**6** The line(s) is released from the looped back condition. To verify, select **View>Loopback...**, highlight the port AID, and click on **Select**.

.....

END OF STEPS

.....





## Task 228: Replace LLY2 (LLY2AE) TMG/STRAT3 Circuit Packs with LLY2B (LLY2BE) TMG/STRAT3 Circuit Packs

---

**Purpose** Use this procedure to replace the LLY2 (LLY2AE) TMG/STRAT3 circuit packs on a shelf with LLY2B (LLY2BE) TMG/STRAT3 circuit packs.

The LLY2B and LLY2BE TMG/STRAT3 circuit packs support the extended superframe (ESF) and superframe (SF) formats for DS1 timing reference signals. The LLY2 and LLY2AE TMG/STRAT3 circuit packs support the ESF format only.

**Required Privilege Code(s)** A privilege code of at least M4 is required to perform a protection switch. A privilege code of at least S1 is required to view the protection switch status.

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist strap
- Replacement LLY2B (LLY2BE) TMG/STRAT3 circuit packs

**Important!** The WaveStar TDM 2.5G/10G system must be equipped with Release 4.1.1 or later software. Release 4.0 and earlier software releases do not support the LLY2B and LLY2BE TMG/STRAT3 circuit packs.

## Safety precautions

To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system, to prevent electrostatic discharge damage to sensitive components.*



### CAUTION

*The LLY2B TMG/STRAT3 circuit pack does not fit the NEBS Level 3 compliant High Speed Shelf (ED8C789-31, G1E) or Tributary (2.5G) Shelf (ED8C789-30, G2E). The LLY2B TMG/STRAT3 circuit pack is NEBS Level 2 compliant and must be installed in a NEBS Level 2 compliant High Speed Shelf (ED8C789-31, G1) or Tributary (2.5) Shelf (ED8C789-30, G2).*

*The LLY2BE TMG/STRAT3 circuit pack is NEBS Level 3 compliant and can be installed in a NEBS Level 2 or Level 3 compliant shelf.*



### CAUTION

*Do not rock circuit packs back and forth when removing and installing them. Carefully slide circuit packs into or out of the shelf.*

## Related information

For related information, see the following sections in this document:

- *Chapter 5, Circuit Pack/Port Unit Descriptions*
- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Appendix A, CIT Tutorial*

**Before you begin**

Before you begin this task:

- Obtain the work instructions for this task and identify the protection group AID of the TMG/STRAT3 circuit packs to be replaced.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task**

Complete the following steps to replace the LLY2 (LLY2AE) TMG/STRAT3 circuit packs on a shelf with LLY2B (LLY2BE) TMG/STRAT3 circuit packs.

- 
- 1** At the WaveStar CIT, select **Fault>NE Alarm List...** or click on **Alarm List** to obtain an *NE Alarm List*.

- 
- 2** View the *NE Alarm List*.

| IF there are...   | THEN...                                                                                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| no alarms listed, | go to Step 3.                                                                                                                                                           |
| alarms listed,    | go to 365-371-211, <i>WaveStar TDM 2.5G (OC-48)/10G (OC-192) (2-Fiber), Alarm Messages and Trouble Clearing Guide</i> and clear all alarms before proceeding to Step 3. |

- 
- 3** Determine the current status (*Active Side* and *Switch Request State*) of the required TMG/STRAT3 protection group (according to the work instructions).

**Reference:** *SE 228-1: Determine Status of TMG/STRAT3 Protection Group*



**CAUTION**

*Do not rock the circuit pack back and forth. To avoid damage carefully slide the circuit pack out of the slot guides.*

- 4 Locate the Standby (non-active) LLY2 (LLY2AE) TMG/STRAT3 circuit pack, unlock the circuit pack latch, and remove the circuit pack.



**CAUTION**

*Do not rock the circuit pack back and forth. To avoid damage, carefully place the replacement circuit pack into the slot guides and slowly slide it into the shelf (using BOTH hands) until the latch is fully engaged . Use one hand to hold the latch and the other hand to apply force to the bottom of the circuit pack faceplate.*

- 5 Install the replacement LLY2B (LLY2BE) TMG/STRAT3 circuit pack in the slot.

**Result:** The TMG/STRAT3 circuit pack initializes.

- 
- 6 Wait approximately 12 minutes for the circuit pack to stabilize.

- 
- 7 Perform a manual switch from the Active TMG/STRAT3 circuit pack to the Standby (non-active) TMG/STRAT3 circuit pack using the **Fault>Protection Switch...** command.

**Reference:** *SE 228-2: Perform a Manual Protection Switch*



**CAUTION**

*Do not rock the circuit pack back and forth. To avoid damage carefully slide the circuit pack out of the slot guides.*

- 8** Locate the standby (non-active) LLY2 (LLY2AE) TMG/STRAT3 circuit pack, unlock the circuit pack latch, and remove the circuit pack.
- 



**CAUTION**

*Do not rock the circuit pack back and forth. To avoid damage, carefully place the replacement circuit pack into the slot guides and slowly slide it into the shelf (using BOTH hands) until the latch is fully engaged. Use one hand to hold the latch and the other hand to apply force to the bottom of the circuit pack faceplate.*

- 9** Install the replacement LLY2B (LLY2BE) TMG/STRAT3 circuit pack in the slot.

**Result:** The TMG/STRAT3 circuit pack initializes.

---

- 10** Wait approximately 12 minutes for the circuit pack to stabilize.

---

END OF STEPS

---



## SE 228-1: Determine Status of TMG/STRAT3 Protection Group

---

**Procedure** Perform the following steps to determine the current status (*Active Side* and *Switch Request State*) of the shelf TMG/STRAT3 protection group.

---

- 1 At the WaveStar CIT, select **View>Protection...**

**Result:** The *View Protection* screen appears.

---

- 2 Click on the **Ptn Grp** tab (if required), highlight the required **1+1 Equipment etmggrp** according to the work instructions, and click on **Select**.

**Result:** The protection information appears for the protection group.

---

**Important!** The protection group consists of the Side 0 TMG/STRAT3 circuit pack and the Side 1 TMG/STRAT3 circuit pack. One side is active and the other side is standby.

- 3 Verify the **Protection Group AID** and note the **Active Side**. Determine the active TMG/STRAT3 circuit pack and the standby TMG/STRAT3 circuit pack.

**Important!** The *Shelf View* screen also shows the Active and Standby TMG/STRAT3 circuit packs. An **(A)** is shown on the Active TMG/STRAT3 circuit pack and an **(S)** is shown on the Standby TMG/STRAT3 circuit pack.



.....

**4** Observe the **Switch Request State**.

| <b>IF the Switch Request State is...</b> | <b>THEN click on Close and...</b>                                                                                                                          |
|------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No Request,                              | proceed.                                                                                                                                                   |
| Equipment Fail,                          | go to 365-371-211, <i>WaveStar TDM 2.5G (OC-48)/10G (OC-192) (2-Fiber), Alarm Messages and Trouble Clearing Guide</i> . Clear all alarms before proceeding |

.....

E N D   O F   S T E P S



## SE 228-2: Perform a Manual Protection Switch

---

**Procedure** Perform the following steps to do a manual switch from the Active TMG/STRAT3 circuit pack to the Standby (non-active) TMG/STRAT3 circuit pack.

- 
- 1** At the WaveStar CIT, select **Fault>Protection Switch...**

**Result:** The *Protection Switch* screen appears.

- 
- 2** Click on the **Ptn Grp** tab (if required), highlight the required **1+1 Equipment etmggrp** according to the work instructions, and click on **Select**.

**Result:** The protection switch information appears for the protection group.

- 
- 3** Verify the information on the screen (note the current **Active Side**) and select a Manual Switch to the standby (non-active) side in the **Switch Type:** field. Click on **Apply**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**. The standby (non-active) TMG/STRAT3 circuit pack is now active.

---

END OF STEPS



## Task 230: Configuring the Data Communication Network

---

**Purpose** This task description serves as an overview of the individual procedures that must be carried out to configure the Data Communication Network (DCN) for network elements and the CIT.

**Related information** For related information, please refer to Chapter 4, Operations Interfaces.

**Before you begin** Please refer to the individual procedures for information about the required privileges.

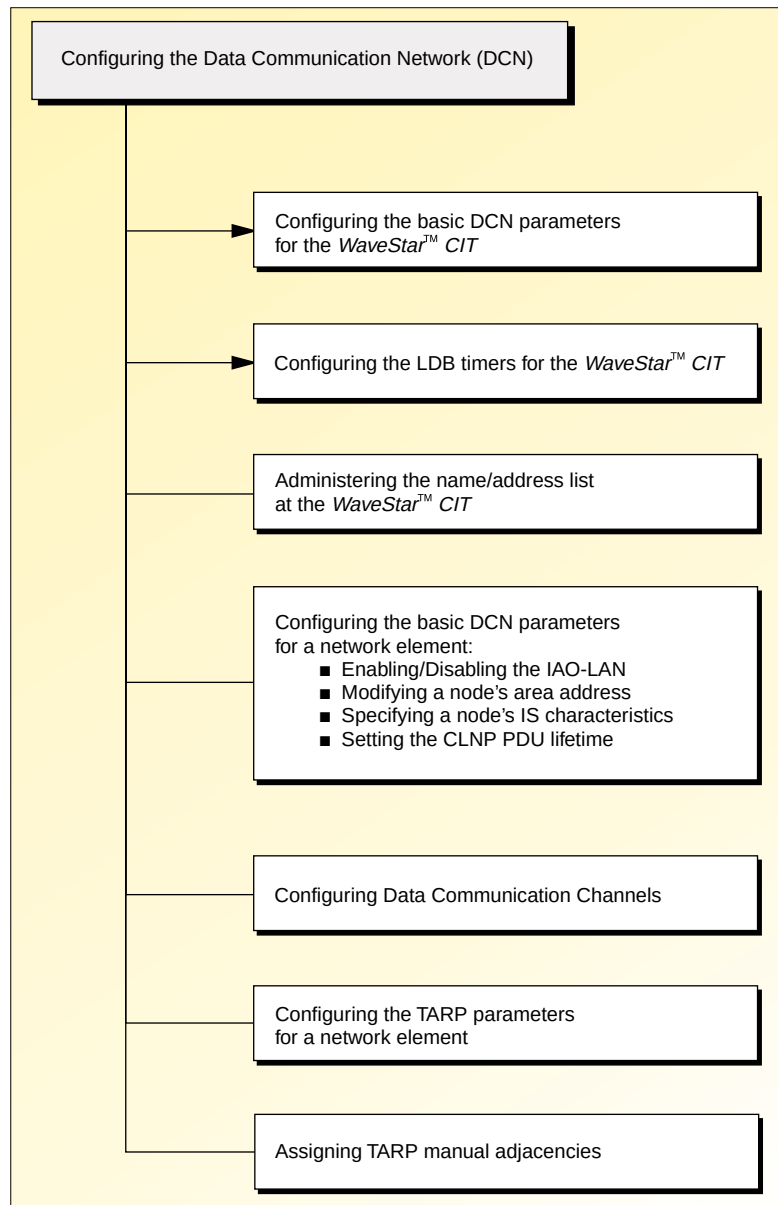
**Tools needed/Required equipment**

The following equipment is required to perform this task:

- WaveStar® CIT

**Configuring the DCN** **Important!** The sequence of carrying out these procedures is optional, and each of the procedures may also be carried out separately.

Configuring the Data Communication Network (DCN) for network elements and the CIT consists of the procedures listed below.



## References

For descriptions of the individual procedures refer to the following:

- T231 Configuring the Basic DCN Parameters for the WaveStar CIT
- T232 Configure the LDB Timers for the WaveStar CIT
- T233 Administer the Name/Address at the WaveStar CIT
- T234 Configuring the Basic DCN Parameters for an NE
- T235 Configuring the Data Communications Channels
- T236 Configuring the TARP Parameters
- T248 Assigning TARP Manual Adjacencies



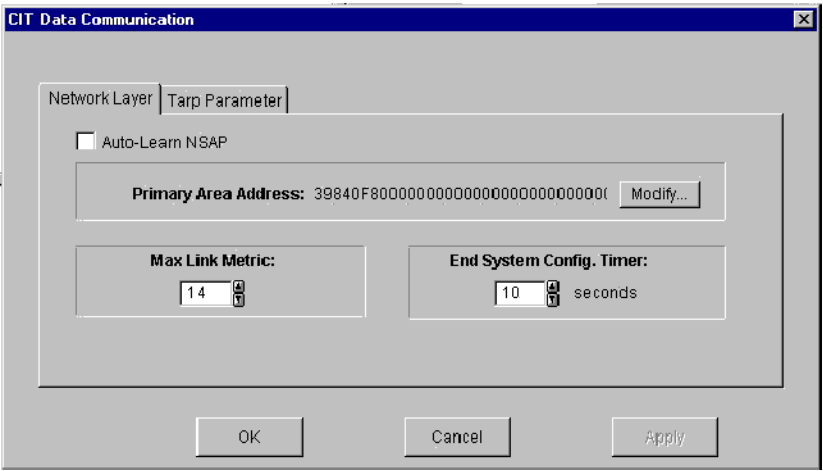


# Task 231: Configuring the Basic DCN Parameters for the CIT

**Purpose** This procedure is part of the DCN configuration.

Use this procedure to configure the network layer parameters relevant to the CIT.

- The *Network Layer* tab** The *Network Layer* tab of the *CIT Data Communication* window enables you to
- view and modify the CIT’s area address (*Primary Area Address*).
  - set the maximum value of the routing metric (*Max Link Metric*).
  - set the CIT’s ESCT (*End System Config. Timer*).



**Window elements** The elements of the *Network Layer* tab and their meaning are listed in the following table.

| Window element       | Meaning                                                                                                                                                                          | Value range | Default setting |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-----------------|
| Auto-Learn NSAP      | This function enables the CIT to automatically “learn” its area address by requesting the area address of the connected network elements. Please refer to the explanation below. |             | enabled         |
| Primary Area Address | The complete area address in hexadecimal representation.                                                                                                                         |             |                 |

| Window element                  | Meaning                                                                                                                                                                     | Value range       | Default setting |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-----------------|
| <i>Modify...</i>                | Click this button to invoke a configuration window for the <i>Primary Area Address</i> . This button will be greyed-out as long as the Auto-Learn NSAP function is enabled. |                   |                 |
| <i>Max Link Metric</i>          | The maximum value of the routing metric                                                                                                                                     | 1 to 63           | 14              |
| <i>End System Config. Timer</i> | The CIT's ESCT                                                                                                                                                              | 1 to 1000 seconds | 10 seconds      |

ESCT: end systems periodically generate ES Hellos (ESHs). The interval between two ESHs is determined by the End System Configuration Timer (ESCT).

#### **“Auto-Learn NSAP” function**

When the CIT application is started it initially has no NSAP address. If the Auto-Learn NSAP function is enabled, it is possible to request the area address of the connected network elements automatically. However, a precondition is that the CIT is physically connected to an NE. The CIT adopts the retrieved area address because the CIT and the NEs on the LAN must have the same area address. The system identifier of the CIT's NSAP address depends on the PC hardware. If the Auto-Learn NSAP function is disabled, you have to enter the CIT's NSAP address manually, either directly in the *Primary Area Address* field or by using the *Modify Primary Area Address* window. Notice that manually modifying the NSAP address is not possible as long as the Auto-Learn NSAP function is enabled.

#### **The *Modify Primary Area Address* window**

In the *Modify Primary Area Address* window, you can change the CIT's area address.

The screenshot shows a dialog box titled "Modify Primary Area Address". It contains the following fields and values:

- Manual Area Address: 39840F80000000000000000000000000
- AFI: 39
- IDI: 840F
- DFI: 80
- ORG: 000000
- Reserved: 0000
- RD: 0000
- Area: 0000

Buttons: OK, Cancel



You can invoke the *Modify Primary Area Address* window by selecting *Modify...* in the *Primary Area Address* segment of the *Network Layer* tab of the *CIT Data Communication* window under the administration tab.

Please refer to NSAP Address Format in Chapter 4, for a description of the individual area address fields.

#### Related information

For related information, please refer to:

- Chapter 4, Operations Interfaces
- Appendix A, CIT Tutorial

#### Before you begin

Prior to performing this task, you must:

- have a valid user login and password for the CIT,
- be logged into the subject CIT, and
- have proper access privileges to perform this task.

#### Required privilege code

You must have at least a privilege code of S3 to perform this task.

#### Tools neededRequired equipment

The following equipment is required to perform this task:

- WaveStar CIT

#### Instructions

Complete the following steps to configure the network layer parameters relevant to the CIT.

- 
- 1 From the CIT main menu select *Administration* → *Data Communications...*

**Result:** The *CIT Data Communication* window opens.

- 
- 2 Select the *Network Layer* tab.

- 
- 3 Check the actual setting of the area address in the *Primary Area Address* segment.

If you like to change the area address:

1. Disable the Auto-Learn NSAP function, and

2. Select *Modify...* in the *Primary Area Address* segment.

**Result:** The *Modify Primary Area Address* window opens.

---

- 4 In the *Modify Primary Area Address* window, you can now
  1. either override the area address as a whole or in parts in the *Manual Area Address* text box, or
  2. change each area address field individually in the *AFI*, *IDI* etc. text boxes.

Click *OK* to confirm your changes.

**Result:** The *Modify Primary Area Address* window is closed.

---

- 5 If desired, change the maximum value of the routing metric in the *Max Link Metric* spin box.
- 

- 6 If desired, change the value of ESCT in the *End System Config. Timer* spin box.
- 

- 7 You may now proceed working in the *CIT Data Communication* window to configure the TARP loop detection buffer (LDB) timers for the CIT, or you may save your changes and close the window. The TARP changes are made under the TARP tab of the Data Communications Window.

| IF ...                                                                       | THEN ...                                                                                   |
|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| you want to proceed configuring the TARP loop detection buffer (LDB) timers, | click <i>Apply</i><br>and confirm your changes in the confirmation window.<br>END OF STEPS |
| you want to save your changes and close the window,                          | click <i>OK</i><br>and continue with Step 8.                                               |

- 
- 8** Close and restart the CIT application for your changes to take effect.

---

END OF STEPS

---





## Task 234: Configuring the Basic DCN Parameters for an NE

---

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                               | <p>This procedure is part of the DCN configuration.</p> <p>Use this procedure to configure the basic DCN parameters for a network element. Configuring the basic DCN parameters includes:</p> <ul style="list-style-type: none"><li>• Enabling/Disabling the Intraoffice LAN (IAO-LAN),</li><li>• Modifying a node's area address (the area address is the configurable part of the NSAP address),</li><li>• Specifying the node's intermediate system (IS) characteristics,</li><li>• Setting the CLNP PDU lifetime.</li></ul> |
| <b>Network elements and nodes</b>            | <p>A distinction has to be made between network elements and nodes. Network elements can be identified by their target identifier (TID), i.e. their NE name ("NE name" and "TID" are used synonymously throughout this), whereas a node is identified by its Network Service Access Point (NSAP) address. Each NSAP address within a network constitutes a node which can individually be addressed.</p>                                                                                                                        |
| <b>The <i>Data Communications</i> window</b> | <p>The <i>LAN Management</i> and <i>Network Layer</i> tabs of the <i>Data Communications</i> window are relevant to perform this task.</p>                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Invoking the window</b>                   | <p>The <i>Data Communications</i> window can be invoked from the <i>System View</i> or <i>Shelf View</i> main menu via <i>Administration</i> → <i>Data Communications</i>...</p>                                                                                                                                                                                                                                                                                                                                                |

**The LAN Management tab**

The *LAN Management* tab of the *Data Communications* window makes it possible to enable or disable the LAN access to the internal LAN, the Operations Network (ON), and to the external LAN (Intraoffice LAN (IAO-LAN)) for a selected DCC controller (ADJCTL/DCCEI circuit pack). The LAN access is enabled in the basic configuration. The *LAN Management* tab also offers the opportunity to modify the LAN Router Priority and the Max Link Metric parameters for both LAN types.



|                                                                                             |        |               |                |
|---------------------------------------------------------------------------------------------|--------|---------------|----------------|
| TARP Manual Adj.                                                                            | TCP/IP | IP Tunnel     | TCP/IP Gateway |
| LAN Management                                                                              |        | Network Layer | TARP           |
| Internal LAN Settings                                                                       |        |               |                |
| Internal LAN Channel: <input checked="" type="radio"/> Enable <input type="radio"/> Disable |        |               |                |
| Internal Max Link Metric: 14                                                                |        |               |                |
| External LAN Settings                                                                       |        |               |                |
| External LAN Channel: <input checked="" type="radio"/> Enable <input type="radio"/> Disable |        |               |                |
| External Max Link Metric: 14                                                                |        |               |                |
| LAN Router Priority                                                                         |        |               |                |
| Router Priority: 64                                                                         |        |               |                |
| OK                                                                                          |        |               |                |

## The Network Layer tab

The *Network Layer* tab of the *Data Communications* window provides information on the actual network layer configuration and offers the opportunity to modify the NE's area address and to specify the NE's routing capability.



## Elements of the Network Layer tab

The elements of the *Network Layer* tab and their meaning are listed in the following table. If applicable, the permitted value range as well as the default settings of the parameters are given.

| Window element | Meaning                                                 | Value range                                                             | Default setting |
|----------------|---------------------------------------------------------|-------------------------------------------------------------------------|-----------------|
| <i>NSAP</i>    | The complete area address in hexadecimal representation | dependent on the actual setting of the configurable NSAP address fields |                 |

| Window element                                | Meaning                                                                                  | Value range                            | Default setting |
|-----------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------|-----------------|
| <i>Modify...</i>                              | Click this button to invoke a configuration window for the <i>Primary Area Address</i> . |                                        |                 |
| <i>Intermediate System Routing Capability</i> | The node's IS routing capability                                                         | <i>Level 1</i> or <i>Level 1&amp;2</i> | <i>Level 1</i>  |

**TARP tab** For information on the TARP tab and on configuring the TARP parameters see Task 236, *Configuring TARP Parameters*.

**TARP Manual Adj. tab** For information on the TARP Manual Adj. tab and on assigning the TARP manual adjacencies, see Task 248, *Configuring TARP Manual Adjacencies*.

**TCP/IP tab** The TCP/IP tab provides options for setting the IP address of the NE, the IP mask, and the IP address of the default router.





**IP Tunnel tab**      The IP Tunnel tab provides options for setting up the IP tunnel routing and mapping information.



LAN Management

Network Layer

TARP

TARP Manual Adj.

TCP/IP

IP Tunnel

TCP/IP Gateway

IP Tunneling

IP Tunnel Status: ☐ Enable ☒ Disable

Filter: ALL

| Dest. IP        | Mask | Next Hop Port | Next Hop Address | Owner |
|-----------------|------|---------------|------------------|-------|
| 192.168.003.001 | 16   | CLNPTunnel    | 192.168.002.21   | LOCAL |
| 192.169.003.001 | 17   | LAN           | 192.169.002.21   | LOCAL |
| 192.170.003.001 | 18   | LAN           | 192.170.002.21   | LOCAL |
| -               | -    | -             | -                | -     |

TAP Properties

TAP Advertise: ☐ Enable ☒ Disable

TAP Learning: ☐ Enable ☒ Disable

TAP group: 20

The IP tunnel tab provides the following options:

| Window element                | Meaning                                    | Value range              | Default setting |
|-------------------------------|--------------------------------------------|--------------------------|-----------------|
| IP Tunnel Status              | Indicates whether tunnel is enabled        | enable/disable           | disable         |
| Filter                        |                                            | all, auto, local, manual |                 |
| Dest IP                       | IP address of the NE on the LAN side       | <IP address>             | 0.0.0.0         |
| Mask                          | Mask of the IP subnet connected to the LAN | <mask>                   | 16              |
| Next Hop Port                 | Port of the next hop                       | CLNPTunnel, LAN          | CLNP Tunnel     |
| Next Hop Address <sup>1</sup> | Address of the next hop.                   | <NSAP> or <IP address>   | <empty>         |

| Window element         | Meaning                                                     | Value range   | Default setting                 |
|------------------------|-------------------------------------------------------------|---------------|---------------------------------|
| Owner <sup>2</sup>     | Is the Routing table automatically or manually provisioned. | Local, Manual | Always manual for added entries |
| Advertise <sup>3</sup> | Is the NE advertised                                        | Yes, No       | Yes                             |
| TAP Cost               |                                                             | 0—65536       | 20                              |

### Notes

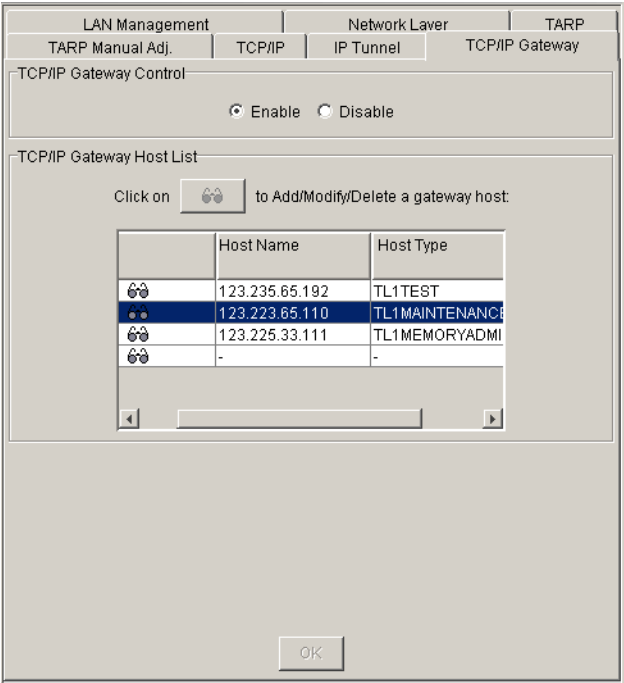
<sup>1</sup>If the next hop port is CLNP, then the address is <NSAP>. If the next hop port is LAN, then the address is <IP address>.

<sup>2</sup>If owner is local, then only the advertise field is editable. The other fields of the routing table are dependent on the configured IP address of the local system.

<sup>3</sup>In LSP the NEs can send (advertise) information about the IP subnets that can be reached via that NE. The routes that are learned by this protocol will always have lower precedence than the routes that were provisioned manually.

TCP/IP Gateway tab

The TCP/IP Gateway control parameter controls both the TL-1 gateway (or T-TD) and the File Transfer gateway (or FT-TD). The File Transfer gateway requires no further provisioning. For the TL-1 gateway the TCP/IP Gateway Host List needs to be provisioned with the management systems that are allowed to connect through the gateway.



| Window element           | Meaning                                  | Value range    | Default setting |
|--------------------------|------------------------------------------|----------------|-----------------|
| TCP/IP Gateway Control   | Enables or disables the gateway function | enable/disable | disable         |
| TCP/IP Gateway Host List | Lists the hosts for the TL-1 gateway     | <IP address>   |                 |

| Window element | Meaning                      | Value range                                                                                                                                                                                                                                                          | Default setting |
|----------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Host Name      | IP address of host           | <IP address>                                                                                                                                                                                                                                                         |                 |
| Host Type      | Type of host for TL-1 access | <ul style="list-style-type: none"> <li>• TL1 Maintenance</li> <li>• TL1 Memory Administration</li> <li>• TL1Test</li> <li>• TL1 Other 1</li> <li>• TL1 PeerCom</li> <li>• TL1 Command</li> <li>• TL1 Other1 (other OS1)</li> <li>• TL1 Other2 (other OS2)</li> </ul> |                 |

For related information, please refer to:

- Chapter 4. Operations Interfaces
- Appendix A. CIT Tutorial

#### Related information

- For related information, please refer to:
  - Chapter 4. Operations Interfaces
  - Appendix A. CIT Tutorial

#### Before you begin

Prior to performing this task, you must:

1. connect the CIT physically to the NE,
2. log into the CIT, and
3. connect to the NE.

#### Required privilege code

You must have at least a privilege code of:

- S4  
to enable or disable the IAO-LAN,
- S3  
to modify a node's area address, specify the node's IS characteristics and/or specify the CLNP PDU lifetime.

#### Tools needed

The following equipment is required to perform this task:

- WaveStar® CIT

**Instructions** Complete the following steps to configure the basic DCN parameters for an NE.

- 
- 1** At the CIT, select *Administration* → *Data Communications...* from the *System View* or *Shelf View* main menu.

**Result:** The equipment selection window opens.

- 
- 2** By means of the equipment selection window, select the DCC controller (ADJCTL/DCCEI circuit pack) of the shelf for which you want to configure the basic DCN parameters.

**Result:** The *Data Communications* window opens.

- 
- 3** Select the parameters tab for the area you wish to configure:

- LAN Management
- Network Layer
- TARP
- TARP Manual Adj.
- TCP/IP
- IP Tunnel
- TCP/IP Gateway
- FTTD-FTP/FTAM

- 
- 4** Configure the area following the directions on the GUI and the descriptions listed earlier in this task.

- 
- 5** If you have made any changes, in the tab click *Apply* and confirm your changes in the confirmation window.

- 
- 6** Select the next tab you wish to work on.

- 
- 7** Repeat Steps 4-6 until you have completed configuration of the DCN for the NE.

END OF STEPS

---



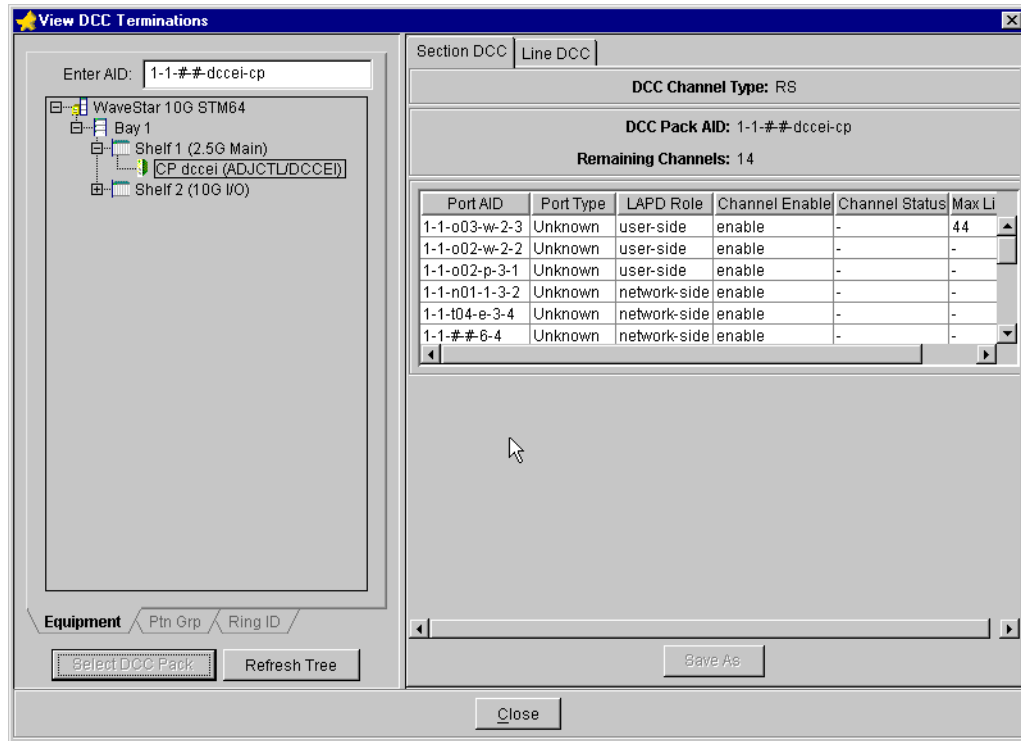
## Task 235: Configuring Data Communication Channels

---

|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                           | Use this procedure to create new or modify existing DCC terminations. This procedure is part of the DCN configuration.                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Preconditions for enabling a DCC</b>  | <p>You are permitted to enable a DCC if all of the following preconditions are fulfilled:</p> <ul style="list-style-type: none"><li>• The corresponding optical interface port is provisioned (configured) or at least pre-provisioned.</li><li>• The type of DCC (either DCC-R or DCC-M) is supported on the corresponding optical interface.</li><li>• The DCC is not yet enabled.</li><li>• There are LAPD channels available. Please refer to Max. number of active DCC links (-1) below.</li></ul> |
| <b>Max. number of active DCC links</b>   | The maximum number of simultaneously supported LAPD channels per DCC controller is 32. Each DCC controller thus can support up to 32 active DCC links. Upon circuit pack insertion, DCCs will automatically be enabled and a LAPD channel assigned as long as LAPD channels are available.                                                                                                                                                                                                              |
| <b>Preconditions for disabling a DCC</b> | <p>You should disable a DCC only if <i>all</i> of the following preconditions are fulfilled:</p> <ul style="list-style-type: none"><li>• The DCC is currently enabled.</li><li>• The DCC is currently not needed for 2-Fiber BLSR management.</li><li>• The DCC is not the only management connection to remote NEs.</li></ul>                                                                                                                                                                          |
| <b>Relevant windows</b>                  | <p>The following CIT windows are relevant to perform this task:</p> <ul style="list-style-type: none"><li>• <i>View DCC Terminations</i></li><li>• <i>Configure DCC Terminations</i></li></ul>                                                                                                                                                                                                                                                                                                          |
| <b>The View DCC Terminations window</b>  | <p>The <i>View DCC Terminations</i> window provides information on the current DCC configuration.</p> <p>There are two possible ways to invoke this window:</p> <ul style="list-style-type: none"><li>• By selecting the <i>DCC Terminations</i> option from the pop-up menu that opens when you right-click on a DCC controller (ADJCTL/DCCEI circuit pack) in the shelf display of the <i>System View</i> window.</li></ul>                                                                           |

- By selecting *View → DCC Terminations...* in the *System View* main menu.

Please note that you must specify the DCC controller first (by entering the respective AID or selecting the DCC controller from the *Equipment Selection* window) before the *View DCC Terminations* window opens.



### Elements of the *View DCC Terminations* window

The window elements of the *View DCC Terminations* window and their meaning are listed in the following table. These window elements are displayed for each LAPD channel terminated on the ADJCTL/DCCEI circuit pack.

The following table lists the window elements of the *View DCC Terminations* window and explains their meaning.

| Parameter                 | Meaning                                                             |
|---------------------------|---------------------------------------------------------------------|
| <i>DCC Pack AID</i>       | The AID of the selected DCC controller (ADJCTL/DCCEI circuit pack). |
| <i>Remaining Channels</i> | The number of available LAPD channels.                              |

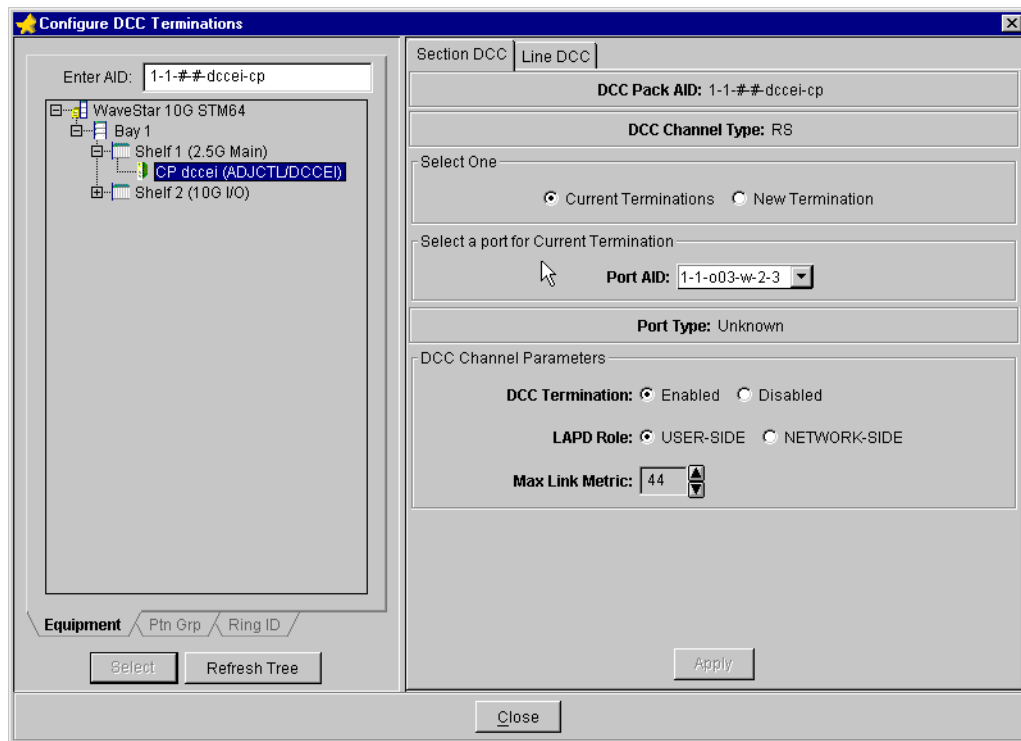


| Parameter                                           | Meaning                                                                                                                                           |
|-----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Scrollable table with details on enabled DCC links: |                                                                                                                                                   |
| <i>(Working) Port AID</i>                           | <p>The AID of the “working” optical interface port.</p> <p>All optical interface ports with DCC enabled are considered to be “working” ports.</p> |
| <i>Port Type</i>                                    | <p>The type of the associated optical interface port.</p> <p>This can be either <i>STM1</i>, <i>STM16</i> or <i>STM64</i>.</p>                    |
| <i>LAPD Role</i>                                    | <p>The assigned LAPD role.</p> <p>This can be either <i>USER-SIDE</i> or <i>NETWORK-SIDE</i> with <i>USER-SIDE</i> being the default setting.</p> |
| <i>Channel Enable</i>                               | Indicates whether the channel is enabled.                                                                                                         |
| <i>Channel Status</i>                               | The current status of the corresponding DCC channel.                                                                                              |
| <i>DCC Protection Type</i>                          | The protection type of the DCC.                                                                                                                   |

## The *Configure DCC Terminations* window

In the *Configure DCC Terminations* window, you can set all the parameters required for the operation of data communication channels.

The *Configure DCC Terminations* window can be invoked from the *System View* or *Shelf View* main menu via *Configuration* → *DCC Terminations...*



### Equipment selection

After you have opened the *Configure DCC Terminations* window, only the equipment selection part on the left-hand side of the window is displayed. The parameter part on the right-hand side is not displayed until after you have selected a DCC controller (ADJCTL/DCCEI circuit pack) by either entering its AID directly in the *Enter AID:* field or selecting it from the equipment tree.

### Parameter part

The parameter part on the right-hand side of the *Configure DCC Terminations* window contains two tabs, one for the *Section DCC* (DCC-R) and one for the *Line DCC* (DCC-M).

## Elements of the *Configure DCC Terminations* window

The window elements of the parameter part of the *Configure DCC Terminations* window are listed in the following table. If applicable, the permitted value range as well as the default setting of the parameters are also given.

| Window element                            | Value range                                                                                  | Default Ssetting                                                            |
|-------------------------------------------|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <i>DCC Pack AID</i>                       | dependent on the previous selection                                                          | no default setting; read-only                                               |
| <i>DCC Channel Type</i>                   | <i>RS</i> (DCC-R) or <i>MS</i> (DCC-M)                                                       | no default setting; dependent on the tab selection; read-only               |
| Selection group box ( <i>Select One</i> ) | <i>Current Terminations</i> or <i>New Termination</i>                                        | <i>Current Terminations</i>                                                 |
| <i>Port AID</i>                           | dependent on the previous selection                                                          | only selectable optical interface ports are listed                          |
| <i>Port Type</i>                          | dependent on the selected optical interface port: <i>STM1</i> , <i>STM16</i> or <i>STM64</i> | no default setting; read-only                                               |
| Radio buttons ( <i>DCC Termination</i> )  | <i>Enabled</i> or <i>Disabled</i>                                                            | <i>Enabled</i> (as long as the upper limit of 32 DCCs has not been reached) |
| <i>LAPD Role</i>                          | <i>USER-SIDE</i> or <i>NETWORK-SIDE</i>                                                      | <i>USER-SIDE</i>                                                            |

### Related information

For related information, please refer to:

- Chapter 4, Operations Interfaces

### Before you begin

Prior to performing this task, you must have an overview of the current network topology.

Furthermore, you must:

1. Connect the WaveStar<sup>TM</sup> CIT physically to the subject NE,
2. log into the WaveStar<sup>TM</sup> CIT, and
3. connect to the NE.

## Required skillsRequired privilege codes

You must have at least a privilege code of:

- S1  
to view the currently enabled DCC terminations,
- S3  
to create new or modify existing DCC terminations.

## Tools neededRequired equipment

The following equipment is required to perform this task:

- WaveStar™ CIT

**Instructions** Complete the following steps to create a new DCC termination or to modify an existing DCC termination.

- .....
- 1 At the CIT, open the *View DCC Terminations* window and verify that at least one LAPD channel is indicated available by checking the *Remaining Channels* field (cf. <Undefined Cross-Reference> ).

.....

2

| IF ...                                        | THEN ...                                                    |
|-----------------------------------------------|-------------------------------------------------------------|
| there is at least one LAPD channel available, | continue with Step 3.                                       |
| there are no LAPD channels available,         | disable dispensable DCC channels, and continue with Step 3. |

- .....
- 3 Invoke the *Configure DCC Terminations* window from the *System View* main menu via *Configuration* → *DCC Terminations...*

- .....
- 4 Select the DCC controller (ADJCTL/DCCEI circuit pack) for which you want to configure the DCC terminations by means of the equipment selection part of the window.

- .....
- 5 In the parameter part, select the action you want to perform

6

| If you want to...                                   | then ...                                                      |
|-----------------------------------------------------|---------------------------------------------------------------|
| <i>create</i> a new DCC termination,                | select <i>New Termination</i> and continue with Step 7.       |
| <i>modify</i> an existing DCC termination,          | select <i>Current Terminations</i> and continue with Step 8.  |
| <i>disable</i> a currently enabled DCC termination, | select <i>Current Terminations</i> and continue with Step 11. |

7 In the group box, select the working optical interface port, and continue with Step 9.

8 In the group box, select the working optical interface port, and continue with Step 9.

9 Enable the DCC termination by selecting the *Enabled* option in the *DCC Channel Parameters* group box.

10 In the group box, chose the LAPD mode

**Important!** The LAPD mode setting must be different at both ends of a DCC link. Otherwise, an alarm (either “User-Network Side RSect Failure” or “User-Network Side MSect Failure”) will be generated.

11 In the *Select a port for Current Termination* group box, select the working optical interface port for which you want to disable the DCC communication.

- 
- 12** Disable the DCC termination by selecting the *Disabled* option in the *DCC Channel Parameters* group box.

**Important!** Disabling a previously enabled DCC at an NE needs to be coordinated with disabling the same DCC at the opposite end of the DCC link (remote NE) to avoid persistent alarms from the remote NE.

---

END OF STEPS



## Task 236: Configuring the TARP Parameters

---

**Purpose** This procedure is part of the DCN configuration.

Use this procedure to configure the following:

- TARP loop detection buffer (LDB) entry timer and flush timer for the CIT.
- TAPR Responder
- TARP Propagation

**CIT TARP functionality** The CIT supports the TARP originator functionality which cannot be disabled. The related timers (T1, T2, T3 and T4) are permanently preset according to the Telcordia Technologies (formerly Bellcore) GR-253 standard.

**The TARP Parameters tab** The *TARP Parameters* tab of the *CIT Data Communication* window enables you to set the TARP loop detection buffer timers:

- The LDB entry timer determines the time interval in minutes during which a previously processed and again received TARP PDU will be discarded. Possible values are 1 to 10 minutes, the default value is 5 minutes.
- The LDB flush timer serves to periodically re-initialize the loop detection buffer. Possible values are 1 to 1440 minutes (24 hours), the default value is 5 minutes.
- TARP Responder (enable/disable). When the DSA is not available and the user needs to login to a PF-3000 NE via the TID (target identifier), the CIT will send out TARP requests for translation of the TID to an OSI network address (NSAP). The NE will either propagate the TARP request or respond to it if the TID matches. The benefit is realized when the user walks up to a LAN with several NEs, wishes to login to a particular NE but the DSA is not available.
- TARP Propagation (enable/disable). TARP propagation is used when the CIT (Lucent or another vendor's) tries to login to a remote NE which is not registered in the DSA's directory information base (DIB). The PF-2000 NE will not be registered in the DSA's DIB if the T5GW is not in the PF-2000 NE's level 1 area. Other vendors' NEs may not be registered in the DIB.

**Related information**

For related information, please refer to:

- Chapter 4, Operations Interfaces
- Appendix A, CIT Tutorial

**Before you begin**

Prior to performing this task, you must:

- have a valid user login and password for the CIT,
- be logged into the subject CIT, and
- have proper access privileges to perform this task.

**Required skillsRequired privilege code**

You must have at least a privilege code of S3 to perform this task.

**Tools neededRequired equipment**

The following equipment is required to perform this task:

- WaveStar™ CIT

**Instructions**

- 1 From the CIT main menu select *Administration* → *Data Communications*....

**Result:** The *CIT Data Communication* window opens.

- 2 Select the *TARP* tab.

- 3 If desired, set the LDB timer values according to your needs.

Please note that the default timer values conform to the Telcordia Technologies GR-253 standard.

- 4 Enable or disable the TARP propagation functionality according to your needs by selecting the corresponding check box in the *TARP Propagation* group box. The TARP propagation functionality is enabled by default.

**Important!** It is recommended to have the TARP propagation functionality enabled for the low-speed part of the main shelf.



- 
- 5** Enable or disable the TARP responder functionality according to your needs by selecting the corresponding check box in the *TARP Responder* group box. The TARP responder functionality is enabled by default.

**Important!** It is recommended to have the TARP responder functionality enabled for the low-speed part of the main shelf.

---

- 6** You may now select another tab of the *Data Communications* window to configure other DCN-related parameters, or you may save your changes and close the window.

| If you want to ...                                                                 | then ...                                                                                                                                    |
|------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| save your changes and select another tab of the <i>Data Communications</i> window, | click <i>Apply</i><br>and confirm your changes in the confirmation window, and refer to the corresponding task description.<br>END OF STEPS |
| save your changes and close the <i>Data Communications</i> window,                 | click <i>OK</i><br>and confirm your changes in the confirmation window.<br>END OF STEPS                                                     |

- 
- 7** Close and restart the CIT application for your changes to take effect.

END OF STEPS

---





## Task 241: Change Maximum Number of Backups to WaveStar CIT

---

**Purpose** Use this procedure to change the maximum number of backup folders allowed on a WaveStar CIT. The maximum number of backup folders may be 1 to 10 or infinite.

The provisioned maximum number of backup folders is implemented and maintained on an individual WaveStar CIT basis. For example, two WaveStar CITs may have different values for the provisioned maximum number of backup folders.

If the provisioned maximum number of backup folders is reached, the system overwrites the last backup folder.

**Required privilege codes** A privilege code of at least S4 is required to perform this task.

**Required equipment** The following equipment is required to perform this task:

- WaveStar CIT
- WaveStar TDM 2.5G/10G Release 5 or later software.

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Operation Task 205, Manually Back Up Database to WaveStar CIT*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to change the maximum number of backup folders allowed on a WaveStar CIT.

---

**1** At the WaveStar CIT, select **Configuration>Software>Remote Backup...**

**Result:** The *Backup Database* screen appears.

- 
- 2** Verify that **CIT** appears in the **Backup to/Via:** field and click on **Setup** (at the bottom of the screen).

**Result:** The *Provision Backup Number* screen appears.

---

**Important!** The maximum number of backups to the WaveStar CIT may be from 1 to 10 or infinite.

- 3** Enter or select the **Maximum Number of Backups to CIT per System** and click on **OK**.

- 
- 4** Click on **Close** to exit the *Backup Database* screen.

---

END OF STEPS



## Task 247: Change Super User Login ID

---

**Purpose** Use this procedure to change the login ID of either of the two super users.

**Important!** This task is for administrators only.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the super user login to be changed and the new value.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to change a super user login ID:

- 
- 1** At the WaveStar CIT *System View*, select **Administration>Security>Change Super User Id...**

**Result:** The *Change Super User Login ID* screen appears.

- 
- 2** Change the super user login ID according to the work instructions, and click on **OK**.

**Result:** A dialog box appears asking you to confirm changing the super user login ID. Click on **Yes**.

---

END OF STEPS

---





# Task 248: Assigning TARP Manual Adjacencies

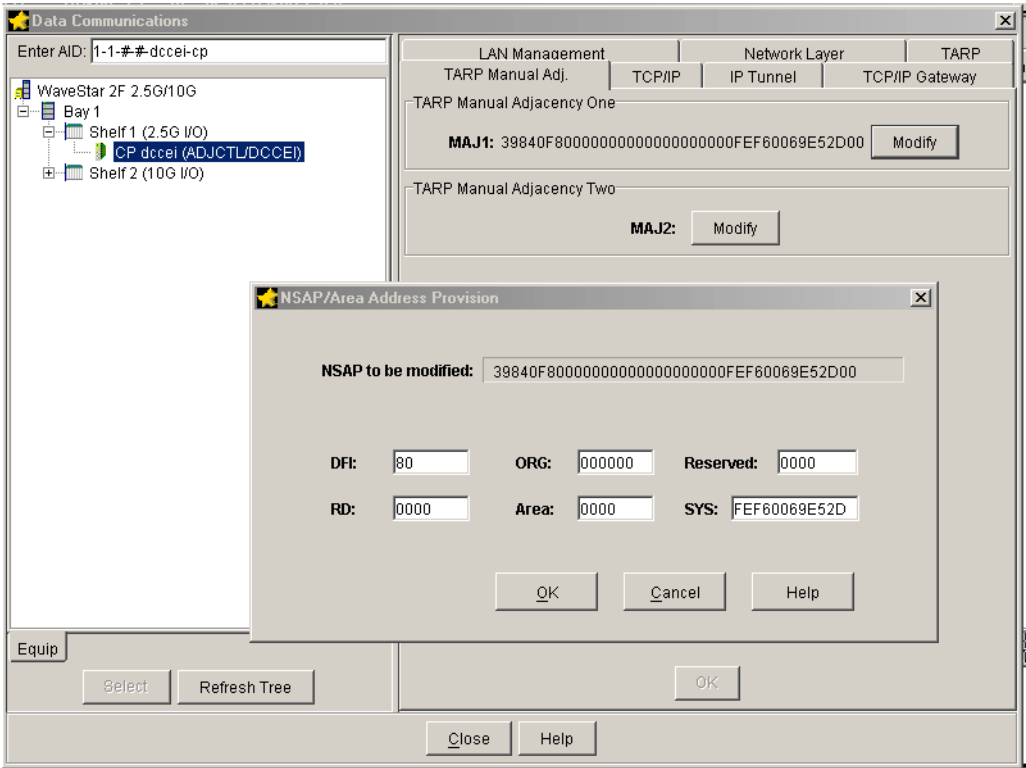
**Purpose** Use this procedure to manually assign adjacent nodes that support TARP (“TARP manual adjacencies”) by entering their Network Entity Title (NET).

This procedure is part of the DCN configuration.

The area address together with the system identifier (SYSTEM field) of the NSAP address is also called the Network Entity Title (NET).

**The Data Communications window** The *TARP Manual Adj.* tab of the *Data Communications* window is relevant to perform this task.

The *TARP Manual Adj. Data Communications* window makes it possible to enter new or modify existing TARP manual adjacencies.



The *Data Communications* window can be invoked from the *System View* or *Shelf View* main menu via *Administration → Data Communications...*

**Related information** For related information, please refer to Chapter 4, Operations Interfaces.

**Before you begin** Prior to performing this task, you must:

1. connect the CIT physically to the NE,
2. log into the CIT, and
3. connect to the NE.

Take notes of the NSAP addresses of the TARP manual adjacencies you are going to assign.

**Required skillsRequired privilege code**

You must have at least a privilege code of S3 to perform this task.

**Tools neededRequired equipment**

The following equipment is required to perform this task:

- CIT

**Instructions** Complete the following steps to assign TARP manual adjacencies:

- 
- 1** At the CIT, select *Administration → Data Communications...* from the *System View* or *Shelf View* main menu.

**Result:** The equipment selection window opens.

- 
- 2** By means of the equipment selection window, select the DCC controller (ADJCTL/DCCEI circuit pack) of the shelf for which you want to configure TARP manual adjacencies.

**Result:** The *Data Communications* window opens.

- 
- 3** Select the *TARP Manual Adj.* tab of the *Data Communications* window.



- 
- 4 Click the modify button next to the manual adjacency (MAJ1 or MAJ2) that you want to modify.

**Result:** The NSAP/Area Address Provision window opens.

---

- 5 Do one of the following:
1. Enter the new value of the desired TARP manual adjacency's NSAP as a whole (in hexadecimal representation) into the associated text box.
  2. Enter the individual fields of the NSAP in the boxes provided.

**Important!** When entering the NSAP as a whole you must enter a complete NSAP address. The selector (SEL) field, however, will not be evaluated.

---

- 6 Make sure that the NET is correct.

| IF ...                  | THEN ...                                                                          |
|-------------------------|-----------------------------------------------------------------------------------|
| the NET is correct,     | click OK in the <i>NSAP/Area Address Provision</i> window.                        |
| the NET is not correct, | correct the NET, then click OK in the <i>NSAP/Area Address Provision</i> window.. |

**Result:** The *Modify Existing Manual Adjacencies* window is closed.

- 
- 7** You may now select another tab of the *Data Communications* window to configure other DCN-related parameters, or you may save your changes and close the window.

| IF ...                                                                                         | THEN ...                                                                                                                    |
|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| you want to save your changes and select another tab of the <i>Data Communications</i> window, | click <i>Apply</i><br>and confirm your changes in the confirmation window, and refer to the corresponding task description. |
| you want to save your changes and close the <i>Data Communications</i> window,                 | click <i>OK</i><br>and confirm your changes in the confirmation window.                                                     |

---

END OF STEPS



## Task 249: Establish TCP/IP Gateway Access for WaveStar CIT

---

**Purpose** Use this procedure to change establish TCP/IP gateway access for the WaveStar CIT.

**Required equipment** The following equipment is required to perform this task:

- Personal computer (PC) with WaveStar Craft Interface Terminal (CIT) software installed
- Network Communications Controller (NCC) installed

**Important!** The PC must meet the minimum requirements stated in the *WaveStar TDM 2.5G/10G Software Release Description*.

The PC should be connected directly to the NE or through a LAN to the NCC.

**Related information** For related information, see the following sections in this document:

- *Chapter 4, Operations Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial*.

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the IP address of the gateway.

**Task** Complete the following steps to establish TCP/IP gateway access:

---

**1** Log in to the WaveStar CIT.

**Reference:** *Operation Task 223 Login/Logout of Network Element*

---

**2** At the *WaveStar CIT* screen, select **Administration>TCP/IP Gateway...**

**Result:** The *TCP/IP Gateway* screen appears.

- 
- 3** Enter the gateway IP address (per the work instructions) and select the *Use TCP/IP Gateway* box. Click on **OK**.

**Result:** A dialog box appears asking you to confirm executing this command and to restart the WaveStar CIT. Click on **OK**.

To use the WaveStar CIT with OSI, uncheck the *Use TCP/IP Gateway* box.

- 
- 4** Select **File>Exit** to log out of the WaveStar CIT.

- 
- 5** Log in to the WaveStar CIT.

**Result:** A dialog box appears warning you that network element connections use TCP/IP.

Enter the target identifier (TID) to log in to a network element.

---

END OF STEPS



## Task 250: Upgrade In-Service 576x576 STS-1 Switch to 768x768 STS-1 Switch

---

**Purpose** Use this procedure to upgrade in-service the 576x576 STS-1 switch in the 10G shelf to a 768x768 STS-1 switch.

The 768x768 STS-1 switch supports one 10G shelf and up to four 2.5G I/O shelves. The 576x576 STS-1 switch supports one 10G shelf and up to two 2.5G I/O shelves.

**Required privilege code(s)** A privilege code of at least M4 is required to perform a protection switch. A privilege code of at least S1 is required to view the protection switch status.

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist strap
- 2 replacement SWITCH/STS768 circuit packs for the SWITCH/STS/576 circuit packs in slot **SWITCH 0** and **SWITCH 1** of the 10G shelf
- 2 replacement PPROC/STS384 circuit packs for the PPROC/STS192 circuit packs in slot **PPROC 0** and **PPROC 1** of the 10G shelf

**Important!** The WaveStar TDM 2.5G/10G system must be equipped with Release 6.0.0 or later software. Release 5.0 and earlier software releases do not support the 768x768 STS-1 switch.

**Safety precautions**

To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system, to prevent electrostatic discharge damage to sensitive components.*

**CAUTION**

*Do not rock circuit packs back and forth when removing and installing them. Carefully slide circuit packs into or out of the shelf.*

**Related information**

For related information, see the following sections in this document:

- *Chapter 5, Circuit Pack/Port Unit Descriptions*
- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task, verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to upgrade in-service the 576x576 STS-1 switch to a 768x768 STS-1 switch.

---

**1** At the WaveStar CIT, select **Fault>NE Alarm List...** or click on **Alarm List** to obtain an *NE Alarm List*.

---

**2** View the *NE Alarm List*.

| IF there are...   | THEN...                                                                                                                                                                 |
|-------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| no alarms listed, | go to Step 3.                                                                                                                                                           |
| alarms listed,    | go to 365-371-211, <i>WaveStar TDM 2.5G (OC-48)/10G (OC-192) (2-Fiber), Alarm Messages and Trouble Clearing Guide</i> and clear all alarms before proceeding to Step 3. |

---

**3** Determine the status (*Active Side* and *Switch Request State*) of the 576x576 switch protection group (*1+1 Equipment esysswitchgrp*).

**Reference:** *SE 250-1: Determine Status of 576x576 Switch Protection Group*

---

**4** Replace the standby (non-active) SWITCH/STS576 and PPROC/STS192 circuit packs in the 10G shelf with the SWITCH/STS768 and PPROC/STS384 circuit packs.

**Reference:** *SE 250-2: Replace Standby SWITCH/STS576 and PPROC/STS192 Circuit Packs*

---

**5** Perform a protection switch from the Active switch side to the Standby (non-active) switch side using the **Fault>Protection Switch...** command.

**Reference:** *SE 250-3: Perform Protection Switch*

- 
- 6** Replace the standby (non-active) SWITCH/STS576 and PPROC/STS192 circuit packs in the 10G shelf with the SWITCH/STS768 and PPROC/STS384 circuit packs.

**Reference:** *SE 250-2: Replace Standby SWITCH/STS576 and PPROC/STS192 Circuit Packs*

---

- 7** Perform a protection switch from the Active switch side to the Standby (non-active) switch side using the **Fault>Protection Switch...** command to verify the Standby switch side operates correctly.

**Reference:** *SE 250-3: Perform Protection Switch*

---

N D O F S T E P S

---





## SE 250-1: Determine Status of 576x576 Switch Protection Group

---

**Procedure** Perform the following steps to determine the current status (*Active Side* and *Switch Request State*) of the 576x576 switch protection group (*1+1 Equipment esysswitchgrp*).

---

- 1 At the WaveStar CIT, select **View>Protection...**

**Result:** The *View Protection* screen appears.

---

- 2 Click on the **Ptn Grp** tab (if required). Then click on **1+1 Equipment esysswitchgrp** and **Select**.

**Result:** The protection information appears for the 576x576 switch protection group.

---

**Important!** The 576x576 switch protection group consists of Side 0 circuit packs and Side 1 circuit packs. One side is active and the other side is standby.

- 3 Verify the **Protection Group AID** and note the **Active Side**. Determine the active SWITCH/STS576 circuit pack and the standby SWITCH/STS576 circuit pack on the 10G I/O shelf (*shelf 1-2*).

**Important!** The *Shelf View* screen of the 10G I/O shelf also shows the Active and Standby SWITCH/STS576 circuit packs. An **(A)** is shown on the Active SWITCH/STS576 circuit pack and an **(S)** is shown on the Standby SWITCH/STS576 circuit pack.

---

**4** Observe the **Switch Request State**.

| <b>IF the Switch Request State is ...</b> | <b>THEN click on Close and ...</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Forced Switch,                            | Clear the forced switch by performing the following:<br><ol style="list-style-type: none"><li>1. At the WaveStar CIT, select <b>Fault&gt;Protection Switch...</b> . (The <i>Switch Protection</i> screen appears.)</li><li>2. Click on the <b>Ptn Grp</b> tab (if required). Then click on <b>1+1 Equipment esysswitchgrp</b> and <b>Select</b>. (The protection switch information appears for the switch protection group.)</li><li>3. Verify the information on the screen (note the current <b>Active Side</b>) and select <i>Clear Forced</i> in the <b>Switch Type:</b> field. Click on <b>Apply</b>. (A dialog box appears asking you to confirm executing this command.)</li><li>4. Click on <b>Yes</b>. The protection switch is cleared. Click on <b>Close</b>.</li></ol> |
| Equipment Fail,                           | go to 365-371-211, <i>WaveStar TDM 2.5G (OC-48)/ 10G (OC-192) (2-Fiber), Alarm Messages and Trouble Clearing Guide</i> . Clear all alarms before proceeding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| No Request,                               | Proceed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

---

N D O F S T E P S



## SE 250-2: Replace Standby SWITCH/STS576 and PPROC/STS192 Circuit Packs

---

**Procedure** Perform the following steps to replace the standby SWITCH/STS576 and PPROC/STS192 circuit packs in the 10G shelf with SWITCH/STS768 and PPROC/STS384 circuit packs.

---



### CAUTION

*Do not rock the circuit pack back and forth. To avoid damage carefully slide the circuit pack out of the slot guides.*

**Important!** The *Shelf View* screen shows an **(A)** on an Active circuit pack and an **(S)** on a Standby circuit pack.

- 1 Locate the Standby (non-active) SWITCH/STS576 circuit pack, unlock the circuit pack latches, and remove the circuit pack.
- 



### CAUTION

*Do not rock the circuit pack back and forth. To avoid damage, carefully place the replacement circuit pack into the slot guides and slowly slide it into the shelf (using BOTH hands) until the latch is fully engaged .*

- 2 Install the replacement SWITCH/STS768 circuit pack in the slot.

**Result:** The SWITCH/STS768 circuit pack initializes.



### CAUTION

*Do not rock the circuit pack back and forth. To avoid damage carefully slide the circuit pack out of the slot guides.*

**Important!** The *Shelf View* screen shows an **(A)** on an Active circuit pack and an **(S)** on a Standby circuit pack.

- 3** Locate the Standby (non-active) PPROC/STS192 circuit pack in slot **PPROC 0** or **PPROC 1**, unlock the circuit pack latches, and remove the circuit pack.



### CAUTION

*Do not rock the circuit pack back and forth. To avoid damage, carefully place the replacement circuit pack into the slot guides and slowly slide it into the shelf (using BOTH hands) until the latch is fully engaged .*

- 4** Install the replacement PPROC/STS384 circuit pack in the slot.

**Result:** The PPROC/STS384 circuit pack initializes.

- 
- 5** Wait several minutes for the SWITCH/STS768 and PPROC/STS384 circuit packs to stabilize.

---

N D O F S T E P S



## SE 250-3: Perform Protection Switch

---

**Procedure** Perform the following steps to do a protection switch from the Active switch side to the Standby (non-active) switch side.

---

- 1 At the WaveStar CIT, select **Fault>Protection Switch...**

**Result:** The *Switch Protection* screen appears.

---

- 2 Click on the **Ptn Grp** tab (if required). Then click on **1+1 Equipment esysswitchgrp** and **Select**.

**Result:** The protection switch information appears for the switch protection group.

---

- 3 Verify the information on the screen (note the current **Active Side**) and select a *Manual* switch to the standby (non-active) side in the **Switch Type:** field. Click on **Apply**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**. The standby (non-active) switch side is now active. Click on **Close**.

---

END OF STEPS

---





## Task 251: Verify Receive Section Trace

---

**Purpose** Use this procedure as part of the routine (preventive) maintenance of a system. The frequency of performing this task is left to the discretion of the user, based on the particular system being maintained. The purpose of this task is to ensure that the receive STS-N section trace (J0 byte) for a port matches the expected section trace (as defined in the work instructions/office records).

**Important!** Discrepancies between the receive section trace and the work instructions do not necessarily indicate an immediate problem. However, the importance of following the work instructions for section traces lies in distributing network traffic evenly. Noncompliance with work instructions can result in poor utilization of system resources and affect quality of service.

**Required privilege code(s)** A privilege code of at least M1+P1 is required to perform this task.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Related information** For related information, see *Chapter 2, Maintenance/Trouble Clearing*, in 365-371-211, *WaveStar TDM 2.5G/10G (2-Fiber), Alarm Messages and Troubleclearing Guide*, and the following sections in this document:

- *Chapter 4, Operations Interfaces*
- *Circuit Order/Provisioning Task 358, Provision Section Trace*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Verify the work instructions specify the assigned addresses (AIDs) and provisioned section trace character string(s).
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to verify the received section trace(s).

.....

**1** From the work instructions/office records, determine the section trace character string to be observed for each STS-N section to be verified. (Section is between the source and destination network elements.)

.....

**2** At the WaveStar CIT System View, select **View>View Equipment Details...** .

**Result:** The *View Equipment Details* screen appears.

.....

**3** Open the shelf, circuit pack, and port details by clicking on the plus (+) sign next to each entity.

.....

**4** Highlight the required optical port and click on **Select**.

**Result:** The optical port parameters appear.

.....

**5** Click on the **Trace Settings** tab.

**Result:** The *Section Trace Parameters* appear.

.....

**6** Compare the character string in the *J0 (Section Trace) Retrieval Value:* field with the J0 byte section trace character string from the work instructions/office records, and make a note of any differences.

.....

**7**

| IF...                                      | THEN...                                              |
|--------------------------------------------|------------------------------------------------------|
| additional sections are to be verified,    | go to Step 4.                                        |
| no additional sections are to be verified, | click on <b>Close</b> .<br><b>STOP! End of Task.</b> |

.....

N D O F S T E P S

.....





## Task 252: Change Network Element Login Banner

---

|                                   |                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to change the network element login banner text.                                                                                                                                                                                                                                                                                     |
| <b>Required privilege code(s)</b> | A privilege code of at least S5 is required to perform this task.                                                                                                                                                                                                                                                                                       |
| <b>Required equipment</b>         | The WaveStar Craft Interface Terminal (CIT) is required to perform this task.<br><br><b>Important!</b> Release 6 or later software is required to perform this task.                                                                                                                                                                                    |
| <b>Related information</b>        | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, CIT Tutorial.</i></li></ul>                                                                                                                         |
| <b>Before you begin</b>           | Before you begin this task: <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Verify that the work instructions identify the affected network element and specify the changes to the banner.</li><li>• Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.</li></ul> |
| <b>Procedure</b>                  | Perform the following steps to change the text of the network element login banner.<br><br><hr/> <ol style="list-style-type: none"><li><b>1</b> At the WaveStar CIT System View, select <b>Administration&gt;Change NE Login Banner...</b></li></ol>                                                                                                    |

**Result:** The *NE Login Banner* screen appears.

- 
- 2** Change the network element login banner according to the work instructions and click on **OK**.

**Result:** A dialog box appears asking you to confirm the changes. Click on **Yes**.

---

N D O F S T E P S



# Part III

---

## Circuit Order / Provisioning Tasks



## Task 300: Add DS1 Timing Reference

---

|                                   |                                                                                                                                                                                                        |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to add a DS1 timing reference to a WaveStar TDM 2.5G/10G system.                                                                                                                    |
| <b>Required Privilege Code(s)</b> | A privilege code of at least P3 is required to access the <i>Provision Timing/Sync</i> screen. A privilege code of at least P1 is required to access the <i>View Timing/Sync</i> screen.               |
| <b>Required equipment</b>         | The following equipment is required to perform this task: <ul style="list-style-type: none"><li>• WaveStar Craft Interface Terminal (WaveStar CIT)</li><li>• Wrist strap</li></ul>                     |
| <b>Safety precautions</b>         | To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task. |



### CAUTION

*Wait 3 minutes after performing this task before making any other changes to the WaveStar TDM 2.5G/10G system. In WaveStar TDM 2.5G Release 2, wait 7 minutes after performing this task before making any other changes to the system.*



### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system, to prevent electrostatic discharge damage to sensitive components.*

- Related Information** For related information, see the following sections in this document:
- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
  - *Appendix A, CIT Tutorial*

- Before you begin** Before you begin this task:
- Obtain the work instructions for this task.
  - Verify that the work instructions identify the timing parameters that must be provisioned.
  - Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to add a DS1 timing reference(s) to a WaveStar TDM 2.5G/10G system.

- 
- 1** At the WaveStar CIT, select **View>Timing/Sync ...**

**Result:** The *View Timing/Sync* screen appears.

- 
- 2** Click on the **External Timing Input Ports, Timing Reference, and System Timing** tabs, and compare the information with the work instructions. Then click on **Close**.

---

**3**

| IF the system is a standalone... | THEN...                                                                                                                                                                                                                                       |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WaveStar TDM 2.5G application,   | connect the external timing cable(s) to the shelf and the office building integrated timing supply (BITS) clock.<br><br><b>Reference:</b> <i>SE 300-1: Connect External Timing Cable(s) to a Standalone WaveStar TDM 2.5G System</i>          |
| WaveStar TDM 10G application,    | connect the external timing cable(s) to the first Low Speed 2.5G shelf and the office building integrated timing supply (BITS) clock.<br><br><b>Reference:</b> <i>SE 300-2: Connect External Timing Cable(s) to a WaveStar TDM 10G System</i> |

---

**4** If required, select **Configuration>Timing/Sync**, click on the **External Timing Input Ports** tab, and provision the DS1 port parameters based on the work instructions. Then click on **Apply**.

---

**5** If required, select **Configuration>Timing/Sync**, click on the **Timing Reference** tab, and provision the timing reference parameters based on the work instructions. Then click on **Apply**.

---

**6** If required, select **Configuration>Timing/Sync**, click on the **System Timing** tab, and provision the system timing parameters based on the work instructions. Then click on **OK**.

---

**7** Select **View>Timing/Sync...**

Result: The *View Timing/Sync* screen appears.

---

**8** Click on the **External Timing Input Ports**, **Timing Reference**, and **System Timing** tabs, and verify that the DS1 port parameters, timing reference parameters, and system timing parameters are provisioned correctly.

---

END OF STEPS

---



## SE 300-1: Connect External Timing Cable(s) to a Standalone WaveStar TDM 2.5G System

---

**Procedure** Perform the following steps to connect the timing cable(s) to the shelf and the office BITS clock.

- 
- 1** If required, label the Service Timing cable as **P42** and the Protection Timing cable as **P36**.
  - **2** If required, connect the Service Timing cable (labeled **P42**) to the **SRVE TMG IN** connector (labeled **J42**) on the WaveStar TDM 2.5G shelf backplane.
  - **3** If required, connect the Protection Timing cable (labeled **P36**) to the **PROT TMG IN** connector (labeled **J36**) on the WaveStar TDM 2.5G shelf backplane.
  - **4** Connect the unterminated end of the Service Timing cable and Protection Timing cable to the office BITS clock as required.

---

END OF STEPS





## SE 300-2: Connect External Timing Cable(s) to a WaveStar TDM 10G System

---

**Procedure** Perform the following steps to connect the timing cable(s) to the first Low Speed 2.5G shelf and the office BITS clock.

- 
- 1** If required, label the Service Timing cable as **P42** and the Protection Timing cable as **P36**.
  - **2** If required, connect the Service Timing cable (labeled **P42**) to the **SRVE TMG IN** connector (labeled **J42**) on the shelf backplane.
  - **3** If required, connect the Protection Timing cable (labeled **P36**) to the **PROT TMG IN** connector (labeled **J36**) on the shelf backplane.
  - **4** Connect the unterminated end of the Service Timing cable and Protection Timing cable to the office BITS clock as required.

---

END OF STEPS





# Task 301: Change System Timing Configuration

---

- Purpose** Use this procedure to:
- Change the Provisioned Clock Mode parameter from Free Running to Locked
  - Change the Provisioned Clock Mode parameter from Locked to Free Running
  - Enable or disable System SSM (synchronization status message) mode (Release 4 and later)
  - Change the Timing Reference Wait to Restore parameter
  - Change the Timing Input Format parameter from ESF (extended superframe) to SF (superframe) (Release 4 and later)

**Required privilege code(s)** A privilege code of at least P3 is required to access the *Provision Timing/Sync* screen. A privilege code of at least P1 is required to access the *View Timing/Sync* screen.

- Required equipment** The following equipment is required to perform this task:
- WaveStar Craft Interface Terminal (WaveStar CIT)
  - Wrist strap

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.

*Wait 3 minutes after performing this task before making any other changes to the WaveStar TDM 2.5G/10G system. In WaveStar TDM 2.5G Release 2, wait 7 minutes after performing this task before making any other changes to the system.*



**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system, to prevent electrostatic discharge damage to sensitive components.*

**Related Information** For related information, see the following sections in this document:

- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial*

**Before you begin**

Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the timing parameters that must be provisioned.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task**

Complete the following steps to change the provisioned system timing configuration parameters of the WaveStar TDM 2.5G/10G system.

---

**1**

| IF changing the ...                                                    | THEN go to ... |
|------------------------------------------------------------------------|----------------|
| Provisioned Clock Mode from Free Running to Locked,                    | Step 2.        |
| Provisioned Clock Mode from Locked to Free Running,                    | Step 8.        |
| Timing Reference Wait to Restore parameter,                            | Step 8.        |
| System SSM (Synchronization Status Message) Mode parameter,            | Step 8.        |
| Timing Input Format from ESF (extended superframe) to SF (superframe), | Step 10        |

---

**Important!** Before changing the Provisioned Clock Mode from Free Running to Locked, the DS1 external timing input port(s) must be provisioned, and the timing references must be assigned and provisioned.

- 2** At the WaveStar CIT, select **View>Timing/Sync...**, click on the **External Timing Input Ports** tab, and verify that the port *Timing Input Format* parameter is provisioned correctly.

---

3

| IF the port Timing Input Format parameter is... | THEN...                                                                                                                                                                         |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| provisioned correctly,                          | click on the <b>Timing Reference</b> tab, and verify that the timing references are connected to ports and the system timing reference priority is assigned. Then go to Step 6. |
| not provisioned correctly,                      | click on <b>Close</b> and go to Step 4.                                                                                                                                         |

- 
- 4 Select **Configuration>Timing/Sync**, click on the **External Timing Input Ports** tab, provision the *Timing Input Format* parameter based on the work instructions, and click on **OK**.

- 
- 5 Select **View>Timing/Sync...**, click on the **Timing Reference** tab, and verify that the timing references are connected to ports and the system timing reference priority is assigned.

---

6

| IF the timing reference parameters are... | THEN...                                 |
|-------------------------------------------|-----------------------------------------|
| provisioned correctly,                    | click on <b>Close</b> and go to Step 8. |
| not provisioned correctly,                | click on <b>Close</b> and go to Step 7. |

- 
- 7 Select **Configuration>Timing/Sync**, click on the **Timing Reference** tab, provision the timing reference parameters based on the work instructions, and click on **OK**.

- 
- 8 Select **Configuration>Timing/Sync**, click on the **System Timing** tab, provision the parameters based on the work instructions, and click on **OK**.

- 
- 9** Select **View>Timing/Sync...** , click on the **System Timing** tab, and verify that the system timing parameters are provisioned correctly.

**STOP! End of Task.**

---

**Important!** Software Release 4.0.0 and later releases support the ESF and SF timing input formats.

- 10** At the WaveStar CIT, select **Help>About This Network Element...** and verify the system is running software Release 4.0.0 or later software.

---

**Important!** The LLY2B and LLY2BE TMG/STRAT3 circuit packs support the ESF and SF input timing formats. The LLY2 and LLY2AE TMG/STRAT3 circuit packs support the ESF input timing format only.

- 11** Visually check the 2.5G Tributary Shelf connected to the BITS clock and verify the shelf is equipped with LLY2B or LLY2BE TMG/STRAT3 circuit packs.

The circuit pack apparatus codes can also be viewed by double-clicking on the required circuit pack in the Shelf View screen.

---

**12**

| IF the shelf is...                                         | THEN...                                                                       |
|------------------------------------------------------------|-------------------------------------------------------------------------------|
| equipped with LLY2B or LLY2BE TMG/STAT3 circuit packs      | Continue with Step 13.                                                        |
| not equipped with LLY2B or LLY2BE TMG/STRAT3 circuit packs | Replace the TMG/STRAT3 circuit packs.<br><b>Reference:</b> Operation Task 228 |

- 
- 13** Select **Configuration>Timing/Sync.** Click on the **System Timing** tab and change the *Provisioned Timing Mode* parameter to Free Running. Click on **Apply**.

---

**14** Click on the **Timing Reference** tab and record the provisioning information for the EXTREF1 and EXTREF2 timing references.

---

**15** Select timing reference EXTREF1. Change the *Port AID* parameter to NOT-CONNECTED and the *System Timing Reference Priority* parameter to DISABLE. Click on **Apply**.

Repeat for Timing Reference EXTREF2 and click on **Apply**.

---

**16** Locate the BITS clock that supplies the timing references to the network element and change the BITS clock from ESF to SF format.

---

**17** Click on the **External Timing Input Ports** tab. Change the *Timing Input Format* parameter to SF and the *Apply To:* parameter to **Both exttmg0 and exttmg1**. Click on **Apply**.

---

**18** Click on the **Timing Reference** tab. Provision the EXTREF1 timing reference as recorded in Step 14 and click on **Apply**.

Repeat for EXTREF2 and click on **Apply**.

---

**19** Click on the **System Timing** tab. Change the *Provisioned Clock Mode* parameter to **Locked** and click on **Apply**. Click on **OK** to close the screen.

---

END OF STEPS

---





## Task 302: Create New Optical Port Protection Group

---

**Purpose** Use this procedure to create a new 2-Fiber BLSR, or 1+1 optical port protection group.

**Required privilege code(s)** You must have a security privilege code of at least M4 to provision port protection groups and a security privilege code of at least P3 to provision circuit packs.

**Required equipment** WaveStar Craft Interface Terminal (WaveStar CIT)

**Related Information** For related information, see the following sections in this document:

- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Identify the type of protection group being created.
- Identify the slots, circuit packs, and ports that are being used for this task.
- Be able to log in to an NE with the CIT and be familiar with the functions of the CIT.

**Task** Perform the following steps to create a new port protection group.

---

**1** Use the WaveStar CIT to log in to the network element.

---

**2** On the *System View* toolbar, select **View > Cross-Connections** to verify that no cross-connections have been made on any port to be included in the port protection group

*Note:* When the View Cross Connections window opens, select the shelf, then click **Select** at bottom of window to view cross-connections.

---

3

| IF...                                                                             | THEN...                                                                                                            |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| cross-connections have already been made on any port in the new protection group, | port protection group cannot be created.<br>Refer trouble to your provisioning group.<br><i>Stop! End of Task.</i> |
| no cross-connections have been made on any port in the new protection group,      | continue with the next step.                                                                                       |

---

4 Determine if all required circuit packs are installed and ports are provisioned for the new port protection group.

**Reference:** SE 302-1

---

5

| If the ...                                                                                                           | Then ...                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| required Slot or slots are empty and have not been provisioned for circuit packs,                                    | install and/or provision the required circuit pack(s).<br><b>Reference:</b> T-306                                                                                              |
| required Slot or slots are empty but are preprovisioned for the required circuit packs,                              | install and/or provision the required circuit pack(s).<br><b>Reference:</b> T-306                                                                                              |
| required Slot or slots are empty but preprovisioned for circuit packs that do not support the port protection group, | refer trouble to your provisioning group.<br>You may have to use the <b>Configuration &gt; Delete</b> command to delete the existing circuit pack.<br><i>Stop! End if Task</i> |
| circuit pack (CP) types installed do not support the port protection group,                                          | refer trouble to your provisioning group.<br>You may have to use the <b>Configuration &gt; Delete</b> command to delete the existing circuit pack.<br><i>Stop! End if Task</i> |
| required circuit packs (CP) have been installed, but the ports have not been provisioned,                            | select <b>Configuration &gt; Provision</b> on the System View toolbar to provision the required circuit pack ports.<br><b>Reference:</b> T 307                                 |

| If the ...                                                                           | Then ...                     |
|--------------------------------------------------------------------------------------|------------------------------|
| required circuit packs (CP) have been installed and the ports have been provisioned, | continue with the next step. |

- 
- 6** On the *System View* toolbar, select **Configuration > Create New > Protection Group**.

**Result:** The Create New Protection Group window opens.

- 
- 7** In the **Create New Protection Group** window:

1. Select the **Ptn Grp** at bottom of window.
2. Select the required bay.
3. Select the required shelf.
4. Click the **Select I/O Shelf** button at bottom of window.

**Result:** Provisionable parameter area displays on right side of window.

- 
- 8** Choose the desired port **Protection Type** from the drop-down menu box:

- 2-Fiber BLSR
- 1 + 1

**Result:** Provisionable parameters display for the selected port protection type.

- 
- 9** Provision the required parameters for the selected port protection group.

*Note:* For help in creating the protection group and provisioning the required parameters, see “Configuration — Creating New Optical Port Protection Groups” in *Chapter 7, Provisioning, Security, and Administration*.

---

**10** Verify all parameters are correct. Click **Apply** to make the changes.

**Result:** Verification window opens stating creation of a new protection group may affect the NE and asks if you want to execute the command.

---

**11** Click **Yes**.

**Result:** DCC Terminations Provisioning message appears indicating the LAPD role of User Side (default).

---

**12** Click **OK**, then click **Close**.

---

**13** Enable DCC channel terminations, as required.

---

END OF STEPS

---



## SE 302-1: Determine Provisioning Status of Optical Transmission Circuit Packs and Ports

---

**Procedure** Perform the following steps to determine if the required circuit packs are installed and the required optical ports are provisioned.

---

- 1 On the *System View* toolbar, select **View > View Equipment Details**

**Result:** **View Equipment Details** window opens

---

- 2 Open the bay, then open the shelf details by clicking on the plus (+) sign next to the required shelf.
- 

- 3 Find the required slots in the shelf equipment list. Select a required slot, then click **Select**.

**Result:** **View Slot/Circuit Pack Details** window opens.

---

4

| If ...                                                                                                                                  | Then ...                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| only Slot is listed and no circuit pack is listed for the required slot,                                                                | no circuit pack has been installed and the slot has not been preprovisioned for a circuit pack (Holder Status: Empty).<br>Return to the main task. |
| the required CP is listed for a required slot but the circuit pack is not installed (Holder Status: Empty),                             | the slot has been preprovisioned for the correct type of circuit pack.<br>Return to the main task.                                                 |
| a CP is listed and uninstalled for a required slot, but the circuit pack type does not support the port protection group being created, | the slot has been preprovisioned for the type of circuit pack listed (Holder Status: Empty).<br>Return to the main task.                           |

| If ...                                                                                                                                     | Then ...                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| a CP type is listed and installed for a required slot, but the circuit pack type does not support the port protection group being created, | the slot is already equipped and provisioned with the listed circuit pack (Holder Status: Valid).<br>Return to the main task. |
| the correct CP type is listed and installed for the type of port protection group being created,                                           | the required circuit pack has been installed in the required slot (Holder Status: Valid).<br>Continue with the next step.     |

---

**5** Continue with the next step.

1. Click on the plus (+) sign next to the required circuit pack.
2. Select the port.
3. Click **Select** at bottom of window.
4. Verify that all the required port parameters are correct.

**Result:** View Optical Port Details window opens.

---

**6** Repeat this procedure for each of the required slots, circuit packs, and ports.

---

END OF STEPS



## Task 303: Create New Cross-Connection

---

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to create a new cross-connection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required privilege code(s)</b> | You must have a security privilege code of at least P3 to perform this task.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Required equipment</b>         | WaveStar Craft Interface Terminal (WaveStar CIT)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Related information</b>        | <p>For related information, see the following sections in this document</p> <ul style="list-style-type: none"><li>• <i>Circuit Order/Provisioning Task 304, Modify/Delete/Roll Cross-Connections</i></li><li>• <i>Circuit Order/Provisioning Task 365, View Intershelf Bandwidth Utilization</i></li><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, WaveStar CIT Tutorial</i></li></ul>                                                                                                                           |
| <b>Before you begin</b>           | <p>Before you begin this task, you must:</p> <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Determine the cross-connection(s) to be made.</li><li>• Identify the tributaries for the cross-connections.</li><li>• Log in to the NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul>                                                                                                                                                                                      |
| <b>Task</b>                       | <p>Complete the following steps to create a new cross-connection.</p> <hr/> <ol style="list-style-type: none"><li><b>1</b> From the <i>System View</i> toolbar, select <b>View &gt; Rings &gt; Ring Map</b> to select and view all the nodes in a selected ring, if required.</li></ol> <hr/> <ol style="list-style-type: none"><li><b>2</b> From the <i>System View</i> toolbar, select <b>View &gt; View Equipment Details</b> and verify that all slots, circuit packs, ports, protection groups, and required tributaries have been provisioned.</li></ol> |

**Reference:** SE 303-1

---

3

| IF ...                                                                                          | THEN...                                                                                                                                         |
|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| circuit packs, ports, protection groups, and/or required tributaries have not been provisioned, | refer trouble to your provisioning group. Equipment entities must be provisioned before you make cross-connections.<br><i>Stop! End of Task</i> |
| circuit packs, ports, protection groups, and required tributaries have been provisioned,        | on the <i>System View</i> toolbar, select <b>View &gt; Cross Connections</b> .<br><b>Result:</b> The View Cross Connections window opens.       |

---

4 Enter the AID of the tributary being connected or expand the equipment list to the required tributary. Click **Select**.

**Result:** The **View Cross Connections for ...** window opens.

---

5

| IF...                                                    | THEN...                                                                                                                                                                 |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| the required tributary has already been cross-connected, | click <b>Close</b> and refer trouble to your provisioning group.<br><i>Stop! End of Task</i>                                                                            |
| the required tributary has not been cross-connected,     | click <b>Close</b> and select <b>Configuration &gt; Cross-Connection</b> on the <i>System View</i> toolbar.<br><b>Result:</b> The Cross Connection Wizard window opens. |

---

6 Select **Create a new cross-connection**, then click **Next**.

---

7 Follow the directions in the remaining windows to create the new cross-connection.



- 
- 8** Verify cross-connection parameters, then click **Finish** at the end of the wizard windows.

| IF...                                                 | Then...                                                                                           |
|-------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| other cross-connections are being made at this NE,    | repeat this procedure for all cross-connections to be made at this node.                          |
| no other cross-connections are being made at this NE, | click <b>Close</b> , then click <b>Yes</b> to confirm your exit from the Cross Connection Wizard. |

- 
- 9** On the *System View* toolbar, use the **View > Cross Connection** menu to verify the correct cross connection was made.

- 
- 10** Log off the NE and log in to the next NE requiring a cross-connection. Repeat this procedure for all NEs requiring a cross-connection from your work instruction.

---

END OF STEPS



## SE 303-1: View Equipment Details for Provisioned Status

---

- Purpose** Perform the following steps to view the provisioned status for any of the following:
- Shelf
  - Slot or circuit pack
  - Port
  - Port Protection Group
  - Tributary

**Task** .....

- 1** On the *System View* toolbar, select **View > View Equipment Details**, if not already performed.

**Result:** **View Equipment Details** window opens.

.....

- 2** Open the bay, then open the shelf details by clicking on the plus (+) sign next to the required shelf.
- .....

- 3** View the required slots in the shelf equipment list.
- .....

**4**

| IF...                                                                                                       | THEN...                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| only Slot is listed and a circuit pack is not listed for the required slot,                                 | a circuit pack has not been installed and the slot has not been preprovisioned for a circuit pack (Holder Status: Empty).<br>Return to the main task. |
| the required CP is listed for a required slot but the circuit pack is not installed (Holder Status: Empty), | the slot has been preprovisioned for the correct type of circuit pack.<br>Return to the main task.                                                    |
| a CP is listed and uninstalled for a required slot, but the circuit pack type is not the correct type,      | the slot has been preprovisioned for the type of circuit pack listed (Holder Status: Empty).<br>Return to the main task.                              |

| IF...                                                                                                     | THEN...                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| a CP type is listed and installed for a required slot, but the circuit pack type is not the correct type, | the slot is already equipped and provisioned with the listed circuit pack (Holder Status: Valid).<br>Return to the main task. |
| the CP type listed and installed is the same type circuit pack you are provisioning,                      | the required circuit pack is installed in the required slot (Holder Status: Valid).                                           |

- 
- 5** Continue to expand the equipment list. Highlight the required circuit pack, port, or tributary and click **Select** to view the provisioning details.
- 

- 6** Click **Close** at bottom of window.

---

END OF STEPS

---





## Task 304: Modify/Delete/Roll Cross-Connection

---

**Purpose** Use this procedure to modify, delete, or roll an existing cross-connection. Use task procedure T-303 to create a new cross-connection.

In Release 5 and later releases, rolling an existing cross-connection from a VCG tributary to another tributary is not supported.



### CAUTION

*Modifying, deleting, or rolling a cross connection can cause service interruption. Rolling a cross connection disconnects a circuit input tributary from an output tributary and then connects the input tributary to another output tributary. To prevent an interruption of transmission, all the required paths in the new path must be set up before rolling a cross connection.*

**Required privilege code** You must have a security privilege code of at least P3 to perform this task.

**Required equipment** WaveStar Craft Interface Terminal (WaveStar CIT)

**Related Information** For related information following sections in this document:

- *Circuit Order/Provisioning Task 365, View Intershelf Bandwidth Utilization*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Before you begin this task, you must:

- Obtain the work instructions for this task.
- Determine the cross-connection(s) to be modified, deleted, or rolled.
- Identify the tributaries for the cross-connections.
- Login to the NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to modify, delete, or roll an existing cross-connection.

---

- 1** Select **View > Cross Connections** from the *System View* or *Shelf View* toolbar.

**Result:** The **View Cross Connections** window opens.

---

- 2** Select the **Equipment** or **Ptn Grp** tab and then expand and highlight the shelf, circuit pack, port, or tributary you want to view.
- 

- 3** Click **Select** to view existing cross-connections.

**Result:** The **View Cross-Connections for ...** window opens.

---

- 4** Select (highlight) the connection to view properties of the cross-connection.

**Result:** Properties display at bottom of screen.

---

**5**

| IF...                                                                                    | THEN...                                                                                                         |
|------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| the tributary has an existing cross-connection loopback or Redline parameter set to Yes, | determine reason for the condition before performing cross-connection requests.<br>Continue with the next step. |

---

- 6** Click **Close**, then select **Configuration > Cross-Connection** from the *System View* or *Shelf View* toolbar.

**Result:** The **Cross Connection Wizard** window opens.

---

- 7** Select your task from one of the following:
  - Modify parameters on an existing cross-connection
  - Delete leg(s) of an existing cross-connection

- Roll a cross-connection leg from one tributary to another.

**Example:** See task T 344 for an example of bridging and rolling an existing cross-connection.

- 
- 8** Click **Next** and read and follow all directions in the remaining windows to modify, delete, or roll the cross-connection.
- 

- 9** Verify cross-connection parameters, then click **Finish** at the end of the wizard windows.

| IF...                                                       | THEN...                                                                         |
|-------------------------------------------------------------|---------------------------------------------------------------------------------|
| other cross-connection requests are being made at this NE,  | repeat this procedure for other cross-connection requests.                      |
| no other cross-connection requests are required at this NE, | click <b>Close</b> , then click <b>Yes</b> to exit the cross-connection wizard. |

---

- 10** On the *System View* or *Shelf View* toolbar, use the **View > Cross Connections** menu to verify the correct cross-connection request was made.
- 

- 11** Log off the NE and log in to the next NE requiring a cross-connection request. Repeat this procedure for all NEs required on your work instruction.

---

END OF STEPS

---







## Task 305: Enable/Disable DCC Terminations

---

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | Use this procedure to enable or disable optical interface DCC terminations.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Required privilege code</b> | You must have a security privilege code of at least S3 to perform this task.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Required equipment</b>      | WaveStar Craft Interface Terminal (WaveStar CIT)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Related information</b>     | <p>For related information, see the following sections in this document:</p> <ul style="list-style-type: none"><li>• <i>Chapter 6, Control, Transmission, and Synchronization Interfaces</i></li><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, WaveStar CIT Tutorial</i></li></ul>                                                                                                                                                                                                |
| <b>Before you begin</b>        | <p>Prior to performing this task, you must:</p> <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Identify the circuit packs and ports for DCC terminations.</li><li>• Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul>                                                                                                                                                                                           |
| <b>Task</b>                    | <p>Complete the following steps to provision DCC terminations.</p> <hr/> <p><b>1</b> Use the WaveStar CIT to log in to the , R4.</p> <hr/> <p><b>2</b> On the <i>System View</i> menu, select <b>View &gt; DCC Terminations</b>.</p> <p><b>Result:</b> The <b>View DCC Terminations</b> window opens.</p> <hr/> <p><b>3</b> Select the required bay, shelf, and <b>CP dccei (ADJCTL/DCCEI)</b> circuit pack, then click <b>Select DCC Pack</b>.</p> <p><b>Result:</b> The <b>View DCC Terminations</b> detail window opens.</p> |

- 
- 4 Verify that enough **Remaining Channels** are available for the ports being terminated.

| IF...                                  | THEN...                                                                                                                                          |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| not enough DCC channels are available, | refer trouble to your provisioning group.<br>You may have to disable other DCC channels before completing this task.<br><i>Stop! End of Task</i> |
| enough DCC channels are available,     | Click <b>Close</b> .                                                                                                                             |

- 
- 5 On the *System View* menu, select **Configuration > DCC Terminations**.

**Result:** Configure DCC Terminations window opens.

- 
- 6 Select the required bay, shelf and **CP dccei (ADJCTL/DCCEI)** circuit pack, then click **Select** at bottom of window.

**Result:** Provisionable parameters area displays on right side of window.

- 
- 7 Select **Current Terminations** to provision an existing DCC termination, or select **New Termination** to provision a new DCC termination.

- 
- 8 Select a port for Current/New Termination.

- 
- 9 Verify port and protection group AID.

- 
- 10 Select **DCC Terminations** as **Enabled** or **Disabled**.

**Important!** One end of line should be set to User Side and the other end of the line should be set to Network Side.

- 
- 11** Select **LAPD Role** as **USER-SIDE** or **NETWORK-SIDE**, as required.  
Provision other parameters as required.

**Important!** If you disable a DCC channel at one NE then you may have to disable the DCC channel at the other end to prevent alarms.

- 
- 12** Click **Apply** to make changes.

**Result:** Verification window opens stating execution of the command may affect NE service and asks if you want to execute the command.

- 
- 13** Click **Yes**, then click **Close** to exit.

---

END OF STEPS





# Task 306: Install and Provision Transmission Circuit Packs/Port Units

---

**Purpose** Use this procedure to install and provision transmission circuit packs/port units.

**Required privilege code** You must have a security privilege code of at least P3 to perform this task.

**Required equipment** The following are required in order to complete this task

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist Strap

**Related information** For related information, see the following sections in this document:

- *Chapter 6, Control, Transmission, and Synchronization Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Identify the slots and circuit packs being installed or provisioned.
- Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to install and provision transmission port units.

---

**1** Use the WaveStar CIT to log in to the network element.

---

**2** On the *System View* menu, select **View > View Equipment Details** to view the equipment details for the slot and circuit pack you are installing and provisioning.

**Reference:** SE 306-1

---

### 3

| IF the ...                                                                                              | THEN...                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Slot is empty and has not been preprovisioned for a circuit pack,                                       | Continue with Step 4.                                                                                                                                                                     |
| slot is empty but is preprovisioned for the required circuit pack,                                      | Continue with Step 4.                                                                                                                                                                     |
| slot is empty but preprovisioned for a circuit pack different from the circuit pack you are installing, | refer trouble to your provisioning group.<br>You may have to use the <b>Configuration &gt; Delete</b> command to delete the circuit pack before you continue.<br><i>Stop! End of Task</i> |
| slot is already equipped with a circuit pack (CP) different from the circuit pack you are installing,   | refer trouble to your provisioning group.<br>You may have to use the <b>Configuration &gt; Delete</b> command to delete the circuit pack before you continue.<br><i>Stop! End of Task</i> |
| required circuit pack (CP) has been installed, but the circuit pack has not been provisioned,           | continue with Step 6.                                                                                                                                                                     |
| required circuit pack (CP) has already been installed and the circuit pack has been provisioned,        | <i>Stop! End of Task</i>                                                                                                                                                                  |

- 
- 4 Install required circuit pack into the required slot. Wait until the green LED lights steadily.

**Result:** Green LED blinks for several minutes, then lights steadily.

---

- 5 On the *System View* menu, select **View > View Equipment Details** to verify circuit pack is listed correctly.
- 

- 6 Provision or verify circuit pack parameters.

**Reference:** SE 306-2

7

| IF...                                             | THEN...                                                  |
|---------------------------------------------------|----------------------------------------------------------|
| circuit pack ports are being provisioned now,     | provision circuit pack ports.<br><b>Reference:</b> T 307 |
| circuit pack ports are not being provisioned now, | <i>Stop! End of Task</i>                                 |

END OF STEPS



## SE 306-1: View Equipment Details for Slot and Circuit Pack Provisioning

---

**Procedure** Perform the following steps to view the equipment details for the shelf, slots, and circuit pack provisioned status.

---

- 1** On the *System View* toolbar, select **View > View Equipment Details**

**Result:** **View Equipment Details** window opens.

---

- 2** Open the bay, then open the shelf details by clicking on the plus (+) sign next to the required shelf.
- 

- 3** Open the bay, then open the shelf details by clicking on the plus (+) sign next to the required shelf.

**Result:** **View Slot Details...** or **Circuit Pack Details...** window opens.



---

**4**

| <b>IF...</b>                                                                                                                      | <b>THEN...</b>                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| only Slot is listed and a circuit pack is not listed for the required slot,                                                       | a circuit pack has not been installed and the slot has not been preprovisioned for a circuit pack (Holder Status: Empty).         |
| the required circuit pack (CP) type is displayed but not installed in the required slot,                                          | the slot has been preprovisioned for the type of circuit pack listed, but a circuit pack is not installed (Holder Status: Empty). |
| a circuit pack (CP) type is displayed but not installed, and the circuit pack is not the same type as the one you are installing, | the slot has been preprovisioned for the type of circuit pack listed, but a circuit pack is not installed (Holder Status: Empty). |
| a circuit pack (CP) type is displayed and installed, but the circuit pack is not the same type as the one you are installing,     | the slot is already equipped and provisioned with the listed circuit pack (Holder Status: Valid).                                 |
| the circuit pack (CP) type listed is installed and is the same type circuit pack you required,                                    | the required circuit pack has already been installed in the required slot (Holder Status: Valid).                                 |

---

END OF STEPS

---



## SE 306-2 : Provision Circuit Pack Parameters

---

**Procedure** Perform the following steps to provision a circuit pack.

- 
- 1** On the *System View* toolbar, select **Configuration > Provision**.

**Result:** **Provision Parameters ...** window opens.

- 
- 2** Open the bay, then open the shelf details by clicking on the plus (+) sign next to the required shelf.

- 
- 3** Select the required circuit pack, then click **Provision**.

**Result:** Provisionable parameter area displays on right side of window.

- 
- 4** Provision parameters as required.

- 
- 5** Verify parameters are correct.

- 
- 6** Click **Apply** to apply any changes, then click **Close**.

---

END OF STEPS



## Task 307: Provision Transmission Circuit Pack Ports

---

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to provision optical port unit and DS3/EC1 circuit pack ports after circuit packs are installed and provisioned.                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Required privilege code(s)</b> | You must have a security privilege code of at least P3 to perform this task.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Required equipment</b>         | WaveStar Craft Interface Terminal (CIT)                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Related information</b>        | <p>For related information, see the following sections in this document:</p> <ul style="list-style-type: none"><li>• <i>Chapter 6, Control, Transmission, and Synchronization Interfaces</i></li><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, WaveStar CIT Tutorial</i></li></ul>                                                                                                                                                                      |
| <b>Before you begin</b>           | <p>Prior to performing this task, you must:</p> <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Identify the circuit packs and ports being provisioned.</li><li>• Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul>                                                                                                                                                                    |
| <b>Task</b>                       | <p>Complete the following steps to provision ports of transmission port units.</p> <hr/> <ol style="list-style-type: none"><li><b>1</b> Use the WaveStar CIT to log in to the network element.</li><li><b>2</b> On the <i>System View</i> menu, select <b>View &gt; View Equipment Details</b> to view the equipment details for the slot and circuit pack with the ports you are provisioning.</li></ol> <p><b>Result:</b> View Equipment Details window opens</p> <p><b>Reference:</b> SE 307-1</p> |

3

| IF...                                                                                                  | THEN...                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| The Slot is empty,                                                                                     | refer trouble to your provisioning group.<br>This task assumes the correct circuit pack is installed.<br><i>Stop! End of Task</i>                       |
| The slot is equipped with a circuit pack (CP) different from the circuit pack you expect to provision, | refer trouble to your provisioning group.<br>This task assumes the correct circuit pack is installed.<br><i>Stop! End of Task</i>                       |
| The CP type is listed with the same type circuit pack you expect to provision,                         | highlight the circuit pack and click <b>Select</b> at bottom of window.<br>View circuit pack details for proper provisioning, then click <b>Close</b> . |

4 If the circuit pack has not been provisioned, you must provision the circuit pack before you provision the ports.

**Reference:** T 306

5 On the *System View* menu, select **Configuration > Provision**.

**Result:** The **Provision Parameters ...** window opens.

6 Open the bay, shelf, and circuit pack details by clicking on the plus (+) sign next to each entity.

7 Highlight the required port, then click **Provision**.

**Result:** Provisionable parameter area displays on right side of window.

8 Provision parameters as required.

9 Verify parameters are correct.

- 
- 10** Click **Apply** to make changes.

**Result:** Verification window opens stating execution of the command may affect NE service and asks if you want to execute the command.

---

- 11** Click **Yes**, then click **Close** to exit.

---

END OF STEPS

---



## SE 307-1: View Equipment Details for Slot and Circuit Pack Provisioning

---

**Procedure** Perform the following steps to view the equipment details for the shelf, slots, and circuit pack provisioned status.

- 
- 1 On the *System View* toolbar, select **View > View Equipment Details**, if not already performed.

**Result:** **View Equipment Details** window opens

- 
- 2 Open the bay, then open the shelf details by clicking on the plus (+) sign next to the required shelf.

- 
- 3 View the required slots in the shelf equipment list..

---

- 4

| IF...                                                                                                                                         | THEN ...                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| only Slot is listed and no circuit pack is listed for the required slot,                                                                      | no circuit pack has been installed and the slot has not been preprovisioned for a circuit pack (Holder Status: Empty).<br>Return to the main task.            |
| the required circuit pack (CP) type is displayed but not installed in the required slot,                                                      | the slot has been preprovisioned for the type of circuit pack listed, but a circuit pack is not installed (Holder Status: Empty).<br>Return to the main task. |
| a circuit pack (CP) type is displayed but not installed, but the circuit pack listed is not the same type as the one you expect to provision, | the slot has been preprovisioned for the type of circuit pack listed, but a circuit pack is not installed (Holder Status: Empty).<br>Return to the main task. |

| IF...                                                                                                                              | THEN ...                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| a circuit pack (CP) type is displayed and installed, but the circuit pack is not the same type as the one you expect to provision, | the slot is equipped and provisioned with the listed circuit pack (Holder Status: Valid).<br>Return to the main task. |
| the circuit pack (CP) type listed is installed and is the same type circuit pack you expect to provision,                          | the required circuit pack is installed in the required slot (Holder Status: Valid).                                   |

---

**5** Click **Close** at bottom of window.

---

END OF STEPS







## Task 308: Delete Optical Port Protection Group

---

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to delete an existing optical port protection group.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required privilege code(s)</b> | You must have a security privilege code of at least M4 to perform this task.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Required equipment</b>         | WaveStar Craft Interface Terminal (CIT)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Related information</b>        | <p>For related information, see the following sections in this document:</p> <ul style="list-style-type: none"><li>• <i>Chapter 6, Control, Transmission, and Synchronization Interfaces</i></li><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, WaveStar CIT Tutorial</i></li></ul>                                                                                                                                                                                                                                                                                                                  |
| <b>Before you begin</b>           | <p>Prior to performing this task, you must:</p> <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Identify the protection group AID, slots, circuit packs, and ports that are associated with the port protection group being deleted.</li><li>• Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul>                                                                                                                                                                                                                                   |
| <b>Task</b>                       | <p>Perform the following steps to delete an existing port protection group.</p> <hr/> <p><b>1</b> Use the WaveStar CIT to login to the network element.</p> <hr/> <p><b>2</b> Remove service, then delete any existing cross-connections on any port associated with the port protection group being deleted. Also delete any line timing references associated with the optical ports in the protection group being deleted.</p> <p><b>Reference:</b> T 304</p> <hr/> <p><b>3</b> On the <i>System View</i> or <i>Shelf View</i> toolbar, select <b>View &gt; Protection</b>.</p> <p><b>Result:</b> The <b>View Protection</b> window opens.</p> |

- 
- 4** Select the **Ptn Grp** tab, then select the bay, shelf, and protection group you want to view.
- 

- 5** Click **Select**.

**Result:** The **Protection Group** parameters displays.

---

- 6** Verify no protection switches exist on any port of the port protection group, then click **Close**.
- 

- 7** On the *System View* or *Shelf View* toolbar, select **Configuration > Delete**

**Result:** The **Delete** window opens.

---

- 8** Select the **Ptn Grp** tab, then open the Bay and Shelf details and select (highlight) the port protection group being deleted.
- 

- 9** Click **Select** at bottom of window.

**Result:** A deletion confirmation window opens to display the parameters of the selected group.

---

- 10** Verify you have selected the correct port protection group to be deleted, then click **Yes**.

**Result:** A warning window opens asking if you want to execute the command.

---

- 11** Click **Yes** to delete the port protection group.

---

END OF STEPS

---



## Task 309: Modify Existing Optical Port Protection Group

---

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to modify an existing optical port protection group.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Required privilege code(s)</b> | You must have a security privilege code of at least M4 to perform this task.                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Required equipment</b>         | WaveStar Craft Interface Terminal (CIT)                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Related information</b>        | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• <i>Chapter 6, Control, Transmission, and Synchronization Interfaces</i></li><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, WaveStar CIT Tutorial</i></li></ul>                                                                                                                                                               |
| <b>Before you begin</b>           | Prior to performing this task, you must: <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Identify the slots, circuit packs, and ports that are associated with the port protection group being modified.</li><li>• Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul>                                                                                                     |
| <b>Task</b>                       | Perform the following steps to modify an existing port protection group.<br><br><hr/> <ol style="list-style-type: none"><li><b>1</b> Use the WaveStar CIT to login to the NE.</li><li><b>2</b> On the <i>System View</i> toolbar, select <b>Configuration &gt; Provision</b><br/><br/><b>Result:</b> The <b>Provision Parameters for Protection Group...</b> window opens.</li><li><b>3</b> Select the <b>Ptn Grp</b> tab and open the required bay and shelf configurations.</li></ol> |

- 
- 4 Select the port protection group being modified, then click the **Provision** button.

**Result:** Provisionable parameters area displays on right side of window.

- 
- 5 Verify the AID of the port protection group being modified.

- 
- 6 Modify parameters as required.

- 
- 7 Verify that all parameters are correct.

- 
- 8 Click **Apply**.

**Result:** A warning window opens asking if you want to execute the command.

- 
- 9 Click **Yes** to execute, then click **Close** to exit.

---

END OF STEPS



## Task 313: Create 1XN Electrical Equipment Protection Group

---

|                                   |                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to create/verify a 1XN DS3/EC1 electrical equipment protection group.                                                                                                                                                                                                                                                             |
| <b>Required privilege code(s)</b> | You must have a security privilege code of at least M4 to perform this task.                                                                                                                                                                                                                                                                         |
| <b>Required equipment</b>         | WaveStar Craft Interface Terminal (CIT)                                                                                                                                                                                                                                                                                                              |
| <b>Related information</b>        | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, WaveStar CIT Tutorial</i></li></ul>                                                                                                              |
| <b>Before you begin</b>           | Prior to performing this task, you must: <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Verify no alarms exist, especially alarms indicating illegal circuit pack types.</li><li>• Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul> |
| <b>Task</b>                       | Complete the following steps to create a 1XN DS3/EC1 electrical equipment protection group.                                                                                                                                                                                                                                                          |

- 
- 1** Log in to the NE then select **View > View Equipment Details** from the *System View* toolbar.

**Result:** **View Equipment Details** window opens.

---

- 2** Expand the required bay and shelf details by clicking on the plus (+) symbol next to the shelf.
- 

- 3** View the **eprn (DS3EC1/8)** and **eprotsw (SWITCH/DS3EC1)** slots in the shelf details.

---

4

| IF...                                                                               | THEN...                                                                                        |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| the <b>eprn</b> and <b>eprtsw</b> slots are equipped with the proper circuit packs, | the 1XN electrical equipment protection group is already established.<br>Continue with Step 7. |
| either of the required slots is empty,                                              | continue with Step 5.                                                                          |

---

5 View slot 16 in the required shelf details

| IF...                                                           | THEN...                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| slot 16 is equipped with an optical port unit,                  | the electrical protection group cannot be established. Slot 16 must be empty (not provisioned) or contain only a DS3/EC1 port unit if 1XN electrical protection is required.<br><br>Refer trouble to your provisioning group.<br><i>Stop! End of Task</i> |
| slot 16 is unequipped or equipped with a DS3EC1/8 circuit pack, | continue with Step 6.                                                                                                                                                                                                                                     |

---

6 Install and provision a DS3EC1/8 protection circuit pack and SWITCH/DS3EC1 circuit pack into the eprn and eprtsw slots, respectively. Install other DS3EC1/8 circuit packs at this time, if required.

**Reference:** T 306

---

7 On the *System View* toolbar, select the **Configuration > Provision** command.

**Result:** The **Provision Parameters for Protection Group...** window opens.

---

8 Select the **Ptn Grp** tab at bottom of window, then open the bay and shelf details as required.

- 
- 9** Select the **1XN Equipment eds3ec1grp** protection group, then click **Provision** at bottom of window.

**Result:** The provisionable parameters area displays on right side of window.

---

- 10** Verify the protection group AID. Provision the parameters as required.
- 

- 11** Click **Apply** if you made any changes.

**Result:** A warning window opens asking if you want to execute the command.

---

- 12** Click **Yes**, then click **Close** to exit.

---

END OF STEPS

---







## Task 314: Provision Path Trace

---

|                                   |                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to provision the transmit path trace fields of one or more 1-way STS-1 signals. Path trace is only applicable to a DS3EC1/8 port unit because it is an STS-1 terminating device, whereas OC3/STM1, OC12/STM4, OC48/STM16 port units are not STS-1 terminating devices. This procedure can be performed from any WaveStar TDM 2.5G/10G system in the network. |
| <b>Required privilege code(s)</b> | A privilege code of at least P3+M1 is required to perform this task.                                                                                                                                                                                                                                                                                                            |
| <b>Required equipment</b>         | A WaveStar Craft Interface Terminal (CIT) is required to perform this task.                                                                                                                                                                                                                                                                                                     |
| <b>Safety precautions</b>         | To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.                                                                                                                                                                          |



### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system, to prevent electrostatic discharge damage to sensitive components.*

|                            |                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Related information</b> | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• <i>Chapter 6, Control, Transmission, and Synchronization Interfaces</i></li><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Operation Task 208, Verify Receive Path Trace</i></li><li>• <i>Appendix A, CIT Tutorial</i></li></ul> |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

For related information in 365-371-211, *Alarm Messages and Trouble Clearing Guide*, see *Chapter 2, Maintenance/Trouble Clearing*.

**Before you begin**

Before you begin this task:

- Obtain the work instructions for this task and note the assigned addresses (AIDs).
- Determine which WaveStar TDM 2.5G/10G systems are the source network element and the destination network element for the STS-1 path(s) to be provisioned.
- Determine the write format (Release 4 and later) and path trace character string for each STS-1 path to be provisioned (path is between the source and destination network elements).
- Verify that a WaveStar CIT is connected and logged in to the source network element for the first STS-1 path to be provisioned.

**Task** Complete the following steps to provision the STS-1 path trace fields of one or more 1-way STS-1 signals.

---

**1** Provision path trace at the source network element.

**Reference:** *SE 314-1: Provision Path Trace at a Network Element*

---

**2** Terminate the log in session at the source network element.

---

**3** Log in to the destination network element for the first STS-1 path to be provisioned.

---

**4** Provision path trace at the destination network element.

**Reference:** *SE 314-1: Provision Path Trace at a Network Element*

---

**5** Terminate the log in session at the destination network element.

- 
- 6** Check the provisioning just done by verifying the STS-1 receive path trace signal.

**Reference:** *Operation Task 208, Verify Path Trace*

---

END OF STEPS

---



## SE 314-1: Provision Path Trace at a Network Element

---

**Procedure** Perform the following steps to provision path trace at the source or destination network element.

- 
- 1 At the WaveStar CIT, select **Configuration>Provision...**

**Result:** The *Provision Parameters for Protection Group or Equipment* screen appears.

---

- 2 Open the shelf, circuit pack, and port details by clicking on the plus (+) sign next to each entity.
- 

- 3 Highlight the required DS3 port and click on **Provision**.

**Result:** The DS3 port parameters appear.

---

- 4 Provision the **STS-1 Path Trace** parameter(s) according to the work instructions and click on **Apply**.

**Result:** In Release 4, a dialog box appears asking you to confirm executing this command. In Release 3 and earlier releases, a dialog box appears asking to pad the path trace with blanks. Click on **Yes** and another dialog box appears asking you to confirm executing this command.

---

- 5 Repeat Step 2 through Step 4 for any additional STS-1 paths to be provisioned.

END OF STEPS

---



## Task 315: Alarm Severity Assignment Profile (ASAP) — Create/Provision

---

**Purpose** The system software contains one default profile for each of the different profile types. Depending on previous provisioning, the system may already contain other defined profile types.

Use this procedure to do the following:

- Create a new ASAP profile.
- Provision or modify an existing ASAP profile.

**Required privilege code(s)** You must have a privilege code of at least M3 to provision ASAP profiles. You must have a privilege code of at least M1 to view ASAP profiles.

**Required equipment** WaveStar Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Prior to performing this task, you must:

- Obtain the work instructions for this task that detail the following:
  - The type and name of the ASAP profile to be provisioned or created
  - The alarm severity parameter(s) to be changed or entered in the existing or new profile

You may want to keep the same ASAP profile type definitions for all the NEs. It is recommended that the name/ acronym of the network provider for the connected service be used as the ASAP name (for example, ATT or MCI). The WaveStar CIT **ASAP Name:** screen field supports name lengths up to a maximum of 24 ASCII characters.

You cannot change the name of a default profile or an active profile. A profile is active if it has been assigned to any network entity, for example to an OC-n port.

- If you want to change the name of an active profile:
  1. Create a new profile with the proper name.

2. Change the parameter values as necessary.
  3. Provision the required entities with the new profile.
  4. Delete the previous profile, if supported by the software release.
- If this approach is not possible because the allowable number of profiles would be exceeded, then:
    5. Temporarily assign the “Default” profile to the entities that are using the existing active profile.
    6. Provision the existing profile in order to change the profile name.
    7. Provision the required entities with the new profile name.
  - Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to create or modify/provision an ASAP profile.

---

**1** Use the WaveStar CIT to log in to the network element.

---

**2** Select **Configuration > Alarms > Alarms Severity Assignment Profile** on the *System View* toolbar.

**Result:** The **Provision Alarm Severity Profile** window opens.

---

**3**

| IF you want...                | Then..                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| to create a new ASAP profile, | <ol style="list-style-type: none"> <li>1. Select <b>New ASAP</b> at top of window.</li> <li>2. Click on (highlight) the <b>ASAP Type</b> to be created.</li> <li>3. Click <b>New ASAP</b> at bottom of window.</li> <li>4. Enter name of the new ASAP profile type in the <b>ASAP Name:</b> box.</li> <li>5. Continue with Step 5.</li> </ol> <p><b>Result:</b> Default profile type parameters display on right side of window.</p> |

| IF you want...                                   | Then..                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| to modify or provision an existing ASAP profile, | <ol style="list-style-type: none"> <li>1. Select <b>Provision ASAP</b> at top of window.</li> <li>2. Click on the plus (+) sign next to the <b>ASAP Type</b> to open the list of ASAP profiles.</li> <li>3. Select (highlight) the ASAP profile name to be modified.</li> <li>4. Click on Provision at bottom of window.</li> <li>5. Continue with Step 4.</li> </ol> <p><b>Result:</b> Profile type parameters display on right side of window.</p> |

- 
- 4** If you want to enter a new name for the selected profile, enter the new name of the profile in the **New Name** box at top of window.

You cannot change the name of the **Default** profile for any profile type.

- 
- 5** For each of the **Probable Causes**, click on each of the **Alarm Level** boxes and choose your required alarm severity for the Probable Cause.

- 
- 6** Click **Apply** at bottom of window.

**Result:** A warning window opens asking if you want to execute the command.

- 
- 7** Click **Yes**, then click **Close** to exit

---

END OF STEPS







## Task 318: Provision Performance Monitoring (PM) Functions

---

**Purpose** This procedure is provided as a reference for all the performance monitoring tasks provided in this manual. Use this procedure to access all the following performance monitoring tasks:

- View PM threshold crossing alert (TCA) profiles
- Modify TCA profiles
- Initialize PM registers
- Provision ports with PM TCA profile information
- Enable or disable PM data collection.

**Required privilege code(s)** You must have the following security privilege codes to perform the listed function:

- PM1 — View PM threshold crossing alert (TCA) profiles
- PM3 — Modify TCA profiles
- PM3 — Initialize PM registers
- P3 — Provision ports with PM TCA profile information
- P3 — Enable or disable PM data collection.

**Required equipment** WaveStar Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Chapter 8, Performance Monitoring*
- *Appendix A, WaveStar CIT Tutorial*

**Task** Choose the task you want to perform from the tasks listed

- 
- 1** View PM threshold crossing alert (TCA) profiles.

Use this task to view the TCA profiles that are already available.

**Reference:** T319

- 
- 2** Create/Modify/Delete TCA profiles.

Use this task if you are required to:

- Create any new profiles which may later be assigned to selected ports or tributaries. You may decide to use the default profiles already in the system.
- Modify existing profiles to your new requirements.
- Delete any existing profiles no longer needed.

**Reference:** T320

---

**3** Initialize PM registers.

Use this task with Caution. This task is used to reset all selected registers to zero for selected ports or tributaries.

**Reference:** T321

---

**4** Provision ports with PM TCA profile information.

Use this task to assign a TCA profile to selected ports or tributaries, if required.

**Reference:** T322

---

**5** Enable or disable PM data collection.

Use this task to either enable or disable PM data collection for selected ports or tributaries.

**Result:** T323

---

**6** Display and save PM register values.

Use this task to display and save TCA register values that have been accumulated.

**Result:** T324

END OF STEPS

---



## Task 319: View Performance Monitoring (PM) Threshold Crossing Alert (TCA) Profiles

---

**Purpose** Use this procedure to view all the current TCA profiles associated with the following PM parameter groups:

- Physical layer
- SONET Section/Line layer
- SONET Path
- DS3 Line and intermediate path

**Required privilege code** You must have a security privilege code of at least PM1 to perform this task.

**Required equipment** WaveStar Craft Interface Terminal (WaveStar CIT).

**Related information** For related information, see the following sections in this document:

- *Chapter 8, Performance Monitoring*
- *Appendix A, WaveStar CIT Tutorial*

**Task** Complete the following steps to view an existing TCA profile.

---

**1** Log into the network element using the WaveStar CIT.

---

**2** Select one of the following from the *System View* or *Shelf View* toolbar to view a profile associated with the listed parameter group.

1. SONET Physical layer — **Performance > View TCA Profile > Physical**
2. SONET Section/line layer — **Performance > View TCA Profile > SONET Section Line**
3. SONET Path layer — **Performance > View TCA Profile > SONET Path**
4. DS3 Line/Path — **Performance > View TCA Profile > DS3**

5. Ethernet — **Performance > View TCA Profile > Ethernet**

**Result:** The **Select a TCA Profile Name** window for the selected parameter group opens.

---

- 3** Select the name of the profile to be displayed from the drop-down block, then click **Select**.

**Result:** The **View TCA Profile Details** window opens displaying the threshold values for each of the monitored parameters.

---

- 4** Click **Close** to exit.

---

END OF STEPS

---



## Task 320: Create, Modify, or Delete Threshold Crossing Alert (TCA) Profile

---

**Purpose** Use this procedure to perform the following:

- Create a new TCA profile
- Modify an existing TCA profile
- Delete an existing TCA profile

**Required privilege code(s)** You must have a security privilege code of at least PM3 to perform this task.

**Required equipment** WaveStar Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- *Chapter 9, Performance Monitoring*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Identify the ports, tributaries, and TCA profiles related to the task.
- Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to create, modify, or delete a TCA profile.

---

- 1** From the *System View* or *Shelf View* toolbar, select the menu command required from one of the following:
  - SONET Physical profile — **Performance > Provision PM TCA Profile > Physical**
  - SONET Section/line profile — **Performance > Provision PM TCA Profile > SONET Section Line**
  - SONET Path profile — **Performance > Provision PM TCA Profile > SONET Path**
  - DS3 Line/Path profile — **Performance > Provision PM TCA Profile > DS3**

- Ethernet profile — **Performance > Provision PM TCA Profile > Ethernet**

**Result:** The **Provision TCA Profile** window opens for the selected profile group.

- 
- 2** Verify that the **Profile Type** listed is the type you selected.

**3**

| IF you are...                  | THEN...                |
|--------------------------------|------------------------|
| creating a new TCA profile,    | continue with Step 14. |
| deleting an existing profile,  | continue with Step 4   |
| modifying an existing profile, | continue with Step 8.  |

- 
- 4** Select **Existing Profile**, then choose the profile name to delete.

- 
- 5** Select the **Delete** option.

**Result:** A warning window opens stating that the selected profile will be deleted and asks if you want to continue.

- 
- 6** Verify the correct profile is being deleted, then click **Yes** to delete the profile.

**Result:** A confirmation window opens informing you that the profile has been deleted.

- 
- 7** Click **OK**, then click **Close** to exit.

*Stop! End of Task*

- 
- 8** Select **Existing Profile**, then choose the profile name to modify.

- 
- 9** Click **Modify** at bottom of window.

**Result:** The **Edit TCA Profile** window opens

.....

**10** Verify the correct **Profile Type** is displayed.

.....

**11** Change the parameters as required. Setting a parameter value to “0” will disable thresholding for that parameter.

.....

**12** Click **OK** to make changes when all the necessary parameters are entered.

**Result:** A warning box opens asking if you want to execute the command.

.....

**13** Click **Yes**, then click **Close** to exit.

*Stop! End of Task*

.....

**14** Select **New Profile**.

.....

**15** Enter a name for the new profile in the space provided. The name may be up to 24 alphanumeric characters maximum.

.....

**16** Select **Create** at bottom of window.

**Result:** A warning box opens asking if you wish to continue.

.....

**17** Click **Yes**.

**Result:** A box opens informing you that the profile has been created using default values with the name you selected.

.....

**18** Click **OK** to return to Provision TCA Profile window.

19

---

| IF you want to ...                                              | THEN...                                           |
|-----------------------------------------------------------------|---------------------------------------------------|
| accept the default values for the new profile,                  | Click <b>Close</b> .<br><i>Stop! End of Task.</i> |
| enter different values than the default values for the profile, | proceed to Step 8 to modify the default values.   |

END OF STEPS





## Task 321: Initialize Performance Monitoring (PM) Registers

---

**Purpose** Use this procedure to set to zero (initialize) all current 15-minute or current day section, line, path, or DS3 PM registers.

PM must be enabled before registers can be initialized. You cannot initialize port PM registers if PM is disabled on the port for the selected register location (NEND, FEND, or ALL). You cannot initialize PM registers for tributaries if Path PM is disabled for the selected tributary. Reference task T 323, *Enable or Disable Performance Monitoring (PM) Data Collection*.



### CAUTION

*This procedure will reset selected register counts to zero. Ensure that you want to do this before continuing.*

**Required privilege code(s)** You must have a security privilege code of at least PM3 to perform this task.

**Required equipment** WaveStar Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- *Chapter 8, Performance Monitoring*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Identify the ports or tributaries related to the task.
- Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to initialize selected PM threshold registers.

---

- 1** On the *System View* toolbar, select **Performance > Initialize Registers**.

**Result:** The **Initialize Registers for a Performance Monitoring Port** window opens.

---

- 2** Select the required bay, shelf, port, VCG, or tributary, then click **Select**.  
Select trib if you are initializing SONET Path PM registers. Select a port if you are initializing other PM register types.

**Result:** Parameters display on right side of window for the port or tributary selected.

---

- 3** Verify the correct port or tributary AID and port rate are displayed for the selected port or tributary.
- 

- 4** Make the required selections for the displayed parameters to initialize the required register type.

**Reference:** SE 321-1

---

- 5** Click **Apply** to make changes.

**Result:** A warning box opens asking if you want to execute the command.

---

- 6** Click **Yes** to execute the command, then click **Close** to exit.

This command will fail if PM is not enabled for the selected register type.

END OF STEPS

---



## SE 321-1: PM Register Initialization Parameters

---

**Parameter selections**    The following table explains some of the input parameters for the initialization of PM registers.

| Parameter        | Description                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PM Register Type | <p>For DS3 ports, the PM Register Type is DS3.</p> <p>For all other port types, choose the type of register to initialize:</p> <ul style="list-style-type: none"><li>• SECTION-LINE may be chosen if you selected a port. Parameter is not available for tributaries.</li><li>• PATH may be chosen if you selected a tributary. Parameter is not available for ports.</li><li>• ALL selects both of the above registers.</li></ul> |
| Location         | <p>You may choose to initialize just the near-end registers or the far-end registers or both.</p> <ul style="list-style-type: none"><li>• NEND — Near-end PM data only is initialized.</li><li>• FEND — Far-end PM data only is initialized. Not applicable to SONET physical and section layers and non-C-bit DS3 line layer PM.</li><li>• ALL — Both near-end and far-end (if applicable) PM data are initialized.</li></ul>     |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Direction(For DS3 Only) | <ul style="list-style-type: none"> <li>IN — Only PM data to the DS3 facility will be reset.<br/>DS3 Incoming PM has to be enabled in order to reset registers.</li> <li>OUT — Only PM data from the DS3 facility will be reset.<br/>DS3 Outgoing PM has to be enabled in order to reset registers.</li> <li>PTF — Path Terminating Function</li> <li>ALL — Both directions will be reset.</li> </ul>                                                                                                                                                                                                                                      |
| Time Period             | <ul style="list-style-type: none"> <li>15-MIN — Choose to initialize the 15-minute registers.</li> <li>1-DAY — Choose to initialize the 1-Day registers.</li> <li>ALL — Choose this option to initialize both types of registers.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                              |
| Apply to                | <ul style="list-style-type: none"> <li>This Port/Trib Only — Choose to initialize registers for only the port or trib selected.</li> <li>All Tribs, This Port — Initializes PM registers for all the tributaries on the port that contains the tributary you selected.</li> <li>All Ports/Trib This Pack — This selection allows you to initialize registers for all the ports/tribs on the circuit pack containing the selected port.</li> <li>All Ports/Trib This Type, This Shelf — This selection allows you to initialize the registers for all the ports/tribs on the shelf that are the same type as the selected port.</li> </ul> |



## Task 322: Provision Ports or Tributaries with Performance Monitoring (PM) Threshold Crossing Alert (TCA) Profiles

---

**Purpose** Use this procedure to provision ports or tributaries with TCA profile information for selected PM parameter groups.

**Required privilege code(s)** You must have a security privilege code of at least P3 to perform this task.

**Required equipment** WaveStar Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- *Chapter 8, Performance Monitoring*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Identify the ports or tributaries related to the task.
- Identify the name of the TCA profile to apply to the required ports or tributaries.
- Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to provision ports or tributaries with PM TCA profile information.

---

**1** On the *System View* toolbar, select **Performance > Provision Ports**.

**Result:** The **Provision Parameters for a Performance Monitoring Port** window opens.

---

**2** Open up the required bay, shelf, and port or tributary details. Select the required port or tributary, then click **Provision** at bottom of window.

**Result:** The **Provision Parameters for a Performance Monitoring Port** window opens.

- 
- 3** Select the required **PM TCA Profile** group.

**Result:** A list of profiles is displayed for the PM TCA Profile group you selected.

- 
- 4**

| IF...                                                                      | THEN...                                                                                                |
|----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| the correct profile is already assigned to the selected port or tributary, | continue with the next step.                                                                           |
| the correct profile is not assigned,                                       | select the correct profile to apply to the selected port or tributary.<br>Continue with the next step. |

- 
- 5** For **PM Activation**, select **Enable** to enable performance monitoring or **Disable** to disable performance monitoring.

This option enables or disables *all* profile group performance monitoring parameters. See task T 320 for procedures to modify a profile to disable monitoring of *individual* selected parameters.

- 
- 6** From the Apply to list, select the required application.

**Reference:** SE 322-1

- 
- 7** Click **Apply**.

**Result:** A warning box opens stating that execution of this command may affect service and asks if you want to execute the command.

- 
- 8** Click **Yes**, then click **Close** to exit.

- 
- 9** Verify the correct profile has been applied to the required port or tributary.

END OF STEPS

---



## SE 322-1: Provision PM Ports Screen Field Selections

---

### **Provision PM port screen selection information**

The following is supporting information for some of the available selections in the Provision PM Ports screens

| Apply to                                | Description/Behavior                                                                                                                                                     |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| this port (trib) only                   | Enables or disables selected PM profile parameters to only the port/trib you selected.                                                                                   |
| all tribes, this port                   | Enables or disables selected PM profile parameters to all the tribes on the port that contains the trib you selected.                                                    |
| all ports (tribs) this pack             | Enables or disables selected PM profile parameters to all the ports/tribs on the circuit pack that contains the port/trib you selected.                                  |
| all ports (tribs) this type, this shelf | Enables or disables selected PM profile parameters to all the ports/tribs on all the circuit packs on a shelf that have the same type port/trib as the one you selected. |





## Task 323: Enable or Disable Performance Monitoring (PM) Data Collection

---

|                                   |                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to enable or disable all PM data collection for selected ports or tributaries.                                                                                                                                                                                                                          |
| <b>Required privilege code(s)</b> | You must have a security privilege code of at least P3 to perform this task.                                                                                                                                                                                                                                               |
| <b>Required equipment</b>         | WaveStar Craft Interface Terminal (CIT)                                                                                                                                                                                                                                                                                    |
| <b>Related information</b>        | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• <i>Chapter 8, Performance Monitoring</i></li><li>• <i>Appendix A, WaveStar CIT Tutorial</i></li></ul>                                                                                                        |
| <b>Before you begin</b>           | Prior to performing this task, you must: <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Identify the ports or tributaries related to the task.</li><li>• Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul> |
| <b>Task</b>                       | Complete the following steps to enable or disable PM data collection for selected ports or tributaries.                                                                                                                                                                                                                    |

- 
- 1** On the *System View* or *Shelf View* toolbar, select **Performance > Provision Ports**.

**Result:** The **Provision Parameters for Port Performance Monitoring** window opens.

- 
- 2** Open the required bay, shelf, and circuit pack details, then select the required port, tributary, or SONET optical port tributary. Click **Provision** at bottom of window.

**Result:** The provisioning parameters display on right side of window for the port or tributary selected. The type of window depends on your selection.

---

**3** Locate your required ...PM TCA Profile group.

---

**4** Select the required TCA profile for the profile type and direction of PM (if applicable).

If profiles other than the Default profile have been created, the list of profiles may be displayed for the ...PM TCA Profile group you located.

If the **Not Reported** PM TCA Profile is selected, then all TCA reporting will be disabled (reporting disabled) for the selected profile group. PM registers continue to accumulate and may be displayed if PM is enabled.

---

**5** For ... PM Activation, select **Enable** to enable performance monitoring or **Disable** to disable performance monitoring for each profile type and direction.

This option enables or disables all profile group performance monitoring threshold parameters for the selected port or tributary. See T320 to modify a profile to disable monitoring of individually selected PM parameters.

---

**6** From the **Apply to** list, select the required application.

**Reference:** SE 323-1

---

**7** Click **Apply**.

**Result:** A warning box opens stating this command may affect service and asks if you want to continue.

---

**8** Click **Yes**, then click **Close** to exit.

9

| IF...                                                                      | THEN...                      |
|----------------------------------------------------------------------------|------------------------------|
| you are enabling or disabling Physical or Section-Line PM on a SONET port, | <i>Stop! End of Task</i>     |
| you are enabling PM on a DS3 port,                                         | continue with the next step. |
| you are disabling PM on a DS3/EC1 port or OCn port tributary,              | <i>Stop! End of Task</i>     |
| you are enabling path PM on a SONET port tributary,                        | continue with Step 15.       |
| you are enabling or disabling PM on an ethernet port, VCG, or tributary,   | continue with Step 15.       |

- 10 On the *System View* or *Shelf View* toolbar, select **Configuration > Provision**.

**Result:** The **Provision Parameters for Protection Group or Equipment** window opens.

- 11 Open the required bay, shelf, and DS3 circuit pack details, then select the required port. Click **Provision**.

**Result:** The provisioning parameters display on right side of window for the port selected. There are three tabs (Transmission, Fault, and Trace) with the appropriate parameters listed for each.

- 12 In the **Fault** tab, for the **Violation Monitoring Mode** parameter, located at bottom of window, select **Violation Monitoring** in the drop-down menu box.

- 13 Click **Apply**.

**Result:** A warning box opens asking if you want to execute the command.

- 
- 14** Click **Yes** to execute the command, then click **Close** to exit.

*Stop! End of Task.*

---

- 15** On the *System View* or *Shelf View* toolbar, select **Configuration > Provision**.

**Result:** The **Provision Parameters for Protection Group or Equipment** window opens.

---

- 16** Open the required bay, shelf, circuit pack, and port (SONET) or VCG (ethernet) details, then select the required tributary. Click **Provision**.

**Result:** The provisioning parameters display on right side of window for the tributary selected. The type of window depends on your selection.

---

- 17** Find the **Tributary Monitoring Mode** parameter in the Fault Management section located at top of window, then select **Monitored** in the drop-down menu box.
- 

- 18** Click **Apply**.

**Result:** A warning box opens asking if you want to execute the command.

---

- 19** Click **Yes** to execute the command, then click **Close** to exit.

---

END OF STEPS

---



## SE 323-1: Provision PM Screen Field Selections

---

### **Provision PM screen selection information**

The following is supporting information for some of the available selections in the Provision PM screens:

| Apply to                                | Description/Behavior                                                                                                                                                     |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| this port (trib) only                   | Enables or disables selected PM profile parameters to only the port/trib you selected.                                                                                   |
| all tribs, this port                    | Enables or disables selected PM profile parameters to all the tributaries on the port that contains the trib you selected.                                               |
| all ports (tribs) this pack             | Enables or disables selected PM profile parameters to all the ports/tribs on the circuit pack that contains the port/trib you selected.                                  |
| all ports (tribs) this type, this shelf | Enables or disables selected PM profile parameters to all the ports/tribs on all the circuit packs on a shelf that have the same type port/trib as the one you selected. |





## Task 324: Display and Save Performance Monitoring (PM) Register Values

---

**Purpose** Use this procedure to display the PM register values for the following PM parameter groups when available:

- SONET Physical
- SONET Section
- SONET Line
- SONET Path
- DS3 Line/Path
- Ethernet (Release 6 and later)

**Required privilege code(s)** You must have a security privilege code of at least PM1 to perform this task.

**Required equipment** WaveStar Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- *Chapter 8, Performance Monitoring*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Prior to performing this task, you must:

- Ensure Performance Monitoring is activated (T 323)
- Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to retrieve, display, and/or save PM register values.

---

**1** From the *System View* toolbar, select the menu command required from one of the following to display the PM register values associated with the listed parameter group:

- SONET Physical layer — **Performance > Reports > SONET Physical**
- SONET Section layer — **Performance > Reports > SONET Section**

- SONET Line layer — **Performance > Reports > SONET Line**
- SONET Path layer — **Performance > Reports > SONET Path**
- DS3 Line — **Performance > Reports > DS3 Line**
- DS3 Path — **Performance > Reports > DS3 Path**
- Ethernet — **Performance > Reports > Ethernet**

**Result:** The **Equipment PM Parameters Selection** window opens

- 
- 2** Open the bay, shelf, and circuit pack details, then select the port or tributary from which you want to receive a report. Click **Select**.

**Result:** The selection parameters display for the PM parameter group selected.

- 
- 3** Select the **Time Period**, **Monitored Date**, and **Monitor Time** you want to display or save to file.

---

**4**

| IF you want to...                         | THEN...                           |
|-------------------------------------------|-----------------------------------|
| display all counts, including zeros (0s), | select <b>Monitor Level: 0-UP</b> |
| display only parameters that have counts, | select <b>Monitor Level: 1-UP</b> |

- 
- 5** Select an available tab such as **Near End** or **Far End** and highlight the parameters in the **Available Parameters** box that you want to display. Click **Select** to move the highlighted parameters to the **Selected Parameters** box.

If you click **Select All**, all parameters will move to the **Selected Parameters** box.



---

**6** Click **Apply**.

If you selected **Monitor Level: 0-UP** and there is a “no data available” response, then PM is disabled. If you selected **Monitor Level: 1-UP** and there is a “no data available” response, then there are either no counts or PM is disabled.

**Result:** The parameter group **PM Report** displays for the selected parameters.

---

**7** View the report, then ...

| IF you want to...                | THEN...                                                                                                              |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------|
| save the results to a file,      | click <b>Save As</b> , enter the file name, then click <b>Save</b> .<br>File is saved in the WaveStar CIT Directory. |
| exit,                            | click <b>Close</b> .                                                                                                 |
| recheck count, up to the minute, | click <b>Refresh</b> .                                                                                               |
| print the results,               | click <b>Print</b> , select printer, then click <b>OK</b> .                                                          |

---

END OF STEPS

---





## Task 325: Add a Node to an In-Service 2-Fiber BLSR

---

**Purpose** Use this procedure to develop a detailed Method of Procedure (MOP), per local operating instructions, for adding a node to an existing **in-service** 2-fiber BLSR. The “Node To Be Added” can be either a WaveStar™ 2.5G, WaveStar 10G2F, or a WaveStar 10G4F. For WaveStar BandWidth Manager, a node is simply a Port Protection Group. Port Protection Groups can be provisioned per I/O shelf.

**Required equipment/personnel** The following equipment and personnel are required in order to complete this task:

- WaveStar Craft Interface Terminal (CIT)
- Wrist strap
- Optical power meter, to measure the level of received power
- Appropriate optical LBOs
- Technical assistance at the two (East and West) adjacent nodes.

**Assumptions** This procedure assumes that the following activities have already been completed.

1. That the new node is currently powered-up.
2. That the new node has been installed correctly per the specified engineering configuration.
3. That the new node has been installed with the correct complement of circuit packs.
4. That all new fibers have been tested and known to be correct.
5. That office records have been checked to make certain the TID for the new node is indeed unique for the subject BLSR.
6. That office records have been checked to make certain that a synchronization plan exists for the new node TID and a copy is available during this task.

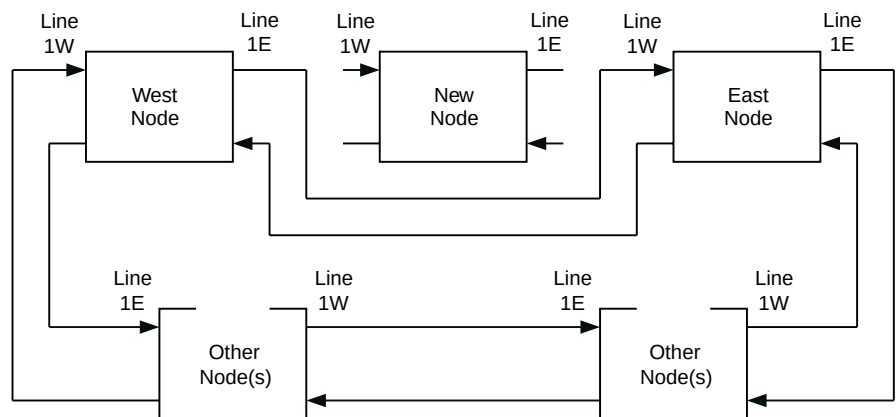
**Before you begin** This task is written from the “Node To Be Added” perspective, although action is required at two other nodes. The “Node To Be Added” is located between two operational nodes. One operational node will be called the *West Node* and the other will be called the *East Node*.

**Task** Complete the following steps to add a new node to an existing in-service ring.

---

**Important!** Refer to the figure below and observe that the node to be connected to Line 1W of the new node is referred to, in this task, as the West node. And, that the node to be connected to Line 1E of the new node is referred to, in this task, as the East node.

- 1 *Verify that office records match the existing ring map.* From office records, determine which nodes in the ring network will be called the West node and the East node for this procedure.



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- 2 *Verify that the existing ring topology matches office records:*
  1. Instruct a technician at either the East node or the West node to log in to the local node.
  2. From the *System View* screen, select menu items **View-Rings-Ring Map**.
  3. Compare the office records report with the list/display from the ring map.

**Important!** Confirmation is when the two nodes, that are identified from office records as the West node and the East node, are in agreement with the ring map. Any discrepancies must be resolved before continuing with Step 3.

---

**3** *Provisioning actions to be performed on the new node.* Instruct the technician at the new node to:

1. Connect the WaveStar CIT to the local node.
2. Log in to the WaveStar CIT application.
3. Log in to the local node.

**Important!** If the node installation crew was provided with the end user's desired TID, then you may assume that the TID has already been set. Otherwise, it may be necessary to check with the installers.



**CAUTION**

*Incorrectly provisioned source node TID and/or destination node TID can result in a service outage under certain multiple failure conditions.*

**4** As appropriate, change the new node TID to correspond with office records.

**Reference:** Task 329

---

**5** Instruct the technician at the new node to:

1. Obtain the synchronization records for this new node TID.
2. As necessary, change/provision synchronization for this new node.

**Reference:** Task 301

---

**6** Enable the DCC Termination for the AID corresponding to Line 1W.

**Reference:** Task 305

---

**7** Enable the DCC Termination for the AID corresponding to Line 1E.

**Reference:** Task 305

- 
- 8 For the new node, create a new 2-fiber BLSR Port Protection Group.

**Important!** Refer to office records and the current work order for all required information (for example, the East Port AID, the West Port AID, and so forth).

**Reference:** Task 302

---



**CAUTION**

*This step will require manual input of Source and Destination TIDs. This information can be obtained from office records.*

- 9 At the new node, make any necessary tributary-to-tributary (through) cross-connections, and verify that there are no unnecessary cross-connections.

**Reference:** Task 303

---



**CAUTION**

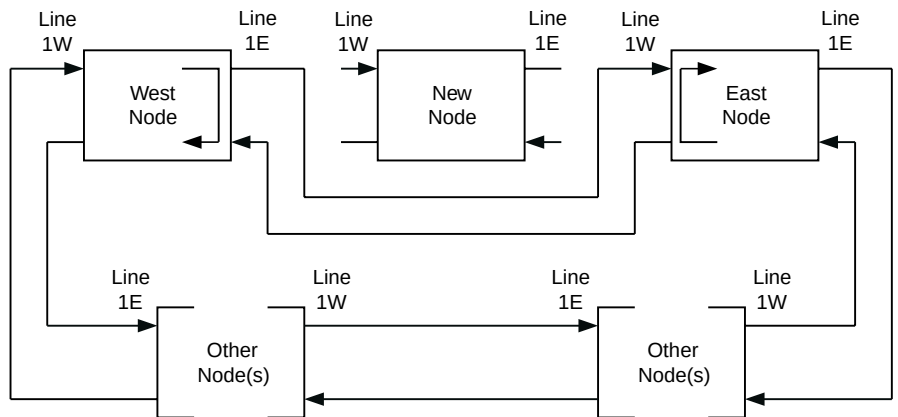
*A line-forced switch will preempt extra traffic, if any, on the protection tributaries.*

**Important!** For this step and Step 4, refer to the following figure. The service tributaries to be connected (add/drop/through) to the new node will now be looped back in the opposite direction at the West node and at the East node.

- 10 Instruct the technician at the West node (or travel to that location) to display the WaveStar CIT System View screen, and enter/select the following:

1. **Fault-Protection Switch.**
2. **Bay** (which contains the shelf that supports the subject ring).
3. **Shelf** (which supports the subject ring).
4. Protection Group (for example, **2F BLSR t\_ \_**).
5. Desired port (which in this case is **East Port \_ \_ - \_**)

6. Click on the button labeled **Select**.
7. In the right-hand window, verify that the displayed information is correct.
8. In the field labeled *Direction*, select/highlight **East**.
9. In the field labeled *Switch Type*, left-click on the drop-down arrow and select **Force To Protection**.
10. Click on the button labeled **Apply**.



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**Important!** This completes a forced switch on Line 1E and may have caused traffic hits.

- 
- 11** Instruct the technician at the East node (or travel to that location) to display the WaveStar CIT *System View*, and enter/select the following:
    1. **Fault-Protection Switch.**
    2. **Bay** (which contains the shelf that supports the subject ring).
    3. **Shelf** (which supports the subject ring).
    4. Protection Group (for example, **2F BLSR t\_ \_**).
    5. Desired port (which in this case is **West Port \_ \_ - \_**).
    6. Click on the button labeled **Select**.
    7. In the right-hand window, verify that the displayed information is correct.
    8. In the field labeled *Direction*, select/highlight **West**.
    9. In the field labeled *Switch Type*, left-click on the drop-down arrow and select **Force To Protection, Ring**.

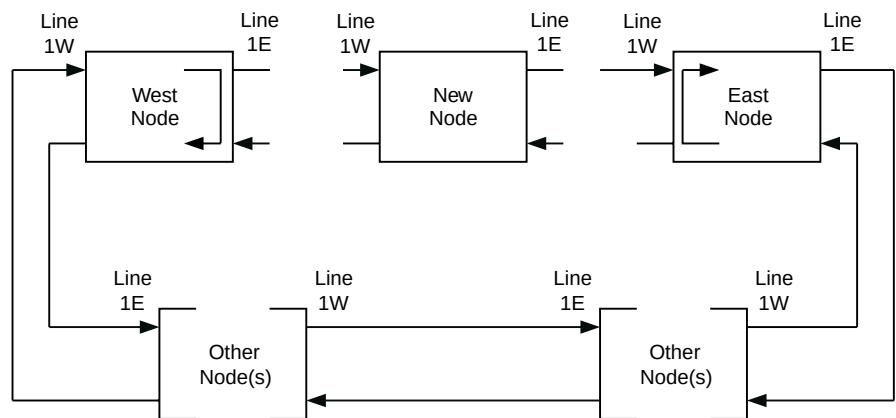
10. Click on the button labeled **Apply**.

**Important!** This completes a forced switch on Line 1W and may have caused traffic hits.

---

**Important!** Refer to the following figure inorder to help locate the optical fibers that can now be removed from the West node (fibers connected to East node).

**12** Instruct the technician at the West node to remove the optical fibers (Lines 1E) connected to the East node.



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---

**Important!** Refer to the previous figure inorder to help locate the optical fibers that can now be removed from the East node (fibers connected to West node).

**13** Instruct the technician at the East node to remove the optical fibers (Lines 1W) connected to the West node.

---

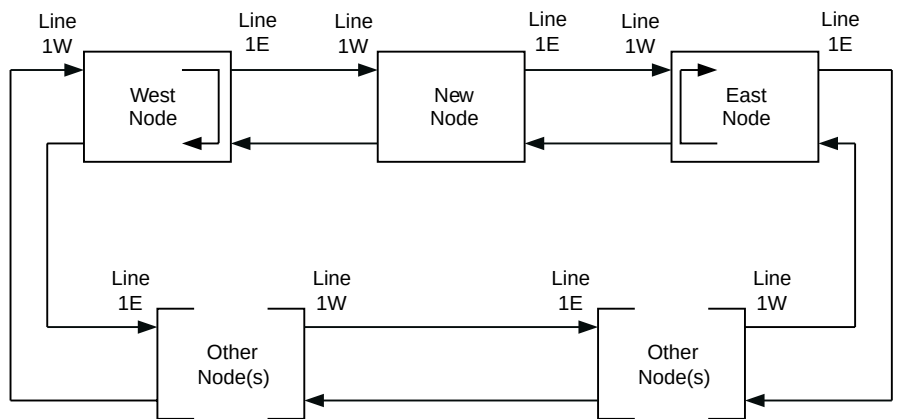
**Important!** Refer to the following figure and observe that new optical connections can now be made to the new node.



---

**Important!** Lightguide buildouts (if required) are installed on the receive fibers of the new node as well as the West node and East node.

- 14** At the new node, clean and connect the 1W transmit fiber to the **OUT** connector.



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**Reference:** Task 703

- 
- 15** Instruct the technician at the West node to:
1. Select the receive fiber.
  2. Obtain the optical power meter:
    - Connect the power meter to the receive fiber.
    - Measure the level of received power.
  3. Depending on the measured level of power, change the lightguide buildout to the appropriate value.
  4. Clean and connect the fiber to the West node **IN**.

**Reference:** Task 707

**Reference:** Task 703

- 
- 16** Instruct the technician at the West node to:
1. Use the WaveStar CIT, and log in to the West node.

2. Bring up the *System View* screen, and left-click on the **Alarm List** button.
3. Verify that an incoming OC-48 LOS does not exist for the 1E receive fiber; or if adding an OC-192 node, verify that an incoming OC-192 LOS does not exist for the 1E receive fiber.

**Important!** Steady/permanent alarms should be cleared using the appropriate trouble-clearing task. Transient alarms generally do not require any customer intervention.

---

**17** Instruct the technician at the West node to:

1. Select the 1E transmit fiber.
2. Clean and connect the fiber to the West node **OUT**.

**Reference:** “Task 703

---

**18** At the new node:

1. Select the 1W receive fiber (from the West node).
2. Obtain the optical power meter:
  - Connect the power meter to the receive fiber.
  - Measure the level received power.
3. Depending on the measured level of power, change the lightguide buildout to the appropriate value.
4. Clean and connect the fiber to the new node 1W **IN**.

**Reference:** Task 707

**Reference:** Task 703

---

**19** At the new node and from the *System View* screen:

1. Click on the **Update Alarms** button.
2. Verify that an incoming OC-48 LOS does not exist for the 1W receiver; or if adding an OC-192 node, verify that an incoming OC-192 LOS does not exist for the 1W receiver.

- 
- 20** At the new node, clean and connect the 1E transmit fiber to the **OUT** connector.

**Reference:** Task 707

---

- 21** Instruct the technician at the East node to:

1. Select the 1W receive fiber.
2. Obtain the optical power meter:
  - Connect the power meter to the **IN** fiber.
  - Measure the power level.
3. Depending on the measured level of power, change the lightguide buildout to the appropriate value.
4. Clean and connect the fiber to the East node 1W **IN** connector.

**Reference:** Task 707

**Reference:** Task 703

---

- 22** Instruct the technician at the East node to:

1. Use the WaveStar CIT, and log in to the East node.
  2. Bring up the *System View* screen, and click on the **Alarm List** button.
  3. Verify that an incoming OC-48 LOS does not exist for the 1W receive fiber; or if adding an OC-192 node, verify that an incoming OC-192 LOS does not exist for the 1W receive fiber.
- 

- 23** Instruct the technician at the East node to:

1. Select the 1W transmit fiber.
  2. Clean and connect the fiber to the East node **OUT** connector.
- 

- 24** At the new node:

1. Select the 1E receive fiber (from the East node).
2. Obtain the optical power meter:

- Connect the power meter to the receive fiber.
  - Measure the power and visually observe the displayed measurement/value.
3. Depending on the measured value, change the lightguide buildout to the appropriate value.
  4. Clean and connect the fiber to the new node 1E IN connector.

**Reference:** Task 707

**Reference:** Task 703

---

**25** At the new node and from the *System View* screen:

1. Click on the **Update Alarms** button.
2. Verify that an incoming OC-48 LOS does not exist for the 1E receiver; or if adding an OC-192 node, verify that an incoming OC-192 LOS does not exist for the 1E receiver.

**Important!** At this point in time, it is normal for Alarm List to display several alarms. These alarms include Ring Incomplete. The East and West nodes will also each list BLSR Protection Default K-byte alarms.

The *Ring Auto Discovery* software will automatically start, following clearing of the LOS and DCC Section Failure alarms. It may take from 2 to 10 minutes for *Ring Auto Discovery* to complete. During this time interval, the new node Alarm List will continue to show the *Ring Incomplete* alarm. When *Ring Auto Discovery* has successfully completed, the alarm *Ring Incomplete* will clear and the ring has successfully been built.

---

**26** At the new node and from the *System View* screen, enter/select the following:

1. **View-Rings-Ring Map.**
2. Expand down the directory and highlight the appropriate Ring ID (for example, **2F BLSR t\_-\_**).
3. Left-click on the **Select** button.
4. Verify that the ring is complete and that it does indeed include the new node.

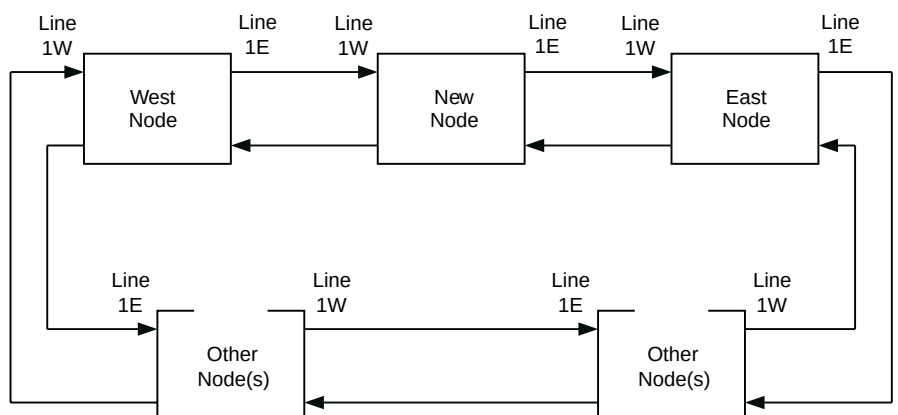
---

**Important!** Refer to the following figure. The forced switch at the West node can now be cleared.

- 27** Instruct the technician at the West node to display the WaveStar CIT *System View* screen, and enter/select the following:
1. **Fault-Protection Switch.**
  2. **Bay** (which contains the shelf that supports the subject ring).
  3. **Shelf** (which supports the subject ring).
  4. Protection Group (for example, **2F BLSR t\_ \_**).
  5. Desired port (which in this case is **East Port \_ \_ - \_**).
  6. Click on the button labeled **Select**.
  7. In the right-hand window, verify that the displayed information is correct.
  8. In the field labeled *Direction*, select/highlight **East**.
  9. In the field labeled *Switch Type*, click on the drop-down arrow and select **Clear**.
  10. Click on the button labeled **Apply**.

**Important!** As an alternative, now that the ring is up and if the login at the new node has login privileges at the West node, remotely log in to the West node and execute the command.

The line switch may cause traffic hits.



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---

**Important!** Refer to the previous figure. The forced switch at the East node can be cleared now.

- 28** Instruct the technician at the East node to display the WaveStar CIT *System View* screen, and enter/select the following:
1. **Fault-Protection Switch.**
  2. **Bay** (which contains the shelf that supports the subject ring).
  3. **Shelf** (which supports the subject ring).
  4. Protection Group (for example, **2F BLSR t\_ \_**).
  5. Desired port (which in this case is **West Port \_ \_ - \_**).
  6. Click on the button labeled **Select**.
  7. In the right-hand window, verify that the displayed information is correct.
  8. In the field labeled *Direction*, select/highlight **West**.
  9. In the field labeled *Switch Type*, left-click on the drop-down arrow and select **Clear**.
  10. Click on the button labeled **Apply**.

**Important!** As an alternative, now that the ring is up and if the login at the new node has login privileges at the East node, remotely log in to the East node and execute the command.

---

**Important!** The new node has NOW been added to the ring network.

- 29** At the new node, verify that the ring map is correct. From the *System View* screen, enter/select the following:
1. **View-Rings-Ring Map.**
  2. Expand down the directory and highlight the appropriate Ring ID (for example, **2F BLSR t\_ - \_**).
  3. Click on the **Select** button.
  4. Verify that the ring is complete and that it does indeed include the new node.

.....  
**30** Instruct the technician at the new node to verify that there are no standing alarms associated with this work activity.

.....  
**31** Instruct the technician at the West node to verify that there are no standing alarms associated with this work activity.

.....  
**32** Instruct the technician at the East node to verify that there are no standing alarms associated with this work activity.

.....  
E N D O F S T E P S







## Task 326: Delete a Node from an In-Service 2-Fiber BLSR

---

|                                   |                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to develop a detailed Method of Procedure (MOP), per local operating instructions, for deleting a node from an existing <b>in-service</b> 2-fiber BLSR. The Node (To Be Deleted) can be either a WaveStar 2.5G or a WaveStar 10G. A node in a WaveStar BandWidth Manager is a Port Protection group. Several can be provisioned on a shelf.      |
| <b>Required privilege code(s)</b> | You must have a security privilege code of at least P2 or greater to perform this task.                                                                                                                                                                                                                                                                             |
| <b>Required equipment</b>         | <p>The following equipment is required to perform this task:</p> <ul style="list-style-type: none"><li>• WaveStar Craft Interface Terminal (CIT)</li><li>• Wrist strap</li><li>• Optical power meter, to measure the level of received power</li><li>• Appropriate optical LBOs</li><li>• Technical assistance at the two (East and West) adjacent nodes.</li></ul> |
| <b>Safety precautions</b>         | To assure both personal safety and the proper functioning of the WaveStar BandWidth Manager system, it is imperative to review and understand these warnings and precautions prior to performing this task.                                                                                                                                                         |
| <b>Safety precautions</b>         | To assure both personal safety and the proper functioning of the WaveStar BandWidth Manager system, it is imperative to review and understand these warnings and precautions prior to performing this task.                                                                                                                                                         |



### CAUTION

*A line forced switch will preempt extra traffic, if any, on the protection tributaries.*

|                            |                                                                                                                                                           |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Related information</b> | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• Appendix A, WaveStar CIT Tutorial</li></ul> |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|

**Before you begin** This task is written from the “Node To Be Deleted” perspective, although action is required at two other nodes. The Node To Be Deleted is located between two operational nodes. One operational node will be called the *West Node*, and the other will be called the *East Node*.

Prior to performing this task, you must:

- Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to delete a node from an existing in-service BLSR.

---

**Important!** Alarms will be active at different times during this procedure

- 1** Log in to the “Node To Be Deleted”.

---

**Important!** Add and drop cross-connections, if they exist, could be carrying traffic. So follow local operating procedures to reroute or terminate the traffic.

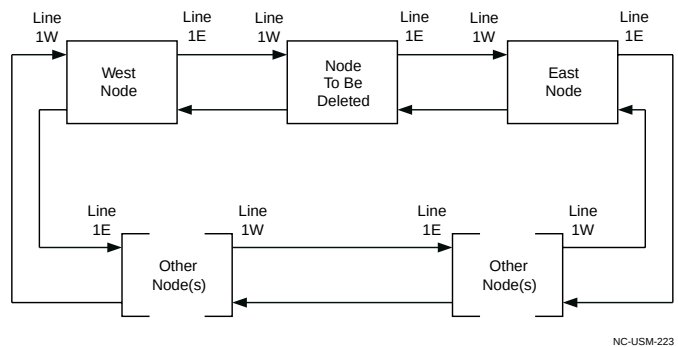
- 2** *Verify that the Node To Be Deleted does not have any add/drop traffic.*  
At the WaveStar CIT and from the *System View* screen:
  1. select **View-Cross Connections**
  2. verify that there are no tributary-to-port (drop) or port-to-tributary (add) cross-connections.

- 
- 3** Refer to Figure 326-1, and observe that the node connected to line 1W of the Node To Be Deleted is referred to, in this procedure, as the *West Node* and that the node connected to line 1E of the Node To Be Deleted is referred to, in this procedure, as the *East Node*.

*Identify the name of the West Node and of the East Node.* At the WaveStar CIT and from the *System View* screen:

1. select **View-Rings-Ring Map**
2. highlight the AID of the desired BLSR, for example, **2 BLSR t\_-\_-**
3. click on the **SELECT** button.

**Figure 326-1 Identify the East Node and the West Node**



- 
- 4** Determine, from the Ring Map, the name of the West Node and the name of the East Node.

The East and West node names are easily determined from the two column headers labeled *Node Port Direction* and *Node Neighbor NE Name*.

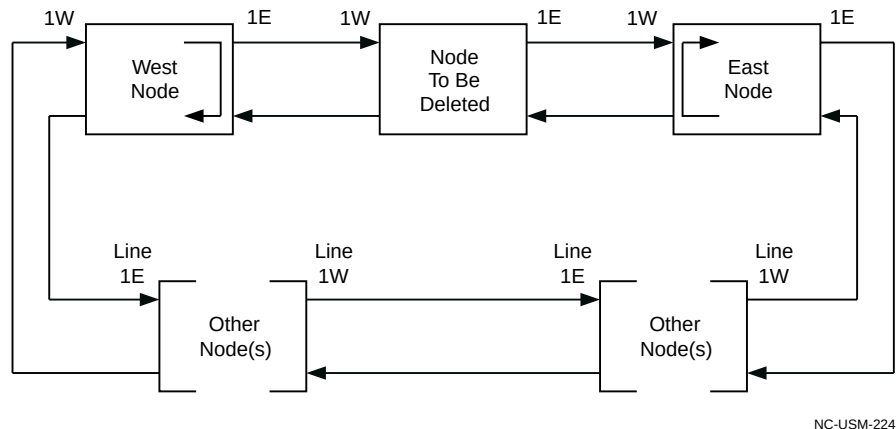
- 
- 5** *Perform a forced switch on the West Node and then the East Node.* The service tributaries that connect the Node To Be Deleted will now be looped back in the opposite direction by performing a Forced Switch (on the BLSR) at the West node and then the East node. Refer to Figure 326-2.

Instruct the technician at the West node (or travel to that location) to display the WaveStar CIT *System View* screen and enter/select the following:

- 1. FAULT-Protection Switch**
- 2. Bay** (which contains the shelf that supports the subject ring)
- 3. Shelf** (which supports the subject ring)
- 4. Protection Group** (for example, **2F BLSR t\_ \_ \_**)
- Click on the button labeled **Select**
- In the right-hand window, select the **Desired Direction** (which in this case is **East Port \_ \_ - \_** at the West node)
- Switch Type** (which, in this case, is **Forced to Protection, Ring**)
- Click on the button labeled **Apply**

9. Read the information message and, if OK, click on the **YES** button.

**Figure 326-2 Forced Protection Switch at the West Node and the East Node**



**Important!** This makes a forced switch on line 1E, and may cause traffic hits.

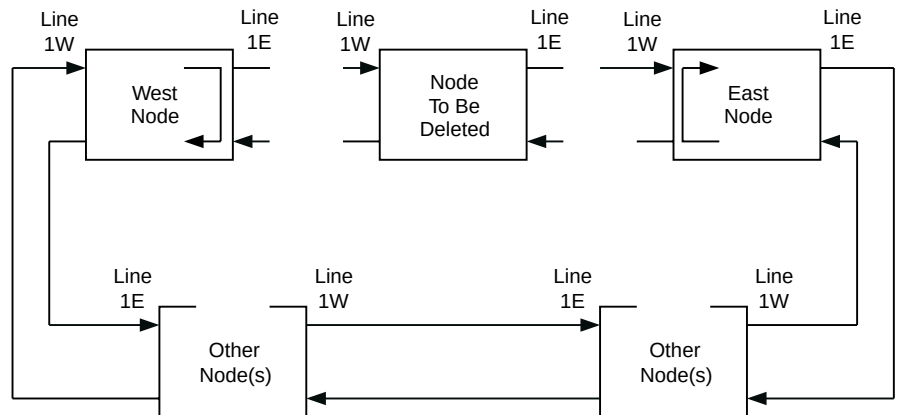
- 6 Instruct the technician at the East node (or travel to that location) to display the WaveStar CIT *System View* screen and to enter/select the following:
  1. **FAULT-Protection Switch**
  2. **Bay** (which contains the shelf that supports the subject ring)
  3. **Shelf** (which supports the subject ring)
  4. Protection Group (for example, **2F BLSR t\_ \_ - \_**)
  5. Click on the button labeled **Select**
  6. In the right-hand window select the Desired Direction (which in this case is **West Port \_ \_ - \_** at the East node)
  7. Switch Type (which, in this case, is **Forced to Protection, Ring**)
  8. Click on the button labeled **Apply**
  9. Read the information message and, if OK, click on the **YES** button.

**Important!** This makes a forced switch on line 1W, and may cause traffic hits.

- 
- 7** *Disconnect the 1W Fibers and then the 1E Fibers.* Refer to Figure 326-3 in order to help locate the optical fibers that now can be removed at the Node To Be Deleted (fibers connected to the West Node).

Disconnect the optical fibers, both OUT and IN, at the Node To Be Deleted (line 1W) that is connected to the West Node.

**Figure 326-3 Optical Fibers Removed**



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- 
- 8** Refer to Figure 326-3 in order to help locate the optical fibers that can now be removed at the Node To Be Deleted (fibers connected to the East Node).

Disconnect the optical fibers, both OUT and IN, at the *Node To Be Deleted* (line 1E) that connects to the East Node.

The node is now completely isolated from the ring.

- 
- 9** At the node deleted, deprovision all tributary-to-tributary (through) cross-connections.

**Reference:** T 303

- 
- 10** For the “deleted node” delete the 2-Fiber BLSR Port Protection Group.

**Result:** T 302

- 
- 11** Disable the DCC Termination for the AID corresponding to “Line 1E”.

**Result:** T 305

---

- 12** Disable the DCC Termination for the AID corresponding to “Line 1W”.

**Result:** T 305

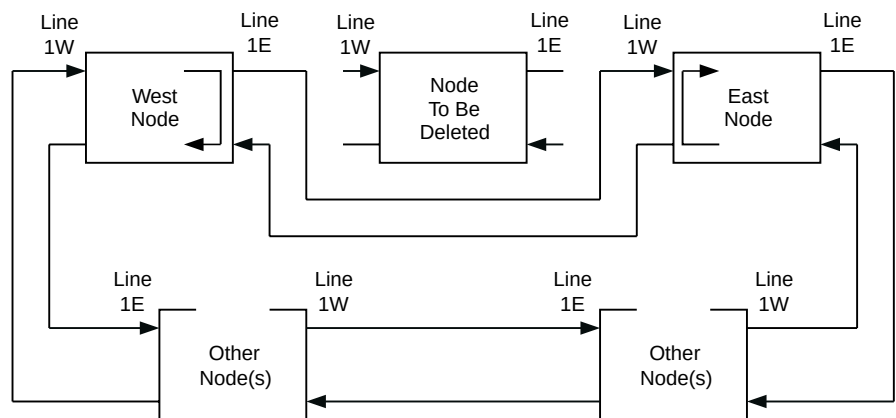
---

- 13** Refer to Figure 326-4 and notice that new optical connections now can be made at the West Node and at the East Node (bypass the Node To Be Deleted).

At the Node To Be Deleted, splice the 1W and 1E optical fibers per local procedures.

Lightguide buildouts (if required) are installed only on the receive fibers at the East and West Nodes.

**Figure 326-4 Optical Fibers Connected to the East Node and the West Node**



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- 
- 14** Instruct the technician at the East Node to connect fiber 1W (OUT).
- 

- 15** Instruct the technician at the West Node to measure the receive power level on fiber 1E (IN) and to change the lightguide buildout as necessary.

**Reference:** T 707

---

---

**16** Instruct the technician at the West Node to connect fiber 1W (OUT).

---

**17** Instruct the technician at the East Node to measure the receive power level on fiber 1W (IN) and to change the lightguide buildout as necessary.

**Reference:** T 707

---

**18** Instruct the technicians, at both the West Node and East Node, to wait one minute for the LEDs on each node's circuit pack to stop flashing.

If the LEDs do not stop flashing after about one minute, troubleshoot the incoming signal failure.

**Reference:** T 700

---

**Important!** Whenever the receiver's LEDs stop blinking, the ring is then re-connected, and transient alarms will exist. Protection Switching is suspended during Ring Auto Discovery. Until the Ring Auto Discovery software completes, there may be multiple alarms, for example, *Ring Incomplete*, *BLSR Protection Default K-byte*, and so forth. Depending on how many nodes are in the ring, it may take several minutes for this alarm to clear.

**19** *Verify correct operation of the reconfigured ring.* After a sufficient wait (2 to 10 minutes), instruct the technician at either the East or West Node to click on the **Alarm List** button and to verify that the alarm *Protection Switch Suspended* has cleared.

---

**20** At the East or West node, verify that the new ring map is correct. From the *System View* screen, enter/select the following:

1. **View-Rings-Ring Map.**
2. Expand down the directory and highlight the appropriate Ring ID (for example, **2F BLSR t\_-\_**)
3. Click on the **Select** button

4. Verify that the ring is complete and that it does, indeed, include the new node.

**Reference:** T 528

- 
- 21** *Take-down the Forced Switch at the East Node and then at the West Node.* The Forced Switch at the East Node now can be cleared. Refer to Figure 326-5.

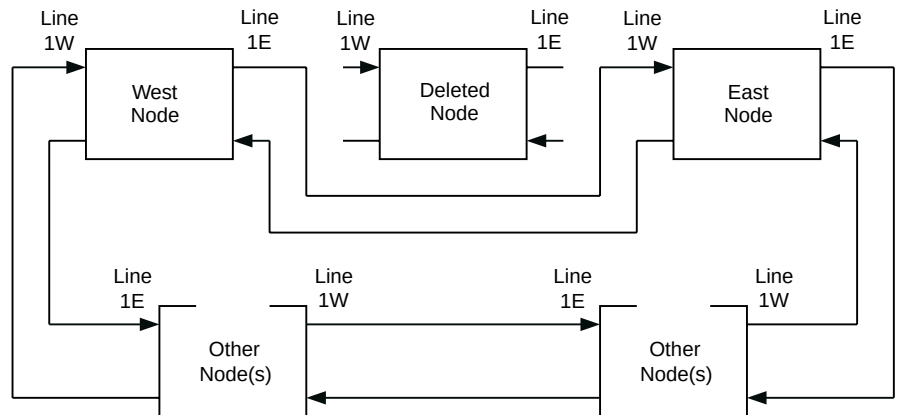
Instruct the technician at the East node (or travel to that location) to display the WaveStar CIT *System View* screen and to enter/select the following:

1. **FAULT-Protection Switch**
2. **Bay** (which contains the shelf that supports the subject ring)
3. **Shelf** (which supports the subject ring)
4. Protection Group (for example, **2F BLSR t\_ \_ - \_**)
5. Click on the button labeled **Select**
6. In the right-hand window, select the Desired Direction (which in this case is **West Port \_ \_ - \_**)
7. Switch Type (which, in this case, is **Clear**)
8. Click on the button labeled **Apply**.  
The line switch may cause traffic hits.
9. Read the information message and, if OK, click on the **YES** button.

- 
- 22** The forced switch at the West Node now can be cleared. Refer to Figure 326-5.



**Figure 326-5 Clear of the Forced Switch at both the East Node and West Node**



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Instruct the technician at the West node (or travel to that location) to display the WaveStar CIT *System View* screen and to enter/select the following:

1. **FAULT-Protection Switch**
2. **Bay** (which contains the shelf that supports the subject ring)
3. **Shelf** (which supports the subject ring)
4. Protection Group (for example, **2F BLSR t\_ \_ - \_**)
5. Click on the button labeled **Select**
6. In the right-hand window, select the Desired Direction (which, in this case, is **East Port \_ \_ - \_**)
7. Switch Type (which, in this case, is **Clear**)
8. Click on the button labeled **Apply**.  
The line switch may cause traffic hits.
9. Read the information message and, if OK, click on the **YES** button.

---

**23** The Node To Be Deleted has been deleted from the BLSR.

Verify that all work associated with this activity is complete.

---

END OF STEPS





# Task 328: Turn-up and Verify Correct Operation of an Open/Closed Ring — an Overview

---

- Purpose** Use this procedure to develop local procedures to turn-up a 2-fiber ring. In high-level and very general terms, turn-up is defined as the sum of the following:
1. Provision protection groups and verifying:
    - Port
    - DCC (channel enabled/disabled, User/Network side)
  2. Connecting the fibers sequentially from node-to-node
  3. Checking and verifying that the ring actually does Auto Discovery, and lastly
  4. Determining that the ring is fully functional and without any alarms.

**Required privilege code(s)** You must have a security privilege code of at least P2 or greater to perform this task.

- Required equipment** The following equipment is required to perform this task:
- WaveStar Craft Interface Terminal (CIT)
  - Wrist strap
  - Optical power meter
  - Appropriate optical LBOs.

**Related information** Refer to the 2-Fiber Ring Work Sheet on the accompanying pages. It is strongly suggested that you familiarize yourself with the diagram on the appropriate WorkSheet. The steps of this procedure use the same terminology as depicted in these diagrams. Thus, if you are familiar with these diagrams, then you should better be able to keep your perspective when performing the steps. Extra copies of each WorkSheet are included at the end of this procedure.

A node's existing provisioning plays an important role in determining successful functioning of Auto Discovery. Before starting this task, verify that the node's existing provisioning is correct.

For related information, see the following section in this document:

- Appendix A, WaveStar CIT Tutorial

**Before you begin**

Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Identify the circuit packs and ports being provisioned.
- Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

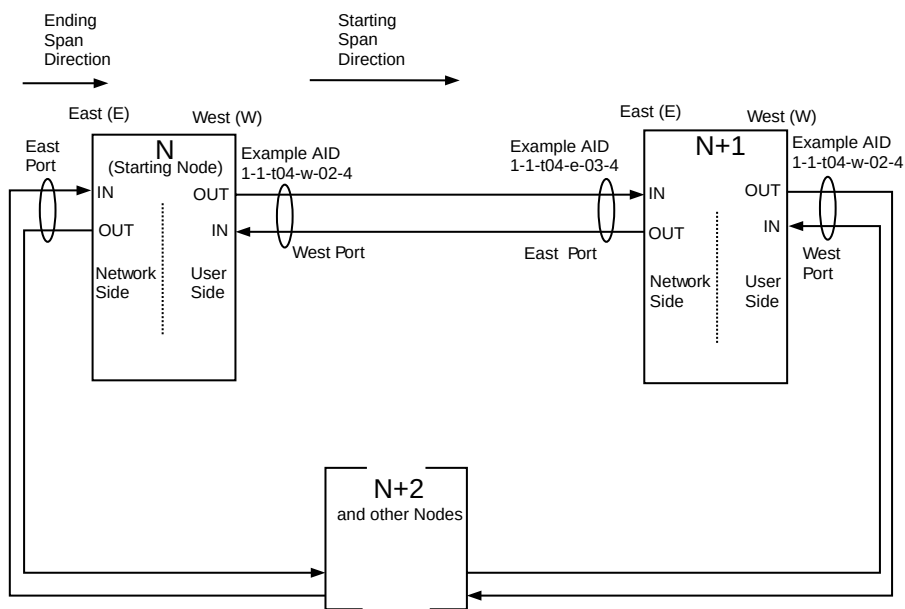
This procedure is written from the perspective that two or more people are needed to perform all the steps necessary to complete this task. The number of people will impact the amount of time and the risks associated in completing these activities. The strategy will be that one section/span (node-to-node) will be completed before moving to the next section/span.

For a 2-fiber ring, the node that you start with will be the node that you end with.

The starting node is referred to with the letter N and the next adjacent node as N+1. Subsequent nodes are similarly referred to as N+2, N+3, and so forth.

Verify that both nodes already have (a) the circuit packs (OC-48 or OC-192) installed, and (b) those circuit packs provisioned.

Figure 328-6 2-Fiber Ring WorkSheet



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| 2-FIBER RING WORKSHEET _____ SRN NAME/ID _____                                                                                                                                      |                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>N</u><br><br>TID= _____<br>Ring ID: _____<br>Protection Group AID _____<br>OUT Fiber Color/ID _____<br><br>IN Color/ID _____<br>Received Power Level _____<br>Required PAD _____ | <u>N+1</u><br><br>TID= _____<br>Protection Group AID _____<br>IN Fiber Color/ID _____<br>Received Power Level _____<br>Required IN PAD _____<br><br>OUT Fiber Color _____ |

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**Task** Complete the following steps to turn-up a 2-fiber BLSR.

- 1 The starting point for these activities will be the TID identified in your work order. For illustration purposes, we will identify this node with the letter N. Additionally, we will identify the neighbor node with the letter N+1.

Clean and connect the OUT fiber (or fibers) at the N node.

The OUT port (or ports) of the OC48/OC192 port unit will be specified in your work order.

**Reference:** T 703

- 
- 2** Instruct the person at the N+1 node to connect their power meter to the IN fiber (or fibers) and measure their received power level.

Instruct the person at the N+1 node to record these measured values.

---

- 3** Instruct the person at the N+1 node to select the appropriate LBO for each fiber (or fibers).

**Reference:** T 711

---

- 4** Instruct the person at the N+1 node to install the LBO (or LBOs).

**Reference:** T 707

---

- 5** Instruct the person at the N+1 node to clean and connect the fiber to the IN port of the OC48/OC192 port unit per their work order.

**Reference:** T 703

---

- 6** Clean and connect the OUT fiber (or fibers) at the N+1 node.

The OUT port (or ports) of the OC48/OC192 port unit will be specified in the work order.

**Reference:** T 703

---

- 7** Instruct the person at the N+1 node to:

1. Provision the DCC termination, for that node's span, per specifications detailed within the work order
2. Provision an Optical Port Protection group for this subject ring.

**Important!** Refer to the work order for specific AID information.

**Reference:** T 302, T 305

---

- 8** Instruct the person at the N node to connect their power meter to the IN fiber (or fibers) and measure their received power level.
-

- 
- 9** Instruct the person at the N node to select the appropriate LBO for each fiber (or fibers).

**Reference:** T 711

---

- 10** Instruct the person at the N node to install the LBO (or LBOs).

**Reference:** T 707

---

- 11** Instruct the person at the N node to clean and connect the fiber to the IN port of the OC48/OC192 port unit per the work order.

**Reference:** T 703

---

- 12** Instruct the person at the N node to:

1. Provision the DCC termination, for that node's span, per specifications detailed within the work order
2. Provision an Optical Port Protection group for this subject ring.

**Important!** Refer to the work order for specific AID information.

**Reference:** T 302, T 305

---

- 13**

| If...                                                                    | Then...                                                                                                                   |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| there are additional nodes to be connected (any fiber spans remaining)   | go to Step 1 and (for Steps 1-16) change all existing occurrences of N to N+1 and all existing occurrences of N+1 to N+2. |
| there are no additional nodes to be connected (no fiber spans remaining) | continue with next step.                                                                                                  |

---

**Important!** The nodes will automatically attempt to communicate via the DCC as Node-to-Node sections are reprovisioned with each other and the Ring Auto Discovery

software will attempt to build a Ring Map. If these system/network activities are successful, then the ring is established and there will not be any alarms. Otherwise, the ring will NOT be established (NOT be up) and there will be one or more alarms at one or more of the NEs.

**14** Instruct the person at the starting point node to select, from the *System View* screen:

1. **View-Rings-Ring Map**
2. Double-click on the system node type (WaveStar BandWidth Manager)
3. Double-click on the subject **Ring ID**
4. Click on the appropriate ring type (for example, **2F BLSR**)
5. Click on the **Select** button
6. Click on the **Display Ring Map Graph** button.

**15** From Step 17, is the ring map complete (a full circle)?

| IF... | THEN...                  |
|-------|--------------------------|
| Yes   | <i>Stop! End of Task</i> |
| No,   | Continue.                |

**16** Determine the node ID of where the ring is incomplete.

**Important!** You can select the various nodes to identify their node ID and determine their neighbor(s) and port connecting to their neighbor(s).

**17** Log in to the identified node ID and click on the **Alarm List** button.

**18** Identify the alarm and refer the issue to trouble-clearing personnel.  
*STOP! End of Task.*

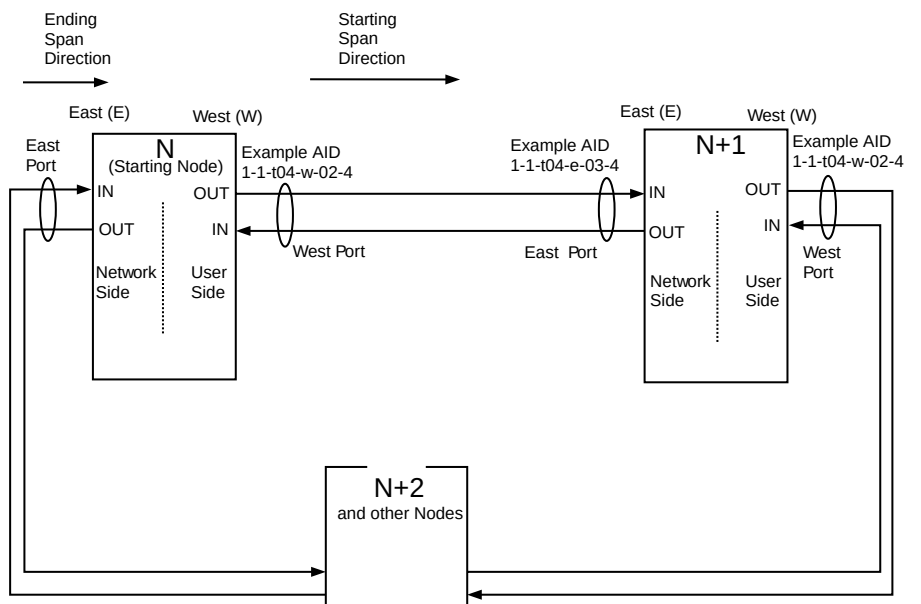


- 19 For the existing span, instruct the person at the N+1 node to remain in place while the person from N node to travel to the N+1 node of the new span.

- 20 Continue with Step 1.

END OF STEPS

## 2-Fiber Ring Worksheet (Make Additional Copies as Needed)



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| 2-FIBER RING WORKSHEET _____ SRN NAME/ID _____                                                                                                                                                                    |                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><u>N</u></p> <p>TID= _____</p> <p>Ring ID: _____</p> <p>Protection Group AID _____</p> <p>OUT Fiber Color/ID _____</p><br><p>IN Color/ID _____</p> <p>Received Power Level _____</p> <p>Required PAD _____</p> | <p><u>N+1</u></p> <p>TID= _____</p> <p>Protection Group AID _____</p> <p>IN Fiber Color/ID _____</p> <p>Received Power Level _____</p> <p>Required IN PAD _____</p> <p>OUT Fiber Color _____</p> |

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## Task 329: Change an NE's TID

---

**Purpose** Use this procedure to change an NE's TID. The more common time to change a TID will be prior to placing that NE in-service. However, this procedure can also be used to change the TID of an in-service NE.

**Required privilege codes** You must have at least an S4 and an M4 privilege code in order to complete this task.

**Required equipment** WaveStar Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Prior to performing this task, you must:

- Obtain the work instructions for this task, specifying the new TID.
- Be able to log in to an NE with the WaveStar CIT, and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to change an NE's TID.

---

**1** As appropriate, connect your WaveStar CIT to the subject NE.

---

**2** As appropriate, log in to the WaveStar CIT application.

---

**3** As appropriate, log in to the subject WaveStar NE.

---

**Important!** The TID can only be changed whenever the NE is in its Maintenance Condition. From the *System View* screen, observe the warning box, which is located in the bottom right-hand part of this screen.

- 4 Is the box lighted (red background and displaying the word *Maintenance*)?

| If... | Then...               |
|-------|-----------------------|
| YES,  | go to Step 7.         |
| NO,   | continue with Step 5. |

---

**Important!** Before changing the NE's **Maintenance Condition** to ON, you should understand that upon exiting from Maintenance Condition, the NE will perform a reset, and your log-in session to the NE will be dropped. Following this NE's reset, you can (as needed) log in again.

- 5 From the *System View* screen, click on **Fault-Enter/Exit Maintenance Condition-Enter Maintenance Condition**.

**Result:** The following information message is displayed.  
*Execution of Enter Maintenance Condition may affect the NE service. Do you want to execute this command?*

- 
- 6 Click the **YES** button.

- 
- 7 From the *System View* screen, click on **Administration-Set TID**.

---

**Important!** The TID must be unique for the ring. Permitted syntax is (a) 1 to 20 characters – where a character is either a letter, a digit, or a hyphen, (b) the initial (first) character must be a letter, and (c) the character immediately following a hyphen must be a letter. And, the WaveStar CIT will convert lowercase letters to upper case before they are stored in the NE's NVM.

- 8 From the work order:
1. obtain the desired TID and enter it into the field labeled *New TID/NE Name*:
  2. confirm your entry in the field labeled *Confirm TID/NE Name*:
  3. click on the **OK** button.

4. read the information message and click on the **YES** button.

---

**Important!** Upon exiting from Maintenance Condition, the NE will perform a reset and your log-in session to the NE will be dropped. Following this NE's reset, you can (as needed) login again.

**9** From the *System View* screen:

1. Click on **Fault-Enter/Exit Maintenance Condition-Exit Maintenance Condition**
2. Read the information message and click on **YES** to execute.

**Important!** The NE will reset the two circuit packs (SYS50DM and DCCEI). Existing cross-connections remain up/established and unaffected. However, the current login session is terminated and must be re-established.

---

**10** Login to the subject WaveStar NE with the new/changed TID.

| If...                                           | Then...                                                                                                   |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| the login using the new TID was successful,     | the TID was successfully changed on this NE. Continue with Step 11.                                       |
| the login using the new TID was not successful, | the TID was not successfully changed on this NE. Escalate to your next higher level of technical support. |

---

**11** Each and every cross-connection that either originates or terminates with this NE must be changed to include this new TID.

---

**12** Every NE, on this ring, that has a source cross-connection or destination cross-connection with the old TID must be changed to reflect the new TID. As necessary, sequentially go around the ring and verify that each NE no longer has any cross-connection with the old TID.

- 
- 13** Verify that the ring maps for all nodes associated with this NE are correct by logging into each NE and checking its individual ring map.

END OF STEPS

---



## Task 336: Create NonReporting Alarm Severity Assignment Profiles (ASAPs)

---

**Purpose** Use this procedure to create NonReporting ASAPs. NonReporting ASAPs are Alarm Severity Assignment Profiles assigned to specific profile types or equipment groups to filter out alarms. NonReporting ASAPs may be created for any or all of the port or tributary profile types you select. The NonReporting profile sets the SA Alarm Level and NSA Alarm Level to "Not Reported" for each of the probable causes for that profile. Profiles of this type might be used to filter alarms from the system during new shelf installation or addition of equipment groups.

**Required privilege code(s)** You must have a privilege code of at least M3 to create NonReporting ASAP profiles. You must have a privilege code of at least M1 to view ASAP profiles.

**Required equipment** WaveStar™ Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- Chapter 7, "Provisioning, Security, and Administration"
- Appendix A, "WaveStar CIT Tutorial"

**Before you begin** Prior to performing this task, you must:

- Obtain the work instructions for this task that detail the port, tributary, and equipment profiles for which you want to create NonReporting ASAPs.
- Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to create NonReporting ASAPs.

---

**1** Use the WaveStar CIT to log in to the system.

---

**2** Select **Configuration > Alarms > Create NonReporting ASAPs** on the *System View* toolbar.

**Result:** The **Create NonReporting ASAP Profiles** window opens.

---

- 
- 3** Under **Available ASAP Types**, select the equipment type(s) for which you want to create a NonReporting ASAP

**Important!** If no ASAP types are listed, then NonReporting ASAPs have already been created for each of the profiles.

---

- 4** Use the buttons in the middle of the screen to add the selected types to the **Selected ASAP Types** box.
- 

- 5** When all your required selections are in the **Selected ASAP Types** box, click **OK**.

**Result:** A warning box opens informing you that your selection may affect the NE and asks if you want to execute the command.

---

- 6** Click **Yes**, then click **Close** to exit if the window did not automatically close.
- 

- 7** Use the **View > View Alarms > View Alarm Severity Assignment Profiles** to verify the selected NonReporting ASAP has been created.

**Reference:** T 337

---

- 8** Set NonReporting ASAPs, if required.

**Reference:** T 338

---

END OF STEPS

---





## Task 337: View Alarm Severity Assignment Profiles (ASAPs)

---

**Purpose** Use this procedure to view details on existing ASAPs.

**Required privilege code(s)** You must have a privilege code of at least M1 to view ASAP profiles.

**Required equipment** WaveStar™ Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- Chapter 7, “Provisioning, Security, and Administration”
- Appendix A, “WaveStar CIT Tutorial”

**Before you begin** Prior to performing this task, you must:

- Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to view existing ASAP profiles.

---

**1** Use the WaveStar CIT to log in to the network element.

---

**2** Select **Fault > View Alarm Assignment Profile** on the *System View* toolbar.

**Result:** The **View Alarm Severity Profile** window opens.

---

**3**

| If...                                                                        | Then...                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| you want to view details for all the profile names for a specific ASAP Type, | Do the following: <ol style="list-style-type: none"><li>1. select the ASAP Type</li><li>2. click <b>View ASAP</b> at bottom of window.</li></ol> <p><b>Result:</b> Details of all the profile names for the selected ASAP type display on right side of window.</p> |

| If...                                                                             | Then...                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| you want to view details for an individual profile name for a selected ASAP Type, | <p>Do the following:</p> <ol style="list-style-type: none"> <li>1. click on the plus (+) sign next to the ASAP Type to open the list of profile names for this type.</li> <li>2. Select the profile name to display</li> <li>3. click <b>View ASAP</b> at bottom of window.</li> </ol> <p><b>Result:</b> Details of the selected profile name display on right side of window.</p> |

---

**4** Click **Close** to exit.

END OF STEPS

---



## Task 338: Set NonReporting Alarm Severity Assignment Profiles (ASAPs)

---

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to set or assign NonReporting ASAPs to selected ports, tributaries, circuit packs, or an entire shelf. Setting NonReporting ASAPs allows you to prevent the reporting of alarms on all existing or preprovisioned equipment of the same type on the shelf selected.                                                                                                                                                                                                                                                                                                 |
| <b>Required privilege code(s)</b> | You must have a privilege code of at least M3 to set NonReporting ASAP profiles. You must have a privilege code of at least M1 to view ASAP profiles.                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Required equipment</b>         | WaveStar™ Craft Interface Terminal (CIT)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Related information</b>        | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• Chapter 7, “Provisioning, Security, and Administration”</li><li>• Appendix A, “WaveStar CIT Tutorial”</li></ul>                                                                                                                                                                                                                                                                                                                                                          |
| <b>Before you begin</b>           | Prior to performing this task, you must: <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul>                                                                                                                                                                                                                                                                                                                              |
| <b>Task</b>                       | Complete the following steps to assign NonReporting ASAP profiles to selected entities.<br><br><hr/> <ol style="list-style-type: none"><li><b>1</b> Use the WaveStar CIT to log in to the system.</li></ol> <hr/> <ol style="list-style-type: none"><li><b>2</b> Select <b>Configuration &gt; Alarms &gt; Set NonReporting ASAPs</b> on the <i>System View</i> toolbar.<br/><br/><b>Result:</b> The <b>Set NonReporting ASAPs</b> window opens.</li></ol> <hr/> <ol style="list-style-type: none"><li><b>3</b> Open the correct bay details, then select the required shelf.</li></ol> |

- 
- 4 Click **Select** at bottom of window.

**Result:** All shelf equipment types that have had a NonReporting ASAP created are displayed on right side of window.

Equipment types that have not had NonReporting ASAPs created will not be displayed.

- 
- 5 Click on the required **Port** or **Tributary Selection** tab.

- 
- 6 Select the required available port or tributary types from the **Available Port/Tributary Types** box.

- 
- 7 Use the **Add**, **Remove**, **Add All**, and **Clear** buttons to add selected available types to the **Selected Port/Tributary Types** box.

- 
- 8 When all selections are made, click **Apply** at bottom of window.

**Result:** A warning box opens stating that the NE may be affected by this command and asks if you want to execute the command. In addition, a list of ASAPs which do not have an associated NonReporting profile are listed for the selected equipment types.

- 
- 9

| If...                                                                                | Then...                                                                                                                                                                        |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| you need to create additional NonReporting profiles,                                 | do the following:<br>1. click <b>No</b> to abort the command,<br>2. click <b>Close</b> to exit from the Set NonReporting ASAP window.<br>3. Continue with the next step.       |
| no additional profiles need to be created and you still want to execute the command, | do the following:<br>1. click <b>Yes</b> to execute the command<br>2. click <b>Close</b> to exit from the <b>Set NonReporting ASAP</b> window.<br>3. <i>Stop! End of Task.</i> |

---

**10** Create NonReporting ASAPs as required and repeat this procedure.

**Reference:** T 336

END OF STEPS

---





## Task 339: Provision Alarm Configurations

---

- Purpose** Use this procedure to perform the following:
- Enable or disable office alarms
  - Set facility alarm delay times for generating and clearing of alarms
  - Set equipment alarm delay times for generating and clearing of alarms.

**Required privilege code** You must have a privilege code of at least M3 to provision alarm configurations.

**Required equipment** WaveStar™ Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- Chapter 7, “Provisioning, Security, and Administration”
- Appendix A, “WaveStar CIT Tutorial”

**Before you begin** Prior to performing this task, you must:

- Obtain the work instructions for this task.
- Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to provision alarm configurations.

---

**1** Use the WaveStar CIT to log in to the system.

---

**2** Select **Configuration > Alarms > Alarm Configuration** on the *System View* toolbar.

**Result:** The *Alarm Configuration Provisioning* window opens.

---

**3** Provision the following parameters, as required:

- Office Alarm  
Select Enabled or Disabled

- Facility Alarm-Clear Delay  
Select zero (0), default, for no delay or select a value from 11 to 60 seconds.
- Facility Alarm-Generate Delay  
Select zero (0), default, for no delay or select a value from 11 to 60 seconds. This value must be less than or equal to the Facility Alarm-Clear Delay value.
- Equipment Alarm-Clear Delay  
Select zero (0), default, for no delay or select a value from 11 to 60 seconds.
- Equipment Alarm-Generate Delay  
Select zero (0), default, for no delay or select a value from 11 to 60 seconds. This value must be less than or equal to the Facility Alarm-Clear Delay value and less than or equal to the Equipment Alarm-Clear Delay value.

---

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

**Result:** A warning window opens stating that NE service might be affecting and asks if you want to execute the command.

---

**5** Click **Yes** to execute the command.

---

END OF STEPS

---





## Task 340: Change System Timing Reference Priority

---

**Purpose** Use this procedure to change the System Timing Reference Priority of the following timing references:

- External DS1 Reference 1 (EXTREF1)
- External DS1 Reference 2 (EXTREF2)
- OC-48 line reference (LINE1) (Release 4 and earlier)
- OC-3, OC-12, OC-48, or OC-192 line references (LINE1 through LINE6) (Release 5 and later)

For *nonrevertive* operation, the System Timing Reference Priority parameter of each timing reference should be provisioned with the same value. For *revertive* operation, the System Timing Reference Priority parameter of each timing reference should be provisioned different values.

**Required privilege codes** A privilege code of at least P3 is required to change the System Timing Reference Priority parameter. A privilege code of at least P1+M1 is required to view the Timing Reference tab of the *View Timing/Sync* screen.

**Required equipment** The WaveStar CIT is required to perform this task.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



**CAUTION**

*Wait 3 minutes after performing this task before making any other changes to the WaveStar TDM 2.5G/10G system. In WaveStar TDM 2.5G Release 2, wait 7 minutes after performing this task before making any other changes to the system.*



**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system, to prevent electrostatic discharge damage to sensitive components.*

**Related information** For related information, see the following sections in this document:

- *Chapter 6, Control, Transmission, and Synchronization*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin**

Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the timing reference(s) and the System Timing Reference Priority to be provisioned.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task**

Complete the following steps to change the maximum number of backup folders allowed on a WaveStar CIT.

- 
- 1** At the WaveStar CIT, select **Configuration>Timing/Sync**.

**Result:** The *Provision Timing/Sync* screen appears.

- 
- 2** Click on the **Timing Reference** tab.

- 
- 3** Select the desired timing reference and provision the **System Timing Reference Priority** parameter based on the work instructions.

---

**4**

| IF you ...                                                                                               | THEN ...                                    |
|----------------------------------------------------------------------------------------------------------|---------------------------------------------|
| want to change the <b>System Timing Reference Priority</b> parameter of another timing reference,        | click on <b>Apply</b> and return to Step 3. |
| do not want to change the <b>System Timing Reference Priority</b> parameter of another timing reference, | click on <b>OK</b> and go to Step 5.        |

- 
- 5** Select **View>Timing/Sync...**, click on the **Timing Reference** tab, and verify that the **System Timing Reference Priority** parameter of the desired timing reference(s) is provisioned correctly.

---

END OF STEPS





# Task 341: View Performance Monitoring (PM) Parameters for Selected Ports or Tributaries

---

|                                   |                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to view the performance monitoring (PM) parameters assigned to selected ports or tributaries.                                                                                                                                                                                                           |
| <b>Required privilege code(s)</b> | You must have a security privilege code of at least P3 to perform this task.                                                                                                                                                                                                                                               |
| <b>Required equipment</b>         | WaveStar <sup>TM</sup> Craft Interface Terminal (CIT)                                                                                                                                                                                                                                                                      |
| <b>Related information</b>        | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• Chapter 8, “Performance Monitoring”</li><li>• Appendix A, “WaveStar CIT Tutorial”</li></ul>                                                                                                                  |
| <b>Before you begin</b>           | Prior to performing this task, you must: <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Identify the ports or tributaries related to the task.</li><li>• Be able to log in to an NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul> |
| <b>Task</b>                       | Complete the following steps to view the assigned PM parameters for selected ports or tributaries.                                                                                                                                                                                                                         |

- 
- 1** On the *System View* toolbar, select **Performance > View PM Ports**.

**Result:** The *View Parameters for Port Performance Monitoring* window opens.

---

- 2** Open up the required bay, shelf, and port details. Select the required port, VCG, or tributary to view, then click **Select** at bottom of window.

**Result:** The assigned PM profiles and parameters display on right side of window for the port or tributary selected. The type of window depends on your selection.

---

- 3** Note the PM TCA Profile assignments and PM Activation status.
-

4

| IF you...                                  | THEN...                                                                                                                                                                                         |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| want to view the details of a TCA profile, | under Control Options, <i>View Details</i> , click on the profile you wish to view.<br><br><b>Result:</b> The <i>View TCA Profile Details</i> window opens.<br><br>Continue with the next step. |
| are finished,                              | click <b>Close</b> to exit.                                                                                                                                                                     |

5 Note the parameters and settings for the profile you selected.

6

| If you ...                                                                    | Then...                                                                                                                                                    |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| want to view the shelf AIDs that have been assigned the selected TCA profile, | click <b>View Assigned AIDs</b> at bottom of window.<br><br><b>Result:</b> The <i>View Assigned AIDs</i> window opens.<br><br>Continue with the next step. |
| are finished,                                                                 | click <b>Close</b> in each window to exit.                                                                                                                 |

7 Open up the bay details and highlight the required shelf. Then, click **Select Shelf** at bottom of window.

**Result:** Parameters display on right side of window with the profile type, profile name, and the associated assigned AIDs for the selected shelf.

8 Click **Close** in each window to exit.

END OF STEPS





## Task 344: Example of Bridging and Rolling an Existing Cross-Connection

---

**Purpose** Use this procedure to roll an existing cross-connection from one source to another source.

**Required privilege code** You must have a security privilege code of at least P3 to perform this task.

**Required equipment** WaveStar Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- Chapter 7, Provisioning, Security, and Administration
- Appendix A, WaveStar CIT Tutorial

**Before you begin** Before you begin this task, you must:

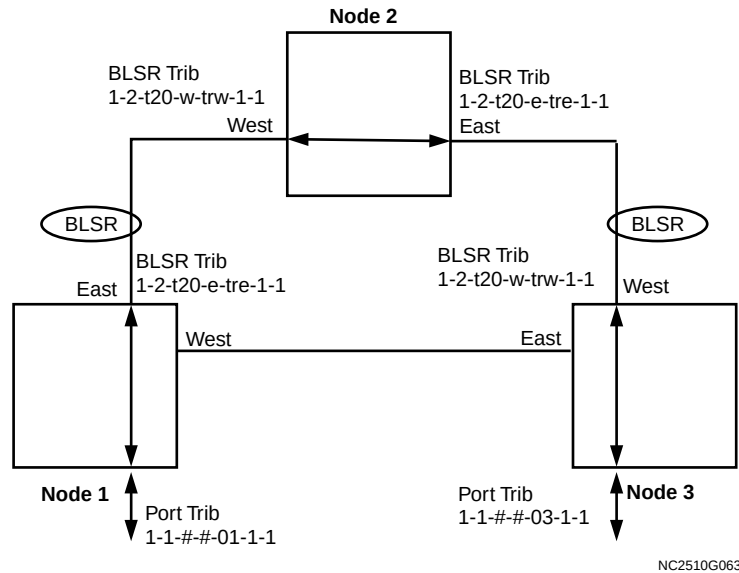
- Obtain the work instructions for this task.
- Determine the cross-connection(s) to be rolled.
- Identify the tributaries for the new cross-connections.
- Log in to the NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Important!** The following procedure is based on a hypothetical example. You can use this example procedure to apply the basic concepts to the task you want to perform.

**Task** Complete the following steps to bridge and roll an existing cross-connection.

- 
- 1** From the System View toolbar, select **View > Rings > Ring Map** to select and view all the nodes in a selected ring, if required.

Reference the following figure as an example ring map.



In this example, a two-way STS-1 cross-connection exists from a port tributary at Node 1 to a port tributary at Node 3 using tributary 1 on the east port of the OC-192 2-Fiber BLSR at Node 1. We want to free tributary 1 of the BLSR to be used for another cross-connection. This means we have to roll the existing cross-connection to another free tributary on the BLSR. For this example, we will roll to tributary 4 on the BLSR.



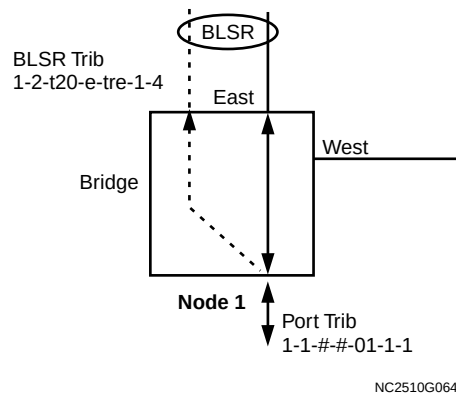
#### CAUTION

*Before rolling the existing cross-connection to a new BLSR tributary, you must establish the new cross-connections at intermediate nodes, and bridge the existing circuit at the end nodes.*

- 2 From the System View toolbar, select **View > View Equipment Details** and verify that all slots, circuit packs, ports, protection groups, and required tributaries have been provisioned at each node.
- 3 Remotely login to the adjacent node (Node 2) going East and establish a new two-way STS-1 tributary-to-tributary (1-2-t20-e-tre-1-4 to 1-2-t20-w-trw-1-4) cross-connection using the **Configuration > Cross-Connection** command.

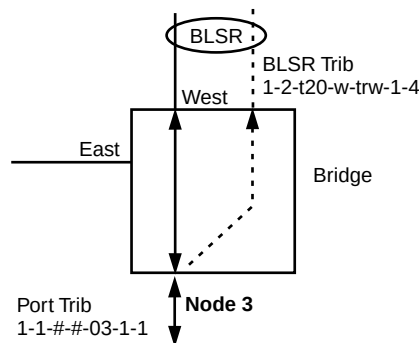


- 
- 4 Repeat Step 3 for all intermediate nodes until you reach the destination node.
- 
- 5 At Node 1, use the **Configuration > Cross-Connection** command to establish a one-way STS-1 cross-connect bridge from port tributary 1-1-##-01-1-1 to the new BLSR tributary 1-2-t20-e-tre-1-4. See Figure below.



**Important!** When performing the bridge at Node 1 using the Cross Connection Wizard, note that the Source tributary is the port tributary 1-1-##-01-1-1, the Existing Destination tributary is 1-2-t20-e-tre-1-1, and the New Destination tributary is 1-2-t20-e-tre-1-4. The Destination NE Name is Node 3 in the final screen of the wizard.

- 
- 6 At Node 3, use the **Configuration > Cross-Connection** command to establish a one-way STS-1 cross-connect bridge from port 1-1-##-03-1-1 to the new BLSR tributary 1-2-t20-w-trw-1-4 using the **Configuration > Cross-Connection** command. See Figure below.



**Important!** When performing the bridge at Node 3 using the Cross Connection Wizard, note that the Source tributary is the port tributary 1-1-##-03-1-1, the Existing Destination tributary is 1-2-t20-w-trw-1-1, and the new Destination tributary is 1-2-t20-w-trw-1-4. The Destination NE Name is Node 1 in the final screen of the wizard.



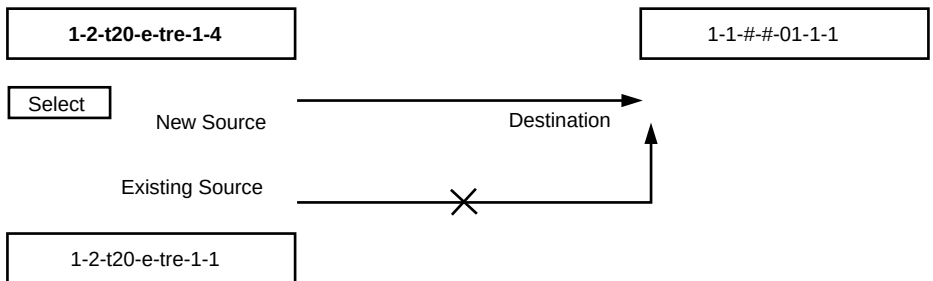
#### CAUTION

*Service interruption will occur if all new cross-connections are not properly made before performing the following roll procedures.*

- 7 Use the **View > Cross-Connection** command to verify that you have made all the new required cross-connections.
- 8 Use the **Configuration > Cross-Connection** command to perform the following roll procedures at each end node.
- 9 At Node 1, select the Roll option in the Cross Connection Wizard.
- 10 In Cross Connection Wizard screen 1, select the 2-Way cross-connection type between port tributary 1-1-##-01-1-1 and the original BLSR port tributary 1-2-t20-e-tre-1-1. Click **Next**.

- 
- 11** In Cross Connection Wizard screen 2, select the original Source port BLSR tributary 1-2-t20-e-tre-1-1 as the leg you want to roll. Click **Next**.
- 

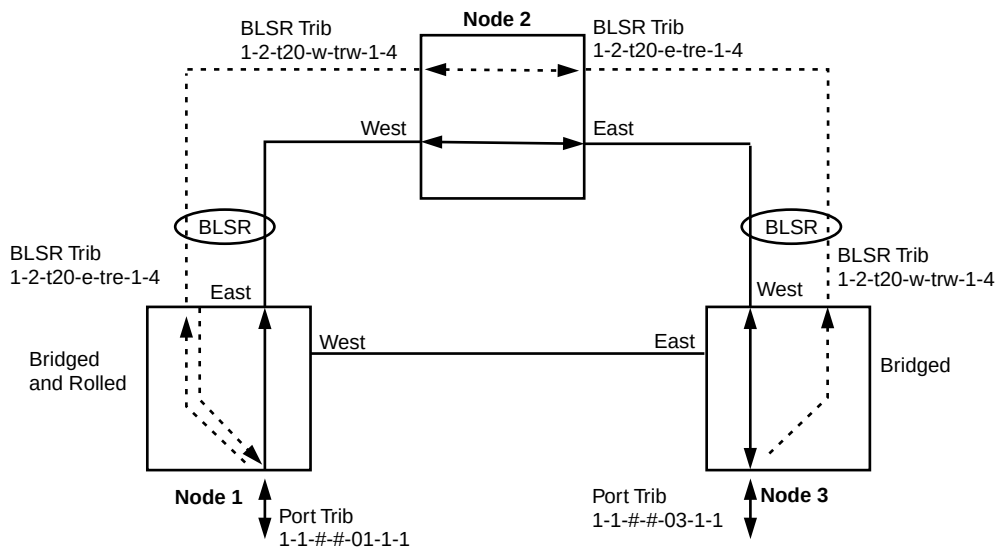
- 12** In Cross Connection Wizard screen 3, select the New Source tributary as 1-2-t20-e-tre-1-4. Click **Next**.



NC25-10G069

- 
- 13** In Cross Connection Wizard screen 4, verify the information is correct, then click **Finish**.

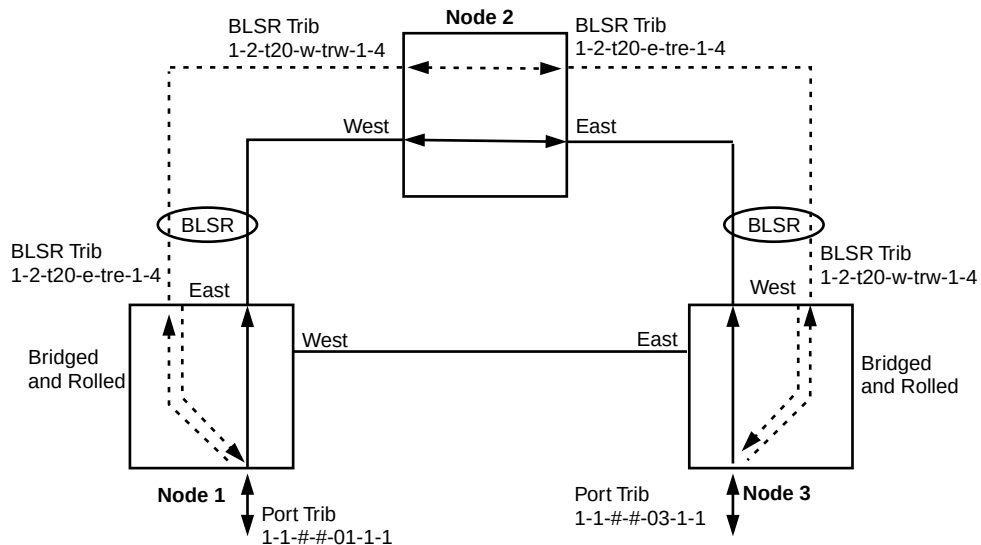
The cross-connections at this point should look like the following. Note that the new cross-connection at Node 1 is now a 2-way cross-connection and the original cross-connection is now a 1-way cross-connection.



NC2510G066

- 14** Repeat Steps 8 through 13 at Node 3 for cross-connections between port tributary 1-1-##-03-1-1 and the original BLSR port tributary 1-2-t20-w-trw-1-1.

After the cross-connections are rolled at Node 3, the cross-connections should look like the following:



NC2510G067

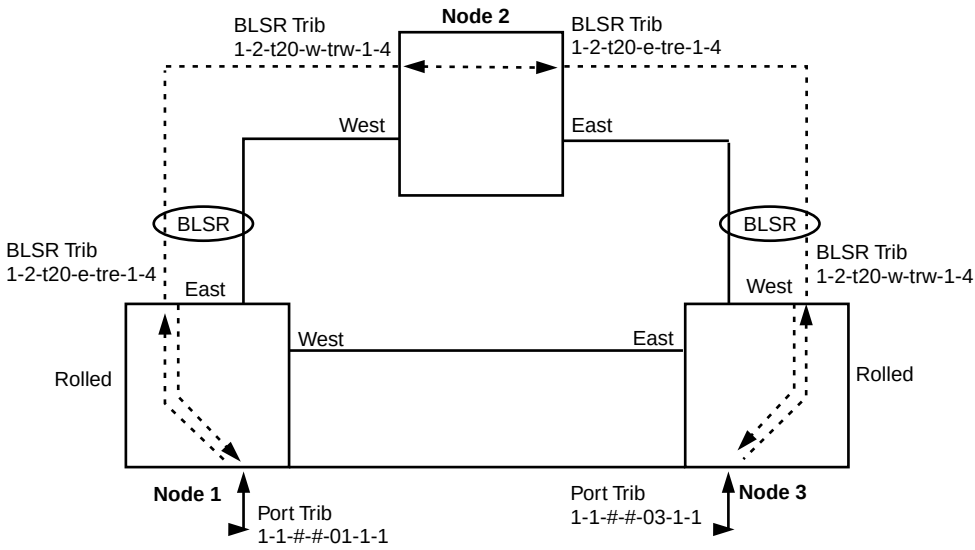


## CAUTION

*Service interruption will occur if all new cross-connections and roll procedures are not properly made before deleting the original cross-connections.*

- 15 Use the **View > Cross-Connection** command to verify that you have made all the new required cross-connections.
- 16 At Node 1, use the **Configuration > Cross-Connection** delete command to delete the original, now 1-way, cross-connection between port tributary 1-1-#-#-01-1-1 and the original BLSR port tributary 1-2-t20-e-tre-1-1.
- 17 At Node 3, use the **Configuration > Cross-Connection** delete command to delete the original, now one-way, cross-connection between port tributary 1-1-#-#-03-1-1 and the original BLSR port tributary 1-2-t20-w-trw-1-1.
- 18 At all intermediate nodes, use the **Configuration > Cross-Connection** delete command to delete the original tributary-to-tributary cross-connections. For example at Node 2, delete the through cross-connection between tributary 1-2-t20-w-trw-1-1 and tributary 1-2-t20-e-tre-1-1.

The final configuration should look like the following:



NC2510G068

END OF STEPS



## Task 349: Configure Miscellaneous Discrete Inputs and Outputs

---

**Purpose** Use this procedure to configure the miscellaneous discrete inputs (MDI) or miscellaneous discrete outputs (MDO).

**Required privilege code** You must have a security privilege code of at least P3 to perform this task.

**Required equipment** WaveStar Craft Interface Terminal (CIT)

**Related information** For related information, see the following sections in this document:

- Chapter 7, Provisioning, Security, and Administration
- Appendix A, WaveStar CIT Tutorial

**Before you begin** Before you begin this task, you must:

- Obtain the work instructions for this task.
- Identify the inputs or outputs you want to configure.
- Determine the names for the various inputs and outputs.
- Log in to the NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.

**Task** Complete the following steps to configure miscellaneous discrete inputs (MDI) or outputs (MDO).

---

**1** From the System View toolbar, select **Configuration > Misc Discretes**.

The *Configure Miscellaneous Discretes* window opens.

---

**2**

| If you are provisioning              | Then                  |
|--------------------------------------|-----------------------|
| input miscellaneous discretes (MDI)  | continue with Step 3. |
| output miscellaneous discretes (MDO) | continue with Step 8. |

- 
- 3** Select an available MDI Input you want to provision or an existing MDI you want to edit, then click **Select**.

The provisionable parameters display for the selected input.

---

- 4** Enter or edit the name for the MDI input in the **Name** box.
- 

- 5** Select an **Alarm Severity Assignment Profile (ASAP)** in the drop-down list box.
- 

- 6** Click **Apply** to activate your changes.

A warning appears which indicates that the NE service may be affected by the changes.

---

- 7** Click on **Yes** to execute the command.

If you want to provision MDO Outputs, continue with the next Step, otherwise, Stop.

---

- 8** Select an available MDO Output you want to provision or an existing MDO you want to edit, then click **Select**.

The provisionable parameters display for the selected output.

---

- 9** Enter or edit the name for the MDO output in the **Name** box.
- 

- 10** In the **Initial State** box, select **Operated** if you want to operate the MDO output. Select **Released** if you want to stop the MDO output.
- 

- 11** In the **Duration Mode** box, select whether the relay contact is to be opened or closed **Continuously** or **Momentarily**. Selecting **Momentarily** indicates the relay contact will be opened or closed momentarily for a fixed period of 300 ms.
-



---

**12** Click **Apply** to activate your changes.

A warning appears which indicates that the NE service may be affected by the changes.

---

**13** Click on **Yes** to execute the command.

Repeat this procedure to provision any other inputs or outputs.

END OF STEPS

---



## Task 350: Configure Gigabit Ethernet Ports and VLANs for Service

---

|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                                  | Use this procedure to configure the gigabit ethernet (GbE) circuit packs for service. Procedures are provided to make STS-1 cross-connections for bandwidth allocation, port provisioning, and VLAN provisioning.                                                                                                                                                                                                                                                                                                        |
| <b>Required privilege code</b>                  | You must have a security privilege code of at least P3 and M1 to perform this task.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Required equipment</b>                       | WaveStar Craft Interface Terminal (CIT)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Related information</b>                      | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, WaveStar CIT Tutorial</i></li></ul>                                                                                                                                                                                                                                                                                  |
| <b>Before you begin</b>                         | Before you begin this task, you must: <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Determine the number of STS-1s and respective tributary AIDs associated with the allocated bandwidth for this service.</li><li>• Determine the customer vlan IDs associated with this service.</li><li>• Identify the ports and vlan group you want to configure.</li><li>• Log in to the NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul> |
| <b>Instructions for STS-1 cross-connections</b> | Complete the following steps to configure the gigabit ethernet circuit packs.                                                                                                                                                                                                                                                                                                                                                                                                                                            |

- 
- 1** Use the **Configuration > Cross-Connection** command from the **System View** menu to make all the required 2-way STS-1 cross-connections associated with this service.

**Important!** All required terminating and pass through cross-connections must be made at each NE. From 1 to 21 STS-1s may be allocated for this service. Service is not activated until the Vlan IDs and ports are properly provisioned.

Create New Cross-Connection - T 303,

---

END OF STEPS

---

## Instructions for external LAN ports

Complete the following steps to configure the parameters of one or more Gigabit Ethernet port(s):

- 
- 1 Use the **Configuration > Provision** command from the **System View** menu to open the **Provision Parameters for Protection Groups or Equipment** window.

On the left side of the window, the equipment selection tab becomes visible. The shelves belonging to the system are listed.

- 
- 2 Select the desired shelf. Double click on the shelf or click on the + in front of the shelf name.

The list of circuit packs and slots which are available becomes visible below the shelf name.

- 
- 3 Select the desired port unit (GE1/SX2 or GE1/LX2). Double click on the port unit or click on the + in front of the unit name.

- 
- 4 Select the desired 1GE LAN port (Port 1 or Port 2), then click on the **Provision** button at bottom of window.

On the right side of the window 3 tabs containing the provisionable parameters are displayed.

- 
- 5 Select the **Port Data** tab, then select **Port Mode** in the **Fault** box of the tab.

The following values are possible:

- **AUTO**
- **Monitored**
- **Not Monitored**

- 
- 6** Select the **Alarm Severity Profile** in the respective drop-down list box. You can choose between the default and a specific ASAP.

**Important!** Click on **View Details...** to obtain more detailed information on the ASAPs.

---

- 7** Select the **Flow Control** tab, then select the **Flow Control Mode**.

The following values are possible:

- **Disable**
- **AUTO**

On the same tab the **Flow Control Mode Operation** is displayed. The values **Enable**, **Disable** and **Unavailable** are possible.

---

- 8** Select the **Admitted Frame Types** tab, then define whether **Untagged VLAN Frames** are admitted by clicking on the respective check box.
- 

- 9** If the untagged VLAN frames are admitted, insert a **Port VLAN Identifier** in the range from **1** to **4093**.
- 

- 10** Edit the valid VLAN list for this port in the **Edit VLAN List** box. A VLAN identifier is an integer with values form **1** to **4093**. Several identifiers can be seperated by a comma. A VLAN range is denoted with two VLAN identifiers separated by a dash. In the group box **Edit VLAN List**, click on the radio button **Add** in order to add the edited VLAN list to the **Valid Tagged VLANs** list or click on the radio button **Delete** to remove it. If you wish to retrieve details on a selected VLAN, select a VLAN ID from the **VLAN ID** box and click on the button **VLAN Overview** in order to open the **VLAN Overview** window.
- 

- 11** In the drop-down list box **Apply to:** select whether the changes shall affect only the selected port, all ports of the present type on the selected circuit pack, or all ports of the present type in the selected shelf.

- 
- 12** Click on **Apply** in order to activate your changes. If you wish to discard your changes, click on **Close**.

---

END OF STEPS

---

## Instructions for VCG WAN ports

Use the following procedure to provision the VCG ports.

- 
- 1** Use the **Configuration > Provision** command from the **System View** menu to open the **Provision Parameters for Protection Groups or Equipment** window.

On the left side of the window, the equipment selection tab becomes visible. The shelves belonging to the system are listed.

- 
- 2** Select the desired shelf. Double click on the shelf or click on the + in front of the shelf name.

The list of available circuit packs and slots become visible below the shelf name.

- 
- 3** Select the desired port unit (for example, GE1/SX2). Double click on the port unit or click on the + in front of the unit name.

- 
- 4** Select the desired VCG port (Port v1 or Port v2), then click on the **Provision** button at bottom of the window.

On the right side of the window, 3 tabs (VCG Data, VLAN, and LCAS) containing the provisionable parameters are displayed.

- 
- 5** Click on the **VCG Data** tab, then select the **VCG Monitoring Mode** in the Fault group box.

The following values are possible:

- **Monitored**
- **Not Monitored**

- 
- 6** Select the **Alarm Severity Profile** in the respective drop-down list box. You can choose between the default and a specific ASAP. Via the push-button **View Details...** you can retrieve more detailed information on the ASAPs.
- 
- 7** In the **Apply to:** drop-down list box, select whether the changes will affect only the selected VCG port, all VCG ports of the present type on the selected circuit pack, or all VCG ports of the present type in the selected shelf.
- 
- 8** Select the **VLAN** tab for a VLAN overview of Valid Tagged VLANs.
- 
- 9** Select the **LCAS** tab and enable/disable the LCAS mode according to the work instructions.

---

END OF STEPS

---





## Task 351: View VLAN Data

---

|                                |                                                                                                                                                                                                                           |
|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | Use this procedure to view the provisioned VLAN data for gigabit ethernet ports and VCGs.                                                                                                                                 |
| <b>Required privilege code</b> | You must have a security privilege code of at least P1 or M1 to perform this task.                                                                                                                                        |
| <b>Required equipment</b>      | WaveStar Craft Interface Terminal (CIT)                                                                                                                                                                                   |
| <b>Related information</b>     | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• Chapter 7, Provisioning, Security, and Administration</li><li>• Appendix A, WaveStar CIT Tutorial</li></ul> |
| <b>Before you begin</b>        | Before you begin this task, you must: <ul style="list-style-type: none"><li>• Log in to the NE with the WaveStar CIT and be familiar with the functions of the WaveStar CIT.</li></ul>                                    |

### Task

---

- 1** In the **System View** menu, use the **View>VLAN Topology>VLAN Details** command to call up the window **VLAN Overview**. Alternatively you can click on the **VLAN Overview** button on the Ethernet port provisioning window.

- 
- 2** Select the required GE1/SX2 circuit pack, or click on the Data tab and select a VLAN ID, then click **Select**.

The following values are displayed:

- **VLAN ID**
- **Ethernet Port AID**
- **VCG AID**
- **VCG Rate**
- **VCG Size**

---

END OF STEPS

---



## Task 352: Delete a Transmission Circuit Pack

---

|                                |                                                                                                                                                                                                        |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                 | Use this procedure to delete an installed transmission circuit pack that is out of service .                                                                                                           |
| <b>Required privilege code</b> | A privilege code of at least P3 is required to perform this task.                                                                                                                                      |
| <b>Required equipment</b>      | A WaveStar Craft Interface Terminal (CIT) is required to perform this task.                                                                                                                            |
| <b>Safety precautions</b>      | To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task. |



### CAUTION

*Deleting a circuit pack may interrupt service if proper procedures are not followed. Deleting any circuit packs involved in port protection groups may require facility and/or traffic rearrangements.*

|                            |                                                                                                                                                                                                                                         |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Related information</b> | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, WaveStar CIT Tutorial</i></li></ul> |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Before you begin**

Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the circuit pack to be deleted and the associated cross-connections, protections groups, and timing references.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to delete an installed transmission circuit pack that is out of service.

---

**1** Verify that all service/traffic has been removed from the circuit pack per local procedures.

---

**2** Verify no cross-connections are associated with the circuit pack to be deleted.

**Reference:** *SE 352-1: Verify Cross-Connections*

---

**3** If required, delete any cross-connections associated with the circuit pack.

**Reference:** *Circuit Order/Provisioning Task 304, Modify/Delete/Roll Cross-Connection*

---

**4** Verify no protection groups are associated with the circuit pack to be deleted.

**Reference:** *SE 352-2: Verify Protection Groups*

---

**5** If required, delete any protection groups associated with the circuit pack and its port(s).

**Reference:** *Circuit Order/Provisioning Task 308, Delete Optical Protection Group*

- 
- 6 Disable any DCC terminations to the circuit pack.

**Reference:** *Circuit Order/Provisioning Task 305, Enable/Disable DCC Terminations*

---

- 7 Verify no line timing references are connected to ports on the circuit pack to be deleted.

**Reference:** *SE 352-3: Verify Timing References*

---

- 8 If required, disconnect any line timing references from ports on the circuit pack.

**Reference:** *SE 352-4: Disconnect Line Timing References*

---



**CAUTION**

*Do not rock the circuit pack back and forth. To avoid damage carefully slide the circuit pack out of the slot guides.*

- 9 Locate the circuit pack, disconnect any optical fibers, unlock the circuit pack latches, and remove the circuit pack.
- 

- 10 Select **Configuration>Delete...**

**Important!** An alternate way to delete the circuit packs is from the *Shelf View*. Right click on the circuit pack being deleted and select **Delete Circuit Pack**. See *Appendix A, WaveStar CIT Tutorial* for details on the Shelf View procedures.

**Result:** The *Delete* screen appears.

- 
- 11** Highlight the required circuit pack and click on **Select**.

**Result:** A dialog box appears asking you to confirm deleting the circuit pack. Click on **Yes**.

---

END OF STEPS

---



## SE 352-1: Verify Cross-Connections

---

**Procedure** Perform the following steps to verify the cross-connections associated with the circuit pack.

- 
- 1** At the WaveStar CIT, select **View>Cross Connections...** .

**Result:** The *View Cross Connections* screen appears.

---

- 2** Highlight the required circuit pack and click on **Select**.

**Result:** The *View Cross Connections* screen for the circuit pack appears.

---

- 3** Record any cross-connections that are associated with the circuit pack.

---

END OF STEPS

---



## SE 352-2: Verify Protection Groups

---

**Procedure** Perform the following steps to verify the protection groups associated with the circuit pack.

---

- 1** Select **View>Protection...**

**Result:** The *View Protection* screen appears.

---

- 2** Click on the **Equip** tab, highlight the required circuit pack, and click on **Select**.

**Result:** The protection information for the circuit pack appears.

---

- 3** Record the protection group ID (PGID) of any protection group(s) associated with the circuit pack and its port(s).

END OF STEPS

---





## SE 352-3: Verify Timing References

---

**Procedure** Perform the following steps to verify no line timing references are connected to any ports associated with the circuit pack.

---

- 1** Select **View>Timing/Sync...**

**Result:** The *View Timing/Sync* screen appears.

---

- 2** Click on the **System Timing** tab and view the *Timing Reference* information. Note the line *Timing References* (for example, LINE1 through LINE6) and the associated *Port AIDs*.
- 

- 3** Record any timing references connected to port(s) on the circuit pack.

---

END OF STEPS

---



## SE 352-4: Disconnect Line Timing References

---

**Procedure** Perform the following steps to disconnect any line timing references connected to ports associated with the circuit pack.

---

- 1** Select **Configuration>Timing/Sync**.

**Result:** The *Provision Timing/Sync* screen appears.

---

- 2** Click on the **Timing Reference** tab, select the required *Timing Reference* from the drop down menu and provision the *Port AID* as *NOT-CONNECTED*. Then click on **OK**.

END OF STEPS

---



## Task 353: Delete a Shelf

---

**Purpose** Use this procedure to delete (deprovision) an existing WaveStar 2.5G I/O shelf or 10G I/O shelf from the system. Deprovisioning an existing shelf requires that a minimal set of mandatory circuit packs remain in the system to retain communications between the WaveStar CIT and system controller.

The shelves in the system must be deleted in the following order:

1. Shelf 5 (2.5G I/O) (Release 6 and later)
2. Shelf 4 (2.5G I/O) (Release 6 and later)
3. Shelf 3 (2.5G I/O)
4. Shelf 2 (10G I/O)
5. Shelf 1 (2.5G I/O)

When a new shelf is created and transmission cannot be established, it may be necessary to use this procedure to deprovision the shelf and create a new shelf.

**Required privilege code** A privilege code of at least P3 is required to perform this task.

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (CIT)
- Wrist strap

**Related information** For related information, see the following sections in this document:

- *Chapter 3, Platform Descriptions*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin**

Before you begin this task:

- Obtain the work instructions for this task.
- Identify the shelf to be deleted (deprovisioned) from the system.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to delete (deprovision) a 2.5G I/O or 10G I/O shelf.

---

**1** Verify that all service/traffic has been removed from the shelf per local procedures.

---

**2** Verify no cross connections exist on the shelf.

**Reference:** *SE 353-1: Verify no Cross-Connections Exist*

---

**3** Verify no loopbacks exist on the shelf.

**Reference:** *SE 353-2: Verify no Loopbacks Exist*

---

**4** Verify no optical port protection groups exist.

**Reference:** *SE 353-3: Verify no Optical Port Protection Groups Exist*

---

**5** Disable any DCC terminations to circuit packs on the shelf.

**Reference:** *Circuit Order/Provisioning Task 305, Enable/Disable DCC Terminations*

---

**6** Verify no line timing references are connected.

**Reference:** *SE 353-4: Verify No Line Timing References are Connected*

7

| IF the shelf being deleted is a... | THEN...                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2.5G I/O Shelf                     | Unlatch and remove the following circuit packs <i>ONLY</i> : <ul style="list-style-type: none"><li>• Port units in slots 1 through 8 and slots 9 through 16</li><li>• DS3EC1/8 circuit pack in EPRN slot</li><li>• SWITCH/DS3EC1 circuit pack in EPROTSW slot</li></ul> <b>Important!</b> Do not remove any of the remaining circuit packs. |
| 10G I/O Shelf                      | Unlatch and remove the following circuit packs <i>ONLY</i> : <ul style="list-style-type: none"><li>• OC192 port units in slots OC192 STM64 W and OC192 STM64 E.</li><li>• PPROC/STS192 circuit packs in slots PPROC W and PPROC E</li></ul> <b>Important!</b> Do not remove any of the remaining circuit packs.                             |

8 Delete the circuit packs removed in Step 7.

**Reference:** *SE 353-5: Delete Circuit Packs*

9 Highlight/select the shelf being deleted, then click on **Select**.

**Result:** A warning window opens to ask you if you want to continue. Select **Yes**.

10 Verify the shelf is deleted from the bay in the *System View* display.

END OF STEPS



## SE 353-1: Verify No Cross-Connections Exist

---

**Procedure** Perform the following steps to verify no cross-connections exist.

- 
- 1** At the WaveStar CIT, select **View > Cross Connections**.

**Result:** The *View Cross Connections* screen appears.

---

- 2** Open the Bay details then highlight the shelf being deleted (deprovisioned). Click on **Select**.

**Result:** The *View Cross Connections* screen for the shelf appears.

---

- 3** Verify that no cross-connections exist for the shelf.
- 

**4**

| IF...                       | THEN...                                                                                                                                                                        |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| no cross-connections exist, | click on <b>Close</b> and continue.                                                                                                                                            |
| cross-connections exist,    | click on <b>Close</b> and delete all cross-connections before continuing.<br><b>Reference:</b> <i>Circuit Order/Provisioning Task 304 Modify/Delete/Roll Cross-Connections</i> |

---

END OF STEPS



## SE 353-2: Verify No Loopbacks Exist

---

**Procedure** Perform the following steps to verify no loopbacks exist.

- 
- 1** At the WaveStar CIT, select **View > Loopback**.

**Result:** The *View Loopbacks* screen appears.

---

- 2** Open the Bay details then highlight the shelf being deprovisioned. Click on **Select**.

**Result:** The *View Loopback* screen for the shelf appears.

---

- 3** Verify that no loopbacks exist for the shelf.
- 

**4**

| IF...               | THEN...                                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| no loopbacks exist, | click on <b>Close</b> and continue.                                                                                                                |
| loopbacks exist,    | click on <b>Close</b> and release all loopbacks before continuing.<br><b>Reference:</b> <i>Operation Task 209 Release a Looped Back Circuit(s)</i> |

---

END OF STEPS

---



## SE 353-3: Verify No Optical Port Protection Groups Exist

---

**Procedure** Perform the following steps to verify no optical port protection groups exist.

- 
- 1** At the WaveStar CIT, select **View > Protection**.

**Result:** The *View Protection* screen appears.

---

- 2** Open the Bay and Shelf details for the shelf being deprovisioned.
- 

- 3** Verify no optical port protection groups exist on the shelf.
- 

**4**

| IF...                                    | THEN...                                                                                                                                                                                      |
|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| no optical port protection groups exist, | click on <b>Close</b> and continue.                                                                                                                                                          |
| optical port protection groups exist,    | click on <b>Close</b> and delete all optical port protection groups before continuing.<br><b>Reference:</b> <i>Circuit Order/Provisioning Task 308, Delete Optical Port Protection Group</i> |

---

END OF STEPS

---





## SE 353-4: Verify No Line Timing References are Connected

---

**Procedure** Perform the following steps to verify no line timing references are connected.

---

- 1** At the WaveStar CIT, select **View > Timing/Sync**.

**Result:** The *View Timing/Sync* screen appears.

---

- 2** Click on the **Timing References** tab.

**Result:** Timing reference parameters display.

---

- 3** Click on the **System Timing** tab and view the *Timing Reference* information. Note the line *Timing References* (for example, LINE1 through LINE6) and the associated *Port AIDs*. Check to see if a port AID is listed that is associated with the shelf you are deleting.
- 

**4**

| IF a Port AID associated with the shelf to be deleted is... | THEN...                                                            |
|-------------------------------------------------------------|--------------------------------------------------------------------|
| connected to a timing reference,                            | click on <b>Close</b> go to Step 5.                                |
| not connected to a timing reference,                        | click on <b>Close</b> .<br><b>STOP! End of Supporting Element.</b> |

---

- 5** Select **Configuration > Timing/Sync**.

**Result:** The *Provision Timing/Sync* screen appears.

---

- 6** Click on the **Timing Reference** tab.

**Result:** Timing reference parameters display.

---

- 7** Select the required *Timing Reference* from the drop down menu and provision the *Port AID* as *NOT-CONNECTED*.

- 
- 8** Click **Apply** to make changes. Then, click **OK** to exit.

---

END OF STEPS

---



## SE 353-3: Delete Circuit Packs

---

**Procedure** Perform the following steps to delete circuit packs.

---

- 1** At the WaveStar CIT, select **Configuration > Delete**.

**Important!** An alternate way to delete the circuit packs is from the *Shelf View*. Right click on the circuit pack being deleted and select **Delete Circuit Pack**. See *Appendix A, WaveStar CIT Tutorial* for details on the Shelf View procedures.

**Result:** The *Delete* screen appears.

---

- 2** Open the required bay and shelf details.
- 

- 3** Highlight the required circuit pack and click on **Select**.

**Result:** A warning window opens to ask you if you want to continue. Select **Yes**.

---

- 4** Repeat Step 1 through Step 3 to delete any remaining circuit packs.

---

END OF STEPS

---





## Task 354: Add WaveStar TDM 2.5G Shelf to In-Service WaveStar TDM 10G System (576x576 STS-1 Switch)

---

**Purpose** Use this procedure to add a WaveStar TDM 2.5G shelf to an in-service WaveStar TDM 10G system equipped with a 576x576 STS-1 switch in the 10G shelf.

A 10G shelf equipped with a 576x576 STS-1 switch supports up to 2 WaveStar TDM 2.5G shelves.

**Required equipment** The WaveStar CIT is required to perform this task.

**Important!** If the 10G shelf is equipped with a 768x768 STS-1 switch, refer to *Circuit Order/Provisioning Task 356, Add a WaveStar TDM 2.5G Shelf to an In-Service WaveStar TDM 10G System (768x768 STS-1 Switch)*.

**Required privilege codes** A privilege code of at least S4+P5+M5+T5 is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 2, Network Topologies*
- *Chapter 3, Product Description*
- *Chapter 5, Circuit Pack/Port Unit Descriptions*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Have the knowledge and skills required for this type of installation.

**Task** Complete the following steps to add a WaveStar TDM 2.5G shelf to an in-service WaveStar TDM 10G system:

- 
- 1** Install the new WaveStar 2.5G shelf in the bay.

**Reference:** *SE 354-1: Install WaveStar 2.5G Shelf*

- 
- 2** Label the ED8C789-21 Group 10, 11, 20, and 30 backplane cables. Pre-made labels are not provided.

**Reference:** *SE 354-2: Backplane Cables and Associated Labels*

---

- 3** Install the new 2.5G I/O shelf backplane cables.

**Reference:** *SE 354-3: Install New 2.5G I/O Backplane Cables*

---

- 4** Using the office records, determine if DS3/EC1 connector panels are required on the new 2.5G I/O shelf.

| IF DS3/EC1 connector panels are ... | THEN...                               |
|-------------------------------------|---------------------------------------|
| required,                           | install the DS3/EC1 connector panels. |
| not required,                       | continue with Step 5.                 |

**Reference:** *SE 354-4: Install DS3/EC1 Connector Panels*

---

**Important!** Refer to ED8C789-16 for additional cable routing and dressing information.

- 5** Install the 2.5G power cables by connecting one pair of power cables to the new 2.5G I/O shelf. The red cable (Load A) is connected to the right side power connector (as viewed from the back of the shelf). The blue cable (Load B) is connected to the left side.

**Reference:** *SE 354-5: 2.5G Shelf Power Cables*

---

- 6** Install the DS3 cables.

**Reference:** *SE 354-6: DS3 Cable Connections*

---

- 7** Apply power to the new 2.5G I/O shelf.

**Reference:** *SE 354-7: Power the 2.5G I/O Shelf*

---

**8** Install circuit packs in the new 2.5G I/O shelf.

**Reference:** *SE 354-8: Install Circuit Packs*

---

**9** Using the WaveStar CIT, add the new 2.5G I/O shelf to the system.

**Reference:** *SE 354-9: Create New 2.5G I/O Shelf*

---

**10** Test the new 2.5G I/O shelf LEDs.

**Reference:** *SE 354-10: Test LEDs*

---

**11** Test TMG/STRAT3 and SWITCH/STS576 circuit pack protection switching.

**Reference:** *SE 354-11: Test Circuit Pack Protection Switching*

---

**12** Test the optical output power of the optical port units.

**Reference:** *SE 354-12: Test Port Unit Optical Output Power*

---

**13** Test the backplane cables.

**Reference:** *SE 354-13: Test Backplane Cables*

---

**14** Test the electrical port units, slots, and cables associated with each slot.

**Reference:** *SE 354-14: Test Electrical Port Units, Slots, and Cables*

---

**15** Perform cable in and out reversal test to verify that the electrical input and output cables are not reversed.

**Reference:** *SE 354-15: Perform Cable In/Out Reversal Test*

---

END OF STEPS

---



# SE 354-1: Install WaveStar 2.5G Shelf

---

**Procedure**     Perform the following steps to install a WaveStar 2.5G shelf in a bay.

- 
- 1**     Remove the front and rear doors from the new WaveStar 2.5G shelf, if attached.

**Important!**     If the shelf is too heavy to place into the bay, the fan unit can also be removed.

---

- 2**     The new WaveStar 2.5G shelf requires enough vertical space for the shelf itself, a heat baffle below it, a heat baffle above it (not required if the shelf is at the top of a bay frame), and any in-bay horizontally-mounted DS3 panels.

| IF there is ...                                                | THEN mount the WaveStar 2.5G shelf ...                                                                                                                                                                            |
|----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| enough vertical space in the bay frame with the 10G system     | below the heat baffle which is below the in-service 2.5G shelf. Use the thread-cutting screws provided with the installation kit to mount the shelf to ensure a good ground connection from the bay to the shelf. |
| not enough vertical space in the bay frame with the 10G system | in an adjacent bay frame, preferably at the top. Use the thread-cutting screws provided with the installation kit to mount the shelf to ensure a good ground connection from the bay to the shelf.                |

---

- 3**     Mount a heat baffle below the new 2.5G shelf.



4

| IF the new WaveStar 2.5G shelf is ...                                                  | THEN...                                                |
|----------------------------------------------------------------------------------------|--------------------------------------------------------|
| mounted at the top of the bay,                                                         | Continue with Step 5.                                  |
| not mounted at the top of the bay and there is no heat baffle mounted above the shelf, | mount a heat baffle above the new WaveStar 2.5G shelf. |

5 Re-insert the fan unit if it was removed earlier.

END OF STEPS



## SE 354-2: Backplane Cables and Associated Labels

---

### Required backplane cables and associated labels (10G shelf to new 2.5G shelf)

The following table shows the required backplane cables and the associated labels to connect the 10G shelf to the new 2.5G shelf.

| ED8C789-21 | Label for 10G End | Label for new 2.5G End |
|------------|-------------------|------------------------|
| GR10       | J20               | J512                   |
| GR10       | J24               | J518                   |
| GR10       | J28               | J500                   |
| GR10       | J32               | J506                   |
| GR11       | J13               | J510                   |
| GR11       | J17               | J516                   |
| GR11       | J37               | J498                   |
| GR11       | J41               | J504                   |

### Required backplane cables and associated labels (in-service 2.5G shelf to new 2.5G shelf)

The following table shows the required backplane cables and the associated labels to connect the in-service 2.5G shelf (main I/O shelf) and the new 2.5G shelf.

| ED8C789-21 | Label for in-service 2.5G End | Label for new 2.5G End |
|------------|-------------------------------|------------------------|
| GR20       | J406                          | J491                   |
| GR20       | J410                          | J490                   |
| GR20       | J493                          | J496                   |
| GR20       | J495                          | J497                   |
| GR30       | J399                          | J395                   |
| GR30       | J400                          | J396                   |



## SE 354-3: Install the 2.5G I/O Shelf Backplane Cables

---

### Procedure

**Important!** Refer to ED8C789-16 for additional cable routing and dressing information.

Perform the following steps to install the new 2.5G I/O shelf backplane cables.

---

- 1 Run the G20 and G30 cables in sequence from the new 2.5G I/O shelf to the 2.5G Main shelf. Before connecting the cables to the backplane, tie the cables to the appropriate towel bar (see ED8C789-16). After the cables are tied, connect the cables to the backplane in the following sequence.

**Important!** On one side of each connector at the end of the cable there are three adjacent holes. When installing these cables, *make sure the side of the connector with the 3 adjacent holes is toward the black strain-relief device on the backplane*. Make sure the strain-relief device clicks into the 3 holes on the connector. Refer to *ED8C789-16, Installers Cabling Plan for a 10G Bay System*, for cable routing diagrams.

At the 2.5G main shelf, leave jumpers P395 and P491 in place. At the new 2.5G I/O shelf, remove jumpers P395 and P491 and replace them with the appropriate cable assemblies.

| At the 2.5G Main Shelf connect... | At the new 2.5G I/O Shelf connect... |
|-----------------------------------|--------------------------------------|
| J406 to P406 (G20)                | J491 to P491 (G20)                   |
| J410 to P410 (G20)                | J490 to P490 (G20)                   |
| J493 to P493 (G20)                | J496 to P496 (G20)                   |
| J495 to P495 (G20)                | J497 to P497 (G20)                   |
| J399 to P399 (G30)                | J395 to P395 (G30)                   |
| J400 to P400 (G30)                | J396 to P396 (G30)                   |

- 
- 2** Run the G10 and G11 cables in sequence from the 10G I/O shelf to the new 2.5G I/O shelf. Before connecting the cables to the backplane, tie the cables to the appropriate towel bar (see ED8C789-16). After the cables are tied, connect the cables to the backplane in the following sequence.

**Important!** The ED8C789-21 GR11 cable assembly has different connectivity at each end. The end with the label **10G CONN** must be connected to the 10G I/O shelf and the other end to the 2.5G I/O shelf. The other cable assemblies are symmetric; that is, either end of the cable can be connected to either shelf.

| At the 10G I/O Shelf connect...            | At the new 2.5G I/O Shelf connect... |
|--------------------------------------------|--------------------------------------|
| J20 to P20 (G10)                           | J512 to P512 (G10)                   |
| J24 to P24 (G10)                           | J518 to P518 (G10)                   |
| J28 to P28 (G10)                           | J500 to P500 (G10)                   |
| J32 to P32 (G10)                           | J506 to P506 (G10)                   |
| J13 to P13 (G11) <b>10G CONN</b> label end | J510 to P510 (G11)                   |
| J17 to P17 (G11) <b>10G CONN</b> label end | J516 to P516 (G11)                   |
| J37 to P37 (G11) <b>10G CONN</b> label end | J498 to P498 (G11)                   |
| J41 to P41 (G11) <b>10G CONN</b> label end | J504 to P504 (G11)                   |

---

N D O F S T E P S



## SE 354-4: Install DS3/EC1 Connector Panels

---

**Procedure** Perform the following steps to install the DS3/EC1 connector panels on the new 2.5G I/O shelf.

---

### 1

| IF installing...                                       | THEN go to ... |
|--------------------------------------------------------|----------------|
| in-bay, horizontally-mounted DS3/EC1 connector panels, | Step 2.        |
| front access, side-mounted DS3/EC1 connector panels    | Step 3.        |
| rear-mounted DS3/EC1 connector panels                  | Step 4.        |

---

### 2 *In-Bay, Horizontally-Mounted DS3/EC1 Connector Panels:*

| IF using DS3EC1/8 port units in slots ... | THEN mount the DS3EC1 connector panel ...                                                                                                       |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-6 of the new 2.5G I/O shelf             | below the heat baffle that is below the 2.5G shelf. This panel is stamped <b>BOTTOM</b> on one side of the panel, just above the cable opening. |
| 11-16 of the new 2.5G I/O shelf           | above the heat baffle that is above the 2.5G shelf. This panel is stamped <b>TOP</b> on one side of the panel, just above the cable opening.    |

---

**3** *Front-Access, Side-Mounted DS3/EC1 Connector Panels:*

| <b>IF using DS3EC1/8 port units in slots ...</b> | <b>THEN insert six screws into the screw holes on the ...</b>                                                                                                                                                                                                                                                         |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-6 of the new 2.5G I/O shelf                    | <p>left side of the 2.5G shelf (as viewed from the front). Do not tighten the screws. Refer to the following figure.</p>  <p>Slide the DS3/EC1 connector panels over the screws and hold in place while tightening the screws.</p> |
| 11-16 of the new 2.5G I/O shelf                  | <p>right side of the 2.5G shelf (as viewed from the front). Do not tighten the screws. Slide the DS3/EC1 connector panels over the screws and hold in place while tightening the screws.</p>                                                                                                                          |

---

#### 4 *Rear-Mounted DS3/EC1 Connector Panels:*

| <b>IF using DS3EC1/8 port units in slots ...</b> | <b>THEN insert six screws into the screw holes on the rear of the...</b>                                                                                                                                        |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-6 of the new 2.5G I/O shelf                    | left side panel of the 2.5G shelf bay uprights (as viewed from the front). Do not tighten the screws.<br><br>Slide the DS3/EC1 connector panels over the screws and hold in place while tightening the screws.  |
| 11-16 of the new 2.5G I/O shelf                  | right side panel of the 2.5G shelf bay uprights (as viewed from the front). Do not tighten the screws.<br><br>Slide the DS3/EC1 connector panels over the screws and hold in place while tightening the screws. |

---

END OF STEPS

---



# SE 354-5: 2.5G Shelf Power Cables

---

**ED9C280-28 power cables**      The following table shows the ED9C280-28 power cables used to connect the 2.5G I/O shelf.

| ED9C280-28 | Gauge            | Color        | Length (Feet) | Load    |
|------------|------------------|--------------|---------------|---------|
| GR 65      | 6                | Red and Blue | 12            | A and B |
| GR 66      | 6                | Red and Blue | 50            | A and B |
| GR 67      | 6                | Red and Blue | 75            | A and B |
| GR 68      | 6 spliced to 2/0 | Red and Blue | 50            | A and B |
| GR 69      | 6 spliced to 2/0 | Red and Blue | 75            | A and B |





## SE 354-6: Install DS3 Cables

---

**Procedure** Perform the following steps to install DS3 cables.

- 1 Make and attach the labels to the ends of each ribbon cable. Refer to the *Cable Label* column in the following table.
- 2 Install each DS3/EC1 ribbon cable according to the following table and the applicable figure.

---

END OF STEPS

---

**Required DS3 cable connections**

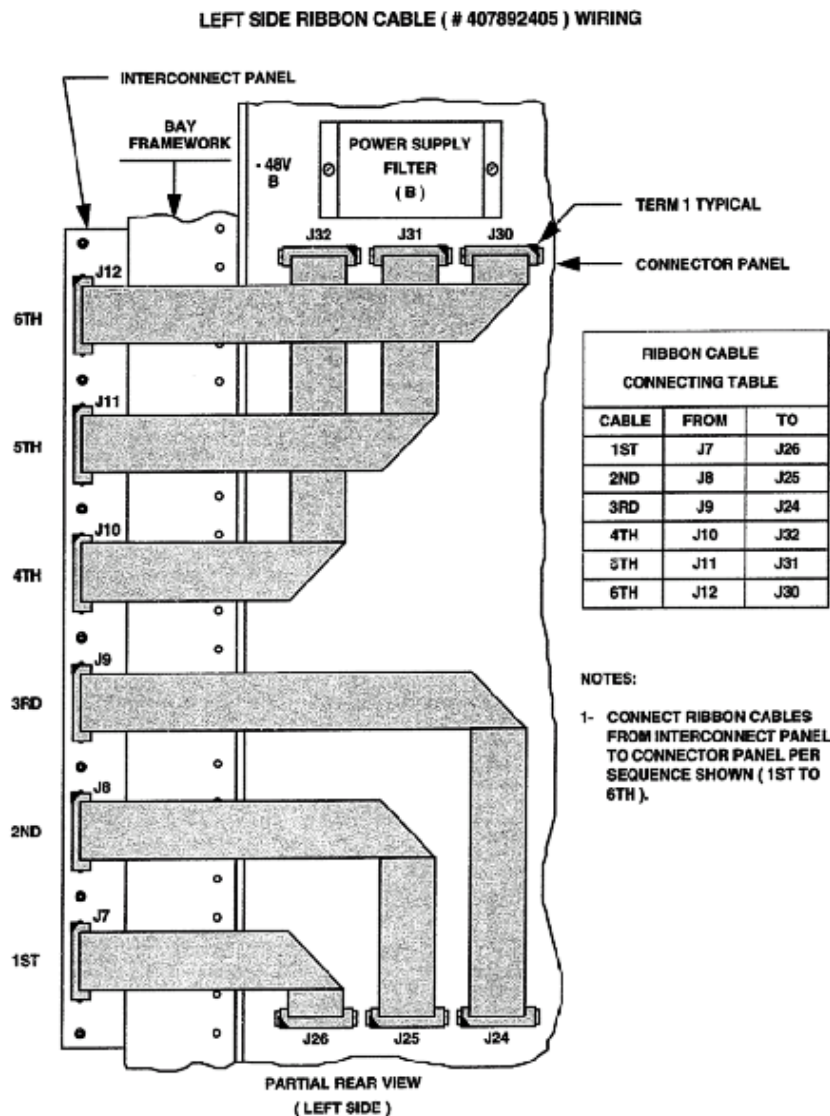
The following table shows the required DS3 cable connections between the backplane of the new 2.5G I/O shelf and the DS3/EC1 connector panels. (The following figures show connection locations on the panels and shelf.)

| DS3/EC1 Connector Panel                                    |           |                   |             | 2.5G Shelf Backplane |                   |             |
|------------------------------------------------------------|-----------|-------------------|-------------|----------------------|-------------------|-------------|
| Location                                                   | Connector | Panel Designation | Cable Label | Connector            | Panel Designation | Cable Label |
| Right side of 2.5G shelf from the rear or below 2.5G shelf | J1        | Out 33-48         | P1          | J23                  | Out PU 5-6        | P23         |
|                                                            | J2        | Out 17-32         | P2          | J22                  | Out PU 3-4        | P22         |
|                                                            | J3        | Out 1-16          | P3          | J21                  | Out PU 1-2        | P21         |
|                                                            | J4        | In 33-48          | P4          | J29                  | In PU 5-6         | P29         |
|                                                            | J5        | In 17-32          | P5          | J28                  | In PU 3-4         | P28         |
|                                                            | J6        | In 1-16           | P6          | J27                  | In PU 1-2         | P27         |
| Left side of 2.5G shelf from the rear or above 2.5G shelf  | J7        | Out 33-48         | P7          | J26                  | Out PU 15-16      | P26         |
|                                                            | J8        | Out 17-32         | P8          | J25                  | Out PU 13-14      | P25         |
|                                                            | J9        | Out 1-16          | P9          | J24                  | Out PU 11-12      | P24         |
|                                                            | J10       | In 33-48          | P10         | J32                  | In PU 15-16       | P32         |
|                                                            | J11       | In 17-32          | P11         | J31                  | In PU 13-14       | P31         |
|                                                            | J12       | In 1-16           | P12         | J30                  | In PU 11-12       | P30         |

**Important!** If the -48V power connector prevents access to the J27 and J32 connectors, use a phillips head screwdriver to temporarily detach the power connector from the shelf assembly. Move the power connector and connect the DS3 cable, then reattach the power connector.

**Right-side, front-access,  
vertically-mounted DS3/  
EC1 connector panel**

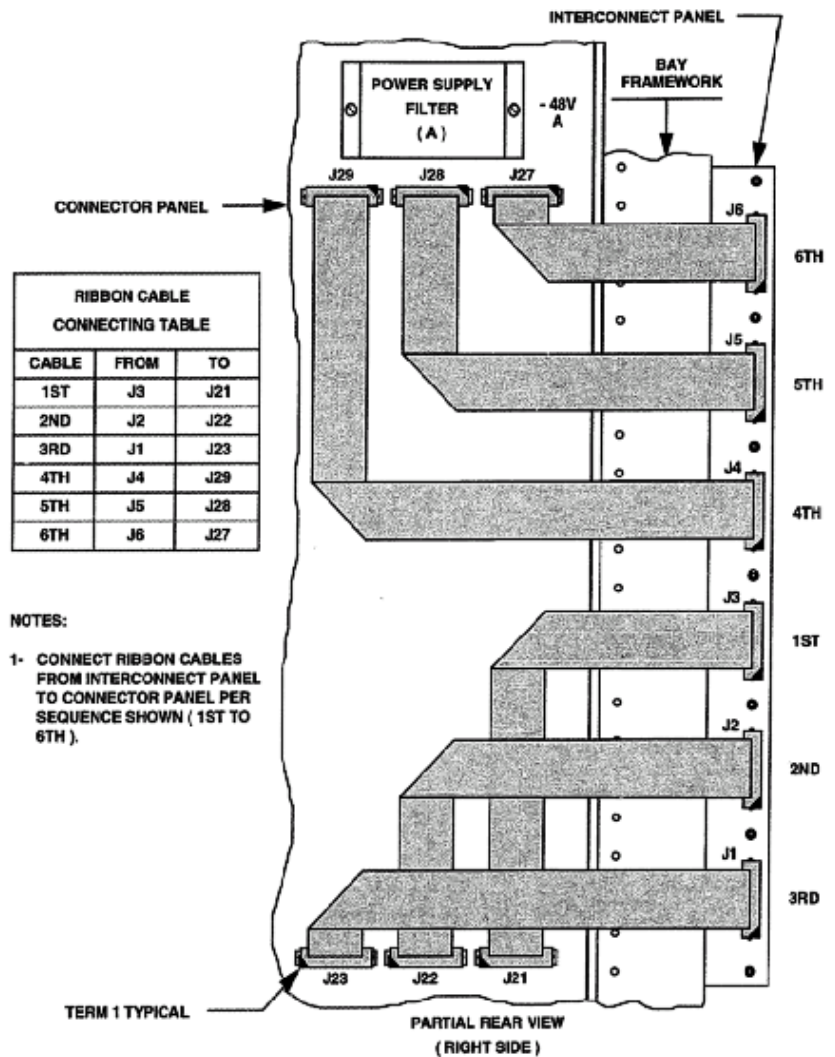
The following figure shows the proper ribbon cable connections for the front-access DS3/EC1 connector panel on the right side of a 2.5G I/O shelf as viewed from the front of the equipment or from the left side as viewed from the rear.



**Left-side, front-access,  
vertically-mounted DS3/  
EC1 connector panel**

The following figure shows the proper ribbon cable connections for the front-access DS3/EC1 connector panel on the left side of a 2.5G I/O shelf as viewed from the front of the equipment or from the right side as viewed from the rear.

**RIGHT SIDE RIBBON CABLE ( # 407892405 ) WIRING**



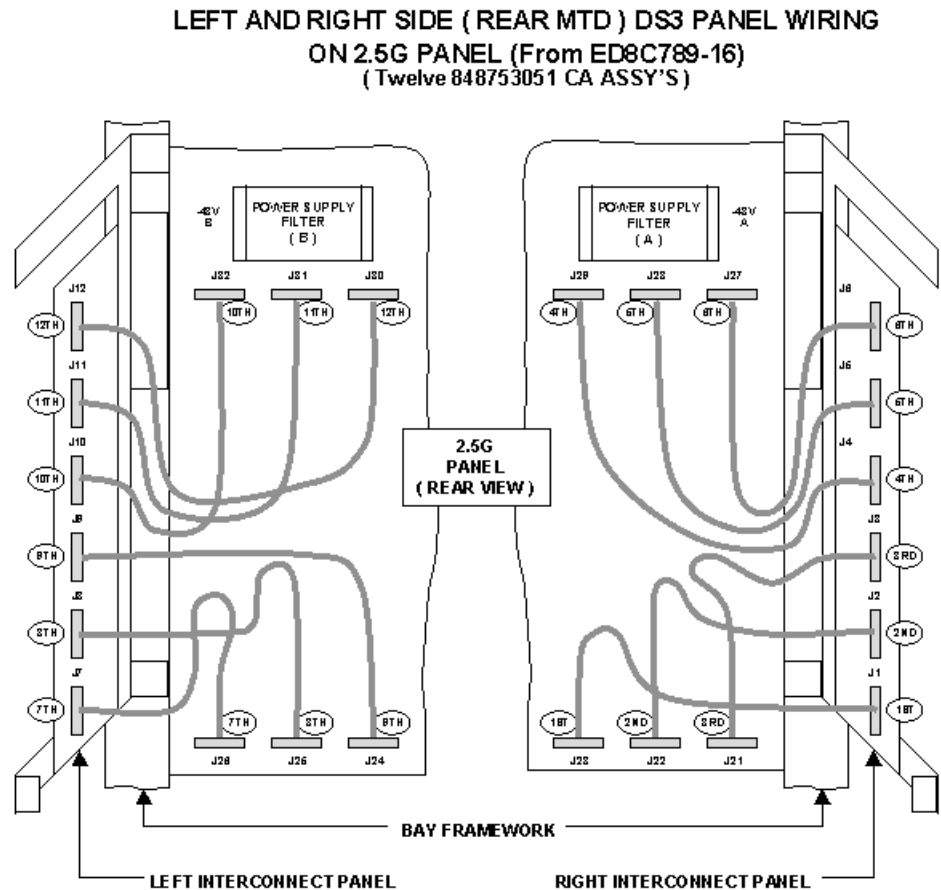
The following figure shows the proper ribbon cable connections for the front-access DS3/EC1 connector panels installed above and below a 2.5G I/O shelf.

( Six 848535126 CA ASSY'S AND Six 848535035 CA ASSY'S )



**Rear-access,  
vertically-mounted DS3/  
EC1 connector panels**

The following figure shows the proper ribbon cable connections for the DS3/EC1 connector panels installed at the rear of the 2.5G I/O shelf.



## SE 354-7: Power the 2.5G I/O Shelf

---

**Procedure** Perform the following steps to apply power to the new 2.5G I/O shelf.

- 1 Inspect the 10G shelf and verify that all packing material has been removed.
- 2 Verify that the circuit breakers at the Battery Distribution and Fuse Bay (BDFB) are in the **OFF** position, or the fuses on the BDFB are *not installed*.
- 3 Verify that any circuit packs in the 2.5G I/O shelf are unseated.
- 4 Verify that the circuit breakers on the 2.5G I/O shelf are in the **OFF** position.
- 5 At the BDFB, insert one 30-amp fuse for Load A and one 30-amp fuse for Load B for the 2.5G I/O shelf. If circuit breakers are used, put both circuit breaker in the **ON** position.
- 6 Using a volt/ohm meter verify the voltage at the connectorized end of each power cable.  
**Result:** The voltage should be -48 V DC (between -41.75 and -60 V DC) at each cable connector.
- 7 At the BDFB, remove the 30-amp fuses for Load A and Load B for the 2.5G I/O shelf. If circuit breakers are being used, put both circuit breakers in the **OFF** position.
- 8 Connect the power feeders to the correct locations on the 2.5G I/O shelf.

---

**9** At the BDFB, re-insert one 30-amp fuse for Load A and one 30-amp fuse for Load B for the 2.5G I/O shelf. If circuit breakers are used, put both circuit breaker in the **ON** position.

---

**10** At the 2.5G I/O shelf, operate the **Load A** circuit breaker to the **ON** position.

**Result:** The **PWR ON** LED is lighted on the shelf user panel. The **PWR ON** and **FAIL** LEDs are lighted on the fan shelf.

---

**11** Operate the **Load A** circuit breaker to the **OFF** position.

**Result:** The **PWR ON** LED is extinguished on the user panel and fan shelf.

---

**12** Repeat Step 10 and Step 11 for the **Load B** circuit breaker.

---

**13** Operate the **Load A** and **Load B** circuit breakers to the **ON** position.

**Result:** The **PWR ON** LED is lighted on the user panel and fan shelf.

---

N D O F S T E P S

---



## SE 354-8: Install Circuit Packs

---

### Procedure



#### CAUTION

*To avoid damaging circuit pack components located on the solder side of the circuit board, use extreme caution when installing circuit packs, especially “AE” coded packs for NEBS Level 3 open-door compliance. Make sure to slide each circuit pack straight into its slot and slightly away from the adjacent circuit pack.*



#### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 10G (2-Fiber) system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in Appendix D, Safety.”*

**Important!** When installing the TMG/STRAT3 circuit packs, use BOTH hands. Use one hand to hold the latch, and the other hand to apply force to the bottom of the circuit pack. This allows the circuit pack to slide into the slot more easily.



Perform the following steps to install the circuit packs.

- 1 Install the following circuit packs in the new 2.5G I/O shelf.

| Circuit Pack               | 2.5G I/O Shelf Slot<br>(See Figure) |
|----------------------------|-------------------------------------|
| ADJCTL/DCCEI (LEY 1)       | DCCEI                               |
| SWITCH/STS576 (LEY4)       | SWITCH0                             |
| SWITCH/STS576 (LEY4)       | SWITCH1                             |
| TMG/STRAT3 (LLY2 or LLY2B) | TMG0                                |
| TMG/STRAT3 (LLY2 or LLY2B) | TMG1                                |

|             |             |             |             |             |             |             |             |      |         |          |             |       |       |          |       |       |             |              |              |              |              |              |              |              |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------|---------|----------|-------------|-------|-------|----------|-------|-------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Port Unit 1 | Port Unit 2 | Port Unit 3 | Port Unit 4 | Port Unit 5 | Port Unit 6 | Port Unit 7 | Port Unit 8 | EPRN | EPROTSW | SWITCH 0 | CTL SYSDM 0 | DCCEI | BLANK | SWITCH 1 | TMG 0 | TMG 1 | Port Unit 9 | Port Unit 10 | Port Unit 11 | Port Unit 12 | Port Unit 13 | Port Unit 14 | Port Unit 15 | Port Unit 16 |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|------|---------|----------|-------------|-------|-------|----------|-------|-------|-------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|

- 2

| IF DS3EC1/8 port unit<br>protection is... | THEN go to ... |
|-------------------------------------------|----------------|
| required,                                 | Step 3.        |
| not required,                             | Step 5.        |

- 3 Unpack and insert a SWITCH/DS3EC1 (LEY 18) circuit pack into the slot labeled **EPROTSW** .

- 
- 4 Unpack and insert a DS3EC1/8 (LEY 17) port unit into the slot labeled **EPRN**.
- 

- 5 Unpack and insert port units (DS3EC1/8 [LEY17], OC3/STM1 [for example, LEY16], OC12/STM4 [for example, LEY13], OC48/STM16 [for example, LEY7] and gigabit ethernet [for example, LEY309]) into slots 1-16 as required per work order.

The following restrictions apply to the port unit slots.

- If a protection DS3EC1/8 port unit is used, slot 16 must either contain a DS3EC1/8 port unit or else be empty.
- DS3EC1/8 port units cannot be installed in slots 7, 8, 9, and 10.
- OC48/STM16 and gigabit ethernet port units occupy two slots: odd on the left and even on the right. The port unit is known by its even-numbered slot.
- OC48/STM16 port units that are East/West in a BLSR must be in adjacent slots in the same quadrant, or symmetric slots with one on each side of the shelf. Specifically, the only acceptable combinations are: 2&4, 6&8, 10&12, 14&16, 2&16, 4&14, 6&12, or 8&10.

- 
- 6 Unpack the CTL/SYS50DM (LEY10B) circuit pack. Insert the LEY10B into the slot labeled **CTLSYSDM0**. The slot labeled **CTLSYSDM1** remains empty.

**Result:** Note that the LEDs on most circuit packs light on and off until the software is downloaded to the shelf. (The software is downloaded later in this task).

---

**Important!** For proper operation of the system, each slot should contain either a circuit pack or a blank faceplate.

- 7 In the remaining empty slots install a blank faceplate. Refer to the following table for more information about blank faceplates.

---

ND OF STEPS

---

**Blank faceplates**    The following table shows the blank faceplates and comcodes.

| Circuit Pack Slot | Blank Faceplate Comcode              |                                   |
|-------------------|--------------------------------------|-----------------------------------|
|                   | Non-NEBS3<br>ED8C789-30, G2<br>Shelf | NEBS3<br>ED8C789-30, G2E<br>Shelf |
| 1-8               | 848294690                            | 848514451                         |
| 9-16              |                                      |                                   |
| EPRN              |                                      |                                   |
| EPROTSW           | 848295093                            | 848514485                         |
| CTL SYSDM 1       | 848294799                            | 848514501                         |

## SE 354-9: Create New 2.5G I/O Shelf

---

**Procedure** Perform the following steps to create a new 2.5G I/O shelf in the system.

---

**1** Using the WaveStar CIT, log in to the network element.

---

**2**

---

| IF a new bay...            | THEN ...                                                                                                                                                                                                                                                                                        |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| is required to be created, | Perform the following to create a new bay in the CIT System View:<br><br>1. Select <b>Configuration&gt;Create New&gt;Bay</b> . The <i>Create New Bay</i> screen appears.<br><br>2. Provision the <i>Bay Access Identifier</i> parameter as required and click on <b>OK</b> . Proceed to Step 3. |
| is not required.           | Proceed to Step 3.                                                                                                                                                                                                                                                                              |

---

**3** At the WaveStar CIT, select **Configuration>Create New>Shelf**.

**Result:** The *Create New Shelf* screen appears.

---

**4**

---

| IF new 2.5G I/O shelf is mounted in the... | THEN at the left side of the screen, click on...                                           |
|--------------------------------------------|--------------------------------------------------------------------------------------------|
| same bay as the 10G system                 | <b>Bay 1</b> to highlight it, then click on <b>Select Bay</b> at the bottom of the screen. |
| bay adjacent to 10G system                 | <b>Bay 2</b> to highlight it, then click on <b>Select Bay</b> at the bottom of the screen. |

- .....
- 5** Provision the following parameters:

| Parameter                                | Provisioned Value                                                                  |
|------------------------------------------|------------------------------------------------------------------------------------|
| Shelf AID                                | 1-3 ( <i>same bay as 10G system</i> )<br>2-1 ( <i>bay adjacent to 10G system</i> ) |
| Shelf Type                               | 2.5G I/O                                                                           |
| SS Bit Override<br>(Release 6 and later) | Desired Value                                                                      |
| ON Cable Identifier                      | 2                                                                                  |
| Alarm Severity Assignment<br>Profile     | Desired Value                                                                      |

- .....
- 6** Click on **Apply** then click on **Yes** to confirm. Wait until the **Apply** button is grayed out.
- .....

- 7** Click on **Close** at the bottom of the screen.
- .....

- 8** Wait until the 2.5G shelf boots (all LEDs stop blinking and only green LEDs are lighted). Then, select **View>System View Display**.

**Result:** The 2.5G shelves and the 10G shelf are displayed in the bay(s).

.....

N D O F S T E P S

.....



## SE 354-10: Test LEDs

---

**Procedure** Complete the following steps to verify the shelf LEDs are operating properly.

---

**1** At the WaveStar CIT, select **Fault>Test>LED**.

---

**2** Click on the new 2.5G I/O shelf and click on **Select**.

**Result:** Another *Test LED* screen appears requesting the number of iterations.

---

**3** Verify the shelf AID on the *Test LED* screen, enter the Number of Iterations (2 iterations are recommended) and click on **Start**.

**Result:** A dialog box appears noting that each test iteration causes the LEDs to cycle on and off 3 seconds. Each test iteration takes approximately 40 seconds. Click on **Yes**.

All labeled LEDs on the User Panel turn on for 3 seconds, then off for 3 seconds. This repeats 3 times the number of test iterations chosen. Then all labeled LEDs on the circuit packs in the 2.5G shelf turn on for 3 seconds, then off for 3 seconds. This repeats 3 times the number of test iterations chosen. The Test Status should indicate Test Successful.

---

**4** Locate and press the **LED Test** pushbutton on user panel of the 2.5G shelf.

**Result:** All labeled LEDs on the User Panel turn on for 3 seconds, then off for 3 seconds. This repeats 3 times. Then all labeled LEDs on the circuit packs in the 2.5G shelf turn on for 3 seconds, then off for 3 seconds.

---

END OF STEPS



## SE 354-11: Test Circuit Pack Protection Switching

---

**Procedure** Complete the following steps to verify TMG/STRAT3 and SWITCH/STS576 circuit pack protection switching.

---

- 1 At the WaveStar CIT *Shelf View* of the new 2.5G I/O shelf, determine the Active and Standby TMG/STRAT3 circuit packs. An **A** appears on the faceplate of the Active TMG/STRAT3 circuit pack, and an **S** appears on the faceplate of the Standby TMG/STRAT3 circuit pack.

The green **Active** LED on the circuit pack faceplate also shows the Active/Standby status. The green **Active** LED is lighted when the circuit pack is Active and extinguished when the circuit pack is Standby.

---

- 2 Select **Fault>Protection Switch...**

**Result:** The *Switch Protection* screen appears.

---

- 3 Double click on the appropriate bay (**Bay 1** or **Bay 2**). Click on the new 2.5G I/O shelf and **1+1 Equipment etmggrp**. Then click on **Select**.

**Result:** The protection switch information appears for the protection group.

---

- 4

| IF the...                                 | THEN select Switch Type...                                                                  |
|-------------------------------------------|---------------------------------------------------------------------------------------------|
| bottom TMG/STRAT3 circuit pack is Active, | Manual to Side 1. Click on <b>Apply</b> and <b>Yes</b> .<br><i>Do not close the screen.</i> |
| top TMG/STRAT3 circuit pack is Active,    | Manual to Side 0. Click on <b>Apply</b> and <b>Yes</b> .<br><i>Do not close the screen.</i> |

**Result:** The previously Standby TMG/STRAT3 circuit pack becomes active, and the previously Active TMG/STRAT3 circuit pack becomes Standby. No alarms should be active.

- 
- 5 On the left side of the screen, click on **1+1 Equipment esysswitchgrp** and **Select**.

**Result:** The protection switch information appears for the protection group.

---

**Important!** The **Switch Status** shows the Active side.

- 6 Determine the Active and Standby SWITCH/STS576 circuit packs.

The green **Active** LED on the circuit pack faceplate also shows the Active/Standby status. The green **Active** LED is lighted when the circuit pack is Active and extinguished when the circuit pack is Standby.

---

7

| IF the ...                                                | THEN select Switch Type...                                                       |
|-----------------------------------------------------------|----------------------------------------------------------------------------------|
| Side 0 SWITCH/STS576 circuit pack (left side) is Active,  | Manual to Side 1. Click on <b>Apply</b> and <b>Yes</b> . Click on <b>Close</b> . |
| Side 1 SWITCH/STS576 circuit pack (right side) is Active, | Manual to Side 0. Click on <b>Apply</b> and <b>Yes</b> . Click on <b>Close</b> . |

**Result:** The previously Standby SWITCH/STS576 circuit packs in all shelves (2.5G and 10G) and the Standby PPROC circuit pack in the 10G shelf become Active. The previously Active circuit packs become Standby. No alarms should be active.

---

N D O F S T E P S





## SE 354-12: Test Port Unit Optical Output Power

---

**Procedure** Complete the following steps to test the port unit optical output power .

- 1 Obtain an optical power meter. Insure that the optical power meter is set for the correct wavelength.
- 2 Connect a 0-dB LBO to the **OUT** port of the port unit being tested.
- 3 Using a 0-dB single mode fiber jumper between the LBO and the optical power meter, measure the output optical power. The output optical power should be in the following range:

| Port Unit          | Optical Output Power (dBm)                                           |
|--------------------|----------------------------------------------------------------------|
| OC48/STM16/1.3LR1  | -2.0 to 3.0                                                          |
| OC48/STM16/1.5LR1  | -2.0 to 3.0                                                          |
| OC48/STM16/POU     | -2.8 to 1.0                                                          |
| OC48/STM16/1.3VSR1 | -6.0 to -1.0                                                         |
| OC12/STM4/1.3LR2   | -2.5 to 2.0                                                          |
| OC12/STM4/1.3SR2   | -15.0 to -8.0                                                        |
| OC3/STM1/1.3LR4    | -5.0 to 0.0                                                          |
| OC3/STM1/1.3SR4    | -15.0 to -8.0                                                        |
| OC3/STM1/1.3SR8    | -15.0 to -8.0                                                        |
| GE1/SX2            | -9.5 to -4.0                                                         |
| GE1/LX2            | -11.0 to -3.0 (Single Mode Fiber)<br>-11.5 to -3.0 (Multimode Fiber) |

The OC48/STM16/DWDM and OC48/STM16/WDM port units should be tested with the connected WaveStar OLS system. Tests are provided in the Installation Manual of the specific OLS product.

---

ND OF STEPS



## SE 354-13: Test Backplane Cables

---

**Procedure** Complete the following steps to test the backplane cables.

- 
- 1 Obtain an OHMmeter and connect one lead of the OHMmeter to the backplane ground.
- 

**Important!** Test each cable one at a time. Do not disconnect more than one cable at a time.

- 2 Starting with the first cable, disconnect one end of the cable.

**Reference:** *SE 352-2: Backplane Cables and Associated Labels*

---

- 3 Disconnect the other end of the cable and touch the other lead of the OHMmeter to it.

**Result:** If the cable is connected properly, the OHMmeter will indicate open.

If the OHMmeter indicates a SHORT, make note of the cable and continue to the next step. There is a good chance that another cable will indicate a SHORT. These cables are probably reversed and should be corrected.

---

**Important!** Reconnect both ends of the cable before testing another cable.

- 4 Reconnect both ends of the cable to the appropriate backplane connectors.
- 

- 5 Repeat Step 2 through Step 4 for the remaining cables.

---

ND OF STEPS

---



## SE 354-14: Test Electrical Port Units, Slots, and Cables

---

### Connector panels and the associated slots

If only one DS3/EC1 connector panel is installed, then electrical port units are only permitted in the slots corresponding to the connector panel.

For example, the DS3EC1/8 port units are installed in slots 1-6 if the DS3/EC1 connector panel:

- is mounted on the on the left side of the 2.5G shelf as viewed from front of equipment, or
- is mounted below the shelf, or
- is rear-mounted and is on the right side of the 2.5G shelf as viewed from the back of the equipment.

The DS3EC1/8 port units are installed in slots 11-16 if the DS3/EC1 connector panel:

- is mounted on the on the right side of the 2.5G shelf as viewed from front of equipment, or
- is mounted above the shelf, or
- is rear-mounted and is on the left side of the 2.5G shelf as viewed from the back of the equipment.

### Procedure

**Important!** In order to test all slots in the new 2.5G I/O shelf, the electrical port units may have to be moved and the test run again, unless a full complement of port units is available.

Complete the following steps to test the electrical port units, slots, and cables.

- 
- 1** Perform a cross-connect loopback on first tributary of the installed port unit being tested using the **Fault>Analysis>Cross-Connect Loopback** command. Select the shelf, slot, port, and tributary.

**Result:** The **ABN** LED is lighted.

- 
- 2** At the local cross-connect panel, connect the output of a DS3 test set to the **IN** port of the cross-connect panel for the tributary being tested. Connect the input of the DS3 test set to the OUT port of the local cross-connect panel for the tributary being tested.

**Result:** Error free transmission.

---

**Important!** The DS3EC1/8 port units are 1xN (N is equal to or less than 12) protected or unprotected.

- 3** If required, perform the following to test the DS3EC1/8 port unit protection.
1. Select **Fault>Protection Switch...** . The *Switch Protection* screen appears.
  2. Double click on the appropriate bay (**Bay 1** or **Bay 2**). Then click on the new 2.5G I/O shelf.
  3. Click on **1xN Equipment eds3ec1grp** and **Select**. The protection switch information for the protection group appears.
  4. Select the *port unit AID* in the **Working Pack AID:** field and *Manual* for the **Switch Type**. Then click on **Apply** and **Yes**. *Do NOT close the screen.*

**Result:** Transmission switches to the protection DS3EC1/8 port unit. The LEDs on the circuit packs in the EPROTSW and EPRN slots are lighted, and the LED on the DS3EC1/8 port unit being tested is extinguished.

- 
- 4** In the *Switch Protection* screen, change the **Switch Type** to *Clear*. Then click on **Apply** and **Yes**. Click on **Close**.

**Result:** Transmission switches back to the working DS3EC1/8 port unit after the provisionable wait-to-restore period. (The system wait-to-restore default is 5 minutes.) The LEDs on the circuit packs in the EPROTSW and EPRN slots are extinguished, and the LED on the DS3EC1/8 port unit being tested is lighted.

- 
- 5 Release the looped back tributary using the **Fault>Analysis>Cross-Connect Loopback** command. Select the shelf, slot, port, and tributary. Then click on **Release** and **Yes** to confirm.

**Result:** The **ABN** LED is extinguished.

---

- 6 Repeat Step 1 through Step 5 for each port/tributary on the port unit.
- 

- 7 Repeat Step 1 through Step 6 for each installed port unit.
- 

- 8 If all slots have not been tested, remove all port units, and insert the DS3EC1/8 port units in any applicable slots that have not been tested with a DS3EC1/8 port unit. Repeat Step 1 through Step 5 for each slot that has not been previously tested.
- 

- 9 Verify the **ABN** LED is extinguished on the User Panel. If the **ABN** LED is lighted, a cross-connect loopback still exists and must be released.
- 

- 10 To clear any minor (MN) Loss of Signal (LOS) alarms that may be raised on the remaining ports:
- Right click on the blue LED representing the alarmed port.
  - Select **Provision Port x** (where x is the port number).
  - Change *Port Mode* from **Monitored** to **Auto**.
  - Click **OK**, then click **Yes**.

---

N D O F S T E P S

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## SE 354-15: Perform Cable In and Out Reversal Test

---

**Procedure** Complete the following steps to verify that the electrical input and output cables are not reversed.

- 1 Insert DS3EC1/8 port units into the shelf (if necessary).
- 2 At the DS3EC1 connector panel, connect the *output* of the first port to the input of the DS3 test set.
- 3 Verify that an AIS or Idle signal is received.
- 4 At the DS3EC1 connector panel, connect the input of the DS3 test set to the *input* of the first port.
- 5 Verify that no signal is received.
- 6 Repeat Step 2 through Step 5 for all ports.

END OF STEPS



# Task 355: Convert In-Service WaveStar TDM 2.5G System to WaveStar TDM 2.5G/10G System

---

**Purpose** Use this procedure to convert an existing in-service WaveStar TDM 2.5G System to a WaveStar TDM 2.5/10G system.

**Required equipment** The WaveStar CIT is required to perform this task.

**Required privilege codes** A privilege code of at least S4+P5+M5+T5 is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 2, Network Topologies*
- *Chapter 3, Product Description*
- *Chapter 5, Circuit Pack/Port Unit Descriptions*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Have the knowledge and skills required for this type of installation.

**Task** Complete the following steps to convert an existing in-service WaveStar TDM 2.5G System to a WaveStar TDM 2.5/10G system:

---

**1** Install the new WaveStar 10G I/O shelf in the bay.

**Reference:** *SE 355-1: Install 10G I/O Shelf*

---

**2** Label the ED8C789-21 Group 10, 11, 20, and 30 backplane cables. Pre-made labels are not provided.

**Reference:** *SE 355-2: Backplane Cables and Associated Labels*

---

**3** Install the 2.5G-to-10G backplane cables.

**Reference:** *SE 355-3: Install 2.5G-to-10G Backplane Cables*

---

---

**Important!** Refer to ED8C789-16 for additional cable routing and dressing information.

- 4 Install the 10G power cables by connecting one pair of power cables to the 10G shelf. The red cable (Load A) is connected to the right side power connector (as viewed from the back of the shelf). The blue cable (Load B) is connected to the left side.

**Reference:** *SE 355-4: 10G Shelf Power Cables*

---

- 5 Apply power to the 10G shelf.

**Reference:** *SE 355-5: Power the 10G Shelf*

---

- 6 Install circuit packs in the 10G shelf.

**Reference:** *SE 355-6: Install Circuit Packs*

---

- 7 Using the WaveStar CIT, add the 10G shelf to the system.

**Reference:** *SE 355-7: Create New 10G Shelf*

---

- 8 Test the 10G shelf LEDs.

**Reference:** *SE 355-8: Test LEDs*

---

- 9 Test TMG/STRAT3, SWITCH, and PPROC circuit pack protection switching.

**Reference:** *SE 355-9: Test Circuit Pack Protection Switching*

---

- 10 If required, test the optical output power of the OC192/STM64 port units.

**Reference:** *SE 355-10: Test OC192/STM64 Port Unit Optical Output Power*



---

**11** Test 2.5G-to-10G backplane cables.

**Reference:** *SE 355-11: Test 2.5G-to-10G Backplane Cables*

---

N D O F S T E P S

---



# SE 355-1: Install 10G I/O Shelf

**Procedure**    Perform the following steps to install a 10G I/O shelf in a bay.

**1**    Remove the front and rear doors from the new 10G shelf, if attached.

**Important!**    If the shelf is too heavy to place into the bay, the fan unit can also be removed.

**2**

| IF the in-service 2.5G shelf uses...                                                    | THEN...                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| side-mounted or rear-mounted vertical DS3 panels, or no DS3 panels,                     | mount the 10G shelf just above the heat baffle which is above the 2.5G shelf. Use the thread-cutting screws provided with the installation kit to mount the shelf to ensure a good ground connection from the bay to the shelf.                            |
| in-bay horizontally mounted DS3 panels and a DS3 panel is mounted above the 2.5G shelf, | mount a heat baffle directly above the in-bay DS3 panel, then mount the 10G shelf above the heat baffle. Use the thread-cutting screws provided with the installation kit to mount the shelf to ensure a good ground connection from the bay to the shelf. |

**3**    Re-insert the fan unit if it was removed earlier.

END OF STEPS



## SE 355-2: Backplane Cables and Associated Labels

---

### Required backplane cables and associated labels

The following table shows the required backplane cables and the associated labels to connect the 10G I/O shelf and 2.5G (main) shelf.

| ED8C789-21 | Label for 10G End | Label for 2.5G End |
|------------|-------------------|--------------------|
| GR20       | J7                | J409               |
| GR20       | J8                | J405               |
| GR20       | J9                | J492               |
| GR20       | J10               | J494               |
| GR30       | J5                | J397               |
| GR30       | J6                | J398               |
| GR10       | J12               | J510               |
| GR10       | J16               | J516               |
| GR10       | J36               | J498               |
| GR10       | J40               | J504               |
| GR11       | J21               | J512               |
| GR11       | J25               | J518               |
| GR11       | J29               | J500               |
| GR11       | J33               | J506               |



## SE 355-3: Install the 2.5G-to-10G Backplane Cables

---

### Procedure

**Important!** Refer to ED8C789-16 for additional cable routing and dressing information.

Perform the following steps to install the 2.5G-to-10G backplane cables.

- 
- 1 Run the G20 and G30 cables in sequence from the 10G shelf to the 2.5G shelf. Before connecting the cables to the backplane, tie the cables to the appropriate towel bar (see ED8C789-16). After the cables are tied, connect the cables to the backplane in the following sequence.

**Important!** On one side of each connector at the end of the cable there are three adjacent holes. When installing these cables, make sure the side of the connector with the 3 adjacent holes is toward the black strain-relief device on the backplane. Make sure the strain-relief device clicks into the 3 holes on the connector. Refer to *ED8C789-16, Installers Cabling Plan for a 10G Bay System*, for cable routing diagrams.

For the 2.5G (main) shelf, leave jumpers P395 and P491 in place.

| At the 10G I/O Shelf connect... | At the 2.5G Shelf connect... |
|---------------------------------|------------------------------|
| J7 to P7 (G20)                  | J409 to P409 (G20)           |
| J8 to P8 (G20)                  | J405 to P405 (G20)           |
| J9 to P9 (G20)                  | J492 to P492 (G20)           |
| J10 to P10 (G20)                | J494 to P494 (G20)           |
| J5 to P5 (G30)                  | J397 to P397 (G30)           |
| J6 to P6 (G30)                  | J398 to P398 (G30)           |

- 
- 2** Run the G10 and G11 cables in sequence from the 10G shelf to the 2.5G shelf. Before connecting the cables to the backplane, tie the cables to the appropriate towel bar (see ED8C789-16). After the cables are tied, connect the cables to the backplane in the following sequence.

**Important!** The ED8C789-21 GR11 cable assembly has different connectivity at each end. The end with the label **10G CONN** must be connected to the 10G I/O shelf and the other end to the 2.5G shelf. The other cable assemblies are symmetric; that is, either end of the cable can be connected to either shelf.

| At the 10G I/O Shelf connect...            | At the 2.5G Shelf connect... |
|--------------------------------------------|------------------------------|
| J12 to P12 (G10)                           | J510 to P510 (G10)           |
| J16 to P16 (G10)                           | J516 to P516 (G10)           |
| J36 to P36 (G10)                           | J498 to P498 (G10)           |
| J40 to P40 (G10)                           | J504 to P504 (G10)           |
| J21 to P21 (G11) <b>10G CONN</b> label end | J512 to P512 (G11)           |
| J25 to P25 (G11) <b>10G CONN</b> label end | J518 to P518 (G11)           |
| J29 to P29 (G11) <b>10G CONN</b> label end | J500 to P500 (G11)           |
| J33 to P33 (G11) <b>10G CONN</b> label end | J506 to P506 (G11)           |

---

ND OF STEPS



# SE 355-4: 10G Shelf Power Cables

---

**ED9C280-28 power cables**      The following table shows the ED9C280-28 power cables used to connect the 10G I/O shelf.

| ED9C280-28 | Gauge            | Color        | Length (Feet) | Load    |
|------------|------------------|--------------|---------------|---------|
| GR 65      | 6                | Red and Blue | 12            | A and B |
| GR 66      | 6                | Red and Blue | 50            | A and B |
| GR 67      | 6                | Red and Blue | 75            | A and B |
| GR 68      | 6 spliced to 2/0 | Red and Blue | 50            | A and B |
| GR 69      | 6 spliced to 2/0 | Red and Blue | 75            | A and B |



## SE 355-5: Power the 10G Shelf

---

**Procedure** Perform the following steps to apply power to the 10G shelf.

- .....  
**1** Inspect the 10G shelf and verify that all packing material has been removed.  
.....
- 2** Verify that the circuit breakers at the Battery Distribution and Fuse Bay (BDFB) are in the **OFF** position, or the fuses on the BDFB are *not installed*.  
.....
- 3** Verify that any circuit packs in the 10G shelf are unseated.  
.....
- 4** Verify that the circuit breakers on the 10G shelf are in the **OFF** position.  
.....
- 5** At the BDFB, insert one 30-amp fuse for Load A and one 30-amp fuse for Load B for the 10G shelf. If circuit breakers are used, put both circuit breaker in the **ON** position.  
.....
- 6** Using a volt/ohm meter verify the voltage at the connectorized end of each power cable.  
  
**Result:** The voltage should be -48 V DC (between -41.75 and -60 V DC) at each cable connector.  
.....
- 7** At the BDFB, remove the 30-amp fuses for Load A and Load B for the 10G shelf. If circuit breakers are being used, put both circuit breakers in the **OFF** position.  
.....
- 8** Connect the power feeders to the correct locations on the 10G shelf.

---

**9** At the BDFB, re-insert one 30-amp fuse for Load A and one 30-amp fuse for Load B for the 10G shelf. If circuit breakers are used, put both circuit breaker in the **ON** position.

---

**10** At the 10G shelf, operate the **Load A** circuit breaker to the **ON** position.

**Result:** The **PWR ON** LED is lighted on the shelf user panel. The **PWR ON** and **FAIL** LEDs are lighted on the fan shelf.

---

**11** Operate the **Load A** circuit breaker to the **OFF** position.

**Result:** The **PWR ON** LED is extinguished on the user panel and fan shelf.

---

**12** Repeat Step 10 and Step 11 for the **Load B** circuit breaker.

---

**13** Operate the **Load A** and **Load B** circuit breakers to the **ON** position.

**Result:** The **PWR ON** LED is lighted on the user panel and fan shelf.

---

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## SE 355-6: Install Circuit Packs

---

### Procedure



#### CAUTION

*To avoid damaging circuit pack components located on the solder side of the circuit board, use extreme caution when installing circuit packs, especially “AE” coded packs for NEBS Level 3 open-door compliance. Make sure to slide each circuit pack straight into its slot and slightly away from the adjacent circuit pack.*



#### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 10G (2-Fiber) system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in Appendix D, Safety.”*

**Important!** When installing the TMG/STRAT3 circuit packs, use BOTH hands. Use one hand to hold the latch, and the other hand to apply force to the bottom of the circuit pack. This allows the circuit pack to slide into the slot more easily.

Perform the following steps to install the circuit packs.

- 
- 1 Install the following circuit packs in the 10G shelf.

| Circuit Pack                        | 10G Shelf Slot (See Figure) |
|-------------------------------------|-----------------------------|
| OC192/STM64*                        | OC192/STM64 W               |
| PPROC/STS192*                       | PPROC W                     |
| SWITCH/STS576 or<br>SWITCH/STS768** | SWITCH 0                    |
| PPROC/STS192 or<br>PPROC/STS384**   | PPROC 0                     |

|                                         |               |
|-----------------------------------------|---------------|
| CTL/SYS50DM<br>(no flash disk required) | CTL SYSDM 0   |
| ADJCTL/DCCEI                            | DCCEI         |
| TMG/STRAT3                              | TMG 0         |
| TMG/STRAT3                              | TMG 1         |
| PPROC/STS192 or<br>PPROC/STS384**       | PPROC 1       |
| SWITCH/STS576 or<br>SWITCH/STS768**     | SWITCH 1      |
| PPROC/STS192*                           | PPROC E       |
| OC192/STM64*                            | OC192/STM64 E |

\* Optional. One OC192/STM64 port unit and its associated PPROC/STS192 circuit pack are required for a single unprotected (0x1) OC-192 application. Two OC192/STM64 port units and PPROC/STS192 circuit packs are required for ring applications.

\*\* SWITCH/STS576 and PPROC/STS192 circuit packs are required for a 576x576 STS-1 switch. SWITCH/STS768 and PPROC/STS384 circuit packs are required for a 768x768 STS-1 switch.

**Result:** Note that the LEDs on most circuit packs light on and off until the software is downloaded to the shelf. (The software is downloaded later in this task).

|               |       |
|---------------|-------|
| Reserved      |       |
| OAT/R W       |       |
| OC192/STM64 W |       |
| PPROC W       |       |
| SWITCH 0      |       |
| PPROC 0       |       |
| CTL SYSDM 0   |       |
| DCCEI         |       |
| BLANK         |       |
| BLANK         |       |
| TMG 0         | TMG 1 |
| PPROC 1       |       |
| SWITCH 1      |       |
| PPROC E       |       |
| OC192/STM64 E |       |
| OAT/R E       |       |
| Reserved      |       |

---

**Important!** For proper operation of the system, each slot should contain either a circuit pack or a blank faceplate.

- 2** In the remaining empty slots install a blank faceplate. Refer to the following table for more information about blank faceplates.

---

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---

**Blank faceplates** The following table shows the blank faceplates and comcodes.

| Circuit Pack Slot                     | Blank Faceplate Comcode              |                                   |
|---------------------------------------|--------------------------------------|-----------------------------------|
|                                       | Non-NEBS3<br>ED8C789-31, G1<br>Shelf | NEBS3<br>ED8C789-31, G1E<br>Shelf |
| Far Left and Far Right                | 848294799                            | 848514501                         |
| OC192/STM4 W<br>(requires two blanks) |                                      |                                   |
| PPROC W                               |                                      |                                   |
| CTL SYSDM 1                           |                                      |                                   |
| OC192/STM4 E<br>(requires two blanks) |                                      |                                   |
| PPROC E                               |                                      |                                   |
| OA                                    | 848295093                            | 848514485                         |
| DCC                                   | 848294690                            | 848514451                         |

# SE 355-7: Create New 10G Shelf

**Procedure**    Perform the following steps to create a new 10G shelf in the system.

- 1    Using the WaveStar CIT, log in to the network element.
- 2    At the WaveStar CIT, select **Configuration>Create New>Shelf**.
- 3    At the left side of the screen, click on **Bay 1** to highlight it, then click on **Select I/O Bay** at the bottom of the screen.
- 4    Provision the following parameters:

| Parameter                         | Provisioned Value |
|-----------------------------------|-------------------|
| Shelf AID                         | 1-2               |
| Shelf Type                        | 10G I/O           |
| ON Cable Identifier               | 1                 |
| Alarm Severity Assignment Profile | Desired Value     |

- 5    Click on **Apply** and wait until the **Apply** button is grayed out.
- 6    Click on **Close** at the bottom of the screen.
- 7    Wait until the 10G shelf boots (all LEDs stop blinking and only green LEDs are lighted). Then, select **View>System View Display**.

**Result:** The 2.5G and 10G shelves are displayed in the bay.

END OF STEPS



## SE 355-8: Test LEDs

---

**Procedure** Complete the following steps to verify the LEDs are operating properly.

---

**1** At the WaveStar CIT, select **Fault>Test>LED**.

---

**2** Click on the 10G shelf and click on **Select**.

**Result:** Another *Test LED* screen appears requesting the number of iterations.

---

**3** Verify the shelf AID on the *Test LED* screen, enter the Number of Iterations (2 iterations are recommended) and click on **Start**.

**Result:** A dialog box appears noting that each test iteration causes the LEDs to cycle on and off 3 seconds. Each test iteration takes approximately 40 seconds. Click on **Yes**.

All labeled LEDs on the User Panel turn on for 3 seconds, then off for 3 seconds. This repeats 3 times the number of test iterations chosen. Then all labeled LEDs on the circuit packs in the 10G shelf turn on for 3 seconds, then off for 3 seconds. This repeats 3 times the number of test iterations chosen.

---

**4** Locate and press the **LED Test** pushbutton on user panel of the 10G shelf.

**Result:** All labeled LEDs on the User Panel turn on for 3 seconds, then off for 3 seconds. This repeats 3 times. Then all labeled LEDs on the circuit packs in the 10G shelf turn on for 3 seconds, then off for 3 seconds.

---

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## SE 355-9: Test Circuit Pack Protection Switching

---

**Procedure** Complete the following steps to verify TMG/STRAT3, SWITCH, and PPROC circuit pack protection switching.

---

- 1 At the WaveStar CIT *Shelf View* of the 10G shelf, determine the Active and Standby TMG/STRAT3 circuit packs. An **A** appears on the faceplate of the Active TMG/STRAT3 circuit pack, and an **S** appears on the faceplate of the Standby TMG/STRAT3 circuit pack.

The green **Active** LED on the circuit pack faceplate also shows the Active/Standby status. The green **Active** LED is lighted when the circuit pack is Active and extinguished when the circuit pack is Standby.

---

- 2 Select **Fault>Protection Switch...**

**Result:** The *Switch Protection* screen appears.

---

- 3 Double click on **Bay 1**. Click on **Shelf 2 (10G I/O)** and **1+1 Equipment etmgrp**. Then click on **Select**.

**Result:** The protection switch information appears for the protection group.

---

- 4

| IF the ...                                | THEN select Switch Type...                                                   |
|-------------------------------------------|------------------------------------------------------------------------------|
| bottom TMG/STRAT3 circuit pack is Active, | Manual to Side 1. Click on Apply and Yes.<br><i>Do not close the screen.</i> |
| top TMG/STRAT3 circuit pack is Active,    | Manual to Side 0. Click on Apply and Yes.<br><i>Do not close the screen.</i> |

**Result:** The previously Standby TMG/STRAT3 circuit pack becomes active, and the previously Active TMG/STRAT3 circuit pack becomes Standby. No alarms should be active.

- 
- 5 On the left side of the *Switch Protection* screen, click on **1+1 Equipment esysswitchgrp** and **Select**.

**Result:** The protection switch information appears for the protection group.

---

**Important!** The **Switch Status** shows the Active side.

- 6 Determine the Active and Standby SWITCH circuit packs.

The green **Active** LED on the circuit pack faceplate also shows the Active/Standby status. The green **Active** LED is lighted when the circuit pack is Active and extinguished when the circuit pack is Standby.

---

7

| IF the ...                                         | THEN select Switch Type...                                        |
|----------------------------------------------------|-------------------------------------------------------------------|
| Side 0 SWITCH circuit pack (left side) is Active,  | Manual to Side 1. Click on Apply and Yes. Click on <b>Close</b> . |
| Side 1 SWITCH circuit pack (right side) is Active, | Manual to Side 0. Click on Apply and Yes. Click on <b>Close</b> . |

**Result:** The previously Standby SWITCH circuit packs in all shelves (10G and 2.5G) and the Standby PPROC circuit pack in the 10G shelf become Active. The previously Active circuit packs become Standby. No alarms should be active.

---

N D O F S T E P S



## SE 355-10: Test OC192/STM64 Port Unit Output Power

---

**Procedure** Complete the following steps to test the optical output power of the OC192/STM64 port units.

- 
- 1** Obtain an optical power meter. Insure that the optical power meter is set for the correct wavelength.
  - 2** Connect a 0-dB LBO to the **OUT** port of the port unit being tested.
  - 3** Using a 0-dB single mode fiber jumper between the LBO and the optical power meter, measure the output optical power. The output optical power should be in the following range:
- 

| Port Unit          | Optical Output Power (dBm) |
|--------------------|----------------------------|
| OC192/STM64/1.5SR1 | -4.0 to 2.0                |
| OC192/STM64/1.5IR1 | -1.0 to 2.0                |
| OC192/STM64/POU    | -1.0 to 2.0                |

The OC192/STM64/WDM port units should be tested with the connected WaveStar OLS system. Tests are provided in the Installation Manual of the specific OLS product.

---

ND OF STEPS





# SE 355-11: Test 2.5G-to-10G Backplane Cables

---

**Procedure** Complete the following steps to test the 2.5G-to-10G backplane cables.

- 
- 1 Obtain an OHMmeter and connect one lead of the OHMmeter to the backplane ground.

---

**Important!** Test each cable one at a time. Do not disconnect more than one cable at a time.

- 2 Starting with the first cable, disconnect one end of the cable.

**Reference:** *SE 355-2: Backplane Cables and Associated Labels*

- 
- 3 Disconnect the other end of the cable and touch the other lead of the OHMmeter to it.

**Result:** If the cable is connected properly, the OHMmeter will indicate open.

If the OHMmeter indicates a SHORT, make note of the cable and continue to the next step. There is a good chance that another cable will indicate a SHORT. These cables are probably reversed and should be corrected.

---

**Important!** Reconnect both ends of the cable before testing another cable.

- 4 Reconnect both ends of the cable to the appropriate backplane connectors.

- 
- 5 Repeat Step 2 through Step 4 for the remaining cables.

---

END OF STEPS





## Task 356: Add WaveStar TDM 2.5G Shelf to In-Service WaveStar TDM 10G System (768x768 STS-1 Switch)

---

**Purpose** Use this procedure to add a WaveStar TDM 2.5G shelf to an in-service WaveStar TDM 10G system equipped with a 768x768 STS-1 switch in the 10G shelf.

A 10G shelf equipped with a 768x768 STS-1 switch supports up to 4 WaveStar TDM 2.5G shelves.

**Required equipment** The WaveStar Craft Interface Terminal (WaveStar CIT) is required to perform this task.

**Important!** The system must be equipped with Release 6.0.0 or later software, and the 10G shelf must be equipped with a 768x768 STS-1 switch. If the 10G shelf is equipped with a 576x576 STS-1 switch, refer to *Circuit Order/Provisioning Task 354, Add a WaveStar TDM 2.5G Shelf to an In-Service WaveStar TDM 10G System (576x576 STS-1 Switch)*.

**Required privilege codes** A privilege code of at least S4+P5+M5+T5 is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 2, Network Topologies*
- *Chapter 3, Product Description*
- *Chapter 5, Circuit Pack/Port Unit Descriptions*
- *Appendix A, WaveStar CIT Tutorial*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Have the knowledge and skills required for this type of installation.

**Task** Complete the following steps to add a WaveStar TDM 2.5G I/O shelf to an in-service WaveStar TDM 10G system:

- 1 Install the new WaveStar 2.5G I/O shelf in the bay.

**Reference:** *SE 356-1: Install WaveStar 2.5G I/O Shelf*

- 2 Using the following table, determine which PPROC Port (B, C, or D) connections on the 10G shelf to use when connecting the new 2.5G I/O shelf. Record which PPROC Port connections are selected.

| IF the new 2.5G I/O shelf is the ...                                                                           | THEN connect the new 2.5G I/O shelf to the... |
|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| Second 2.5G I/O shelf and the additional ports require extra cross-connection capacity from the 10G shelf,     | PPROC Port C connections on the 10G Shelf.    |
| Second 2.5G I/O shelf and the additional ports are for add/drop traffic in an OC-192 UPSR,                     | PPROC Port B connections on the 10G Shelf.    |
| Third 2.5G I/O shelf and the second 2.5G I/O shelf already uses the PPROC Port B connections on the 10G shelf, | PPROC Port C connections on the 10G Shelf.    |
| Third 2.5G I/O shelf and the second 2.5G I/O shelf already uses the PPROC Port C connections on the 10G shelf, | PPROC Port B connections on the 10G Shelf.    |
| Fourth 2.5G I/O shelf,                                                                                         | PPROC Port D connections on the 10G Shelf.    |

- 3 Label the ED8C789-21 Group 10, 11, 20, and 30 backplane cables. Pre-made labels are not provided.

**Reference:** *SE 356-2: Backplane Cables and Associated Labels*

- 4 Install the new 2.5G I/O shelf backplane cables.

**Reference:** *SE 356-3: Install New 2.5G I/O Backplane Cables*

- 
- 5 Using the office records, determine if DS3/EC1 connector panels are required on the new 2.5G I/O shelf.

| IF DS3/EC1 connector panels are ... | THEN...                               |
|-------------------------------------|---------------------------------------|
| required,                           | install the DS3/EC1 connector panels. |
| not required,                       | continue with Step 6.                 |

**Reference:** *SE 356-4: Install DS3/EC1 Connector Panels*

---

**Important!** Refer to ED8C789-16 for additional cable routing and dressing information.

- 6 Install the 2.5G power cables by connecting one pair of power cables to the new 2.5G I/O shelf. The red cable (Load A) is connected to the right side power connector (as viewed from the back of the shelf). The blue cable (Load B) is connected to the left side.

**Reference:** *SE 356-5: 2.5G Shelf Power Cables*

- 
- 7 Install the DS3 cables.

**Reference:** *SE 356-6: DS3 Cable Connections*

- 
- 8 Apply power to the new 2.5G I/O shelf.

**Reference:** *SE 356-7: Power the 2.5G I/O Shelf*

- 
- 9 Install circuit packs in the new 2.5G I/O shelf.

**Reference:** *SE 356-8: Install Circuit Packs*

- 
- 10 Using the WaveStar CIT, add the new 2.5G I/O shelf to the system.

**Reference:** *SE 356-9: Create New 2.5G I/O Shelf*

---

**11** Test the new 2.5G I/O shelf LEDs.

**Reference:** *SE 356-10: Test LEDs*

---

**12** Test TMG/STRAT3 and SWITCH/STS576 circuit pack protection switching.

**Reference:** *SE 356-11: Test Circuit Pack Protection Switching*

---

**13** Test the optical output power of the optical port units.

**Reference:** *SE 356-12: Test Port Unit Optical Output Power*

---

**14** Test the backplane cables.

**Reference:** *SE 356-13: Test Backplane Cables*

---

**15** Test the electrical port units, slots, and cables associated with each slot.

**Reference:** *SE 356-14: Test Electrical Port Units, Slots, and Cables*

---

**16** Perform cable in and out reversal test to verify that the electrical input and output cables are not reversed.

**Reference:** *SE 356-15: Perform Cable In/Out Reversal Test*

---

N D O F S T E P S

---



## SE 356-1: Install WaveStar 2.5G I/O Shelf

---

**Procedure** Perform the following steps to install a WaveStar 2.5G I/O shelf in a bay.

---

- 1 Remove the front and rear doors from the new WaveStar 2.5G shelf, if attached.

**Important!** If the shelf is too heavy to place into the bay, the fan unit can also be removed.

---

- 2 The new WaveStar 2.5G shelf requires enough vertical space for the shelf itself, a heat baffle below it, a heat baffle above it (not required if the shelf is at the top of a bay frame), and any in-bay horizontally-mounted DS3 panels.

| IF there is ...                                                | THEN mount the WaveStar 2.5G shelf ...                                                                                                                                                            |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| enough vertical space in the bay frame with the 10G system     | below the heat baffle which is below the in-service 2.5G main shelf.                                                                                                                              |
| not enough vertical space in the bay frame with the 10G system | in an adjacent bay frame.<br>The <i>first</i> shelf in the bay frame should be mounted in the middle position.<br>The <i>second</i> shelf in the bay frame should be mounted in the top position. |

Use the thread-cutting screws provided with the installation kit to mount the shelf to ensure a good ground connection from the bay to the shelf shelf.

---

**3** Mount a heat baffle below the new 2.5G shelf.

---

**4**

| <b>IF the new WaveStar 2.5G shelf is ...</b>                                           | <b>THEN...</b>                                         |
|----------------------------------------------------------------------------------------|--------------------------------------------------------|
| mounted at the top of the bay,                                                         | Continue with Step 5.                                  |
| not mounted at the top of the bay and there is no heat baffle mounted above the shelf, | mount a heat baffle above the new WaveStar 2.5G shelf. |

---

**5** Re-insert the fan unit if it was removed earlier.

---

N D O F S T E P S





## SE 356-2: Backplane Cables and Associated Labels

---

### **10G shelf to new 2.5G shelf**

The following tables show the required backplane cables and the associated labels to connect the 10G shelf (PPROC Ports B, C, or D) and a new 2.5G shelf.

#### **10G shelf (PPROC Port B) and 2.5G shelf**

The following table shows the required backplane cables and the associated labels to connect the PPROC Port B on the 10G shelf and the second or third 2.5G shelf.

| <b>ED8C789-21</b> | <b>Label for 10G End<br/>(PPROC Port B)</b> | <b>Label for 2.5G End</b> |
|-------------------|---------------------------------------------|---------------------------|
| GR10              | J20                                         | J512                      |
| GR10              | J24                                         | J518                      |
| GR10              | J28                                         | J500                      |
| GR10              | J32                                         | J506                      |
| GR11              | J13                                         | J510                      |
| GR11              | J17                                         | J516                      |
| GR11              | J37                                         | J498                      |
| GR11              | J41                                         | J504                      |

### 10G shelf (PPROC Port C) and 2.5G shelf

The following table shows the required backplane cables and the associated labels to connect the PPROC Port C on the 10G shelf and the second or third 2.5G shelf.

| ED8C789-21 | Label for 10G End<br>(PPROC Port C) | Label for 2.5G End |
|------------|-------------------------------------|--------------------|
| GR10       | J14                                 | J510               |
| GR10       | J18                                 | J516               |
| GR10       | J38                                 | J498               |
| GR10       | J42                                 | J504               |
| GR11       | J23                                 | J512               |
| GR11       | J27                                 | J518               |
| GR11       | J31                                 | J500               |
| GR11       | J35                                 | J506               |

### 10G shelf (PPROC Port D) and 2.5G shelf

The following table shows the required backplane cables and the associated labels to connect the PPROC Port D on the 10G shelf and the fourth 2.5G shelf.

| ED8C789-21 | Label for 10G End<br>(PPROC Port D) | Label for 2.5G End |
|------------|-------------------------------------|--------------------|
| GR10       | J22                                 | J512               |
| GR10       | J26                                 | J518               |
| GR10       | J30                                 | J500               |
| GR10       | J34                                 | J506               |
| GR11       | J15                                 | J510               |
| GR11       | J19                                 | J516               |
| GR11       | J39                                 | J498               |
| GR11       | J43                                 | J504               |

### **In-service 2.5G main shelf to new 2.5G shelf**

The following tables show the required backplane cables and the associated labels to connect the in-service 2.5G main shelf and a new 2.5G shelf.

#### **2.5G main shelf and second 2.5G shelf**

The following table shows the required backplane cables and the associated labels to connect the in-service 2.5G main shelf and the second 2.5G shelf.

| <b>ED8C789-21</b> | <b>Label for in-service 2.5G End</b> | <b>Label for new 2.5G End</b> |
|-------------------|--------------------------------------|-------------------------------|
| GR20              | J406                                 | J491                          |
| GR20              | J410                                 | J490                          |
| GR20              | J493                                 | J496                          |
| GR20              | J495                                 | J497                          |
| GR30              | J399                                 | J395                          |
| GR30              | J400                                 | J396                          |

#### **2.5G main shelf and third 2.5G shelf**

The following table shows the required backplane cables and the associated labels to connect the in-service 2.5G main shelf and the third 2.5G shelf.

| <b>ED8C789-21</b> | <b>Label for in-service 2.5G End</b> | <b>Label for new 2.5G End</b> |
|-------------------|--------------------------------------|-------------------------------|
| GR20              | J407                                 | J491                          |
| GR20              | J488                                 | J490                          |
| GR30              | J401                                 | J395                          |
| GR30              | J402                                 | J396                          |

## 2.5G main shelf and fourth 2.5G shelf

The following table shows the required backplane cables and the associated labels to connect the in-service 2.5G main shelf and the fourth 2.5G shelf.

| <b>ED8C789-21</b> | <b>Label for in-service 2.5G End</b> | <b>Label for new 2.5G End</b> |
|-------------------|--------------------------------------|-------------------------------|
| GR20              | J408                                 | J491                          |
| GR20              | J489                                 | J490                          |
| GR30              | J403                                 | J395                          |
| GR30              | J404                                 | J396                          |



## SE 356-3: Install the 2.5G I/O Shelf Backplane Cables

---

### Procedure

**Important!** Refer to ED8C789-16 for additional cable routing and dressing information.

Perform the following steps to install the new 2.5G I/O shelf backplane cables.

- 
- 1 Run the G20 and G30 cables in sequence from the new 2.5G I/O shelf to the 2.5G Main shelf. Before connecting the cables to the backplane, tie the cables to the appropriate towel bar (see ED8C789-16). After the cables are tied, connect the cables to the backplane in the following sequence. (Refer to the following tables.)

**Important!** On one side of each connector at the end of the cable there are three adjacent holes. When installing these cables, *make sure the side of the connector with the 3 adjacent holes is toward the black strain-relief device on the backplane*. Make sure the strain-relief device clicks into the 3 holes on the connector. Refer to *ED8C789-16, Installers Cabling Plan for a 10G Bay System*, for cable routing diagrams.

At the 2.5G main shelf, leave jumpers P395 and P491 in place. At the new 2.5G I/O shelf, remove jumpers P395 and P491 and replace them with the appropriate cable assemblies.

#### Second 2.5G I/O shelf:

| At the 2.5G Main Shelf connect... | At the second 2.5G I/O Shelf connect... |
|-----------------------------------|-----------------------------------------|
| J406 to P406 (G20)                | J491 to P491 (G20)                      |
| J410 to P410 (G20)                | J490 to P490 (G20)                      |
| J493 to P493 (G20)                | J496 to P496 (G20)                      |
| J495 to P495 (G20)                | J497 to P497 (G20)                      |
| J399 to P399 (G30)                | J395 to P395 (G30)                      |
| J400 to P400 (G30)                | J396 to P396 (G30)                      |

**Third 2.5G I/O shelf:**

| At the 2.5G Main Shelf connect... | At the third 2.5G I/O Shelf connect... |
|-----------------------------------|----------------------------------------|
| J407 to P407 (G20)                | J491 to P491 (G20)                     |
| J488 to P488 (G20)                | J490 to P490 (G20)                     |
| J401 to P401 (G30)                | J395 to P395 (G30)                     |
| J402 to P402 (G30)                | J396 to P396 (G30)                     |

**Fourth 2.5G I/O shelf:**

| At the 2.5G Main Shelf connect... | At the fourth 2.5G I/O Shelf connect... |
|-----------------------------------|-----------------------------------------|
| J408 to P408 (G20)                | J491 to P491 (G20)                      |
| J489 to P489 (G20)                | J490 to P490 (G20)                      |
| J403 to P403 (G30)                | J395 to P395 (G30)                      |
| J404 to P404 (G30)                | J396 to P396 (G30)                      |

- 
- 2** Run the G10 and G11 cables in sequence from the 10G shelf (PPROC Port B, C, or D, as required) to the new 2.5G I/O shelf. Before connecting the cables to the backplane, tie the cables to the appropriate towel bar (see ED8C789-16). After the cables are tied, connect the cables to the backplane in the following sequence. (Refer to the following tables.)

**Important!** The ED8C789-21 GR11 cable assembly has different connectivity at each end. The end with the label **10G CONN** must be connected to the 10G shelf and the other end to the 2.5G I/O shelf. The other cable assemblies are symmetric; that is, either end of the cable can be connected to either shelf.

**10G shelf (PPROC Port B):**

| <b>At the 10G Shelf (PPROC Port B) connect...</b> | <b>At the second or third 2.5G I/O Shelf connect...</b> |
|---------------------------------------------------|---------------------------------------------------------|
| J20 to P20 (G10)                                  | J512 to P512 (G10)                                      |
| J24 to P24 (G10)                                  | J518 to P518 (G10)                                      |
| J28 to P28 (G10)                                  | J500 to P500 (G10)                                      |
| J32 to P32 (G10)                                  | J506 to P506 (G10)                                      |
| J13 to P13 (G11) <b>10G CONN</b> label end        | J510 to P510 (G11)                                      |
| J17 to P17 (G11) <b>10G CONN</b> label end        | J516 to P516 (G11)                                      |
| J37 to P37 (G11) <b>10G CONN</b> label end        | J498 to P498 (G11)                                      |
| J41 to P41 (G11) <b>10G CONN</b> label end        | J504 to P504 (G11)                                      |

**10G shelf (PPROC Port C):**

| <b>At the 10G Shelf (PPROC Port C) connect...</b> | <b>At the second or third 2.5G I/O Shelf connect...</b> |
|---------------------------------------------------|---------------------------------------------------------|
| J14 to P14 (G10)                                  | J510to P510 (G10)                                       |
| J18 to P18 (G10)                                  | J516 to P516 (G10)                                      |
| J38 to P38 (G10)                                  | J498 to P498 (G10)                                      |
| J42 to P42 (G10)                                  | J504 to P504 (G10)                                      |
| J23 to P23 (G11) <b>10G CONN</b> label end        | J512 to P512 (G11)                                      |
| J27 to P27 (G11) <b>10G CONN</b> label end        | J518 to P518 (G11)                                      |
| J31 to P31 (G11) <b>10G CONN</b> label end        | J500 to P500 (G11)                                      |
| J35 to P35 (G11) <b>10G CONN</b> label end        | J506 to P506 (G11)                                      |

**10G shelf (PPROC Port D):**

| <b>At the 10G Shelf (PPROC Port D)<br/>connect...</b> | <b>At the fourth 2.5G I/O Shelf<br/>connect...</b> |
|-------------------------------------------------------|----------------------------------------------------|
| J22 to P22 (G10)                                      | J512 to P512 (G10)                                 |
| J26 to P26 (G10)                                      | J518 to P518 (G10)                                 |
| J30 to P30 (G10)                                      | J500 to P500 (G10)                                 |
| J34 to P34 (G10)                                      | J506 to P506 (G10)                                 |
| J15 to P15 (G11) <b>10G CONN</b> label end            | J510 to P510 (G11)                                 |
| J19 to P19 (G11) <b>10G CONN</b> label end            | J516 to P516 (G11)                                 |
| J39 to P39 (G11) <b>10G CONN</b> label end            | J498 to P498 (G11)                                 |
| J43 to P43 (G11) <b>10G CONN</b> label end            | J504 to P504 (G11)                                 |

.....  
N D O F S T E P S





## SE 356-4: Install DS3/EC1 Connector Panels

---

**Procedure** Perform the following steps to install the DS3/EC1 connector panels on the new 2.5G I/O shelf.

---

### 1

| IF installing...                                       | THEN go to ... |
|--------------------------------------------------------|----------------|
| in-bay, horizontally-mounted DS3/EC1 connector panels, | Step 2.        |
| front access, side-mounted DS3/EC1 connector panels    | Step 3.        |
| rear-mounted DS3/EC1 connector panels                  | Step 4.        |

---

### 2 *In-Bay, Horizontally-Mounted DS3/EC1 Connector Panels:*

| IF using DS3EC1/8 port units in slots ... | THEN mount the DS3EC1 connector panel ...                                                                                                       |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-6 of the new 2.5G I/O shelf             | below the heat baffle that is below the 2.5G shelf. This panel is stamped <b>BOTTOM</b> on one side of the panel, just above the cable opening. |
| 11-16 of the new 2.5G I/O shelf           | above the heat baffle that is above the 2.5G shelf. This panel is stamped <b>TOP</b> on one side of the panel, just above the cable opening.    |

---

**3** *Front-Access, Side-Mounted DS3/EC1 Connector Panels:*

| <b>IF using DS3EC1/8 port units in slots ...</b> | <b>THEN insert six screws into the screw holes on the ...</b>                                                                                                                                                                                                                                                         |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-6 of the new 2.5G I/O shelf                    | <p>left side of the 2.5G shelf (as viewed from the front). Do not tighten the screws. Refer to the following figure.</p>  <p>Slide the DS3/EC1 connector panels over the screws and hold in place while tightening the screws.</p> |
| 11-16 of the new 2.5G I/O shelf                  | <p>right side of the 2.5G shelf (as viewed from the front). Do not tighten the screws. Slide the DS3/EC1 connector panels over the screws and hold in place while tightening the screws.</p>                                                                                                                          |

---

#### 4 *Rear-Mounted DS3/EC1 Connector Panels:*

| <b>IF using DS3EC1/8 port units in slots ...</b> | <b>THEN insert six screws into the screw holes on the rear of the...</b>                                                                                                                                        |
|--------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1-6 of the new 2.5G I/O shelf                    | left side panel of the 2.5G shelf bay uprights (as viewed from the front). Do not tighten the screws.<br><br>Slide the DS3/EC1 connector panels over the screws and hold in place while tightening the screws.  |
| 11-16 of the new 2.5G I/O shelf                  | right side panel of the 2.5G shelf bay uprights (as viewed from the front). Do not tighten the screws.<br><br>Slide the DS3/EC1 connector panels over the screws and hold in place while tightening the screws. |

---

END OF STEPS

---



## SE 356-5: 2.5G Shelf Power Cables

---

**ED9C280-28 power cables**    The following table shows the ED9C280-28 power cables used to connect the 2.5G I/O shelf.

| ED9C280-28 | Gauge               | Color        | Length<br>(Feet) | Load    |
|------------|---------------------|--------------|------------------|---------|
| GR 65      | 6                   | Red and Blue | 12               | A and B |
| GR 66      | 6                   | Red and Blue | 50               | A and B |
| GR 67      | 6                   | Red and Blue | 75               | A and B |
| GR 68      | 6 spliced<br>to 2/0 | Red and Blue | 50               | A and B |
| GR 69      | 6 spliced<br>to 2/0 | Red and Blue | 75               | A and B |



## SE 356-6: Install DS3 Cables

---

**Procedure** Perform the following steps to install DS3 cables.

- 1 Make and attach the labels to the ends of each ribbon cable. Refer to the *Cable Label* column in the following table.
- 2 Install each DS3/EC1 ribbon cable according to the following table and the applicable figure.

---

END OF STEPS

---

**Required DS3 cable connections**

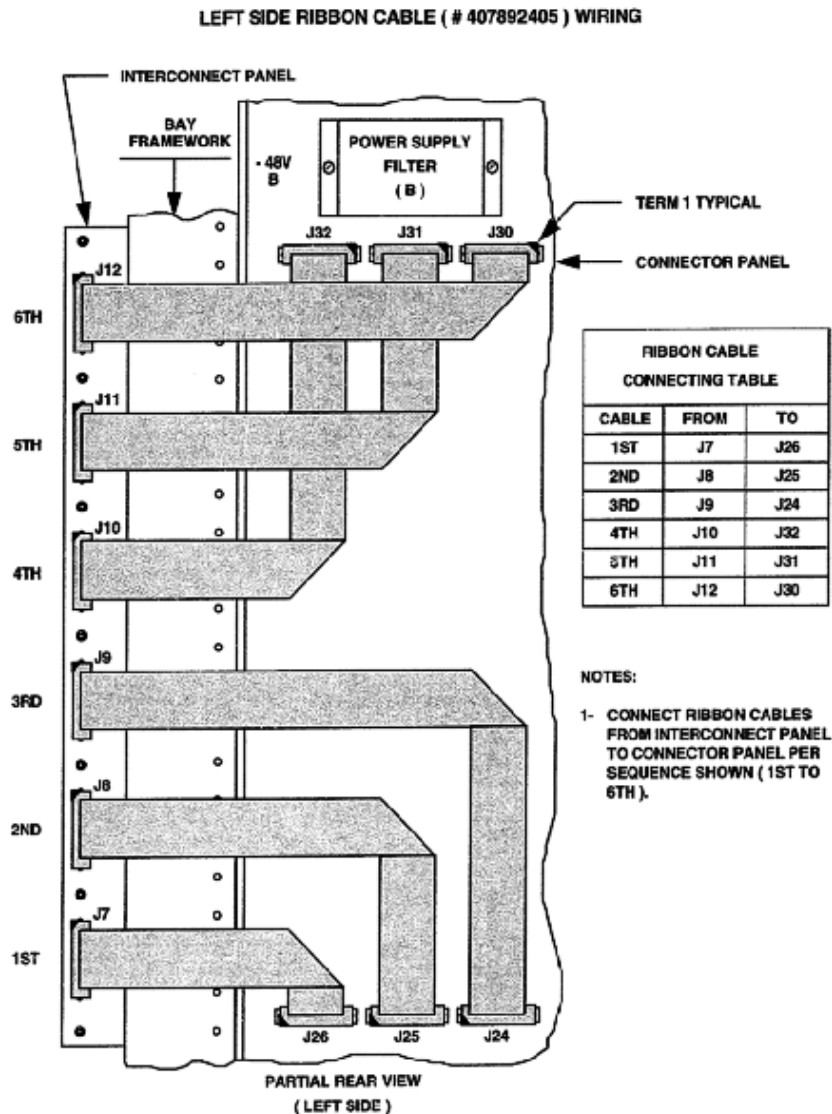
The following table shows the required DS3 cable connections between the backplane of the new 2.5G I/O shelf and the DS3/EC1 connector panels. (The following figures show connection locations on the panels and shelf.)

| DS3/EC1 Connector Panel                                    |           |                   |             | 2.5G Shelf Backplane |                   |             |
|------------------------------------------------------------|-----------|-------------------|-------------|----------------------|-------------------|-------------|
| Location                                                   | Connector | Panel Designation | Cable Label | Connector            | Panel Designation | Cable Label |
| Right side of 2.5G shelf from the rear or below 2.5G shelf | J1        | Out 33-48         | P1          | J23                  | Out PU 5-6        | P23         |
|                                                            | J2        | Out 17-32         | P2          | J22                  | Out PU 3-4        | P22         |
|                                                            | J3        | Out 1-16          | P3          | J21                  | Out PU 1-2        | P21         |
|                                                            | J4        | In 33-48          | P4          | J29                  | In PU 5-6         | P29         |
|                                                            | J5        | In 17-32          | P5          | J28                  | In PU 3-4         | P28         |
|                                                            | J6        | In 1-16           | P6          | J27                  | In PU 1-2         | P27         |
| Left side of 2.5G shelf from the rear or above 2.5G shelf  | J7        | Out 33-48         | P7          | J26                  | Out PU 15-16      | P26         |
|                                                            | J8        | Out 17-32         | P8          | J25                  | Out PU 13-14      | P25         |
|                                                            | J9        | Out 1-16          | P9          | J24                  | Out PU 11-12      | P24         |
|                                                            | J10       | In 33-48          | P10         | J32                  | In PU 15-16       | P32         |
|                                                            | J11       | In 17-32          | P11         | J31                  | In PU 13-14       | P31         |
|                                                            | J12       | In 1-16           | P12         | J30                  | In PU 11-12       | P30         |

**Important!** If the -48V power connector prevents access to the J27 and J32 connectors, use a phillips head screwdriver to temporarily detach the power connector from the shelf assembly. Move the power connector and connect the DS3 cable, then reattach the power connector.

**Right-side, front-access,  
vertically-mounted DS3/  
EC1 connector panel**

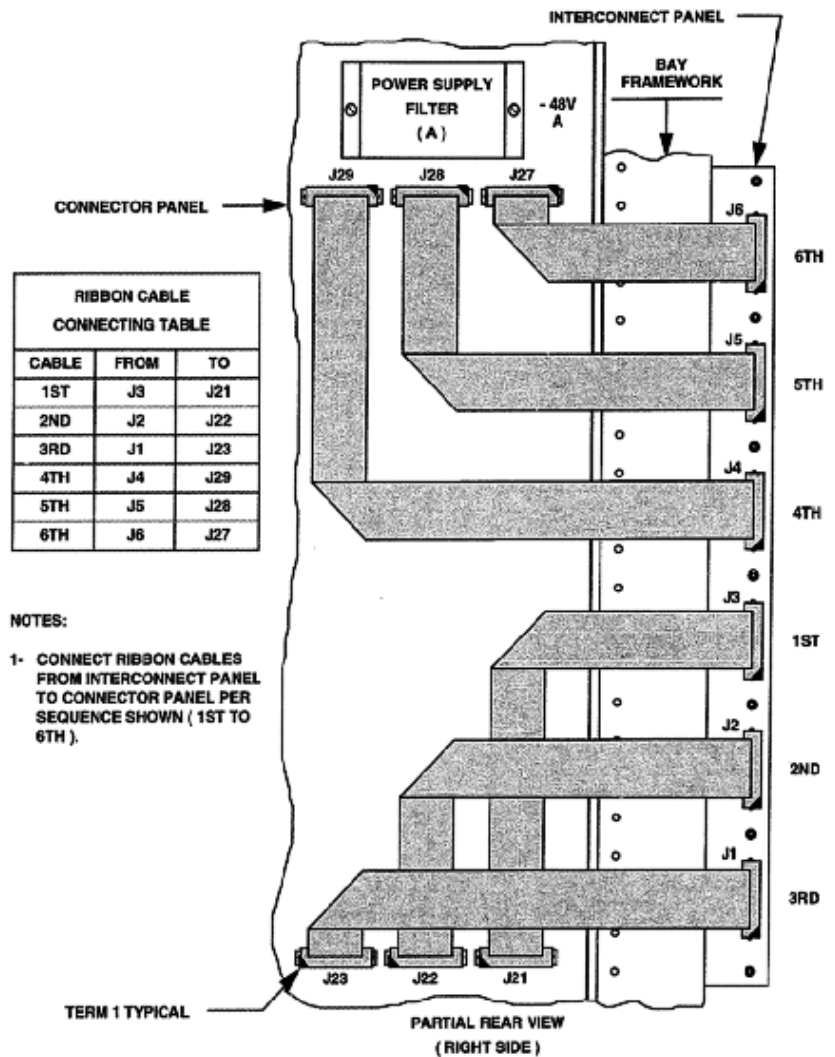
The following figure shows the proper ribbon cable connections for the front-access DS3/EC1 connector panel on the right side of a 2.5G I/O shelf as viewed from the front of the equipment or from the left side as viewed from the rear.



**Left-side, front-access,  
vertically-mounted DS3/  
EC1 connector panel**

The following figure shows the proper ribbon cable connections for the front-access DS3/EC1 connector panel on the left side of a 2.5G I/O shelf as viewed from the front of the equipment or from the right side as viewed from the rear.

**RIGHT SIDE RIBBON CABLE ( # 407892405 ) WIRING**



The following figure shows the proper ribbon cable connections for the front-access DS3/EC1 connector panels installed above and below a 2.5G I/O shelf.

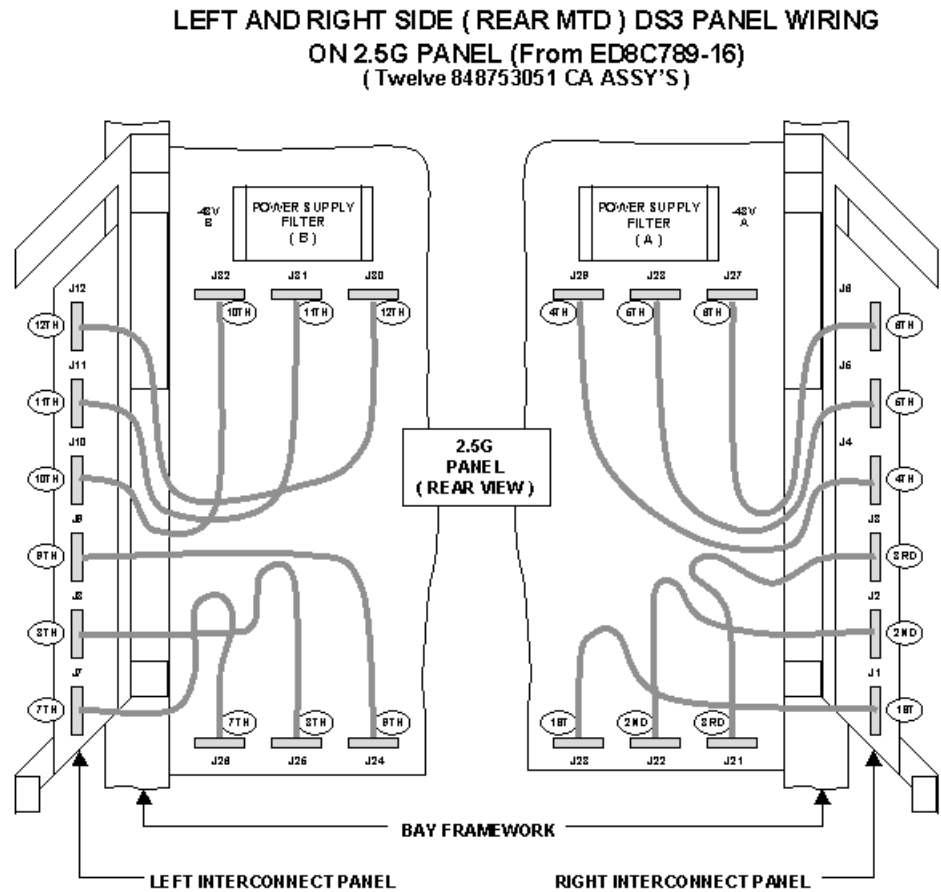
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**Rear-access,  
vertically-mounted DS3/  
EC1 connector panels**

The following figure shows the proper ribbon cable connections for the DS3/EC1 connector panels installed at the rear of the 2.5G I/O shelf.



## SE 356-7: Power the 2.5G I/O Shelf

---

**Procedure** Perform the following steps to apply power to the new 2.5G I/O shelf.

- 1 Inspect the 10G shelf and verify that all packing material has been removed.
- 2 Verify that the circuit breakers at the Battery Distribution and Fuse Bay (BDFB) are in the **OFF** position, or the fuses on the BDFB are *not installed*.
- 3 Verify that any circuit packs in the 2.5G I/O shelf are unseated.
- 4 Verify that the circuit breakers on the 2.5G I/O shelf are in the **OFF** position.
- 5 At the BDFB, insert one 30-amp fuse for Load A and one 30-amp fuse for Load B for the 2.5G I/O shelf. If circuit breakers are used, put both circuit breaker in the **ON** position.
- 6 Using a volt/ohm meter verify the voltage at the connectorized end of each power cable.  
**Result:** The voltage should be -48 V DC (between -41.75 and -60 V DC) at each cable connector.
- 7 At the BDFB, remove the 30-amp fuses for Load A and Load B for the 2.5G I/O shelf. If circuit breakers are being used, put both circuit breakers in the **OFF** position.
- 8 Connect the power feeders to the correct locations on the 2.5G I/O shelf.

---

**9** At the BDFB, re-insert one 30-amp fuse for Load A and one 30-amp fuse for Load B for the 2.5G I/O shelf. If circuit breakers are used, put both circuit breaker in the **ON** position.

---

**10** At the 2.5G I/O shelf, operate the **Load A** circuit breaker to the **ON** position.

**Result:** The **PWR ON** LED is lighted on the shelf user panel. The **PWR ON** and **FAIL** LEDs are lighted on the fan shelf.

---

**11** Operate the **Load A** circuit breaker to the **OFF** position.

**Result:** The **PWR ON** LED is extinguished on the user panel and fan shelf.

---

**12** Repeat Step 10 and Step 11 for the **Load B** circuit breaker.

---

**13** Operate the **Load A** and **Load B** circuit breakers to the **ON** position.

**Result:** The **PWR ON** LED is lighted on the user panel and fan shelf.

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N D O F S T E P S

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## SE 356-8: Install Circuit Packs

---

### Procedure



#### CAUTION

*To avoid damaging circuit pack components located on the solder side of the circuit board, use extreme caution when installing circuit packs, especially “AE” coded packs for NEBS Level 3 open-door compliance. Make sure to slide each circuit pack straight into its slot and slightly away from the adjacent circuit pack.*



#### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 10G (2-Fiber) system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in Appendix D, Safety.”*

**Important!** When installing the TMG/STRAT3 circuit packs, use BOTH hands. Use one hand to hold the latch, and the other hand to apply force to the bottom of the circuit pack. This allows the circuit pack to slide into the slot more easily.

Perform the following steps to install the circuit packs.

- 1 Install the following circuit packs in the new 2.5G I/O shelf.

| Circuit Pack               | 2.5G I/O Shelf Slot<br>(See Figure) |
|----------------------------|-------------------------------------|
| ADJCTL/DCCEI (LEY 1)       | DCCEI                               |
| SWITCH/STS576 (LEY4)       | SWITCH0                             |
| SWITCH/STS576 (LEY4)       | SWITCH1                             |
| TMG/STRAT3 (LLY2 or LLY2B) | TMG0                                |
| TMG/STRAT3 (LLY2 or LLY2B) | TMG1                                |

|              |
|--------------|
| Port Unit 1  |
| Port Unit 2  |
| Port Unit 3  |
| Port Unit 4  |
| Port Unit 5  |
| Port Unit 6  |
| Port Unit 7  |
| Port Unit 8  |
| EPRN         |
| EPROTSW      |
| SWITCH 0     |
| CTL SYSDM 0  |
| DCCEI        |
| BLANK        |
| SWITCH 1     |
| TMG 0        |
| TMG 1        |
| Port Unit 9  |
| Port Unit 10 |
| Port Unit 11 |
| Port Unit 12 |
| Port Unit 13 |
| Port Unit 14 |
| Port Unit 15 |
| Port Unit 16 |

- 2

| IF DS3EC1/8 port unit protection is... | THEN go to ... |
|----------------------------------------|----------------|
| required,                              | Step 3.        |
| not required,                          | Step 5.        |

- 3 Unpack and insert a SWITCH/DS3EC1 (LEY 18) circuit pack into the slot labeled **EPROTSW** .

- 
- 4 Unpack and insert a DS3EC1/8 (LEY 17) port unit into the slot labeled **EPRN**.
- 

- 5 Unpack and insert port units (DS3EC1/8 [LEY17], OC3/STM1 [for example LEY16], OC12/STM4 [for example, LEY13], OC48/STM16 [for example, LEY7], and gigabit ethernet [for example, LEY309]) into slots 1-16 as required per work order.

The following restrictions apply to the port unit slots.

- If a protection DS3EC1/8 port unit is used, slot 16 must either contain a DS3EC1/8 port unit or else be empty.
- DS3EC1/8 port units cannot be installed in slots 7, 8, 9, and 10.
- OC48/STM16 and gigabit ethernet port units occupy two slots: odd on the left and even on the right. The port unit is known by its even-numbered slot.
- OC48/STM16 port units that are East/West in a BLSR must be in adjacent slots in the same quadrant, or symmetric slots with one on each side of the shelf. Specifically, the only acceptable combinations are: 2&4, 6&8, 10&12, 14&16, 2&16, 4&14, 6&12, or 8&10.

- 
- 6 Unpack the CTL/SYS50DM (LEY10B) circuit pack. Insert the LEY10B into the slot labeled **CTLSYSDM0**. The slot labeled **CTLSYSDM1** remains empty.

**Result:** Note that the LEDs on most circuit packs light on and off until the software is downloaded to the shelf. (The software is downloaded later in this task).

---

**Important!** For proper operation of the system, each slot should contain either a circuit pack or a blank faceplate.

- 7 In the remaining empty slots install a blank faceplate. Refer to the following table for more information about blank faceplates.

---

ND OF STEPS

---

**Blank faceplates**      The following table shows the blank faceplates and comcodes.

| Circuit Pack Slot | Blank Faceplate Comcode              |                                   |
|-------------------|--------------------------------------|-----------------------------------|
|                   | Non-NEBS3<br>ED8C789-30, G2<br>Shelf | NEBS3<br>ED8C789-30, G2E<br>Shelf |
| 1-8               | 848294690                            | 848514451                         |
| 9-16              |                                      |                                   |
| EPRN              |                                      |                                   |
| EPROTSW           | 848295093                            | 848514485                         |
| CTL SYSDM 1       | 848294799                            | 848514501                         |

# SE 356-9: Create New 2.5G I/O Shelf

---

**Procedure**    Perform the following steps to create a new 2.5G I/O shelf in the system.

.....

**1**    Using the WaveStar CIT, log in to the network element.

.....

**2**

| IF a new bay...            | THEN ...                                                                                                                                                                                                                                                                                              |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| is required to be created, | Perform the following to create a new bay in the CIT System View:<br><br>1.    Select <b>Configuration&gt;Create New&gt;Bay</b> . The <i>Create New Bay</i> screen appears.<br><br>2.    Provision the <i>Bay Access Identifier</i> parameter as required and click on <b>OK</b> . Proceed to Step 3. |
| is not required.           | Proceed to Step 3.                                                                                                                                                                                                                                                                                    |

.....

**3**    At the WaveStar CIT, select **Configuration>Create New>Shelf**.

**Result:** The *Create New Shelf* screen appears.

.....

**4**    Click on the appropriate **Bay**. Then click on **Select Bay** at the bottom of the screen.



---

**5** Provision the following parameters:

| Parameter                                | Provisioned Value                                                                                                       |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Shelf AID                                | 1 ( <i>middle</i> shelf in bay)<br>2 ( <i>top</i> shelf in bay)<br>3 ( <i>bottom</i> shelf in bay)                      |
| Shelf Type                               | 2.5G I/O                                                                                                                |
| SS Bit Override<br>(Release 6 and later) | Desired Value                                                                                                           |
| ON Cable Identifier                      | 2 (connected to <i>PPROC Port B</i> )<br>3 (connected to <i>PPROC Port C</i> )<br>4 (connected to <i>PPROC Port D</i> ) |
| Alarm Severity Assignment<br>Profile     | Desired Value                                                                                                           |

---

**6** Click on **Apply** then click on **Yes** to confirm. Wait until the **Apply** button is grayed out.

---

**7** Click on **Close** at the bottom of the screen.

---

**8** Wait until the 2.5G shelf boots (all LEDs stop blinking and only green LEDs are lighted). Then, select **View>System View Display**.

**Result:** The 2.5G shelves and the 10G shelf are displayed in the bay(s).

---

N D O F S T E P S



## SE 356-10: Test LEDs

---

**Procedure** Complete the following steps to verify the shelf LEDs are operating properly.

---

**1** At the WaveStar CIT, select **Fault>Test>LED**.

---

**2** Click on the new 2.5G I/O shelf and click on **Select**.

**Result:** Another *Test LED* screen appears requesting the number of iterations.

---

**3** Verify the shelf AID on the *Test LED* screen, enter the Number of Iterations (2 iterations are recommended) and click on **Start**.

**Result:** A dialog box appears noting that each test iteration causes the LEDs to cycle on and off 3 seconds. Each test iteration takes approximately 40 seconds. Click on **Yes**.

All labeled LEDs on the User Panel turn on for 3 seconds, then off for 3 seconds. This repeats 3 times the number of test iterations chosen. Then all labeled LEDs on the circuit packs in the 2.5G shelf turn on for 3 seconds, then off for 3 seconds. This repeats 3 times the number of test iterations chosen. The Test Status should indicate Test Successful.

---

**4** Locate and press the **LED Test** pushbutton on user panel of the 2.5G shelf.

**Result:** All labeled LEDs on the User Panel turn on for 3 seconds, then off for 3 seconds. This repeats 3 times. Then all labeled LEDs on the circuit packs in the 2.5G shelf turn on for 3 seconds, then off for 3 seconds.

---

ND OF STEPS



## SE 356-11: Test Circuit Pack Protection Switching

---

**Procedure** Complete the following steps to verify TMG/STRAT3 and SWITCH/STS576 circuit pack protection switching.

---

- 1 At the WaveStar CIT *Shelf View* of the new 2.5G I/O shelf, determine the Active and Standby TMG/STRAT3 circuit packs. An **A** appears on the faceplate of the Active TMG/STRAT3 circuit pack, and an **S** appears on the faceplate of the Standby TMG/STRAT3 circuit pack.

The green **Active** LED on the circuit pack faceplate also shows the Active/Standby status. The green **Active** LED is lighted when the circuit pack is Active and extinguished when the circuit pack is Standby.

---

- 2 Select **Fault>Protection Switch...**

**Result:** The *Switch Protection* screen appears.

---

- 3 Double click on the appropriate bay (**Bay 1** or **Bay 2**). Click on the new 2.5G I/O shelf and **1+1 Equipment etmggrp**. Then click on **Select**.

**Result:** The protection switch information appears for the protection group.

---

- 4

| IF the ...                                | THEN select Switch Type...                                                                  |
|-------------------------------------------|---------------------------------------------------------------------------------------------|
| bottom TMG/STRAT3 circuit pack is Active, | Manual to Side 1. Click on <b>Apply</b> and <b>Yes</b> .<br><i>Do not close the screen.</i> |
| top TMG/STRAT3 circuit pack is Active,    | Manual to Side 0. Click on <b>Apply</b> and <b>Yes</b> .<br><i>Do not close the screen.</i> |

**Result:** The previously Standby TMG/STRAT3 circuit pack becomes active, and the previously Active TMG/STRAT3 circuit pack becomes Standby. No alarms should be active.

- 
- 5 On the left side of the screen, click on **1+1 Equipment esysswitchgrp** and **Select**.

**Result:** The protection switch information appears for the protection group.

---

**Important!** The **Switch Status** shows the Active side.

- 6 Determine the Active and Standby SWITCH/STS576 circuit packs.

The green **Active** LED on the circuit pack faceplate also shows the Active/Standby status. The green **Active** LED is lighted when the circuit pack is Active and extinguished when the circuit pack is Standby.

---

7

| IF the ...                                                | THEN select Switch Type...                                                       |
|-----------------------------------------------------------|----------------------------------------------------------------------------------|
| Side 0 SWITCH/STS576 circuit pack (left side) is Active,  | Manual to Side 1. Click on <b>Apply</b> and <b>Yes</b> . Click on <b>Close</b> . |
| Side 1 SWITCH/STS576 circuit pack (right side) is Active, | Manual to Side 0. Click on <b>Apply</b> and <b>Yes</b> . Click on <b>Close</b> . |

**Result:** The previously Standby SWITCH/STS576 circuit packs in all shelves (2.5G and 10G) and the Standby PPROC circuit pack in the 10G shelf become Active. The previously Active circuit packs become Standby. No alarms should be active.

---

N D O F S T E P S



## SE 356-12: Test Port Unit Optical Output Power

---

**Procedure** Complete the following steps to test the port unit optical output power .

- 1 Obtain an optical power meter. Insure that the optical power meter is set for the correct wavelength.
- 2 Connect a 0-dB LBO to the **OUT** port of the port unit being tested.
- 3 Using a 0-dB single mode fiber jumper between the LBO and the optical power meter, measure the output optical power. The output optical power should be in the following range:

| Port Unit          | Optical Output Power (dBm)                                           |
|--------------------|----------------------------------------------------------------------|
| OC48/STM16/1.3LR1  | -2.0 to 3.0                                                          |
| OC48/STM16/1.5LR1  | -2.0 to 3.0                                                          |
| OC48/STM16/POU     | -2.8 to 1.0                                                          |
| OC48/STM16/1.3VSR1 | -6.0 to -1.0                                                         |
| OC12/STM4/1.3LR2   | -2.5 to 2.0                                                          |
| OC12/STM4/1.3SR2   | -15.0 to -8.0                                                        |
| OC3/STM1/1.3LR4    | -5.0 to 0.0                                                          |
| OC3/STM1/1.3SR4    | -15.0 to -8.0                                                        |
| OC3/STM1/1.3SR8    | -15.0 to -8.0                                                        |
| GE1/SX2            | -9.5 to -4.0                                                         |
| GE1/LX2            | -11.0 to -3.0 (Single Mode Fiber)<br>-11.5 to -3.0 (Multimode Fiber) |

The OC48/STM16/DWDM and OC48/STM16/WDM port units should be tested with the connected WaveStar OLS system. Tests are provided in the Installation Manual of the specific OLS product.

---

ND OF STEPS



## SE 356-13: Test Backplane Cables

---

**Procedure** Complete the following steps to test the backplane cables.

- 
- 1 Obtain an OHMmeter and connect one lead of the OHMmeter to the backplane ground.
- 

**Important!** Test each cable one at a time. Do not disconnect more than one cable at a time.

- 2 Starting with the first cable, disconnect one end of the cable.

**Reference:** *SE 352-2: Backplane Cables and Associated Labels*

---

- 3 Disconnect the other end of the cable and touch the other lead of the OHMmeter to it.

**Result:** If the cable is connected properly, the OHMmeter will indicate open.

If the OHMmeter indicates a SHORT, make note of the cable and continue to the next step. There is a good chance that another cable will indicate a SHORT. These cables are probably reversed and should be corrected.

---

**Important!** Reconnect both ends of the cable before testing another cable.

- 4 Reconnect both ends of the cable to the appropriate backplane connectors.
- 

- 5 Repeat Step 2 through Step 4 for the remaining cables.

---

ND OF STEPS

---



## SE 356-14: Test Electrical Port Units, Slots, and Cables

---

### Connector panels and the associated slots

If only one DS3/EC1 connector panel is installed, then electrical port units are only permitted in the slots corresponding to the connector panel.

For example, the DS3EC1/8 port units are installed in slots 1-6 if the DS3/EC1 connector panel:

- is mounted on the on the left side of the 2.5G shelf as viewed from front of equipment, or
- is mounted below the shelf, or
- is rear-mounted and is on the right side of the 2.5G shelf as viewed from the back of the equipment.

The DS3EC1/8 port units are installed in slots 11-16 if the DS3/EC1 connector panel:

- is mounted on the on the right side of the 2.5G shelf as viewed from front of equipment, or
- is mounted above the shelf, or
- is rear-mounted and is on the left side of the 2.5G shelf as viewed from the back of the equipment.

### Procedure

**Important!** In order to test all slots in the new 2.5G I/O shelf, the electrical port units may have to be moved and the test run again, unless a full complement of port units is available.

Complete the following steps to test the electrical port units, slots, and cables.

- 
- 1 Perform a cross-connect loopback on first tributary of the installed port unit being tested using the **Fault>Analysis>Cross-Connect Loopback** command. Select the shelf, slot, port, and tributary.

**Result:** The **ABN** LED is lighted.

- 
- 2** At the local cross-connect panel, connect the output of a DS3 test set to the **IN** port of the cross-connect panel for the tributary being tested. Connect the input of the DS3 test set to the OUT port of the local cross-connect panel for the tributary being tested.

**Result:** Error free transmission.

---

**Important!** The DS3EC1/8 port units are 1xN (N is equal to or less than 12) protected or unprotected.

- 3** If required, perform the following to test the DS3EC1/8 port unit protection.
1. Select **Fault>Protection Switch...** . The *Switch Protection* screen appears.
  2. Double click on the appropriate bay (**Bay 1** or **Bay 2**). Then click on the new 2.5G I/O shelf.
  3. Click on **1xN Equipment eds3ec1grp** and **Select**. The protection switch information for the protection group appears.
  4. Select the *port unit AID* in the **Working Pack AID:** field and *Manual* for the **Switch Type**. Then click on **Apply** and **Yes**. *Do NOT close the screen.*

**Result:** Transmission switches to the protection DS3EC1/8 port unit. The LEDs on the circuit packs in the EPROTSW and EPRN slots are lighted, and the LED on the DS3EC1/8 port unit being tested is extinguished.

- 
- 4** In the *Switch Protection* screen, change the **Switch Type** to *Clear*. Then click on **Apply** and **Yes**. Click on **Close**.

**Result:** Transmission switches back to the working DS3EC1/8 port unit after the provisionable wait-to-restore period. (The system wait-to-restore default is 5 minutes.) The LEDs on the circuit packs in the EPROTSW and EPRN slots are extinguished, and the LED on the DS3EC1/8 port unit being tested is lighted.



- 
- 5 Release the looped back tributary using the **Fault>Analysis>Cross-Connect Loopback** command. Select the shelf, slot, port, and tributary. Then click on **Release** and **Yes** to confirm.

**Result:** The **ABN** LED is extinguished.

---

- 6 Repeat Step 1 through Step 5 for each port/tributary on the port unit.
- 

- 7 Repeat Step 1 through Step 6 for each installed port unit.
- 

- 8 If all slots have not been tested, remove all port units, and insert the DS3EC1/8 port units in any applicable slots that have not been tested with a DS3EC1/8 port unit. Repeat Step 1 through Step 5 for each slot that has not been previously tested.
- 

- 9 Verify the **ABN** LED is extinguished on the User Panel. If the **ABN** LED is lighted, a cross-connect loopback still exists and must be released.
- 

- 10 To clear any minor (MN) Loss of Signal (LOS) alarms that may be raised on the remaining ports:
- Right click on the blue LED representing the alarmed port.
  - Select **Provision Port x** (where x is the port number).
  - Change *Port Mode* from **Monitored** to **Auto**.
  - Click **OK**, then click **Yes**.

---

N D O F S T E P S

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## SE 356-15: Perform Cable In and Out Reversal Test

---

**Procedure** Complete the following steps to verify that the electrical input and output cables are not reversed.

- 1 Insert DS3EC1/8 port units into the shelf (if necessary).
- 2 At the DS3EC1 connector panel, connect the *output* of the first port to the input of the DS3 test set.
- 3 Verify that an AIS or Idle signal is received.
- 4 At the DS3EC1 connector panel, connect the input of the DS3 test set to the *input* of the first port.
- 5 Verify that no signal is received.
- 6 Repeat Step 2 through Step 5 for all ports.

END OF STEPS



# Task 357: Replace Circuit Pack with Circuit Pack having Different Code

---

**Purpose** Use this procedure to replace an existing circuit pack with a circuit pack having a different code type or version.

**Required privilege code(s)** A privilege code of at least P3+M1 is required to required to access the *Exchange Circuit Pack* screen.

**Required equipment** The following equipment is required to perform this task:

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Wrist strap
- Replacement circuit pack

**Important!** The WaveStar TDM 2.5G/10G system must be equipped with Release 5.0.0 or later software to perform this task.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



## **WARNING**

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



## **CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system, to prevent electrostatic discharge damage to sensitive components.*



## CAUTION

*Do not rock circuit packs back and forth when removing and installing them. Carefully slide circuit packs into or out of the shelf.*

**Related information** For related information, see the following sections in this document:

- *Chapter 5, Circuit Pack/Port Unit Descriptions*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions specify the address (AID) of the circuit pack to be replaced.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Task** Complete the following steps to replace a circuit pack with a different circuit pack having a different code.

- 
- 1 If required, remove the appropriate shelf cover.

**Reference:** *Supporting Task T705, Remove/Replace Shelf Cover*

---



## CAUTION

*Do not rock the circuit pack back and forth. To avoid damage carefully slide the circuit pack out of the slot guides.*

- 2 Locate the circuit pack to be replaced according to the work instructions. If applicable, disconnect the optical lines to the circuit pack, unlock the circuit pack latches, and remove the circuit pack.

- 
- 3 At the WaveStar CIT, select **Configuration>Exchange Circuit Pack...** .

**Result:** The *Exchange Circuit Pack* screen appears.

---

- 4 Open the shelf and circuit pack details by clicking on the plus (+) sign next to each entity. Click on the required circuit pack and **Select Pack**.

**Result:** A list of valid replacement circuit packs and qualifiers appears.

---

- 5 Click on the required replacement circuit pack according to the work instructions and **Apply**.

**Result:** A dialog box appears asking you to confirm exchanging circuit packs. Click on **Yes**. Then click on **Close** to exit.

---



## CAUTION

*Do not rock the circuit pack back and forth. To avoid damage, carefully place the replacement circuit pack into the slot guides and slowly slide it into the shelf (using BOTH hands) until the latches are fully engaged .*

- 6 If applicable, connect the optical lines to the replacement circuit pack and install the replacement circuit pack in the slot.

**Result:** The replacement circuit pack initializes.

---

**Important!** The initialization times vary depending on the circuit pack type.

- 7 Wait for the replacement circuit pack to stabilize.

- 
- 8** If required, replace the shelf cover.

**Reference:** *Supporting Task T705, Remove/Replace Shelf Cover*

---

N D O F S T E P S

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## Task 358: Provision Section Trace

---

|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to provision the transmit section trace of a terminated STS-N signal at a port. This procedure can be performed from any WaveStar TDM 2.5G/10G system in the network.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Required privilege code(s)</b> | A privilege code of at least P3+M1 is required to perform this task.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Required equipment</b>         | A WaveStar Craft Interface Terminal (CIT) is required to perform this task.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Related information</b>        | <p>For related information, see the following sections in this document:</p> <ul style="list-style-type: none"><li>• <i>Chapter 6, Control, Transmission, and Synchronization Interfaces</i></li><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Operation Task 251, Verify Receive Section Trace</i></li><li>• <i>Appendix A, CIT Tutorial</i></li></ul> <p>For related information in 365-371-211, <i>Alarm Messages and Trouble Clearing Guide</i>, see <i>Chapter 2, Maintenance/Trouble Clearing</i>.</p>                                                                                                                                 |
| <b>Before you begin</b>           | <p>Before you begin this task:</p> <ul style="list-style-type: none"><li>• Obtain the work instructions for this task and note the assigned addresses (AIDs).</li><li>• Determine which WaveStar TDM 2.5G/10G systems are the source network element and the destination network element for the STS-N section(s) to be provisioned.</li><li>• Determine the write format and section trace character string for each STS-N section to be provisioned (section is between the source and destination network elements).</li><li>• Verify that a WaveStar CIT is connected and logged in to the source network element for the first STS-N section to be provisioned.</li></ul> |

**Task** Complete the following steps to provision the section trace of a terminated STS-N signal at a port.

.....

**1** Provision section trace at the source network element.

**Reference:** *SE 358-1: Provision Section Trace at Network Element*

.....

**2** Terminate the log in session at the source network element.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

.....

**3** Log in to the destination network element for the first STS-N section to be provisioned.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

.....

**4** Provision section trace at the destination network element.

**Reference:** *SE 358-1: Provision Section Trace at Network Element*

.....

**5** Terminate the log in session at the destination network element.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

.....

**6** Check the provisioning just done by verifying the STS-N receive section trace signal.

**Reference:** *Operation Task 251, Verify Receive Section Trace*

.....

N D O F S T E P S

.....





## SE 358-1: Provision Section Trace at Network Element

---

**Procedure** Perform the following steps to provision section trace at the source or destination network element.

- 
- 1 At the WaveStar CIT System View, select **Configuration>Provision...**

**Result:** The *Provision Parameters for Protection Group or Equipment* screen appears.

---

- 2 Open the shelf, circuit pack, and port details by clicking on the plus (+) sign next to each entity.
- 

- 3 Highlight the required optical port and click on **Provision**.

**Result:** The optical port parameters appear.

---

- 4 Click on the **Trace Settings** tab.

**Result:** The *Section Trace Parameters* appear.

---

- 5 Provision the *Section Trace Parameter(s)* according to the work instructions and click on **Apply**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**.

---

- 6 Repeat Step 2 through Step 5 for any additional STS-N sections to be provisioned. Click on **Close** to exit.

---

END OF STEPS

---





# Task 359: Change Nonpreemptible Unprotected Traffic (NUT) Configuration of Time Slot

---

**Purpose** Use this procedure to change the nonpreemptible unprotected traffic (NUT) configuration of a time slot in an OC-192 2-fiber bidirectional line-switched ring (BLSR).

This procedure allows users to:

- exclude a time slot(s) from the 2-fiber bidirectional line-switched ring protection
- include a time slot(s) in the 2-fiber bidirectional line-switched ring protection that was previously excluded

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Important!** Release 6 or later software is required to perform this task. Release 5 and earlier releases do not support nonpreemptible unprotected traffic.

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the 2-fiber bidirectional line-switched ring (BLSR) protection group ID and the ring ID.
- Verify that the work instructions identify the time slots to be provisioned and specify the new value of the protection attribute parameter (Protected, Not Protected, Temporarily Not Protected).

**Task** Complete the following steps to change the nonpreemptible unprotected traffic (NUT) configuration of a time slot in an OC-192 2-fiber bidirectional line-switched ring (BLSR):

---

**Important!** To prevent provisioning errors, it is recommended that only one network element be designated and used as a central place to provision nonpreemptible unprotected traffic.

- 1** Log in to the network element designated as the central place to provision nonpreemptible unprotected traffic.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

---

- 2** At the WaveStar CIT System View, select **Configuration>Provision...** .

**Result:** The *Provisionable Parameters for Protection Group or Equipment* screen appears.

---

- 3** Click on the **Ring ID** tab and the required *2-fiber BLSR*. Then click on **Provision**.

**Result:** The protection information appears for the required 2-fiber BLSR.

---

- 4** Verify the *Protection Group AID* and *Ring ID*. Then click on **Local NUT...** .

**Result:** The *Local Non Preemptible Unprotected Traffic* screen appears.

---

**Important!** The *Protection Attribute* parameter in the local NUT configuration determines whether or not the working time slot is protected, and the corresponding protection time slot is preempted.

The operational NUT configuration for the ring is auto provisioned based on the user provisioned local NUT configurations at each network element in the ring network.

- 5 Provision the *Protection Attribute* parameter of the required working time slot according to the work instructions. Then click on **Apply** and **Close**.

Provisioning the *Protection Attribute* parameter as Temporarily Not Protected results in an Abnormal alarm.

- 
- 6 Select **View>Protection...** .

**Result:** The *View Protection* screen appears.

- 
- 7 Click on the required *2-fiber BLSR* and **Select**.

**Result:** The protection information for the 2-fiber BLSR appears.

- 
- 8 Click on the **Provisionable Parameters** tab.

- 
- 9 Select the *NUT type* and click on **View NUT...** to obtain the *Non Preemptible Unprotected Traffic* screen. Verify that the time slot protection attribute was provisioned correctly.

---

N D O F S T E P S





# Task 360: Provision Remote Network Element Status Alarming

---

- Purpose** Use this procedure to:
- Establish an alarm group
  - Add a network element to an existing alarm group

**Required privilege code(s)** A privilege code of at least S1 is required to perform this task.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Important!** Release 6 or later software is required to perform this task. Release 5 and earlier releases do not support remote network element status alarming.

- Related information** For related information, see the following sections in this document:
- *Chapter 7, Provisioning, Security, and Administration*
  - *Appendix A, CIT Tutorial.*

- Before you begin** Before you begin this task:
- Obtain the work instructions for this task.
  - Verify that the work instructions identify the affected network element(s) and specify the required provisioning.

**Task** Complete the following steps to provision remote network element status alarming:

---

**1**

| IF adding a ...                               | THEN go to ... |
|-----------------------------------------------|----------------|
| new alarm group,                              | Step 2.        |
| network element(s) to an existing alarm group | Step 6.        |

---

**Important!** At least one network element in each alarm group must be provisioned as the alarm gateway network element (AGNE). An additional AGNE can be provisioned for redundancy; however, it is recommended that only one AGNE be provisioned for each alarm group.

- 2 From the work instructions, determine which network element(s) is to be provisioned as AGNE(s) of the alarm group.

- 
- 3 Log in to the network element to be provisioned as an AGNE.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

- 
- 4 Provision the network element as the AGNE of the alarm group.

**Reference:** *SE 360-1: Provision Network Element as AGNE*

- 
- 5 If required, repeat Step 3 and Step 4 for the other network element to be provisioned as an AGNE.

---

**Important!** The maximum number of network elements in an alarm group is limited to the number of network elements in the subnetwork (50 network elements). It is recommended that the members of an alarm group be in the same routing area. Alarm group members can be nodes in ring or any other logical grouping such as a maintenance or geographical group.

- 6 From the work instructions, determine which network elements are to be provisioned as members of the alarm group.

- 
- 7 Log in to the network element to be provisioned as an alarm group member.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*



- 
- 8** Provision the network element as an alarm group member.

**Reference:** *SE 360-2: Provision Network Element as Alarm Group Member*

---

- 9** If required, repeat Step 7 and Step 8 for the other network elements to be provisioned as alarm group members.

---

N D O F S T E P S

---



## SE 360-1: Provision Network Element as AGNE

---

**Procedure** Perform the following steps to provision a network element as the alarm gateway network element (AGNE) of an alarm group.

---

- 1** At the WaveStar CIT System View, select **Administration>Set NE...**

**Result:** The *NE Administration* provisioning screen appears.

---

- 2** Provision the *Remote NE Status (Enabled)*, *Alarm Gateway (Yes)*, and *Alarm Group* parameters according to the work instructions and click on **OK**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**.

---

- 3** Select **Administration>View NE Administration...** to obtain the *NE Administration* display screen and verify that the parameters were provisioned correctly.

---

N D O F S T E P S

---



## SE 360-2: Provision Network Element as Alarm Group Member

---

**Procedure** Perform the following steps to provision a network element as an alarm group member.

---

- 1** At the WaveStar CIT, select **Administration>Set NE...**

**Result:** The *NE Administration* provisioning screen appears.

---

- 2** Provision the *Remote NE Status (Enabled)*, *Alarm Gateway (Disabled)*, and *Alarm Group* parameters according to the work instructions and click on **Apply**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**.

---

- 3** Select **Administration>View NE Administration...** to obtain the *NE Administration* display screen and verify that the parameters were provisioned correctly.

---

END OF STEPS

---





# Task 361: Add IP Tunnel(s) through Network

---

|                                   |                                                                                                                                                                                                                                                                                          |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to add an IP tunnel(s) through a network.                                                                                                                                                                                                                             |
| <b>Required privilege code(s)</b> | A privilege code of at least S4 is required to perform this task.                                                                                                                                                                                                                        |
| <b>Required equipment</b>         | <p>The WaveStar Craft Interface Terminal (CIT) is required to perform this task.</p> <p><b>Important!</b> Release 5 or later software is required to perform this task. Release 4 and earlier releases do not support IP tunneling.</p>                                                  |
| <b>Related information</b>        | <p>For related information, see the following sections in this document:</p> <ul style="list-style-type: none"><li>• <i>Chapter 4, Operations Interfaces</i></li><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, CIT Tutorial.</i></li></ul> |
| <b>Before you begin</b>           | <p>Before you begin this task:</p> <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Verify that the work instructions identify the affected network element(s) and specify the required provisioning.</li></ul>                             |
| <b>Task</b>                       | Complete the following steps to add an IP tunnel(s) through a network.                                                                                                                                                                                                                   |

---

**Important!** An IP tunnel is established between two dual-stack network elements on the boundary between the IP and OSI networks. IP traffic is encapsulated at these network elements for transport through the OSI network.

- 1** From the work instructions, determine which network elements are the dual-stack network elements at the boundary between the IP and OSI networks.

- 
- 2** Log in to the first dual-stack network element.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

---

**3** Provision the IP tunnel parameters according to the work instructions.

**Reference:** *SE 361-1: Provision IP Tunnel Parameters*

---

**4** Log in to the other dual-stack network element.

**Reference:** *Operation Task 223, Log In/Log Out of Network Element*

---

**5** Provision the IP tunnel parameters according to the work instructions.

**Reference:** *SE 361-1: Provision IP Tunnel Parameters*

---

**6** Repeat Step 1 through Step 5 to add any remaining IP tunnels.

---

N D O F S T E P S

---



## SE 361-1: Provision IP Tunnel Parameters

---

**Procedure** Perform the following steps to provision the IP tunnel parameters at a network element.

- 
- 1 At the WaveStar CIT System View, select **Administration>Data Communications...**

**Result:** The *Data Communications* screen appears.

---

- 2 Open the bay and shelf details by clicking on the plus (+) sign next to the bay and shelf.
- 

- 3 Highlight the required *dccei (ADJCTL/DCCEI)* circuit pack and click on **Select**.

**Result:** The data communications parameters appear.

---

- 4 Click on the **IP Tunnel** tab.

**Result:** The *IP Tunneling* parameters appear.

---

- 5 Provision the *IP Tunnel Status (Enabled)* and click on **OK**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**.

---

- 6 Click on the **TCP/IP** tab.

**Result:** The *TCP/IP Network Addresses* appear.

---

- 7 Modify the *TCP/IP Network Addresses* as required and click on **OK**.

**Result:** A dialog box appears stating that executing this command resets the stack. Click on **Yes** and the WaveStar CIT disconnects from the network element.

- 
- 8** Log in to the network element and select **Administration>Data Communications...**

**Result:** The *Data Communications* screen appears.

---

- 9** Open the bay and shelf details by clicking on the plus (+) sign next to the shelf.
- 

- 10** Highlight the required *dccei (ADJCTL/DCCEI)* circuit pack and click on **Select**.

**Result:** The data communications parameters appear.

---

- 11** Click on the **IP Tunnel** tab.

**Result:** The *IP Tunneling* parameters appear.

---

- 12** Provision the *TAP Advertise (Enabled)* and *TAP Learn (Enabled)* parameters and enter the *TAP Group* number according to the work instructions. Click on **OK**.

**Result:** A dialog box appears stating that executing this command disconnects the CIT from the network element and asking you to confirm executing this command. Click on **Yes**.

---

N D O F S T E P S

---





## Task 362: Provision TCP/IP Address of Network Element

---

|                                   |                                                                                                                                                                                                                                  |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                    | Use this procedure to provision the TCP/IP address of a network element.                                                                                                                                                         |
| <b>Required privilege code(s)</b> | A privilege code of at least S4 is required to perform this task.                                                                                                                                                                |
| <b>Required equipment</b>         | The WaveStar Craft Interface Terminal (CIT) is required to perform this task.<br><br><b>Important!</b> Release 5 or later software is required to perform this task. Release 4 and earlier releases do not support IP tunneling. |
| <b>Safety precautions</b>         | To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.                           |



### CAUTION

*Changing IP addresses interrupts TCP/IP communications on the network element.*

|                            |                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Related information</b> | For related information, see the following sections in this document: <ul style="list-style-type: none"><li>• <i>Chapter 4, Operations Interfaces</i></li><li>• <i>Chapter 7, Provisioning, Security, and Administration</i></li><li>• <i>Appendix A, CIT Tutorial.</i></li></ul>                                                                             |
| <b>Before you begin</b>    | Before you begin this task: <ul style="list-style-type: none"><li>• Obtain the work instructions for this task.</li><li>• Verify that the work instructions identify the affected network element and specify the required TCP/IP address(es).</li><li>• Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.</li></ul> |

**Procedure** Perform the following steps to provision the TCP/IP address of a network element.

- 
- 1** At the WaveStar CIT System View, select **Administration>Data Communications...**

**Result:** The *Data Communications* screen appears.

- 
- 2** Open the bay and shelf details by clicking on the plus (+) sign next to the bay and shelf.

- 
- 3** Highlight the required *dccei (ADJCTL/DCCEI)* circuit pack and click on **Select**.

**Result:** The data communications parameters appear.

- 
- 4** Click on the **TCP/IP** tab.

**Result:** The *TCP/IP Network Addresses* appear.

- 
- 5** Click on the required **Modify** button to change desired TCP/IP address.

**Result:** The *IP Address Provision* screen appears.

- 
- 6** Provision the required parameter according to the work instructions and click on **OK**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes** and the WaveStar CIT disconnects from the network element.

---

N D O F S T E P S



## Task 363: Add TCP/IP Gateway to Network

---

- Purpose** Use this procedure to add a TCP/IP gateway to a network. The TCP/IP gateway network element is used connect a TCP/IP network to the OSI network.
- Required privilege code(s)** A privilege code of at least S4 is required to perform this task.
- Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.
- Important!** Release 5 or later software is required to perform this task. Release 4 and earlier releases do not support IP tunneling.
- Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### CAUTION

*Changing TCP/IP Gateway parameters may interrupt TCP/IP communications on the network element.*

- Related information** For related information, see the following sections in this document:
- *Chapter 4, Operations Interfaces*
  - *Chapter 7, Provisioning, Security, and Administration*
  - *Appendix A, CIT Tutorial.*
- Before you begin** Before you begin this task:
- Obtain the work instructions for this task.
  - Verify that the work instructions identify the affected network element and specify the required TCP/IP parameters.
  - Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Procedure** Perform the following steps to add a TCP/IP Gateway to a network.

- 
- 1** If required, provision the TCP/IP address of the network element.

**Reference:** *Circuit Order/Provisioning Task 362, Provision TCP/IP Address of Network Element*

---

- 2** At the WaveStar CIT System View, select **Administration>Data Communications...**

**Result:** The *Data Communications* screen appears.

---

- 3** Open the bay and shelf details by clicking on the plus (+) sign next to the bay and shelf.
- 

- 4** Highlight the required *dccei (ADJCTL/DCCEI)* circuit pack and click on **Select**.

**Result:** The data communications parameters appear.

---

- 5** Click on the **TCP/IP Gateway** tab.

**Result:** The TCP/IP Gateway parameters appear.

---

- 6** Provision the *TCP/IP Gateway Control* parameter **Enabled** and click on **OK**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**.

---

- 7** At the WaveStar CIT System View, select **Administration>Data Communications...**

**Result:** The *Data Communications* screen appears.

---

- 8** Open the bay and shelf details by clicking on the plus (+) sign next to the bay and shelf.
-

- 
- 9** Highlight the required *dccei (ADJCTL/DCCEI)* circuit pack and click on **Select**.

**Result:** The data communications parameters appear.

---

- 10** Click on the **TCP/IP Gateway** tab.

**Result:** The TCP/IP Gateway parameters appear.

---

- 11** Provision the *TCP/IP Gateway Host List* by clicking on the *lower sunglasses icon*.

**Result:** The *Edit OS Name and OS Type* screen appears.

---

- 12** Enter the PC *IP address* in the **New OS Name:** field and provision the **New OS Types:** field according to the work instructions. Then click on **Add**.

**Result:** The *Host Name* and *Host Type* are added to the *TCP/IP Gateway Host List*.

---

- 13** Click on **OK**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**.

---

ND OF STEPS

---





## Task 364: Enable/Disable SS Bit Override

---

**Purpose** Use this procedure to enable or disable SS bit override for a shelf. When SS bit override is enabled, the SS bits are set to 00 for all ports on a shelf. This overrides normal SS bit provisioning when interworking with non-compliant SONET network elements. When SS bit override is disabled, the SS bits are set to 10 for all ports on a shelf.

**Important!** Any non-compliant SONET network elements that declare alarms when the SS bits are 10 must connect to ports on a WaveStar 2.5G/10G shelf with the SS bit override enabled. Other ports with cross-connections to this port must be on a shelf with the SS bit override enabled.

**Cross-connect SS-bit behaviour** When an intershelf cross-connection is established, the SS-bit settings on one shelf affect the outgoing signals on another shelf. The following table shows the SS-bit behaviour during an intershelf cross-connection.

Values of the transmitted SS-bits

| Output Shelf | Input Shelf | SS-bit Value | Remark                     |
|--------------|-------------|--------------|----------------------------|
| SHhs         | SHhs        | SShs         |                            |
|              | SHI1        | SSI!         | SS-bits re-written by PPDM |
|              | SHI2        | SSI2         | SS-bit re-written by PPDM  |
| SHI1         | SHhs        | SShs         |                            |
|              | SHI1        | SSI!         | Signal re-written by PPDM  |
|              | SHI2        | SSI2         | SS-bit re-written by PPDM  |
| SHI2         | SHhs        | SShs         |                            |
|              | SHI1        | SSI!         | Signal re-written by PPDM  |
|              | SHI2        | SSI2         | SS-bit re-written by PPDM  |

SHhs = High-speed shelf

SHI1 = Low-speed shelf 1

SHI2 = Low-speed shelf 2

SShs = SS-bit value of the high-speed shelf

SSI1 = SS-bit value of the low-speed shelf 1

SSI2 = SS-bit value of the low-speed shelf 2  
PPDM = Pointer Processor/Delay Management Unit

**Required privilege code(s)** A privilege code of at least P3+M1 is required to perform this task.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Important!** Release 6 or later software is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the shelf and the required provisioning.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Procedure** Perform the following steps to enable or disable SS bit override for a shelf.

---

**1** At the WaveStar CIT, select **Configuration>Provision...**

**Result:** The *Provision Parameter for Protection Group or Equipment* screen appears.

---

**2** Highlight the required shelf and click on **Provision.**

**Result:** The shelf parameters appear.

---

**Important!** When SS bit override is enabled, the SS bits are set to 00 for all ports on a shelf. This overrides normal SS bit provisioning when interworking with non-compliant SONET



network elements. When SS bit override is disabled, the SS bits are set to 10 for all ports on a shelf.

- 3 Provision the *SS Bit Override* parameter according to the work instructions and click on **Apply**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close** to exit screen.

- 
- 4 Select **View>View Equipment Details...** .

**Result:** The View Equipment Details screen appears.

- 
- 5 Highlight the required shelf and click on **Select**.

**Result:** The shelf provisioning information appears.

- 
- 6 Verify that the *SS Bit Override* parameter was provisioned correctly and click on **Close**.

---

N D O F S T E P S





## Task 365: View Intershelf Bandwidth Utilization

---

**Purpose** Use this procedure to obtain a report that shows how much intershelf cross-connection capacity is currently being used and how much is available for additional cross-connections.

**Required privilege code(s)** A privilege code of at least P1 is required to perform this task.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Related information** For related information, see the following sections in this document:

- *Circuit Order/Provisioning Task 303, Create New Cross-Connections*
- *Circuit Order/Provisioning Task 304, Modify/Delete/Roll Cross-Connections*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Procedure** Perform the following steps to view intershelf bandwidth utilization.

---

**1** At the WaveStar CIT, select **View>Intershelf Bandwidth Utilization...**

**Result:** The *View Intershelf Bandwidth Utilization* screen appears.

---

**2** Click on the required tab and record the information, if desired.

For more information about the *View Intershelf Bandwidth Utilization* screen, refer to the WaveStar CIT online help.

---

**3** Click on **Close**.

---

END OF STEPS

---





## Task 367: Add FTAM-FTP Gateway (FT-TD) to Network

---

**Purpose** Use this procedure to add a FTAM-FTP gateway (FT-TD) to a network. The FTAM-FTP gateway (FT-TD) is used connect a TCP/IP network to the OSI network for file transfers.

**Required privilege code(s)** A privilege code of at least S4 is required to perform this task.

**Required equipment** The WaveStar Craft Interface Terminal (CIT) is required to perform this task.

**Important!** Release 5 or later software is required to perform this task.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### CAUTION

*Changing FTAM-FTP Gateway (FT-TD) parameters may interrupt communications on the network element.*

**Related information** For related information, see the following sections in this document:

- *Chapter 4, Operations Interfaces*
- *Chapter 7, Provisioning, Security, and Administration*
- *Appendix A, CIT Tutorial.*

**Before you begin** Before you begin this task:

- Obtain the work instructions for this task.
- Verify that the work instructions identify the affected network element and specify the required FTAM-FTP parameters.
- Verify that a WaveStar CIT is connected and logged in to the WaveStar TDM 2.5G/10G system.

**Procedure** Perform the following steps to add a FTAM-FTP Gateway (FT-TD) to a network.

- 
- 1** If required, provision the TCP/IP address of the network element.

**Reference:** *Circuit Order/Provisioning Task 362, Provision TCP/IP Address of Network Element*

---

- 2** At the WaveStar CIT System View, select **Administration>Data Communications...**

**Result:** The *Data Communications* screen appears.

---

- 3** Open the bay and shelf details by clicking on the plus (+) sign next to the bay and shelf.
- 

- 4** Highlight the required *dccei (ADJCTL/DCCEI)* circuit pack and click on **Select**.

**Result:** The data communications parameters appear.

---

- 5** Select the **TCP/IP Gateway** tab.

**Result:** The FT-TD-FTP/FTAM Gateway parameters appear.

---

- 6** Provision the *TCP/IP Gateway Control* parameter **Enabled** and click on **OK**.

**Result:** A dialog box appears asking you to confirm executing this command. Click on **Yes**. Then click on **Close**.

---

N D O F S T E P S

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# Part IV

---

## Supporting Tasks





## Task 700: How To Properly Remove a Circuit Pack

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>                  | On-site craft should use this procedure when removing a circuit pack from the shelf.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Reason to use this task</b>  | <p>Each circuit pack, depending on its type, has either one or two latches. Each latch has a microswitch which is opened or closed according to the physical position of the latch. The system controller needs to know the status of this microswitch in order to manage certain real-time system functions. Typically, and as a worse case scenario, it will take the system controller a maximum of 5 seconds to recognize and respond to a latch open or close. Any latch can be opened without removing the circuit pack from the backplane connector.</p> <p><b>Important!</b> Reiterating, do not remove a circuit pack in one continuous operation. More specifically, (a) open the latch in order to operate the microswitch, (b) wait 5 seconds, and as appropriate (c) open the latch/latches fully and gently pull the circuit pack from it's slot.</p> |
| <b>Required tools/equipment</b> | <p>The following items are required (on-site) in order to complete this task:</p> <ul style="list-style-type: none"><li>• WaveStar Craft Interface Terminal (CIT)</li><li>• Wrist strap</li><li>• Appropriate replacement circuit pack.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Safety precautions</b>       | To assure both personal safety and the proper functioning of the equipment it is imperative to review and understand this and any precautions prior to performing this task.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |



#### CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a ASOS system, to prevent electrostatic discharge damage to sensitive components.*

**Task** Complete the following steps to replace a circuit pack.

- 1 Locate the static wrist strap and place on the appropriate wrist.
- 2 If the circuit pack is one of the optical I/O packs — then all fibers should be removed before operating either latch mechanism.

**Important!** Prior to beginning this task, the on-site craft must have available, if applicable, the replacement circuit pack.

- 3 Instruct the on-site craft to:
  1. Operate latch momentarily.
  2. Wait 5 seconds for the system controller to recognize the latch operation.
- 4 Instruct the on-site craft to apply equal force to both upper and lower latches, if equipped, or force on the one latch and gently slide the circuit pack from the slot.
- 5 Instruct the on-site craft to place the removed circuit pack in a static bag/box for safe storage and, as applicable, shipping.
- 6 As appropriate, insert the new/replacement circuit pack into the vacant slot.

- 
- 7** Remove the static wrist strap and properly store it.

---

END OF STEPS

---





## Task 702: Remove/Insert a PCMCIA (NVM) Card

---

- Purpose** Use this procedure to:
1. Remove an NVM card from the CTL/SYS50DM circuit pack, and/or
  2. Insert an NVM card into the CTL/SYS50DM circuit pack.

**Important!** You can use this procedure to remove an NVM card regardless of the operational state of the CTL/SYS50DM circuit pack.

As long as the CTL/SYS50DM circuit pack is not equipped with an NVM card, the user can insert an NVM card conditional that the circuit pack's LED is not red.

**Conventions used in this task**

PCMCIA is an interface standard. There is a variety of different I/O cards that are built with a PCMCIA interface; for example, modem cards, local area network (LAN) cards, and Non-Volatile Memory (NVM) cards. Within this task, the term NVM is used exclusively to mean the 220-megabyte card memory that provides a PCMCIA interface.

**Important!** Another possible point of confusion is that the craft may, at times, encounter the term flash memory. The term flash memory is synonymous with NVM.

**Related information** For related information see *Chapter 2, Maintenance/Trouble Clearing* in the *ASOS Alarm Messages and Trouble Clearing Guide*.

**Safety precautions**



**CAUTION**

*Do not ever remove an NVM card when the CTL/SYS50DM circuit pack's green LED is ON (either ON or blinking). Improper removal of an NVM card can result in damaged files*

*and the generation of information messages such as “lost clusters” and/or “missing/damaged sectors”.*



**CAUTION**

*Do not ever remove the NVM card by applying manual force. The mechanical eject mechanism, be it under hardware control or software control, should always (after pressing the “Eject Button”) eject the NVM card.*



**CAUTION**

*Under normal circumstances, the only time to remove an NVM card is whenever the circuit pack is physically inserted in a shelf and the shelf is powered up. If a circuit pack will boot up and give a green LED, then, and under those circumstances, the craft should not make any attempt but to remove the NVM card using the “Eject Button”.*

**Before you begin**

Before you begin understand how the procedure *Remove an NVM Card* works during normal operations and how it should work during most types of failures.

Normal operations are defined as whenever the CTL/SYS50DM circuit pack’s LED is steady or flashing GREEN. Not normal operations are defined as whenever the green LED is steady or is NOT flashing GREEN (for example, the green LED is not lighted but the red LED is lighted).

Normal operations are defined as whenever the CTL/SYS50DM circuit pack’s LED is steady or flashing green. Not normal operations are defined as whenever the green LED is extinguished or is NOT flashing green. Whenever you first insert an NVM card the “Eject Button” is under hardware control. After NVM card insertion and following a time interval of less than 5-seconds the “Eject Button” comes under software control. Thus, during normal operations the NVM “Eject Button” is under software control. If the CTL/SYS50DM should determine that the NVM has failed – then immediately after enabling it’s RED LED the “Eject Button” will be returned to hardware control. If the CTL/SYS50DM is booting, then the recommendation on removing an NVM card is to wait until the boot sequence completes and normal operations

are restored. If the CTL/SYS50DM has failed (it's FAULT LED displays RED), then the circuit pack should be replaced and the existing NVM, which contains the node's generic and data, removed and inserted into the new SYS50DM circuit pack. Normal operations should be restored whenever the circuit pack reboots.

**Important!** The craft at the WaveStar CIT must have a *Maintenance Privilege Code* of at least M4, a *Security Privilege Code* of at least S4, and a *Provisioning Privilege Code* of at least P1 in order to access the WaveStar CIT command **Enter/Exit Maintenance Condition**.

**Task** Complete the following steps to insert and/or remove an NVM card.

.....

**1** Select an action from the following table:

| If you wish to...   | Then you must...                                                                                                                                                                                               |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remove an NVM card, | have a Work Instruction (WI) and purpose in mind for the remove operation (for example, to create a backup NVM, to clear an alarm, and so forth).<br><br><b>Reference:</b> "SE 702-1: Remove an NVM Card" (-4) |
| Insert an NVM card, | have, in-hand, an NVM card of known origin and known condition and physically insert it into the identified CTL/SYS50DM circuit pack.<br><br><b>Reference:</b> "SE 702-2: Insert an NVM Card" (-6)             |

.....  
E N D O F S T E P S  
.....

## SE 702-1: Remove an NVM Card

Perform the following steps to remove an NVM card.

---

**Important!** The NE must be in MCOND before removing an NVM card

- 1 At the WaveStar CIT, select **Fault-Enter/Exit Maintenance Condition** and click.

**Important!** After clicking on the **YES** button, the following information message is displayed: “Execution of Enter Maintenance Condition may affect the NE Service. Do you want to execute this command?” As appropriate, left-click on the **YES** button.

If you executed the command (click on the **YES** button) then the System View window command list box should display “Enter/Exit Maintenance Condition (system) Successful”.

**Result:** The dialog box **Enter/Exit Maintenance Condition** and the current Maintenance Condition (ON or OFF) are displayed. As appropriate, select the button labeled “**Enter Maintenance Condition**” and left-click on the **YES** button.

- 
- 2 Located on the front and near the middle of the CTL/SYS50DM circuit pack is an Eject Button. With your finger, press the Eject Button. Refer to Figure 702-1, “Front/Faceplate View of the SYS50DM Circuit Pack” (-5).

**Important!** If the associated CTL/SYS50DM is rebooting while the Eject Button is being pressed, then it will be necessary to: (a) wait until the reboot completes, (b) place the node in Maintenance Condition, and (c) subsequently press the Eject Button again.

**Result:** After a few seconds the CTL/SYS50DM circuit pack’s green LED should go off, and the mechanical eject mechanism should eject the NVM card.



- 
- 3** Place your fingers on the card, and gently pull the NVM card from its slot.

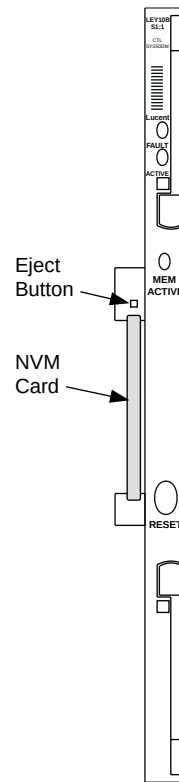
**Result:** Disposition of the NVM card is determined by the WI, local operating procedures, and/or actual condition of the NVM card.

---

END OF STEPS

---

**Figure 702-1 Front/Faceplate View of the SYS50DM Circuit Pack**



NC-USM-032

## SE 702-2: Insert an NVM Card

Perform the steps below to insert an NVM card.

---

**Important!** All PCMCIA NVM cards have the same physical size and will fit into any PCMCIA slot. However, not all NVM cards have the same capacity. Different WaveStar products require different capacity NVM cards. Be sure to obtain the correct capacity NVM card for the application. Also, be sure that the card is correct for the subject NE.

- 1 Per the WI, or otherwise, obtain an NVM card and verify that it is appropriate (for example, correct generic/database and most recent backup) for the subject NE.

- 
- 2 Orient the NVM card so that the writing on the card is left side up and the PCMCIA connector is the end that is to be inserted into the slot.

**Important!** The PCMCIA card should also have an arrow indicating the direction of movement for sliding into the slot.

- 
- 3 Insert the NVM card into the slot, and operate the locking latch.

- 
- 4 At the WaveStar CIT, select **Fault-Enter/Exit Maintenance Condition** and click.

**Important!** If you executed the command (left-click on the **YES** button), the System View window command list box should display “Enter/Exit Maintenance Condition (system) Successful”.

**Result:** The information message “Execution Exit Maintenance Condition may affect the NE service. Do you want to execute this command?”

---

END OF STEPS



## Task 703: Clean Optical Fibers and Connectors

---

**Purpose** Use this procedure to clean optical fibers and connectors.

**Important!** All optical fiber connectors (*ST*<sup>®</sup>, SC, and FC types) should be cleaned before making initial connections or reconnections per the following instructions. Only the connectors being assembled at this particular time should be cleaned.

To prevent contamination, keep all dust caps and plugs in place until you are instructed to remove them.

**Required equipment** Use the following items to clean optical fibers and connectors:

- CLETOP reel type A or B
- CLETOP stick
- Optical quality tissue (TEXWIPE, *ABSORBOND*<sup>™</sup> - TX404 or equivalent)
- Isopropyl alcohol (greater than 91% 2-propanol+water)
- Compressed gas (TX2510 AccuDuster III or equivalent)
- 300B microscope (comcode 104412077 — used for ST, SC, and FC type connectors)
- Optical power meter with appropriate connectors; for example, the HP8140A equipped with HP81401A (ITE#6550) or equivalent

## Safety precautions

To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### WARNING

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



### WARNING

*Eye damage may occur if energized fibers and connectors are viewed using the 300B microscope. Verify that fibers and connectors are de-energized using an optical power meter.*



### WARNING

*Alcohol is flammable and is harmful if swallowed, inhaled, or absorbed through the skin. Keep alcohol away from heat, sparks, or flames. Avoid contact with eyes, skin, and clothing.*



### CAUTION

*Do not shake or tilt the compressed gas container. Use short quick blasts.*

## Related information

For related information, see *Chapter 5, Circuit Pack/Port Unit Descriptions* in *WaveStar TDM 2.5G/10G User Operations Guide*, 365-371-210.

**Before you begin**

Proper cleaning will eliminate exposure to dirt that may cause permanent damage to the connector. Once a connector has been permanently damaged, cleaning will not repair the damage. A damaged connector is suspected when, despite rigorous cleaning, power remains low in the system. Therefore, proper cleaning is critical.

If a connector is damaged it must be replaced by installing a new jumper cable and/or port unit, depending on where the damage has occurred. Typically both mating ends of the connector become damaged. This damage may be caused when connectors are engaged or disengaged while significant optical power (greater than 3.0 dBm) is present in the connection. Do not attempt to clean optically powered connectors.

**Task** Complete the following steps to clean optical fibers and connectors.

.....

**1**

| IF cleaning connector on...   | THEN go to... |
|-------------------------------|---------------|
| optical jumpers and pigtails, | Step 2.       |
| port unit faceplates,         | Step 13.      |

.....

**2** Remove the optical connector from the lightguide buildout/optical port or remove the dust cap from the optical connector.

.....

**3** *Cleaning Connectors on Optical Jumpers and Pigtails*

Using an optical power meter, verify that the connector and fiber to be cleaned has been deenergized/deactivated.

.....

**4** Using a microscope (for example, a 300B microscope), verify that the connector is clean.

**Reference:** *SE 703-1: Verify Connector is Clean Using 300B Microscope*

---

5

| IF the connector is... | THEN...                   |
|------------------------|---------------------------|
| clean,                 | <b>STOP! End of Task.</b> |
| not clean,             | go to Step 6.             |

---

6 Using the CLETOP reel type A or B cleaner, clean the connector.

**Reference:** *SE 703-2: Clean Fiber Using CLETOP Reel Type A or B Cleaner*

---

7 Blow dry the connector ferrule with compressed gas. Hold the compressed gas can in an upright position while blow drying.

---

8 Using a microscope (for example, a 300B microscope), verify that the connector is clean.

**Reference:** *SE 703-1: Verify Connector is Clean Using 300B Microscope*

---

9

| IF the connector is... | THEN...                   |
|------------------------|---------------------------|
| clean,                 | <b>STOP! End of Task.</b> |
| not clean,             | go to Step 10.            |

---

**Important!** Do not use tissue types other than the type specified in this procedure.

10 Clean (if necessary) the cylindrical surface and the endface of the connector ferrule with a tissue dampened with isopropyl alcohol. Wipe the tip of the ferrule several times in orthogonal (90 degree) directions with a sufficient amount of alcohol present on the tissue. Make sure that the tissue is resting on an unyielding surface while wiping the ferrule tip. Any unused areas of the same tissue can be used for subsequent cleanings. Discard tissue in an appropriate manner when finished.

.....

**11** Repeat Step 6 through Step 8.

.....

**12**

| IF the connector is... | THEN...                                                                                            |
|------------------------|----------------------------------------------------------------------------------------------------|
| clean,                 | <b>STOP! End of Task.</b>                                                                          |
| not clean,             | repeat Step 10. If the connector remains dirty after performing Step 10 twice, discard the jumper. |

.....

**Important!** To prevent contamination, keep the optical ports covered with a dust cap or plug when not in use.

**13** *Cleaning Connectors on Port Unit Faceplates*

Remove (if necessary) the lightguide buildout from its base (buildout block).

**Reference:** *Supporting Task 707: Install/Remove Lightguide Buildout*

.....

**14**

| IF the optical port on the faceplate is...                                             | THEN go to... |
|----------------------------------------------------------------------------------------|---------------|
| removable (the optical port is not removable when no lightguide buildout is used),     | Step 15       |
| not removable (the optical port is not removable when no lightguide buildout is used), | Step 19.      |

.....

**15**

| IF the connector inside the faceplate is... | THEN go to... |
|---------------------------------------------|---------------|
| accessible,                                 | Step 16.      |
| not accessible,                             | Step 19.      |

.....

**16** Using the the cleaning cloth that is present on the tip of CLETOP stick, carefully wipe the ferrule endface.

---

**17** Remove the protector caps and plugs (if equipped) from the buildout and buildout block, and store them in a clean container.

---

**18** Place the lightguide buildout into its base (buildout block).

**Reference:** *Supporting Task 707: Install/Remove Lightguide Buildout*

---

**19** Use compressed gas to blow off any loose dirt on the tip of the ferrule or inside the sleeve. Hold the compressed gas nozzle one inch away from the tip of the ferrule or sleeve. Hold the compressed gas can in an upright position while blow drying.

END OF STEPS

---



## SE 703-1: Verify Connector is Clean Using 300B Microscope

---

**Procedure** Perform the following steps using the 300B microscope to verify the connector is clean.

---



### CAUTION

*Eye damage may occur if energized fibers and connectors are viewed using the 300B microscope. Verify that fibers and connectors are de-energized using an optical power meter.*

- 1** Make sure that the viewing area of the microscope itself is free of any spots that might be confused with the spots from a contaminated connector. To verify, look into the microscope eyepiece from a distance of 1 inch without a connector attached to it. The white background displayed by the eyepiece of a clean microscope will be free of black spots and/or rings around the periphery.
- 2** Attach the connector to the microscope.
- 3** Look for a clean, white ferrule tip with a dark circle in the center (fiber cladding and core) by adjusting the focus setting on the microscope. The image on the microscope for a clean connector will be free of spots, streaks, and fiber particles. To confirm that the observed spots are on the connector, slowly disconnect the connector while viewing it through the microscope, and verify that the black spots fade away as the connector is removed from the microscope.

---

END OF STEPS

---



## SE 703-2: Clean Fiber using CLETOP Reel Type A or B Cleaner

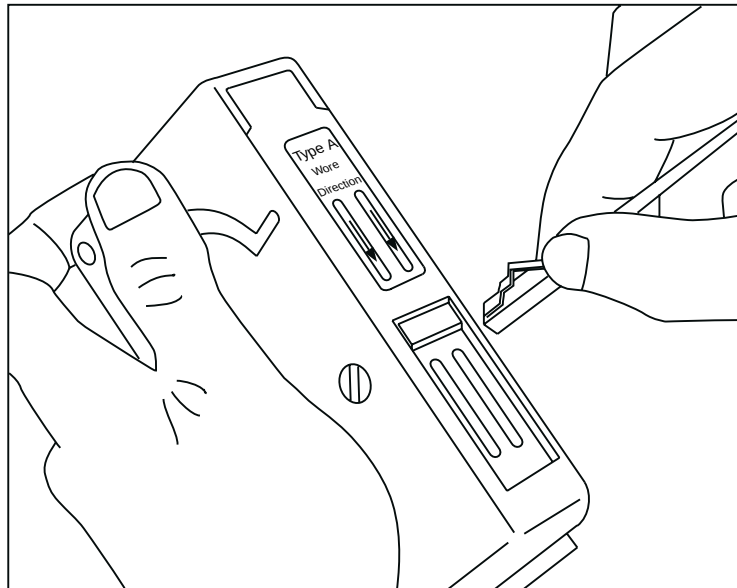
---

**Procedure** Perform the following steps to clean the connector using the CLETOP reel type A or B cleaner.

---

**Important!** The CLETOP reel type A cleaner has two slots, and the CLETOP reel type B cleaner has only one slot.

- 1 Hold the CLETOP reel type A or B cleaner in the palm of one hand with the cleaning side facing you.



NC-USM217

- 
- 2 Using the thumb of the same hand that is holding the cleaner, press the lever all the way down and hold. Do not release the lever.
- 
- 3 While holding the lever down with one hand, use the other hand to press the optical ferrule endface against the cleaning cloth in any one slot and uniformly drag it in the direction indicated by the arrows on the cleaner. Make sure that the endface is in contact with the cleaning cloth at all times, and that uniform force is used while dragging it.

.....

**4** Rotate the connector 90 degrees.

.....

**5**

| IF using the CLETOP reel... | THEN go to... |
|-----------------------------|---------------|
| type A cleaner,             | Step 6.       |
| type B cleaner,             | Step 8.       |

.....

**6** Press the ferrule endface against the cleaning cloth in the other slot of the CLETOP reel type A cleaner and uniformly drag it in the direction shown by the arrows on the cleaner. Make sure that the endface is in contact with the cleaning cloth at all times, and that uniform force is used while dragging it.

.....

**7** Release the lever and allow it to return to its initial position.

**STOP! End of Supporting Element.**

.....

**8** Release the lever of the CLETOP reel type B cleaner (allowing it to return to its initial position), and press the lever all the way down again and hold (advancing the cleaning cloth). Do not release the lever.

.....

**9** Press the ferrule endface against the cleaning cloth in the slot of the CLETOP reel type B cleaner and uniformly drag it in the direction shown by the arrows on the cleaner. Make sure that the endface is in contact with the cleaning cloth at all times, and that uniform force is used while dragging it.

.....

**10** Release the lever and allow it to return to its initial position.

.....

END OF STEPS

.....





## Task 704: Inspect (Repair) Optical and/or Electrical Cable(s)

---

**Purpose** Use this procedure to correct an input or output cable problem such as a damaged or disconnected cable.

**Important!** This procedure uses the word *cable* in a general sense to refer to either the electrical coax cable or to the optical fibers.

**Related information** For related information, see *Chapter 2, Maintenance/Trouble Clearing* in the *Advanced Services Operations System Alarm Messages and Trouble-Clearing Guide*.

**Task** Complete the following steps to identify and repair any local cable problems.

- 
- 1** As appropriate, remove the shelf front cover.
  - 
  - 2** Verify that the cable(s) are properly connected.
  - 
  - 3** Visually inspect each cable, starting at the connector on the local NE and going as far as practical (usually to an interconnection bay or to a cross-connect panel).
  - 
  - 4** Follow local procedures to correct any problem(s) with the cable.
  - 
  - 5** As appropriate, replace the front cover that was removed in Step 1.

---

END OF STEPS

---





# Task 705: Remove/Replace Shelf Cover

---

**Purpose** Use this procedure to remove or replace a shelf cover.

**Required equipment** A wrist strap is required to perform this task.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



## CAUTION

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in the Safety Appendix.*

**Related information** For related information, see *Chapter 3, Product Description* in *WaveStar TDM 2.5G/10G User Operations Guide*, 365-371-210.

**Task** Complete the following steps to remove or replace the shelf cover.

---

**1**

| IF the cover is being... | THEN go to... |
|--------------------------|---------------|
| removed,                 | Step 2.       |
| replaced,                | Step 6.       |

---

**2** At the bottom of the shelf cover, locate the two ¼-turn fasteners.

---

**3** Use the appropriate size slotted screwdriver (or a dime) to rotate the ¼-turn fasteners counterclockwise 90 degrees so the slots are positioned vertically (unlocked position).

---

**4** Grasp the cover and pull it forward until it is horizontal (rotated 90 degrees from the closed position).

---

**5** Lift the pivot pins located at the top of the cover, push back, and lift up on the pins again to remove the cover from the shelf, then lift the cover up until it is free from the shelf framing.

**Stop! End of Task.**

---

**6** Position the pivot pins located at the top of the cover under the flange on the shelf framing.

---

**7** Close the cover and rotate the two ¼-turn fasteners 90 degrees clockwise using the screwdriver (or dime) until the fastener slots are horizontal (locked position).

---

END OF STEPS

---





## Task 706: Replace a Defective Power Filter

---

**The Process** The power filter contains only passive components. It is designed for maximum reliability. Currently, the power filter is not an orderable item, and thus no sparing policy exists.

**What to do** Follow these instructions to replace a failed power filter.

| If...                    | Then...                                                                                                               |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------|
| If a power filter fails, | contact a Lucent Technologies Customer Service Representative, and work out arrangements for obtaining a replacement. |



## Task 707: Install/Remove Lightguide Buildout

---

|                           |                                                                                                                                                                                                        |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose</b>            | Use this procedure to install or remove a lightguide buildout (LBO).                                                                                                                                   |
| <b>Required equipment</b> | A wrist strap is required to perform this task.                                                                                                                                                        |
| <b>Safety precautions</b> | To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task. |



### **WARNING**

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



### **CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in the Safety Appendix.*

|                            |                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Related information</b> | <p>For related information, see:</p> <ul style="list-style-type: none"><li>• <i>Supporting Task 711, Select Lightguide Buildout</i></li></ul> <p>For related information in <i>WaveStar TDM 2.5G/10G User Operations Guide</i>, 365-371-210, see:</p> <ul style="list-style-type: none"><li>• <i>Chapter 3, Product Description</i></li><li>• <i>Chapter 5, Circuit Pack/Port Unit Descriptions</i></li></ul> |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Task** Complete the following steps to install or remove a lightguide buildout (LBO).

---

**1**

| IF the lightguide buildout is being... | THEN go to... |
|----------------------------------------|---------------|
| installed,                             | Step 2.       |
| removed,                               | Step 4.       |

---

**2** Remove the protector caps and plugs (if equipped) from the buildout and buildout block, and store them in a clean container.

---

**3**

| IF the lightguide buildout is ... | THEN ...                                                                                                                                                                                                                                                     |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST, SC, or FC                     | Align the buildout with the slot in the buildout block, push in, and rotate clockwise until locked into position.<br><br><b>Reference:</b> <i>SE 707-1: Examples of Lightguide Buildouts and Buildout Blocks</i><br><br><b>Reference: Stop! End of Task.</b> |
| LC                                | Align the buildout with the slot in the buildout block and push in until locked into position.<br><br><b>Reference:</b> <i>SE 707-1: Examples of Lightguide Buildouts and Buildout Blocks</i><br><br><b>Reference: Stop! End of Task.</b>                    |

4

| IF the lightguide buildout is ... | THEN ...                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST, SC, or FC                     | <div><b>CAUTION</b><br/><i>The locking beam must only be pushed along a line perpendicular to the buildout body in the direction towards the buildout in order to avoid damage to the locking beam.</i></div> <p>Depress the locking beam on the buildout, rotate counterclockwise, and separate from the buildout block by sliding apart.</p> <p><b>Reference:</b> SE 707-1: Examples of Lightguide Buildouts and Buildout Blocks</p> |
| LC                                | <div><b>CAUTION</b><br/><i>The locking beam must only be pushed along a line perpendicular to the buildout body in the direction towards the buildout in order to avoid damage to the locking beam.</i></div> <p>Depress the locking beam on the buildout and separate from the buildout block by sliding apart.</p> <p><b>Reference:</b> SE 707-1: Examples of Lightguide Buildouts and Buildout Blocks</p>                           |

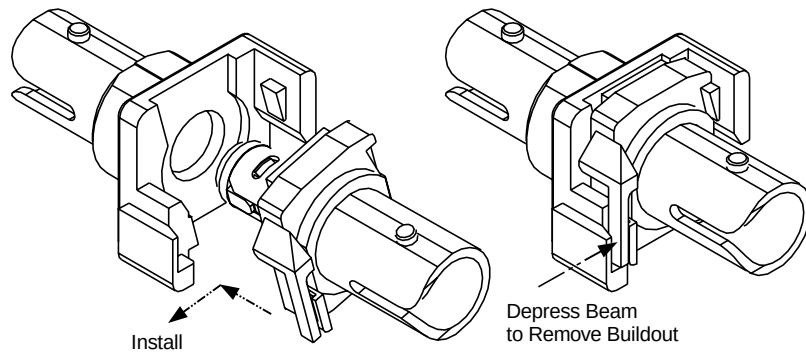
END OF STEPS



# SE 707-1: Examples of Lightguide Buildouts and Buildout Blocks

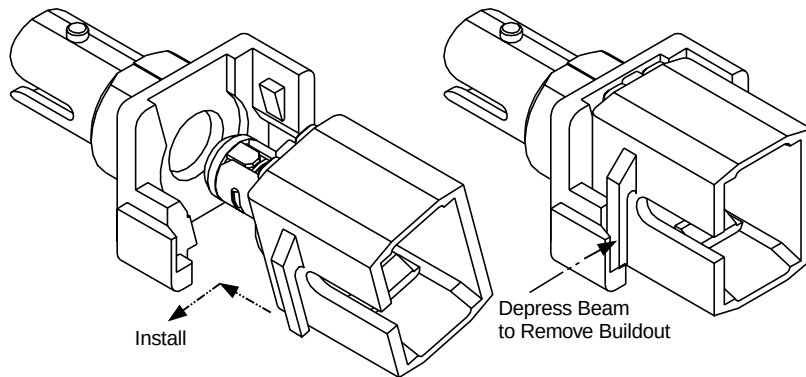
---

## ST buildout and buildout block



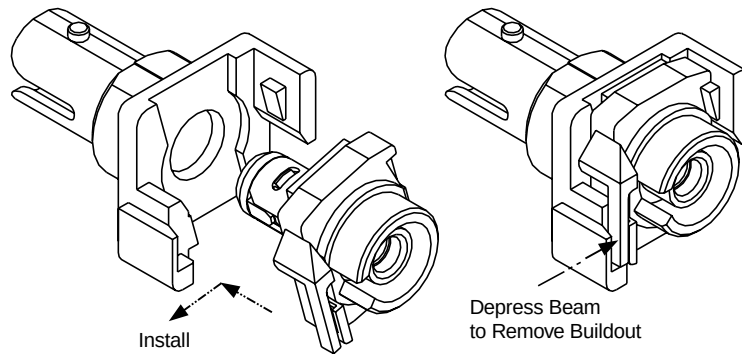
US-USM-138

## SC buildout and buildout block



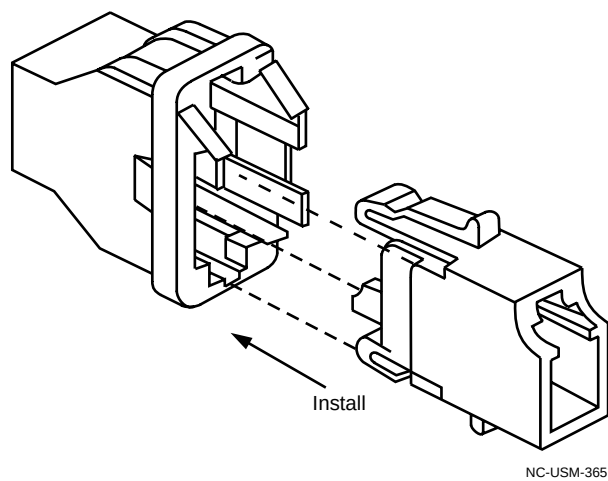
NC-USM-137

## FC buildout and buildout block



NC-USM-136

## LC buildout and buildout block







## Task 708: Make a Manual Optical Loopback

---

**Purpose** Use this procedure to loop back an **out-of-service** optical line at the faceplate connectors of the port unit.

**Required equipment** The following equipment is required to perform this task:

- Wrist strap
- One lightguide jumper (package label FS1E-E-02) for each optical line to be looped back (*ST*<sup>®</sup>, SC, and FC type connections)
- One lightguide jumper (MS1A40LC-LC-2) for each optical line to be looped back (LC type connections)
- One 20-dB loss lightguide buildout (LBO) (code ASTM20 – part number 108053042 for ST connectors) (single mode –multimode) for each OC-3 or OC-12 line to be looped back
- One 20-dB loss lightguide buildout (LBO) (Part number 108279530 for LC connectors) (single mode –multimode) for each OC-3 line to be looped back
- One 20-dB loss lightguide buildout (LBO) (code ASTS20 – part number 108053273 for ST connectors) (single mode – single mode) for each OC-48 optical line to be looped back
- One 15-dB loss lightguide buildout (LBO) (code ASTS15 – part number 108053240 for ST connectors) (single mode – single mode) for each OC-192 optical line to be looped back
- One 15-dB loss lightguide buildout (LBO) (Part number 108358169 for LC connectors) (single mode – single mode) for each OC-192 optical line to be looped back

**Safety precautions**

To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.

**WARNING**

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

**CAUTION**

*Traffic and service interruption can occur to other optical lines if they are accidentally looped back. Recheck the address (AID) of the optical line being looped back.*

**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in the Safety Appendix.*

**Related information**

For related information in *WaveStar TDM 2.5G/10G User Operations Guide*, 365-371-210, see:

- *Chapter 3, Product Description*
- *Chapter 5, Circuit Pack/Port Unit Descriptions*

**Task** Complete the following steps to manually loop back an **out-of-service** optical line at the faceplate of a port unit.

---

**1**

| IF the port unit is...                          | THEN obtain a...                                                                                                                                                                                                              |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LEY14 OC12/STM4/1.3SR2<br>LEY16 OC3/STM1/1.3SR4 | lightguide jumper (package label FS1E-E-02). These port units are equipped with a 0-dB loss lightguide buildout (LBO). No attenuation is required.                                                                            |
| LEY23 OC3/STM1/1.3SR8                           | lightguide jumper (MS1A40LC-LC-2). These port units are equipped with a 0-dB loss lightguide buildout (LBO). No attenuation is required.                                                                                      |
| LEY13 OC12/STM4/1.3LR2<br>LEY15 OC3/STM1/1.3LR4 | lightguide jumper (package label FS1E-E-02) and a 20-dB LBO (code ASTM20 – part number 108053042 for ST connectors).                                                                                                          |
| OC48/STM16/LR<br>OC48/STM16/SR                  | lightguide jumper (package label FS1E-E-02) and a 20-dB loss LBO (code ASTS20 – part number 108053273 for ST connectors).                                                                                                     |
| LEY182 OC48/STM16/<br>1.3VSR1                   | lightguide jumper (package label FS1E-E-02). These port units are equipped with a 0-dB loss lightguide buildout (LBO). No attenuation is required.                                                                            |
| OC192/STM64                                     | lightguide jumper (package label FS1E-E-02) and a 15-dB loss LBO (code ASTS15 – part number 108053240 for ST connectors) or lightguide jumper (MS1A40LC-LC-2) and a 15-dB loss LBO (part number 108358169 for LC connectors). |

**2** At the faceplate connectors of the port unit, remove the optical line connections. Make a record of these disconnections so they can be replaced after the test.

**Reference:** *SE 708-1: Remove Optical Line Connections*

- 
- 3** Remove the LBO from the **IN** connector of the port unit (if equipped).

**Reference:** *Supporting Task 707, Install/Remove Lightguide Buildout*

---

- 4** Remove the protector caps from the ends of the lightguide jumper (loopback cable).
- 

- 5** Clean the LBOs, fiber, and connectors.

**Reference:** *Supporting Task 703, Clean Optical Fibers and Connectors*

---

**6**

| IF the port unit is...                                                   | THEN...                                                                                                                                                                          |
|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LEY14 OC12/STM4/1.3SR2<br>LEY16 OC3/STM1/1.3SR4<br>LEY23 OC3/STM1/1.3SR8 | replace the 0-dB loss LBO (removed in Step 3) into the <b>IN</b> connector of the port unit.<br><b>Reference:</b> <i>Supporting Task 707, Install/Remove Lightguide Buildout</i> |
| LEY13 OC12/STM4/1.3LR2<br>LEY15 OC3/STM1/1.3LR4                          | install the 20-dB loss into the <b>IN</b> connector of the port unit.<br><b>Reference:</b> <i>Supporting Task 707, Install/Remove Lightguide Buildout</i>                        |
| OC48/STM16/SR<br>OC48/STM16/LR                                           | install the 20-dB loss into the <b>IN</b> connector of the port unit.<br><b>Reference:</b> <i>Supporting Task 707, Install/Remove Lightguide Buildout</i>                        |
| LEY1182 OC48/STM16/<br>1.3VSR1                                           | replace the 0-dB loss LBO (removed in Step 3) into the <b>IN</b> connector of the port unit.<br><b>Reference:</b> <i>Supporting Task 707, Install/Remove Lightguide Buildout</i> |
| OC192/STM64                                                              | install the 15-dB loss into the <b>IN</b> connector of the port unit.<br><b>Reference:</b> <i>Supporting Task 707, Install/Remove Lightguide Buildout</i>                        |

- 
- 7** Connect the lightguide jumper between the LBO on the **IN** connector and the corresponding **OUT** connector on the same port unit.
- 

- 8** If required, repeat Step 2 through Step 7 to loop back another optical line.

---

END OF STEPS

---



## SE 708-1: Remove the Optical Line Connections

---

**Procedure** Complete the following steps to remove the optical line connections at the faceplate connectors of the port unit.

---

**Important!** A wrong connection can be avoided by marking or recording all disconnections.

- 1** Remove the optical line connection from the **OUT** connector of the port unit and slide the protector cap over the end of the fiber.
- 
- 2** Remove the optical line connection from the **IN** connector of the port unit and slide the protector cap over the end of the fiber.

---

END OF STEPS

---



## Task 709: Replace Fan Unit

---

**Purpose** Perform this task *ONLY* when instructed to do so as part of a trouble-clearing task.

**Required equipment** The following equipment is required to complete this procedure:

- Replacement fan unit
- WaveStar Craft Interface Terminal (CIT) that is connected to the subject network element (NE)
- Wrist strap

**Safety precautions** To assure both your personal safety and the proper functioning of the WaveStar TDM 2.5G (OC-48)/10G (OC-192) (2-Fiber) product, it is imperative for you to review and understand these warnings and precautions prior to performing this task.



**CAUTION**

*Never remove the fan unit unless you already have a replacement fan unit in hand and immediately perform the replacement, as instructed in this procedure. Leaving the fan unit out for more than 15 minutes can cause the associated network element to fail.*



**CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on an NE to prevent electrostatic discharge damage to sensitive components.*



**CAUTION**

*Leaving the fan unit out of the shelf for more than 15 minutes can cause the associated network element to fail. It is critical*

*that you complete this procedure — as well as the referencing trouble-clearing procedure — soon after performing this step.*

**Related information** For related information, see *Chapter 2, Maintenance/Trouble-Clearing* in this document.

**Task** Complete the following steps to replace a fan unit.

- 1 Physically locate the replacement fan unit near to and within easy reach of the subject NE/shelf.
- 2 If applicable, remove the front cover of the subject NE/shelf.
- 3 With your fingers, unscrew (turn counter-clockwise) the two captive type thumbscrews that are located on the front (one right and one left) of the fan unit.
- 4 Gently and by applying an even force to both the left and right sides, pull the fan unit forward with the center mounted handle in order to remove it from the shelf.
- 5 Carefully insert the replacement new fan unit into the shelf. Again, use the center-mounted handle to push the “self-aligning” fan unit into the shelf.
- 6 Tighten (turn clockwise) the two thumbscrews in order to secure the fan unit into the shelf.
- 7 Return to the trouble-clearing task that referred you to this task.

END OF STEPS





# Task 711: Select Lightguide Buildout

---

**Purpose** Use this procedure to select a lightguide buildout (LBO) based on the following:

- Type of port unit
- Measured received optical power (dBm) at the **IN** connector
- Type of optical connector

The lightguide buildouts are used to adjust the received optical power levels at the **IN** connector of the port unit. If connecting to a different system, refer to the appropriate procedure for that system.

**Important!** All WaveStar TDM 2.5G/10G system port units require single-mode fiber.

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



**CAUTION**

*The LBO must be placed on the IN connector of the port unit faceplate to prevent equipment damage.*



**CAUTION**

*Do not substitute single-mode to single-mode (SM-SM) LBOs for single-mode to multimode (SM-MM) LBOs. Substituting SM-SM LBOs for SM-MM LBOs could cause transmission errors and/or equipment damage.*

**Related information** For related information see the following:

- *Supporting Task 707, Install/Remove Lightguide Buildout*
- *Supporting Task 712 Measure Received Optical Power*

For related information in the *WaveStar TDM 2.5G/10G User Operations Guide*, 365-371-210, see *Chapter 5, Circuit Pack/Port Unit Descriptions*.

**Before you begin** Before you begin this task:

- Verify the type of port unit used.
- Obtain the received optical power measurement for the port unit using an optical power meter (for example, the HP8140A equipped with HP81401A ITE#6550 or equivalent). (Refer to *Supporting Task 712 Measure Received Optical Power*.)
- Verify the type of optical connector (ST<sup>®</sup>, FC, or SC) used.

**Task** Complete the following steps to select an LBO based on the type of port unit, received optical power, and type of optical connector.

1

| IF ...                 | THEN go to ... |
|------------------------|----------------|
| OC3/STM1 port unit,    | Step 2.        |
| OC12/STM4 port unit,   | Step 2 .       |
| OC48/STM16 port unit,  | Step 4.        |
| OC192/STM64 port unit, | Step 6.        |

2 Based on the measured received optical power at the **IN** connector of the OC3/STM1 or OC12/STM4 port unit, determine the LBO value that is required.

**Reference:** *SE 711-1: LBO Values for OC3/STM1 and OC12/STM4 Port Units*

- 
- 3** Based on the required optical connection (ST, FC, SC, or LC), and the LBO value (determined in Step 2), select the required LBO.

**Reference:** *SE 711-2: Single-Mode to Multimode (SS-MM) LBOs*

**Stop! End of Task.**

---

- 4** Based on the measured received optical power at the **IN** connector of the OC48/STM16 port unit, determine the LBO value that is required.

**Reference:** *SE 711-3: LBO Values for OC48/STM16 Port Units*

---

- 5** Based on the required optical connection (ST, FC, or SC) and the LBO value (determined in Step 4), select the required LBO.

**Reference:** *SE 711-4: Single-Mode to Single-Mode (SM-SM) LBOs*

**Stop! End of Task.**

---

- 6** Based on the measured received optical power at the **IN** connector of the OC192/STM64 port unit, determine the LBO value that is required.

**Reference:** *SE 711-5: LBO Values for OC192/STM64 Port Units*

---

- 7** Based on the required optical connection (ST, FC, SC, or LC) and the LBO value (determined in Step 6), select the required LBO.

**Reference:** *SE 711-4: Single-Mode to Single-Mode (SM-SM) LBOs*

---

END OF STEPS

---



## SE 711-1: LBO Values for OC3/STM1 and OC12/STM4 Port Units

---

### Received optical power and LBO values for OC3/STM1 and OC12/STM4 port units

The following table shows the port units, measured received optical power range, and the recommended LBO value.

| Port unit              | Measured received optical power (dBm) | Recommended LBO value (dB) |
|------------------------|---------------------------------------|----------------------------|
| LEY13 OC12/STM4/1.3LR2 | 0.0 to -4.9                           | 15                         |
|                        | -5.0 to -9.9                          | 10                         |
|                        | -10.0 to -14.9                        | 5                          |
|                        | -15.0 and lower                       | 0                          |
| LEY14 OC12/STM4/1.3SR2 | 2.0 to -2.9                           | 15 <sup>1</sup>            |
|                        | -3.0 to -7.9                          | 10 <sup>1</sup>            |
|                        | -8.0 and lower                        | 0                          |
| LEY15 OC3/STM1/1.3LR4  | 0.0 to -4.9                           | 15                         |
|                        | -5.0 to -9.9                          | 10                         |
|                        | -10.0 to -14.9                        | 5                          |
|                        | -15.0 and lower                       | 0                          |
| LEY16 OC3/STM1/1.3SR4  | 0.0 to -3.9                           | 15 <sup>1</sup>            |
|                        | -4.0 to -7.9                          | 10 <sup>1</sup>            |
|                        | -8.0 and lower                        | 0                          |
| LEY23 OC3/STM1/1.3SR8  | 0.0 to -3.9                           | 15 <sup>1</sup>            |
|                        | -4.0 to -7.9                          | 10 <sup>1</sup>            |
|                        | -8.0 and lower                        | 0                          |

#### Notes:

1. Used only when the opposite end of the optical span is equipped with a long-reach port unit.



## SE 711-2: Single-Mode to Multimode (SM-MM) LBOs

---

**SM-MM LBOs** The following table shows the SM-MM LBOs.

| Type of optical connection | LBO value (dB) | Product code | Comcode     | Color         |
|----------------------------|----------------|--------------|-------------|---------------|
| ST                         | 0              | A3070        | 106 795 354 | White or Blue |
|                            | 5              | ASTM5        | 108 052 960 | Gray or Beige |
|                            | 10             | ASTM10       | 108 052 994 | Gray or Beige |
|                            | 15             | ASTM15       | 108 053 018 | Gray or Beige |
|                            | 20             | ASTM20       | 108 053 042 | Gray or Beige |
| FC                         | 0              | A3080        | 106 795 404 | White or Blue |
|                            | 5              | AFCM5        | 108 107 285 | Gray or Beige |
|                            | 10             | AFCM10       | 108 107 301 | Gray or Beige |
|                            | 15             | AFCM15       | 108 107 327 | Gray or Beige |
|                            | 20             | AFCM20       | 108 107 343 | Gray or Beige |
| SC                         | 0              | A3060        | 106 708 951 | White or Blue |
|                            | 5              | ASCM5        | 108 440 579 | Gray or Beige |
|                            | 10             | ASCM10       | 108 440 595 | Gray or Beige |
|                            | 15             | ASCM15       | 108 440 611 | Gray or Beige |
|                            | 20             | ASCM20       | 108 440 637 | Gray or Beige |
| LC                         | 5              | -            | 108 279 381 | -             |
|                            | 10             | -            | 108 279 431 | -             |
|                            | 15             | -            | 108 279 480 | -             |
|                            | 20             | -            | 108 279 530 | -             |



## SE 711-3: LBO Values for OC48/STM16 Port Units

---

### Receive optical power and LBO values for OC48/STM16 port units

The following table shows the measured received optical power ranges and the recommended LBO values for OC48/STM16 port units.

| Port Unit                                                          | Measured received optical power (dBm) | Recommended LBO value (dB) |
|--------------------------------------------------------------------|---------------------------------------|----------------------------|
| LEY7 OC48/STM16/1.3LR1                                             | 0.0 to -4.9                           | 15                         |
| LEY8 OC48/STM16/1.5LR1                                             | -5.0 to -9.9                          | 10                         |
| LEY50-LEY65 OC48/STM16/<br>DWDM1-16                                | -10.0 to -14.9                        | 5                          |
| LEY101-LEY180 OC48/<br>STM16/WDM<br>LEY80-LEY95 OC48/STM16/<br>POU | -15.0 and lower                       | 0                          |
| LEY182 OC48/STM16/1.3VSR1                                          | -1.0 and lower                        | 0                          |



## SE 711-4: Single-Mode to Single-Mode (SM-SM) LBOs

---

**ST-type SM-SM LBOs** The following table shows the ST-type SM-SM LBOs. These LBOs are available in the ST-type LBO Kit J68974E-1, List 116.

| LBO value (dB) | Product code | Comcode     | Color  |
|----------------|--------------|-------------|--------|
| 0              | A3070        | 106 795 354 | White  |
| 5              | A3070B       | 106 795 362 | Yellow |
|                | A3070B1      | 107 406 183 | Yellow |
|                | ASTS5        | 108 053 091 | Green  |
| 10             | A3070D       | 106 795 370 | Yellow |
|                | A3070D1      | 107 406 191 | Yellow |
|                | ASTS10       | 108 053 190 | Green  |
| 15             | A3070F       | 106 795 388 | Yellow |
|                | A3070F1      | 107 406 209 | Yellow |
|                | ASTS15       | 108 053 240 | Green  |
| 20             | A3070H       | 106 795 396 | Yellow |
|                | A3070H1      | 107 406 217 | Yellow |
|                | ASTS20       | 108 053 273 | Green  |

**FC-type SM-SM LBOs**

The following table shows the FC-type SM-SM LBOs. These LBOs are available in the FC-type LBO Kit J68974E-1, List 126.

| <b>LBO value (dB)</b> | <b>Product code</b> | <b>Comcode</b> | <b>Color</b> |
|-----------------------|---------------------|----------------|--------------|
| 0                     | A3080               | 106 795 404    | White        |
| 5                     | A3080B              | 106 795 412    | Yellow       |
|                       | A3080B1             | 107 406 225    | Yellow       |
|                       | AFCS5               | 108 107 095    | Green        |
| 10                    | A3080D              | 106 795 420    | Yellow       |
|                       | A3080D1             | 107 406 233    | Yellow       |
|                       | AFCS10              | 108 107 194    | Green        |
| 15                    | A3080F              | 106 795 438    | Yellow       |
|                       | A3080F1             | 107 406 241    | Yellow       |
|                       | AFCS15              | 108 107 244    | Green        |
| 20                    | A3080H              | 106 795 446    | Yellow       |
|                       | A3080H1             | 107 406 258    | Yellow       |
|                       | AFCS20              | 108 107 277    | Green        |



**SC-type SM-SM LBOs**

The following table shows the SC-type SM-SM LBOs. These LBOs are available in the SC-type LBO Kit J68974E-1, List 136.

| Loss value (dB) | Product code | Comcode     | Color  |
|-----------------|--------------|-------------|--------|
| 0               | A3060        | 106 708 951 | Blue   |
| 5               | A3060B       | 106 708 969 | Yellow |
|                 | A3060B1      | 107 406 142 | Yellow |
|                 | ASCS5        | 108 440 501 | Green  |
| 10              | A3060D       | 106 708 977 | Yellow |
|                 | A3060D1      | 107 406 159 | Yellow |
|                 | ASCS10       | 108 440 600 | Green  |
| 15              | A3060F       | 106 708 985 | Yellow |
|                 | A3060F1      | 107 406 167 | Yellow |
|                 | ASCS15       | 108 440 538 | Green  |
| 20              | A3060H       | 106 708 993 | Yellow |
|                 | A3060H1      | 107 406 175 | Yellow |
|                 | ASCS20       | 108 440 561 | Green  |

**LC-type SM-SM LBOs**

The following table shows the LC-type SM-SM LBOs.

| LBO value (dB) | Product code | Comcode     | Color |
|----------------|--------------|-------------|-------|
| 5              | -            | 108 288 473 | -     |
| 10             | -            | 108 288 457 | -     |
| 15             | -            | 108 358 169 | -     |
| 20             | -            | 108 358 219 | -     |



## SE 711-5: LBO Values for OC192/STM64 Port Units

---

### Receive optical power and LBO values for OC192/ STM64 port units

The following table shows the measured received optical power range and the recommended LBO value.

| Port unit                     | Measured<br>receive optical<br>power (dBm) | Recommended<br>LBO value (dB) |
|-------------------------------|--------------------------------------------|-------------------------------|
| LEY67 OC192/STM64/1.5SR1      | 0.0 to -3.9                                | 15                            |
| LEY69 OC192/STM64/1.5IR1      | -4.0 to -8.9                               | 10                            |
| LEY284-LEY299 OC192/STM64/POU | -9.0 to -13.9                              | 5                             |
| LEY384-LEY399 OC192/STM64/POU | -14.0 and lower                            | 0                             |
| LEY97 OC192/STM64/1.5IRS1     | 0.0 to -1.9                                | 10                            |
|                               | -2.0 to -5.9                               | 5                             |
|                               | -6.0 and lower                             | 0                             |



## Task 712: Measure Received Optical Power

---

**Purpose** Use this procedure to connect an optical power meter and measure the received optical power at the **IN** connector of a port unit.

**Required equipment** The following equipment is required to perform this task:

- Wrist strap
- Optical power meter with appropriate connectors; for example, the HP8140A equipped with HP81401A (ITE#6550) or equivalent

**Safety precautions** To assure both personal safety and the proper functioning of the WaveStar TDM 2.5G/10G system, it is imperative to review and understand these warnings and precautions prior to performing this task.



### **WARNING**

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



### **CAUTION**

*Use a static ground wrist strap whenever handling circuit packs or working on a WaveStar TDM 2.5G/10G system to prevent electrostatic discharge damage to sensitive components. See “Electrostatic Discharge (ESD) Considerations” in the Safety Appendix.*

**Related information** For related information in this document, see the following sections:

- *Supporting Task 711, Select Lightguide Buildout*
- *Supporting Task 707, Install/Remove Lightguide Buildout*

For related information in 365-371-210, *WaveStar TDM 2.5G/10G User Operations Guide*, see *Chapter 5, Circuit Pack/Port Unit Descriptions*.

**Before you begin** Before you begin this task:

- Verify the type of port unit used.
- Verify the location of the port unit and **IN** connector.

**Task** Complete the following steps to connect an optical power meter and measure the received optical power at the **IN** connector of a port unit.

- 
- 1** Remove the optical fiber from the **IN** connector of the port unit faceplate.

---

**Important!** Ensure that the optical power meter is set for the wavelength being measured (for example, 1310 nm or 1550 nm).

- 2** Connect the optical power meter to the optical fiber removed in Step 1, and obtain an optical power measurement. (Record the measurement for office records.)

- 
- 3** Using the optical power measurement obtained in Step 2, determine if the optical power level is correct.

**Reference:** *SE 712-1: Received Optical Power*

4

| IF the optical power level is...         | THEN...                                               |
|------------------------------------------|-------------------------------------------------------|
| correct (in range),                      | <b>STOP! End of Task.</b>                             |
| not correct (optical loss out of range), | check the upstream port unit and outside plant fiber. |

END OF STEPS



## SE 712-1: Received Optical Power

### Port units and correct (in range) received optical power levels

The following table shows ports units and the correct (in range) received optical power levels.

| Port unit                         | Maximum Received Power (PRmax) (dBm)                                                                    | Receiver Sensitivity (PRmin) (dBm) | Recommended Minimum Receive Power Level at Installation (dBm) |
|-----------------------------------|---------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------------|
| LEY13 OC12/STM4/1.3LR2            | −8.0                                                                                                    | −30.5                              | −25.0                                                         |
| LEY14 OC12/STM4/1.3SR2            | −8.0                                                                                                    | −28.0                              | −27.0                                                         |
| LEY15 OC3/STM1/1.3LR4             | −10.0                                                                                                   | −34.0                              | −29.0                                                         |
| LEY16 OC3/STM1/1.3SR4             | −8.0                                                                                                    | −28.0                              | −27.0                                                         |
| LEY23 OC3/STM1/1.3SR8             | −8.0                                                                                                    | −28.0                              | −27.0                                                         |
| LEY7 OC48/STM16/1.3LR1            | −9.0                                                                                                    | −27.0                              | −21.5                                                         |
| LEY8 OC48/STM16/1.5LR1            | −9.0                                                                                                    | −28.0                              | −21.5                                                         |
| LEY50–LEY65 OC48/STM16/DWDMxx     | Refer to 365-575-558, Metropolis metroEON Enhanced Optical Networking, Applications and Planning Guide. |                                    |                                                               |
| LEY80–LEY95 OC48/STM16/POUxxxx    | −9.0                                                                                                    | −28.0                              | −21.5                                                         |
| LEY101–LEY180 OC48/STM16/WDMxxxx  | Refer to 365-575-759, WaveStar Optical Line System (OLS) 1.6T Applications Planning Guide.              |                                    |                                                               |
| LEY182 OC48/STM16/1.3VSR1         | −1.0                                                                                                    | −14.0                              | −7.0                                                          |
| LEY67 OC192/STM64/1.5SR1          | −13.0                                                                                                   | −21.0                              | −17.0                                                         |
| LEY69 OC192/STM64/1.5SR1          | −8.0                                                                                                    | −21.0                              | −17.0                                                         |
| LEY97 OC192/STM64/1.5IRS1         | −3.0                                                                                                    | −14.0                              | −10.0                                                         |
| LEY201–LEY240 OC192/STM64/WDMxxxx | Refer to 365-575-759, WaveStar Optical Line System (OLS) 1.6T Applications Planning Guide.              |                                    |                                                               |
| LEY284–LEY299 OC192/STM64/POUxxxx | −8.0                                                                                                    | −21.0                              | −17.0                                                         |
| LEY384–LEY399 OC192/STM64/POUxxxx | −8.0                                                                                                    | −21.0                              | −17.0                                                         |
| LEY309AE GE1/SX2                  | 0                                                                                                       | −17.0                              | −10.0                                                         |
| LEY310AE GE1/LX2                  | −3.0                                                                                                    | −20.0                              | −16.0                                                         |





# 1 System Introduction

## Overview

---

**Purpose** This chapter introduces the *WaveStar*<sup>®</sup> product family and provides a description of the WaveStar TDM 2.5G/10G (2-Fiber) system. This chapter provides a high-level introduction to the WaveStar TDM 2.5G/10G (2-Fiber) system. It also contains useful information about the WaveStar product family and the applications of the WaveStar TDM 2.5G/10G (2-Fiber) system.

**Objectives** This chapter enables a user to:

- Understand the purpose and functionality of WaveStar TDM 2.5G/10G (2-Fiber) system.
- Understand the WaveStar TDM 2.5G/10G (2-Fiber) system features.

**Related information** For more information about the WaveStar TDM 2.5G/10G (2-Fiber) system, refer to the following manuals in the WaveStar TDM 2.5G/10G (2-Fiber) system documentation set:

- *WaveStar TDM 2.5G/10G (2-Fiber) Applications and Planning Guide*
- *WaveStar TDM 2.5G/10G (2-Fiber) Installation Manual and System Turn-Up Services*
- *WaveStar TDM 2.5G/10G (2-Fiber) Operations Systems Engineering Guide*



**Contents** This chapter contains the following:

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# WaveStar TDM 2.5G/10G (2-Fiber) System

---

**Overview** The WaveStar TDM 2.5G/10G (2-Fiber) add/drop multiplexer supports high-capacity, self-healing transport by means of a SONET-standard OC-192 (high-speed shelf) or OC-48 (low-speed shelf) line rate signal, in a SONET-standard 2-fiber Bidirectional Line-Switched Ring (BLSR) or Unidirectional Path-Switched Ring (UPSR). The WaveStar TDM 2.5G/10G (2-Fiber) architecture follows a platform architecture foundation that is the integration of physical, software infrastructure, transmission, timing, and maintenance architectures.

## Two system options

The WaveStar TDM 2.5G/10G (2-Fiber) system provides two basic system options: a stand-alone 2.5G shelf, and a system that includes one high-speed 10G (OC-192) shelf and one to four low-speed, tributary 2.5G shelves. When the tributary shelf is used as a stand-alone application, it is referred to as the 2.5G Application. An in-service upgrade is available for migrating from a single shelf 2.5G system to a 10G system. For example, an OC-48 2-fiber BLSR can be upgraded to an OC-192 2-fiber BLSR.

## Low speed shelf capacity

Each low-speed 2.5G shelf supports up to 384 STS-1 equivalents of interface capacity for any mix of OC-48, OC-12, OC-3, GE1, and DS3/EC-1 interfaces including zero to four OC-48 2-fiber BLSRs or UPSRs, or zero to sixteen OC-12 UPSRs.

## High speed shelf capacity

The high-speed shelf supports up to 384 STS-1 equivalents of interface capacity. This capacity can be used to support one OC-192 2-Fiber BLSR, or one OC-192 UPSR, or two unprotected OC-192 ports.

## Direct interconnection to other rings

The traffic from any ring can be directly interconnected to other rings without using the additional add/drop ports and cabling that would be needed to connect rings in separate network elements.

**576x576 STS-1 switch fabric**

With the 576x576 STS-1 switch fabric in the high-speed shelf, the system supports one or two low-speed tributary shelves. The cross-connection capacity allows non-blocking connectivity between all 384 STS-1 equivalents of the interface capacity within each shelf, and, in addition, up to 192 STS-1 equivalents of non-blocking connectivity between the high-speed shelf and the low-speed shelves. This is sufficient, with any combination of optical and electrical interfaces in the low-speed shelves, to support full add/drop of all the working (protected) traffic carried by an OC-192 ring.

**768x768 STS-1 switch fabric**

Using the 768x768 STS-1 switch fabric (in the high-speed shelf), the system supports one to four low-speed tributary shelves. The cross-connection capacity allows non-blocking connectivity between all 384 STS-1 equivalents of the interface capacity within each shelf, and, in addition, up to 384 STS-1 equivalents of non-blocking connectivity between the high-speed shelf and the low-speed shelves. This is sufficient, with any combination of optical and electrical interfaces in the low-speed shelves, to support full add/drop of all the traffic carried by an OC-192 ring, including both the working (protected) and the protection access (unprotected) traffic in an OC-192 BLSR, or all the traffic carried by two unprotected OC-192 ports.

**In-service upgrade from 576x576 to 768x768 STS-1 switch fabric**

During the upgrade the two SWITCH/STS576 circuit packs are replaced with two SWITCH/STS768 circuit packs, and 2 of the 4 PPROC/STS192 circuit packs are replaced with two PPROC/STS384 circuit packs.

An in-service upgrade from the 576x576 STS-1 switch fabric to the 768x768 STS-1 switch fabric is available for increasing the cross-connection capacity and supporting additional low-speed shelves.

**Customer needs**

The major customer need addressed by the WaveStar TDM 2.5G/10G (2-Fiber) system is the need to provide a cost-effective, flexible, and upgradable system. Other customer needs met by WaveStar TDM 2.5G/10G (2-Fiber) system include:

- Reduced cost
- Greater add/drop termination capacity
- Efficient bandwidth management
- Relief of fiber exhaust
- In-service upgrade from a single shelf 2.5G system to a 10G system; for example, an OC-48 2-fiber BLSR can be upgraded to an OC-192 2-fiber BLSR.
- Operational efficiency
- Preservation of embedded fiber base
- Reduction in network costs

**Customer benefits**

Major customer benefits realized with the WaveStar TDM 2.5G/10G (2-Fiber) system include:

**Smaller footprint**

Compact size provides substantial reduction in floor space and hence lower cost.

**Investment Protection**

Investment protection through interworking with embedded base.

**Interoperability**

The WaveStar TDM 2.5G/10G (2-Fiber) supports interworking with the following products:

- DDM-2000 OC-12 and OC-3 and FT-2000
- FT-2000 OC-48 Lightwave System
- *Metropolis* metroEON and *WaveStar* 1.6T compatible optics
- *Metropolis* metroDMX OC-48 or OC-192 UPSRs
- Tellabs Titan
- Fujitsu FLM-150, FLM-600, and FLM-2400
- Nortel S/DMS
- Various DWDM products using compatible optics (port units)
- Various operations support systems
- WaveStar family user interface application

**Key features**

The following list summarizes the key features of WaveStar TDM 2.5G/10G (2-Fiber):

- Two configuration options: 1) 2.5G system consisting of one 2.5G shelf; or 2) 2.5G/10G system consisting of one 10G (OC-192) shelf and up to two 2.5G shelves. Supports up to four 2.5G shelves in Release 6.
- 768x768 switch. Supports up to four tributary 2.5G shelves (Release 6).
- 576x576 switch. Supports up to two tributary 2.5G shelves.
- In-service upgrade from 576x576 switch to 768x768 switch
- In-service upgrade from Release 4 to Release 5
- Two-port Gigabit Ethernet interface (GE1/SX2 port unit)
- Gigabit Ethernet interface performance monitoring enhancements in Release 6
- Flexible port unit mixing: GE1/SX2, DS3/EC-1, OC-3, OC-12, and OC-48, including zero to four OC-48 BLSRs or UPSRs on each 2.5G shelf. Also, zero to sixteen OC-12 UPSRs are supported.
- OC-192 nonpreemptible protection access in Release 6
- Interface capacity of up to 384 STS-1 equivalents on each shelf, providing capacity for full add/drop of all the protected traffic carried by any one (or more) of the rings.

- Add/drop traffic from any ring can be directly interconnected to other rings without using additional ports.
- Fully flexible SONET STS-1 granular TSA/TSI
- Transport of STM-1, STM-4, and STM-16 VC payloads (VC-3 high order, VC-4 and VC4-4c, and VC4-16c) over SONET interfaces (OC-3, OC-12, OC-48, and OC-192)
- ANSI and Telcordia standards compliant operations
- OS and CIT access using TCP/IP or OSI or FTDD-FTP/FTAM protocols
- Graphical User Interface (GUI) on the WaveStar Craft Interface Terminal (CIT) for use at the system location and remotely
- TL1 operations interface
- Backup for provisioned data
- Backout from a failed software upgrade
- Internal and external optical amplifiers for system reach beyond 80 km
- Support for *Metropolis* metroEON: OC-48 (16 wavelengths)
- Support for *WaveStar* 1.6T: OC-48 (80 wavelengths) and OC-192 (40 wavelengths)
- Support for OC-48 and OC-192 passive optics (16 and 32 wavelengths respectively)
- OC-192 extended/intermediate reach 1.5 micron optics
- OC-192 long reach 1.5 micron optics
- OC-192 very long reach 1.5 micron optics
- OC-48 very short reach 1.3 micron optics
- OC-48 long reach 1.3 and 1.5 micron optics
- OC-3 and OC-12 long and intermediate/short reach 1.3 micron optics
- OC-3 intermediate/short reach 1.3 micron optics (8 ports)
- DS3/EC-1 transmission interface (0x1 and 1xN) protected
- Gigabit Ethernet LX optics in Release 6
- Automatic Laser Shutdown (ALS) on long-reach and very long-reach OC-192 interfaces
- OSI level 2 routing (up to 50 level 1 areas)
- Choice of in-bay, rear-mounted, or external “wings” DS3/STS-1 connector panel mounting arrangements

- OC-48, OC-12, OC-3 0x1 or linear 1+1 facility protection (bidirectional, both revertive and nonrevertive)
- Interworking with Tellabs TITAN over OC-3 and OC-12 lines, 1+1 or 0x1 protected
- Interworking with Fujitsu FLM-150 and FLM-600 over OC-3 and OC-12 lines (1+1 protected)
- Interworking with Fujitsu FLM-2400 over OC-12 or OC-48 Unidirectional Path Switched Ring (UPSR)
- OC-192 line timing (with SSM), up to 8 line references from the OC-192 system
- OC-48 line timing (with SSM), up to 6 line references when using only the OC-48 low-speed (tributary) shelf
- OC-12 line timing (with SSM)
- OC-3 line timing (with SSM)
- Fixed rate and adaptive rate (pipe mode) tributary operation
  - STS-48c cross-connections (fixed mode)
  - STS-48 cross-connections (pipe mode)
  - STS-12c cross-connections (fixed mode)
  - STS-12 cross-connections (pipe mode)
  - STS-3c cross-connections (fixed mode)
  - STS-3 cross-connections (pipe mode)
- Side (vertical), internal (horizontal), and rear mounting arrangement for DS3 connector panels
- DCCr (section) and DCCm (line) channel on all supported optical interfaces
- At least 32 section DCC/line DCC channels simultaneously
- 1+1 protection available for all DCC channels (unidirectional and non-revertive)
- SONET section, line and path (terminated and intermediate) and DS3 performance monitoring
- ANSI/Bellcore compliant DRI (Drop and Continue method) with interconnected rings (OC-48 or OC-192 BLSR interfaces)
- DS1 timing outputs
- Remote network element status alarming in Release 6



# The WaveStar Product Family

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**Overview** Lucent Technologies offers the industry's widest range of high-quality transport systems and related services designed to total network solutions. Included in this offering is the WaveStar family of products. the WaveStar product family offers telecommunications service providers advanced services and revenue-generating capabilities.

**Family members** The WaveStar product family includes the following:

- WaveStar BandWidth Manager (SONET/SDH)
- WaveStar 2.5G/10G (2-Fiber) (SONET)
- WaveStar TDM 10G STM-64 (2-Fiber) (SDH)
- WaveStar 1.6T (SONET/SDH)
- WaveStar AM 1 (SDH)
- WaveStar TM 1 (SDH)
- WaveStar Add/Drop Multiplexer 16/1 (SDH)
- WaveStar Add/Drop Multiplexer 4/1 (SDH)
- WaveStar DACS 4/4/1 (SDH)
- WaveStar Digital Video System (SONET/SDH)
- WaveStar Subnetwork Management System (SONET/SDH)

**WaveStar product family features** The WaveStar product family offers customers the following:

- Synchronous optical network (SONET) based services
- Synchronous digital hierarchy (SDH) based services
- Scalable cross-connect, multiplex, and transport services
- Network consolidation and reliability
- Interoperability with products of other vendors
- Coordination of network element and element management services



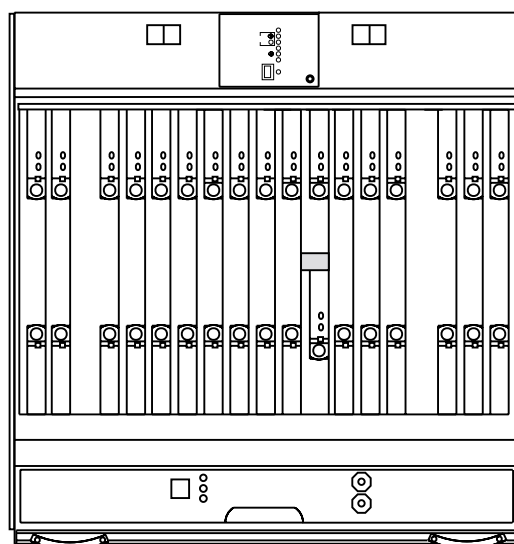
## WaveStar TDM 2.5G/10G (2-Fiber) System Description

---

**Overview** Two options are available. The first option is a 2.5G system consisting of one shelf. The second option is a multi-shelf system, consisting of a high-speed (OC-192) shelf and either one or two 2.5G (OC-48) tributary shelves. In Release 6, the WaveStar TDM 2.5G/10G system equipped with the 768x768 STS-1 switch supports up to four 2.5G tributary shelves.

**WaveStar TDM 2.5G/10G (2-Fiber) high-speed shelf** The following figure shows the high-speed shelf, which contains two OC-192 port units, the switch fabric, and related circuit packs.

**Figure 1-1 WaveStar TDM 2.5G/10G (2-Fiber) High-Speed Shelf**



NC10G024



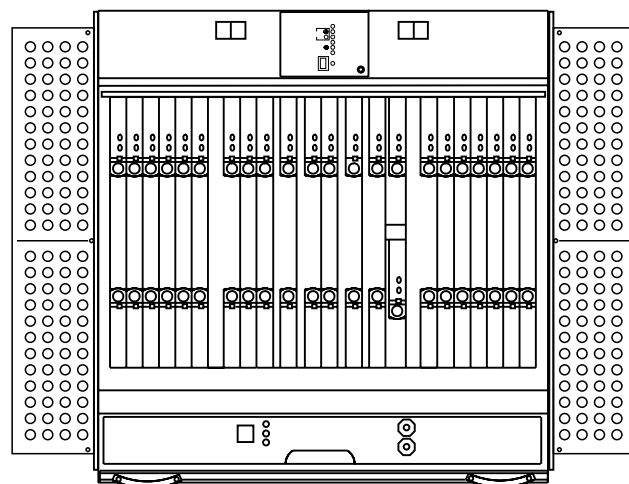
**WaveStar TDM 2.5G/10G (2-Fiber) low-speed (low-speed) shelf**

The WaveStar TDM 2.5G/10G (2-Fiber) low-speed tributary shelf is a WaveStar 2.5G system that interfaces to and from OC-48, OC-12, OC-3, GE1, EC-1, and DS3 lines. Each low-speed shelf has 16 slots that support flexible optical and electrical port unit mixing, and can be mounted in a standard bay frame without requiring other equipment to be mounted nearby.

Up to three low-speed shelves or up to two low-speed shelves and a high-speed shelf can be mounted in one 7-foot bay frame. If an internally mounted Dispersion Compensation Module (DCM) Holder Tray or internally mounted DS3 connector panels are used, up to two low-speed shelves or one low-speed shelf and a high-speed shelf can be mounted in one 7-foot bay frame. See Chapter 3 for information about system options.

The following figure shows the WaveStar TDM 2.5G/10G (2-Fiber) low-speed shelf with the optional DS3/EC1 connector panels mounted externally. These panels are required for shelves that contain DS3/EC1 port units.

**Figure 1-2 WaveStar TDM 2.5G/10G (2-Fiber) Low-Speed Shelf with External DS3 Connectors**



NC-2.5GAPOG-046

The three options for mounting these panels is externally (shown), internally, or in the rear of the WaveStar TDM 2.5G/10G (2-Fiber) shelf. [The rear-mounted panel adds 4 inches to the rear of the WaveStar TDM 2.5G/10G (2-Fiber) shelf.]

The amount of traffic that can be added to/dropped from interfaces from a pair of low-speed shelves to the high-speed shelf is subject to the limit of 192 STS-1s per low-speed shelf or per pair of low-speed shelves. There is no limit on connecting traffic between tributary ports within a low-speed shelf.

### Reference

For more information about the system hardware and DS3 mounting arrangements, refer to *Chapter 3, Product Description*.

## WaveStar TDM 2.5G/10G (2-Fiber) system

The WaveStar TDM 2.5G/10G (2-Fiber) system is an economical solution to providing 10G (OC-192) and 2.5G (OC-48) SONET service with a full complement of optical (GE1, OC-3, OC-12, and OC-48) and electrical (DS3 and EC-1) interfaces, as well as a full complement of service quality options, from unprotected 0x1, 1+1 point to point, to 2-fiber BLSRs and UPSRs. Each low-speed shelf accommodates electrical connector panels for DS3/EC1 connections and has 16 circuit pack slots.

## Transmission interfaces

The WaveStar TDM 2.5G/10G (2-Fiber) system includes the following optical and electrical port units.

### Optical interfaces

OC-192 port units are available in 1.5 $\mu$  wavelength (intermediate, extended- intermediate, long reach, and very long reach).

Each OC-192 port unit contains one bidirectional port. Two OC-192 port units are necessary to terminate one OC-192 2-fiber BLSR or UPSR.

OC-48 port units are available in two wavelengths:

- 1.3 $\mu$  wavelength (very short reach and long reach)
- 1.5 $\mu$  wavelength (long reach)

Each OC-48 port unit contains one bidirectional port. Two OC-48 port units are necessary to terminate one OC-48 2-fiber BLSR or UPSR.

The OC-12 and OC-3 port units (short, intermediate, and long-reach) are available for 1.3 $\mu$  wavelength single-mode fiber applications. The OC-12 port units provide two bidirectional ports. The OC-3 port units provide four or eight (intermediate/short reach only) bidirectional ports.

### **Gigabit ethernet interfaces**

Gigabit Ethernet port unit has 2 bidirectional ports per circuit pack. Two types of circuit packs are available, one for short haul applications with SX ports (850 nm) and one for long haul applications with LX ports (1310 nm).

### **Electrical interfaces**

The DS3EC1/8 port units are capable of transmitting and receiving signals at the DS3 rate. Each port unit contains eight independent bidirectional ports. The DS3EC1/8 port units also support EC-1 signals.

### **Control and synchronization**

The WaveStar TDM 2.5G/10G (2-Fiber) uses a single control system and a 1+1 protected synchronization system. Provisionable synchronization modes are available, including line timing.

### **Switch capacity**

The WaveStar TDM 2.5G/10G (2-Fiber) system supports the option of either of the following switch fabrics in the high-speed shelf:

- 576x576 STS-1 switch fabric
- 768x768 STS-1 switch fabric

It also supports an additional 576x576 STS-1 switch fabric in each low-speed shelf.

### **In-service upgrade from the 576x576 to 768x768 STS-1 switch fabric**

An in-service upgrade from the 576x576 STS-1 switch fabric to the 768x768 STS-1 switch fabric is available for increasing the cross-connection capacity and supporting additional low-speed shelves.

During the upgrade the two SWITCH/STS576 circuit packs are replaced with two SWITCH/STS768 circuit packs, and 2 of the 4 PPROC/STS192 circuit packs are replaced with two PPROC/STS384 circuit packs.

### **576x576 STS-1 switch fabric**

The 576x576 STS-1 switch fabric in each shelf of the WaveStar TDM 2.5G/10G (2-Fiber) system supports:

- Simultaneous cross-connections from each of up to 576 STS-1 equivalent inputs to any of up to 576 STS-1 equivalent outputs.
- Up to 384 STS-1 equivalent one-way cross-connections between inputs and outputs in the same shelf. The remaining 192 STS-1 equivalents are used for cross-connections between the low-speed shelves and the high-speed shelf.

### **768x768 STS-1 switch fabric**

The 768x768 STS-1 switch fabric in the high-speed shelf of the WaveStar TDM 2.5G/10G (2-Fiber) supports:

- Simultaneous cross-connections from each of up to 768 STS-1 equivalent inputs to any of up to 768 STS-1 equivalent outputs.
- Up to 384 STS-1 equivalent one-way cross-connections between inputs and outputs in the same shelf. The remaining 384 STS-1 equivalents are used for cross-connections between the low-speed shelves and the high-speed shelf.

## **Operations interfaces**

The operations interfaces to the WaveStar TDM 2.5G/10G (2-Fiber) provide voice, data, alarm, and status information on service and equipment. Operations interfaces include a WaveStar® craft interface terminal (WaveStar® CIT), user panels, circuit pack/port unit faceplates, circuit breakers, an office alarm interface, and interfaces to OS systems. In Release 6, the WaveStar TDM 2.5G/10G system also supports remote network element status alarming.

### **WaveStar CIT**

The WaveStar CIT is a personal computer (PC) equipped with the *Windows NT*™ operating system or the *Windows 2000*™ operating system and loaded with WaveStar CIT software. The WaveStar CIT software includes a graphical user interface (GUI) that can be used to access local and remote network elements via an intraoffice LAN. OS-based software, for example, subnetwork management system (SNMS) provides an alternate method of remote maintenance from an external center.

The WaveStar CIT allows a user to perform the following tasks:

- Establish and/or remove networks and network components
- Maintain cross-connections
- Generate reports
- Perform provisioning
- Clear network element troubles
- Monitor and report network alarms/performance
- Add to and/or drop from both optical and electrical interfaces
- Create nonblocking cross-connections between facilities
- Software download, backup, and restore



# Applications

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**Overview** WaveStar TDM 2.5G/10G (2-Fiber) increases reliability, lowers costs, increases revenues, and supports flexible growth paths in a wide range of applications. Network topologies that use WaveStar TDM 2.5G/10G (2-Fiber) are listed below and described in *Chapter 2, Network Topologies*.

**Increased reliability** The following topologies increase network reliability:

- Bidirectional line-switched ring protection
- Unidirectional path-switched ring protection
- Dual ring interworking
- Folded rings
- Path-in-line
- Restoration through protection access

**Traffic consolidation** WaveStar TDM 2.5G/10G (2-Fiber) lowers transport costs by supporting:

- Ring interconnections
- Flexible optical hubbing architecture, termination of multiple ring and/or linear interfaces
- Hubbing for various ring, 1+1, and 0x1 terminations
- Loop feeders
- Electrical DS3/EC-1 terminations directly on the 2.5G/10G network element

**Ring closure and ring transport** WaveStar TDM 2.5G/10G (2-Fiber) can lower transport costs by closing WaveStar TDM 2.5G OC-48 2-fiber rings over WaveStar TDM 2.5G/10G (2-Fiber) rings. The backbone capacity of the WaveStar TDM 2.5G/10G (2-Fiber) can be used to transport traffic to/from DDM-2000 nodes. The OC-48 Backbone capacity of the low-speed shelf can be used to close a partial ring of DDM-2000 and FT-2000 nodes. Also, you can use the WaveStar TDM 2.5G/10G (2-Fiber) to terminate multiple OC-48 BLSRs, OC-48 UPSRs, and OC-12 UPSRs.

**Avoiding fiber exhaust**

WaveStar TDM 2.5G/10G (2-Fiber) is compatible with Lucent Technologies OLS systems and can use OC-48 and OC-192 dense wavelength division multiplexing (DWDM) to gain capacity on existing fibers. Also, the WaveStar TDM 2.5G/10G (2-Fiber) supports compatible optics for Passive Optics Units (16 wavelengths at the OC-48 rate and 32 wavelengths at the OC-192 rate) to gain capacity on existing fibers. The OLS systems provide increased distance, and the passive optics units provide lower cost.

In addition, you can replace a WaveStar TDM 2.5G or upgrade it to a WaveStar TDM 10G, and create OC-192 2-fiber BLSR “express rings” to bypass exhausted fibers in existing OC-48 BLSRs.

**Interface mixing**

WaveStar TDM 2.5G/10G (2-Fiber) can lower costs in an environment where there is a mixture of DS3, EC-1, OC-3, OC-12, OC-48, GbE and OC-192 traffic. WaveStar TDM 2.5G/10G (2-Fiber) provides universal port unit slots in which you can use a mixture of transmission interfaces up to the capacity of the shelves.

**Increased Shelf Fill**

By supporting mixtures of interfaces, WaveStar TDM 2.5G/10G (2-Fiber) allows you to take full advantage of the shelf capacity and have fewer shelves with unfilled slots.

**End-to-End Interface Mixing**

You can use a mixture of transmission interfaces in WaveStar TDM 2.5G/10G (2-Fiber) shelves at both ends of a line.

**Flexible growth paths**

WaveStar TDM 2.5G/10G (2-Fiber) supports a variety of possible growth paths for evolving to full add/drop ring topologies from

- In-service upgrade from a single shelves 2.5G system to a 10G system; for example, an OC-48 2-fiber BLSR can be upgraded to an OC-192 2-fiber BLSR.
- Express rings
- Folded rings
- 0% add/drop nodes



# Features

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**Major Features** Major features of WaveStar TDM 2.5G/10G (2-Fiber), are listed below. *Chapter 3, Product Description*, provide descriptions.

## Transmission Interfaces

- 1.5 $\mu$  intermediate reach OC-192 port units
- 1.5 $\mu$  extended intermediate reach OC-192 port units
- 1.5 $\mu$  long reach OC-192 port units
- 1.5 $\mu$  very long reach OC-192 port units
- OC-192 low-cost, passive POU (32 colors)
- OC-192 DWDM (40 colors) port units for use with WaveStar 1.6T system
- 1.3 $\mu$  very short reach OC-48 port units
- 1.3 $\mu$  and 1.5 $\mu$  long reach OC-48 port units
- OC-48 low-cost, passive POU (16 colors)
- OC-48 DWDM 16 colors-- for use with Metropolis metroEON; WDM 80 colors-- for use with WaveStar 1.6T port units
- 1.3 $\mu$  OC-12 short and long reach port units
- 1.3 $\mu$  OC-3 short reach port units (4 ports)
- 1.3 $\mu$  OC-3 intermediate/short reach port units (8 ports)
- 1.3 $\mu$  OC-3 long reach port units (4 ports)
- DS3EC1/8 port units (8 ports)
- Gigabit Ethernet Interface (GE1/SX2) port units
- Universal optical connectors



## Protection

- OC-192 and OC-48 2-fiber BLSR protection
- OC-192, OC-48, and OC-12 UPSR (STS-1 path) protection
- OC-48, OC-12, OC-3 linear 1+1 facility protection (bidirectional, both revertive and nonrevertive)
- OC-192, OC-48, OC-12, OC-3 0x1
- GE1 0x1
- OC-192 BLSR Non-preemptible Unprotected Traffic (STS-1 NPPA)
- User provisionable DCC protection mode
- Non-revertive timing hardware protection

## Administration and Provisioning

- STS-1, STS-3, STS-12, and STS-48 cross-connection rates, including support for STS-Nc rate signals
- Two-way, one-way, bridging, and dual ring interworking (DRI) cross-connection topologies
- OC-192 nonpreemptible protection access
- Rolling cross-connections for all supported signals
- Red-lined cross-connections
- Near and Far-side facility loopbacks
- Non-revertive timing hardware protection
- Equipment inventory
- Security
- TCP/IP, FTTD-FTP/FTAM and OSI access to LAN and DCC interface
- Remote software downloads
- WaveStar Craft Interface Terminal (CIT)
- User provisionable DCC protection mode
- Line and section DCC channels on all optical interfaces
- Login and Password aging
- NE (network element) based inactivity logout

## Maintenance

- Automatic Laser Shutdown (ALS) on long-reach and very long-reach OC-192 interfaces
- Threshold Crossing Alert (TCA) reporting
- Circuit provisioning audits
- Operations interworking
- Full TL1 command/message set
- STS-1 path trace
- Section trace
- Software backup and restoration
- Standard SONET transmission maintenance signals
- SONET section and line performance monitoring
- DS3 performance monitoring
- Advanced NVM/DB consistency checks
- PM Bin access
- Remote network element status alarming (Release 6)

## Synchronization

- DS1 timing outputs
- OC-192 line timing (with SSM), up to 8 line references from the OC-192 system
- OC-48 line timing (with SSM), up to 6 line references when using only the OC-48 low-speed (tributary) shelf
- OC-3, OC-12, OC-48, and OC-192 S1 byte synchronization messaging
- Synchronization mode auto reconfiguration based on S1 byte (SONET only)

**FT-2000 Dual Bay Frame and DS3 Connector Panel Mounting Options**

- Mounting of tributary, low-speed shelf in FT-2000 dual bay frame
- Internal- horizontal DS3/STS-1 connector panel mounting arrangement
- External- vertical DS3/STS-1 connector panel mounting arrangement
- Rear mounting arrangement for DS3/STS-1 connector panels



## Summary

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|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Introduction</b>                                       | This summary provides a synopsis of the information in this chapter.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>WaveStar product family description</b>                | The WaveStar product family offers advanced services and revenue-generating capabilities to providers of global telecommunications services. Family members include the WaveStar Bandwidth Manager, WaveStar TDM 2.5G, and WaveStar TDM 10G systems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>WaveStar TDM 2.5G/10G (2-Fiber) system description</b> | <p>The WaveStar TDM 2.5G/10G (2-Fiber) system is a two-shelf or three-shelf add/drop multiplexer that interfaces OC-48, OC-12, OC-3, and DS3 lines to a 2-fiber OC-192 bidirectional line-switched ring (BLSR).</p> <p>Transmission interfaces include both optical and electrical interfaces. The WaveStar TDM 2.5G/10G (2-Fiber) uses a single control system and a 1+1 protected synchronization system. The WaveStar TDM 2.5G/10G (2-Fiber) system has a 192 STS-1 add/drop capacity for the OC-192 2-fiber BLSR. The WaveStar TDM 2.5G/10G (2-Fiber) system also has the ability to connect each input to any output providing complete flexibility such as cross-connections between tributaries.</p> <p>The WaveStar CIT provides direct, remote, and IAO LAN access to network elements. Additional operations interfaces include user panels, circuit pack/port unit faceplate LEDs, circuit breakers, low voltage protection units, and office alarm interface.</p> |





# 2 Network Topologies

## Overview

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**Purpose** This chapter describes network topologies in which WaveStar TDM 2.5G/10G (2-Fiber) is used to increase reliability, lower costs, increase revenues, and provide growth paths.

**Objectives** This chapter provides information to:

1. Understand how the WaveStar TDM 2.5G/10G (2-Fiber) is used in a network.
2. List the network topologies.
3. Describe the major characteristics of each network topology.

**Related information** For related information see:

- *WaveStar TDM 2.5G/10G (2-Fiber) Installation Manual*
- *WaveStar TDM 2.5G/10G (2-Fiber) Applications, Planning, and Ordering Guide*
- *WaveStar TDM 2.5G/10G (2-Fiber) Operations Systems Engineering Guide*

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**Applications** The table below lists the topologies described in this chapter in terms of the applications for which they can provide solutions.

Applications and Topologies

| Applications                            | Topologies                                                                                                                           |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Increasing Reliability                  | 2-Fiber BLSRs                                                                                                                        |
|                                         | UPSRs                                                                                                                                |
|                                         | Dual Node Ring Interworking                                                                                                          |
| Increase Revenues                       | Gigabit Ethernet Interface                                                                                                           |
|                                         | Broadband Transport                                                                                                                  |
|                                         | Backbone                                                                                                                             |
|                                         | Loop Feeder                                                                                                                          |
|                                         | Restoration Through Protection Access                                                                                                |
| Lowering Costs and Providing for Growth | Hairpinning                                                                                                                          |
|                                         | Optical Hubbing Topologies                                                                                                           |
|                                         | Dense Wavelength Division Multiplexing (DWDM)                                                                                        |
|                                         | Increased Span Length: Internal Optical Amplifiers                                                                                   |
|                                         | Increased Span Length: External Optical Amplifiers                                                                                   |
|                                         | DDM-2000 Linear Interfaces                                                                                                           |
|                                         | Path-in-Line                                                                                                                         |
|                                         | Interface Mixing                                                                                                                     |
|                                         | Multiple Rings                                                                                                                       |
|                                         | Express Rings                                                                                                                        |
|                                         | Mesh Networks                                                                                                                        |
|                                         | Folded Rings                                                                                                                         |
|                                         | 0% Add/Drop Node                                                                                                                     |
| Interworking Capabilities               | Lucent Products: FT-2000, DDM-2000, WaveStar BandWidth Manager, Metropolis™ DMX, earlier releases of WaveStar TDM 2.5G/10G (2-Fiber) |
|                                         | Tellabs Titan 5550                                                                                                                   |
|                                         | Fujitsu Products: FLM-150, FLM-600, and FLM-2400                                                                                     |
|                                         | Nortel S/DMS                                                                                                                         |
|                                         | SDH Transport                                                                                                                        |



## 2-Fiber BLSRs

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**Overview** A 2-fiber bidirectional line-switched ring (BLSR) is a self-healing ring configuration in which traffic is bidirectional between each pair of adjacent nodes and is protected by redundant bandwidth on the bidirectional lines that interconnect the nodes in the ring. Because traffic flow is bidirectional between nodes, traffic can be added at one node and dropped at the next without traveling around the entire ring. This leaves the spans between other nodes available for additional traffic. Therefore, with distributed traffic patterns, a BLSR can carry more traffic than the same facilities could carry if configured for a unidirectional path-switched ring. Additionally, you can use the protection capacity to provide unprotected transport for extra traffic when no failures are present.

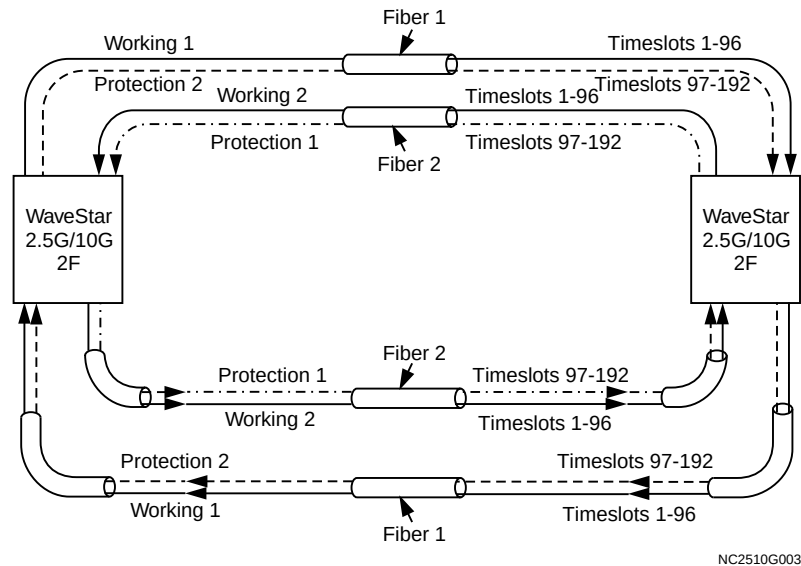
The 10G application of the WaveStar TDM 2.5G/10G (2-Fiber) supports one high-speed OC-192 2-fiber BLSR on the high-speed shelf and up to four OC-48 2-fiber BLSRs on each tributary (low-speed) shelf. The 2.5G application supports up to four OC-48 2-fiber BLSRs on a single shelf.

For both the 2.5G (OC-48) and 10G (OC-192) applications, it is recommended that not more than two OC-48 BLSRs on one shelf share the same fiber route. This minimizes the likelihood of simultaneous failures and insures that SONET restoration and protection switch times are met.



**Traffic capacity** The following figure shows working (also called service) and protection traffic capacities in an OC-192 2-fiber BLSR. The OC-48 2-fiber BLSR operates in the same way, but has 48 STS-1 timeslots in each direction, 24 for working traffic and 24 for protection.

**Figure 2-1 Traffic Capacity in an OC-192 2-Fiber BLSR**



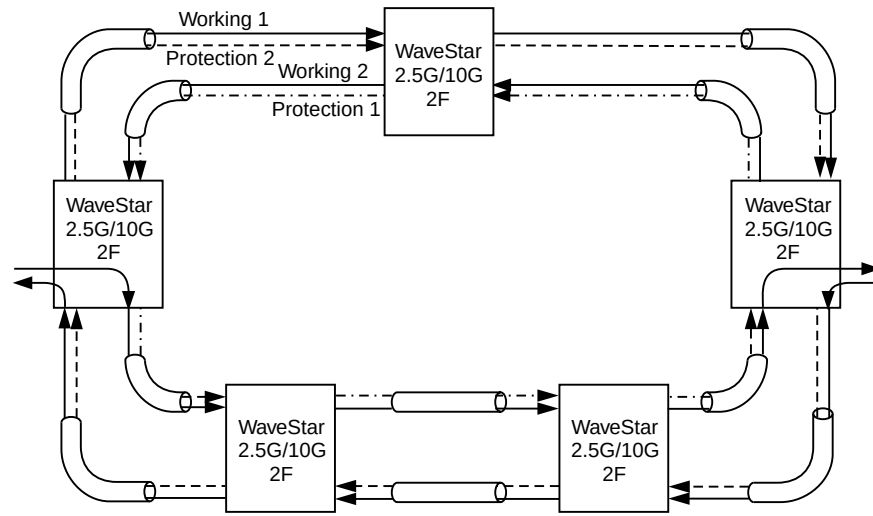
**Self-healing rings**

WaveStar TDM 2.5G/10G (2-Fiber) 2-fiber BLSRs are self-healing in that transport is automatically restored after node or fiber failures. Each OC-192 line carries 96 STS-1 equivalent timeslots of working capacity plus 96 STS-1 equivalent timeslots of protection capacity. Each OC-48 line carries 24 STS-1 equivalent timeslots of working capacity plus 24 STS-1 equivalent timeslots of protection capacity. In the event of a fiber or node failure, service is restored by switching traffic from the working capacity of the failed line to the protection capacity in the opposite direction around the ring. (See the figure below and the figure on the following page.)

**2-fiber BLSR traffic flow**

The figure below shows normal (non-protection-switched) traffic flow on a 2-fiber BLSR.

**Figure 2-2 Normal Traffic Flow in a 2-Fiber BLSR**



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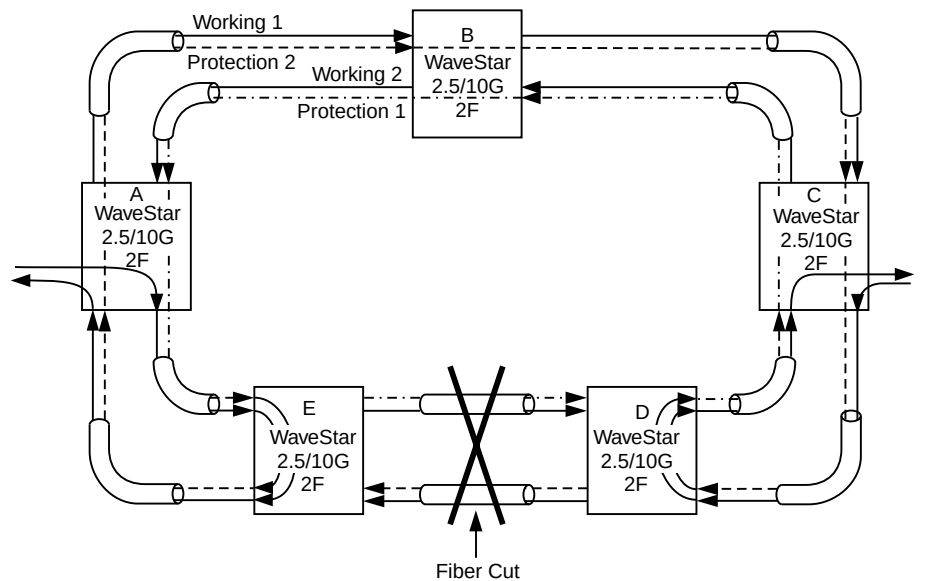
**Protection switching**

When a line failure triggers a protection switch, the nodes adjacent to the failure switch traffic on to protection capacity. Traffic heading toward the failure is looped back on to the protection capacity traveling away from the failure to reach its destination by traveling the opposite way around the ring (see the figure below). Service is reestablished on the protection capacity in  $\leq 50$  milliseconds after detection of the failure (for catastrophic failures in rings without existing protection switches or extra traffic).

**Fiber cut example**

The figure below illustrates a 2-fiber BLSR protection switch that results from a fiber cut.

**Figure 2-3 Loopback Protection Switch in a 2-Fiber BLSR**



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**Protection traffic flow**

In Figure 2-3, traffic going from Node A to Node C that normally passes through Node E and Node D on “working 2” capacity is switched at Node E on to the “protection 2” capacity of the line leaving Node E in the direction of Node A. The traffic loops back through Nodes A, B, and C to Node D where it is looped back to Node C. Similarly, traffic going from Node C to Node A that normally passes through Node D and Node E on “working 1” capacity is switched at Node D on to the “protection 1” capacity of the line leaving Node D in the direction of Node C. The traffic loops back through Nodes C, B, and A to Node E where it is looped back to Node A. Note that only the nodes adjacent to the failure perform loopback protection switches. The same approach is used for a node failure. For example, if Node D fails, Nodes C and E perform loopback protection switches to provide an alternate route for ring traffic.



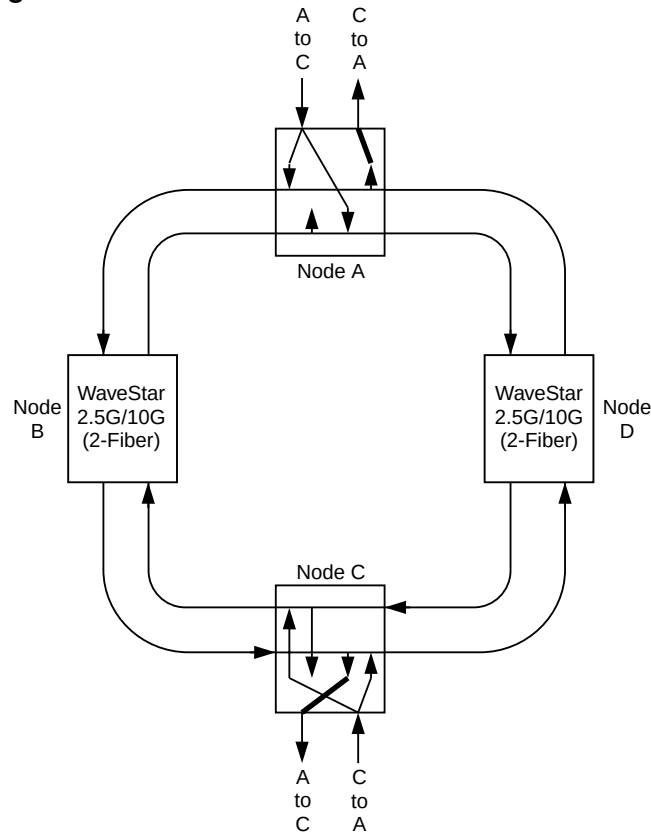
## Unidirectional Path-Switched Rings (UPSRs)

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**Overview** A Unidirectional Path Switched Ring (UPSR) is a self-healing ring configuration in which traffic is sent onto both rotations (both fibers) of the ring in opposite directions. The term “unidirectional” refers to the fact that every signal is normally selected from the same direction (either counter-clockwise or clockwise). “Path-switched” means that if the working signal fails, the path switches to the protection signal. UPSRs operate in an integrated, single ended fashion-- negating the need for complex network-level coordination in the effort to restore traffic.

**2-Fiber UPSR traffic flow**

UPSRs operate as shown in the figure below. Again, traffic is sent onto both rotations (both fibers) of the ring in opposite directions. At the receiving node, the signal with the highest level of integrity (based on SONET path information) is selected and dropped as outgoing traffic. At intermediate nodes, the traffic is “passed-through” without changing the SONET path information. The WaveStar TDM 2.5G/10G (2-Fiber) time slot interchange (TSI) capabilities make the provisioning of add/drop and pass-through traffic quick and easy.

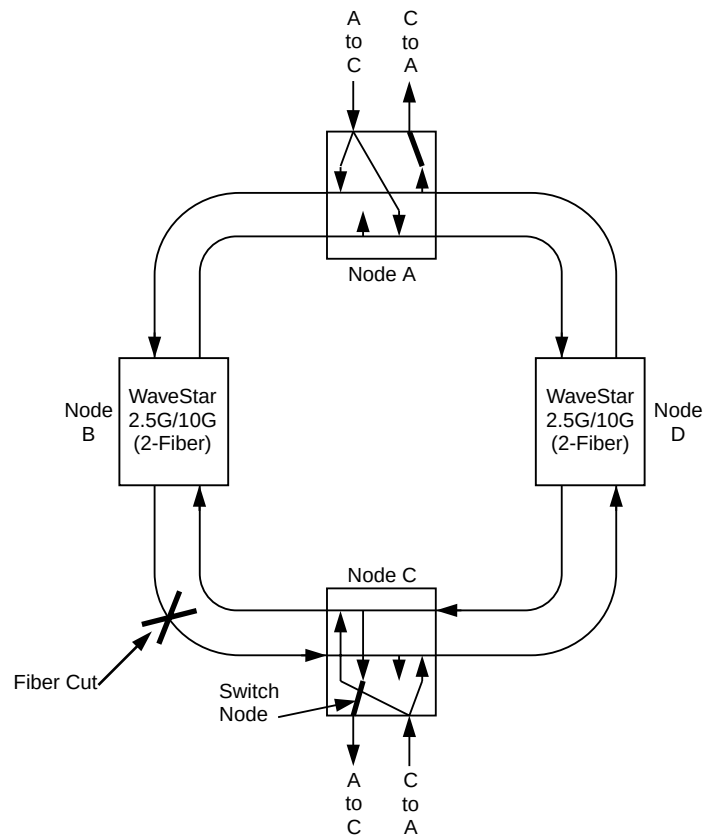
**Figure 2-4 Normal Traffic Flow in a 2-Fiber UPSR**

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**Important!** The WaveStar TDM 2.5G/10G (2-Fiber) supports one OC-192 UPSR in the high speed shelf. The WaveStar TDM 2.5G/10G (2-Fiber) supports zero to four OC-48 UPSRs or zero to sixteen OC-12 UPSRs on a single low-speed (2.5G) shelf. Also, the mixing of BLSR, UPSR, and other interfaces is supported in the same shelf. UPSR traffic can only be dropped to the first and second tributary shelves.

**Self-healing rings**

WaveStar TDM 2.5G/10G (2-Fiber) 2-fiber UPSRs are self-healing in that transport is automatically restored after node or fiber failures. The self-healing nature of a path switched ring is shown in the figure below. In this instance, the fiber cut occurring between nodes B and C causes node C to switch from the counter-clockwise ring to the clockwise ring; thus maintaining service between nodes A and C.

**Figure 2-5 Path Switch in a UPSR**

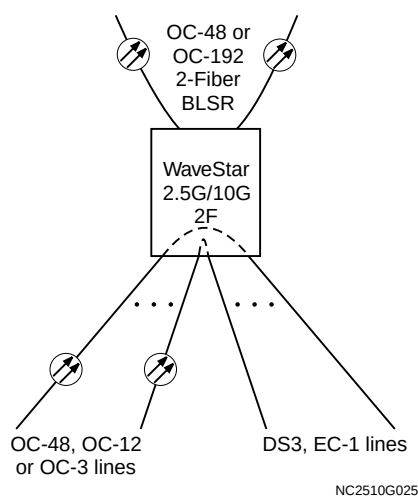
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# Hairpinning Capability

**Overview** In a “hairpinning” topology, low-speed tributary traffic is routed into the system and back out of the system without ever being placed on the high-speed OC-192 BLSR. The cross-connection capability of connecting any input to any output on the same shelf or on different tributary shelves, allows you to use a combination of add/drop and hairpinning of compatible payloads through a variety of interfaces. You can bring traffic in from one remote site and cross-connect it at the STS-1, STS-3c, STS-12c, or STS-48c level back out to other remote sites without consuming any capacity on the OC-192 BLSR. Hairpinning is also supported in 2.5G applications. In addition to adding and dropping traffic to/from the high-speed OC-48 BLSR(s), 2.5G applications support cross-connections between low-speed ports. WaveStar TDM 2.5G/10G (2-Fiber) can operate without a high-speed OC-192 BLSR, for example, to function as a small optical cross-connect system. For information on the minimum complement of circuit packs, see *Chapter 3, Product Description*.

**Hairpinning example** The figure below shows a topology in which traffic is hairpinned among OC-48, OC-12, OC-3, EC-1, and DS3 low-speed tributary interfaces.

**Figure 2-6 Hairpinning Example**





## Optical Hubbing Topologies

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**Overview** An NE is a hub when it is a collection point for lower transmission rate signals. If the lower rate signals are optical and from remote sites, the NE is performing remote optical hubbing.

**Optical hubbing example** The WaveStar TDM 2.5G/10G (2-Fiber) provides an extremely versatile platform for hubbing applications, typically found in metro applications where signals from remote sites are transported optically to a hub node. The hub node is connected to a higher speed backbone or other metro network. Using WaveStar TDM 2.5G/10G (2-Fiber) as a hub can lower transport costs by consolidating large amounts, and diverse types of traffic at the hub. For example, OC-48 (2F BLSR, UPSR, 1+1, 0x1), OC-12 (UPSR, 1+1, 0x1), OC-3 (1+1, 0x1), DS3, EC-1, and GE1 traffic can be consolidated at a hub for transport at OC-192 (2F BLSR, UPSR, or 0x1). OC-12 (UPSR, 1+1, 0x1), OC-3 (1+1, 0x1), DS3, EC-1, and GE1 traffic can also be consolidated onto an OC-48 (2F BLSR, UPSR, 1+1, 0x1). OC-3 (1+1, 0x1), DS3, and EC-1 traffic can be consolidated onto an OC-12 (UPSR, 1+1, 0x1). Also, traffic can be added/dropped at the hub, and/or hairpinned from one remote optical connection to another remote optical connection without ever being cross connected with the higher speed backbone.

Table Maximum Interface Capacity When Interface Rates Are Not Mixed (2-14), outlines the maximum interface capacity of a WaveStar TDM 2.5G/10G (2-Fiber) when interface rates are not mixed. For example, a WaveStar TDM 2.5G/10G (2-Fiber) OC-192 system with two low speed tributary shelves can terminate, 8 OC-48 2F BLSRs, or 8 OC-48 UPSRs, or a combination of up to 8 2F BLSRs and UPSRs.

**Table 2-1 Maximum Interface Capacity When Interface Rates Are Not Mixed**

| <b>Interface and Protection Type</b>            | <b>One Low-Speed Tributary Shelf (stand-alone 2.5G)</b> | <b>2 Low-Speed Tributary Shelves (576x576 STS-1 Switch Fabric in High-Speed Shelf)</b> | <b>4 Low-Speed Tributary Shelves (768x768 STS-1 Switch Fabric in High-Speed Shelf)</b> |
|-------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| OC-48 2F BLSR, UPSR (STS-1 path), 1+1           | 4                                                       | 8                                                                                      | 16                                                                                     |
| OC-48 0x1                                       | 8                                                       | 16                                                                                     | 32                                                                                     |
| OC-12 UPSR (STS-1 path), 1+1                    | 16                                                      | 32                                                                                     | 64                                                                                     |
| OC-12 0x1                                       | 32                                                      | 64                                                                                     | 128                                                                                    |
| OC-3 1+1 (using OC3/STM4/1.3IR-SR8)             | 64                                                      | 128                                                                                    | 256                                                                                    |
| OC-3 0x1 (using OC3/STM4/1.3IR-SR8)             | 128                                                     | 256                                                                                    | 512                                                                                    |
| DS3s or EC-1s or a mix (1:12 per shelf, or 0x1) | 96                                                      | 192                                                                                    | 384                                                                                    |
| Gigabit Ethernet                                | 16                                                      | 32                                                                                     | 64                                                                                     |

The WaveStar TDM 2.5G/10G (2-Fiber) does support mixing of interfaces and protection types in the low speed tributary (or stand-alone 2.5G) shelf. When interface rates are mixed, the interface capacity of a hub depends on how the interfaces (port unit cards) are mixed.

**NOTE:**

Traffic from an OC-192 UPSR cannot be terminated in shelves 3 and 4.

In addition to lowering transport costs by consolidating large amounts, and diverse types of traffic at the hub, other features of the WaveStar TDM 2.5G/10G (2-Fiber) provide additional benefits for hubbing applications. Some examples include:

- Interworking capabilities allow network consolidation of existing embedded base equipment (for example, termination of FT-2000 2F BLSRs, and termination of Metropolis™ DMX UPSRs that have STS-1 path switching).
- Interworking capabilities allow network consolidation for multi-vendor applications.
- OC-48 and OC-192 compatible optics are available for various DWDM applications allowing customers to maximize fiber utilization, and reduce equipment costs by deploying cost effective multiplex/DWDM network architectures.

The full hairpinning capability on each low speed tributary (2.5G stand-alone) shelf allows the most efficient use of bandwidth. STS-1 level signals can be cross connected between any ports on the low speed tributary shelf, which reduces the need to use additional switch fabrics or deploy external equipment (for example, cross connects and DSXs.). More specifically, hairpinning allows:

- Cross-connecting of traffic between the OC-3, OC-12, and OC-48 linear and/or ring interfaces coming into the hub, without ever using the cross connect fabric in the high speed shelf.
- Traffic to be directly interconnected between multiple remote networks, saving the cost of additional ports and cabling that would be needed if the traffic is terminated on separate network elements.
- The grooming of traffic from multiple remote networks into common OC-N or GE1 handoffs. This reduces the number of interfaces on both the WaveStar TDM 2.5G/10G (2-Fiber) and the other equipment.
- STS-1, STS-3, STS-3c, STS-12, STS-12c, STS-48, and STS-48c cross connects are all supported, which allows a wide range of applications.
- In-service upgrade from a single OC-48 2-fiber BLSR ring to an OC-192 2-fiber BLSR ring is supported, allowing the initial deployment of low cost OC-48 architectures for low volume traffic areas, with the ability to grow the network in-service as traffic demands increase.
- 100% add/drop of all OC-192 2-Fiber BLSR working traffic is supported in one bay.

- With protection access traffic, 100% add/drop of all OC-192 BLSR protection access traffic is supported in one bay when optical low-speed interfaces are used. With electrical interfaces, two bays are required.

Details on interworking and DWDM applications using compatible optics are provided later in this chapter.

The next two figures show the WaveStar TDM 2.5G/10G (2-Fiber) used in optical hubbing applications.

Figure Optical Hubbing – Simple Metro Hub with Linear Extensions (2-16) shows the WaveStar TDM 2.5G/10G (2-Fiber) used in a simple metro hub application where linear 1+1 OC-3, OC-12, and OC-48 traffic from two DDM-2000 systems and one WaveStar TDM 2.5G/10G (2-Fiber) system is connected to a TDM 2.5G/10G (2-Fiber) hub node. The hub node is also part of a higher speed network, in this case an OC-192 2F BLSR. This type of architecture is used to consolidate traffic from access networks onto backbone or metro interoffice networks, to add/drop traffic from remote sites to a hub site, and to cross connect traffic between remote sites using the hairpinning capability of the WaveStar TDM 2.5G/10G (2-Fiber) located at the hub site.

**Figure 2-7 Optical Hubbing – Simple Metro Hub with Linear Extensions**

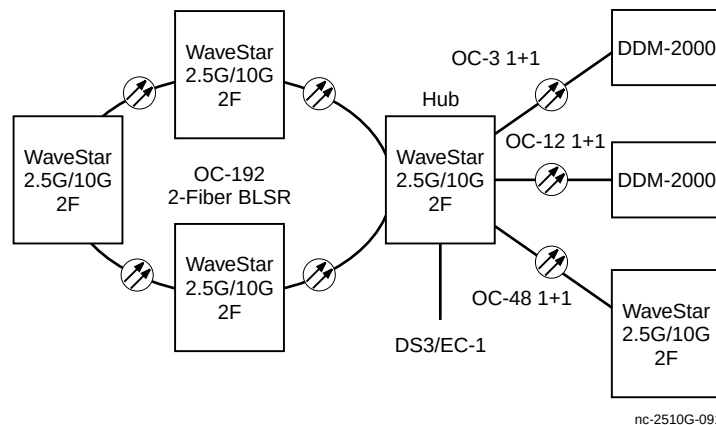
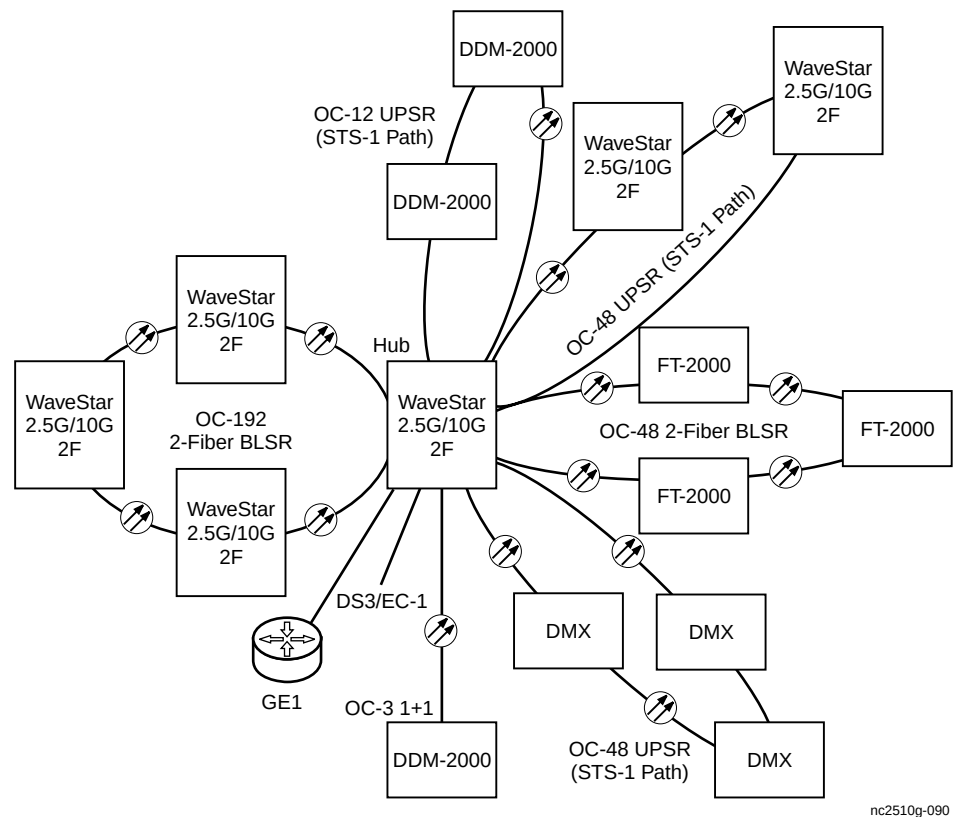


Figure Optical Hubbing – Metro Hub Networking Example (2-17) shows the WaveStar TDM 2.5G/10G (2-Fiber) used in a metro hub application where traffic from various NEs, using various protection schemes, and with various interfaces (OC-3, OC-12, OC-48) is terminated at a WaveStar TDM 2.5G/10G (2-Fiber) hub node. In this case, more than just 1+1 traffic is coming into the hub site from remote sites. Ring (2F BLSR and UPSRs with STS-1 path switching) and

linear 1+1 traffic is being terminated at the hub. This traffic is consolidated with Gigabit Ethernet and DS3/EC-1 traffic, which is added/dropped at the hub site. The TDM 2.5G/10G (2-Fiber) hub node is also part of an OC-192 2F BLSR. This type of architecture is used to consolidate traffic from access and/or metro networks onto high speed backbone networks, to add/drop traffic from various remote sites to a hub site, and to cross connect traffic between remote sites using the hairpinning capability of the WaveStar TDM 2.5G/10G (2-Fiber) located at the hub site.

**Figure 2-8 Optical Hubbing – Metro Hub Networking Example**



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Since any of the rings or linear interfaces shown in either figure, can be used in either access or the backbone networks, the hub may be part of more than just one access and/or backbone network.

**Note:**

For OC-192 applications, the WaveStar TDM 2.5G/10G (2-Fiber) can be used as an OC-192 2F BLSR, UPSR, single 0x1, or dual 0x1 system.

□

# DWDM

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**Overview** Dense wavelength division multiplexing (DWDM) is the optical combining of four or more different optical wavelengths onto a single fiber. DWDM increases the circuit-carrying capacity of lightguide cable by carrying multiple signals of different wavelengths simultaneously over a single fiber. DWDM provides a cost-effective way to utilize the huge carrying capacity of fiber and relieve fiber exhaust problems.

**DWDM-compatible options** To ensure the most cost-effective DWDM network architectures, are deployed, the WaveStar TDM 2.5G/10G (2-Fiber) system supports compatible OC-48 and OC-192 optics (port units), for use in a wide array of DWDM applications:

- 16 different OC-48 wavelengths (OC48/STM16/DWDM), in the 1.5 micron range, for use in applications with the Lucent Technologies Metropolis™ EON system
- 40 different OC-192 wavelengths (OC192/STM64/WDM), and 80 different OC-48 wavelengths (OC48/STM16/WDM), in the 1.5 micron range, for use in applications with the Lucent Technologies WaveStar® OLS 1.6T system
- 32 different OC-192 wavelengths (OC192/STM64/POU), and 16 different OC-48 wavelengths (OC48/STM16/POU), in the 1.5 micron range, for use in applications with the Lucent Passive Optics Units (POUs) in Passive DWDM applications

These compatible port units ensure that **no** Optical Translator Units (OTUs) are required in, or external to, the DWDM system. The result is significant savings in cost and floor space.

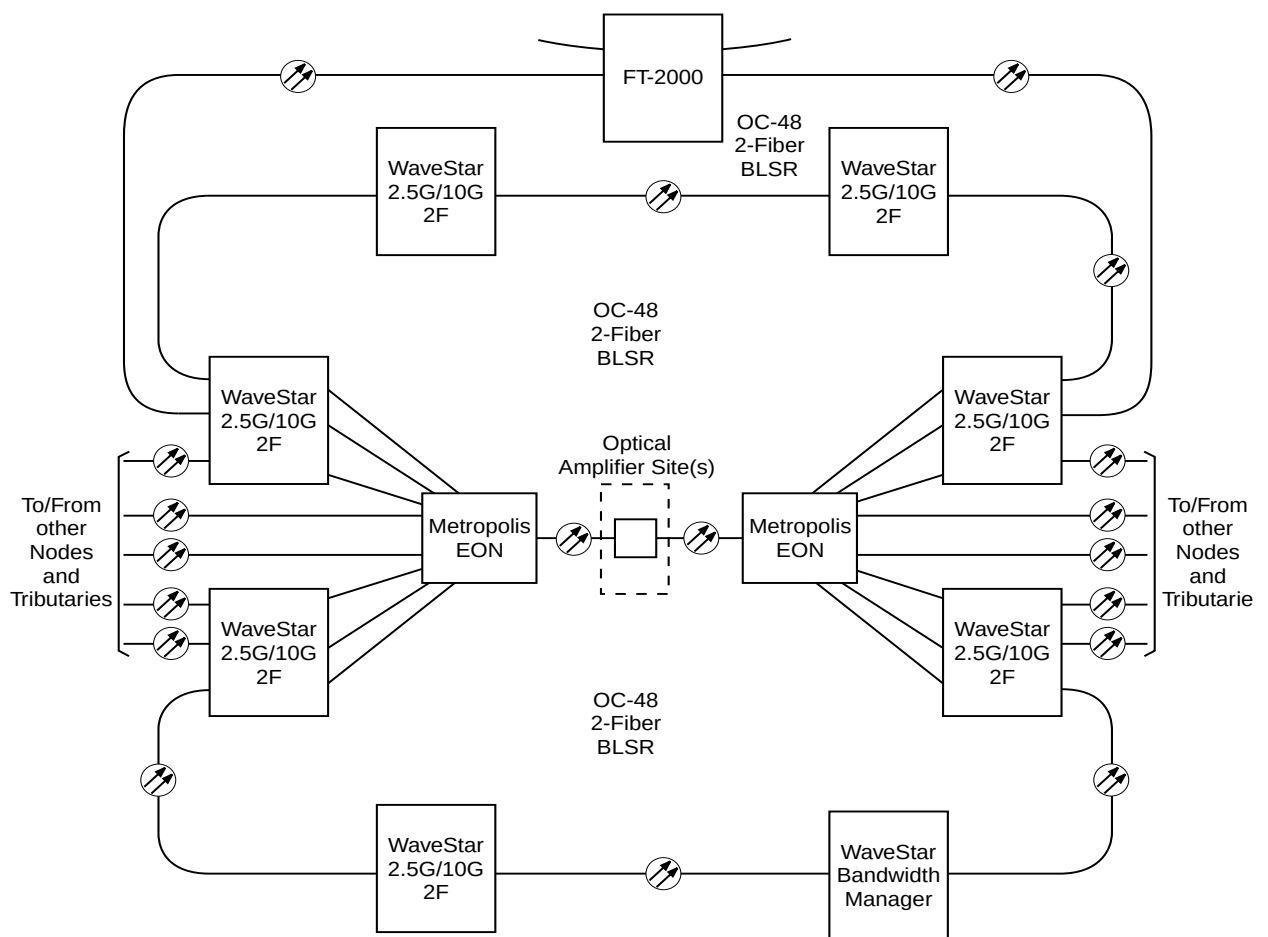
The compatible optical port unit codes are listed in *WaveStar TDM 2.5G/10G Applications and Planning Guide*. Information on passive optics, and the POUs are located throughout this document.

More information about the Lucent Technologies Metropolis™ EON, and the Lucent WaveStar® OLS 1.6T can be found in the *Applications and Planning Guides* for these products.

### Examples of topologies using DWDM-compatible port units

The figure below shows multiple WaveStar TDM 2.5G/10G (2-Fiber) systems equipped with compatible optics (port units) and interfacing with the Lucent Technologies Metropolis™ EON system, to transport multiple OC-48 ring segments over a single fiber span. (One line in the figure represents 2 fibers.) The WaveStar TDM 2.5G/10G (2-Fiber) compatible optics for this application are available in 16 different OC-48 wavelengths, and eliminate the need for OTUs on the Metropolis™ EON system.

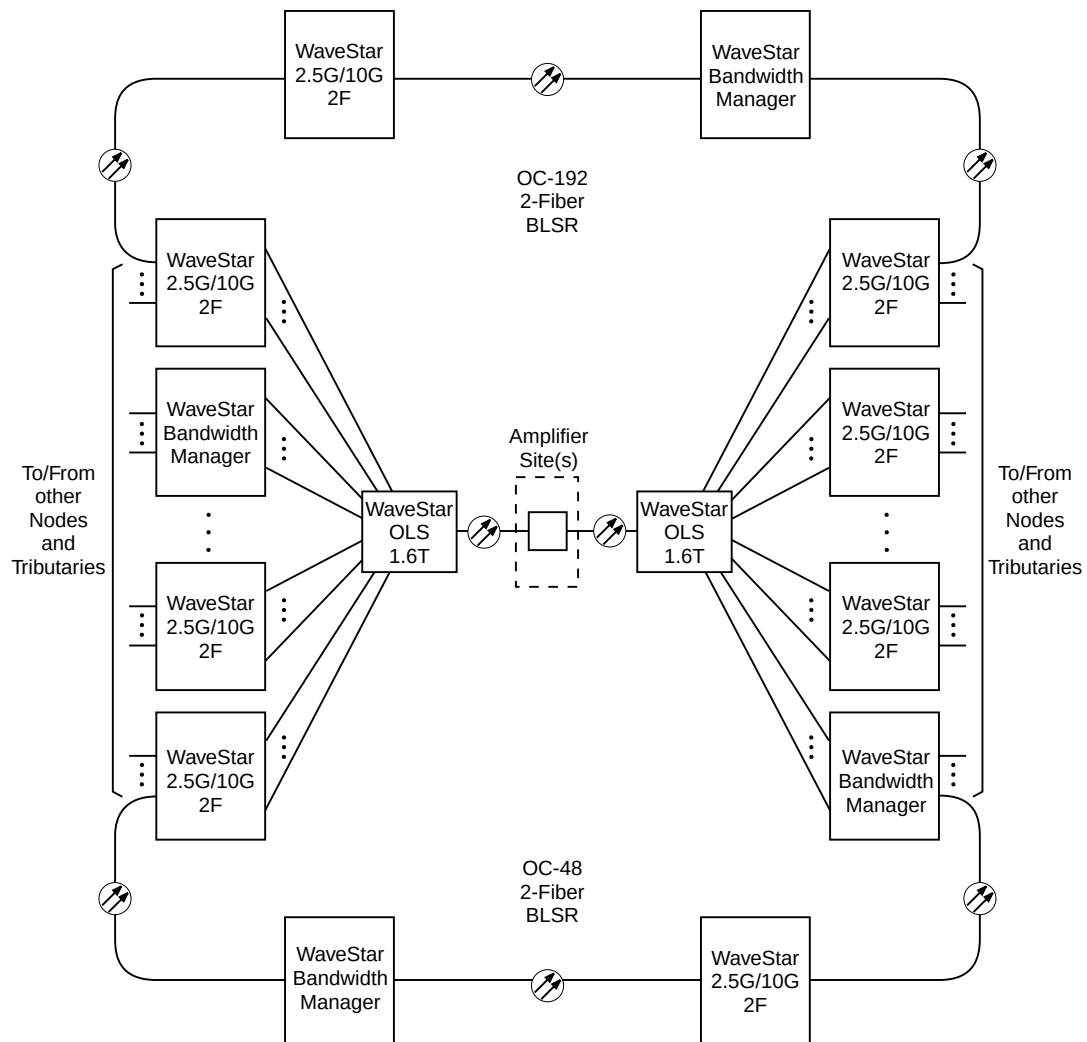
**Figure 2-9 Metropolis EON (OLS 40G) with WaveStar TDM 2.5G/10G (2-Fiber)**



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The figure below shows a WaveStar TDM 2.5G/10G (2-Fiber) system equipped with compatible optics (port units), interfacing with the Lucent Technologies WaveStar® OLS 1.6T system, to transmit ring segments over a single fiber span. (One line in the figure represents 2 fibers.) The WaveStar TDM 2.5G/10G (2-Fiber) compatible optics (port units) for this application are available in 40 different OC-192 wavelengths, and 80 different OC-48 wavelengths. The use of compatible optics eliminate the need for OTUs when the WaveStar TDM 2.5G/10G (2-Fiber) is connected to the WaveStar® OLS 1.6T system.

**Figure 2-10 WaveStar® OLS 1.6T with WaveStar TDM 2.5G/10G (2-Fiber)**



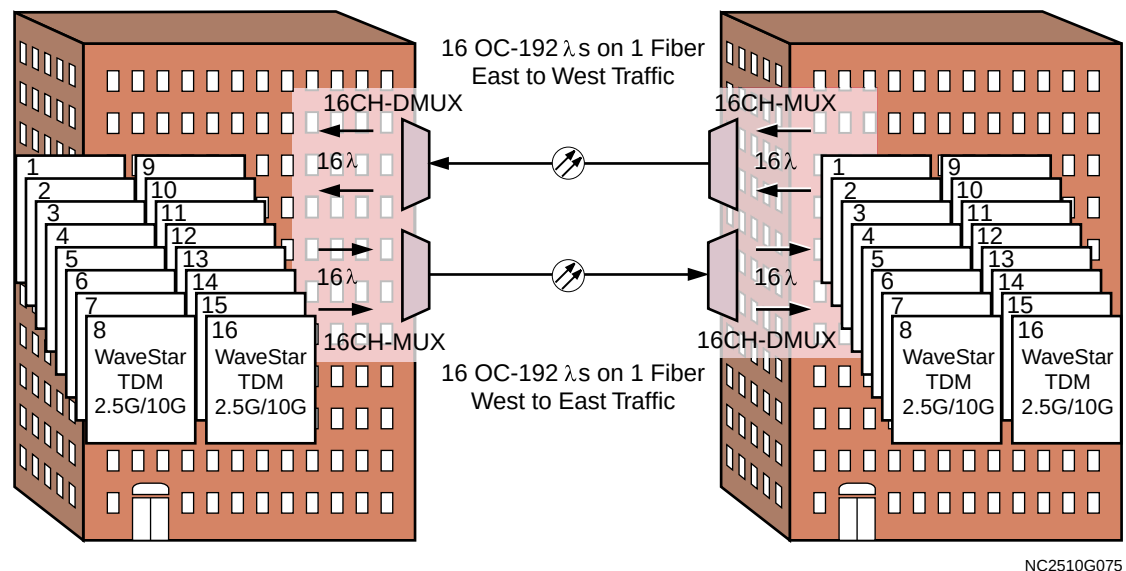
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The figure below shows a typical metro application of the WaveStar TDM 2.5G/10G (2-Fiber) system, equipped with Passive DWDM compatible optics (port units), and interfacing with the 16CH-MUX and 16CH-DMUX Passive Optics Units (POUs). This network topology supports the cost-effective transport of multiple OC-192 wavelength ( $\lambda$ ) signals, between two sites, on a fiber (one fiber for each direction). This application is supported for OC-48 signals as well.

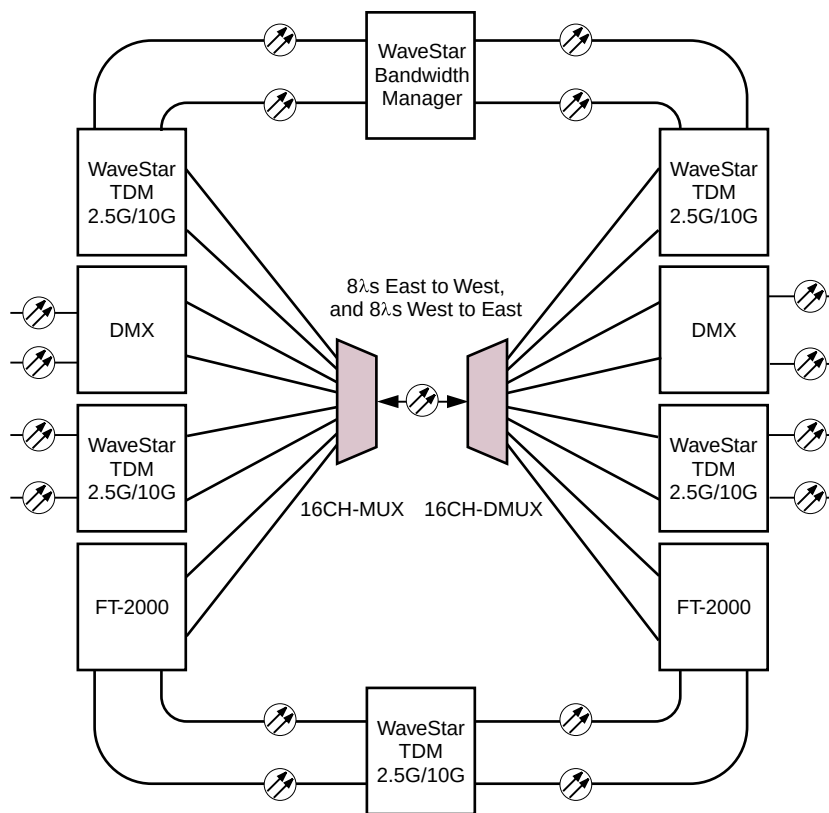
Up to 32 OC-192 signals, of different wavelengths, can be transported on one fiber, unidirectionally, when all four POUs are used with the WaveStar TDM 2.5G/10G (2-Fiber).

**Figure 2-11 Unidirectional Transport of 16 Wavelengths with WaveStar TDM 2.5G/10G (2-Fiber) Systems and Lucent Passive Optics Units (POUs)**



The figure below shows a bidirectional transport application using the POU, in this case the 16CH-MUX and 16CH-DMUX units. The POU are connected with other Lucent products which are equipped with Passive DWDM compatible optics, to transmit and receive information over one fiber. In the topology shown, up to 8 wavelengths ( $\lambda$ s) can be used for east to west traffic, and the other 8 wavelengths can be used for west to east traffic.

**Figure 2-12 Bidirectional Transport of 8 Wavelengths In each Direction On One Fiber Using POU and Lucent Network Elements**



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## Increased Span Length: Internal Optical Amplifiers

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**Overview** For those OC-192 long distance applications over 60 km (loss budget exceeds 18 dB), the WaveStar TDM 2.5G/10G (2-Fiber) system supports two in-shelf optical amplifier units, the Optical Booster Amplifier (OBA) and the Optical Booster/Pre-Amplifier (OBPA). The OBA and OBPA allow the system to support OC-192 applications up to 80 km and up to 120 km, respectively, on SMF - eliminating the need for additional equipment, such as O add/drop terminals or regenerators.

**Concept** The OBA, the SEN3AE, can be paired with various OC-192 optical port units, typically the LEY69AE, to support applications up to 80 km. The OC-192 transmitter output from the LEY69AE is connected to the input of the OBA, and is amplified. The output of the OBA is connected to the fiber in the network. At the receiver side, the fiber from network is connected directly to the receiver on LEY69AE OC-192 port unit. The OBA is not part of the port unit receiver side architecture

The OBPA, the SEN4AE, supports applications up to 120 km on SMF. The SEN4AE provides an OBA type function, and also provides a preamplifier function. The pre-amplifier function provides amplification of the optical signal received from the network fiber. The *pre-amplified* output of the SEN4AE is the input to the receiver of the OC-192 port unit. The SEN4AE receiver filter is frequency dependent, and must operate at a wavelength of 1552.52 nm, therefore the SEN4AE must be paired with a LEY295AE or LEY228AE.

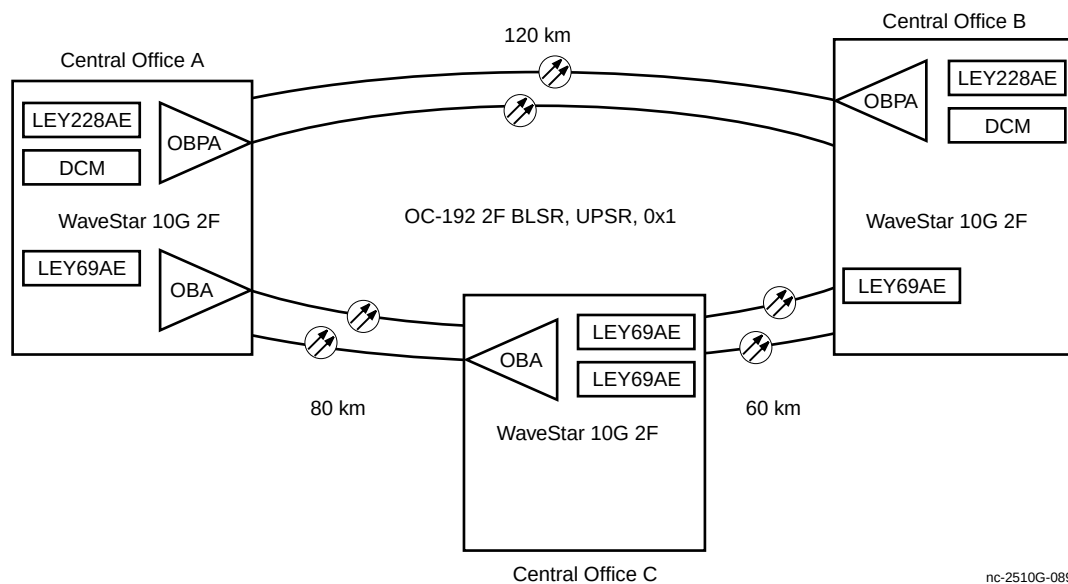
The OBA and OBPA port units can be mounted in slots 2 and/or 16 of the 10G high-speed shelf.

The loss and dispersion characteristics [chromatic dispersion (CD) and polarization mode dispersion (PMD)] for optical equipment and fiber must be considered for all network designs. The signal to noise (S/N) ratio may also need to be calculated for applications. DCMs may or may not be required depending on the fiber route characteristics, the optical line rate being amplified, and optical characteristics of all equipment. Greater span distances can be achieved, and DCMs can be eliminated or reduced in number when Lucent TrueWave (non zero dispersion shifted) fiber is used.

It is assumed that the PMD requirements for a specific application, are consistent with those requirements specified in ITU-T.691 for OC-48 applications, and Telecordia GR 1377 for OC-192 applications.

The figure below shows how the OBA (SEN3AE) and OBPA (SEN4AE) can be used to extend the span distance for OC-192 applications on single-mode fiber (SMF). The use of the OBA and/or OBPA can eliminate the need for additional equipment, such as O add/drop terminals or regenerators.

**Figure 2-13 WaveStar TDM 2.5G/10G (2-Fiber) OBA and OBPA Applications**



In this application, the OBPA (SEN4AE) is paired with the LEY228AE. The LEY295AE could have been used instead of the LEY228AE. DCMs are required for this SMF application. The use of TrueWave fiber would eliminate the need for DCMs in this application, and would also allow for longer transmission distances.

DCMs are connected between the LEY228AE transmitter and the OBPA (SEN4AE) circuit pack in the transmit direction, and between the OBPA (SEN4AE) and the receiver of the LEY228AE in the receive direction.



## Increased Span Length: External Optical Amplifiers (OAs)

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**Overview** For those applications in which the OBA and OBPA are already in use or cannot be used, Lucent Technologies offers a stand-alone External Optical Amplifier (OA) system. This system can be used for both OC-48 and OC-192 applications. The External OA system is stand-alone one shelf system that supports up to 6 OAs.

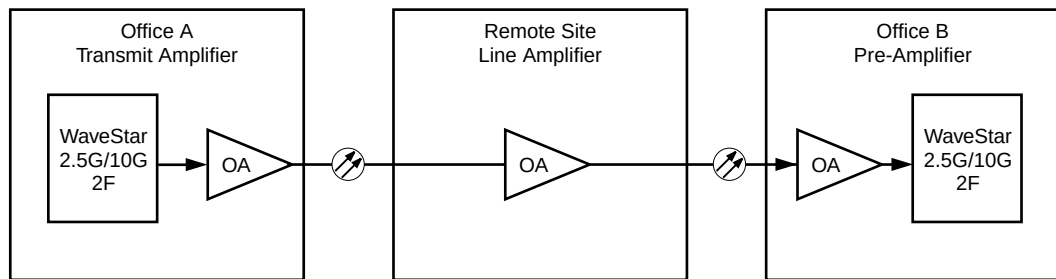
**Concept** The Lucent External OA system can be equipped with up to 6 OAs (in one shelf). There are basically three basic categories of OAs, transmit amplifiers, line amplifiers, and pre-amplifiers. Within a category, there are multiple OAs available. The appropriate OA can be selected for the particular application.

The loss and dispersion characteristics (CD and PMD) for optical equipment and fiber must be considered for all network designs. The S/N ratio may also need to be calculated for applications. DCMs may or may not be required depending on the fiber route characteristics, the optical line rate being amplified, and optical characteristics of the all equipment. Greater span distances can be achieved, and DCMs can be eliminated or reduced in number when Lucent TrueWave (non zero dispersion shifted) fiber is used.

It is assumed that the PMD requirements for a specific application, are consistent with those requirements specified in ITU-T.691 for OC-48 applications, and Telecordia GR1377 for OC-192 applications.

The next figure is a block diagram depicting how the three categories of OAs could be used. DCMs are not shown in this figure below.

**Figure 2-14 External Optical Amplifiers, Application Block Diagram (West to East Traffic)**



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The OAs support unidirectional operation, the optical signal is amplified in one direction. In the figure above, the west to east transmission direction is shown.

**NOTE:**

The External OA applications supported, and defined in this document, are for single frequency/wavelength applications, meaning the optical signal amplified is not a multiwavelength WDM signal. Information concerning solutions for amplifying multi-wavelength WDM signals can be obtained from your Lucent Account Executive

Transmit amplifiers provide a function similar to the OBA. For a range of optical input power levels, from an optical port unit, the signal is amplified. The output power is a set level. There are four transmit amplifiers available, units with outputs of 10, 13, 16, and 19 dBm (typical). The amplifier wavelength range is 1530 to 1560 nm. Applications are supported for a single wavelength in this range.

Line amplifiers are typically located at remote sites to provide a gain function. Three line amplifiers are available. Two of the amplifiers have an operating wavelength range 1530 to 1560 nm, and have maximum gains of +30 dB and +33 dB, respectively. The third amplifier has an operating wavelength range of 1548 to 1560 nm, and provides a maximum gain of +30 dB. The third line amplifier allows for mid stage insertion of a DCM. Applications are supported for any single wavelength defined within the operating wavelength range.

Pre-amplifiers provide a pre-amplifier, gain function before the receiver of a port unit. Pre-amplifiers are available with different gain levels. The pre-amplifiers that provide a maximum gain of 23 dB have an operating wavelength range of 1530 to 1560 nm. Applications are

supported for a single wavelength in this range. The two types of pre-amplifiers with higher maximum gains, 23 and 28 dB respectively, utilize narrow band filters. Wavelengths supported with the narrow band filters, include but are not limited to, 1557.38 nm, 1552.52 nm, 1549.31 nm, 1541.35 nm, and 1533.47 nm. When the pre-amplifiers that have narrow band filters are used, the appropriate optical port unit must also be used. For example, if the pre-amplifier used, requires a wavelength of 1552.52 nm, then the LEY295AE or LEY228AE port units must be used to transmit the appropriate wavelength signal for OC-192 applications.

The appropriate OA should be selected for the application. Not all categories of OAs are needed for every application. Many applications required the use of just transmit amplifiers, or transmit amplifiers and pre-amplifiers.

If a transmit amplifier, and a pre-amplifier with 1552.52 nm narrow band filter are used for an OC-192 application, the application supported is analogous to using the SEN4AE for an OC-192 application.

The OAs are equipped with FC connectors.

The external OA shelf is available in a NEBS 3 compliant version, and can be used for controlled environmental applications. Power units are available for -48 VDC, 110 VAC, and 220VAC applications.

The external OA system provides alarm/status LEDs on the OA circuit packs, relays closures, and can be used with an external telemetry system if desired. On a span basis, protection schemes and alarming functions can be performed by the multiplexers or DCS systems connected to the External OA system.

The external OA system can also be equipped with up to 12 transponders. Each transponder takes up 1 slot in the shelf. An OA takes up two slots.

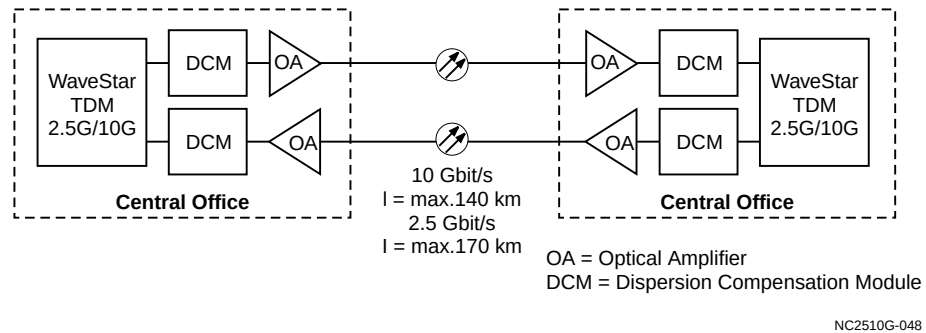
For information on the external OA system and its applications; and solutions for long distance multi-wavelength applications, contact your Lucent Account Executive.

**Applications** Many single frequency/wavelength applications can be supported with the external OA system and WaveStar TDM 2.5G/10G (2-Fiber). Two possible applications are shown in the figures below

The WaveStar TDM 2.5G/10G (2-Fiber) and external OA system can be combined to support single span, single frequency, applications of up to 170 km and up to 140 km, for OC-48 and OC-192 rates,

respectively. This application is shown in Figure External Optical Amplifier Single Span Application (2-28). In this application, transmit amplifiers and pre-amplifier are used.

**Figure 2-15 External Optical Amplifier Single Span Application**



The WaveStar TDM 2.5G/10G (2-Fiber) and the External OA system can be combined to support very long distance transport, single frequency, OC-192 and OC-48 applications. Deploying OAs at multiple sites, intermediate sites and end points, allows transmission of information of up to 500 km, for OC-192 single wavelength applications, using SMF, via five 100 km spans. Figure External Optical Amplifier Multispan Application (2-29) shows this type of application for a 300 km application, with 3 spans. In this application, transmit amplifiers, line amplifiers, and pre-amplifiers are used.

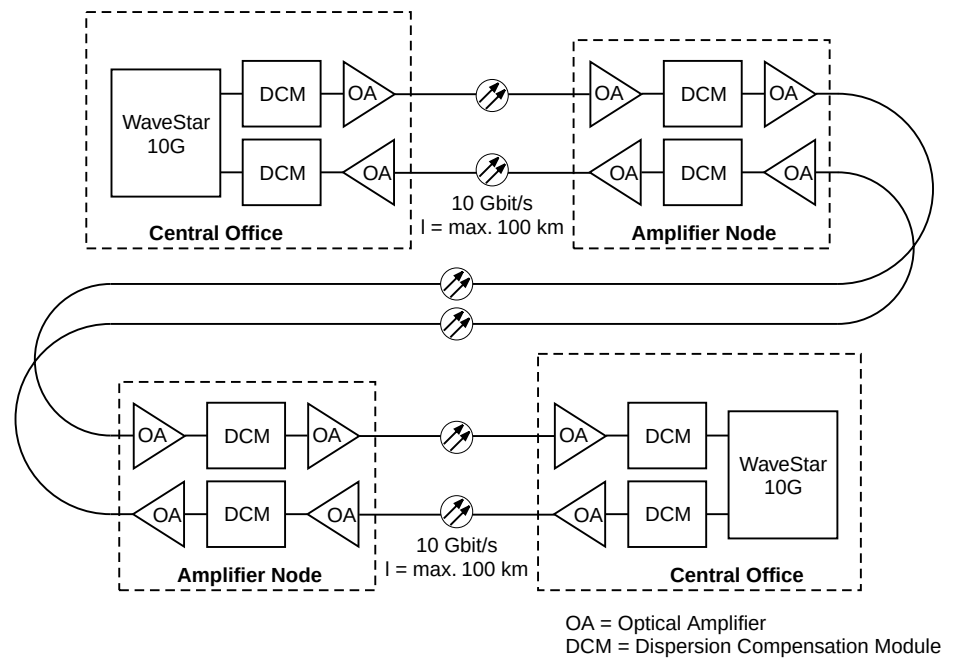
For information on the External OA system and its applications; and solutions for long distance multi-wavelength applications, contact your Lucent Account Executive.

The loss and dispersion characteristics (CD and PMD) for optical equipment and fiber must be considered for all network designs. The S/N ratio may also need to be calculated for applications. DCMs may or may not be required depending on the fiber route characteristics, the optical line rate being amplified, and optical characteristics of the all equipment. Greater span distances can be achieved, and Dispersion Compensation Modules (DCMs) can be eliminated or reduced in number when Lucent TrueWave (non zero dispersion shifted) fiber is used.

It is assumed that the PMD requirements for a specific application, are consistent with those requirements specified in ITU-T.691 for OC-48 applications, and Telecordia GR1377 for OC-192 applications.



**Figure 2-16 External Optical Amplifier Multispan Application**



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## Gigabit Ethernet Interfaces

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**Overview** The WaveStar TDM 2.5G/10G (2-Fiber) supports two Gigabit Ethernet interfaces, the GE1/SX2 and GE1/LX2 port units. The GE1/SX2 port unit conforms to the standards outlined in IEEE 802.3, and supports the 1000BASE-SX interface. The GE1/LX2 port unit also conforms to the standards outlined in IEEE 802.3, and supports the 1000BASE-LX interface.

**Capabilities** The GE1/SX2 and GE1/LX2 port units allow transport of Gigabit Ethernet signals over SONET networks by encapsulating ethernet packets in virtually concatenated STSs. The GE1/SX2 and GE1/LX2 port units support point-to-point connectivity.

Each GE1/SX2 port unit offers two 1000BASE-SX Ethernet LAN ports. Each GE1/LX2 port unit offers two 1000BASE-LX Ethernet LAN ports. Each port, on both port units, supports two Ethernet lines (one transmit and one receive, allowing full duplex operation). Each line can be associated with a virtual concatenated link over the SONET network (also called “WAN link”). The capacity per Gigabit Ethernet line is user provisionable to a maximum of 21 STS-1s. All connections to the 1000BASE-SX Ethernet interface on the GE1/SX2 port unit or to the 1000BASE-LX Ethernet interface on the GE1/LX2 port unit require Dual SC Connectors.

**Virtual Concatenation** STS-1 concatenation can be used for the transport of payloads that do not fit into a single STS-1. Two methods for STS-1 concatenation are defined, contiguous and virtual concatenation. Both methods provide concatenated bandwidth of X times Container-N at the path termination. The difference is the transport between the path termination. Contiguous concatenation maintains the contiguous bandwidth throughout the whole transport. It requires concatenation functionality at each network element. Virtual concatenation breaks the contiguous bandwidth into individual STSs, transports these STSs and recombines them to a contiguous functionality only at the path termination equipment i.e. the GE1/SX2 or the GE1/LX2 Gigabit Ethernet port unit.

The H4 POH byte is used for the sequence and multiframe indication specific for virtual concatenation.

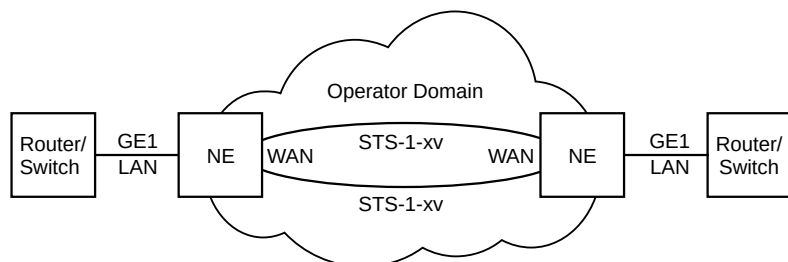
Due to different propagation delay of the STS-1s, a differential delay will occur between the individual STS-1s. This differential delay has to be compensated and the individual STS-1s have to be realigned for access to the contiguous payload area. The realignment process compensates at least a differential delay of a maximum of 32 ms between the fastest and slowest STS-1.

**LCAS** Link capacity adjustment scheme (LCAS) allows the flexible resizing of the bundle: in-service bandwidth reprovisioning changes and automatic fall-down in case of failure on single STS-1s (due to network or equipment failures or differential delay out of range). The objective is to have only short traffic hits during LCAS bandwidth changes comparable to those imposed by path or ring switching (UPSR or BLSR).

**Point-to-point connectivity** The following two figures show possible point-to-point Gigabit Ethernet (GE1) network applications.

#### UPSR or BLSR protection

Protection of the individual STS-1s that form the STS-1-Xv is possible via UPSR and BLSR protection schemes. In STS-1-Xv, the v represents the virtual concatenated group and X represents the number of STS-1 signals in that group.

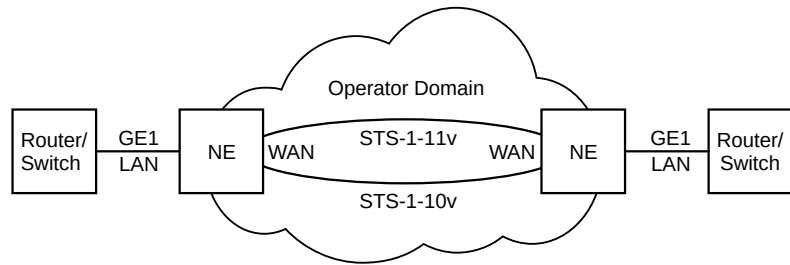


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### LCAS-based protection

If that protection scheme is used, half of the STS-1s of the virtual concatenated group is routed over one fiber, the other half over another fiber. If one fiber fails, about half of the GE1 WAN bandwidth is maintained during failures.

If BLSR is available (optional), half of the STS-1s of the virtual group are routed via preemptible protection access bandwidth.



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### Bridge Modes

The Ethernet Gigabit circuit pack supports two modes of bridge operation: VLAN tagging or repeater mode. The mode can be provisioned per LAN/WAN port pair.

### VLAN Tagging

Customer identification and isolation on WAN ports is performed through VLAN tagging. In case the end user frames are untagged, a default LAN port based VLAN tag will be prepended to the end user frames. The FCS field is recalculated. In case the end user frames are already tagged those will be matched against the “valid VLAN list”. Unmatched frames will be discarded.

VLAN features include

- Learning bridge
- Quality of service

The VLAN tag is a 4 byte tag, formatted as a regular IEEE802.1Q VLAN tag. For detailed information of VLAN tag structure, refer to IEEE802.1Q, section 9.3.

A VLAN tag will always be present on WAN links although not strictly needed in point to point applications. The benefit is interworking with bridges supporting LAN based VPNs and VLAN trunking with multiple end users sharing one SONET path.

### **Repeater Mode**

In the repeater mode the functionality is targeted at “transparent EtherNET transport”, with as few as possible provisioning items by the service provider.

The features of the repeater mode are:

- Point-to-point topology
- No MAC address learning
- No spanning tree protocol
- No quality of service
- No VLAN ingress filtering or classification for end-customer tagged or untagged frames
- No VLAN tag inserted on the WAN link for untagged frames
- Ethernet performance monitoring per port is still applicable
- Flow control is still applicable.



## Interworking Capabilities

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**Overview** The WaveStar TDM 2.5G/10G (2-Fiber) supports interworking with various Lucent PF-2000, WaveStar, and Metropolis family products, as well as with other vendors' products; for various applications and at various interface rates. The following table provides a high level summary of the interworking capabilities of the WaveStar TDM 2.5G/10G (2-Fiber) system.

| Product                                           | Interface Rate and Protection                                                   |
|---------------------------------------------------|---------------------------------------------------------------------------------|
| DDM-2000 OC-3 Release 15 (R15), DDM-2000 OC-12 R7 | OC-12 (UPSR - STS-1 path, 1+1, 0x1), OC-3 (1+1, 0x1)                            |
| FT-2000 OC-48 Lightwave System R9.1               | OC-48 (2F BLSR), OC-12 (1+1, 0x1), OC-3 (1+1, 0x1)                              |
| WaveStar BWM R4.0                                 | OC-192 (2F BLSR), OC-48 (2F BLSR, 1+1), OC-12 (1+1, 0x1), OC-3 (1+1, 0x1)       |
| Metropolis™ DMX (Release 1.1)                     | OC-48 (UPSR - STS-1 path), OC-12 (UPSR - STS-1 path, 1+1, 0x1), OC-3 (1+1, 0x1) |
| Tellabs TITAN 5500 R6                             | OC-12 (1+1, 0x1), OC-3 (1+1, 0x1)                                               |
| Fujitsu FLM-150 R14.2, FLM-600 R14.2              | OC-12 (1+1, 0x1), OC-3 (1+1, 0x1)                                               |
| Fujitsu FLM-2400 R15                              | OC-48 (UPSR - STS-1 path), OC-12 (UPSR - STS-1 path)                            |
| Nortel S/DMS R14.2                                | OC-48 (1+1, 0x1), OC-12 (1+1, 0x1), OC-3 (1+1, 0x1) (DCC pass through only)     |

Important:

Provisioning of SS bits may be required for interworking.

Interworking, and the level of interworking varies between products, and by product release.

DDM-2000 and FT-2000 software releases are TARP-compliant software releases.

Fixed east-west cabling is required for the FT-2000 system

The table is not all inclusive of all product releases that may allow interworking, including previous releases.

Contact your Lucent Account Executive to obtain the latest interworking information.

Topologies showing the various interworking capabilities of the WaveStar TDM 2.5G/10G (2-Fiber) are in this chapter. Information about DWDM applications using compatible optics, and hubbing applications is located earlier in this chapter.

**Interworking with BandWidth Manager and FT-2000 OC-48 Lightwave System**

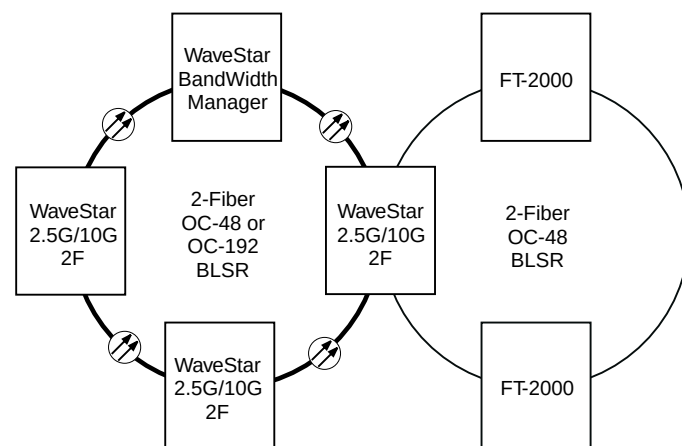
WaveStar TDM 2.5G/10G (2-Fiber) can participate in the same 2-fiber OC-48 BLSR with WaveStar Bandwidth Manager (Release 2.0 or later) and FT-2000 OC-48 Lightwave System (Release 9.1 or later).

WaveStar TDM 2.5G/10G (2-Fiber) can participate in the same 2-fiber OC-192 BLSR with WaveStar Bandwidth Manager Release 3.0 or later.

**Interworking with BandWidth Manager and FT-2000**

WaveStar BandWidth Manager, WaveStar TDM 2.5G/10G (2-Fiber), and FT-2000 interworking is a good solution for central offices and hub sites that terminate many BLSRs. Traffic can be transported over OC-48 and OC-192 2-fiber BLSRs from smaller central offices and hub sites to larger ones as shown in the following figure.

**Figure 2-17 WaveStar 2-Fiber OC-48 and OC-192 BLSR Compatibility**



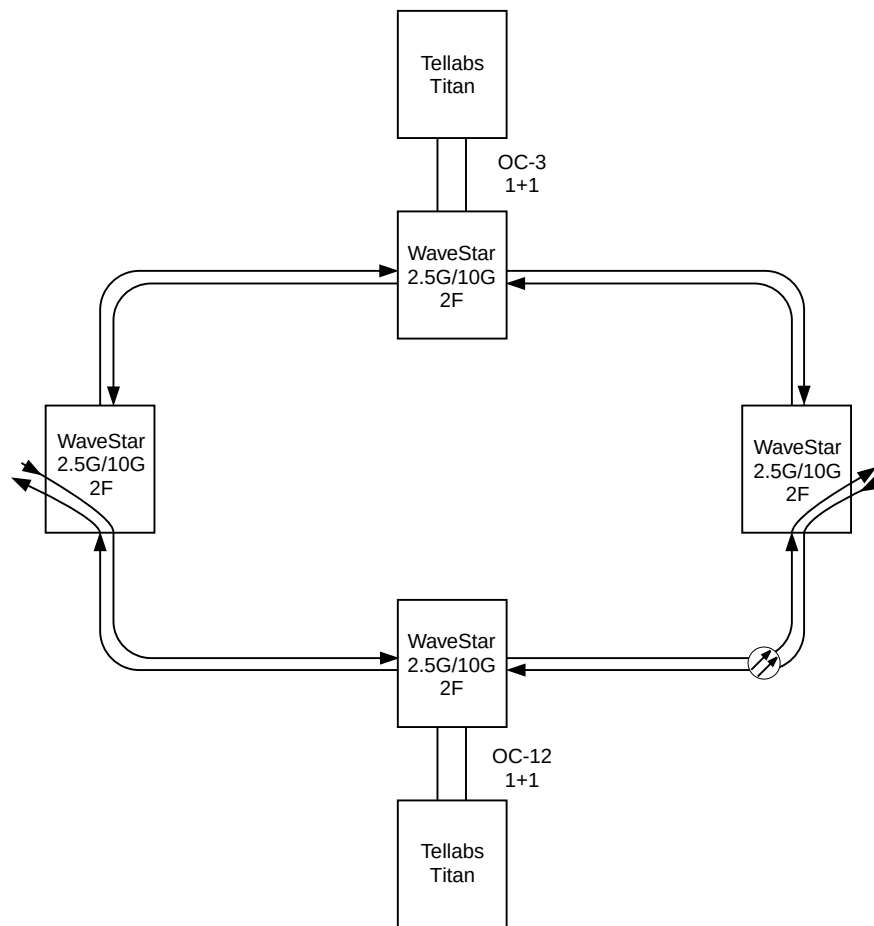
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### Interworking with Tellabs® Titan

The WaveStar TDM 2.5G/10G (2-Fiber) supports interworking with the Tellabs® Titan over OC-3 and OC-12 lines (0x1 and 1+1 protected) as shown in the figure below.

The Titan can serve as the TL1/X.25 GNE (Gateway Network Element) for WaveStar TL1- RNEs. The SNMS and the WaveStar CIT can be connected to the Titan via an OSI LAN and provide full support of remote WaveStar products. The WaveStar CIT supports TL1 cut-through access through Titan to remote DDM 2000s. TARP and Level 2 routing capabilities are required in the DDM 2000s.

**Figure 2-18 Interworking with Tellabs Titan over OC-3 and OC-12 1+1 Interfaces Example**



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As shown in the figure below, the WaveStar TDM 2.5G/10G (2-Fiber) supports interworking with the Fujitsu® FLM-150 R14.2 and FLM-600 R14.2 over OC-3 and OC-12 lines (0x1 and 1+1 protected).

**Figure 2-19 Interworking with Fujitsu FLM-150/FLM-600 over OC-3 and OC-12 (0x1 and 1+1 protected) Interfaces**  
**Example**



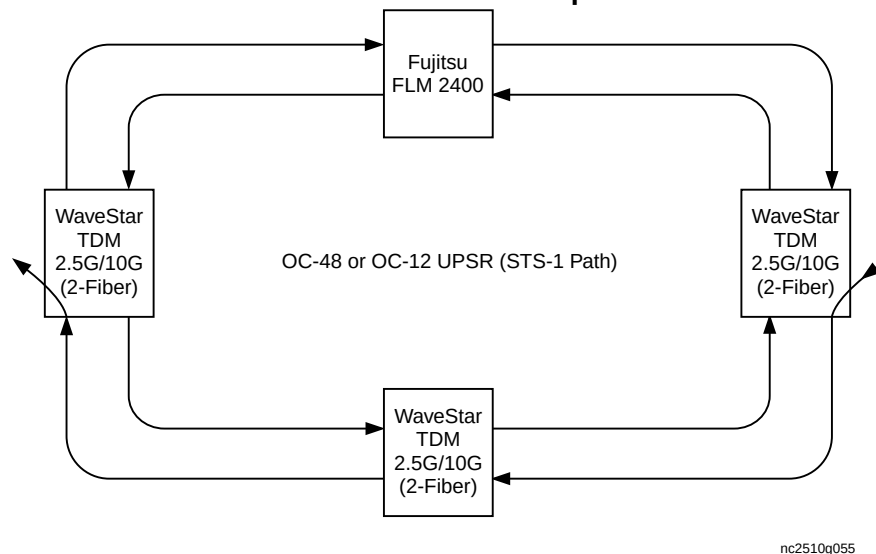
### Interworking with Fujitsu® FLM-2400

The figure below shows how the WaveStar TDM 2.5G/10G (2-Fiber) and the Fujitsu FLM-2400 Release 15 can interwork together in an OC-48 or OC-12 UPSR (STS-1 path switching) application.

The WaveStar CIT supports TL1 cut-through access to remote Fujitsu FLMs. TARP and OSI Level 2 routing capabilities are required in all FLMs. The use of WaveStar products as intermediate nodes has no adverse affects on FLM interworking capabilities currently supported by Lucent applications (FLM to FLM, FLM to DDM-2000, or OS to FLM

to DDM-2000).

**Figure 2-20 Interworking with Fujitsu FLM-2400 over OC-12 or OC-48 UPSR Interfaces Example**

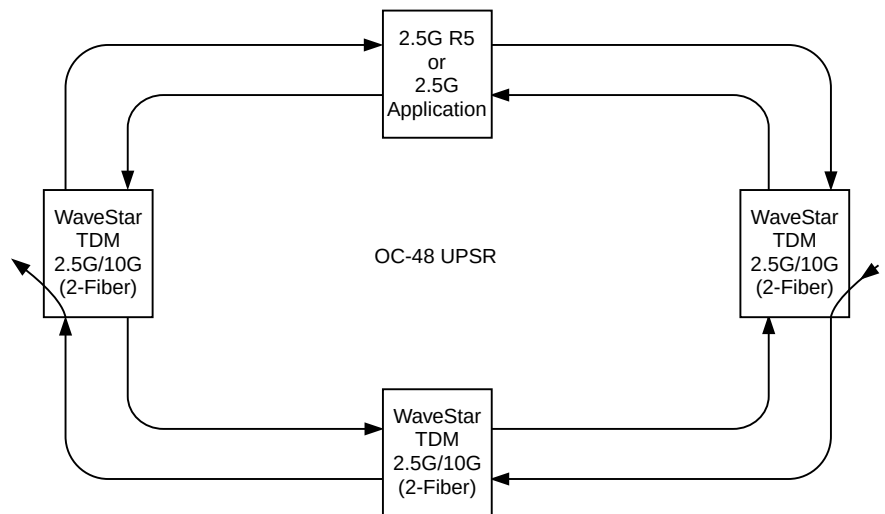


### Interworking with the 2.5G Application of the WaveStar TDM 2.5G/10G (2-Fiber)

As shown in the figure below, the WaveStar TDM 2.5G/10G (2-Fiber) supports interworking with the 2.5G application of the WaveStar TDM 2.5G/10G (2-Fiber) over OC-48 UPSRs (STS-1 path)

**Important!** When the 2.5G (low-speed or tributary) shelf of the WaveStar TDM 2.5G/10G (2-Fiber) system is used by itself, it is referred to as the 2.5G Application of the WaveStar TDM 2.5G/10G (2-Fiber).

**Figure 2-21 Interworking with the 2.5G Application of the WaveStar TDM 2.5G/10G (2-Fiber) Example**



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## DDM-2000 Pseudo Linear Interfaces

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**Overview** This configuration supports applications that multiplex low-speed DS1 traffic onto an OC-3 or OC-12 interface with WaveStar DCC compatibility.

In this application, shown in the figure on the following page, DDM-2000 supports an OC-3 (or OC-12) unidirectional path switched ring (UPSR) interface. The DDM-2000 high-speed OC-3 (or OC-12) UPSR fiber pairs are connected to WaveStar TDM 2.5G/10G (2-Fiber), but those ports (on a tributary I/O shelf) are provisioned as a linear (1+1) transmission protection group. Transmission protection is based on incoming line failures and not on individual path failures (as is done for UPSRs). The paths on such linear (1+1) interfaces can be cross-connected to any other port on the WaveStar TDM 2.5G/10G (2-Fiber).

You can connect and provision multiple DDM-2000s to a WaveStar TDM 2.5G/10G (2-Fiber) for this application, but each DDM-2000 must be in its own separate “single-node” UPSR. The DDM-2000 can be either collocated with or remote from the WaveStar TDM 2.5G/10G (2-Fiber).

Refer to the table below for a summary of WaveStar TDM 2.5G/10G (2-Fiber)'s pseudo-linear compatibility with DDM-2000.

**Table 2-2 DDM-2000 Pseudo-Linear Compatibility**

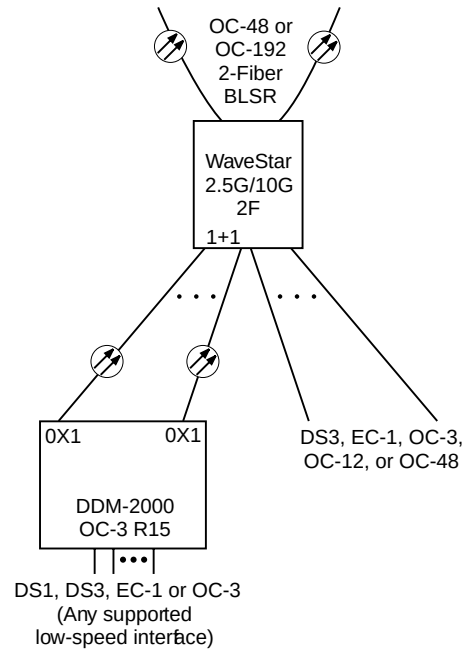
|                                       |                                                     | DDM-2000<br>TARP Releases                   |                                                | DDM-2000<br>OC-3 R15.0<br>and later,<br>FiberReach<br>R4.0 and<br>later        |
|---------------------------------------|-----------------------------------------------------|---------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------------|
|                                       |                                                     | UPSR<br>(VT1.5 XCONs)<br>with distinct DCCs | UPSR<br>(STS-N(c) XCONs)<br>with distinct DCCs | UPSR<br>(VT1.5/STS-<br>N(c) XCONs)<br>with linear<br>(1+1)<br>identical<br>DCC |
| <b>2.5G/10G (2F)</b>                  | Linear (1+1) transmission<br>with distinct 0x1 DCCs | yes                                         | yes                                            | -                                                                              |
| <b>2.5G/10G (2F)<br/>R4 and later</b> | Linear (1+1) transmission and<br>DCC                | -                                           | -                                              | yes                                                                            |

#### **DCC provisioning**

DDM-2000 supports DCC on both high-speed UPSR interfaces by default. The DDM-2000 DCCs default to User-Side and Network-Side, respectively. Both DDM-2000 DCCs should be provisioned to Network-Side. WaveStar TDM 2.5G/10G (2-Fiber) Release 4 and later requires DDM-2000 OC-3 R15s "identical DCC" feature on the DDM-2000 high-speed UPSR interface. DDM-2000's "identical DCC" feature supports linear (1+1) DCC and is compatible with WaveStar's default DCC assignment for a linear (1+1) protection group. The WaveStar linear (1+1) DCC defaults to User-Side.

**Example** The figure below shows a diagram of the WaveStar TDM 2.5G/10G (2-Fiber) interfacing with the DDM-2000, which is operating as a UPSR with low-speed interfaces.

**Figure 2-22 Linear Interface to a DDM-2000 OC-3 or OC-12 UPSR**

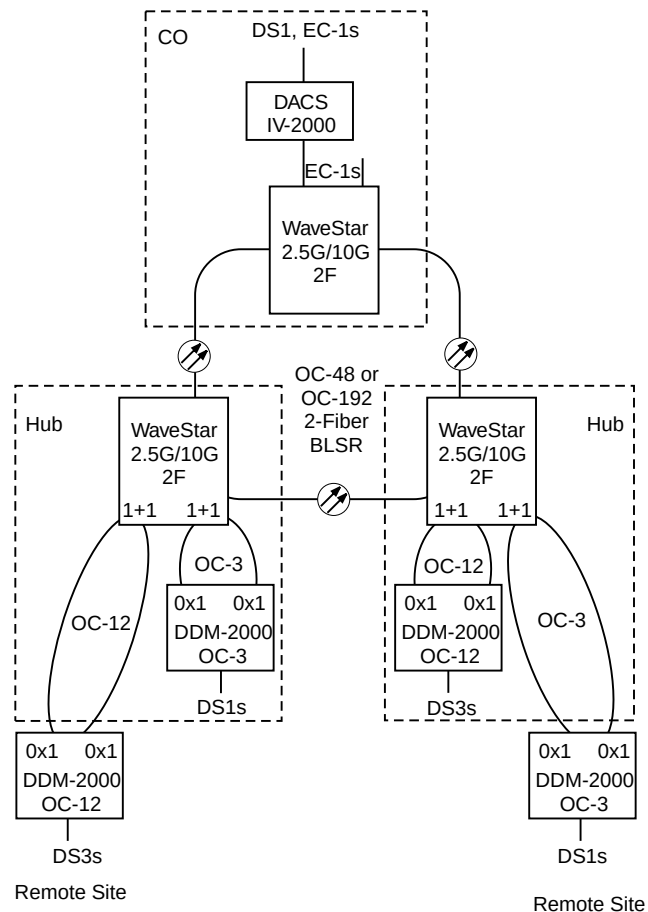


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### Example with DACS IV-2000

The following figure shows a configuration that can be used in conjunction with DACS IV-2000 in a larger CO. The DACS IV-2000 is used to groom DS1 traffic. One or more STS-1s on the BLSR are dedicated to the DS1 add/drop traffic at each hub site. The DACS IV-2000, which supports VT1.5 granularity, rearranges the DS1 traffic, as necessary, on EC-1 interfaces (for example, for efficient use of EC-1 interfaces to a collocated 5ESS Switch).

**Figure 2-23 DS1 Grooming with DACS IV-2000**



## Transporting DDM-2000 Rings Over a WaveStar TDM 2.5G/10G (2-Fiber) Ring

**Overview** If a linear chain is geographically close enough to a backbone system, then the linear chain can be deployed as a ring by connecting both ends to the backbone. Traffic from the newly-formed ring can be transported by the backbone system. This is referred to as ring transport.

### DDM-2000 OC-3/OC-12 ring transport

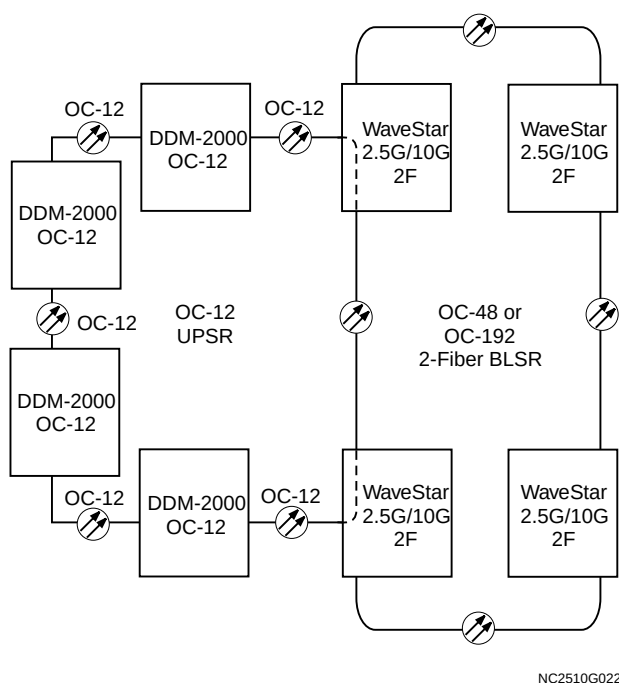
A DDM-2000 OC-3 or OC-12 ring is an end-to-end, self-healing ring providing path-switched protection of DS1 or other services.

A WaveStar TDM 2.5G/10G (2-Fiber) ring carrying backbone traffic can be used to transport a span of a DDM-2000 OC-3 or OC-12 ring. The figure below shows how WaveStar TDM 2.5G/10G (2-Fiber) OC-12 low-speed interfaces can provide transport for a DDM-2000 OC-12 ring. The WaveStar TDM 2.5G/10G (2-Fiber) ring provides 12 STS-1 equivalents of bandwidth to transport the DDM-2000 ring.

### DDM-2000 OC-12 ring transport example

In the figure below, a WaveStar TDM 2.5G/10G (2-Fiber) ring is used to transport a span of a DDM-2000 OC-12 ring.

**Figure 2-24 DDM-2000 OC-12 Ring Transport**





## Path-in-Line

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**Overview** Path-in-line is a configuration in which path-switched, ring traffic is carried within the bandwidth of line-switched rings. The path for a signal is the connection between the point where its SONET frame is assembled and the point where it is disassembled. Figure 2-25 illustrates a configuration in which traffic is protected by both the loopback protection switching capabilities of a WaveStar TDM 2.5G/10G (2-Fiber) BLSR and the path switching protection capabilities of DDM-2000 UPSRs (unidirectional path-switched rings). This example shows the following types of OC-3 interface connections between a WaveStar TDM 2.5G/10G (2-Fiber) ring and DDM-2000 OC-3 rings:

- Dual-homed ring (0x1) interface connections to a WaveStar TDM 2.5G/10G (2-Fiber) ring at Nodes A and E
- Single-homed ring (0x1) interface connections to a WaveStar TDM 2.5G/10G (2-Fiber) ring at Nodes B and C

The subtending DDM-2000 can be collocated with or remote from the WaveStar TDM 2.5G/10G (2-Fiber) nodes.

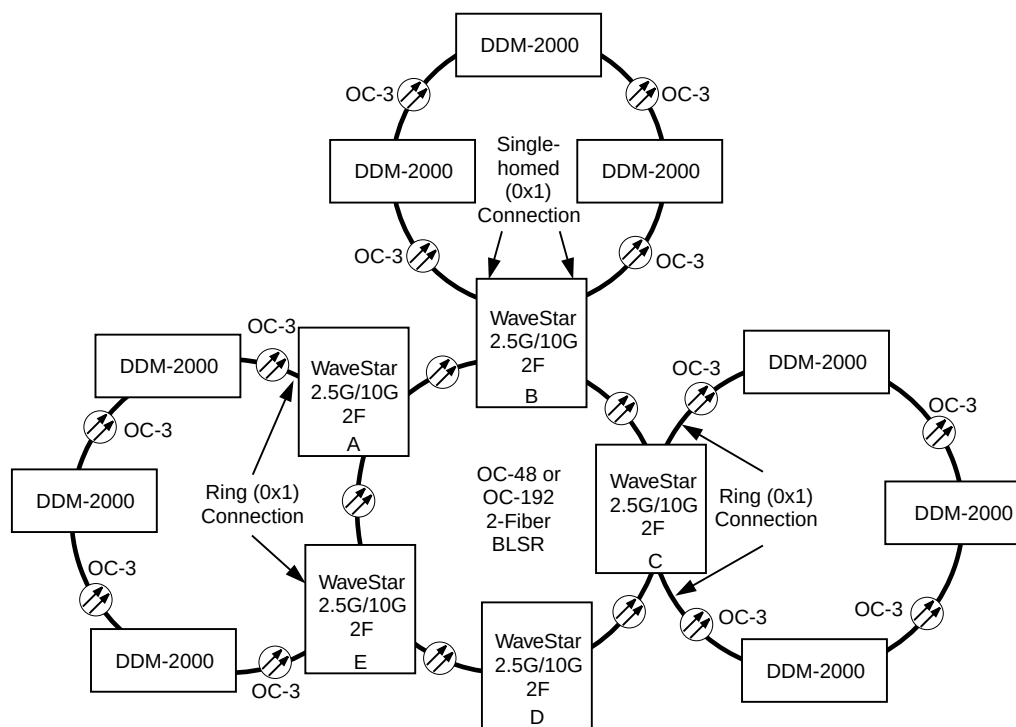
**Dual-homed vs.  
single-homed**

In a dual-homed ring 0x1 interface configuration, one ring connects to the other by means of a 0x1 OC-3 or OC-12 interface connection at each of two WaveStar TDM 2.5G/10G (2-Fiber) nodes. In a single-homed ring 0x1 interface configuration, one ring connects to the other by means of two 0x1 OC-3 or OC-12 interface connections to a single WaveStar TDM 2.5G/10G (2-Fiber) node.

Although the WaveStar TDM 2.5G/10G (2-Fiber) OC-3 or OC-12 interface is unprotected in each of these cases, the DDM-2000 automatically performs a nonrevertive path protection switch if one of the interfaces fails.

**Path-in-line example 1** The figure below shows single-homed and dual-homed configurations. WaveStar TDM 2.5G/10G (2-Fiber) transports path-in-line traffic and can terminate the path-in-line traffic on OC-12 or OC-48 UPSRs (STS-1 path) itself. Yet, in the figure below all path-in-line traffic originates and terminates at the DDM-2000 nodes only. The typical application of this topology is used for VT-level path switching for DS1 traffic.

**Figure 2-25 Dual-homed and Single-homed Path-in-line Connections**



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**Bandwidth management**

In the example in Figure 2-25, the DDM-2000 UPSR provides STS-1 and VT1.5 bandwidth management. This capability enables you to designate one or more bandwidth rails (for example, an STS-1, STS-3, or STS-12 bandwidth) on the WaveStar TDM 2.5G/10G (2-Fiber) ring for different types of service on the DDM-2000 OC-3/OC-12 rings. Because bandwidth management is at the STS-1 and VT1.5 level, you can choose to completely fill a particular bandwidth rail (for example, one STS-3 rail can hold up to 3 STS-1 or 84 DS1 equivalent signals). You can also add, drop, or pass through service at any node. This bandwidth management capability, in essence, allows you to transport virtual OC-3 or OC-12 UPSRs within the OC-48 or OC-192 BLSR bandwidth.

It is generally recommended that the same STS-1s be assigned at every node in a BLSR to support each virtual path-in-line UPSR, for example, STS-1s 1-3 add/dropped or passed through at each BLSR node. The path-in-line approach allows you to add and drop DS1s on the same STS-1s at different sites, thus facilitating efficient bandwidth utilization, for example, to groom all DS1 switched voice traffic onto a minimum number of STS-1s to be terminated as EC1s on a 5ESS switch.

Alternatively, if there is sufficient DS1 traffic demand from each site on a BLSR and/or adequate STS-1 capacity on the BLSR, an STS-1 (or multiple STS-1s) can be dedicated for the DS1 traffic to be added and dropped at each BLSR node. In that case, the path-in-line approach is not necessary.

**Non-preemptible Unprotected Traffic (NUT)**

Preemptible protection access capacity in a BLSR (STS-1s 97-192 in an OC-192 BLSR, STS-1s 25-48 in an OC-48 BLSR) must not be used for path-in-line traffic because the traffic would be vulnerable to even a single failure. Path-in-line traffic must be carried either by the working (service) capacity (STS-1s 1-96 in an OC-192 BLSR, STS-1s 1-24 in an OC-48 BLSR) or by capacity provisioned for Non-preemptible Unprotected Traffic (NUT, also known as Non-Preemptible Protection Access, NPPA). NUT effectively doubles the capacity available for path-in-line traffic or other traffic that does not need to be protected by the BLSR but that must not be preempted by BLSR protection switching.

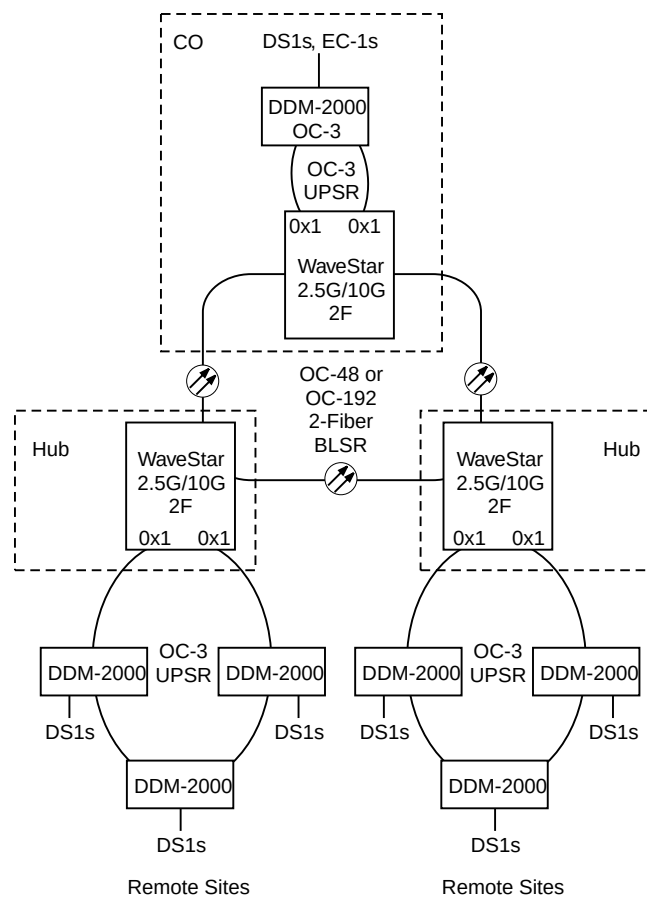
As an example, two STS-1 circuits of path-in-line traffic could be carried by two working tributaries; or instead, they could be carried by one STS-1 working tributary provisioned as an NUT tributary and its

corresponding STS-1 protection tributary which also becomes an NUT tributary. Using the two NUT tributaries saves the capacity of one working tributary for traffic that does require BLSR protection. With additional STS-1 tributaries provisioned as NUT to carry more path-in-line traffic, the savings increases. Also, more path-in-line traffic can be carried in one BLSR than by using the working tributaries alone.

### Path-in-line example 2

The figure below shows how a DDM-2000 OC-3 shelf with OC-12 optics in a small central office (CO) can be used to terminate and groom DS1 traffic from remote DDM-2000s (e.g., for efficient utilization of the EC1 interfaces to a collocated 5ESS Switch). The DDM-2000 OC-3 shelf in the CO terminates multiple OC-3 path-in-line rings with VT1.5 granularity.

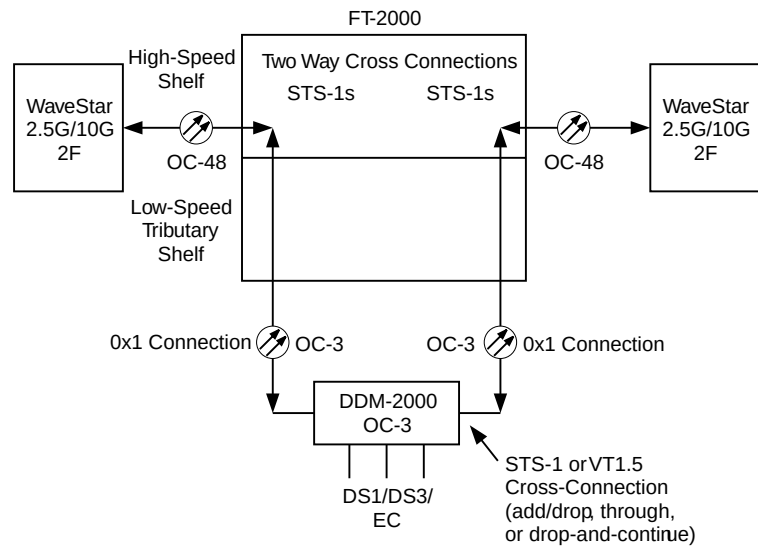
**Figure 2-26 Terminating and Grooming DS1 Traffic from Remote DDM-2000s**



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**Path-in-line example 3**

The figure below illustrates a single-homed (0x1) interface connection between an FT-2000 and a DDM-2000. It also shows two-way cross-connections on an FT-2000 OC-48 Add/Drop-Rings Terminal and an STS-1 or VT1.5 cross-connection on a DDM-2000 Multiplexer. DDM-2000 low-speed interfaces to WaveStar TDM 2.5G/10G (2-Fiber). The FT-2000 and the WaveStar TDM 2.5G/10G (2-Fiber) nodes shown in the figure are interworking within the same BLSR.

**Figure 2-27 Path-In-Line Example with FT-2000**

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## SDH Transport

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**Overview** Although WaveStar TDM 2.5G/10G (2-Fiber) is a SONET system, supporting only SONET interfaces, SONET Performance Monitoring (PM), and so on, the system can transport SDH signals over SONET ports and can use the same cross-connections for SONET or SDH signals. An STS-3 cross-connection can be used for either three VC-3 signals or for a VC-4 signal (STM-1) transported over OC-3, OC-12, OC-48, or OC-192 ports. An STS-48 cross-connection can be used either for VC-3, VC-4, and VC-4-4c or for a VC-4-16c signal (STM-16) transported over OC-48 or OC-192 ports.

**Note** With older embedded-base SDH equipment, provisioning of SS-bits may be required for interworking, refer to the provisionable SS-bits feature information in Chapter 7.



## Dual Node Ring Interworking

---

|                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                  | <p>Dual node ring interworking (DRI) is a configuration that provides path-level protection for selected STS-N circuits that are being carried through two rings. Protection for the route between the two rings is provided by interconnecting the rings at two places (see Figure 2-28). Each circuit that is provisioned with DRI protection is dual-homed, meaning it is duplicated and subsequently terminated at two different nodes on a ring. The two interconnecting nodes in each ring do not need to be adjacent.</p>                                                                                                                                      |
| <b>DRI protection</b>            | <p>The self-healing mechanisms of the two rings remain independent and together protect against simultaneous single failures on both rings (not affecting the interconnections). The DRI configuration additionally protects against failures in either of the interconnections between the rings, whether the failure is in a facility or an interconnection node.</p>                                                                                                                                                                                                                                                                                               |
| <b>Ring interworking</b>         | <p>All WaveStar TDM 2.5G/10G (2-Fiber) tributary (linear) interfaces (DS3, EC-1, OC-3, OC-12, and OC-48) support DRI. The WaveStar TDM 2.5G/10G (2-Fiber) high-speed ring can be an OC-48 or OC-192 2-Fiber BLSR. A WaveStar TDM 2.5G/10G (2-Fiber) ring supports DRI with 2-fiber BLSRs, UPSRs, and rings using the following products:</p> <ul style="list-style-type: none"> <li>• WaveStar TDM 2.5G/10G (2-Fiber)</li> <li>• WaveStar BandWidth Manager</li> <li>• DDM-2000 OC-3</li> <li>• DDM-2000 OC-12</li> <li>• FT-2000 ADR</li> </ul> <p>Additionally, there can be intermediate network elements in the interconnection routes between the two rings.</p> |
| <b>BLSR-to-BLSR interworking</b> | <p>In the BLSR, a bidirectional DRI-protected circuit to and from the terminating node is added and dropped at both a primary node and a secondary node, both of which interconnect with the other ring. The primary and secondary nodes are defined and provisioned on a per-circuit basis.</p>                                                                                                                                                                                                                                                                                                                                                                      |

**BLSR drop and continue**

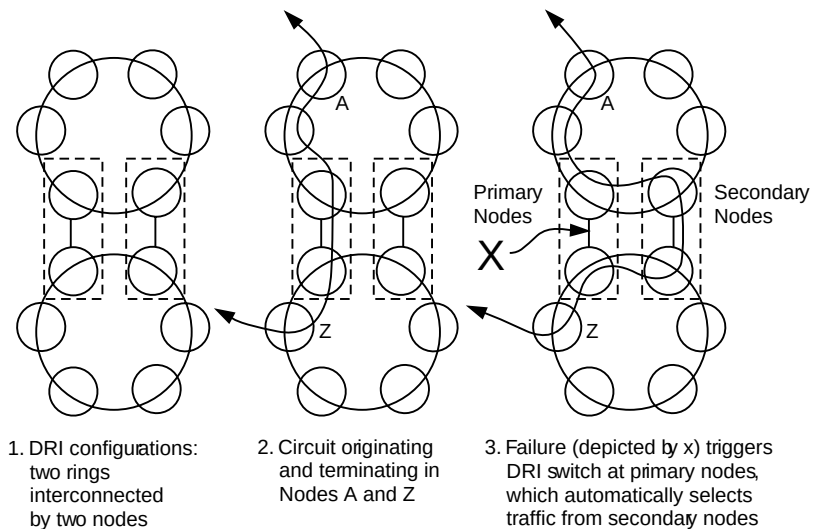
WaveStar TDM 2.5G/10G (2-Fiber) supports the drop and continue method of DRI, in which the primary node is between the terminating node and the secondary node and is the node that performs the drop-and-continue and path-selection functions. The primary node drops the circuit in the direction of the other ring and also continues (bridges) the circuit to the secondary node. The secondary node drops the circuit in the direction of the other ring and adds the circuit from the other ring in the direction of the terminating node. The primary node either adds the circuit received on its tributary interface from the other ring or passes through the duplicate signal received on the line from the secondary node, depending on standards-compliant path selection criteria.

**BLSR to BLSR protection switching example**

The figure below illustrates a failure of the interconnection to a primary node at the point labeled “X” in the figure. A failure in the route from Node A to Node Z results in a DRI switch at the primary node in the lower ring. A failure in the route from Node Z to Node A results in a DRI switch at the corresponding primary node in the top ring.

A DRI protection switch in a WaveStar TDM 2.5G/10G (2-Fiber) occurs in  $\leq 50$  milliseconds (not counting the detection time) plus a provisionable hold-off time nominally of 100 milliseconds.

**Figure 2-28 Dual Ring Interworking Protection**



NC-2.5GAPOG-006



**Types of connections**

The two types of connections shown in Figure 2-29 are the following:

- A direct intraoffice connection between the primary nodes, Node 1 and Node 2, at the first central office (CO 1).
- An optically extended, direct secondary connection between the secondary nodes (Node 3 at the second central office (CO 2) and Node 4 of the DDM-2000 OC-3 ring). This type of connection is achieved through the OC-3 low-speed interfaces at the interconnected nodes and can go through other equipment.

Both types of connections can be used in either primary or secondary nodes.

**DRI protection switching**

Protection switching results from specific failure conditions.

**EC-1, OC-3, OC-12, OC-48, or OC-192 SONET interface**

WaveStar TDM 2.5G/10G (2-Fiber) DRI protection switching results from the following failure conditions (grouped by priority, from highest to lowest):

- LOP-P, AIS-P, or UNEQ-P
- Excessive STS path BER
- STS PDI-P
- STS signal degrade

**DS3 electrical interface**

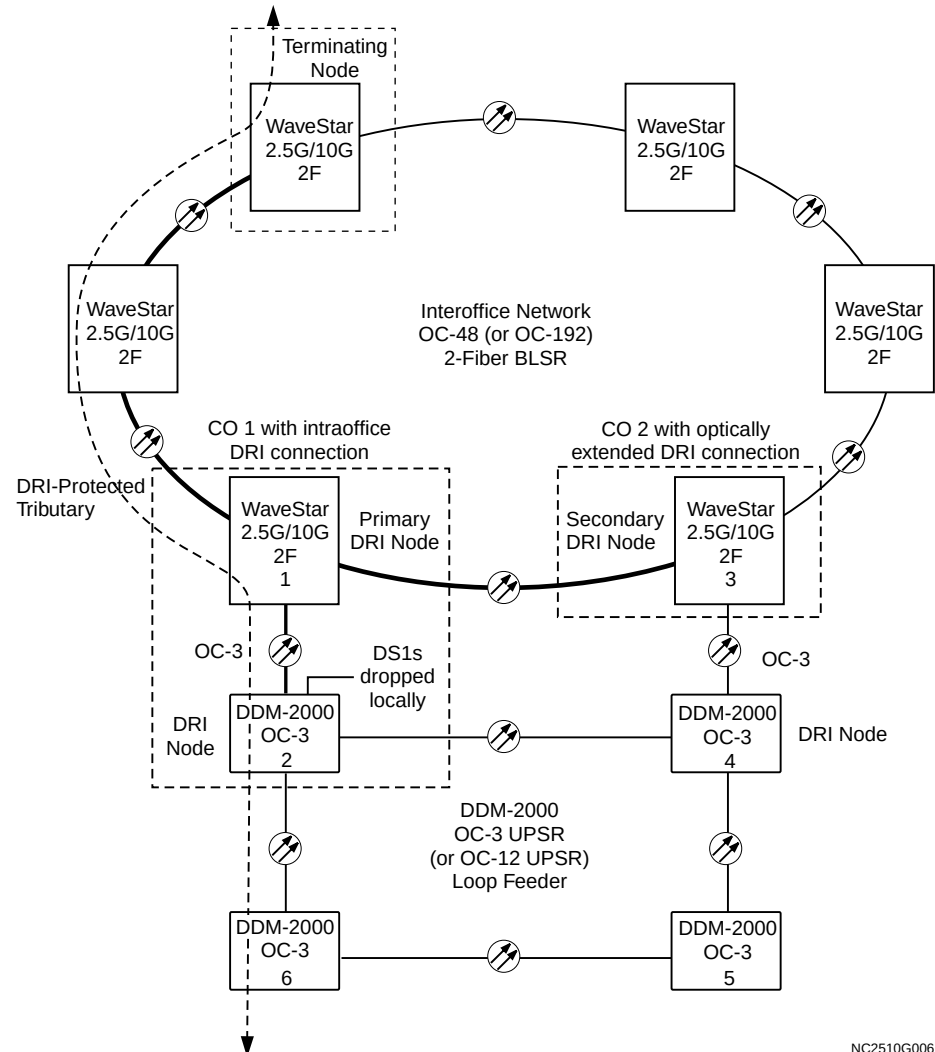
For DS3 interfaces, protection switching results from the following failure conditions (grouped by priority, from highest to lowest):

- LOS or OOF
- AIS

**BLSR to UPSR  
interworking**

The following figure illustrates a DRI configuration that uses OC-3 interfaces between a WaveStar TDM 2.5G/10G (2-Fiber) BLSR and a DDM-2000 OC-3 (or OC-12) UPSR.

**Figure 2-29 DRI Between WaveStar TDM 2.5G/10G (2-Fiber) BLSR and DDM-2000 UPSR**



NC2510G006

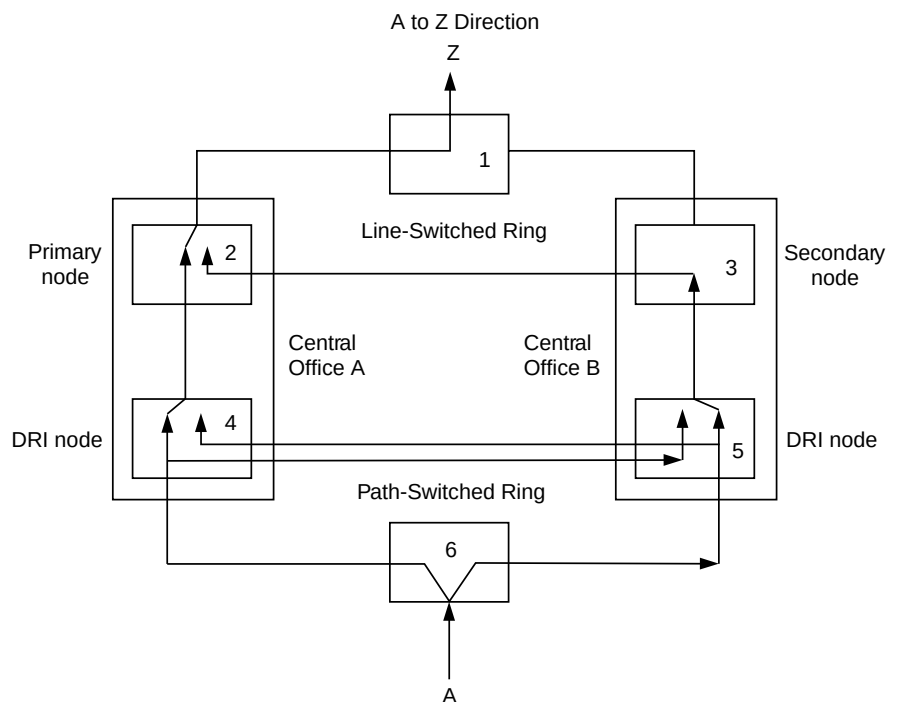
### BLSR to UPSR DRI circuit examples

Figure 2-30 and Figure 2-31 show examples of a DRI configuration between a WaveStar TDM 2.5G/10G (2-Fiber) BLSR and a DDM-2000 unidirectional path-switched ring (UPSR). Figure 2-30 illustrates the 1-way circuit labeled A to Z Direction, in which the line-switched ring accepts two identical traffic inputs: one to the primary node (Node 2) and one to the secondary node (Node 3). In this case, there is no failure, so the primary node (Node 2) selects the traffic received by its own tributary interface. However, if a failure were to occur on the incoming signal, the primary node would automatically perform a DRI protection switch and select the signal received from the secondary node (Node3).

### BLSR to UPSR DRI traffic flow example: A-Z

The figure below illustrates the A-to-Z direction of traffic in a DRI configuration between a WaveStar TDM 2.5G/10G (2-Fiber) BLSR and a DDM-2000 UPSR.

**Figure 2-30 1-Way Circuit in Dual Interworked Rings: A to Z Direction**



NC-2.5GAPOG-007

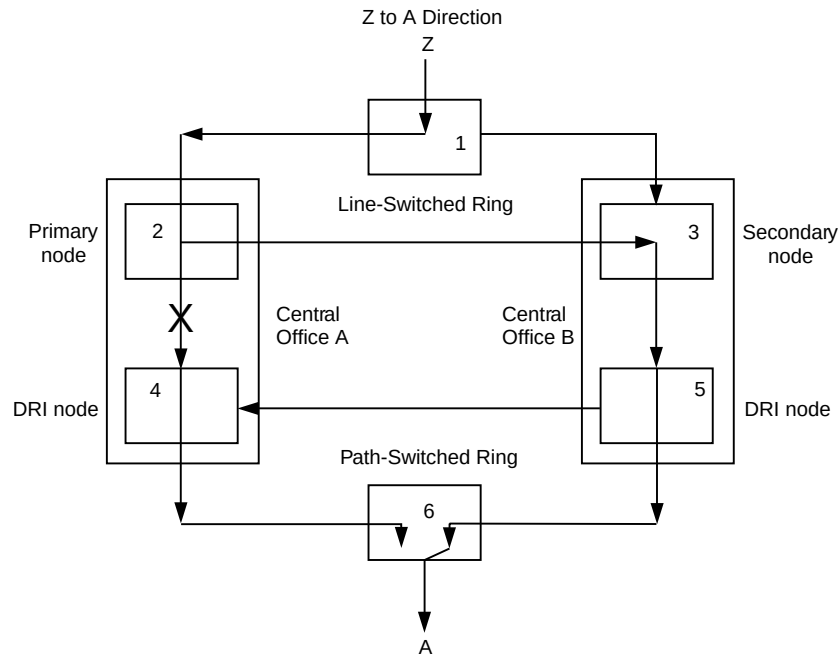
**BLSR to UPSR  
protection-switched DRI  
traffic flow**

For the 1-way circuit labeled Z to A Direction (see Figure 2-31), the line-switched ring provides two identical traffic outputs: one from the primary node (Node 2) and one from the secondary node (Node 3). The primary node (Node 2) bridges (duplicates) the traffic by using its drop-and-continue capability. A failure at the connection between the primary nodes (Node 2 and Node 4) causes the path-switched ring to initiate a protection switch at Node 6. Node 6 automatically selects the traffic received from the secondary node (Node 5).

**BLSR to UPSR  
DRI traffic flow  
example: Z-A**

The figure below illustrates the Z-to-A direction of traffic in a DRI configuration between a WaveStar TDM 2.5G/10G (2-Fiber) BLSR and a DDM-2000 UPSR.

**Figure 2-31 1-Way Circuit in Dual Interworked Rings: Z to A Direction**



NC-2.5GAPOG-008



## Folded Rings

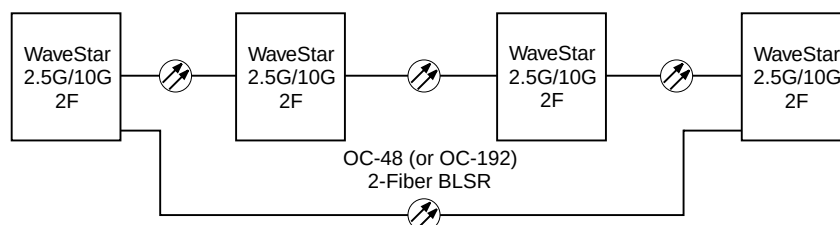
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**Overview** A folded ring is a ring that uses a linear cable route between its end nodes. All traffic passes through the same geographical locations, perhaps even in the same cable sheaths between nodes, instead of through diverse locations. This configuration is useful for networks in which not all locations are ready to be connected. In many cases, the initial network traffic demand suggests a linear add/drop chain because of short-term service needs between some of the nodes.

Later, the network traffic demand can evolve into a ring when there is a need for service and fiber facilities to other nodes in the network. It is easier to evolve the linear add/drop chain into a full ring configuration if a folded ring is used in the nodes that have this short-term service need. Folded rings have upgrade, operational, and self-healing advantages over other topologies for this type of evolution.

**Folded ring example** The figure below shows a ring deployed geographically to act as a linear add/drop chain.

**Figure 2-32 Simple Folded Ring**

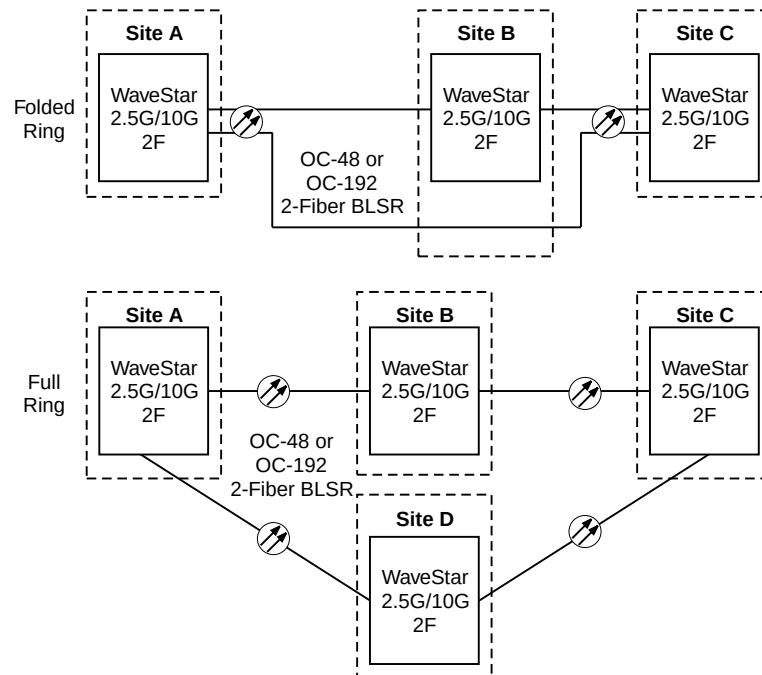


**Reliability** A folded ring configuration protects traffic from node failures. It cannot protect against a fiber cut if all the fibers are in the same cable. However, it does enhance the reliability of a linear route until there is enough traffic to warrant expanding to full rings.

**Growth example**

The top part of the figure below shows a network deployed as a folded ring for Sites A, B, and C. If the distance between Site A and Site C in the folded ring is too great for the OC-48 or OC-192 span, a second system (not shown) could be placed at Site B to serve as a 0% add/drop repeater.

The bottom part of the figure below shows the ring expanded at a later time into a full ring by adding Site D. Note that Site D is a separate system, and cannot be located in the Site B system.

**Figure 2-33 Folded Ring Evolution**

NC2510G008



# Multiple Rings

---

## **Overview** A single node can support multiple rings

1

. For instance, to increase network capacity and reliability, you can add an OC-192 BLSR into configurations of existing OC-48 BLSRs. WaveStar TDM 2.5G/10G (2-Fiber) has the capability to terminate and cross-connect circuits between multiple BLSRs (OC-192 or OC-48) and UPSRs (OC-48 or OC-12), significantly reducing the need for low-speed circuit packs and interfaces. In multiple ring applications, the WaveStar TDM 2.5G/10G (2-Fiber) cross-connects circuits between OC-48 and OC-192 ring interfaces internally by means of its STS-1 granularity TSI capability.

The OC-192 lines of the WaveStar TDM 2.5G/10G (2-Fiber) are associated with a node in an OC-192 BLSR ring, and the OC-48 lines of the WaveStar TDM 2.5G/10G (2-Fiber) are associated with one or more nodes in one or more OC-48 BLSR rings. The circuit is protected by the BLSR protection switching within each BLSR ring independently.

The OC-48 lines of the WaveStar TDM 2.5G/10G (2-Fiber) are associated with a node in one or more OC-48 UPSR rings, and the OC-12 lines of the WaveStar TDM 2.5G/10G (2-Fiber) are associated with one or more nodes in one or more OC-12 UPSR rings. The circuit is protected by the path protection switching within each node independently.

## **OC-192 BLSR as a backbone or “super-trunk”**

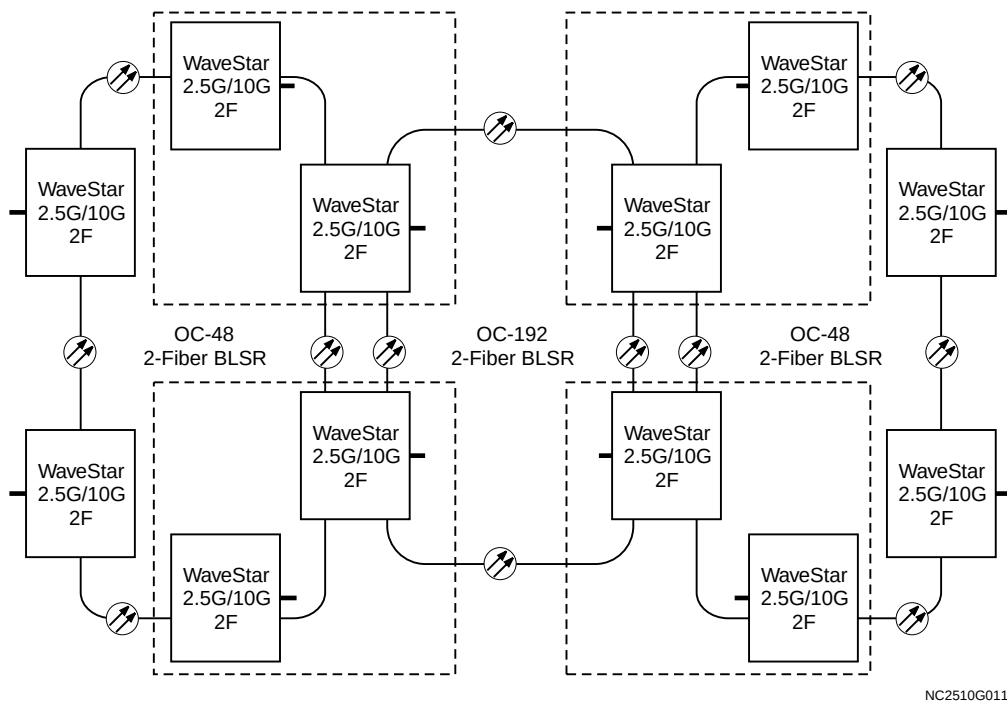
In a backbone or “super-trunk” topology, the OC-192 ring serves as the central core of the network. You can use an OC-192 BLSR as a backbone interworked with OC-48 BLSRs. As more capacity is needed and as more fibers are available, you can add up to 16 nodes (the maximum according to the SONET standard) to an OC-192 BLSR.

---

1This feature is available in Release 5.1.x and later releases in which the numbering scheme is x.1.x, where x is a number between 0 and 9. This feature is unavailable in Release 5.0.x and later releases in which the numbering scheme is x.0.x.

**Backbone example** The following figure shows an OC-192 BLSR used as a backbone for two OC-48 BLSRs.

**Figure 2-34 OC-192 Backbone BLSR with 2.5G/10G Subtending OC-48 BLSRs**

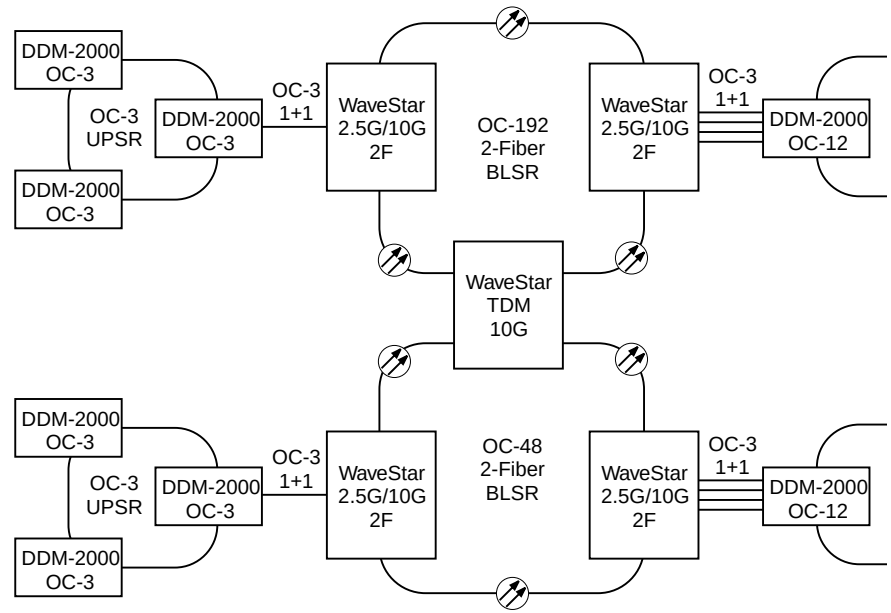




### Backbone example with subtending DDM-2000

The figure below shows an OC-192 BLSR used as a backbone for an OC-48 BLSR and subtending DDM-2000 rings connected by means of OC-3 linear (1+1) and OC-12 UPSR interfaces.

**Figure 2-35 OC-192 BLSR as Backbone for an OC-48 BLSR with Subtending DDM-2000 Rings**



# Mesh Networks

---

**Overview** A mesh network is a common topology (especially in data networks) that allows multiple routes between hosts in a network. Mesh topologies are relatively immune to bottleneck and component failure. Due to the variety of paths, traffic can be routed around failed or busy components.

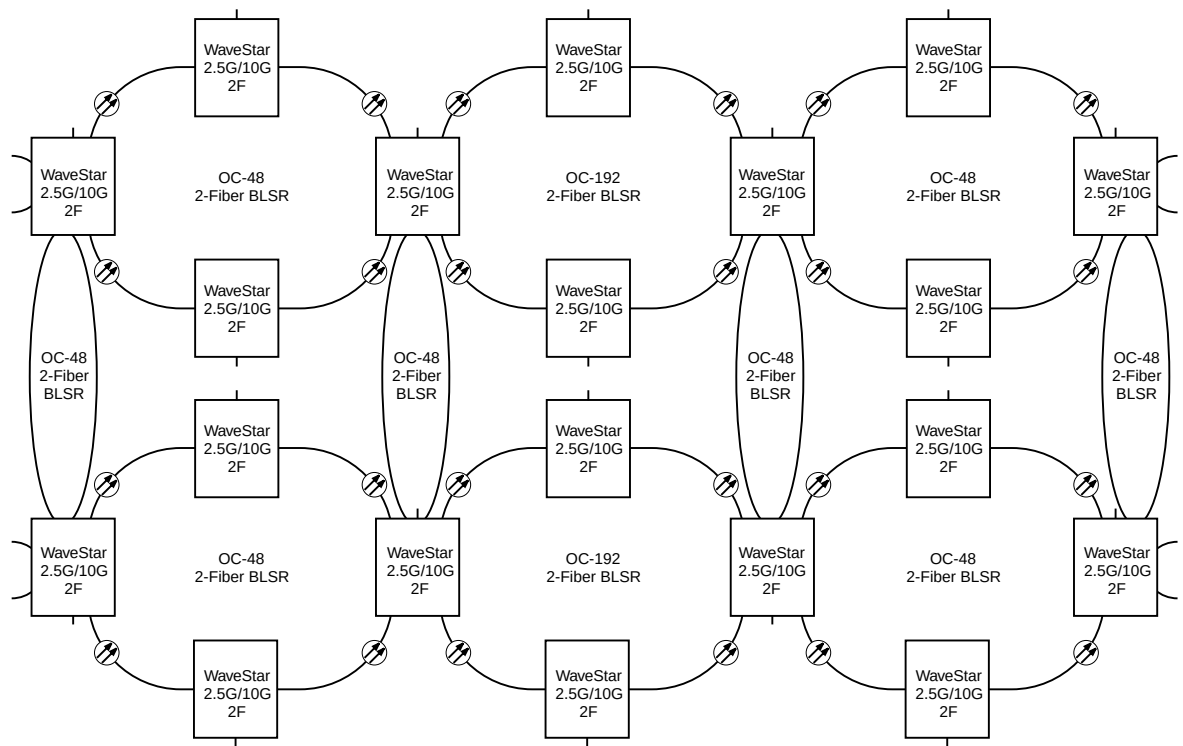
**Creating a mesh network** With the WaveStar TDM 2.5G/10G (2-Fiber), you can interconnect adjoining pairs of rings to create mesh networks with BLSR protection in a cost-effective manner. For additional protection, you can use dual node ring interworking (DRI) to support two interconnections between each pair of rings.

By using WaveStar TDM 2.5G/10G (2-Fiber) add/drop multiplexers at the points of interconnection of multiple rings, a single network element can route traffic from a node in one ring to a node in the other ring. The mesh can include linear interfaces, for example, optical 1+1 or electrical 1xN linear systems, as well as BLSRs and UPSRs.

### Multiple interconnected rings

The figure below shows multiple, interconnected rings creating a mesh network.

**Figure 2-36 Multiple, Interconnected Rings**



## Restoration Through Protection Access

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**Overview** Protection access is the capability or practice of accessing the protection capacity of a ring in order to carry extra traffic. If a failure occurs, preemptible protection access capacity is taken back for normal protection use by the ring.

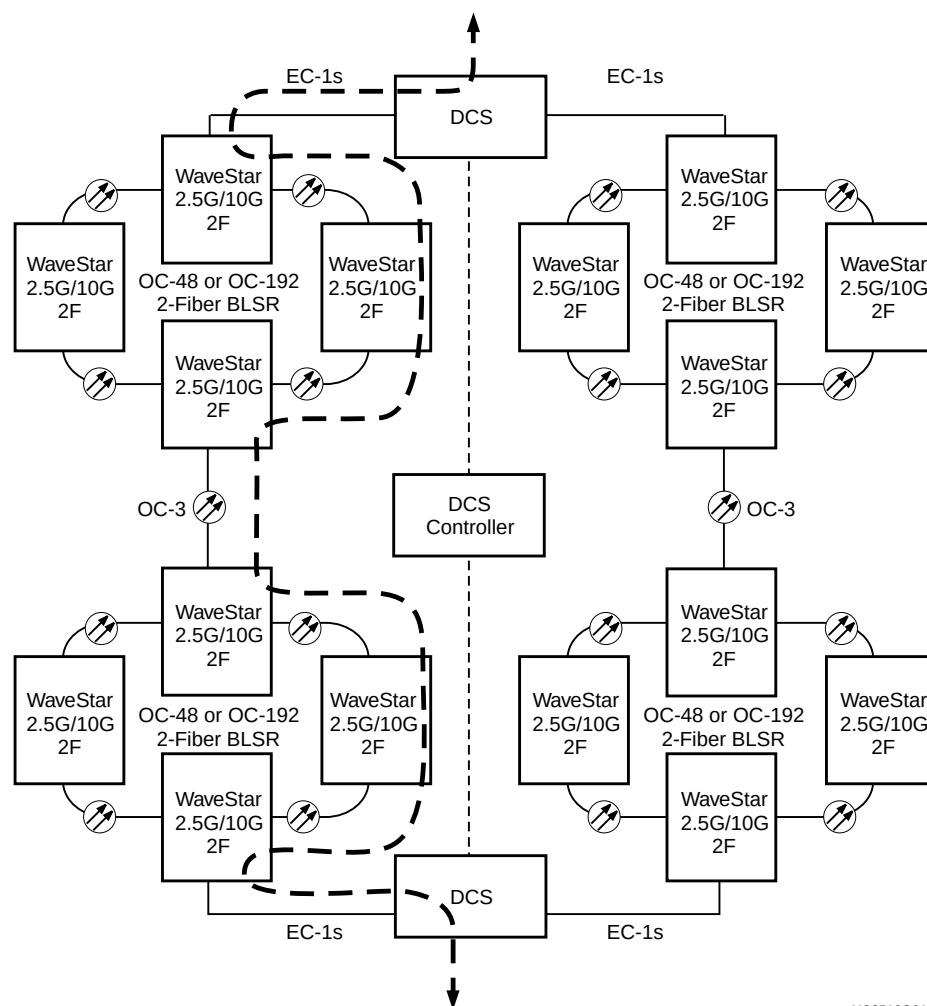
WaveStar TDM 2.5G/10G (2-Fiber) offers both Preemptible Protection Access and Non-preemptible Unprotected Traffic (also known as Non-Preemptible Protection Access) as an economical way to obtain more capacity for traffic that does not need to be protected. Typically, a customer would temporarily provision the capacity as non-preemptible when it is more important for the restored traffic to remain uninterrupted in case of a subsequent failure than it is for the working traffic on the corresponding tributary to remain protected during the restoration. Figure 2-37 and Figure 2-38 show examples of DCS-based configurations for restoration through protection access.

**DCS-based restoration** In the figure below, WaveStar TDM 2.5G/10G (2-Fiber) is used with a DCS and a DCS controller to restore network traffic by accessing protection capacity. If a failure occurs between central offices, the DCS controller receives alarms and sends cross-connect commands to the DCSs in the network to reroute traffic around the failure. The protection channels are used to carry rerouted traffic until the failure is fixed and the regular route is restored.

**Protection access example**

The figure below shows the path of DCS-protected traffic using the working capacity of two WaveStar TDM 2.5G/10G (2-Fiber) BLSRs.

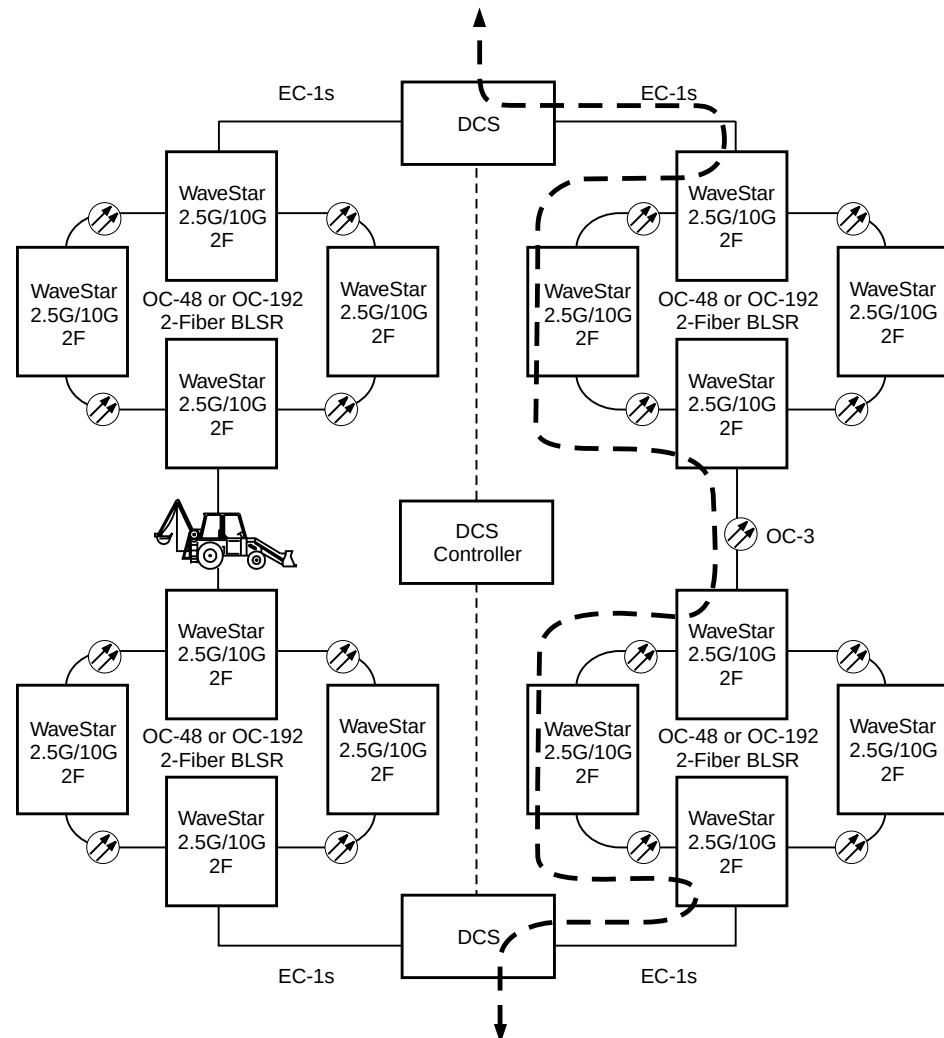
**Figure 2-37 DCS-Based Network Restoration Using Protection Access**



NC2510G018

**Restoration** The figure below shows an example of DCS-protected traffic being restored over the protection capacity of two WaveStar TDM 2.5G/10G (2-Fiber) BLSRs.

**Figure 2-38 Restoration Over Protection Capacity**



NC2510G019



## Loop Feeder

---

**Overview** The “loop” is typically the wiring and associated equipment that connect the devices of the subscribers or users to the central office (CO). The equipment in the CO or in outside buildings that moves the signals into and out of the CO is loop feeder equipment. The WaveStar TDM 2.5G/10G (2-Fiber) supports the loop feeder equipment from within the CO building or from within a controlled environment vault (CEV) outside the CO. Figure 2-39 shows a loop feeder configuration being used to support the following:

- Intrasite hubbing connection to a local DDM-2000 OC-3 or OC-12 (CEV 1 and office building)
- Intersite remote hubbing connection to a remote DDM-2000 OC-3 (CEV 2) (Although not shown, you could also use a remote DDM-2000 OC-12 connection.)

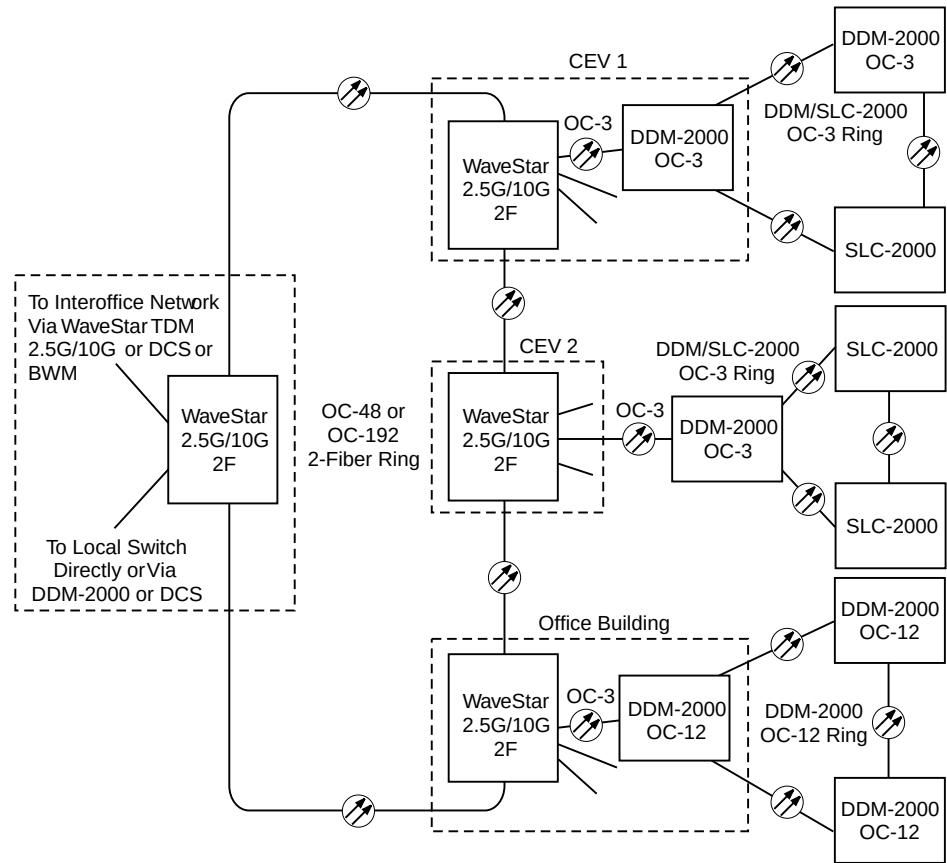
### **Intrasite hubbing connections**

Through its OC-3 low-speed interface, WaveStar TDM 2.5G/10G (2-Fiber) can have an intrasite connection to a local DDM-2000 OC-3 or OC-12. In the CEV 1 section of Figure 2-39, the DDM-2000 OC-3 is a node in an OC-3 ring that supports VT and STS-1 path switching. All VT-switching takes place in the DDM-2000. In this example, the WaveStar TDM 2.5G/10G (2-Fiber) OC-3 interface connects to the OC-3 interface of a DDM-2000 OC-3 ring terminal. However, the remote nodes in the DDM-2000 OC-3 ring beyond the local DDM-2000 could be a combination of DDM-2000 OC-3 and SLC-2000 nodes.

In the office building section of Figure 2-39, the local DDM-2000 OC-12 is a node in an OC-12 ring. In this example, the WaveStar TDM 2.5G/10G (2-Fiber) OC-3 low-speed interface connects to the OC-3 low-speed interface of a DDM-2000 OC-12 ring terminal.

**Loop feeder network** The following figure shows a WaveStar TDM 2.5G/10G (2-Fiber) ring supporting loop feeder equipment.

**Figure 2-39 Loop Feeder Support**



NC2510G021

### Intersite remote hubbing connections

Through the WaveStar TDM 2.5G/10G (2-Fiber) OC-3 or OC-12 low-speed interface, WaveStar TDM 2.5G/10G (2-Fiber) can have an intersite connection to a DDM-2000 OC-3 or OC-12, or to an SLC-2000. In the example shown in Figure 2-39, the WaveStar TDM 2.5G/10G (2-Fiber) OC-3 interface connects to the OC-3 interface of a DDM-2000 OC-3 ring terminal in CEV 2. The nodes in the DDM-2000 OC-3 ring beyond this remote DDM-2000 can be a combination of DDM-2000 OC-3 and SLC-2000 nodes.



**CO connections**

At a CO, direct EC-1, OC-3, or OC-12 terminations on the WaveStar TDM 2.5G/10G (2-Fiber) are desirable for STS-12c, STS-3c, DS3, and DS1 services that require intraoffice transport to a DCS in the same CO or that require interoffice transport and are not terminated in this CO. At a CEV or hut, direct OC-3 or OC-12 terminations on the WaveStar TDM 2.5G/10G (2-Fiber) are desirable for all services to avoid the need to deploy additional equipment.



# Broadband Transport

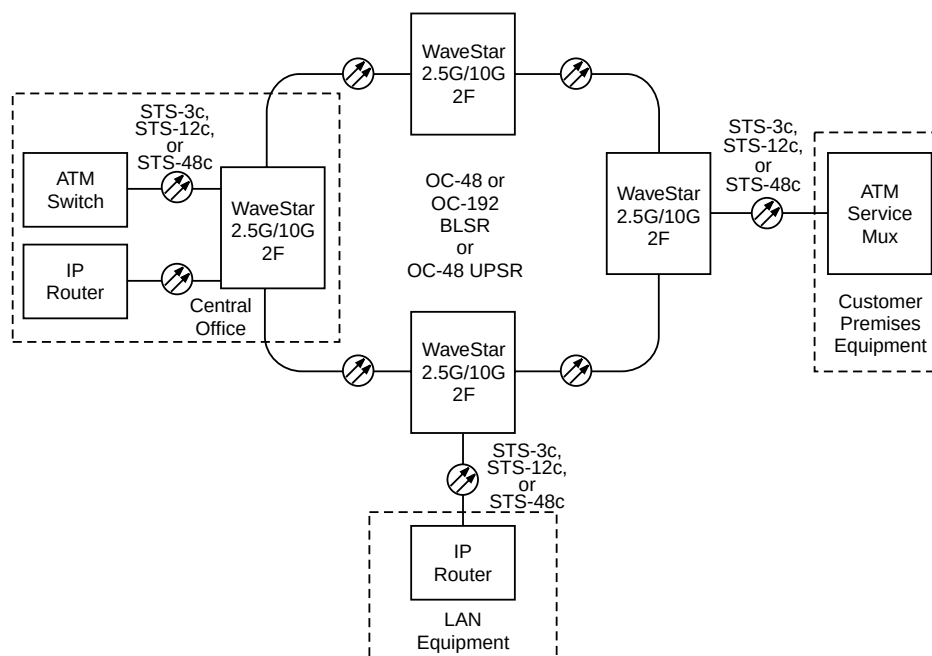
**Overview** Broadband transport is transmitting and receiving voice, data, and/or video communications at greater than 2 Mb/s rates. Broadband services include:

- LAN interconnection
- Video distribution from a video server
- Medical imaging

WaveStar TDM 2.5G/10G (2-Fiber) can transport STS-3c, STS-12c, and STS-48c payloads, including asynchronous transport mode (ATM) and internet protocol (IP) traffic, over OC-3, OC-12, OC-48, or OC-192 lines. Although some data services do not rely on SONET transmission protection, WaveStar TDM 2.5G/10G (2-Fiber) transmission protection switching is typically much quicker than data service-based restoration.

**ATM and IP transport** The figure below shows WaveStar TDM 2.5G/10G (2-Fiber) transporting ATM and IP traffic between a central office and customer premises.

**Figure 2-40 Broadband Service Transport**



NC2510G023



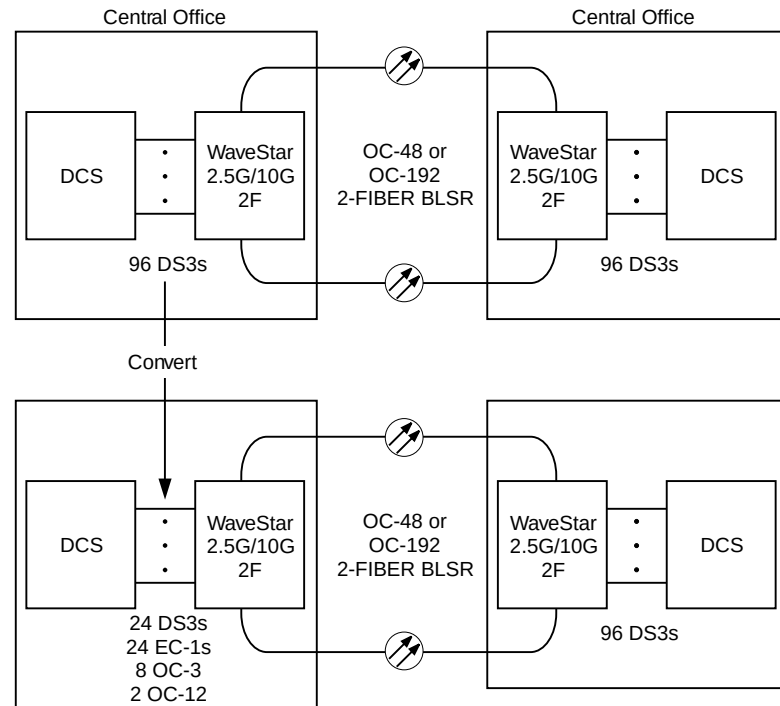
## Interface Mixing

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|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                    | Interface mixing is using more than one type of port unit on the tributary shelves. This interface mixing provides the flexibility to make more efficient use of shelf capacities and to upgrade nodes independently of one another.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Shelf fill</b>                  | <p>In today's central offices many shelves are only partially filled. This is because some earlier systems required any particular shelf to contain only electrical interfaces or only optical interfaces, or only interfaces of the same rate. Therefore, the odd numbers of low-speed interface circuit packs often ended up in shelves by themselves, leaving unused slots.</p> <p>WaveStar TDM 2.5G/10G (2-Fiber) supports a mix of EC-1, DS3, OC-3, OC-12, and OC-48 interface circuit packs both within the same tributary shelf and between source and destination shelves. By accommodating any combination of GE1/SX2, GE1/LX2, DS3, EC-1, OC-3, OC-12, and OC-48 circuit packs in one shelf, WaveStar TDM 2.5G/10G (2-Fiber) can reduce the number of shelves by increasing circuit pack slot usage (shelf fill).</p> |
| <b>End-to-end interface mixing</b> | WaveStar TDM 2.5G/10G (2-Fiber) supports several combinations of transmission interfaces concurrently with a mix of port units (transmission interface circuit packs) within and between the terminals in a ring. A circuit can enter a WaveStar TDM 2.5G/10G (2-Fiber) network through one type of interface and exit through another type. The only requirement is for compatible payloads. For example, an STS-1 that is carrying DS3 traffic must terminate on an NE that is provisioned for an STS-1 that is carrying DS3 traffic and not on an NE that is provisioned for an STS-1 carrying VT1.5 circuits.                                                                                                                                                                                                               |
| <b>Network evolution</b>           | WaveStar TDM 2.5G/10G (2-Fiber) interface mixing capabilities offer more efficient network evolution and let planners deploy equipment based on the needs of the particular application. For example, network needs (sudden demand) may require SONET deployment in one area before others. See Figure 2-41.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

**Interface mixing example**

The figure below shows how asynchronous DS3 interfaces at one end of a circuit within a WaveStar TDM 2.5G/10G (2-Fiber) network can be converted in-service to SONET interfaces (EC-1, OC-3, OC-12, or OC-48) without any changes at the other end of the line.

**Figure 2-41 End-to-End Interface Mixing**

NC2510G024



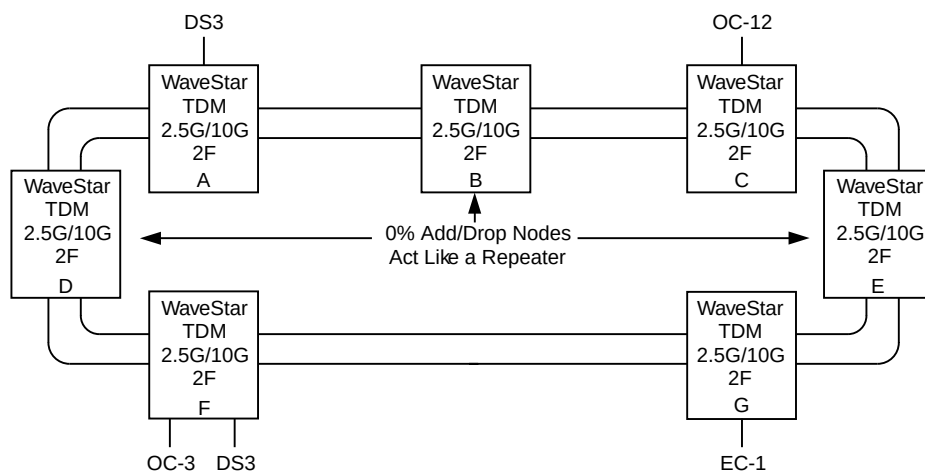
## 0% Add/Drop Node

**Overview** A 0% add/drop configuration is one in which a network element is used as if it were a repeater. This creates a BLSR node at which none of the ring capacity is added or dropped. All traffic is through traffic. In a 2.5G application, the tributary shelf is equipped as a 0% add/drop node on the OC-48 BLSR. In a 10G application using an OC-192 BLSR, a minimum complement of circuit packs is required in the high-speed shelf. For information about the minimum complement of circuit packs, see *Chapter 3, Product Description*.

**Uses for 0% add/drop** A 0% add/drop node provides access to the OC-192 DCC to perform remote operations, administration, maintenance, and provisioning for other nodes in the ring. Additionally, 0% add/drop node provides a convenient growth path for in-service upgrades when add/drop capability is needed in the future.

**0% add/drop example** The figure below shows a network in which several nodes currently use 0% add/drop. As the demand for services increases, you can add low speed interface circuit packs as necessary to support add/drop traffic at nodes that do not currently require such connections.

**Figure 2-42 0% Add/Drop Application**



NC2510G034







# 3 Product Description

## Overview

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**Purpose** This chapter describes physical characteristics of the WaveStar TDM 2.5G/10G (2-Fiber) including the following:

- Shelf and bay configurations
- Circuit packs/ port units
- Basic architecture
- Transmission
- Control
- Power
- Cooling

**Objectives** This chapter provides information to perform the following:

1. Recognize the major components of the WaveStar TDM 2.5G/10G (2-Fiber) system.
2. Identify powering and cooling requirements of the WaveStar TDM 2.5G/10G (2-Fiber) system.

**Contents** This chapter provides the following information:

|                              |               |
|------------------------------|---------------|
| Shelf and Bay Configurations | <b>3 - 3</b>  |
| Basic Architecture           | <b>3 - 29</b> |
| Transmission                 | <b>3 - 32</b> |
| Control                      | <b>3 - 35</b> |
| Power                        | <b>3 - 38</b> |
| Cooling                      | <b>3 - 39</b> |
| Summary                      | <b>3 - 42</b> |



## Shelf and Bay Configurations

---

**Overview** WaveStar TDM 2.5G/10G (2-Fiber) supports two basic system options:

- **2.5G system option** – A stand-alone tributary shelf that supports OC-48, Gigabit Ethernet (GE1), OC-12, and OC-3 port units and accommodates electrical connector panels and DS3EC1/8 port units for DS3/EC1 connections. A tributary shelf can have up to eight OC-48 port units, up to eight GE1 port units, up to sixteen OC-12 port units, up to sixteen OC-3 port units, up to 12 DS3 port units, or a mixture of port units.

The interface capacity varies according to the number and type of port units you equip the shelf with. Up to three tributary shelves can fit in a 7-foot bay.

When internally mounted DS3 connector panels are used, up to two tributary shelves can fit in a 7-foot bay.

- **10G system option** – A 7-foot bay with a high-speed (OC-192) shelf and one or two low-speed, tributary shelves, plus an optional second bay with one or two more low-speed, tributary shelves.

An in-service upgrade is available for migrating one WaveStar TDM 2.5G (2-Fiber) BLSR to a WaveStar TDM 10G (2-Fiber) BLSR.

The first tributary shelf (the Main 2.5G shelf) is common to both options. It contains the control and timing for the entire 2.5G/10G system and has an interface capacity of up to 384 STS-1s.

The three optional tributary shelves (the Expansion 2.5G shelves) can be added while the system is in service, and each provides an interface capacity of up to 384 STS-1s.

The high-speed shelf supports up to two OC-192 port units.

Each shelf has a switch fabric. The high-speed shelf can be equipped either with a 576x576 STS-1 switch fabric or a 768x768 STS-1 switch fabric. The larger switch fabric is needed to support more than two tributary shelves, and it provides a larger cross-connection capacity between the high-speed shelf and the tributary shelves.

The high-speed shelf has 18 usable circuit pack slots, and each tributary shelf has 25 circuit pack slots (16 universal slots for port units).

To see detailed engineering drawings of typical bay and floor plan arrangements, order the engineering drawing ED 8C789-10, listed in “About This Information Product” at the beginning of this document.

**DS3/EC1 mounting options**

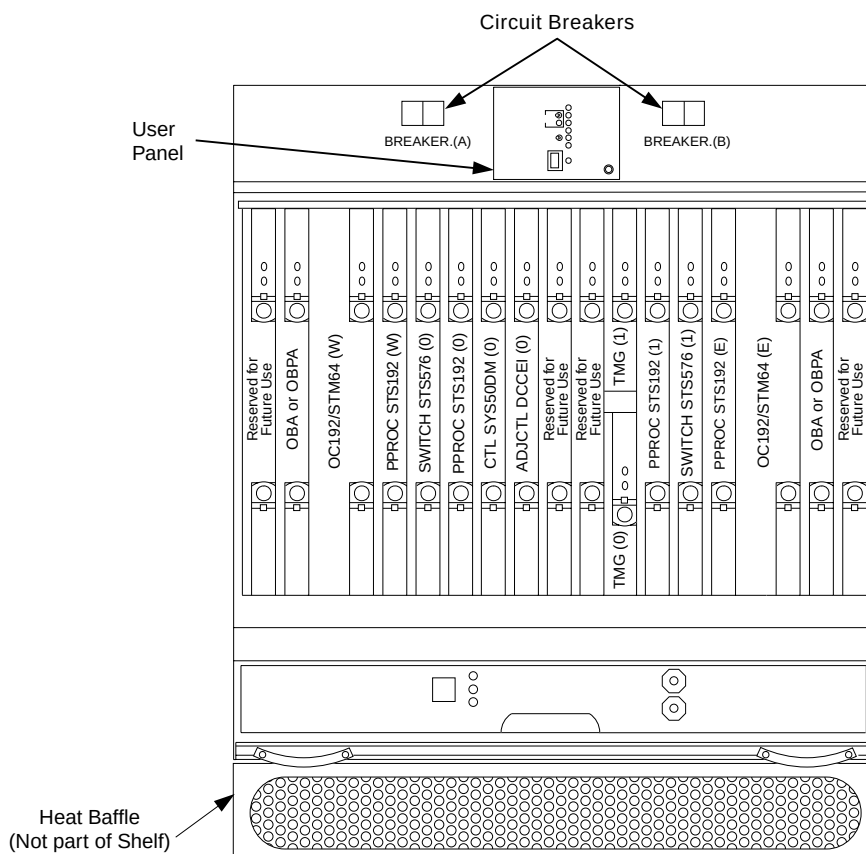
The optional DS3/EC1 connector panels can be installed in any of three ways:

- As external “wings” attached to the outside of the bay. This configuration requires equipping the bays with spacers to ensure adequate space between bays for cabling and for connector panel mounting.
- As internal in-bay modules. This configuration allows one seven-foot bay to contain up to two low-speed shelves or one low-speed shelf and one high-speed shelf.
- As rear-mounted panels. This configuration allows one seven-foot bay to contain either three 2.5G (OC-48) tributary shelves or one high-speed (OC-192) shelf and two tributary shelves. This option adds to the depth (3.45") of the bay.

**High-speed shelf layout**

The following figure shows the layout for the WaveStar TDM 2.5G/10G (2-Fiber) high-speed shelf when the 576x576 STS-1 switch fabric is used. Table 3-1 provides a list of the slot labels and their location on the shelf. Table 3-2 discusses how the slots can be equipped.

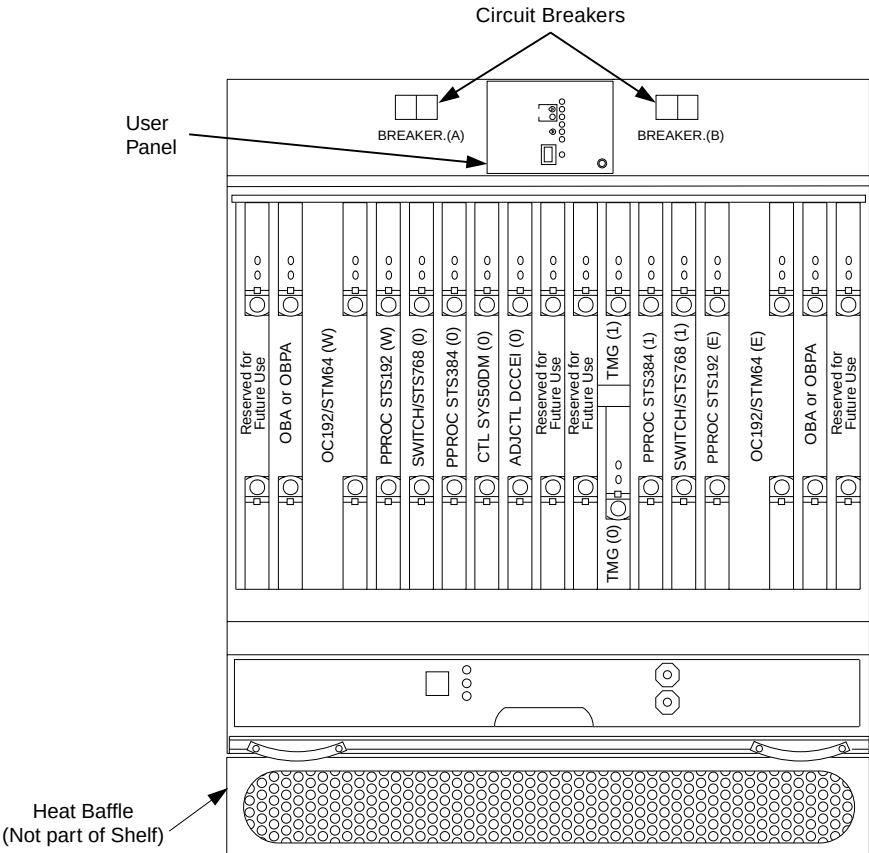
**Figure 3-1 WaveStar TDM 2.5G/10G (2-Fiber) High-Speed Shelf, 576x576 STS-1 Switch Fabric**



NC10G025

The following figure shows the layout for the WaveStar TDM 2.5G/10G (2-Fiber) high-speed shelf when the 768x768 STS-1 switch fabric is used. Table 3-1 provides a list of the slot labels and their location on the shelf. Table 3-2 discusses how the slots can be equipped.

**Figure 3-2 WaveStar TDM 2.5G/10G (2-Fiber) High-Speed Shelf, 768x768 STS-1 Switch Fabric**



In the figure above, slots SWITCH 0 and SWITCH 1 contain the SWITCH/STS768 circuit pack. Note that when SWITCH/STS768 circuit pack is used, the shelf must also be equipped with PPROC/STS384 circuit packs in the PPROC 0 and PPROC 1 slots. The other common circuit packs for this shelf are the same as when it is equipped with the SWITCH/STS576 circuit packs.

**Labels for the high-speed shelf**

The following table shows the labels for the high-speed shelf plug-in units and circuit pack slots.

**Table 3-1 Labels for the High-Speed Shelf Circuit Pack Slots**

| Slot<br>(left to right) | Label         |
|-------------------------|---------------|
| 1st                     | - blank-      |
| 2nd                     | OBA or OBPA   |
| 3rd                     | OC192 STM64 W |
| 4th                     | PPROC W       |
| 5th                     | SWITCH 0      |
| 6th                     | PPROC 0       |
| 7th                     | CTL SYSDM 0   |
| 8th                     | DCCEI         |
| 9th                     | -blank-       |
| 10th                    | -blank-       |
| 11th, a and b           | TMG 1/TMG 0   |
| 12th                    | PPROC 1       |
| 13th                    | SWITCH 1      |
| 14th                    | PPROC E       |
| 15th                    | OC192 STM64 E |
| 16th                    | OBA or OBPA   |
| 17th                    | - blank-      |

**Circuit pack slots for high-speed shelf** The following table lists the circuit pack slots for the high-speed shelf.

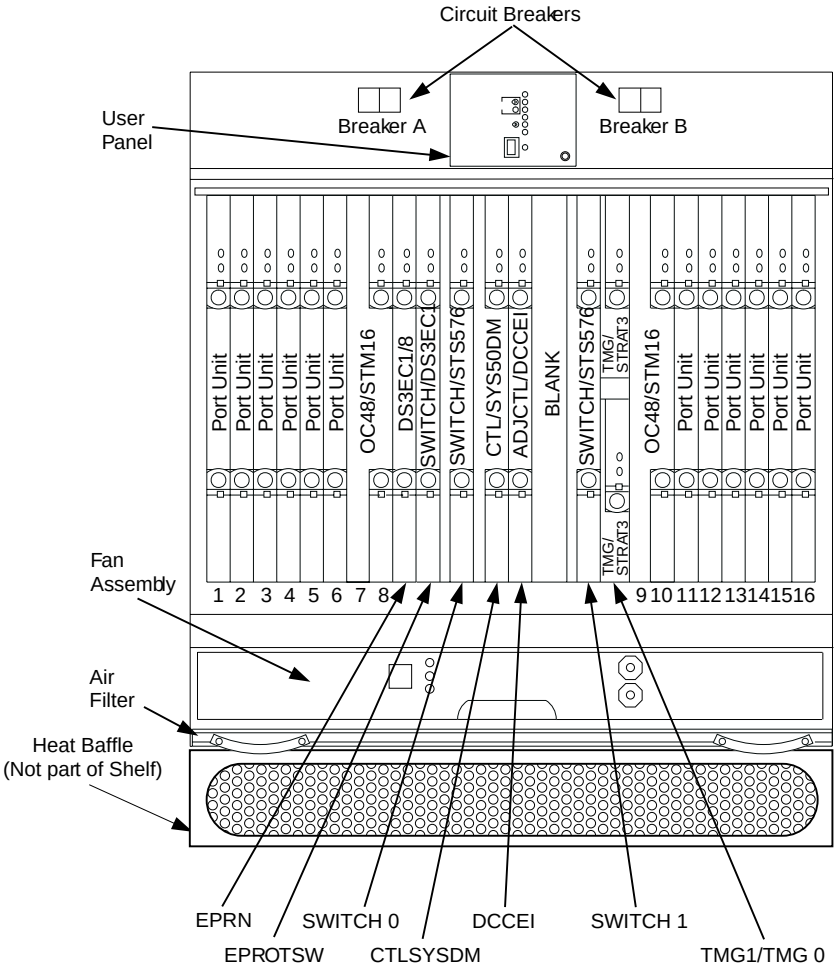
**Table 3-2 High-Speed Shelf Circuit Pack Slot Equipage**

| Slot Designation               | Slot Equipage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (blank)                        | Reserved for future use.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| OBA or OBPA                    | Either the OBA (Optical Booster Amplifier) or OBPA (Optical Booster Pre-Amplifier) port units occupy these slots. These port units are responsible for amplifying optical signals from the OC-192 port units in order to achieve long-reach transmission distances for a span.                                                                                                                                                                                                                                                                      |
| OC192 STM64 W<br>OC192 STM64 E | Each of the two OC-192 port units occupies two slots. The two port units can be any of: <ul style="list-style-type: none"> <li>• OC192/STM64/SR1 (intermediate range) 1.5μ port units</li> <li>• OC192/STM64/IR1 (extended/intermediate range) 1.5μ port units</li> <li>• 32 OC192/STM64/POU passive port units</li> <li>• 40 OC192/STM64/WDM port units</li> </ul>                                                                                                                                                                                 |
| PPROC W                        | The PPROC/STS192 circuit pack in this slot supports the OC192 port unit function assigned to the western aggregate port. The CP is responsible for pointer processing and synchronization to the system clock and for POH monitoring.                                                                                                                                                                                                                                                                                                               |
| SWITCH 0                       | Fabric Switch 0. The SWITCH/STS576 or SWITCH/STS768 circuit pack in this slot can make cross-connections between the STS-1 equivalent tributaries in the port units within the shelf, or between shelves. This switch is paired with Fabric Switch 1 in a 1+1 non-revertive protection mode configuration.                                                                                                                                                                                                                                          |
| PPROC 0                        | The PPROC/STS192 or PPROC/STS384 circuit pack in this slot provides frame delay management between the switch functions of each tributary shelf and the high-speed shelf, which ensures that all the tributaries to the switches are aligned. It works in conjunction with Fabric Switch 0.<br><br>The PPROC you use depends on the switch fabric used. Equip this slot with PPROC/STS192 when SWITCH 0 and SWITCH 1 are equipped with SWITCH/STS576. Equip this slot with PPROC/STS384 when SWITCH 0 and SWITCH 1 are equipped with SWITCH/STS768. |

| Slot Designation | Slot Equipage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CTL SYS50DM 0    | Controller for the system and nonvolatile memory. The CTL/SYS50DM circuit pack in this slot is the working controller for the high-speed shelf.                                                                                                                                                                                                                                                                                                                                                                                                     |
| DCCEI            | Adjunct controller, DCC, and external interface. The ADJCTL/DCCEI circuit pack terminates up to 32 data communications channels and interfaces them to the shelf 10Base-T LAN.                                                                                                                                                                                                                                                                                                                                                                      |
| DCC              | This slot is left empty for the current release of WaveStar TDM 2.5G/10G (2-Fiber).                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| CTL SYS50DM 1    | This slot is left empty for the current release.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| TMG 1<br>TMG 0   | Two half-height Stratum 3 timing generator circuit packs are located one above the other in this slot. When WaveStar TDM 2.5G/10G (2-Fiber) is initially powered on after shipment from the factory, the lower TMG/STRAT3 is the active circuit pack and the upper TMG/STRAT3 is the standby circuit pack. However, both circuit packs are of equal level and protection switching is nonrevertive, so there is no default configuration.                                                                                                           |
| PPROC 1          | The PPROC/STS192 or PPROC/STS384 circuit pack in this slot provides frame delay management between the switch functions of each tributary shelf and the high-speed shelf, which ensures that all the tributaries to the switches are aligned. It works in conjunction with Fabric Switch 1.<br><br>The PPROC you use depends on the switch fabric used. Equip this slot with PPROC/STS192 when SWITCH 0 and SWITCH 1 are equipped with SWITCH/STS576. Equip this slot with PPROC/STS384 when SWITCH 0 and SWITCH 1 are equipped with SWITCH/STS768. |
| SWITCH 1         | Fabric Switch 1. The SWITCH/STS576 or SWITCH/STS768 circuit pack in this slot can make cross-connections between the STS-1 equivalent tributaries in the port units within the shelf, or between shelves. This switch is paired with Fabric Switch 0 in a 1+1 non-revertive protection mode configuration.                                                                                                                                                                                                                                          |
| PPROC E          | The PPROC/STS192 circuit pack in this slot supports the OC192 port unit function assigned to the eastern aggregate port. The CP is responsible for pointer processing and synchronization to the system clock and for POH monitoring.                                                                                                                                                                                                                                                                                                               |

**Tributary shelf layout** The following figure shows the WaveStar TDM 2.5G/10G (2-Fiber) tributary shelf plug-in units and circuit pack slots, including the slots used for GE1, DS3/EC1, OC-3, OC-12, and OC-48 tributary port units.

**Figure 3-3 WaveStar TDM 2.5G/10G (2-Fiber) Tributary Shelf**



NC-2.5GAPOG-064



**Circuit pack slots for tributary shelf**

The table below identifies the circuit packs used in the WaveStar TDM 2.5G/10G (2-Fiber) tributary shelf.

**Table 3-3 Tributary Shelf Circuit Pack Slot Equipage**

| Slot Designation | Slot Equipage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 - 16           | <p>Any mix of transmission interface circuit packs:</p> <ul style="list-style-type: none"> <li>• DS3EC1/8 (DS3 port unit)</li> <li>• OC3/STM1/1.3LR4 (OC-3 port unit, long reach 1.3μ fiber)</li> <li>• OC3/STM1/1.3I/SR8 (OC-3 port unit, intermediate/short reach 1.3μ fiber)</li> <li>• OC12/STM4/1.3LR2 (OC-12 port unit, long reach 1.3μ fiber)</li> <li>• OC12/STM4/1.3I/SR2 (OC-12 port unit, intermediate/short reach 1.3μ fiber)</li> <li>• OC48/STM16/1.3VSR1 (OC-48 port unit, very short reach 1.3μ fiber)</li> <li>• OC48/STM16/1.3LR1 (OC-48 port unit, long reach 1.3μ fiber)</li> <li>• OC48/STM16/1.5LR1 (OC-48 port unit, long reach 1.5μ fiber)</li> <li>• Any of 16 Metropolis™ EON-compatible DWDM port units</li> <li>• Any of 80 WaveStar® OLS 1.6T compatible WDM port units</li> <li>• Any of 16 Lucent Passive optics port units</li> <li>• Gigabit Ethernet (GE1) interface port unit</li> </ul> <p>Slots 7 -10 do not support DS3EC1/8 port units. In addition, if you are using 1xN DS3 or EC-1 protection, slot 16 cannot contain an optical port unit. Therefore, it is recommended that, when using DS3EC1/8 port units, you install the first one in slot 16.</p> <p>Each OC-48 and GE1 port unit occupies two slots, which must be an odd (left) even (right) pair. For any OC-48 2-fiber BLSR, the two ports must be in slot numbers located either as adjacent pairs (2 and 4, 6 and 8, 10 and 12, or 14 and 16) or symmetric pairs (8 and 10, 6 and 12, 4 and 14, or 2 and 16).</p> |
| EPRN             | Electrical protection. This slot can be equipped with a DS3EC1/8 port unit to protect DS3EC1/8 port units or it can be left empty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| EPROTSW          | Electrical protection switch. This slot can be equipped with a SWITCH/DS3EC1 protection switching circuit pack to provide the 1xN switching function for protected DS3EC1/8 port units. This slot can also be left empty.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

| Slot Designation | Slot Equipage                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SWITCH 0         | Fabric Switch 0. The SWITCH/STS576 circuit pack in this slot can make cross-connections for 576 STS-1 equivalent circuits. This switch is paired with Fabric Switch 1 in a 1+1 nonrevertive protection mode configuration.                                                                                                                                                                                                              |
| CTLSYS50DM 0     | Controller for the system and nonvolatile memory. The CTL/SYS50DM circuit pack in this slot is the working controller for the shelf. In the first tributary shelf, this is the main controller for the entire WaveStar TDM 2.5G/10G (2-Fiber) system. Use this controller for CIT and EMS connections and to collect all alarms and signal them on the User Panel and the office alarm interface.                                       |
| DCCEI            | Adjunct controller, DCC, and external interface. The ADJCTL/DCCEI circuit pack in this slot terminates up to 32 data communications channels and interfaces them to the shelf 10Base-T LAN.                                                                                                                                                                                                                                             |
| CTLSYS50DM 1     | The slot is left empty for the current release.                                                                                                                                                                                                                                                                                                                                                                                         |
| SWITCH 1         | Fabric Switch 1. The SWITCH/STS576 circuit pack in this slot can make cross-connections for 576 STS-1 equivalent circuits. This switch is paired with Fabric Switch 0 in a 1+1 nonrevertive protection mode configuration.                                                                                                                                                                                                              |
| TMG 1<br>TMG 0   | Two half-height Stratum 3 timing generator circuit packs are located one above the other in this slot. When WaveStar TDM 2.5G/10G (2-Fiber) is initially powered on after shipment from the factory, the lower TMG/STRAT3 is the active circuit pack and the upper TMG/STRAT3 is the standby circuit pack. However, both circuit packs are of equal level: protection switching is nonrevertive, and there is no default configuration. |

**Minimum complement of circuit packs**

The minimum complement of circuit packs required for an operational WaveStar TDM 2.5G/10G (2-Fiber) system is the following circuit packs in the tributary control (2.5G I/O MAIN) shelf:

- SWITCH/STS576 (two)
- CTL/SYS50DM (one)
- ADJCTL/DCCEI (one)
- TMG/STRAT3 (two)
- port units as required for the application

No specific minimum of port units is required for the system to operate.

**Important!** Although the WaveStar TDM 2.5G/10G (2-Fiber) requires only one SWITCH/STS576 and one TMG/STRAT3 circuit pack to operate, it is not recommended that you use only one of either pack. It is recommended that you always use two of each of these circuit packs in order to ensure that the WaveStar TDM 2.5G/10G (2-Fiber) system's switching and synchronization functions are properly protected at all times.

The minimum complement of circuit packs that uses the OC-192 2-fiber BLSR consists of the following:

- SWITCH/STS576 (two in high-speed shelf and two in tributary shelf)
- CTL/SYS50DM (one in high-speed shelf and one in tributary shelf)
- ADJCTL/DCCEI (one in high-speed shelf and one in tributary shelf)
- TMG/STRAT3 (two in high-speed shelf and two in tributary shelf)
- OC192/STM64 (two in high-speed shelf)

**DS3/EC1 connector panels**

To terminate DS3/EC1s, the tributary shelves require DS3/EC1 connector panels. Each DS3/EC1 connector panel has 48 pairs of BNC cable connectors. Each pair includes a transmit and a receive connection. These are connected electrically to the shelf backplane through shielded ribbon cables.

Three options exist for attaching the connector panels:

- External, vertical “wings” attached to the bay frame
- Internal, horizontal modules inserted inside the bay frame
- Panels mounted at the back of the shelf

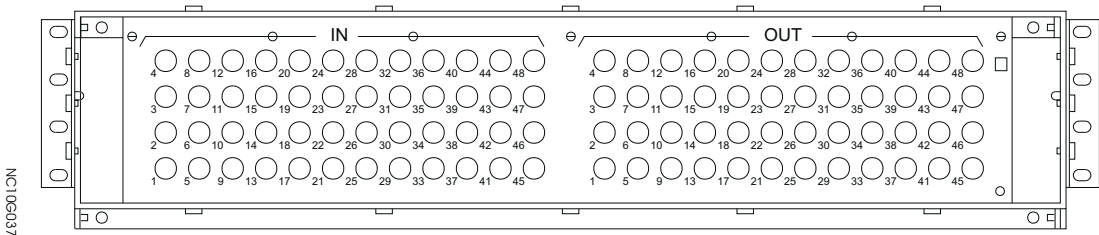
The external connector panels attach to the two sides of the shelf like wings and require additional space between bay frames. The rear-mounted connector panels attach to the back of the bay frame and require approximately 4 additional inches of space to the rear of the bayframe. Each side panel connects to a maximum of six of the port unit slots on the that same side (1-6 or 11-16). With the external connectors, the DS3/EC1 cables that connect to the front of the panels are run through the cabling areas between bays.

The internal, “in-bay” DS3/EC1 connector panels fit into a bay above and below the tributary shelf. The panel that mounts on the top of a shelf connects to a maximum of six of the port unit slots on the left side (11-16). The panel that mounts under a shelf connects to a maximum of six of the port unit slots on the right side (1-6). With the internal connectors, the DS3/EC1 cables attach to the backplane from the back of the connector panels.

**Figure of DS3/EC1 connector panel**

The following figure shows an example of a connector panel. In this case, the panel is a front, horizontal view of an in-bay DS3/EC1 connector panel module with the front door removed.

**Figure 3-4 In-Bay DS3/EC1 Connector Panel**



**DS3/EC1 connector dimensions**

The dimensions of the vertically and externally attached DS3/EC1 connector panels are as follows:

|        |                             |
|--------|-----------------------------|
| Height | 546.1 mm (21.5 in. nominal) |
| Width  | 101.6 mm (4 in. nominal)    |
| Depth  | 57.2 mm (2.25 in. nominal)  |

The dimensions of the horizontally and internally equipped DS3/EC1 connector panels are as follows:

|        |                             |
|--------|-----------------------------|
| Height | 115 mm (4.5 in. nominal)    |
| Width  | 543 mm (21 in. nominal)     |
| Depth  | 347.5 mm (13.7 in. nominal) |

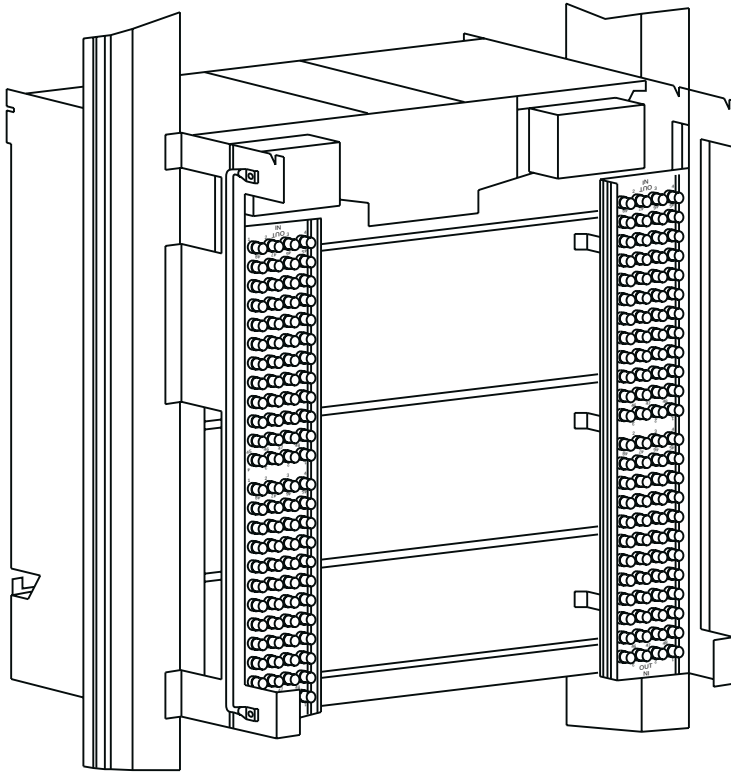
The dimensions of the rear-mounted DS3/EC1 connector panels are as follows:

|        |                                                                                  |
|--------|----------------------------------------------------------------------------------|
| Height | 546.1 mm (21.5 in. nominal)                                                      |
| Width  | 101.6 mm (4 in. nominal)                                                         |
| Depth  | 170 mm (6.7 in.),<br>87 mm (3.45 in.) beyond the<br>standard depth of the shelf. |

**Figure of rear-mounted DS3/EC1 connector panels**

The following figure shows a rear view of a shelf with rear-mounted DS3/EC1 connector panels with the rear door removed.

**Figure 3-5 Rear-Mounted DS3/EC1 Connector Panels**

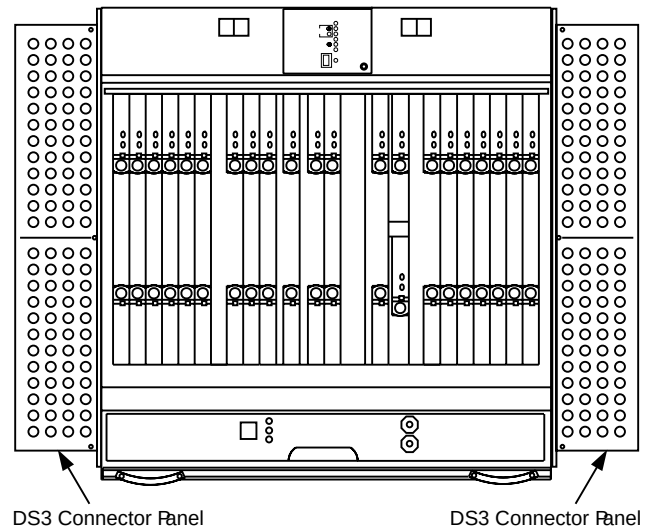


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**DS3/EC1 connector panel mounting**

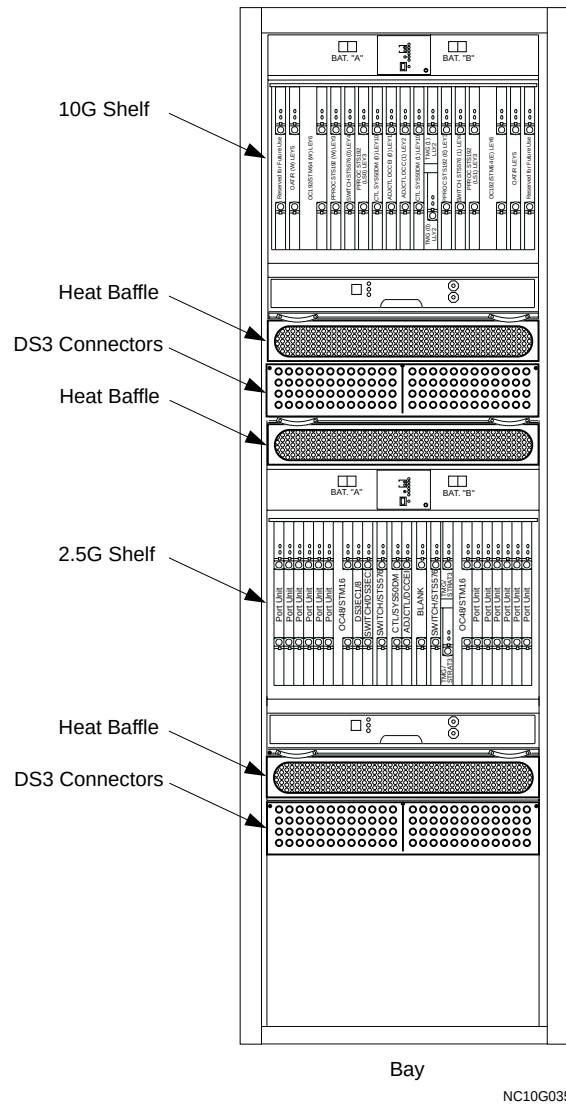
The following figure shows DS3/EC1 connector panels mounted vertically and externally on the sides of a tributary shelf.

**Figure 3-6 DS3/EC1 Connector Panels Mounted Externally**



The following figure shows DS3/EC1 connector panels mounted internally in a bay.

**Figure 3-7 DS3/EC1 Connector Panels Mounted Internally**



**Important!** When DS3/EC1 connector panels are mounted on the interior of the WaveStar TDM 2.5G/10G (2-Fiber) shelf, a bay can support only two shelves.



**Shelf dimensions** The WaveStar TDM 2.5G/10G (2-Fiber) shelf dimensions without DS3/EC1 connector panels are as follows:

|        |                         |
|--------|-------------------------|
| Height | 575 mm (23 in. nominal) |
| Width  | 543 mm (21 in. nominal) |
| Depth  | 400 mm (15 in. nominal) |

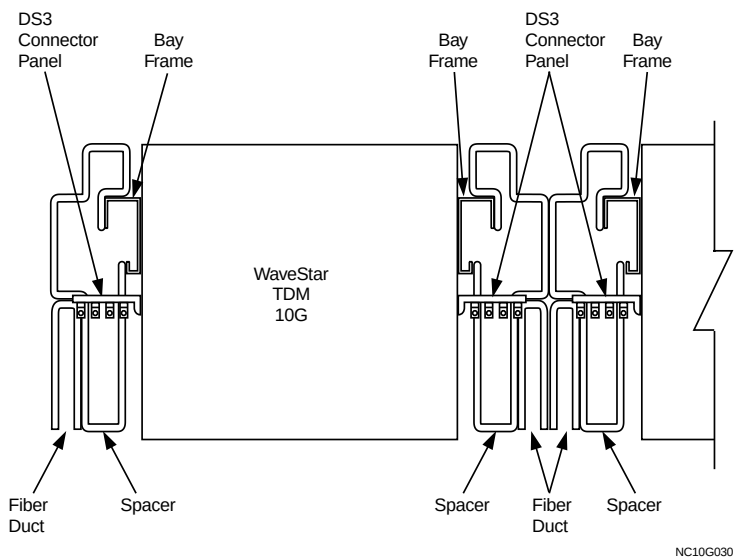
With the external, vertical DS3/EC1 connector panels, the tributary shelf is 755 mm wide (30 in. nominal).

**Shelf mounting** WaveStar TDM 2.5G/10G (2-Fiber) shelves mount into standard seismic network bay frames. The bay frames must be mounted on the floor such that the narrower shelf mounting flanges are facing the maintenance aisle.

Shelves equipped with external, vertical DS3/EC1 connector panels must be mounted in bays that are separated by spacers. The bay spacers provide structural integrity and the correct amount of space between bays. (See Figure 4-7.)

**Bay spacers** The following figure shows a top view of bays using spacers to accommodate externally attached DS3/EC1 connector panels.

**Figure 3-8 Top View of Bay Spacers**



**Multiple shelves**

With the configuration of one high-speed shelf and one tributary shelf, the shelves should be mounted in the upper two positions. This allows for future growth to a second tributary shelf in the bottom position.

A WaveStar TDM 2.5G/10G (2-Fiber) shelf in the top position of a bay requires a heat baffle immediately below it. WaveStar TDM 2.5G/10G (2-Fiber) shelves in the other two bay positions require heat baffles directly between them. There must be no gaps above or below the heat baffles and the shelves.

Up to three tributary shelves fit into a bay, provided that all DS3/EC1 connector panels are mounted externally or at the back of the shelf. If DS3/EC1 connector panels are mounted internally, only two WaveStar TDM 2.5G/10G (2-Fiber) shelves can fit in a bay. In bays with only two tributary shelves with external DS3/EC1 connector panels, it is recommended that the shelves be mounted in the lower two positions. It is preferable to reserve the upper mounting position for future expansion or for interworking with other equipment.

The heat baffle mounted below the lowest shelf in the bay is required to ensure adequate air flow between the lowest shelf and the bottom of the bay.

**Installation of tributary shelf in an FT-2000 OC-48 Lightwave System Dual Bay Frame**

Up to two tributary shelves can be inserted into an FT-2000 OC-48 Lightwave System Dual Bay as shown in the figure (Figure 4-8) on the following page.

**Configuration A**

When you replace one HSS/LSS FT-2000 OC-48 Lightwave System shelf, the upper shelf must be removed first. The FT-2000 System is removed as one complete shelf. It is then replaced by a WaveStar TDM 2.5G/10G (2-Fiber) Shelf assembly and one heat baffle (as shown in Configuration A below). The two DS3/EC1 connector panels pictured below are optional.

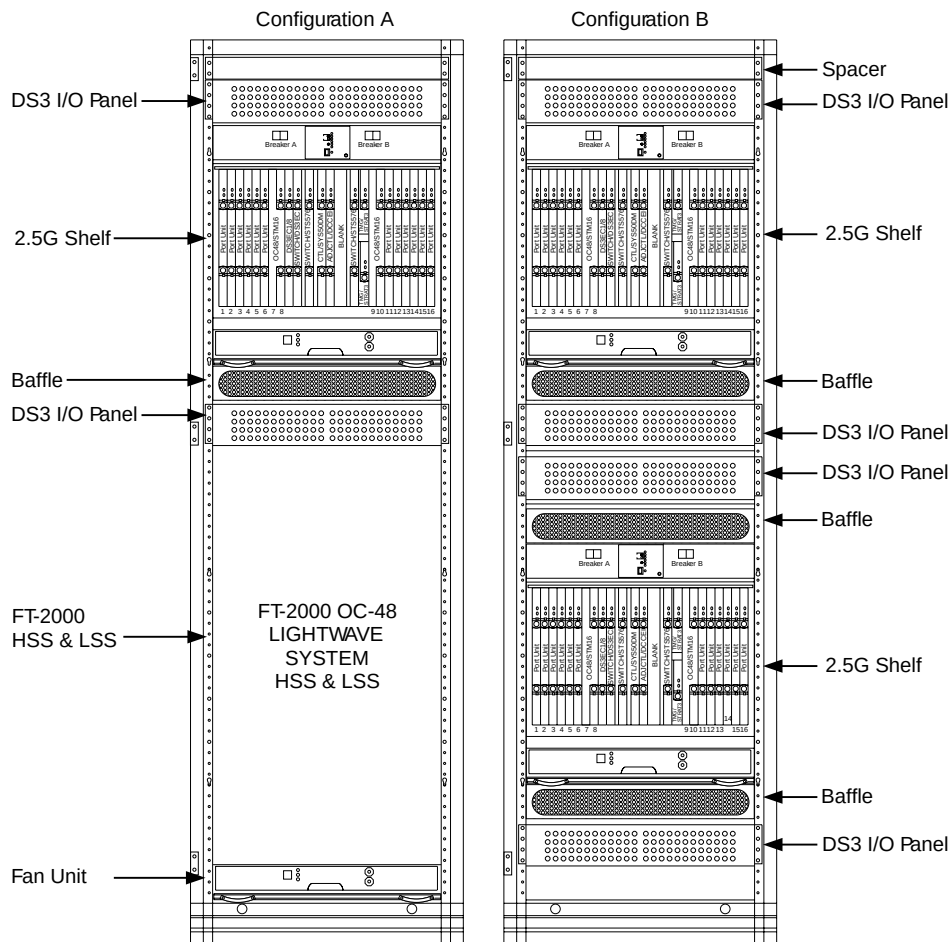
**Configuration B**

When you replace two HSS/LSS FT-2000 OC-48 Lightwave System shelves or add a second WaveStar TDM 2.5G/10G (2-Fiber) system, the final configuration is represented by Configuration B in the figure below. The lower HSS/LSS Shelf assembly, Fan Unit, and Power Distribution Filter are removed. They are then replaced by a WaveStar TDM 2.5G/10G (2-Fiber) Shelf assembly, two heat baffles, two DS3/EC1 connector panels, and one Space/Filler Plate (located at top of bay where the PDP was positioned). The two DS3/EC1 connector panels pictured below are optional. When both FT Shelves are replaced, the Fan Unit is not required because WaveStar TDM 2.5G/10G (2-Fiber) shelves contain shelf-based fan cooling systems.

Illustration

The figure below shows how a WaveStar TDM 2.5G/10G (2-Fiber) Shelf mounts in an FT-2000 OC-48 Lightwave System Dual Bay.

Figure 3-9 Installation of Tributary Shelf in an FT-2000 Dual Bay



NC-2.5GAPOG-080

Dispersion Compensation Module (DCM) holder tray

For applications requiring the use of Dispersion Compensation Modules (DCMs), a DCM holder tray can be miscellaneously mounted into a WaveStar TDM 2.5G/10G (2-Fiber) bay. The tray holds 4 DCMs. A bay with a DCM holder tray, can support up to two WaveStar TDM 2.5G/10G (2-Fiber) shelves.

**Passive Optics Units  
(Passive DWDM Filter  
Units)**

Lucent Passive Optics Units (POUs) are a family of Passive WDM and DWDM filter units that complement Lucent's overall product offerings, to provide the most cost-effective transport of signals over a fiber, to maximize fiber and network utilization, and to relieve fiber exhaust conditions.

The current 4 POUs are:

- 16CH-MUX
- 16CH-DMUX
- 16CH-MUXINT
- 16CH-DMUXINT

These 4 units combine multiple signals, of different wavelengths, onto a single fiber. Each MUX/DMUX pair supports the optical combining of 16 signals of different wavelengths onto one fiber in one direction (16 wavelength unidirectional application), or the optical combining of 8 wavelengths from 2 directions (8 east to west and 8 west to east) onto one fiber (8 wavelength bidirectional application).

The 4 POUs can be combined to support 32 wavelength unidirectional or 16 wavelength bidirectional applications. In these applications, the wavelengths for the 16CH-MUX and 16CH-DMUX pair are interleaved with the other 16 wavelengths from the 16CH-MUXINT and 16CH-DMUXINT pair. The "INT" denotes interleaver.

The Figures 4-10 through 4-14 outline the wavelengths and frequencies supported for each of the POUs. The corresponding channel number is also provided. The inputs and outputs are shown for each 16 wavelength unidirectional, and each 8 wavelength bidirectional application. The last figure outlines how the POUs are connected together to support the 32 wavelength unidirectional application (for west to east traffic).

The COMMON port is the output or input port for the mutliwavelength (DWDM) signal. The UPGRADE ports located on the 16CH-MUXINT and 16CH-DMUXINT units are used for applications requiring wavelength interleaving. The UPGRADE ports are connected with the appropriate COMMON ports on the 16CH-MUX and 16CH-DMUX units for applications where wavelength interleaving is required.

Figure 3-10 16CH-MUX and 16CH-DMUX Unidirectional Application(s)

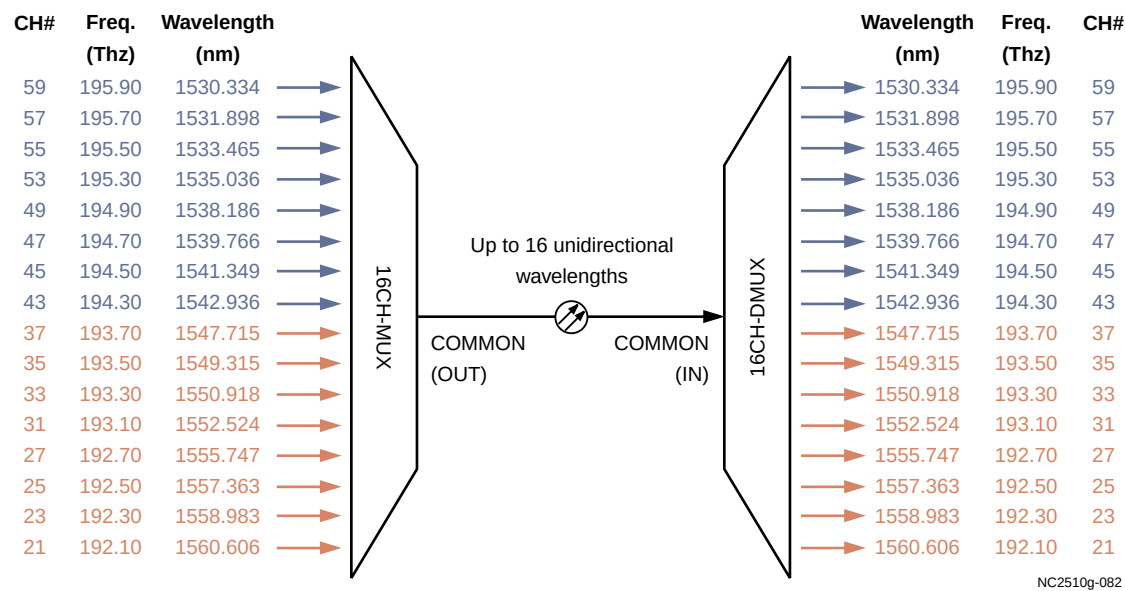


Figure 3-11 16CH-MUX and 16CH-DMUX Bidirectional Application(s)

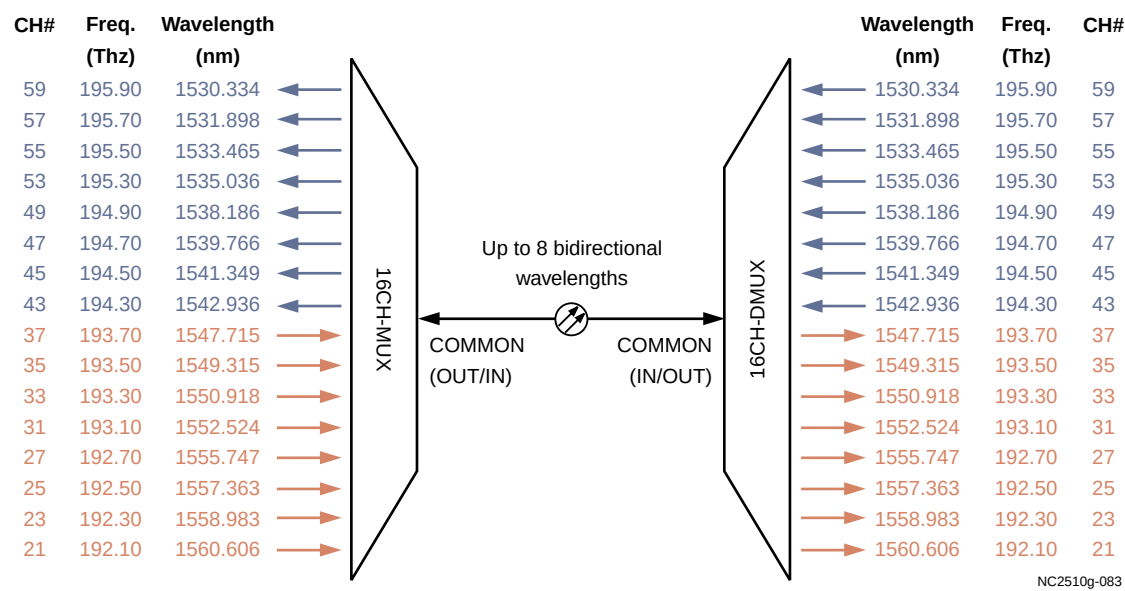


**Figure 3-12 16CH-MUXINT and 16CH-DMUXINT Unidirectional Application(s)**

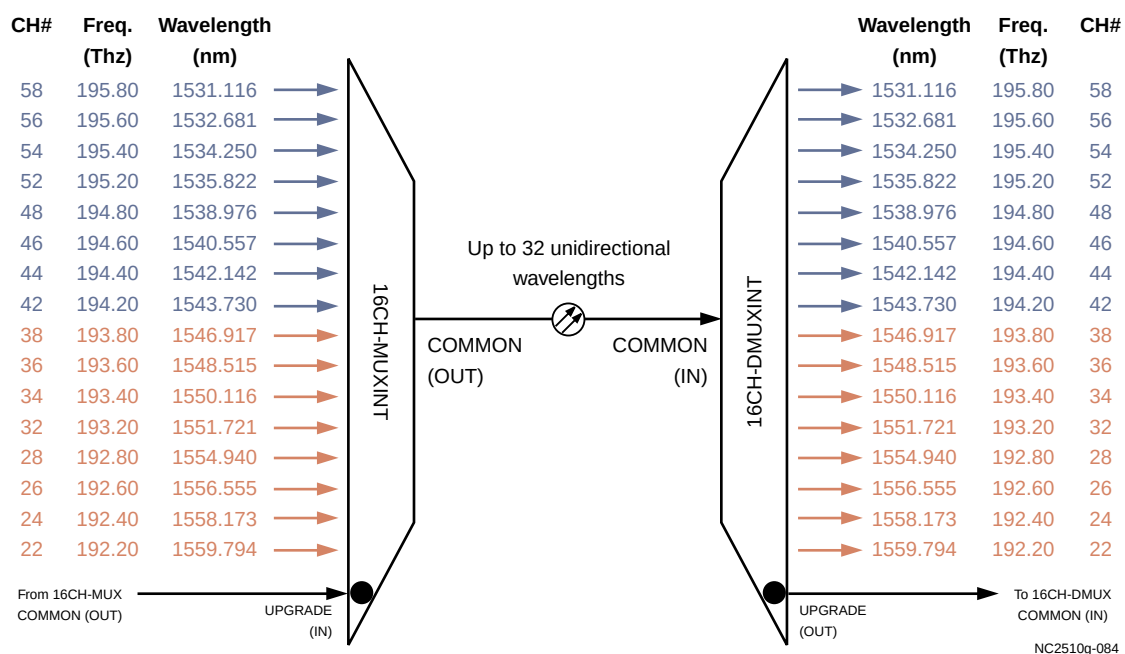


**Figure 3-13 16CH-MUXINT and 16CH-DMUXINT Bidirectional Application(s)**

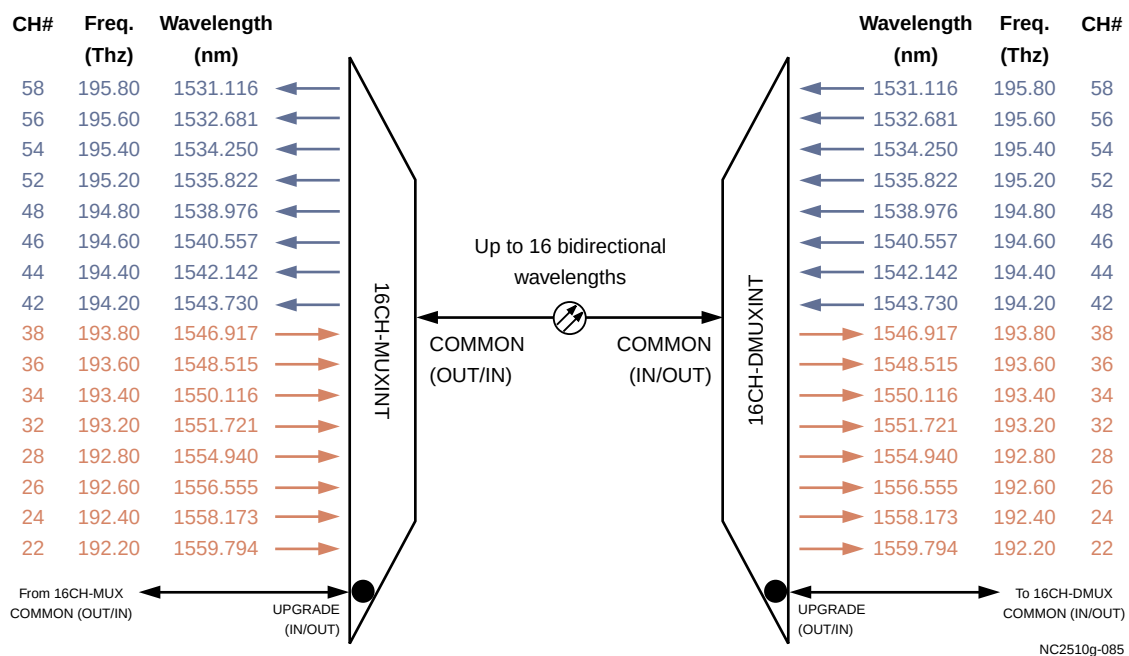
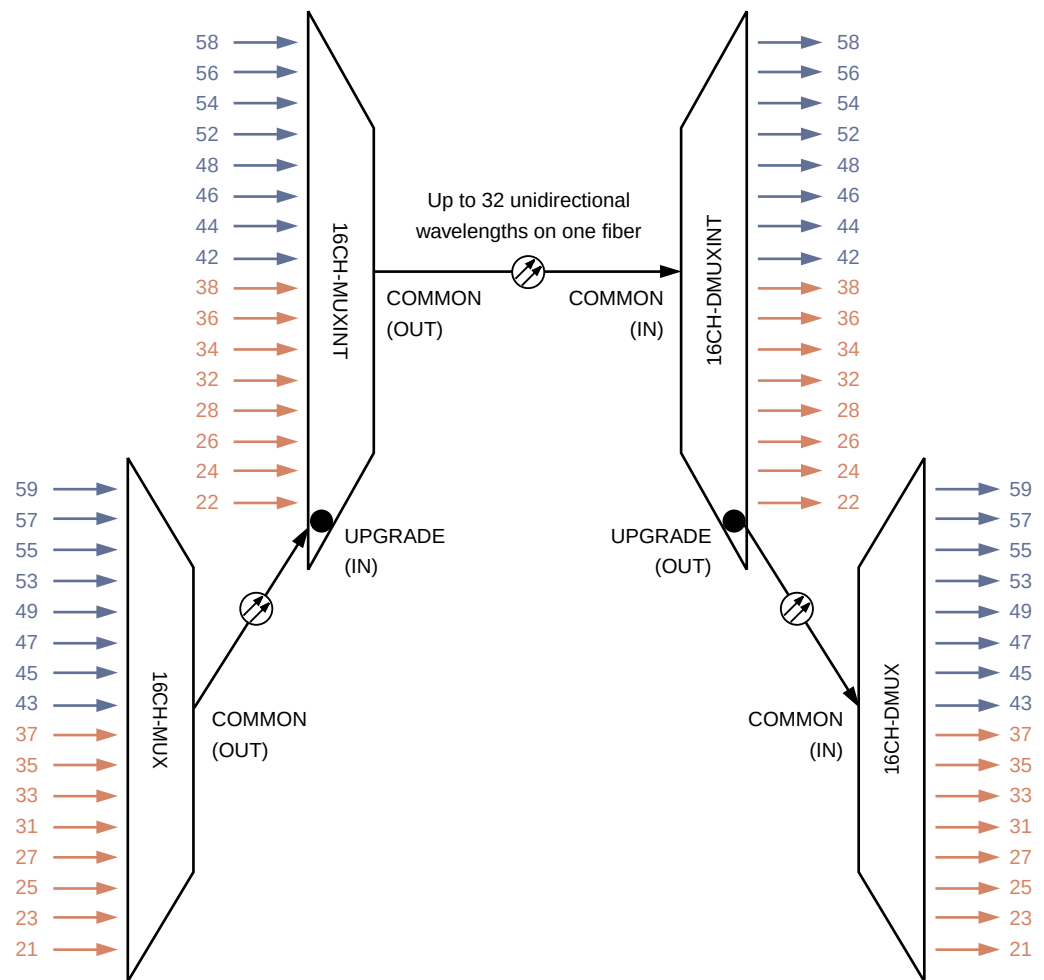


**Figure 3-14 Example of 32 Wavelength Unidirectional Application  
West to East Traffic Flow**



Each POU, the 16CH-MUX, 16CH-DMUX, 16CH-MUXINT, and 16CH-DMUXINT have Universal Optical Connectors, equipped from the factory with 0 dB LBO optical attenuators. Other types of optical attenuators, ST and FC, can be order separately, if desired.

The wavelength, frequency, and channel number are provided above the optical connector on each POU.

The POUs can be used in controlled environment applications.

Each POU has a small footprint (less than 3 inches in height). The POUs can be used in 23-inch Lucent Technologies NEBS and NEBS 2000 bays.



When one POU is used in a 7-foot bay with a WaveStar TDM 2.5G/10G (2-Fiber) system or systems, the bay can hold up to 2 WaveStar TDM 2.5G/10G shelves (one 10G high speed with a tributary shelf, or two 2.5G/tributary shelves).

The following applications are supported with the POUs and the WaveStar TDM 2.5G/10G (2-Fiber) R6 system equipped with Passive DWDM compatible optics:

- Unidirectional transport of up to 16, OC-192 and/or OC-48, wavelengths on one fiber using the 16CH-MUX and the 16CH-DMUX
- Bidirectional transport of up to 8, OC-192 and/or OC-48, wavelengths on one fiber using the 16CH-MUX and the 16CH-DMUX
- Unidirectional transport of up to 16 OC-192 wavelengths on one fiber using the 16CH-MUXINT and the 16CH-DMUXINT
- Unidirectional transport of up to 32 OC-192 wavelengths on one fiber using the 16CH-MUX, 16CH-DMUX, 16CH-MUXINT, and 16CH-DMUXINT.
- Bidirectional transport of up to 16 OC-192 wavelengths on one fiber using the 16CH-MUX, 16CH-DMUX, 16CH-MUXINT, and 16CH-DMUXINT.

The appropriate optical connection should be made between each POU and the appropriate Passive DWDM compatible optics circuit pack on the WaveStar TDM 2.5G/10G (2-Fiber).

The POUs do not require power, software, or operations support. Protection schemes and alarming functions can be performed by the multiplexers or DCS systems connected to the POUs.

The Passive Optics Units can be used to combine signals from different products, and at different rates (OC-48 and OC-192) onto a single fiber. The signals being combined must have different frequencies/wavelengths, and those frequencies/wavelengths must be supported on appropriate POUs.

The worst case conditions should be considered when designing a Passive DWDM route. The worse case optical transmitter/receiver specifications for all products transmitting/receiving information to/from a POU should be used to calculate the span distance for the Passive DWDM route. Optical specifications vary by product, and by optical rate. Typically, using OC-48 optics allows longer distances than OC-192 optics (distance versus capacity tradeoff).

The loss, for the combination of the 16CH-MUX and 16CH-DMUX units, is 6.4 dB. The loss anytime the 16CH-MUXINT and 16CH-DMUXINT units are used is 10.2 dB

Information for the WaveStar TDM 2.5G/10G (2-Fiber) Passive DWDM compatible optics port units, such as wavelengths and loss budgets in applications with the POU's, and ordering information can be found in *WaveStar TDM 2.5G/10G Applications and Planning Guide*.

Each WaveStar TDM 2.5G/10G (2-Fiber) Passive DWDM compatible optics port unit has a 4-digit numeric suffix, after the "POU" in its description. This suffix directly corresponds to the frequency of each optical signal. For example, the OC-192 port unit designated OC192/STM64/POU9210, operates at a frequency of 192.10 THz (192.10 THz). This frequency, 192.10 THz, a wavelength 1560.606 nm, is supported on the 16CH-MUX and 16CH-DMUX units.

**Hint:** It is easier to upgrade an existing 16 wavelength unidirectional (8 bidirectional) architecture, to a 32 wavelength unidirectional (16 bidirectional) architecture, if the 16CH-MUXINT and 16CH-DMUXINT units are deployed initially. Then the upgrade simply requires that the 16CH-MUX and 16CH-DMUX units, be added to the network by connecting their COMMON ports with the UPGRADE ports on the 16CH-MUXINT and 16CH-DMUXINT units. Service can then be added on the 16CH-MUX and 16CH-DMUX.

If the 16CH-MUX and 16CH-DMUX are deployed first, at some point in the upgrade, the signal carrying multiple wavelengths (COMMON ports on the 16CH-MUX and 16CH-DMUX) will need to be disconnected, and then connected to the UPGRADE ports on the 16CH-MUXINT and 16CH-DMUXINT. This could require the rolling of traffic or be service affecting. Of course, the choice of which POU's to deploy, depends on the specific application.

The appropriate selection of wavelengths for network deployments helps to keep sparing costs for optical port units to a minimum.



## Basic Architecture

---

### Overview

The WaveStar TDM 2.5G/10G (2-Fiber) system with the high-speed shelf option, and at least one tributary shelf, is a flexible high-capacity multiplexer that supports OC-192 2-fiber BLSR or 2-fiber UPSR applications. The system can multiplex DS3/EC1, OC-3, OC-12, GE1, and OC-48 signals on the OC-192 ring. The low-speed interfaces can be protected in a variety of ways (see information later in this chapter). The OC-192 system supports up to four tributary shelves when equipped with the 768x768 STS-1 switch fabric in the high-speed shelf (up to two tributary shelves when equipped with the 576x576 STS-1 switch fabric). Each tributary shelf can terminate up to 4 OC-48 BLSRs, 4 OC-48 UPSRs, or up to 16 OC-12 UPSRs. Each tributary shelf allows the flexible mixing of interfaces and protection schemes for those interfaces.

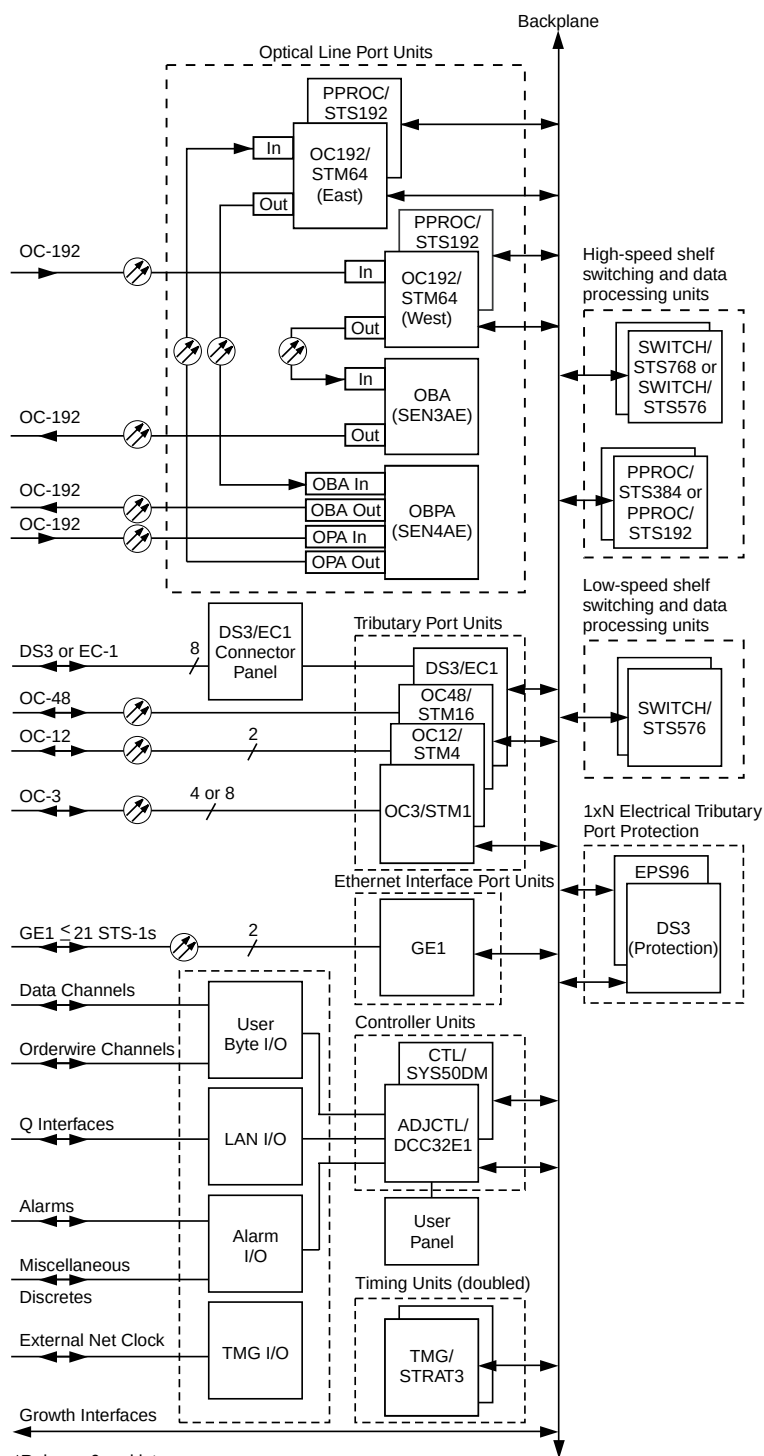
For stand-alone OC-48 applications, the WaveStar TDM 2.5G/10G (2-Fiber) stand-alone tributary shelf (also referred to as the 2.5G Application) supports all of the following stand-alone OC-48 applications, 2-fiber BLSR, UPSR, 1+1, 0x1 applications. Just as in the case for each tributary shelf in an OC-192 application, the stand-alone system can terminate up to 4 OC-48 BLSRs and 4 OC-48 UPSRs (up to 16 OC-12 UPSRs are supported). In addition to the OC-48 interfaces, DS3/EC1, OC-3, OC-12, and GE1 interfaces are also supported. The system supports flexible mixing of interfaces and protection schemes for those interfaces. Full hairpinning is supported to ensure that interfaces can be utilized in the most efficient way.

### Diagram of basic architecture for system with high-speed shelf

The figure below outlines the overall architecture of a WaveStar TDM 2.5G/10G (2-Fiber) system that includes both the high-speed and tributary shelves. This diagram does not show the physical distribution of functions on different shelves.

### NOTE:

For information about which OC-192/STM64 port units to use with SEN3AE (OBA) and SEN4AE (OBPA) and whether or not the application requires Dispersion Compensation Modules (DCMs), see Chapter 2, “Network Topologies.”

**Figure 3-15 System with High-Speed Shelf -- Basic Architecture**

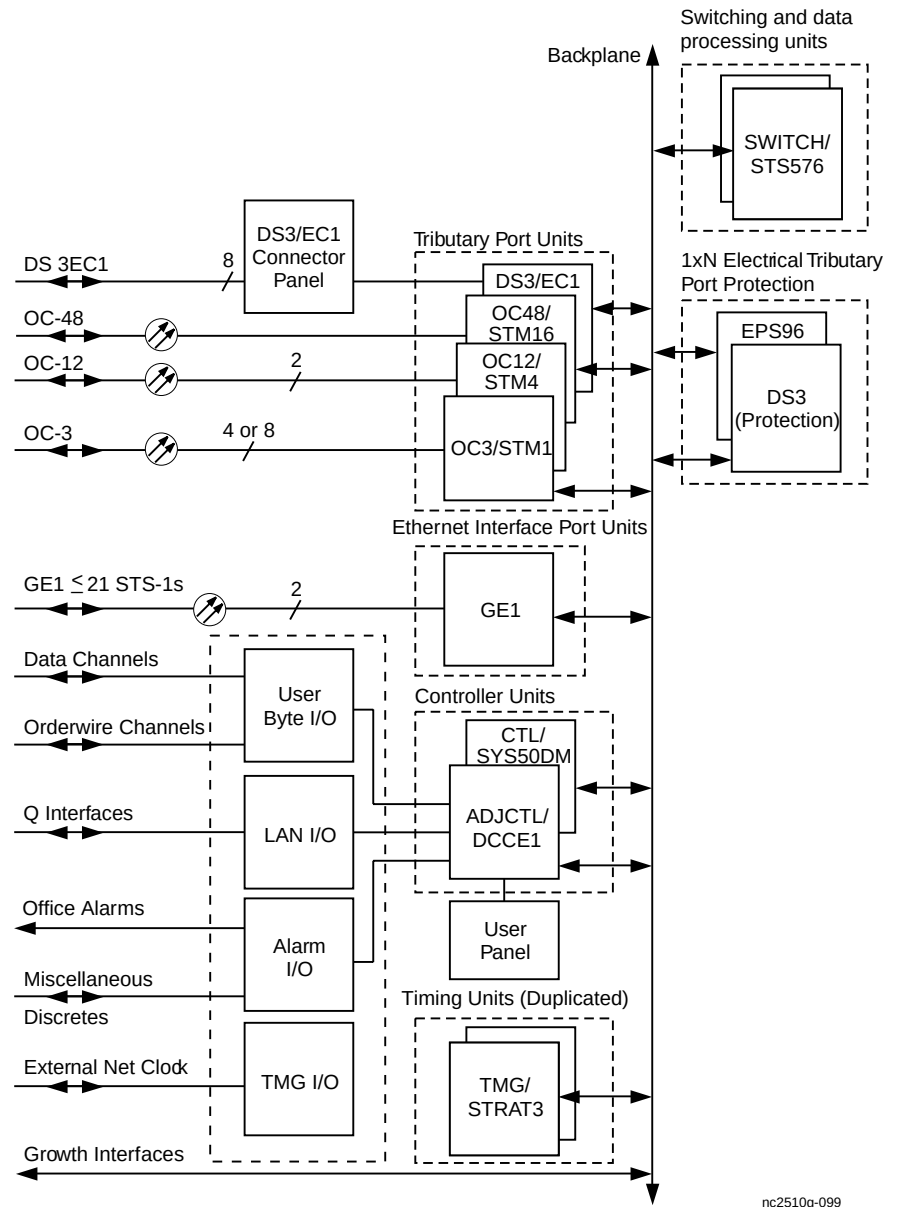
\*Release 6 and later.

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### Diagram of basic architecture for stand-alone tributary shelf

The figure below outlines the overall architecture of the tributary shelf.

**Figure 3-16 Stand-alone Tributary Shelf Basic Architecture**



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# Transmission

---

**Overview** The WaveStar TDM 2.5G/10G (2-Fiber) add/drop multiplexer uses two port units (transmission interface circuit packs) in the high-speed shelf to connect as a node in an OC-192 2-fiber BLSR or UPSR, or as a node on or between two OC-192 unprotected ports. It uses up to 16 tributary port unit circuit packs on each tributary shelf to connect as nodes in a mix of supported network configurations, including interfacing with up to 4 OC-48 2-fiber BLSRs, 4 OC-48 UPSRs, 16 OC-12 UPSRs or a mix of these ring types and other interfaces on the tributary shelf. Traffic can be connected between any of the ports. For information about the port units, refer to *Chapter 5, Circuit Pack and Port Unit Descriptions*.

**Optical transmission** In order to provide the most cost effective solutions for short and long distance applications and to maximize the utilization of fiber base the specific applications need, the WaveStar TDM 2.5G/10G (2-Fiber) system supports a wide range of optical transmission capabilities for OC-192 and OC-48 applications. A summary of these capabilities is provided below. Information on other transmission interfaces is provided in the remainder of this chapter. Detailed specifications for port units are provided in the *WaveStar TDM 2.5G/10G Applications and Planning Guide*.

For OC-48 applications:

- Standard 1.3μ
- Standard 1.5μ
- DWDM applications
  - 16 OC-48 wavelengths in the 1.5μ range for use with Metropolis™ EON
  - 16 OC-48 wavelengths in the 1.5μ range for use with POU shelves (DWDM Filter Units).
  - 80 OC-48 wavelengths in the 1.5μ range for use with WaveStar® OLS 1.6T.

For OC-192 applications:

- Standard 1.5 $\mu$
- DWDM applications
  - 32 OC-192 (DWDM) wavelengths in the 1.5 $\mu$  range for use with POU Shelves (DWDM Filter Units).
  - 40 OC-192 (DWDM) wavelengths in the 1.5 $\mu$  range for use with WaveStar<sup>®</sup> OLS 1.6T.
- Internal optical amplifiers (OBA and OBPA used with the appropriate OC192 port unit)
- Compatible with External Optical Amplifier

**Add/drop optical transmission**

WaveStar TDM 2.5G/10G (2-Fiber) supports OC-12 and OC-3 1.3 $\mu$  interfaces over standard fiber and OC-48 1.3 $\mu$  or 1.5 $\mu$  interfaces over standard fiber. OC-12 and OC-3 transmission can be provisioned for 0x1 or 1+1 protection. OC-12 UPSRs are also supported. OC-48 transmission can be provisioned for 0x1, 1+1, UPSR, or BLSR protection.

**DS3/EC1 transmission**

WaveStar TDM 2.5G/10G (2-Fiber) supports DS3/EC1 transmission over coaxial cables. A DS3/EC1 connector panel is required either on the left side of, above, or on the right rear of (as you face the back of the shelf) the appropriate tributary shelf for any DS3/EC1 port unit circuit packs in slots 1 through 6. A panel is required either on the right side of, below, or on the left rear of (as you face the back of the shelf) the appropriate tributary shelf for any DS3/EC1 port units in slots 11 through 16. Therefore, it is practical to keep all DS3/EC1 circuit packs in the same side of the shelf until you need to terminate more than 48 DS3/EC1s.

**Gigabit ethernet transmission**

The Gigabit Ethernet (GE1) interfaces supported by the WaveStar TDM 2.5G/10G (2-Fiber) allows you to transport Gigabit Ethernet signals over SONET networks by encapsulating ethernet packets in virtually concatenated STS1s. The GE1 interfaces support point-to-point connectivity. They provide two fully independent bidirectional ports on each port unit. The GE1 interfaces are:

GE1/SX2:

- 770 to 860 nm, Short Reach (according to IEEE802.3, clause 38.3), 2 interfaces per circuit pack.

GE1/LX2:

- 1270 to 1335 nm, Long Reach (according to IEEE802.3, clause 38.4), 2 interfaces per circuit pack.

All connections to the 1000BASE-SX ethernet interface on the GE1/SX2 and GE1/LX2 port units require Dual SC Connectors.

**Transmission provisioning**

Provisioning of the transmission circuit packs is controlled by the system controller circuit pack in response to commands received over the SONET DCC circuits or from a WaveStar Craft Interface Terminal (CIT) connected to the port on the user panel.

**Transmission architecture**

WaveStar TDM 2.5G/10G (2-Fiber) transmission port units interconnect with a 576x576 STS-1 switch fabric in each low-speed tributary shelf and with either a 576x576 STS-1 switch fabric or a 768x768 STS-1 switch fabric in the high-speed shelf. The switch provides cross-connections between input and outputs at the STS-1 level or higher. It also provides both line protection switching and path protection switching. For 1xN equipment protection of DS3/EC-1 port units, the switch also interfaces to an electrical protection switch unit (the SWITCH/DS3/EC1 circuit pack) that selects between the working and protection DS3/EC1 circuit packs.





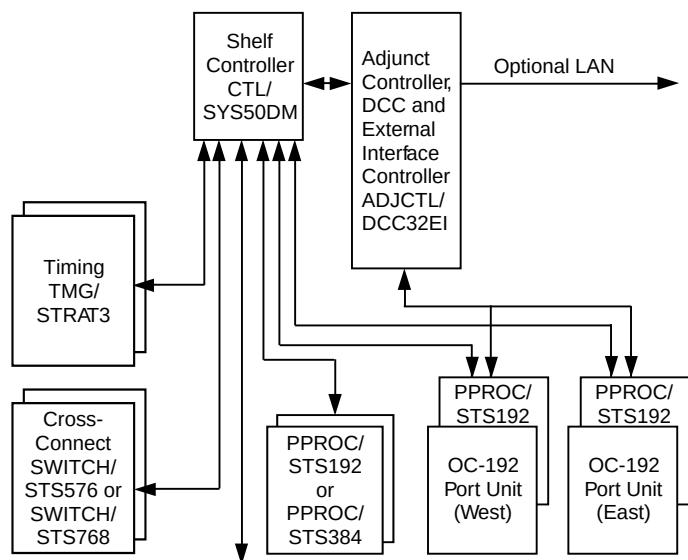
# Control

**Overview** The WaveStar TDM 2.5G/10G (2-Fiber) shelf functions are controlled by shelf controller circuit packs and by function microcontrollers on the port units (transmission circuit packs). The shelf controllers control the port units and also the timing and switching circuit packs, which have no internal function controllers. Overall system operation is controlled by signals received over the SONET DCC channels or from the user interface (WaveStar CIT or OS system).

The controller in the first tributary shelf additionally serves as a system controller for the complete network element (including the high-speed shelf, if used, and the tributary shelf or shelves).

**Control architecture** The high-speed shelf interfaces with the tributary shelf or shelves by means of backplane wiring. The following figure shows the major paths of control and status information among the circuit packs in the WaveStar TDM 2.5G/10G (2-Fiber) high-speed shelf.

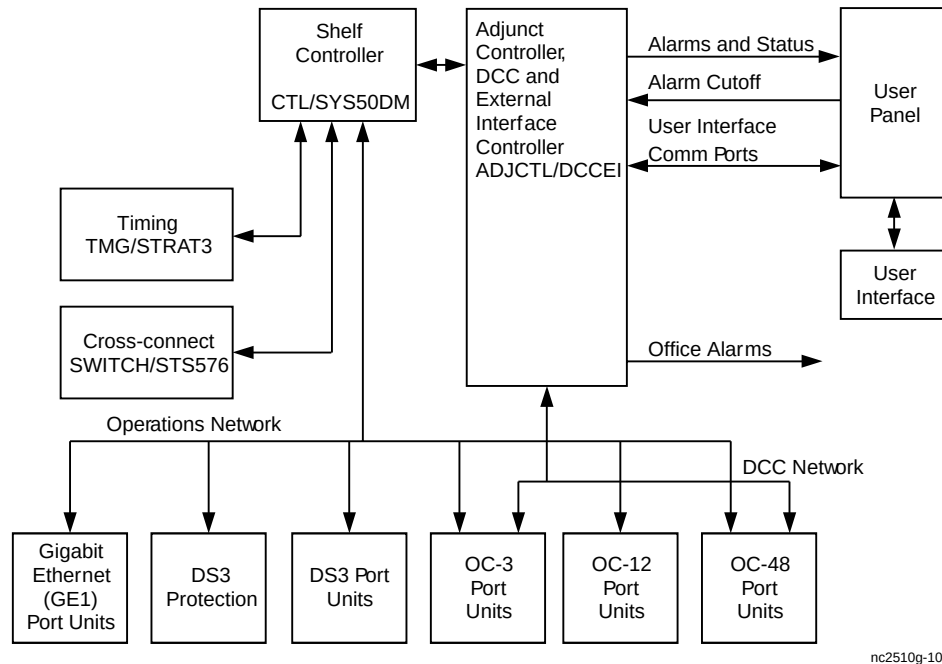
**Figure 3-17 WaveStar TDM 2.5G/10G (2-Fiber) High-Speed Shelf Control Architecture**



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The following figure shows the control architecture for the tributary (low-speed) shelf. The minimum configuration includes one tributary shelf and the maximum includes two tributary shelves.

**Figure 3-18 WaveStar TDM 2.5G/10G (2-Fiber) Tributary Shelf Control Architecture**



- Control circuit packs** WaveStar TDM 2.5G/10G (2-Fiber) uses one shelf controller and one adjunct controller:
- CTL/SYS50DM – shelf controller
  - ADJCTL/DCCEI – adjunct controller that handles DCC signals and external interfaces

**CTL/SYS50DM circuit pack**

The CTL/SYS50DM shelf controller circuit pack contains the main processor and memory controlling the WaveStar TDM 2.5G/10G (2-Fiber) shelves. The primary functions this circuit pack performs include:

- Communicates with the function controllers in the port units to monitor performance and to perform provisioning and maintenance
- Directly controls the timing and switching circuit packs
- Detects the presence of circuit packs in the shelf
- Communicates with the user interface by way of the ADJCTL/DCCEI circuit pack
- Resets circuit packs as necessary
- Monitors shelf power

**ADJCTL/DCCEI circuit pack**

Serving as an interface to the shelf controllers, the ADJCTL/DCCEI adjunct controller obtains, processes and stores information for transfer to and from the shelf controller. Additionally, the ADJCTL/DCCEI controller supports

- DCE (data communications equipment) configurations for user interface ports
- Status indicators on the user panel



# Power

---

- Overview** The WaveStar TDM 2.5G/10G (2-Fiber) system uses a distributed powering system, rather than bulk power supplies. It distributes –48 V power throughout each shelf, and each circuit pack uses onboard power converters to derive the necessary operating voltages.
- Dual power feeds** On each shelf, office power feeders BREAKER (A) and BREAKER (B) are filtered and protected by circuit breakers at the input to the shelf. The two –48 V supplies are then distributed separately to each circuit pack and the fan unit, where they are filtered and fused before being converted to the working voltages.
- Circuit breakers** The –48 V circuit breakers have self-indicating rocker switches. The normally hidden portion of the rocker switch is red. When the breaker is tripped, the red portion is exposed, providing a visual indication. You can trip a breaker manually by inserting a small screwdriver blade (or equivalent) into the slot on the rocker switch. This feature reduces the risk of a shelf being switched off accidentally.
- The fan unit also has two circuit breakers, but they cannot be manually tripped. When these breakers trip, a white cylinder protrudes from the breaker. These breakers can be reset by pressing the white cylinder so that it is flush with the black body of the breaker.
- Power indicator** The green PWR ON indicators on the user panel and fan units remain lighted as long as either –48 V supply is received from the circuit breakers.



# Cooling

---

**Overview** Cooling is provided by a plug-in fan unit. Fans draw air in through a filter beneath the fan unit and force it through the shelf from bottom to top. Heat baffles are required beneath each shelf to prevent the fan unit from drawing in the exhaust air from the shelf beneath it. The fan filter must be replaced when a filter alarm occurs. Alternatively, the filter should be replaced every 6 months to ensure the proper cooling. For specific dimensions of the cooling equipment, see *Appendix B, Technical Specifications*.

**Fan controller** The fan unit includes six fans and a microcontroller that senses air flow, air temperature, and fan faults. The microcontroller adjusts the speed of the fans to compensate for the failure of a fan or to conserve power when full air flow is not needed. It also reports the status of the fan unit to the shelf controller.

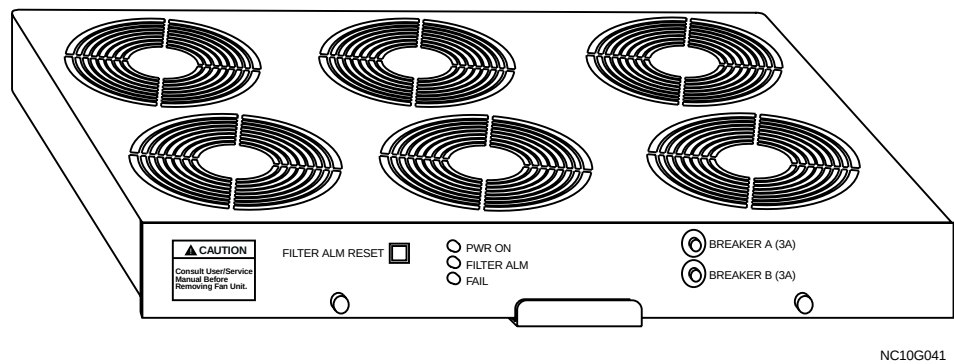
**Controls and indicators** The front panel of the fan unit includes the following controls and indicators:

- Status indicators
  - PWR ON (power on)
  - FILTER ALM (filter alarm)
  - FAIL
- Filter alarm reset button
- Circuit breakers
  - BREAKER (A) (25A)
  - BREAKER (B) (25A)

**Important!** The fan unit must be installed and operating in a shelf before any circuit packs are installed.

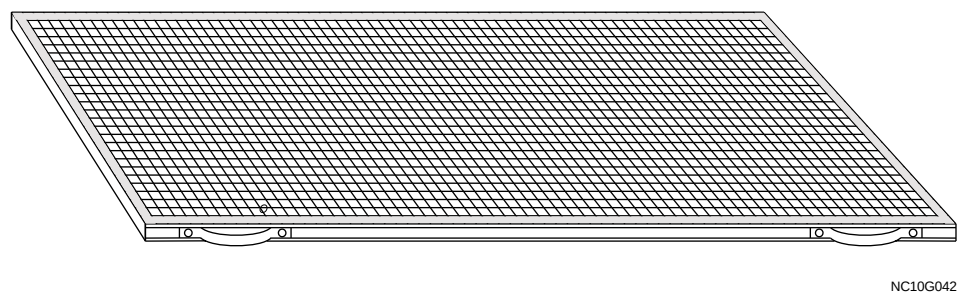
**Fan unit**     The following figure illustrates the fan unit that mounts in each WaveStar TDM 2.5G/10G (2-Fiber) shelf.

**Figure 3-19 Fan Unit**



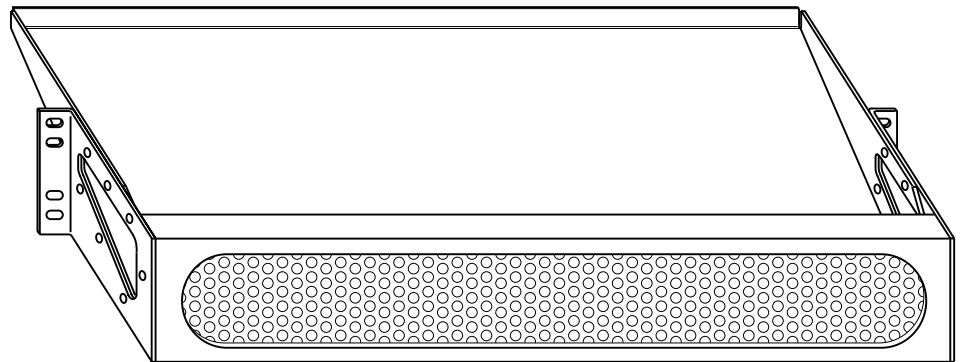
**Filter assembly**     The figure below shows the filter that is installed beneath the fan assembly.

**Figure 3-20 Fan Filter**



**Heat baffle** The figure below shows the heat baffle that must be mounted between and beneath shelves to ensure proper cooling.

**Figure 3-21 Heat Baffle**



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**Blank faceplates** Any slot that is not equipped with a circuit pack must be covered with a blank faceplate to preserve the cooling of the shelf.



## Summary

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|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Shelf and bay configurations</b> | <p>WaveStar TDM 2.5G/10G (2-Fiber) offers two basic options:</p> <ul style="list-style-type: none"> <li>• A stand-alone tributary shelf that interfaces OC-12, OC-3, and DS3 lines to OC-48 bidirectional line-switched rings (BLSR).</li> <li>• A single bay with a high-speed shelf and either one or two tributary (low-speed) shelves and optional DS3 connectors.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Circuit packs</b>                | <p>The minimum complement of circuit packs required for an operational WaveStar TDM 2.5G/10G (2-Fiber) system is the following circuit packs in the tributary control shelf:</p> <ul style="list-style-type: none"> <li>• SWITCH/STS576 (two)</li> <li>• CTL/SYS50DM (one)</li> <li>• ADJCTL/DCCEI (one)</li> <li>• TMG/STRAT3 (two)</li> <li>• port units as required for the application</li> </ul> <p>No specific minimum of port units is required for the system to operate.</p> <p>The minimum complement of circuit packs that uses the OC-192 2-fiber BLSR consists of the following:</p> <ul style="list-style-type: none"> <li>• SWITCH/STS576 (two in high-speed shelf and two in tributary shelf)</li> <li>• CTL/SYS50DM (one in high-speed shelf and one in tributary shelf)</li> <li>• ADJCTL/DCCEI (one in high-speed shelf and one in tributary shelf)</li> <li>• TMG/STRAT3 (two in high-speed shelf and two in tributary shelf)</li> <li>• OC192/STM64 (two in high-speed shelf)</li> </ul> |
| <b>Powering</b>                     | <p>The WaveStar TDM 2.5G/10G (2-Fiber) requires two –48 V office feeders on each shelf. Each circuit pack uses onboard power converters to derive the necessary operating voltages.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Cooling</b>                      | <p>The WaveStar TDM 2.5G/10G (2-Fiber) includes a fan unit containing six microprocessor-controlled fans. Each shelf requires a heat baffle immediately below the filter for the fan unit.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |







# 4 Operations Interfaces

## Overview

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**Purpose** This chapter introduces the operations interfaces of the WaveStar TDM 2.5G/10G (2-Fiber). Operations interfaces are interfaces that allow access to a network element and provide communication of alarm and status information on service and equipment. This communication can occur directly or remotely. Direct and remote access to the WaveStar TDM 2.5G/10G (2-Fiber) is typically obtained through the use of the WaveStar craft interface terminal (CIT). Local operations interfaces include the user panel light-emitting diodes (LEDs) and controls, the circuit pack faceplate LEDs, and office alarms. The 10BaseT Ethernet intraoffice local area network (IAO LAN) supports communication with operations systems (OSs).

**Contents** The following topics are discussed in this chapter:

|                                         |        |
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# WaveStar Craft Interface Terminal (CIT)

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|                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Introduction</b>               | This section provides information about the WaveStar CIT which is the primary tool used to interface with the WaveStar TDM 2.5G/10G (2-Fiber).                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>WaveStar CIT definition</b>    | The WaveStar CIT is a personal computer (PC) with WaveStar CIT software installed. The WaveStar CIT provides full graphical user interface (GUI) access to the administrative, maintenance, and provisioning capabilities of the WaveStar TDM 2.5G/10G (2-Fiber). The GUI includes pull-down menus and wizards to guide performance of tasks.                                                                                                                                                                                     |
| <b>Related information</b>        | For additional information about the WaveStar CIT, refer to <i>Appendix A, WaveStar CIT Tutorial</i> . For detailed information about minimum PC requirements, refer to the <i>WaveStar TDM 2.5G/10G Software Release Description</i> .                                                                                                                                                                                                                                                                                           |
| <b>WaveStar CIT features/uses</b> | <p>The WaveStar CIT provides a fully-functional GUI through which all WaveStar TDM 2.5G/10G (2-Fiber) tasks can be performed. The WaveStar CIT provides an easy-to-use interface and security features to prevent unauthorized access. The tasks facilitated by the WaveStar CIT include:</p> <ul style="list-style-type: none"><li>• Provisioning</li><li>• Reporting</li><li>• Cross-connections</li><li>• Protection switching</li><li>• Software download</li><li>• Backup and restoration of user provisioned data</li></ul> |
| <b>Security</b>                   | <p>The WaveStar TDM 2.5G/10G (2-Fiber) is protected against unauthorized access to the WaveStar CIT system functions (such as provisioning). Security is controlled through logins, passwords, and multiple authorization levels. In Release 6, the network element provides a provisionable login banner.</p> <p>For more information about security, refer to Chapter 7, Provisioning, Security, and Administration.</p>                                                                                                        |

**WaveStar CIT direct access**

Direct access to the WaveStar TDM 2.5G/10G (2-Fiber) is accomplished through the WaveStar CIT. The WaveStar CIT is connected to the WaveStar TDM 2.5G/10G (2-Fiber) by the CIT port of the user panel or through two rear panel connectors (J35, J41). The WaveStar CIT interface is a 10BaseT Ethernet LAN connection (10 Mb/s, 4-wire twisted pair with an RJ45 connector).

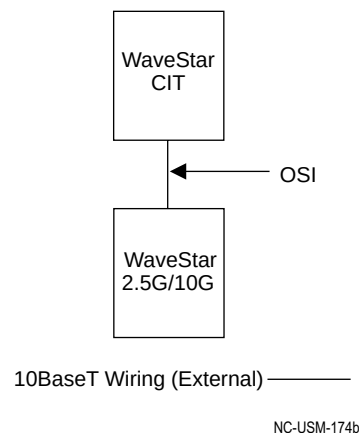
For wiring details, refer to *WaveStar TDM 2.5G/10G (2-Fiber) Installation Manual*.

The WaveStar CIT user interface is a GUI; however, the WaveStar CIT interface to the WaveStar TDM 2.5G/10G (2-Fiber) supports transaction language 1 (TL1) as well as File Transfer and Access Management (FTAM) for software downloads and provisionable data backup and restore. This interface allows the WaveStar CIT to issue TL1 commands and receive reports. The WaveStar CIT also receives TL1 alarm reports for autonomous events that are detected by the WaveStar TDM 2.5G/10G (2-Fiber).

This interface, including the TL1 and FTAM applications, is based on the Open Systems Interconnection (OSI) protocol.

**Important!** CIT direct access to WaveStar TDM 2.5G/10G (2-Fiber) via a high-speed shelf or tributary I/O shelf (as well as all other OSI LAN and DCC based operations) is dependent on adherence to the “IS-IS Level 2 Routing Guidelines” described in the “Subnetwork Size” section of this chapter.

**Figure 4-1 WaveStar CIT Direct Access**



## Operations Systems (OS) Interface

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**Description** The WaveStar TDM 2.5G/10G (2-Fiber) OS interface is accessed through one of the 10BaseT Ethernet IAO LAN rear panel connectors. The WaveStar TDM 2.5G/10G (2-Fiber) interface supports Transaction Language 1 (TL1) for commands/messages, and File Transfer and Access Management (FTAM) for software downloads and provisionable data backup and restore. This interface is compatible with Telcordia's Network Monitoring and Analysis (NMA), Telcordia's Transport Element Management System (T-EMS), and the WaveStar Subnetwork Management System (SNMS).

The WaveStar TDM 2.5G/10G (2-Fiber) OS interfaces supported include the following:

- OSI LAN/WAN (to SNMS or other compatible OS)
- TCP/IP (RFC1006) (through NCC to SNMS)
- TL1/X.25 (through NCC to NMA, T-EMS, or other compatible OS)
- TL1 TCP/IP (either using the internal gateway function or routed through NCC to NMA, T-EMS, or other compatible OS)
- FTP/FTAM (for software download, etc.)

**Important!** The example scenarios provided here are based on common (typical) installations and may not reflect the exact manner in which the system is configured. The focus is on how communications work through the operations interfaces, not on the specifics of a particular installation.

### **Network communications controller (NCC)**

The NCC is available to perform protocol conversion, if necessary, for the OS interfaces listed above. The local NE to NCC interface is OSI protocol over the 10BaseT Ethernet IAO LAN. The NCC can be provisioned to be any of the following:

- TL1/X.25 gateway
- TL1 TCP/IP gateway
- RS-232 gateway (when used with a terminal server)

Each NCC provides one or two (NCC R3.2) 10BaseT LAN interfaces and, optionally, one X.25 interfaces capable of running at up to 56 kbps. The NCC functions are provisionable depending on operational needs.

An NCC can be provisioned to provide any or all of the following T1.245 SONET directory services (SDS)-related functions for the OSI part of a SONET subnetwork:

- T1.245 directory system agent (DSA) including the directory information base (DIB) where the actual NE directory information is stored
- T1.245 registration manager (RM) to facilitate automatic WaveStar TDM 2.5G/10G (2-Fiber) registration in the DIB
- T5 gateway to automatically register NEs that support target ID (TID) address resolution protocol (TARP) but not T1.245 SDS (for example, Lucent PF-2000 NEs)

The NCC uses TARP as a backup or whenever necessary to support all of the functions above.

The SDS-related functions of the NCC are for OSI only. They do not register an IP address. The only name translation is between TID and NSAP.

Release 3.2 of the NCC is compatible with WaveStar TDM 2.5G/10G (2-Fiber). For more information about the NCC, refer to the Network Communications Controller (NCC) User's Guide.

#### **IAO LAN access**

This section explains how the 10BaseT Ethernet IAO LAN is used by the WaveStar TDM 2.5G/10G (2-Fiber) to communicate with SNMS or another compatible OS using the Open Systems Interconnect (OSI) protocol stack.

#### **IAO LAN function**

The IAO LAN serves two main purposes:

- It provides a standard means of connecting a network element into a central office (CO) data communications network (DCN) to provide OS access
- It provides an alternate path for data communications channel (DCC) communications to travel within a subnetwork.

The WaveStar TDM 2.5G/10G (2-Fiber) IAO LAN is internally connected to the DCC subnetwork so that operations messages on the IAO LAN can be seamlessly delivered to a remote network element by the DCC and vice-versa (DCC to IAO LAN).

**Internal IAO LAN hub**

The system supports an internal 4-port 10BaseT Ethernet IAO LAN hub (located on the ADJCTL/DCCEI circuit pack in each shelf). The WaveStar TDM 2.5G/10G (2-Fiber) 10BaseT Ethernet IAO LAN backplane connectors and the WaveStar CIT port on the user panel are all connected to this internal hub. The internal LAN hub supports direct connection of the WaveStar CIT (or NCC or SNMS) without requiring an external LAN hub.

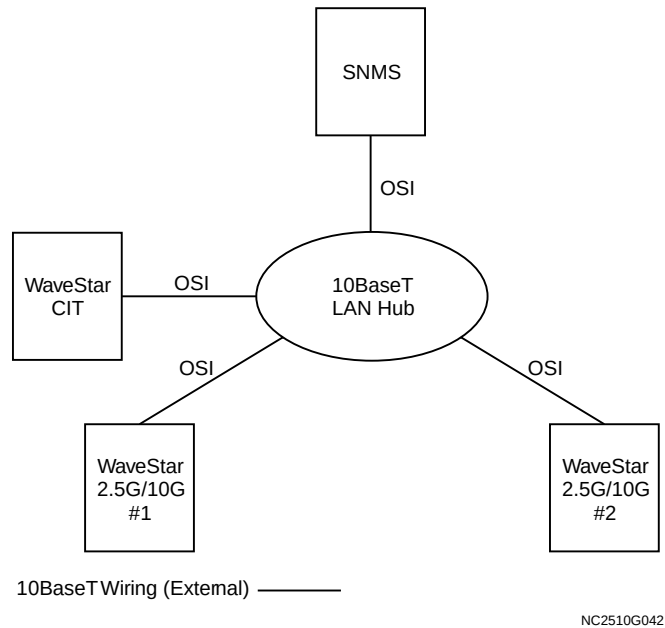
**Daisy Chain**

The internal IAO LAN hub also supports daisy-chaining of multiple WaveStar TDM 2.5G/10G (2-Fiber) shelves, for example, in the same bay. A daisy-chain connection is similar to a null-modem connection. Reference is made to a 10BaseT connection where there is no hub. In this connection, the receive pair on one end of the cable is connected to the transmit pair on the opposite end. Conversely, the transmit pair on one end is connected to the receive pair on the opposite end.

**Important!** A daisy-chain connection can only be repeated five times. A preferred connection would go through an external office LAN hub.

**IAO LAN access with OSI protocol**

The following figure shows multiple WaveStar TDM 2.5G/10G (2-Fiber) systems communicating with a local SNMS. The operation of the WaveStar TDM 2.5G/10G (2-Fiber) within this scenario is similar to the operation described in WaveStar CIT Direct Access, with one exception: SNMS and WaveStar CIT are connected to the WaveStar TDM 2.5G/10G (2-Fiber) systems through an external LAN hub.

**Figure 4-2 OS Access with OSI Protocol**

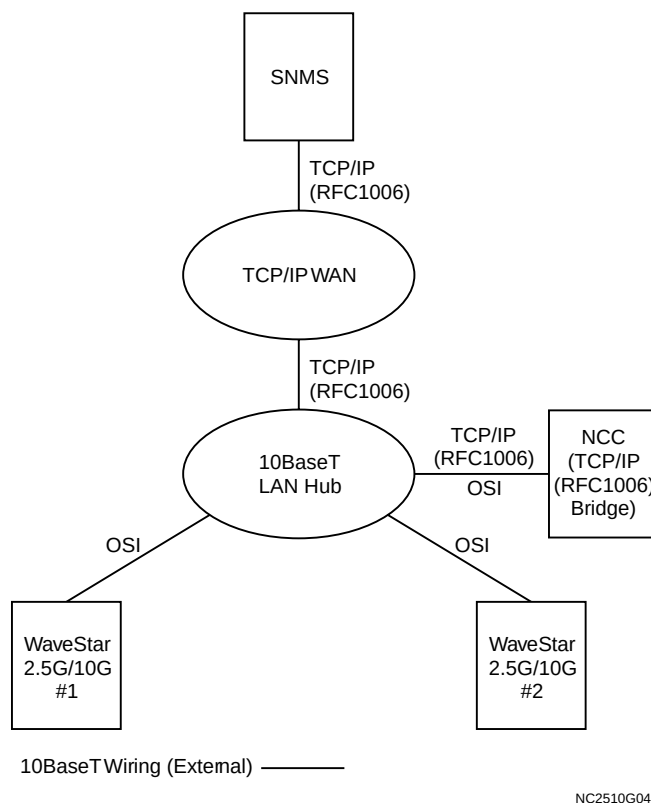


**TCP/IP (RFC1006 bridge)**

A TCP/IP bridge enables connection of multiple collocated WaveStar TDM 2.5G/10G (2-Fiber) systems to a remote SNMS equipped to communicate through a TCP/IP WAN. (See the following figure.) Since the SNMS communicates through TCP/IP, a bridge is required to provide a mapping between TCP/IP and OSI. In this scenario, the bridge is an NCC.

The NCC is provisioned to provide an RFC1006 bridge between TCP/IP (SNMS– NCC) and OSI (NCC–NE). This process is bidirectional, mapping messages originating in the SNMS to the proper NE NSAP as well as mapping messages originating in the NE to the proper SNMS IP address and returning them to the SNMS.

**Figure 4-3 OS Access with TCP/IP (RFC1006) Protocol**

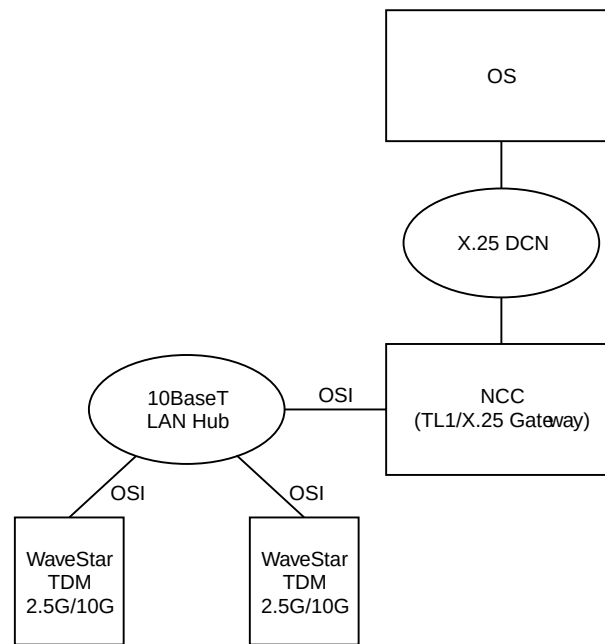


**TL1/X.25** An X.25 gateway may be used to connect multiple collocated WaveStar TDM 2.5G/10G (2-Fiber) systems to a remote OS equipped to communicate through an X.25 DCN. (See following figure.) Since the OS communicates through X.25, a gateway is required to provide a mapping between X.25 and OSI. In this scenario, the gateway is an NCC.

The NCC is provisioned to provide a TL1/X.25 gateway between X.25 DCN (OS–NCC) and OSI (NCC–NE). This process is bidirectional, mapping messages originating in the OS to the proper NE NSAP as well as mapping messages originating in the NE to the proper OS X.25 virtual circuit and returning them to the OS.

This interface supports TL1 messages only.

**Figure 4-4 OS Access with TL1/X.25**



NC2510G044



**OS access alternatives** The following table identifies the supported OS access alternatives.

**Table 4-1 OS Access Alternatives**

| OS Access                                                                                      | Supported TL1-RNEs                     |                |                               |
|------------------------------------------------------------------------------------------------|----------------------------------------|----------------|-------------------------------|
|                                                                                                | WaveStar<br>TDM 2.5G/<br>10G (2-Fiber) | PF-2000<br>NEs | Fujitsu<br>FLM-150<br>FLM-600 |
| SNMS via OSI LAN to subnetwork                                                                 | yes                                    | —              | —                             |
| ITM-SNC via OSI LAN to subnetwork                                                              | —                                      | yes            | yes                           |
| OSs via OSI LAN to subnetwork                                                                  | yes                                    | yes            | yes                           |
| SNMS via NCC TCP/IP (RFC1006) Bridge to subnetwork                                             | yes                                    | yes            | —                             |
| OSs via integrated TL1 TCP/IP Gateway to subnetwork (Requires TDM 2.5G/10G Rel. 4.2 or later.) | yes                                    | yes            | yes                           |
| OSs via NCC 3.2 or later TL1 TCP/IP Gateway to subnetwork                                      | yes                                    | yes            | yes                           |
| FTP via TCP/IP with IP Tunneling                                                               | yes                                    | —              | —                             |
| ITM-SNC via PF-2000 TL1/X.25 GNE to subnetwork                                                 | —                                      | yes            | N/A                           |
| OSs via NCC TL1/X.25 Gateway to subnetwork                                                     | yes                                    | yes            | yes                           |
| OSs via PF-2000 (except FT-2000 R9.1 or later) TL1/X.25 GNE to subnetwork                      | —                                      | yes            | N/A                           |
| OSs via FT-2000 R9.1 or later TL1/X.25 GNE to subnetwork                                       | yes                                    | yes            | N/A                           |
| OSs via TITAN 5500 TL1/X.25 GNE to subnetwork                                                  | yes                                    | yes            | N/A                           |

“N/A” means that OS access is not applicable (such OS access may or may not be compatible with Fujitsu RNEs).

**Wavestar subnetwork management system**

The WaveStar SNMS, a separate and optional Lucent Technologies product, can be used as an end-user management system and as an element management layer within a multi-level TMN-based management architecture. When used as an end-user system, SNMS provides a Java-based GUI for users to access and manage WaveStar TDM 2.5G/10G (2-Fiber) systems with visibility down to the circuit pack, port, and tributary levels. As an end-user system, SNMS provides a complete suite of element management functionality including fault, configuration, and security management. When a network management system (NMS) is used as the primary end-user system, SNMS will provide the interface between the NMS and the SONET network - translating and forwarding commands and messages between the NMS and the managed network.

**TL1 autonomous messages**

The WaveStar TDM 2.5G/10G (2-Fiber) OS interface supports Transaction Language 1 (TL1) autonomous messages. An active TL1 login to the NE is required in order to receive autonomous messages from the NE.

For additional details on TL1 autonomous messages, refer to WaveStar TDM 2.5G/10G (2-Fiber) Operation Systems Engineering Guide (OSEG).

**TL1 commands**

The WaveStar TDM 2.5G/10G (2-Fiber) OS interface supports TL1 commands. An active TL1 login to the NE is required in order to send commands to the NE and receive responses from the NE.

For additional details on TL1 commands, refer to WaveStar TDM 2.5G/10G (2-Fiber) Operation Systems Engineering Guide (OSEG).



## Remote Access

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### **Remote access for CIT and OS**

The WaveStar CIT can be connected to the WaveStar TDM 2.5G/10G (2-Fiber) as previously described for WaveStar CIT direct access or to the 10BaseT IAO LAN hub.

Remote access requires DCC, OSI LAN, or TCP/IP connectivity from the local WaveStar TDM 2.5G/10G (2-Fiber) to another remote WaveStar TDM 2.5G/10G (2-Fiber) system. This network operations capability uses the section DCC bytes in the SONET overhead of the optical signals. WaveStar CIT dialogues and OS messages are transmitted in these DCC bytes.

### **Access to other systems**

Remote access is supported to the following systems:

- PF-2000
- Fujitsu FLM-150
- Fujitsu FLM-600

The following access methods are supported:

- WaveStar CIT: TL1 cut-through
- ITM-SNC (EMS): IAO LAN or TL1/X.25 Gateway
- WaveStar DCC

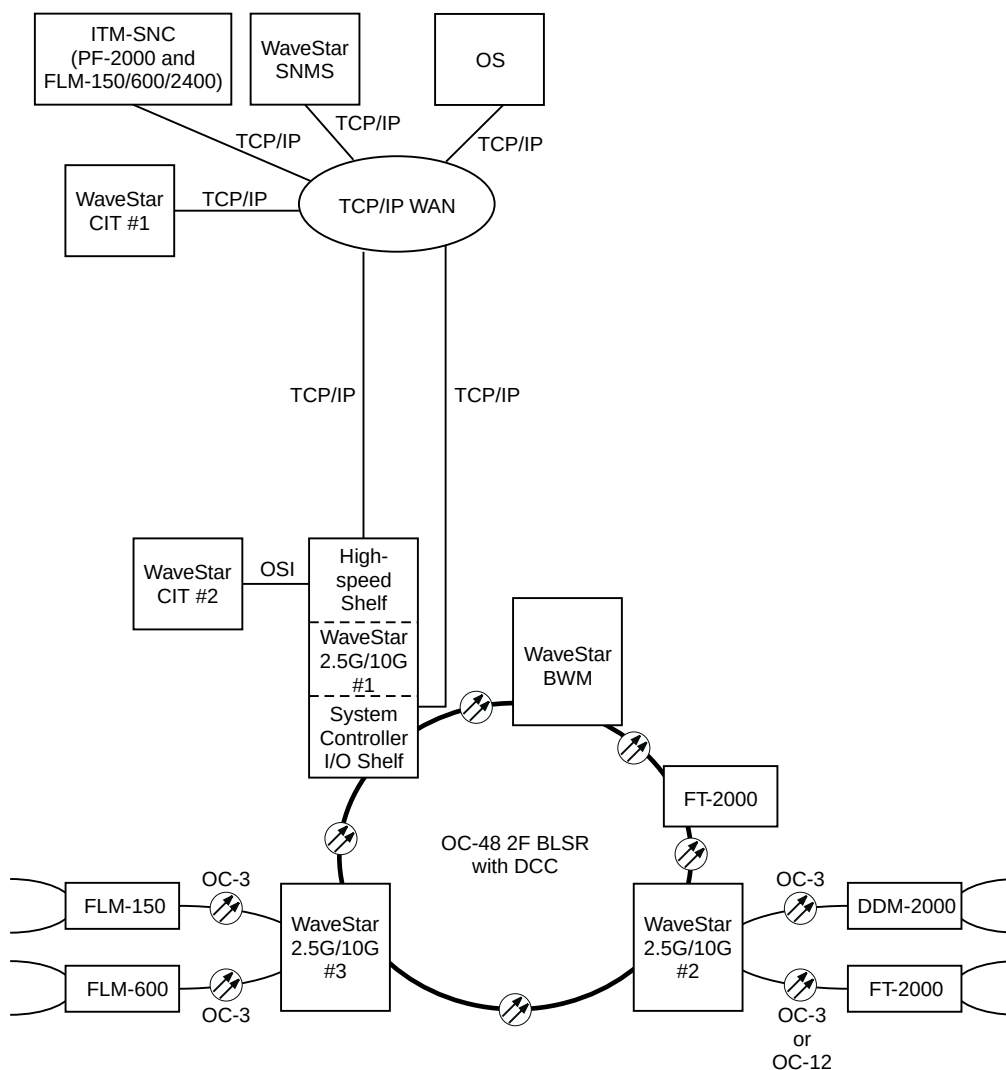
The Wavestar DCC aslo is compatible with TARP releases of the following:

- Lucent PF2000 family of products
- Tellabs TITAN 5500/s DCS R6.0 (Digital Cross-connect System)
- Fujitsu FLM-150 R14.2
- Fujitsu FLM-600 R14.2

## Configurations

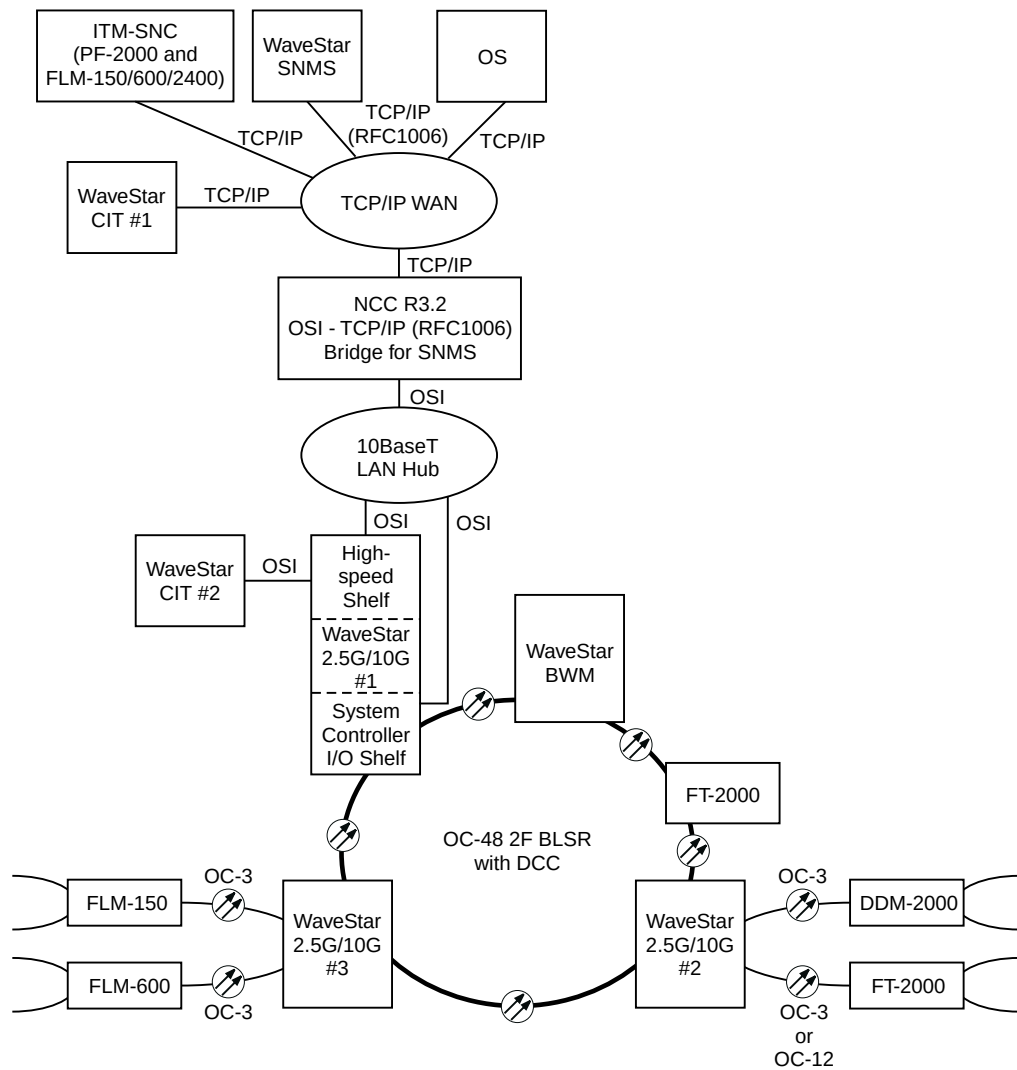
The configurations in the following figures allow the WaveStar CIT and OS connected through WaveStar TDM 2.5G/10G (2-Fiber) #1 to communicate with the other WaveStar TDM 2.5G/10G (2-Fiber) systems (#2 and #3). The WaveStar CIT and OS support capabilities are equivalent for both local and remote WaveStar TDM 2.5G/10G (2-Fiber) systems.

**Figure 4-6 WaveStar CIT and OS Remote Access Example Using Integrated TL1 TCP/IP Gateway**



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**Figure 4-7 WaveStar CIT and OS Remote Access Example Using NCC**



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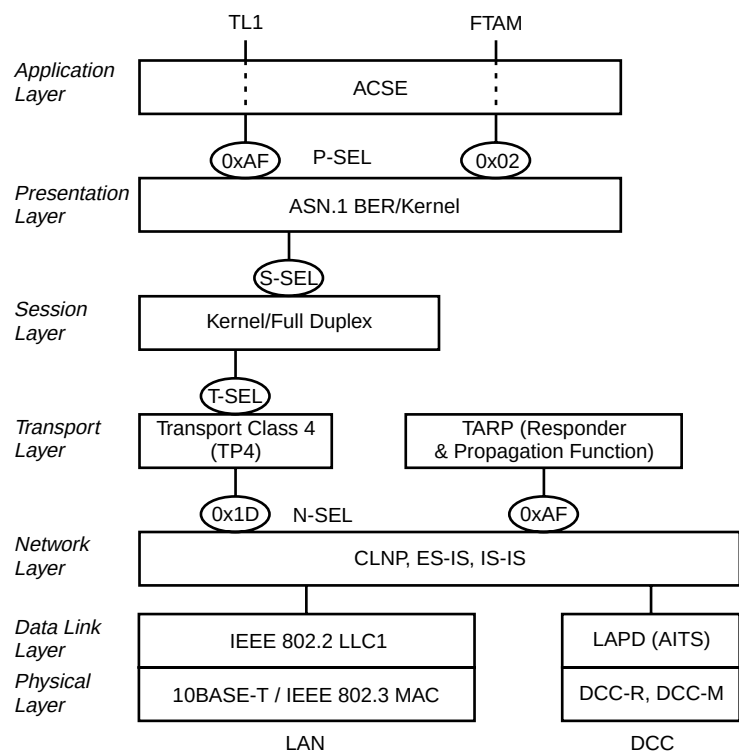
## DCN protocols and services

### Standard 7-layer OSI stack

The network elements support the exchange of management information over the standard 7-layer OSI protocol stack over Local Area Networks (LAN) and over Data Communication Channels (DCC) to the Telcordia Technologies (formerly Bellcore) GR-253 standard.

### Protocols and services

The following figure shows how network elements support the protocols and services.



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### FTAM

File Transfer, Access and Management (FTAM), defined by ISO 8571, is an Application Service Element (ASE). FTAM facilitates file transfer and allows file manipulation across a network. The FTAM protocol is used for software management purposes, such as software download, backup or restoration.

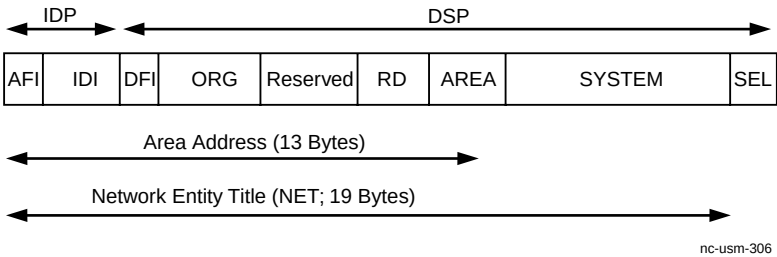


# NSAP address format

**NSAP address** The Network Service Access Point (NSAP) address is used by the network protocol for location information. The NSAP address of a node is its DCN-wide identifier which uniquely identifies the node in the network.

**ISO-DCC NSAP address format** Although different NSAP formats exist, preferably all nodes in a network should use the same address structure. The system supports only the 20-byte ISO Data Country Code (DCC) NSAP address format in accordance with ISO 8348.

The structure of the ISO-DCC NSAP address format is shown in the following figure.



The NSAP address consists of the Initial Domain Part (IDP) and the Domain Specific Part (DSP).

The first 13 bytes (“AFI” to “AREA” fields) of the NSAP address make up the area address.

The meaning of the individual fields of the ISO-DCC NSAP address is explained in NSAP address fields (4-18).

**NSAP address fields** The following table lists the NSAP address fields and describes their meaning.

| Field                             | Meaning                                                             | Description                                                                                                                                        |
|-----------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| <i>Initial Domain Part (IDP):</i> |                                                                     |                                                                                                                                                    |
| AFI                               | Authority and Format Identifier specifying the NSAP address format. | The predefined value is 0x39 (hex.), indicating that the ISO Data Country Code (ISO-DCC) is the address format.<br><br>This field is configurable. |

| Field                              | Meaning                                                                                           | Description                                                             |
|------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| IDI                                | Initial Domain Identifier specifying the country code.                                            | The predefined value is 0x840F (hex.).<br>This field is configurable.   |
| <i>Domain Specific Part (DSP):</i> |                                                                                                   |                                                                         |
| DFI                                | DSP Format Identifier specifying the DSP format.                                                  | The predefined value is 0x80 (hex.).<br>This field is configurable.     |
| ORG                                | Organization identifier (or Operator identifier) representing the Network Service Provider (NSP). | The predefined value is 0x000000 (hex.).<br>This field is configurable. |
| Reserved                           | Reserved portion of the NSAP.                                                                     | The predefined value is 0x0000 (hex.).<br>This field is configurable.   |
| RD                                 | Routing Domain                                                                                    | The predefined value is 0x0000 (hex.).<br>This field is configurable.   |
| AREA                               | Area identifier indicating the routing area to which a node belongs.                              | The predefined value is 0x0000 (hex.).<br>This field is configurable.   |

| Field  | Meaning                                                                                                                                                                                           | Description                                                                                                                                                                                                                                                                                                   |
|--------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SYSTEM | System identifier representing the node. The IEEE 802.3 MAC address, stored on the DCC controller (ADJCTL/DCCEI circuit pack) during the manufacturing process, is used as the system identifier. | The system identifier is the field that makes the NSAP address unique throughout the DCN.<br>This field is <i>not configurable</i> .<br>When a new DCC controller is inserted, then the system identifier, and thus the NSAP address, automatically changes.                                                  |
| SEL    | The selector field is used to direct the Protocol Data Units (PDUs) to the correct destination making use of the CLNP network layer service.                                                      | The predefined value is: <ul style="list-style-type: none"> <li>• 0x1D (hex.) for PDUs to be processed via the OSI stack</li> <li>• 0xAF (hex.) for PDUs to be processed via the TID Address Resolution Protocol (see Name-to-address translation (4-31)).</li> </ul> This field is <i>not configurable</i> . |

**Network entity title** The area address together with the system identifier (SYSTEM field) of the NSAP address is also called the Network Entity Title (see NSAP address fields (4-18)).

**DCC controller reset** All parameters related to DCC communication including all fields of the NSAP address are retained over a DCC controller reset. All parameters are kept in non-volatile memory.

**Configuring the NSAP address** You can configure the NSAP address on each active DCC controller individually.

**Important!** Changing the NSAP address causes the DCC controller to be restarted, thus causing momentary loss of communication with the system via that circuit pack.

**Additional information** For information on how to change the configurable fields of the network element's NSAP address, please refer to Task 234.



## Data communication channels

---

### Exchange of network management information

Network management information can be exchanged between network elements via Data Communication Channels (DCCs) using the D1-D12 Section Overhead (SOH) bytes of the first STS-1 frame within an STS transmission signal.

This makes it possible to set up a Data Communication Network (DCN) which uses SONET connections for exchanging network management data.

Please note that all nodes in an area must have DCC connectivity *within the area* to all other nodes in the same area.

The DCC uses OSI protocols. IP traffic is carried on the DCC by encapsulating it in CLNP PDUs.

### Section DCC

The Section Data Communication Channel (Section DCC or DCC-R) makes use of the SONET section overhead (SOH) bytes D1-D3 thus providing a transmission channel with a capacity of 192 kilobits per second. The Section DCC is automatically set as the default DCC for provisioned (configured) or pre-provisioned optical interface ports.

### Line DCC

The Line Data Communication Channel (Line DCC or DCC-M) uses the SONET line overhead (LOH) bytes D4-D12 thus providing a transmission channel with a capacity of 576 kilobits per second.

### Supported data communication channels

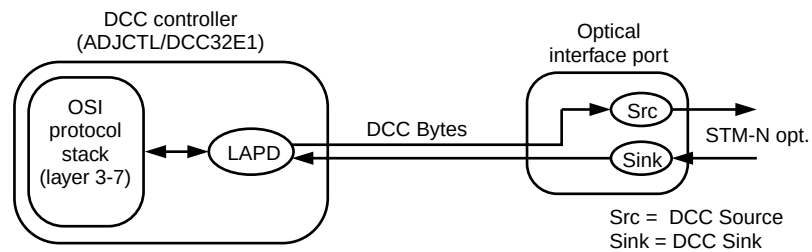
The following table gives an overview which Data Communication Channels are supported for which optical interfaces.

| Optical Interface | Section DCC | Line DCC |
|-------------------|-------------|----------|
| OC-3              | X           | X        |
| OC-12             | X           | X        |
| OC-48             | X           | X        |
| OC-192            | X           | X        |

## Termination of Data Communication Channels

The system supports the 7-layer OSI protocol stack over the DCC links which terminate on the DCC controller (ADJCTL/DCC32EI). The ADJCTL/DCC32EI circuit pack provides the source and sink of the DCC bytes to and from the active DCC links via LAPD devices. The LAPD protocol according to ITU-T Rec. Q.921 is used. You can define DCC links by assigning DCC terminations to optical interface ports. The following figure illustrates the functional principle.

**Figure 4-8 DCC Links**



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## Max. number of active DCC links

The maximum number of simultaneously supported LAPD channels per DCC controller is 32. Each DCC controller thus can support up to 32 active DCC links. Upon circuit pack insertion, DCCs will automatically be enabled and an LAPD channel assigned as long as LAPD channels are available.

## DCC provisioned state

A Data Communication Channel (either Section DCC or Line DCC) can be in one of the following provisioned states:

- *Enabled*
  - The corresponding DCC bytes are allocated to an optical interface port.
  - The DCC is assigned an LAPD channel.
- *Disabled*
  - The corresponding DCC bytes are no longer allocated to an optical interface port.
  - The DCC is no longer accessed by an LAPD channel.

The provisioned state of a DCC as well as the LAPD channel assignments are persistent over a DCC controller or NE reset.

**No DCC protection switching!**

The system does not support DCC protection switching. However, the system allows for protection switching of the DCC overhead bytes with the optical interfaces on which they reside. If no protection of the optical interface is provisioned, then the DCC bytes are unprotected as well.

**Mandatory DCC access for BLSR**

When an BLSR protection group is created and the BLSR management mode is “automatic discovery”, then two DCCs must be *enabled* (one for the east and one for the west port), and each of the DCCs must be assigned an LAPD channel; otherwise the creation of the BLSR protection group will fail due to insufficient resources (LAPD channels).

**Important!** The following has to be observed:

1. Data Communication Channels used for BLSR management cannot be disabled as long as the BLSR protection group exists and the BLSR management mode is “automatic discovery”.
2. If the neighboring node in an SONET BLSR is an ADM-16/1, then you must enable the Line DCC on the side connected to the ADM-16/1.

**Enabling of DCCs**

A Data Communication Channel can be enabled in either of the following ways, always provided that the required number of LAPD channels is available:

- Automatically upon circuit pack initialization  
When a port unit is initialized (e.g. after circuit pack insertion) the Section DCC will be enabled for each port provided that the required number of LAPD channels is available.
- Automatically upon creation of a protection group
- Manually by user provisioning  
Please refer to Task 235.

A DCC will be successfully enabled if an LAPD channel exists that

- can be assigned to this DCC in the unprotected mode, or
- can be shared with this DCC in a protected mode.

A DCC channel with its own LAPD channel when in the unprotected mode, can share its LAPD channel when in the 1+1, 1:1 or 1:N protection mode.

**DCC pre-provisioning** A DCC can be pre-provisioned to be enabled for a provisioned or pre-provisioned optical interface port even if the DCC controller or port is not physically equipped.

**Disabling of DCCs** A Data Communication Channel can be disabled in either of the following ways:

- Automatically when an optical interface port is de-provisioned.  
When an optical interface port is provisioned to be removed (de-provisioned), then all enabled DCCs will be disabled, and the corresponding LAPD channels will be released.
- Manually by user provisioning.  
Please refer to Task 235.

**Important!** Disabling a previously enabled DCC at a local NE needs to be coordinated with disabling the same DCC at the opposite end of the DCC link (remote NE) to avoid persistent communication alarms from the remote NE.

**LAPD mode** The LAPD protocol, which controls communication between the network elements, operates in either of the following modes:

- *Network Side*  
The LAPD is assigned as Network. This mode complies with the standards and interoperates successfully with other LAPDs operating in user\_side mode.
- *User Side*  
The LAPD is assigned as User. This mode complies with the standards and interoperates successfully with other LAPDs operating in network\_side mode.

Please note that the DCCs work according to the master/slave principle, i.e. the LAPD modes of two interconnected SONET ports must be set differently. A corresponding “User-Network Side Failure” alarm will be generated if the LAPD mode is the same at both ends of a DCC.

**AIMS and UITS supported** The network elements support the Acknowledged Information Transfer Service (AIMS) and the Unacknowledged Information Transfer Service (UITS) as the basis for the LAPD protocol with the AIMS mode being the default mode of operation.

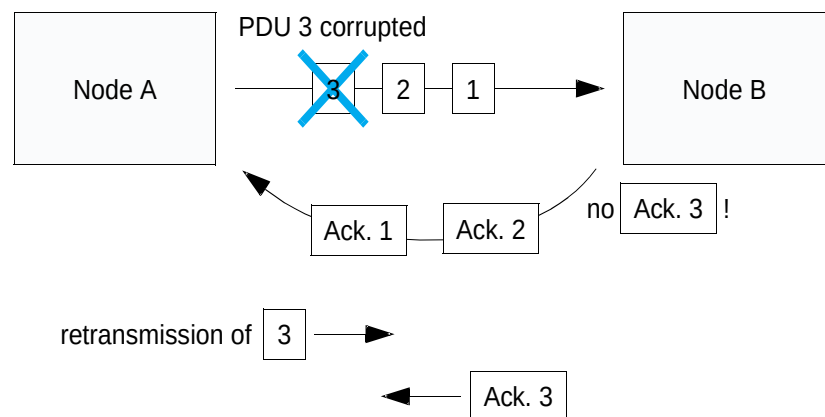


### **AITS and UITs functional principles**

In the LAPD protocol, all PDUs are sent with a checksum to verify that the data has not been corrupted during the transmission over the DCC link. If a PDU is received with a bad checksum, it is not acknowledged and will be resent:

- In the *Unacknowledged Information Transfer Service* (UITs), corrupted PDUs are ignored and no further actions taken. Upper layers of the OSI stack are responsible for recovery actions.
- In the *Acknowledged Information Transfer Service* (AITS), PDUs are numbered and transmitted sequentially, and acknowledgement PDUs are sent back from the receiver to the sender. If a PDU is lost, that is, if the sender gets no acknowledgement, the PDU is retransmitted.

**Figure 4-9 Functional principle of the AITS**



### **Routing metric**

The shortest-path-first (SPF) algorithm calculates the preferred route between two nodes based on the cost of a route. The cost of a route is described by a single dimensionless routing metric.

The system makes use of the default routing metric as defined in ISO 10589.

**DCCs Supported by Port Type** The following table lists the maximum number of transmission and DCC interfaces for the WaveStar TDM 2.5G/10G (2-Fiber)

**Table 4-2 DCC Types Supported**

| Max No. Shelves Per System | Max. No. Simultaneous Optical Ports per Shelf | Optical Port Type  | Max. No. Simultaneous DCCs per Shelf |
|----------------------------|-----------------------------------------------|--------------------|--------------------------------------|
| 1 High Speed               | 1 pair                                        | OC-192 2F BLSR     | 1 pair                               |
|                            | 4                                             | OC-192 (0x1)       | 4                                    |
| 2 Low Speed                | 4 pairs                                       | OC-48 2F BLSR      | 4 pairs                              |
|                            | 4 pairs                                       | OC-48 Linear (1+1) | 4                                    |
|                            | 8                                             | OC-48 (0x1)        | 8                                    |
|                            | 16 pairs                                      | OC-12 Linear (1+1) | 16 pair                              |
|                            | 32                                            | OC-12 (0x1)        | 32                                   |
|                            | 32 pairs                                      | OC-3 Linear (1+1)  | 32                                   |
|                            | 64                                            | OC-3 (0x1)         | 32                                   |

Notes:

Each optical port includes both a transmit and a receive fiber.

OC-3 and OC-12 DCC interfaces are limited by the maximum number of 32 supported DCC terminations in this release.

**DCC Compatibility** WaveStar TDM 2.5G/10G (2-Fiber) supports the optical interfaces with DCC compatibility as shown in the following table.

In addition to DCC compatibility, WaveStar TDM 2.5G/10G (2-Fiber) supports IAO LAN compatibility with all of the products listed in the following table, except FT-2000 and DDM-2000 Fiber Reach, which do not support a direct IAO LAN interface.

**Table 4-3 Optical Interface Support for WaveStar TDM 2.5G/10G (2-Fiber)**

| Optical Interfaces with DCC Compatibility |                     | WaveStar TDM 2.5G/10G (2-Fiber) |                  |                               |                               |
|-------------------------------------------|---------------------|---------------------------------|------------------|-------------------------------|-------------------------------|
|                                           |                     | OC-192                          | OC-48            | OC-12                         | OC-3                          |
| WaveStar TDM 2.5G/10G (2-Fiber)           | OC-192              | 2F<br>0x1                       |                  |                               |                               |
|                                           | OC-48               |                                 | 2F<br>1+1<br>0x1 |                               |                               |
|                                           | OC-12               |                                 |                  | 1+1<br>0x1                    |                               |
|                                           | OC-3                |                                 |                  |                               | 1+1<br>0x1                    |
| FT-2000<br>OC-48 ADR                      | OC-3<br>Low-Speed   |                                 |                  |                               | 1+1<br>0x1                    |
|                                           | OC-12<br>Low-Speed  |                                 |                  | 1+1<br>0x1                    |                               |
|                                           | OC-48<br>High-Speed |                                 | 2F*              |                               |                               |
| DDM-2000<br>OC-12                         | OC-3<br>Low-Speed   |                                 |                  |                               | 1+1<br>0x1                    |
|                                           | OC-12<br>High-Speed |                                 |                  | 1+1<br>(see<br>note 1)<br>0x1 |                               |
| DDM-2000<br>OC-3                          | OC-3<br>Low-Speed   |                                 |                  |                               | 1+1<br>0x1                    |
|                                           | OC-3<br>High-Speed  |                                 |                  |                               | 1+1<br>(see<br>note 2)<br>0x1 |
|                                           | OC-12<br>High-Speed |                                 |                  | 1+1<br>(see<br>note 3)<br>0x1 |                               |
| DDM-2000 Fiber<br>Reach                   | OC-3<br>High-Speed  |                                 |                  |                               | 1+1<br>(see<br>note 4)<br>0x1 |
|                                           | OC-12<br>High-Speed |                                 |                  | 1+1<br>(see<br>note 5)<br>0x1 |                               |

| Optical Interfaces with DCC Compatibility |                  | WaveStar TDM 2.5G/10G (2-Fiber) |            |            |            |
|-------------------------------------------|------------------|---------------------------------|------------|------------|------------|
|                                           |                  | OC-192                          | OC-48      | OC-12      | OC-3       |
| Tellabs TITAN 5500/S                      | OC-3             |                                 |            |            | 1+1<br>0x1 |
|                                           | OC-12            |                                 |            | 1+1<br>0x1 |            |
| Fujitsu FLM-150                           | OC-3 Low-Speed   |                                 |            |            | 1+1<br>0x1 |
|                                           | OC-3 High-Speed  |                                 |            |            | 1+1<br>0x1 |
| Fujitsu FLM-600                           | OC-3 Low-Speed   |                                 |            |            | 1+1<br>0x1 |
|                                           | OC-12 High-Speed |                                 |            | 1+1<br>0x1 |            |
| Fujitsu FLM-2400                          | OC-48 High-Speed |                                 | 1+1<br>0x1 |            |            |

#### Notes

The “2F” entries represent 2-fiber BLSR compatibility.

The “1+1” entries represent linear (1+1) protected DCC compatibility for dual 0X1 DCCs on a linear (1+1) transmission protection group.

The “0x1” entries represent unprotected 0x1 DCC compatibility.

Dual “0x1” DCCs can be assigned to a linear (1+1) transmission interface if “1+1” DCC compatibility is not supported.

\* - Requires FT-2000 R9.1.

1. Dual 0x1 DCCs are required.

2. DDM-2000 OC-3 R15 “identical DCC” feature is recommended.

3. DDM-2000 OC-3 R15.0 “identical DCC” feature is recommended.

4. DDM-2000 FiberReach R4.0 “identical DCC” feature is recommended.

5. DDM-2000 FiberReach R4.0 “identical DCC” feature is recommended.



## Subnetwork

---

- Subnetwork size** A subnetwork consists of a group of network elements connected by DCC and/or OSI LAN. The maximum subnetwork size supported by WaveStar TDM 2.5G/10G (2-Fiber) is 512 nodes.
- Each shelf counts as one node. Therefore, a system with a 2.5G shelf and a 10G shelf would count as two nodes.
- If SNMS (or ITM-SNC) is connected to a subnetwork by an OSI LAN, then each SNMS (and ITM-SNC) NSAP also counts toward the maximum subnetwork size. The SNMS (and ITM-SNC) LAN redundancy feature uses a maximum of two NSAPs.
- Five WaveStar CITs are allowed in a subnetwork, but additional WaveStar CITs count toward the maximum subnetwork size. The maximum subnetwork size requires IS-IS Level 2 routing.
- IS-IS Level 2 Routing** IS-IS Level 2 Routing involves the division of subnetworks into multiple areas. Areas are connected by Level 2 Intermediate Systems (ISs) or routers which maintain DCC connectivity throughout the subnetwork. The assignment of WaveStar nodes to areas or to serve as Level 2 ISs is accomplished by provisioning.
- Advantages of IS-IS Level 2 Routing** The advantage of IS-IS Level 2 Routing is to limit the DCC routing information that must be maintained by each node in a subnetwork. Each node within an area maintains routing tables to route DCC messages to other nodes in the same area. If a node needs to route a DCC message to a node in a different area, the node relies on a Level 2 IS in its own area to route the message to a Level 2 IS in the target area and to route from that Level 2 IS to the target node within that area.
- The Level 2 ISs route DCC messages between nodes in different areas. The DCC messages include all of the NE-NE (and OS-NE) communications necessary to support the OI applications, for example, a TL1 login message from a TL1-GNE to a TL1-RNE.
- In addition to maintaining a routing table to route DCC messages to other nodes in the same area, Level 2 ISs need to maintain routing information for the Level 2 ISs in all other areas (but not for all nodes within each of these other areas),

**IS-IS Level 2 Routing Guidelines**

The following guidelines are provided for IS-IS level 2 routing

- All nodes in an area must have the same NSAP area address.
- All nodes in an area must have DCC (or OSI LAN) connectivity within the area to all other nodes in the same area.
- At least one Level 2 IS is required in each area (two Level 2 ISs are recommended in each area, when practical, for DCC communications redundancy to and from each area).
- All Level 2 ISs must have DCC connectivity, either directly or indirectly via other Level 2 ISs, to all other Level 2 ISs in the subnetwork to form a single Level 2 subdomain that provides connectivity to all areas.
- To distribute the load of OSI network layer routing messages and processing in a subnetwork, it is recommended, when feasible, but not required that; 1) all area sizes be approximately the same and, 2) the number of Level 2 ISs be about the same as the average area size. For example, a perfectly balanced network of 200 nodes would include 20 nodes per area in each of 10 areas and 20 Level 2 ISs (2 Level 2 ISs per area).

**Subnetwork Parameters**

The following parameters should be used for subnetwork routing:

- Maximum number of nodes per area: 50
- Maximum number of Level 2 ISs per subnetwork: 50
- Maximum number of WaveStar TDM 2.5G/10G (2-Fiber) shelves: 3
- Maximum subnetwork size: 512



## Name-to-address translation

---

**Overview** The communication between network elements and their management systems, such as the CIT, is established by using TL1 command messages.

A TL1 message addresses a network element by its “name”, also referred to as its target identifier (TID), whereas nodes within an OSI network are identified by their NSAP address. Hence a name-to-address translation becomes necessary.

**Naming conventions** “NE name” and “TID” are used synonymously throughout this manual.

**TID to NSAP-address translation** The system offers two possible ways to accomplish the TID to NSAP-address translation:

- A static routing table
- The TID Address Resolution Protocol (TARP)

To establish a management association to a remote NE, the CIT first evaluates the static routing table. If the corresponding name/address pair cannot be found in the table, the TARP will automatically be used.

**Static routing** The complete area address part of the NE’s NSAP address is configurable (see NSAP address fields (4-18)). Therefore, the CIT allows static routing, i.e. the TID-to-NSAP-address translation is realized by using a static routing table (Name/Address List) stored in the CIT.

**Static routing table**

The static routing table:

- must be constructed and maintained manually by a system administrator and
- must be synchronized in *all* CITs managing the network elements.

**Important!** *Each DCC controller exchange needs to be reflected in the static routing tables of all CITs managing the NEs.*

The IEEE 802.3 MAC address, stored on the DCC controller (ADJCTL/DCCEI) circuit pack during the manufacturing process, is used as the system identifier in the NE's NSAP address (see NSAP address fields (4-18)). Hence, when a new DCC controller is inserted, then the system identifier, and so the NSAP address, automatically changes.

After a DCC controller exchange, the static routing tables in all CITs managing the NEs need to be adapted. Please refer to Task 233.

**TARP**

The TID Address Resolution Protocol (TARP) according to Telcordia Technologies (formerly Bellcore) GR-253 standard provides a means to perform the TID to NSAP address translation dynamically by means of TARP Protocol Data Units (TARP PDUs), originating from an end system such as the CIT.

Three basic TARP functionalities can be distinguished:

- TARP originator functionality
- TARP propagation functionality
- TARP responder functionality

**TARP originator functionality**

The TARP originator functionality means the ability to spontaneously originate a TARP PDU type 1, 2 or 5 query (see Types of TARP PDUs (4-33)) and broadcast it over the OSI network.



**TARP propagation functionality**

The TARP propagation functionality means the ability to evaluate a received TARP PDU type 1, 2 or 5 query and to further broadcast it over the OSI network if the requested TID or NSAP address does not match the NE's TID or NSAP address, and if the requested TID or NSAP address could not be found in the TARP Data Cache (TDC; see TARP data cache (4-34)).

A TARP propagator decrements the lifetime of a received TARP PDU by one and broadcasts the modified PDU to all of its network neighbors (with the exception of the previous PDU sender). When the TARP PDU lifetime becomes zero, then no further propagation takes place.

**TARP responder functionality.**

The TARP responder functionality means the ability to respond to a TARP PDU type 1, 2 or 5 query via a type 3 response (see below).

**Types of TARP PDUs**

The following table shows the five defined types of TARP PDUs.

**Table 4-4 Types of TARP PDUs**

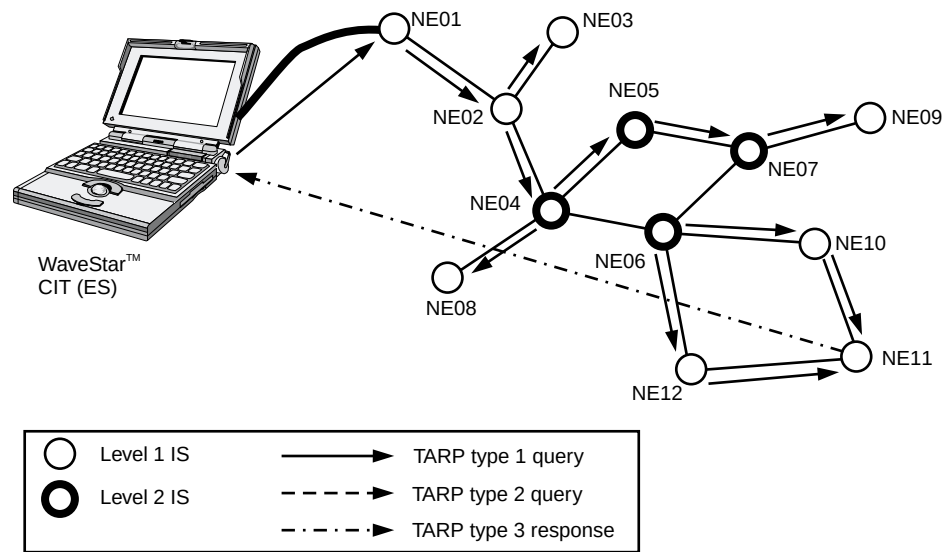
| Type | Characteristic          | Description                                                                                             |
|------|-------------------------|---------------------------------------------------------------------------------------------------------|
| 1    | Query                   | Given an NE name (TID), the corresponding NSAP address is requested (restricted to IS-IS level-1 area). |
| 2    | Query                   | Given an NE name (TID), the corresponding NSAP address is requested (IS-IS level-1 and 2 areas).        |
| 3    | Response                | Response to a TARP Query.                                                                               |
| 4    | Autonomous notification | Autonomous notification of a TID or NSAP address change, or a reset indication.                         |
| 5    | Query                   | Given an NSAP address, the corresponding NE name (TID) is requested.                                    |

**Supported TARP functionality**

The CIT supports the TARP originator functionality which is permanently enabled network elements support the TARP propagation and TARP responder functionalities. These functionalities can be either enabled or disabled.

**TARP Example** The following figure shows an example to illustrate the TARP functional principle.

**Figure 4-10 TARP example**



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When a user requests to establish a management association to NE11 and the corresponding NSAP address cannot be found in the static routing table, then the CIT originates a TARP type 1 query. This query will be propagated over the network until it reaches NE11. NE11 then sends a TARP-type-3 response directly back to the CIT.

Please note that the TARP Data Cache (see TARP data cache (4-34)) was not taken into consideration for this example.

**Network services/protocols** TARP depends on the network layer services and protocols provided by the Connectionless Network Service/Connectionless Network Protocol (CLNS/CLNP) and the ES-IS and IS-IS routing protocols to obtain information about the network neighbors of an NE.

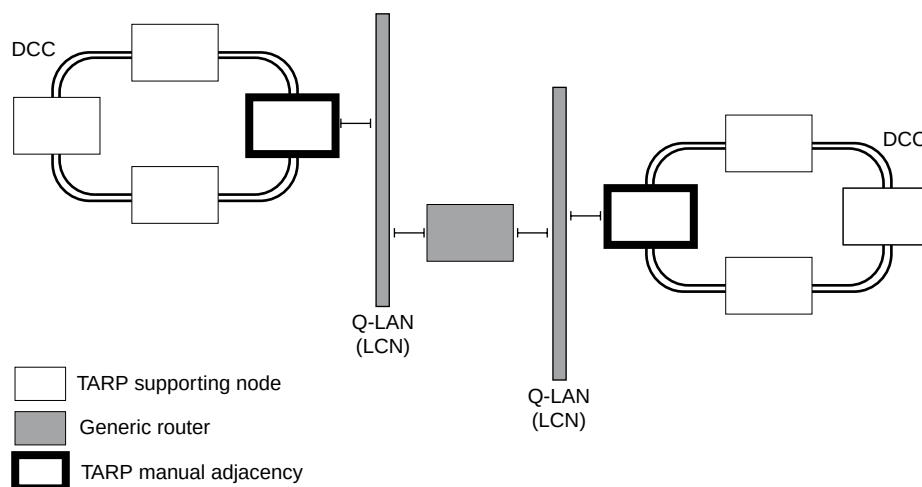
**TARP data cache** A local database, the TARP Data Cache (TDC), is used in each NE to store information on the NE's adjacencies, i.e. its direct neighbors in the network. Hence an NE may be able to respond to a TARP query, even if the requested TID or NSAP address does not match the NE's own TID or NSAP address. Thus, the network performance can be enhanced.

**TARP manual adjacencies**

By using TARP manual adjacencies it is possible to route TARP PDUs over subnetworks which do not support the TARP functionality. However, a precondition is that the nodes within the non-TARP subnetwork are “generic routers”. A TARP manual adjacency is simply the Network Entity Title (see Network entity title (4-20)) of a node that supports TARP.

This is illustrated in the following figure.

**Figure 4-11 TARP Manual Adjacencies**



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**Loop detection**

WaveStar nodes provide a loop detection mechanism to prevent a repeated processing of previously processed TARP PDUs. A loop detection buffer (LDB) in conjunction with an LDB entry timer and an LDB flush timer is used for this purpose. A previously processed and again received TARP PDU is discarded.

**Configuration of TARP parameters**

For information on the configuration of TARP parameters, please refer to the following procedures:

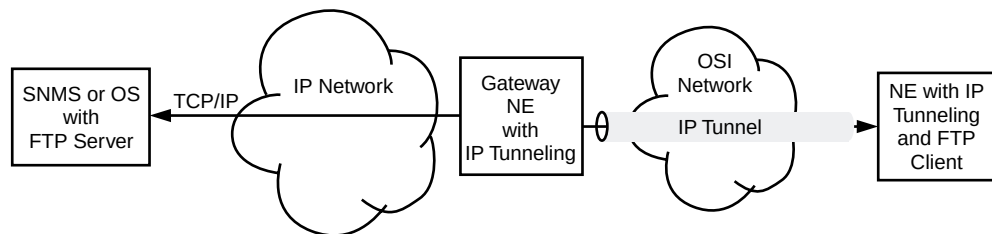
- Task 236, Configuring TARP Parameters
- Task 248, Assigning TARP Manual Adjacencies

□

# IP Tunneling

**IP tunneling overview** IP Tunneling is a means of enabling communications and file transfers from TCP/IP networks across the OSI network to terminating NEs. The tunneling encapsulates the TCP/IP message and protocol in an OSI envelope. The receiving unit can then regain the TCP/IP protocol as well as the message. This is illustrated in the following figure.

**Figure 4-12 FTP with IP Tunneling**



nc-usm-305

## Dual Stack NE

The IP tunnel requires a dual-stack NE on the boundary between the IP and OSI networks. The dual-stack NE provides the routing and mapping that allows the tunneling to take place. The dual-stack NE must be provisioned to enable the tunnel.

## Provisioning

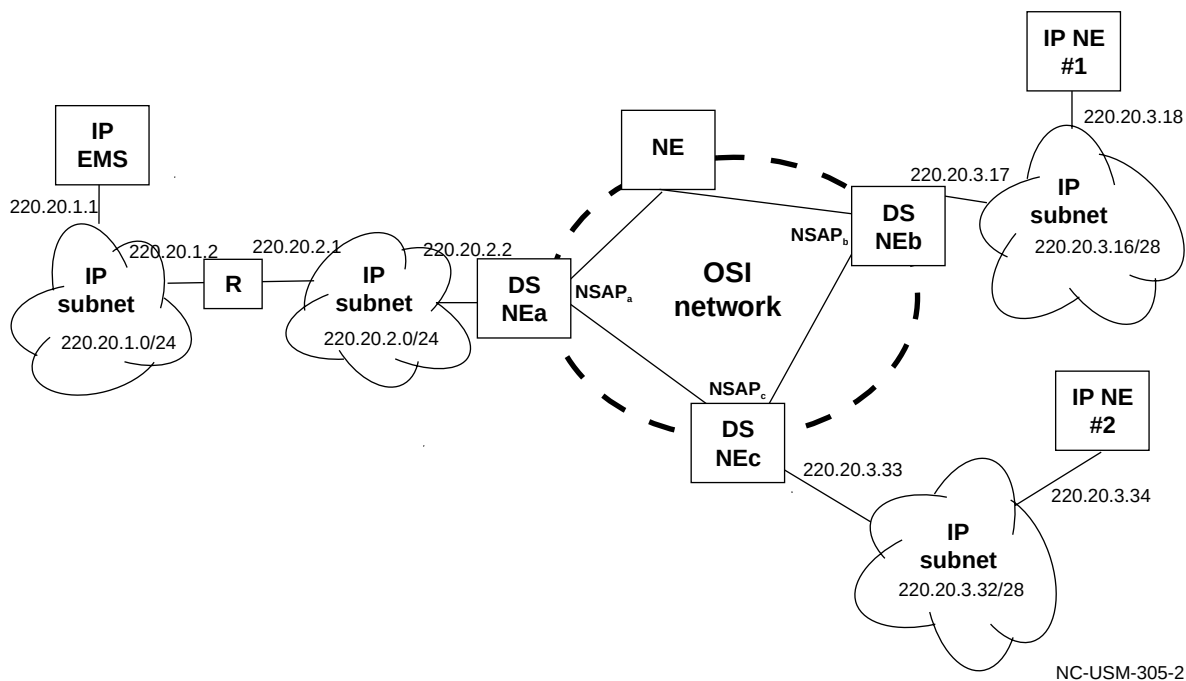
Provisioning for the IP tunnel must be done for any point at which the IP message moves between an IP network and an OSI network and at any point in which the IP messages move between areas in an OSI network.

Tunnel automatic provisioning (TAP), when enabled, will automatically provide the necessary routing and mapping information within an OSI area.

## IP Tunnel Routing and Mapping

The following figure shows an example of the routing and mapping for IP tunnels.

**Figure 4-13 IP Tunnel Routing Information**



### Routing for DS NEa

| destination                | Next IP    | port | owner  |
|----------------------------|------------|------|--------|
| 220.20.3.16/28             | 0.0.0.0    | clnp | manual |
| 220.20.3.32/28             | 0.0.0.0    | clnp | manual |
| 220.20.1.0/24              | 220.20.2.1 | LAN  | manual |
| 220.20.2.0/24 <sup>a</sup> | <local>    | LAN  | local  |

### Routing for DS NEc

| destination    | Next IP | port | owner  |
|----------------|---------|------|--------|
| 220.20.3.32/28 | <local> | LAN  | local  |
| 220.20.1.0/24  | 0.0.0.0 | clnp | manual |

### Mapping for DS NEa

| IP             | NSAP              |
|----------------|-------------------|
| 220.20.3.16/28 | NSAP <sub>b</sub> |
| 220.20.3.32/28 | NSAP <sub>c</sub> |

### Mapping for DS NEc

| IP            | NSAP              |
|---------------|-------------------|
| 220.20.1.0/24 | NSAP <sub>a</sub> |

### Legend:

IP EMS      The element manager for the IP NEs  
 IP NE      A network element that is communicates with its manager via IP messages (as opposed to OSI messages).

|           |                                                                                                                                                                                                                                                                                                           |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DS NE     | A network element that supports Dual Stack with tunneling.                                                                                                                                                                                                                                                |
| R         | An IP router.                                                                                                                                                                                                                                                                                             |
| IP subnet | A set of interconnected IP nodes that can exchange messages without the need for a router. The IP addresses of these nodes share the same subnet address (defined by the subnet mask of the subnet) and have individual host address parts of their IP addresses to identify them uniquely in the subnet. |

### How it works

The IP messages are routed through the IP network to the OSI boundary. The dual-stack NE at the boundary encapsulates the IP message. The message is then routed through the OSI network as an OSI message. The dual-stack NE at the destination OSI network boundary unencapsulates the IP message and sends it through the IP network.

### Example

In the preceding figure, the message would be routed as follows:

If the IP EMS were to communicate with IP NE #2 (220.20.3.34) it would send the message through its IP subnet. The message would then go to the router, which would forward it to the appropriate IP subnet (220.20.2.0/24). That subnet would send the message to DS NEa (220.20.2.2).

DS NEa would encapsulate the message and forward it based on information in its routing and mapping tables. In this case, the routing table shows that the destination IP address is through the clnp port (the OSI network). The mapping table indicates the NSAP for the target node (NSAPc) in the OSI network.

The encapsulated message would be sent to DS NEc (NSAPc). DS NEc's routing and mapping tables indicate that the destination IP address (220.20.3.34) is on the local LAN. The message would then be unencapsulated and forwarded to the destination address through the IP subnetwork on the LAN port of DS NEc.

Note that the owner of the routing across the network boundaries is listed as "manual." Those are the rows of the routing tables that need to be manually provisioned. The routing through the attached IP subnetwork is listed as local. Those routings are determined by the IP subnetwork and need not be provisioned. The routing within the OSI network area is also automatically provisioned. Any routing between areas in an OSI network needs to be manually provisioned. The IP/NSAP mapping tables need to be provisioned.



## NE name administration

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**Definition**    **NE Name (TID)** The NE name, also referred to as the NE's target identifier (TID), is an alphanumeric string of up to 20 characters, used to uniquely identify a network element within the network.  
 "NE name" and "TID" are used synonymously throughout this chapter.

**Configuration rules**    The following NE name configuration rules must be observed:

- Each NE name must be unique within the network.
- Each NE name may contain only the characters listed in the table on the next page.
- Each NE name must be no more than 20 characters in length.
- The NE name may contain segments separated by hyphens ("-") or slashes ("/"), but each segment must begin with an alphabetic character.
- Telcordia operating systems limit names to only alphanumeric characters and hyphens.
- Please note that NE names are case insensitive.

### Examples:

The following are examples for valid and invalid NE names.

- "NE-A1", "CHICAGO7" or "NY-B3-C5" are valid NE names.
- "NE-01", "CHICAGO-7" or "NY-3-5" are invalid NE names.

### Characters allowed in an NE name

The following table lists the characters that may be used in an NE name.

| ASCII Character | Description        | Code (hex) |
|-----------------|--------------------|------------|
| A .. Z          | Upper case letters | 41 .. 5A   |
| a .. z          | Lower case letters | 61 .. 7A   |
| 0 .. 9          | Digits             | 30 .. 39   |
| '               | Apostrophe         | 27         |
| -               | Hyphen             | 2D         |
| (               | Left parenthesis   | 28         |
| )               | Right parenthesis  | 29         |

| ASCII Character | Description          | Code (hex) |
|-----------------|----------------------|------------|
| .               | Period (full stop)   | 2E         |
| /               | Slash (Solidus)      | 2F         |
| +               | Plus sign            | 2B         |
| !               | Exclamation mark     | 21         |
| *               | Asterisk             | 2A         |
| [               | Left square bracket  | 5B         |
| ]               | Right square bracket | 5D         |
| ^               | Caret                | 5E         |
| ‘               | Grave accent         | 60         |
| {               | Left curly brace     | 7B         |
|                 | Vertical bar         | 7C         |
| }               | Right curly brace    | 7D         |
| <               | Less than            | 3C         |
| >               | Greater than         | 3E         |
| ~               | Tilde                | 7E         |
| %               | Percent sign         | 25         |
| #               | Number sign          | 23         |

**Changing the NE name** For information on how to change the NE name, please refer to Task 329.





# Hardware User Interface

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|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Introduction</b>                          | WaveStar TDM 2.5G/10G (2-Fiber) provides a number of switches and indicators that constitute the hardware user interface. Those are summarized below and described in more detail in the Product Description chapter.                                                                                                                                                                                                                  |
| <b>User panels</b>                           | User panels are located on each shelf to provide easily visible shelf-level alarm indicators. Each user panel contains a multiple number of LEDs used to indicate status, alarms, and abnormal conditions. Each panel also contains panel buttons and connectors used to test the LEDs, silence audible alarms, connect to system ground, and connect a WaveStar CIT to the system LAN. The switch shelf CIT connector is inoperative. |
| <b>Circuit pack/port unit faceplate LEDs</b> | The faceplate of all circuit packs contain a red FAULT and green ACTIVE LED. The FAULT LED will illuminate when the system detects an error associated with the circuit pack. Illumination of the ACTIVE LED indicates the circuit pack is either active or in standby mode.                                                                                                                                                           |
| <b>Fan unit LEDs and controls</b>            | Each fan unit contains a faceplate with LEDs and a reset switch. A green PWR ON LED indicates the fan is receiving power. A red FAIL LED illuminates any time an alarm is associated with the fan unit. A red FILTER ALM LED illuminates when the unit requires service for a clogged filter. Additionally there are two controls associated with the fan unit: a FILTER ALM RESET button and two circuit breakers.                    |
| <b>Circuit breakers</b>                      | Power circuit breakers for power feeds A and B are provided. Each circuit breaker provides a visual indication of its status via a rocker switch.                                                                                                                                                                                                                                                                                      |



# Office Alarms Interface

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|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Introduction</b>          | This section provides information about the WaveStar TDM 2.5G/10G (2-Fiber) office alarms interface.                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b>           | <p>WaveStar TDM 2.5G/10G (2-Fiber) provides relays for connection to local office alarms. Relays are provided for each type of alarm condition:</p> <ul style="list-style-type: none"><li>• CR (critical)</li><li>• MJ (major)</li><li>• MN (minor)</li></ul> <p>The system also reports temporary abnormal (ABN) conditions that could potentially affect transmission; for example, a WaveStar CIT-initiated protection switch or lockout, or loopback.</p> |
| <b>Office alarms</b>         | The office alarms interface is a set of discrete relays controlling audible and visible office alarms. Separate relays handle critical, major, and minor alarms. If desired, critical and major alarm outputs can be wired so that either, neither, or both of the outputs control the major office alarm.                                                                                                                                                    |
| <b>Steady state current</b>  | The steady state current for office alarm connections must not exceed 0.9 amps at 60 volts or 1.8 amps at 30 volts. The maximum transient currents (20 msec duration) during initial contact closure must not exceed 9 amps at 60 volts or 18 amps at 30 volts.                                                                                                                                                                                               |
| <b>Intermittent failures</b> | To prevent intermittent failures from causing unnecessary maintenance activity, a provisionable incoming signal alarm delay is provided. The office alarms will not be activated unless an incoming signal condition of greater duration than the alarm delay occurs. When a failure clears, an alarm clear delay prevents premature clearing of the alarm.                                                                                                   |
| <b>Multiple alarms</b>       | When multiple alarm conditions occur, the highest level office alarm (audible and visible) is activated. When the highest level alarm condition clears, the office alarm signals to the next highest level alarm condition.                                                                                                                                                                                                                                   |

### **Alarm Cut-off**

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

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



# Miscellaneous Discrete Interface

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**Introduction** This section describes the features of the WaveStar WaveStar TDM 2.5G/10G (2-Fiber) miscellaneous discrete interface.

The user-setable miscellaneous discrete interface allows an operational system (OS) to control and monitor equipment collocated with the WaveStar NE through a set of input and output contact closures. There are 8 miscellaneous discrete environmental inputs that can monitor conditions like open doors or high temperature, and 8 miscellaneous discrete outputs to control equipment such as fans and generators. The status of the miscellaneous discrete environmental inputs can be queried on demand via the WaveStar CIT. The WaveStar NE collects miscellaneous discrete alarms and automatically sends them to the operational system (OS).

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

**Power source** The power source to enable the control of external customer equipment may have a voltage range from a minimum of 3 V to a maximum of 72 V. The system provides a unidirectional opto-isolator connection across each corresponding control output wiring pair. The load current across each control output wiring pair must be limited by the external customer equipment and must not exceed 35 mA.

For detailed wiring information, refer to the WaveStar TDM 2.5G/10G (2-Fiber) Installation Manual.

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

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

- Inputs/Outputs** Environmental inputs are addressed by numbers 1 through 16, and control outputs are addressed by numbers 1 through 8. The environmental inputs can be assigned in any order; but if the bay is equipped with a fan assembly, the number 16 input is reserved for the fan alarm.
- OS access** OS access to individual environmental inputs and control outputs is provided through the TL1 interfaces described in Operations Systems (OS) Interface (4-5).
- Local access** Local access to the environmental inputs is provided through the WaveStar CIT interface.



## Orderwire Interface and Customer User Bytes

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- Introduction** This section provides information about the orderwire interface and customer user bytes.
- Description** Orderwire interfaces provide voice communications between adjacent network elements for use by maintenance personnel in performing facility maintenance. WaveStar TDM 2.5G/10G (2-Fiber) provides two pairs of 64 kb/s (E1 and E2) orderwire (OW) interfaces.
- Each pair includes:
- Section (local) orderwire (E1)
  - Line (express) orderwire (E2)
- The section and line orderwire use the E1A-422 protocol and user bytes. Additional user bytes (F1) are available for use.
- Access** The ADJCTL/DCCEI circuit pack provides access to the orderwire interface and user bytes. Orderwire is connected into the shelf via connectors on the backplane.
-

## Summary

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|                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Introduction</b>    | The operations interfaces communicate alarm and status information about the WaveStar TDM 2.5G/10G (2-Fiber) equipment and services. Operations interfaces include direct and remote access through the WaveStar CIT. Local access can be obtained through the user panel light-emitting diodes (LEDs) and controls, the circuit pack faceplate LEDs, and office alarms. The IAO LAN supports communication with operations systems (OSs).                                                                                                                                                                                                                                                                                             |
| <b>WaveStar CIT</b>    | The WaveStar CIT is a PC that meets minimum requirements loaded with WaveStar CIT software. The WaveStar CIT provides full GUI access to the administrative, maintenance, and provisioning capabilities of the WaveStar NE. The WaveStar TDM 2.5G/10G (2-Fiber) supports direct and remote access to the CIT.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>OS interface</b>    | <p>The OS interface is accessed through one of the IAO LAN backplane connectors. This interface is compatible with Telcordia's Network Monitoring and Analysis (NMA), Telcordia's Transport Element Management System (T-EMS), and the Lucent WaveStar Subnetwork Management System (SNMS).</p> <p>The OS interfaces supported include the following:</p> <ul style="list-style-type: none"><li>• OSI LAN/WAN (to SNMS or other compatible OS)</li><li>• TCP/IP (RFC1006) (by NCC to SNMS)</li><li>• TL1/X.25 (by NCC to NMA, T-EMS, or other compatible OS)</li><li>• TL1 TCP/IP (using either the integrated gateway or the NCC to NMA, T-EMS, or other compatible OS)</li><li>• FTP/FTAM (to SNMS for software downloads)</li></ul> |
| <b>Remote Access</b>   | Remote access requires DCC and/or OSI LAN connectivity from the local WaveStar NE to another remote WaveStar system. This network operations capability uses the section DCC bytes in the SONET overhead of the optical signals. WaveStar CIT dialogues and OS messages are transmitted in these DCC bytes.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Subnetwork Size</b> | A subnetwork consists of a group of network elements with DCC and/or OSI LAN connectivity among the network elements. The maximum subnetwork size supported by WaveStar TDM 2.5G/10G (2-Fiber) is 512 nodes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|                                         |                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hardware User Interface</b>          | User panels are located on each shelf to provide easily visible shelf-level alarm indicators. Each user panel contains a multiple number of LEDs used to indicate status and alarms. Each panel also contains panel buttons and connectors used to test the LEDs, silence audible alarms, connect to system ground, and connect a WaveStar CIT to the system LAN. |
| <b>Office alarms interface</b>          | The system provides a discrete set of relays controlling audible and visible office alarms. Alarms can be defined as critical, major, or minor.                                                                                                                                                                                                                   |
| <b>Miscellaneous discrete interface</b> | Miscellaneous discrete interface signals provide access from the NE to other equipment and to the environment for both monitoring and control.                                                                                                                                                                                                                    |
| <b>Orderwire and user bytes</b>         | The orderwire interface provides a voice channel for technicians across the network.                                                                                                                                                                                                                                                                              |







# 5 Circuit Pack/Port Unit Descriptions

## Overview

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**Purpose** This chapter provides a detailed functional description of the WaveStar TDM 2.5G/10G (2-Fiber) circuit packs and port units.

**Objectives** This chapter describes the major functions of each:

- Circuit pack
- Port unit

**Related information** For related information, see:

- *WaveStar TDM 2.5G/10G (2-Fiber), Applications, Planning, and Ordering Guide*
- *WaveStar TDM 2.5G/10G (2-Fiber), Installation Manual*
- *WaveStar TDM 2.5G/10G (2-Fiber), Operations Systems Engineering Guide*
- *WaveStar TDM 2.5G/10G (2-Fiber), Alarm Messages and Trouble Clearing Guide*

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# Circuit Pack/Port Unit and Software Compatibility

## Standard Circuit Pack Codes, Names, and Compatible Software

The following table shows the standard circuit packs/port units and the compatible software.

| Code               | Name                                      | Compatible Software Release |               |              |                       |                       |                       |                       |
|--------------------|-------------------------------------------|-----------------------------|---------------|--------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                    |                                           | 2.5G<br>2.0.0               | 2.5G<br>3.0.1 | 10G<br>1.0.0 | 2.5G/<br>10G<br>4.0.0 | 2.5G/<br>10G<br>4.1.x | 2.5G/<br>10G<br>5.x.x | 2.5G/<br>10G<br>6.x.x |
| LEY1               | ADJCTL/DCCEI Circuit Pack                 | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LEY401             | ADJCTL/DCCEI Circuit Pack                 |                             |               |              |                       |                       | X                     | X                     |
| LEY10B             | CTL/SYS50DM Circuit Pack                  | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LEY17              | DS3EC1/8 Port Unit                        | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LEY309             | GE1/SX2 Port Unit                         |                             |               |              |                       |                       | X                     | X                     |
| SEN3               | OBA10G/1.5LR1                             |                             |               |              |                       | X                     | X                     | X                     |
| SEN4               | OBPA10G/1.5VR1                            |                             |               |              |                       |                       | X                     | X                     |
| LEY13              | OC12/STM4/1.3LR2 Port Unit                | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LEY14              | OC12/STM4/1.3SR2 Port Unit                |                             | X             | X            | X                     | X                     | X                     | X                     |
| LEY15              | OC3/STM1/1.3LR4 Port Unit                 | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LEY16              | OC3/STM1/1.3SR4 Port Unit                 |                             | X             | X            | X                     | X                     | X                     | X                     |
| LEY23              | OC3/STM1/1.3SR8 Port Unit                 |                             |               |              |                       |                       | X                     | X                     |
| LEY7               | OC48/STM16/1.3LR1 Port Unit               | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LEY8               | OC48/STM16/1.5LR1 Port Unit               | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LEY50 -<br>LEY65   | OC48/STM16 /DWDM01 - 16<br>Port Unit      | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LEY80 -<br>LEY95   | OC48/STM16/POU9590 -<br>POU9210 Port Unit |                             | X             |              | X                     | X                     | X                     | X                     |
| LEY101 -<br>LEY180 | OC48/STM16/WDM9585 -<br>WDM9190 Port Unit |                             |               |              | X                     | X                     | X                     | X                     |
| LEY182             | OC48/STM16/1.3VSR1 Port<br>Unit           |                             |               |              |                       |                       | X                     | X                     |
| LEY67              | OC192/STM64/1.5SR1 Port Unit              |                             |               | X            | X                     | X                     | X                     | X                     |

| Code               | Name                                       | Compatible Software Release |               |              |                       |                       |                       |                       |
|--------------------|--------------------------------------------|-----------------------------|---------------|--------------|-----------------------|-----------------------|-----------------------|-----------------------|
|                    |                                            | 2.5G<br>2.0.0               | 2.5G<br>3.0.1 | 10G<br>1.0.0 | 2.5G/<br>10G<br>4.0.0 | 2.5G/<br>10G<br>4.1.x | 2.5G/<br>10G<br>5.x.x | 2.5G/<br>10G<br>6.x.x |
| LEY69              | OC192/STM64/1.5IR1 Port Unit               |                             |               |              | X                     | X                     | X                     | X                     |
| LEY97              | OC192/STM64/1.5IRS1 Port unit              |                             |               |              | X                     | X                     | X                     | X                     |
| LEY201 -<br>LEY240 | OC192/STM64/WDM9580 -<br>WDM9190 Port Unit |                             |               |              | X                     | X                     | X                     | X                     |
| LEY284 -<br>LEY299 | OC192/STM64/POU9590 -<br>POU9210 Port Unit |                             |               |              | X                     | X                     | X                     | X                     |
| LEY3               | PPROC/STS192 Circuit Pack                  |                             |               | X            | X                     | X                     | X                     | X                     |
| LEY47              | PPROC/STS384 Circuit Pack                  |                             |               |              |                       |                       |                       | X                     |
| LEY18              | SWITCH/DS3EC1 Circuit Pack                 | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LEY4               | SWITCH/STS576 Circuit Pack                 | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LEY73              | SWITCH/STS768 Circuit Pack                 |                             |               |              |                       |                       |                       | X                     |
| LLY2               | TMG/STRAT3 Circuit Pack                    | X                           | X             | X            | X                     | X                     | X                     | X                     |
| LLY2B              | TMG/STRAT3 Circuit Pack                    |                             |               |              |                       | X                     | X                     | X                     |

**NEBS Level 3 Compliant  
Circuit Pack Codes, Names,  
and Compatible Software**

The following table shows the NEBS level 3 compliant circuit packs/  
port units and the compatible software.

| Code                   | Name                                   | Compatible Software Release |               |              |                       |                       |                       |                      |
|------------------------|----------------------------------------|-----------------------------|---------------|--------------|-----------------------|-----------------------|-----------------------|----------------------|
|                        |                                        | 2.5G<br>2.0.0               | 2.5G<br>3.0.1 | 10G<br>1.0.0 | 2.5G/<br>10G<br>4.0.0 | 2.5G/<br>10G<br>4.1.x | 2.5G/<br>10G<br>5.x.x | 2.5/<br>10G<br>6.x.x |
| LEY1AE                 | ADJCTL/DCCEI Circuit Pack              | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LEY10BE                | CTL/SYS50DM Circuit Pack               | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LEY17AE                | DS3EC1/8 Port Unit                     | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LEY309AE               | GE1/SX2 Port Unit                      |                             |               |              |                       |                       | X                     | X                    |
| LEY310AE               | GE1/LX2 Port Unit                      |                             |               |              |                       |                       |                       | X                    |
| SEN3AE                 | OBA10G/1.5LR1                          |                             |               |              |                       | X                     | X                     | X                    |
| SEN4AE                 | OBPA10G/1.5VR1                         |                             |               |              |                       |                       | X                     | X                    |
| LEY13AE                | OC12/STM4/1.3LR2 Port Unit             | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LEY14AE                | OC12/STM4/1.3SR2 Port Unit             |                             | X             | X            | X                     | X                     | X                     | X                    |
| LEY15AE                | OC3/STM1/1.3LR4 Port Unit              | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LEY16AE                | OC3/STM1/1.3SR4 Port Unit              |                             | X             | X            | X                     | X                     | X                     | X                    |
| LEY23AE                | OC3/STM1/1.3SR8                        |                             |               |              |                       |                       | X                     | X                    |
| LEY7AE                 | OC48/STM16/1.3LR1 Port Unit            | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LEY8AE                 | OC48/STM16/1.5LR1 Port Unit            | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LEY50AE -<br>LEY65AE   | OC48/STM16/DWDM01 - 16 Port Unit       | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LEY80AE -<br>LEY95AE   | OC48/STM16/POUxxxx Port Unit           |                             | X             |              | X                     | X                     | X                     | X                    |
| LEY101AE -<br>LEY180AE | OC48/STM16/WDM9585 - WDM9190 Port Unit |                             |               |              | X                     | X                     | X                     | X                    |
| LEY182AE               | OC48/STM16/1.3VSR1 Port Unit           |                             |               |              |                       |                       | X                     | X                    |
| LEY67AE                | OC192/STM64/1.5SR1 Port Unit           |                             |               | X            | X                     | X                     | X                     | X                    |

| Code                   | Name                                       | Compatible Software Release |               |              |                       |                       |                       |                      |
|------------------------|--------------------------------------------|-----------------------------|---------------|--------------|-----------------------|-----------------------|-----------------------|----------------------|
|                        |                                            | 2.5G<br>2.0.0               | 2.5G<br>3.0.1 | 10G<br>1.0.0 | 2.5G/<br>10G<br>4.0.0 | 2.5G/<br>10G<br>4.1.x | 2.5G/<br>10G<br>5.x.x | 2.5/<br>10G<br>6.x.x |
| LEY69AE                | OC192/STM64/1.5IR1 Port Unit               |                             |               |              | X                     | X                     | X                     | X                    |
| LEY97AE                | OC192/STM64/1.5IRS1 Port Unit              |                             |               |              |                       | X                     | X                     | X                    |
| LEY201AE -<br>LEY240AE | OC192/STM64/WDM9580 -<br>WDM9190 Port Unit |                             |               |              | X                     | X                     | X                     | X                    |
| LEY284AE -<br>LEY299AE | OC192/STM64/POU9590 -<br>POU9210 Port Unit |                             |               |              | X                     | X                     | X                     | X                    |
| LEY384AE -<br>LEY399AE | OC192/STM64/POU9580 -<br>POU9220Port Unit  |                             |               |              |                       |                       | X                     | X                    |
| LEY3AE                 | PPROC/STS192 Circuit Pack                  |                             |               | X            | X                     | X                     | X                     | X                    |
| LEY47AE                | PPROC/STS384 Circuit Pack                  |                             |               |              |                       |                       |                       | X                    |
| LEY18AE                | SWITCH/DS3EC1 Circuit Pack                 | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LEY4AE                 | SWITCH/STS576 Circuit Pack                 | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LEY73AE                | SWITCH/STS768 Circuit Pack                 |                             |               |              |                       |                       |                       | X                    |
| LLY2AE                 | TMG/STRAT3 Circuit Pack                    | X                           | X             | X            | X                     | X                     | X                     | X                    |
| LLY2BE                 | TMG/STRAT3 Circuit Pack                    |                             |               |              |                       | X                     | X                     | X                    |



## ADJCTL/DCCEI Circuit Pack

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**Purpose of circuit pack** The Adjunct Control/Data Communications Channel External Interface (ADJCTL/DCCEI) circuit packs provide access to the transport overhead bytes and external user interfaces for the system. The overhead bytes include the data communications channel (DCC), orderwire, and user bytes. The DCC and external interface functions are independent of each other.

**Supported ADJCTL/DCCEI circuit packs** The following table shows the supported ADJCTL/DCCEI circuit packs.

| Name         | Code            | Description                                               |
|--------------|-----------------|-----------------------------------------------------------|
| ADJCTL/DCCEI | LEY1 and LEY1AE | Supports V.11 orderwire and user byte interfaces          |
| ADJCTL/DCCEI | LEY401          | Supports V.11 or G.703 orderwire and user byte interfaces |

ADJCTL/DCCEI circuit pack faceplate

The following figure shows the ADJCTL/DCCEI circuit pack faceplate.



NC-USM-039

Faceplate LEDs

The ADJCTL/DCCEI circuit pack provides the following faceplate LEDs.

| LED       | Color | Function                                                                                                 |
|-----------|-------|----------------------------------------------------------------------------------------------------------|
| FAULT     | Red   | Continuously lighted when a circuit pack failure is detected or the circuit pack loses one power feeder. |
| EI FAULT  | Red   | Continuously lighted when a failure is detected in the external interface (EI) part of the circuit pack. |
| ACTIVE    | Green | Lighted when the circuit pack is active/in-service.                                                      |
| EI ACTIVE | Green | Lighted when the external interface (EI) part of the circuit pack is active/in-service.                  |

The EI FAULT and EI ACTIVE LEDs are controlled by the CTL/ SYS50DM circuit pack.



**Faceplate push-button switch**

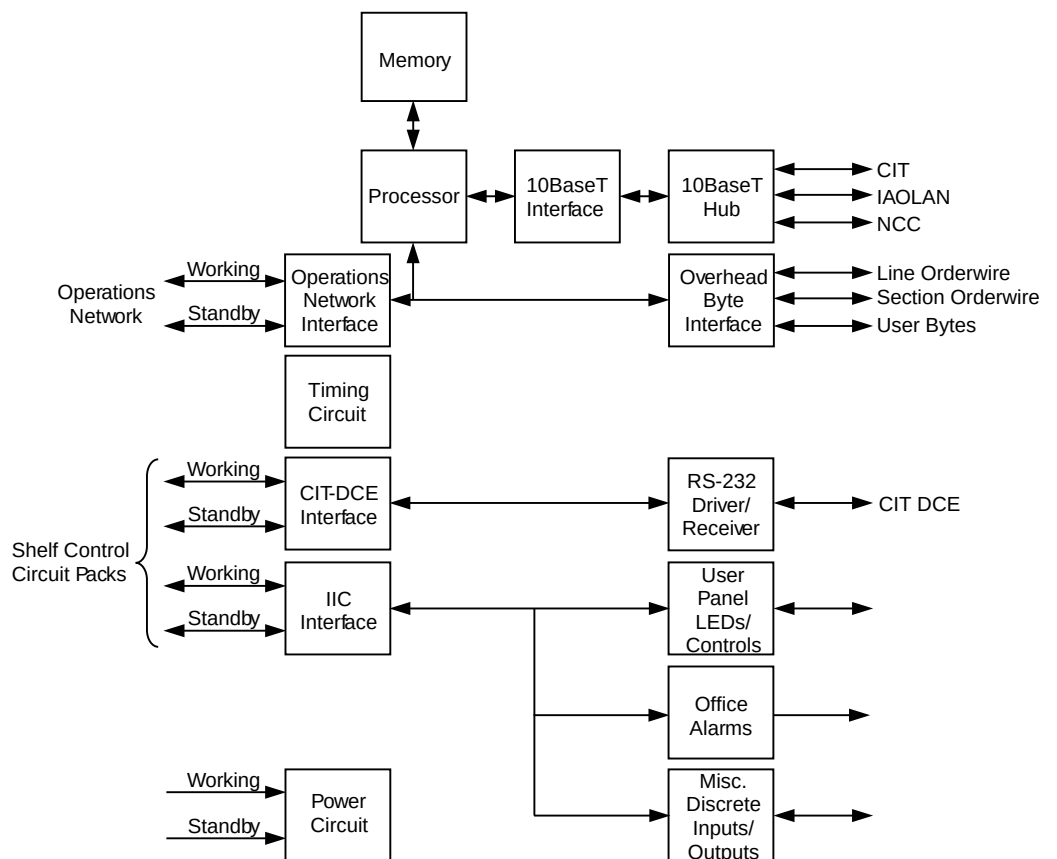
The ADJCTL/DCCEI circuit pack has a RESET push-button switch recessed on its faceplate. When the RESET push-button switch is pressed, the ADJCTL/DCCEI circuit pack performs a circuit pack reset.

**General description of operation**

The ADJCTL/DCCEI circuit pack assembles and disassembles the embedded information for the transport overhead bytes. These overhead bytes include section and line data communications bytes, section and line orderwire bytes, and user bytes. The ADJCTL/DCCEI circuit pack also provides external user interfaces.

**Functional block diagram**

The following figure shows a functional block diagram of the ADJCTL/DCCEI circuit pack.



NC-USM-055

**Control circuitry** The processor controls and monitors the operation of the circuit pack. The processor also performs protocol processing of the open systems interconnection (OSI) 7-layer stack for the 10BaseT interface. In Release 5 and later releases the processor performs Internet Protocol (IP) or OSI protocol processing. The processor also manages communication with the CTL/SYS50DM circuit pack via the operations network.

**Memory circuitry** The ADJCTL/DCCEI circuit packs provide the following memory functions.

#### **Start-up memory**

The start-up memory of the LEY1 and LEY1AE ADJCTL/DCCEI circuit packs consist of one megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory of the LEY401 ADJCTL/DCCEI circuit pack consists of four megabytes of flash EEPROM. The start-up memory contains the program that allows the processor to load the executable code and data from the CTL/SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

#### **Operating memory**

The operating memory of the LEY1 and LEY1AE ADJCTL/DCCEI circuit packs consist of 32 megabytes of dynamic random access memory (DRAM). The operating memory of the LEY401 ADJCTL/DCCEI circuit pack consist of up to 128 megabytes of synchronous dynamic random access memory (SDRAM). The operating memory is used to store executable code/data.

#### **Nonvolatile memory**

The nonvolatile memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the circuit pack history such as the *CLEI* code and type/version information.

**Interface circuitry**

The ADJCTL/DCCEI circuit packs provide the following external interface functions.

**10BaseT interface**

The 10BaseT interface provides access to the intraoffice LAN (10 Mb/s ethernet LAN) via the 10BaseT four-port hub. The 10BaseT interface performs IP or OSI protocol processing for the intraoffice LAN (IAOLAN) data.

In the receive direction, the 10BaseT interface accepts IAOLAN data from the 10BaseT four-port hub. The IAOLAN data is routed to the processor for protocol processing.

In the transmit direction, the 10BaseT interface accepts the IAOLAN data from the processor and transmits the information to the 10BaseT four-port hub.

**Operations network interface**

The operations network interface provides access to the CTL/SYS50DM circuit pack and transmission port units via the operations network. For more information about the operations network, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

**Overhead byte interface**

The overhead byte interface accepts the data communications channel (DCC) bytes from the operations network or the intraoffice LAN (IAOLAN) and the following overhead bytes from the shelf backplane:

- Line orderwire
- Section orderwire
- User

**Important!** The LEY1 and LEY1AE ADJCTL/DCCEI circuit packs support V.11 orderwire and user byte interfaces. The LEY401 ADJCTL/DCCEI circuit pack supports V.11 or G.703 orderwire and user byte interfaces.

The overhead byte interface multiplexes this information and sends it via the operations network to the transmission port units for transmission over the optical transmission line. This information provides end-to-end communications and maintenance.

In the receive direction, the transmission port units transmit the overhead bytes via the operations network to the overhead byte interface. The overhead byte interface then demultiplexes the DCC and overhead bytes and makes them available for use.

### Supported overhead bytes

The ADJCTL/DCCEI circuit packs supports the following overhead bytes.

| Name      | Overhead byte | Data rate | Access    |
|-----------|---------------|-----------|-----------|
| Orderwire | E1a           | 64 kb/s   | Backplane |
| Orderwire | E1b           | 64 kb/s   | Backplane |
| Orderwire | E2a           | 64 kb/s   | Backplane |
| Orderwire | E2b           | 64 kb/s   | Backplane |
| User      | F1            | 64 kb/s   | Backplane |
| User      | F2            | 64 kb/s   | Backplane |
| DCC       | D1-D3         | 192 kb/s  | IAOLAN    |
| DCC       | D4-D12        | 576 kb/s  | IAOLAN    |

### Inter-integrated circuit interface

The inter-integrated circuit (IIC) interface is a communication link between the ADJCTL/DCCEI circuit pack and the CTL/SYS50DM circuit pack. The inter-integrated circuit interface allows the CTL/SYS50DM circuit pack to control the user panel and office alarms.

### Timing circuitry

A free-running 6.48-MHz oscillator provides a reference signal for the timing circuit. The timing circuit multiplies the 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. The 155.52-MHz timing signal is used to generate all other output timing signals.

**User interface circuitry**

The ADJCTL/DCCEI circuit pack provides the following user interface functions.

**Four-Port 10BaseT hub**

The four-port 10BaseT hub provides one internal port for the system and three external user ports. The three external user ports are for the:

- WaveStar Craft Interface Terminal (WaveStar CIT)
- Intraoffice LAN (IAOLAN)
- Network Communications Controller (NCC)

**CIT DCE**

The CIT DCE interface is configured as data circuit equipment (DCE) for direct craft interface terminal (CIT) access. The CIT DCE interface allows direct access to a PC running WaveStar CIT software. The CIT DCE interface supports data rates up to 19200 baud. The CIT DCE interface is reserved for use in a future release.

**User panel LEDs and controls**

The ADJCTL/DCCEI circuit pack provides the outputs to light the following LEDs on the user panel:

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

The ADJCTL/DCCEI circuit pack also accepts the alarm cut-off (ACO) and LED test (LED TEST) inputs from the user panel. For more information about the user panel, refer to *Chapter 4, Operations Interfaces*.

**Office alarms interface**

The ADJCTL/DCCEI circuit pack provides relays to interface with a central office alarm grid. The relays are controlled by the CTL/SYS50DM circuit packs. Relays are provided for audible and visible alarms for the following:

- Critical
- Major
- Minor

The normally closed contacts for the critical and major relays provide the alarm closure if power fails. For more information about the office alarms interface, refer to *Chapter 4, Operations Interfaces*.

**User-settable miscellaneous discrete interface**

In Release 5 and later releases, the ADJCTL/DCCEI circuit pack accepts up to 8 user-settable miscellaneous discrete inputs and provides up to 8 miscellaneous discrete outputs. For more information about the miscellaneous discrete interface, refer to *Chapter 4, Operations Interfaces*.

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane. The power feeders are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V and +3.3 V used on the circuit pack.

The ADJCTL/DCCEI circuit pack monitors the two power sources. If the ADJCTL/DCCEI circuit pack detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the circuit pack faceplate.

**Quick reference summary**

The ADJCTL/DCCEI circuit pack performs the following control and interface functions:

- Interfaces with the 10BaseT interface to send and receive IAOLAN data
- Interfaces with the CTL/SYS50DM circuit pack via the operations network interface to send and receive system messages
- Processes and routes messages between the 10BaseT and operations network interfaces using the Internet Protocol (IP) or open system interconnection (OSI) protocol
- Provides communications between the transmission port units and the shelf control circuit packs using the operations network

- Provides the following external user interfaces:
  - Four-port 10BaseT hub
  - CIT DCE interface for direct local access to the system operating at up to 19200 baud (reserved for future use)
  - Office alarms
  - User panel LEDs and controls
  - User-settable miscellaneous discrete interface that provides environmental inputs and control outputs (Release 5 and later releases)
- Provides internal fault detection and interfaces with the CTL/SYS50DM circuit pack
- Stores inventory information (for example, *CLEI* code and serial number)
- Controls the circuit pack faceplate FAULT and ACTIVE LEDs



## CTL/SYS50DM Circuit Pack

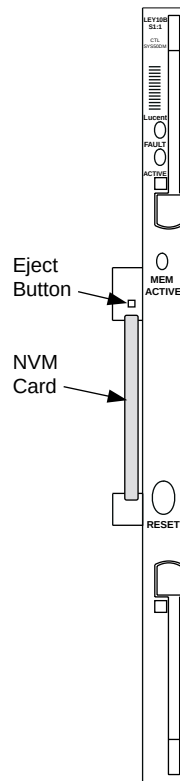
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### Purpose of circuit pack

The Control/System 50DM (CTL/SYS50DM) circuit pack provides the main control and memory functions for the I/O Shelf.

### CTL/SYS50DM circuit pack faceplate

The following figure shows the CTL/SYS50DM circuit pack faceplate.



NC-USM-032

### Faceplate LEDs

The CTL/SYS50DM circuit pack provides the following faceplate LEDs.

| LED        | Color | Function                                                      |
|------------|-------|---------------------------------------------------------------|
| FAULT      | Red   | Continuously lighted when a circuit pack failure is detected. |
| ACTIVE     | Green | Lighted when the circuit pack is active/in-service.           |
| MEM ACTIVE | Green | Lighted when the flash disk memory is accessed.               |



**Faceplate push-button switch**

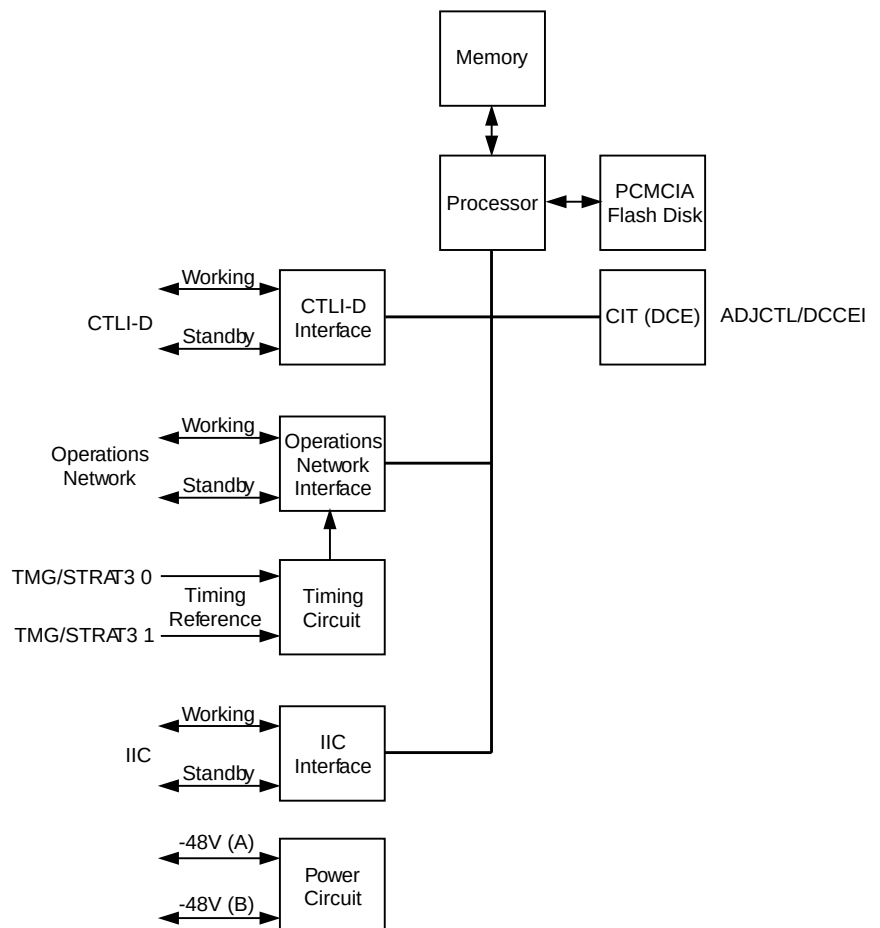
The CTL/SYS50DM circuit pack has a RESET push-button switch recessed on its faceplate. When the RESET push-button switch is pressed, the CTL/SYS50DM circuit pack performs a system reset.

**General description of operation**

The CTL/SYS50DM circuit pack provides control and memory functions for the I/O Shelf. It performs shelf-level computations and performance monitoring. It also provides the serial user interfaces.

**Functional block diagram**

The following figure shows a functional block diagram of the CTL/SYS50DM circuit pack.



NC-USM-056

**Control circuitry**

The processor is the highest-level processor in the system 2-level control hierarchy. The processor controls and monitors the operation of the circuit pack. The processor also manages communication with other circuit packs via the operations bus, control interface for devices, and inter-integrated circuit bus.

**Memory circuitry** The CTL/SYS50DM circuit pack provides the following memory functions.

**Start-up memory**

The start-up memory consists of 2 megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the secondary operating memory into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to 64 megabytes of dynamic random access memory (DRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Secondary operating memory**

The secondary operating memory is used to store copies of the executable code and data. The secondary operating memory consists of one Personal Computer Memory Card International Association (PCMCIA) flash disk card. The flash disk card supports up to 220 megabytes of memory. The flash disk cards are removable and can be accessed from the circuit pack faceplate.

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the circuit pack history such as the *CLEI* code and type/version information.

**Interface circuitry** The CTL/SYS50DM circuit pack provides the following interface functions.

**Operations network interface**

The operations network interface provides access to the ADJCTL/DCCEI and transmission port units via the operations network. For more information about the operations network, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

**Control interface for devices (CTLI-D) interface**

The CTLI-D interface provides access to the external interface function of the TMG/STRAT3 and SWITCH/STS576 circuit packs via the CTLI-D bus.

**Inter-integrated circuit interface**

The inter-integrated circuit interface provides access to the external interface function of the ADJCTL/DCCEI circuit pack via the inter-integrated circuit bus.

**Timing circuitry**

The timing circuit receives two 6.48-MHz timing reference signals from the TMG/STRAT3 circuit packs. The timing circuit multiplies the 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**User interface circuitry**

The CTL/SYS50DM circuit pack provides the following user interface functions.

**CIT DCE**

The CIT DCE interface is configured as data circuit equipment (DCE) for direct WaveStar craft interface terminal (CIT) access. The CIT DCE interface allows direct access to a PC running *WaveStar* CIT software. The CIT DCE interface supports data rates up to 19200 baud. The CIT DCE interface is reserved for use in a future release.

**Protection circuitry**

The CTL/SYS50DM circuit pack provides the following protection functions.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The CTL/SYS50DM circuit pack monitors these timing reference signals and can select the working or standby timing reference signal.

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V and +3.3 V used on the circuit pack.

The CTL/SYS50DM circuit pack monitors the two power sources. If the CTL/SYS50DM circuit pack detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the circuit pack faceplate.

**Quick reference summary** The CTL/SYS50DM circuit pack provides the following functions.

### Control functions

The CTL/SYS50DM circuit pack performs the following control and maintenance functions:

- Stores the operating copy of the system executable code and data
- Provides a removable PCMCIA flash disk memory card
- Performs shelf maintenance computations and performance monitoring
- Automatically resets the system during powerup
- Performs self-audits
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the circuit pack faceplate EI FAULT LED on the ADJCTL/DCCEI circuit pack
- Controls the circuit pack faceplate FAULT LED on the SWITCH/STS576 and TMG/STRAT3 circuit pack
- Controls the circuit pack FAULT, ACTIVE, and MEM ACTIVE LEDs on the circuit pack faceplate

### Interface functions

The CTL/SYS50DM circuit pack performs the following interface functions:

- Communications with other circuit packs using the operations network
- Communications with other circuit packs using the control interface for devices (CTLI-D) bus
- Communications with other circuit packs using the inter-integrated circuit (IIC) bus
- CIT DCE interface via the ADJCTL/DCCEI circuit pack for direct local access to the system operating at up to 19200 baud (future)



## DS3EC1/8 Port Unit

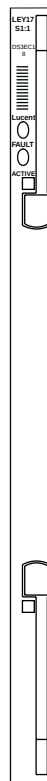
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**Purpose of circuit pack**

The DS3EC1 8-port interface (DS3EC1/8) port unit provides a low speed interface between eight asynchronous DS3 signals and an internal synchronous transmission interface signal (TXI). In Release 3 and later releases, the DS3EC1/8 port unit interfaces with up to eight asynchronous DS3 and/or synchronous electrical carrier level 1 (EC-1) signals (provisionable).

**DS3EC1/8 port unit faceplate**

The following figure shows the DS3EC1/8 port unit faceplate.



NC-USM-031

**Faceplate LEDs** The DS3EC1/8 port unit provides the following faceplate LEDs.

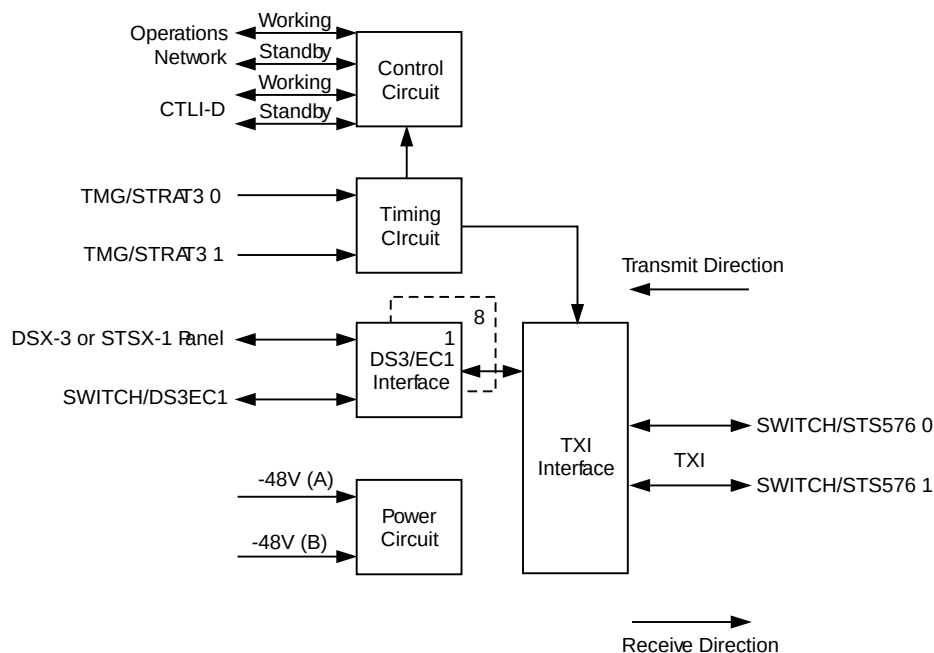
| LED    | Color | Function                                                                                                                                                                                                                 |
|--------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a port unit failure is detected or the port unit loses one power feeder.<br><br>Flashes on and off when an incoming signal failure from the DSX-3 or STSX-1 panel (or equivalent) is detected. |
| ACTIVE | Green | Lighted when the port unit is active/in-service.                                                                                                                                                                         |

**General description of operation**

The DS3EC1/8 port unit terminates up to eight bidirectional DS3 lines complying with standard DSX-3 signal specifications and/or EC-1 lines complying with SONET signal specifications. The eight electrical signals are converted to STS-1 signals and multiplexed into one internal transmission interface (TXI) signal (622.08 Mb/s). The TXI signal supports up to 12 multiplexed STS-1 signals. The TXI signal is sent to the 576x576 STS-1 switch (SWITCH/STS576) circuit packs. In the transmit direction, the SWITCH/STS576 circuit packs send two TXI signals to the DS3EC1/8 port unit. The DS3EC1/8 port unit selects and demultiplexes one 622.08 Mb/s TXI signal into eight STS-1 signals. The STS-1 signals are converted back to DS3 or EC-1 signals. The DS3EC1/8 port unit also interfaces with the shelf Control/System 50DM (CTL/SYS50DM) circuit pack.

**Functional block diagram**

The following figure shows a functional block diagram of the DS3EC1/8 port unit.



NC-USM-045

**Control circuitry**

The processor is the lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the port unit. The processor also manages communication with other circuit packs via the operations network and the control interface for devices (CTLI-D) interfaces. For more information about the operations network and the CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

**Memory circuitry**

The DS3EC1/8 port unit provides the following memory functions.

**Start-up memory**

The start-up memory consists of one megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to four megabytes of dynamic random access memory (DRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the port unit history such as the *CLEI* code and type/version information.

**Transmission circuitry**     The DS3EC1/8 port unit provides the following transmission functions.

**Receive direction**

In the receive direction, the DS3EC1/8 port unit accepts up to eight 44.736 Mb/s bipolar 3-zero substitution (B3ZS) coded DS3 signals and/or 51.84 Mb/s EC-1 signals. These DS3/EC-1 signals are split by the DS3/EC1 interface. One copy of the DS3/EC-1 signals is sent to the SWITCH/DS3EC1 circuit pack (for protection), and the other copy of the DS3/EC-1 signals is processed by the DS3/EC1 interface. The DS3/EC1 interface recovers timing from the DS3/EC-1 signals and sends the received data and recovered clock to the TXI interface.

The TXI interface converts each DS3/EC-1 to an STS-1 format (51.84 Mb/s). The STS-1 path overhead and pointer bytes are also added to the STS-1 signal. The byte multiplexer/demultiplexer then scrambles and multiplexes the eight STS-1 signals into one 622.08 Mb/s TXI signal. The 622.08 Mb/s TXI signal is sent to the SWITCH/STS576 0 and SWITCH/STS576 1 circuit packs.

**Transmit direction**

In the transmit direction, the SWITCH/STS576 circuit packs send two 622.08 Mb/s TXI signals to the TXI interface. The TXI interface selects one TXI signal and recovers timing. The selected TXI signal is descrambled and demultiplexed into eight STS-1 signals. Each STS-1 signal goes through STS-1 pointer processing, and the STS-1 path overhead is removed and processed. The TXI interface sends eight DS3/EC-1 signals and a clock signal to the DS3/EC1 interface.



The DS3/EC1 interface selects the signals from the TXI interface or the SWITCH/DS3EC1 circuit pack (for protection) and outputs them to the DSX-3 or STSX-1 panel (or equivalent). The DS3/EC1 interface provides eight standard bipolar B3ZS-coded DS3 and/or SONET standard EC-1 signals.

**Timing circuitry** The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**Protection circuitry** The DS3EC1/8 port unit provides the following protection functions.

#### **DS3EC1/8 port unit protection**

Optional 1xN ( $N \leq 12$ ) revertive DS3EC1/8 port unit protection is provided. A DS3/EC-1 protection bus is implemented with on-board relays on the DSX-3/STXS-1 side and with selectors at the TXI level on the SWITCH/STS576 circuit packs. The DS3/EC1 Switch (SWITCH/DS3EC1) circuit pack provides power to these relays and controls their operation. If the +5 volt power on the DS3EC1/8 port unit fails, the relays are still operational and controlled by the SWITCH/DS3EC1 and CTL/SYS50DM circuit packs. Shorting contacts are provided in the DS3EC1/8 port unit backplane connector so that when the port unit is removed, the DSX-3/STXS-1 cables short through to the SWITCH/DS3EC1 circuit pack for routing to the protection DS3EC1/8 port unit. When the DS3EC1/8 port unit is reinserted, the relays are in the protection state until the CTL/SYS50DM circuit pack determines that the port unit is good.

#### **Switch fabric protection**

Switch fabric protection is performed by selecting the working or standby TXI signals from the shelf SWITCH/STS576 circuit packs. The DS3EC1/8 port unit monitors these TXI signals and can select the working or standby TXI signal. The CTL/SYS50DM circuit pack can inhibit this autonomous selection and make its own selection.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The DS3EC1/8 port unit monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Fault detection circuitry**

The DS3EC1/8 port unit provides the following fault detection functions.

**Monitoring and testing**

The control circuit monitors all the activities on the port unit. The DS3EC1/8 port unit has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed whenever the DS3EC1/8 port unit is inserted in a slot or reset.

**Loopbacks**

In Release 5 and later releases, the DS3EC1/8 port unit supports nearside and farside facility loopbacks. Nearside facility loopbacks allow an incoming DS3 line to be looped back in the port unit to the output of the same line. Farside facility loopbacks allow an outgoing DS3 line to be looped back in the port unit to the switch fabric and the outgoing line in the opposite direction.

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V and +3.3 V used on the port unit. The SWITCH/DS3EC1 circuit pack supplies power to the input and output protection relays on the DS3EC1/8 port unit.

The DS3EC1/8 port unit monitors the two power sources. If the DS3EC1/8 port unit detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the port unit faceplate.

**Quick reference summary**    The DS3EC1/8 port unit performs the following functions.

### **Receive functions**

The DS3EC1/8 port unit performs the following receive functions:

- Receives eight B3ZS-coded DS3 signals (44.736 Mb/s) from a DSX-3 panel (or equivalent) and/or SONET standard EC-1 signals (51.84 Mb/s) from a STSX-1 panel (or equivalent)
- Recovers clock from each DS3/EC-1 signal
- Synchronizes and maps each DS3/EC-1 signal to an STS-1 (51.84 Mb/s) synchronous payload envelope (SPE)
- Inserts STS-1 path overhead and pointer bytes
- Multiplexes eight STS-1 signals to a 622.08 Mb/s TXI signal
- Sends a 622.08 Mb/s TXI signal to each SWITCH/STS576 circuit pack

### **Transmit functions**

The DS3EC1/8 port unit performs the following transmit functions:

- Receives two 622.08 Mb/s TXI signals from the SWITCH/STS576 circuit packs and selects one TXI signal
- Demultiplexes the selected 622.08 Mb/s TXI signal into eight STS-1 signals
- Extracts path overhead and converts STS-1 signals to EC-1 signals
- Extracts the path overhead and the embedded DS3 signal from each STS-1 signal
- Desynchronizes the DS3 signals
- Encodes each DS3 signal into a B3ZS format
- Provides eight DS3 signals to a DSX-3 panel (or equivalent) and/or EC-1 signals to an STSX-1 panel (or equivalent)

**Timing and control functions**

The DS3EC1/8 port unit performs the following timing and control functions:

- Selects the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs
- Selects the working or standby operations network and CTLI-D signals
- Provides relays for low speed protection switching
- Performs internal fault detection and interfaces with the CTL/SYS50DM circuit packs using the operations network
- Provides nearside and farside facility loopbacks (Release 5 and later)
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the circuit pack faceplate FAULT and ACTIVE LEDs



## GE1/SX2 Port Unit

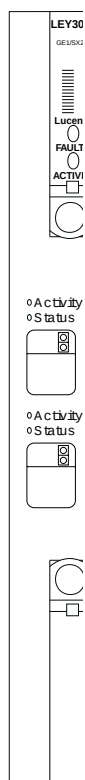
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### Purpose of circuit pack

The 1 Gigabit Ethernet (GE1/SX2) port unit provides an interface between two 1000Base-SX optical ethernet ports and internal synchronous transmission interface signals (TXI). The GE1/SX2 port unit supports short range applications in the 850-nanometer wavelength range.

### GE1/SX2 port unit faceplate

The following figure shows the GE1/SX2 port unit faceplate.



NC-USM-28

**Faceplate LEDs** The GE1/SX2 port unit provides the following faceplate LEDs.

| LED         | Color  | Function                                                                                                                                                              |
|-------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT       | Red    | Continuously lighted when a port unit failure is detected or the port unit loses one power feeder.<br>Flashes on and off when an incoming signal failure is detected. |
| ACTIVE      | Green  | Lighted when the port unit is active/in-service.                                                                                                                      |
| PORT 1 LINK | Green  | Lighted when the Port 1 ethernet link is up.                                                                                                                          |
| PORT 1 DATA | Yellow | Lighted when the Port 1 ethernet is transmitting or receiving data.                                                                                                   |
| PORT 2 LINK | Green  | Lighted when the Port 2 ethernet link is up.                                                                                                                          |
| PORT 2 DATA | Yellow | Lighted when the Port 2 ethernet is transmitting or receiving data.                                                                                                   |

**General description of operation**

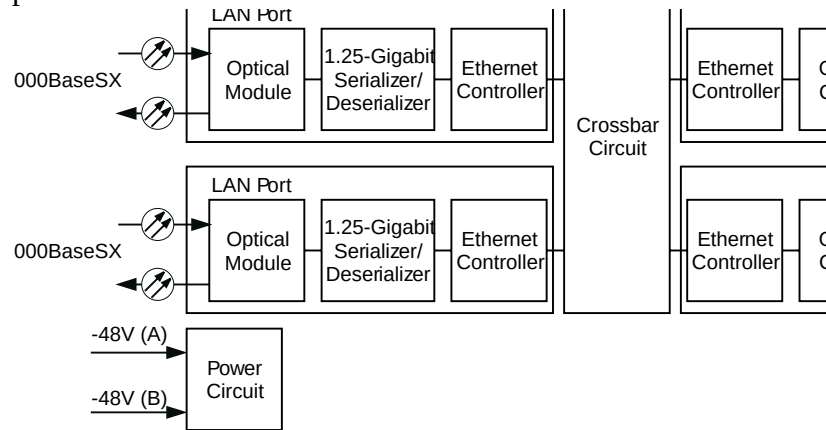
The GE1/SX2 port unit terminates up to two bidirectional 1000BaseSX optical ethernet ports. Each optical ethernet signal is converted to a serial 1.25 Gb/s electrical signal. The serial 1.25 Gb/s electrical ethernet signals are demultiplexed to parallel data and processed for SONET transport. The data is then converted to internal transmission interface (TXI) signals (622.08 Mb/s) and transmitted to the 576x576 STS-1 switch (SWITCH/STS576) circuit packs.

In the transmit direction, the SWITCH/STS576 circuit packs send TXI signals to the GE1/SX2 port unit. The GE1/SX2 port unit selects and converts the 622.08 Mb/s TXI signals to parallel ethernet data. The parallel data is multiplexed to a serial 1.25 Gb/s electrical signal and converted to an optical 1000Base-SX signal for transmission.

The GE1/SX2 port unit also interfaces with the shelf Control/System 50DM (CTL/SYS50DM) circuit pack.

**Functional block diagram**

The following figure shows a functional block diagram of the GE1/SX2 port unit.

**Control circuitry**

The processor is the lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the port unit. The processor also manages communication with other circuit packs via the operations network and the control interface for devices (CTLI-D) interfaces. For more information about the operations network and the CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

**Memory circuitry**    The GE1/SX2 port unit provides the following memory functions.

**Start-up memory**

The start-up memory consists of four megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to 16 megabytes of synchronous dynamic random access memory (SDRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 1024 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the port unit history such as the *CLEI* code and type/version information.

**Transmission circuitry**    The GE1/SX2 port unit provides the following transmission functions.

**Receive direction (LAN port)**

The GE1/SX2 port unit accepts one incoming 1000BaseSX optical ethernet signal. Fiber access to the GE1/SX2 port unit is via fixed dual SC-type buildout blocks on the port unit faceplate.

The optical module converts 1000BaseSX optical ethernet signal to a 1.25-Gb/s electrical ethernet signal. Clock and data recovery are also provided.

The 1.25-gigabit serializer/deserializer converts the serial 1.25-Gb/s electrical signal to parallel data.

The ethernet controller in the LAN port processes the ethernet data and transmits the ethernet data via a crossbar circuit to the ethernet controller in the WAN port.



**Receive direction (WAN port)**

The ethernet controller in the WAN port processes the ethernet data received from the LAN port and transmits the ethernet data to a Gigabit Ethernet over SONET (GEOS) circuit.

Virtual local area network (VLAN) tagging is used to identify customers (provisionable). If the ethernet data does not have a provisioned VLAN tag, a default VLAN tag is used. The VLAN tag is compared with the VLAN list and any unmatched ethernet data is discarded.

The Gigabit Ethernet over SONET (GEOS) circuit encapsulates the ethernet data for SONET transport via virtually concatenated STS-1c signals. The SONET path overhead and pointer bytes are also inserted. The STS-1c signals are converted to internal transmission interface (TXI) signals and sent to the OC-48 transceiver.

The OC-48 transceiver circuit transmits up to two TXI signals to the SWITCH/STS576 0 circuit pack and two TXI signals to the SWITCH/STS576 1 circuit pack.

**Transmit direction (WAN port)**

In the transmit direction, each OC-48 transceiver circuit receives up to two TXI signals from the SWITCH/STS576 0 circuit pack and two TXI signals from the SWITCH/STS576 1 circuit pack. The OC-48 transceiver circuit selects the working TXI signals and sends them to the GEOS circuit.

The GEOS circuit converts the TXI signals to virtually concatenated STS-1c signals. The SONET overhead bytes and ethernet data are removed from the STS-1c signals.

The ethernet controller in the WAN port processes the ethernet data and transmits the ethernet data via a crossbar circuit to the ethernet controller in the LAN port.

**Transmit direction (LAN port)**

The ethernet controller in the LAN port processes the ethernet data received from the WAN port and transmits the ethernet data to a 1.25-gigabit serializer/deserializer.

The 1.25-gigabit serializer/deserializer converts the parallel ethernet data to a serial 1.25-Gb/s electrical signal and sends it to the optical module.

The optical module converts electrical 1.25-Gb/s ethernet signal to an optical 1000BaseSX ethernet signal for transmission.

**Timing circuitry**

The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. The timing circuit also provides internal 77.76-MHz and 8-KHz timing signals. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**Protection circuitry**

The GE1/SX2 port unit provides the following protection functions.

**Switch fabric protection**

Switch fabric protection is performed by selecting the working or protection TXI signals from the shelf SWITCH/STS576 circuit packs. The GE1/SX2 port unit monitors these TXI signals and can select the working or protection TXI signal. The CTL/SYS50DM circuit pack can inhibit this autonomous selection and make its own selection.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The GE1/SX2 port unit monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Fault detection circuitry**

The GE1/SX2 port unit provides the following fault detection functions.

**Monitoring and testing**

The control circuit monitors all the activities on the port unit. The GE1/SX2 port unit has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed whenever the GE1/SX2 port unit is inserted in a slot or reset.

**Loopbacks**

The GE1/SX2 port unit supports nearside internal loopbacks and farside facility loopbacks. Loopbacks are performed by OC-48 transceiver circuit.

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V, +3.3 V, +2.5 V, and +1.8 V used on the port unit.

The GE1/SX2 port unit monitors the two power sources. If the GE1/SX2 port unit detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the port unit faceplate.

**Quick reference summary**

The GE1/SX2 port unit performs the following functions.

**Receive functions**

The GE1/SX2 port unit performs the following receive functions:

- Receives up to two 1000BaseSX optical ethernet signals
- Recovers clock from each signal
- Converts the optical 1000BaseSX ethernet signal to an electrical 1.25-Gb/s signal
- Converts the serial 1.25-Gb/s signal to parallel ethernet data
- Encapsulates ethernet data in virtually concatenated STS-1c signals
- Inserts STS-1 path overhead and pointer bytes
- Converts the STS-1c signals to 622.08 Mb/s TXI signals
- Sends the 622.08 Mb/s TXI signals to each SWITCH/STS576 circuit pack

**Transmit functions**

The GE1/SX2 port unit performs the following transmit functions:

- Receives working and protection 622.08 Mb/s TXI signals from the SWITCH/STS576 circuit packs and selects the working TXI signals
- Converts the 622.08 Mb/s TXI signals to STS-1c signals
- Extracts SONET path overhead and pointer bytes from the STS-1c signals
- Extracts the ethernet data from the STS-1c signals
- Converts the parallel ethernet data to a serial 1.25-Gb/s signal
- Converts the electrical 1.25-Gb/s signal to an optical 1000BaseSX ethernet signal for transmission

**Timing and control functions**

The GE1/SX2 port unit performs the following timing and control functions:

- Selects the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs
- Selects the working or standby operations network and CTLI-D signals
- Performs internal fault detection and interfaces with the CTL/SYS50DM circuit packs using the operations network
- Provides nearside internal loopbacks and farside facility loopbacks
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the circuit pack faceplate FAULT, ACTIVE, LINK, and DATA LEDs



## GE1/LX2 Port Unit

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### Purpose of circuit pack

The 1 Gigabit Ethernet (GE1/LX2) port unit provides an interface between two 1000Base-LX optical ethernet ports and internal synchronous transmission interface signals (TXI). The GE1/LX2 port unit supports long range applications in the 1310-nanometer wavelength range.

### GE1/LX2 port unit faceplate

The following figure shows the GE1/LX2 port unit faceplate.



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**Faceplate LEDs** The GE1/LX2 port unit provides the following faceplate LEDs.

| LED         | Color  | Function                                                                                                                                                              |
|-------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT       | Red    | Continuously lighted when a port unit failure is detected or the port unit loses one power feeder.<br>Flashes on and off when an incoming signal failure is detected. |
| ACTIVE      | Green  | Lighted when the port unit is active/in-service.                                                                                                                      |
| PORT 1 LINK | Green  | Lighted when the Port 1 ethernet link is up.                                                                                                                          |
| PORT 1 DATA | Yellow | Lighted when the Port 1 ethernet is transmitting or receiving data.                                                                                                   |
| PORT 2 LINK | Green  | Lighted when the Port 2 ethernet link is up.                                                                                                                          |
| PORT 2 DATA | Yellow | Lighted when the Port 2 ethernet is transmitting or receiving data.                                                                                                   |

**General description of operation**

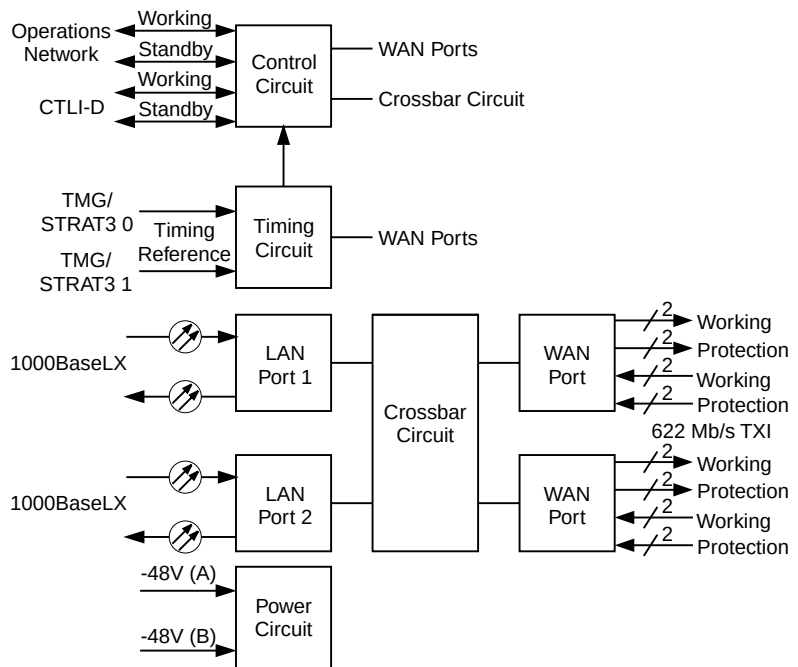
The GE1/LX2 port unit terminates up to two bidirectional 1000BaseLX optical ethernet ports. Each optical ethernet signal is converted to a serial 1.25 Gb/s electrical signal. The serial 1.25 Gb/s electrical ethernet signals are demultiplexed to parallel data and processed for SONET transport. The data is then converted to internal transmission interface (TXI) signals (622.08 Mb/s) and transmitted to the 576x576 STS-1 switch (SWITCH/STS576) circuit packs.

In the transmit direction, the SWITCH/STS576 circuit packs send TXI signals to the GE1/LX2 port unit. The GE1/LX2 port unit selects and converts the 622.08 Mb/s TXI signals to parallel ethernet data. The parallel data is multiplexed to a serial 1.25 Gb/s electrical signal and converted to an optical 1000Base-LX signal for transmission.

The GE1/LX2 port unit also interfaces with the shelf Control/System 50DM (CTL/SYS50DM) circuit pack.

**Functional block diagram**

The following figure shows a functional block diagram of the GE1/LX2 port unit.



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**Control circuitry**

The processor is the lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the port unit. The processor also manages communication with other circuit packs via the operations network and the control interface for devices (CTLI-D) interfaces. For more information about the operations network and the CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

**Memory circuitry** The GE1/LX2 port unit provides the following memory functions.

**Start-up memory**

The start-up memory consists of four megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to 16 megabytes of synchronous dynamic random access memory (SDRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 1024 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the port unit history such as the *CLEI* code and type/version information.

**Transmission circuitry** The GE1/LX2 port unit provides the following transmission functions.

**Receive direction (LAN port)**

The GE1/LX2 port unit accepts one incoming 1000BaseLX optical ethernet signal. Fiber access to the GE1/LX2 port unit is via fixed dual SC-type buildout blocks on the port unit faceplate.

The optical module converts 1000BaseLX optical ethernet signal to a 1.25-Gb/s electrical ethernet signal. Clock and data recovery are also provided.

The 1.25-gigabit serializer/deserializer converts the serial 1.25-Gb/s electrical signal to parallel data.

The ethernet controller in the LAN port processes the ethernet data and transmits the ethernet data via a crossbar circuit to the ethernet controller in the WAN port.



**Receive direction (WAN port)**

The ethernet controller in the WAN port processes the ethernet data received from the LAN port and transmits the ethernet data to a Gigabit Ethernet over SONET (GEOS) circuit.

Virtual local area network (VLAN) tagging is used to identify customers (provisionable). If the ethernet data does not have a provisioned VLAN tag, a default VLAN tag is used. The VLAN tag is compared with the VLAN list and any unmatched ethernet data is discarded.

The Gigabit Ethernet over SONET (GEOS) circuit encapsulates the ethernet data for SONET transport via virtually concatenated STS-1c signals. The SONET path overhead and pointer bytes are also inserted. The STS-1c signals are converted to internal transmission interface (TXI) signals and sent to the OC-48 transceiver.

The OC-48 transceiver circuit transmits up to two TXI signals to the SWITCH/STS576 0 circuit pack and two TXI signals to the SWITCH/STS576 1 circuit pack.

**Transmit direction (WAN port)**

In the transmit direction, each OC-48 transceiver circuit receives up to two TXI signals from the SWITCH/STS576 0 circuit pack and two TXI signals from the SWITCH/STS576 1 circuit pack. The OC-48 transceiver circuit selects the working TXI signals and sends them to the GEOS circuit.

The GEOS circuit converts the TXI signals to virtually concatenated STS-1c signals. The SONET overhead bytes and ethernet data are removed from the STS-1c signals.

The ethernet controller in the WAN port processes the ethernet data and transmits the ethernet data via a crossbar circuit to the ethernet controller in the LAN port.

**Transmit direction (LAN port)**

The ethernet controller in the LAN port processes the ethernet data received from the WAN port and transmits the ethernet data to a 1.25-gigabit serializer/deserializer.

The 1.25-gigabit serializer/deserializer converts the parallel ethernet data to a serial 1.25-Gb/s electrical signal and sends it to the optical module.

The optical module converts electrical 1.25-Gb/s ethernet signal to an optical 1000BaseLX ethernet signal for transmission.

**Timing circuitry**

The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. The timing circuit also provides internal 77.76-MHz and 8-KHz timing signals. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**Protection circuitry**

The GE1/LX2 port unit provides the following protection functions.

**Switch fabric protection**

Switch fabric protection is performed by selecting the working or protection TXI signals from the shelf SWITCH/STS576 circuit packs. The GE1/LX2 port unit monitors these TXI signals and can select the working or protection TXI signal. The CTL/SYS50DM circuit pack can inhibit this autonomous selection and make its own selection.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The GE1/LX2 port unit monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Fault detection circuitry**

The GE1/LX2 port unit provides the following fault detection functions.

**Monitoring and testing**

The control circuit monitors all the activities on the port unit. The GE1/LX2 port unit has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed whenever the GE1/LX2 port unit is inserted in a slot or reset.

**Loopbacks**

The GE1/LX2 port unit supports nearside internal loopbacks and farside facility loopbacks. Loopbacks are performed by OC-48 transceiver circuit.

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V, +3.3 V, +2.5 V, and +1.8 V used on the port unit.

The GE1/LX2 port unit monitors the two power sources. If the GE1/LX2 port unit detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the port unit faceplate.

**Quick reference summary**

The GE1/LX2 port unit performs the following functions.

**Receive functions**

The GE1/LX2 port unit performs the following receive functions:

- Receives up to two 1000BaseLX optical ethernet signals
- Recovers clock from each signal
- Converts the optical 1000BaseLX ethernet signal to an electrical 1.25-Gb/s signal
- Converts the serial 1.25-Gb/s signal to parallel ethernet data
- Encapsulates ethernet data in virtually concatenated STS-1c signals
- Inserts STS-1 path overhead and pointer bytes
- Converts the STS-1c signals to 622.08 Mb/s TXI signals
- Sends the 622.08 Mb/s TXI signals to each SWITCH/STS576 circuit pack

**Transmit functions**

The GE1/LX2 port unit performs the following transmit functions:

- Receives working and protection 622.08 Mb/s TXI signals from the SWITCH/STS576 circuit packs and selects the working TXI signals
- Converts the 622.08 Mb/s TXI signals to STS-1c signals
- Extracts SONET path overhead and pointer bytes from the STS-1c signals
- Extracts the ethernet data from the STS-1c signals
- Converts the parallel ethernet data to a serial 1.25-Gb/s signal
- Converts the electrical 1.25-Gb/s signal to an optical 1000BaseLX ethernet signal for transmission

**Timing and control functions**

The GE1/LX2 port unit performs the following timing and control functions:

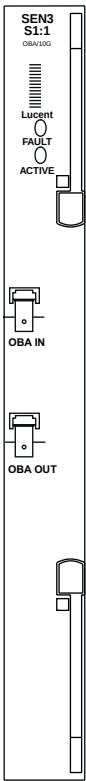
- Selects the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs
- Selects the working or standby operations network and CTLI-D signals
- Performs internal fault detection and interfaces with the CTL/SYS50DM circuit packs using the operations network
- Provides nearside internal loopbacks and farside facility loopbacks
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the circuit pack faceplate FAULT, ACTIVE, LINK, and DATA LEDs



# OBA10G Circuit Pack

**Purpose of circuit pack**      The 10G Optical Booster Amplifier (OBA10G) circuit pack optically amplifies one OC-192 signal (9.95328 Gb/s).

**OBA10G circuit pack faceplate**      The following figure shows the OBA10G circuit pack faceplate.



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**Faceplate LEDs**      The OBA10G circuit pack provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                                                                                    |
|--------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a circuit pack failure is detected or the circuit pack loses one power feeder.<br>Flashes on and off when an incoming signal failure is detected. |
| ACTIVE | Green | Lighted when the circuit pack is active/in-service.                                                                                                                         |

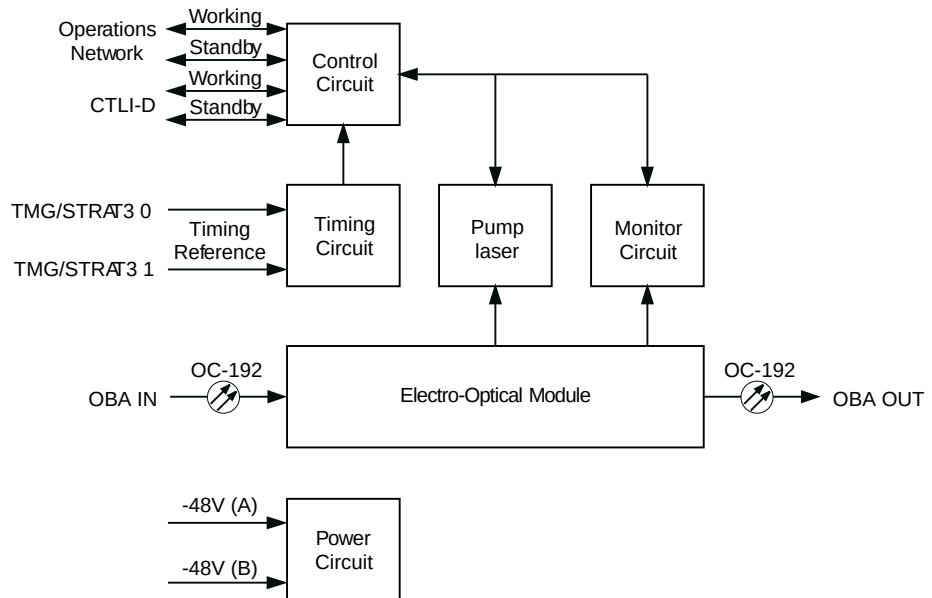
**General description of operation**

The OBA10G circuit pack optically amplifies one outgoing OC-192 signal. The wavelength of the outgoing OC-192 signal (from an OC192/STM64 port unit) must be 1530 to 1565 nanometers. The OC-192 signal is optically amplified and retransmitted.

The OBA10G circuit pack also interfaces with the Control/System 50DM (CTL/SYS50DM) circuit pack.

**Functional block diagram**

The following figure shows a functional block diagram of the OBA10G circuit pack.



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**Control circuitry**

The processor is the lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the circuit pack. The processor also manages communication with other circuit packs via the operations network and the control interface for devices (CTLI-D) interfaces. For more information about the operations network and the CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

**Memory circuitry**      The OBA10G circuit pack provides the following memory functions.

**Start-up memory**

The start-up memory consists of one megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to 16 megabytes of synchronous dynamic random access memory (SDRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile inventory memory is used to store information about the circuit pack history such as the *CLEI* code and type/version information.

**Nonvolatile threshold memory**

The nonvolatile threshold memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile threshold memory is used to store information about the thresholds used for fault detection.

**Transmission circuitry**      The OBA10G circuit pack accepts one OC-192 signal (OBA IN) in the 1530-1565 nanometer range. Fiber access to the OBA10G circuit pack is via fixed SC-type buildout blocks and a removable SC-type or FC type lightguide buildouts on the circuit pack faceplate. ST-type lightguide buildouts are not allowed because of high insertion loss. Lightguide buildouts are chosen based on the attenuation desired and the type of connector interface.

Pump lasers provide the power for optical amplification. The incoming OC-192 signal passes through erbium-doped fiber. The erbium-doped fiber is also driven with a 980-nm optical signal from the pump laser. The erbium-doped fiber transfers energy from the 980-nm pump laser signal to the OC-192 signal and the amplified OC-192 signal is retransmitted (OBA OUT).

The OBA10G circuit pack output is switched off if the circuit pack does not receive an OC-192 input signal.

**Timing circuitry** The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**Protection circuitry** Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The OBA10G circuit pack monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Fault detection circuitry** The control circuit monitors all the activities on the circuit pack. The OBA10G circuit pack has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed whenever the OBA10G circuit pack is inserted in a slot or reset.

**Power circuitry** The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V, +3.3 V and –5 V used on the circuit pack.

The OBA10G circuit pack monitors the two power sources. If the OBA10G circuit pack detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the circuit pack faceplate.



**Quick reference summary**    The OBA10G circuit pack performs the following functions.

### **Transmission functions**

The OBA10G circuit pack performs the following transmission functions:

- Receives one standard OC-192 signal (9.95328 Gb/s) in the 1530- to 1565-nanometer range.
- Optically amplifies and retransmits the OC-192 signal

### **Control functions**

The OBA10G circuit pack performs the following timing and control functions:

- Selects the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs
- Selects the working or standby operations network and CTLI-D signals
- Performs internal fault detection and interfaces with the CTL/ SYS50DM circuit packs using the operations network
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the circuit pack faceplate FAULT and ACTIVE LEDs

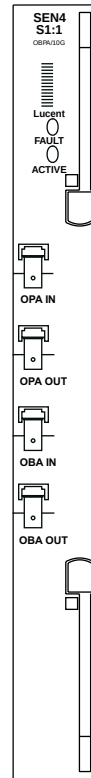


## OBPA10G Circuit Pack

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**Purpose of circuit pack** The 10G Optical Booster Pre-Amplifier (OBPA10G) circuit pack optically amplifies one outgoing OC-192 signal (9.95328 Gb/s) and optically pre-amplifies one incoming OC-192 signal.

**OBPA10G circuit pack faceplate** The following figure shows the OBPA10G circuit pack faceplate.



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**Faceplate LEDs** The OBPA10G circuit pack provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                                                                                    |
|--------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a circuit pack failure is detected or the circuit pack loses one power feeder.<br>Flashes on and off when an incoming signal failure is detected. |
| ACTIVE | Green | Lighted when the circuit pack is active/in-service.                                                                                                                         |

### General description of operation

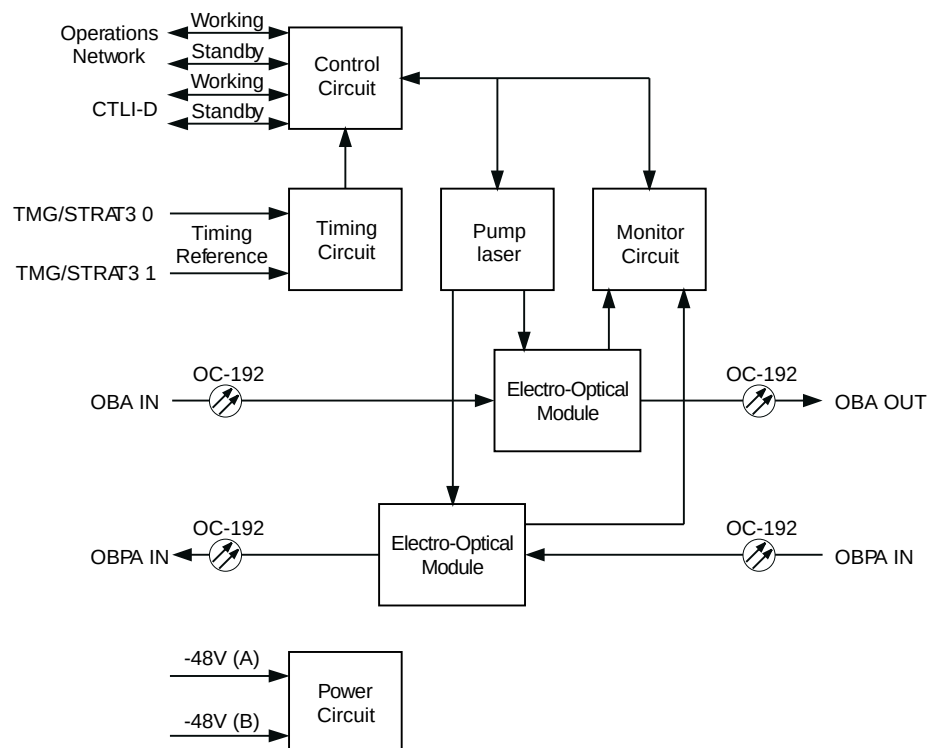
The OBPA10G circuit pack optically amplifies one outgoing OC-192 signal. The wavelength of the outgoing OC-192 signal (from an OC192/STM64 port unit) must be 1552.52 nanometers. The OC-192 signal is optically amplified and retransmitted.

The OBPA10G circuit pack also optically pre-amplifies one incoming OC-192 signal. The wavelength of the incoming OC-192 signal must be 1552.52 nanometers and the low frequency tone must be 197.557 kHz.

The OBA10G circuit pack also interfaces with the Control/System 50DM (CTL/SYS50DM) circuit pack.

### Functional block diagram

The following figure shows a functional block diagram of the OBPA10G circuit pack.



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### Control circuitry

The processor is the lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the circuit pack. The processor also manages communication with other circuit packs via the operations network and the control interface for devices (CTLI-D) interfaces. For more information about the operations network and the CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

**Memory circuitry** The OBPA10G circuit pack provides the following memory functions.

**Start-up memory**

The start-up memory consists of one megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to 16 megabytes of synchronous dynamic random access memory (SDRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile inventory memory is used to store information about the circuit pack history such as the *CLEI* code and type/version information.

**Nonvolatile threshold memory**

The nonvolatile threshold memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile threshold memory is used to store information about the thresholds used for fault detection.

**Transmission circuitry** The OBPA10G circuit pack provides the following transmission functions.

**Optical booster amplifier**

The OBPA10G circuit pack accepts one 1552.52-nanometer OC-192 signal (OBA IN). Fiber access to the OBPA10G circuit pack is via fixed SC-type buildout blocks and a removable ST-type, SC-type, or FC type lightguide buildouts on the circuit pack faceplate. Lightguide buildouts are chosen based on the attenuation desired and the type of connector interface.

Pump lasers provide the power for optical amplification. The incoming OC-192 signal passes through erbium-doped fiber. The erbium-doped fiber is also driven with a 980-nm optical signal from the pump laser. The erbium-doped fiber transfers energy from the 980-nm pump laser signal to the OC-192 signal and the amplified OC-192 signal is retransmitted (OBA OUT).

The OBPA10G circuit pack output is switched off if the circuit pack does not receive an input OC-192 signal.

### **Optical pre-amplifier**

The OBPA10G circuit pack accepts one 1552.52-nanometer OC-192 signal (OBPA IN). Fiber access to the OBPA10G circuit pack is via fixed SC-type buildout blocks and a removable ST-type, SC-type, or FC type lightguide buildouts on the circuit pack faceplate. Lightguide buildouts are chosen based on the attenuation desired and the type of connector interface.

Pump lasers provide the power for optical amplification. The incoming OC-192 signal passes through erbium-doped fiber. The erbium-doped fiber is also driven with a 980-nm optical signal from the pump laser. The erbium-doped fiber transfers energy from the 980-nm pump laser signal to the OC-192 signal and the amplified OC-192 signal is retransmitted (OBPA OUT).

The OBA10G circuit pack output is switched to a low level to avoid high transient power levels if the circuit pack does not receive an input OC-192 signal.

### **Timing circuitry**

The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

### **Protection circuitry**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The OBPA10G circuit pack monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Fault detection circuitry** The control circuit monitors all the activities on the circuit pack. The OBPA10G circuit pack has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed whenever the OBPA10G circuit pack is inserted in a slot or reset.

**Power circuitry** The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V, +3.3 V and –5 V used on the circuit pack.

The OBPA10G circuit pack monitors the two power sources. If the OBPA10G circuit pack detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the circuit pack faceplate.

**Quick reference summary** The OBPA10G circuit pack performs the following functions.

#### **Transmission functions**

The OBPA10G circuit pack performs the following transmission functions:

- Optically amplifies one transmit OC-192 signal (1552.52 nanometers).
- Optically pre-amplifies one receive OC-192 signal (1552.52 nanometers)

#### **Control functions**

The OBPA10G circuit pack performs the following timing and control functions:

- Selects the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs
- Selects the working or standby operations network and CTLI-D signals
- Performs internal fault detection and interfaces with the CTL/SYS50DM circuit packs using the operations network
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the circuit pack faceplate FAULT and ACTIVE LEDs



# OC12/STM4 Port Unit

**Purpose of circuit pack**      The OC12/STM4 interface (OC12/STM4) port unit provides an interface between two OC-12/STM-4 signals and two internal transmission signals.

**Supported OC12/STM4 port units**      The following table shows the supported OC12/STM4 port units.

| Name             | Code              | Description                                                             |
|------------------|-------------------|-------------------------------------------------------------------------|
| OC12/STM4/1.3LR2 | LEY13 and LEY13AE | Supports standard 1.3-μm long-reach applications (up to 51 kilometers)  |
| OC12/STM4/1.3SR2 | LEY14 and LEY14AE | Supports standard 1.3-μm short-reach applications (up to 15 kilometers) |

**OC12/STM4 port unit faceplate**      The following figure shows the OC12/STM4 port unit faceplate.



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**Faceplate LEDs** The OC12/STM4 port unit provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                                                                                                                                                |
|--------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a port unit failure is detected or the port unit loses one power feeder.<br><br>Flashes on and off when an incoming OC-12 signal failure from the lightguide cross-connect panel (or equivalent) is detected. |
| ACTIVE | Green | Lighted when the port unit is active/in-service.                                                                                                                                                                                        |

**General description of operation**

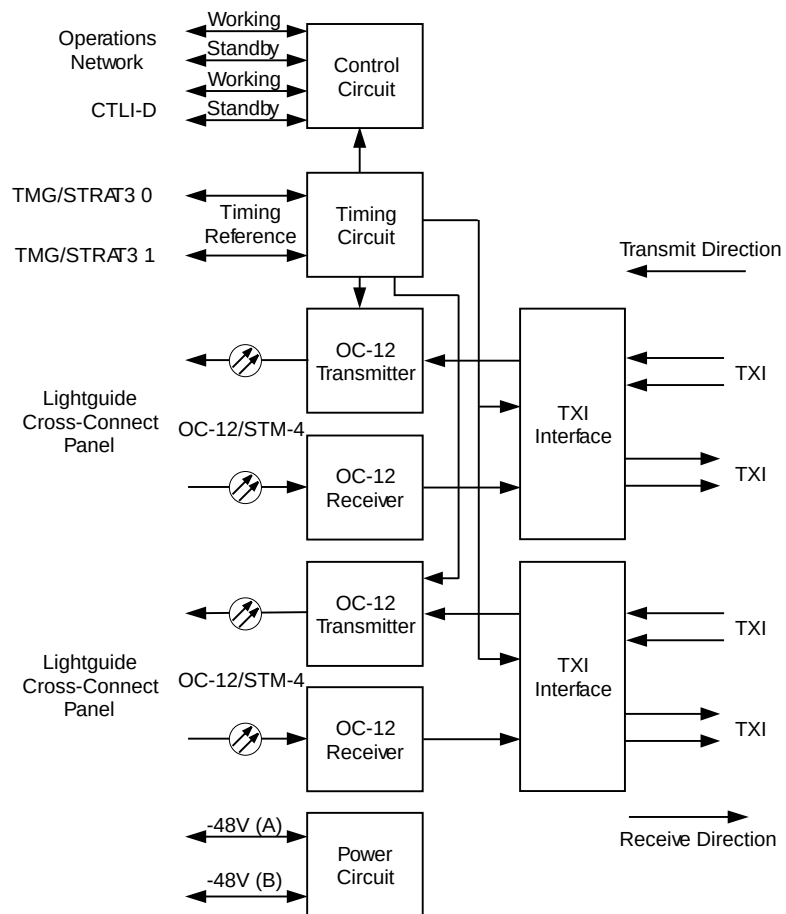
The OC12/STM4 port unit terminates two bidirectional OC-12/STM-4 lines. Each OC-12 signal is converted to an electrical STS-12 signal. The STS-12 signal is demultiplexed into 12 STS-1 signals and converted to a 622.08 Mb/s internal transmission interface (TXI) signal. The TXI signal supports up to 12 multiplexed STS-1 signals. The TXI signal is sent to the shelf 576x576 STS-1/192x192 STM-1 Switch (SWITCH/STS576) circuit packs.

In the transmit direction, the SWITCH/STS576 circuit packs send two working TXI signals to the OC12/STM4 port unit. The OC12/STM4 port unit converts each working 622.08 Mb/s TXI signal into 12 STS-1 signals. The STS-1 signals are multiplexed into an STS-12 signal and converted to an OC-12 signal for transmission. The OC12/STM4 port unit also interfaces with the shelf Control/System 50DM (CTL/SYS50DM) circuit packs.



**Functional block diagram**

The following figures shows a functional block diagram of the OC12/STM4 port unit.



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**Control circuitry**

The processor is a lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the port unit. The processor also manages communication with other circuit packs via the operations network and control interface for devices (CTLI-D) interfaces. For more information about the operations network and CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

The control circuitry also transmits/receives transport overhead bytes to/from the ADJCTL/DCCEI circuit pack via the operations network.

**Memory circuitry** The OC12/STM4 port unit provides the following memory functions.

**Start-up memory**

The start-up memory consists of 256 kilobytes of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to 16 megabytes of dynamic random access memory (DRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the port unit history such as the *CLEI* code and type/version information.

**Transmission circuitry** The OC12/STM4 port unit provides the following transmission functions.

**Receive direction**

In the receive direction, each OC-12 receiver circuit accepts one incoming OC-12 optical signal. The OC-12 optical signal is converted into an STS-12 electrical signal and the line clock and data is recovered. The STS-12 data and clock signals are sent to the TXI interface.

The TXI interface demultiplexes the STS-12 signal into 12 STS-1 signals and processes the transport and path overhead bytes. After the overhead bytes are processed, the STS-1 signals are converted into one TXI signal. The TXI interface circuit retimes the TXI signal, adjusts the pointers, and sends one TXI signal to the SWITCH/STS576 0 circuit pack and one TXI signal to the SWITCH/STS576 1 circuit pack.

**Transmit direction**

In the transmit direction, each TXI interface circuit receives one TXI signal from the SWITCH/STS576 0 circuit pack and one TXI signal from the SWITCH/STS576 1 circuit pack. The TXI interface circuit selects the TXI signal and demultiplexes it into 12 STS-1 signals. The STS-1 signals are multiplexed into one STS-12 signal and transport and path overhead bytes are inserted. The STS-12 signal is then sent to the OC-12 transmitter circuit.

The OC-12 transmitter circuit converts the STS-12 signal into an optical 622.08 Mb/s OC-12 signal for transmission.

**Timing circuitry**

The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**Protection circuitry**

The OC12/STM4 port unit provides the following protection functions.

**Switch fabric protection**

In the receive direction, the OC12/STM4 port unit fans out two TXI signals to the SWITCH/STS576 0 circuit pack and two TXI signals to the SWITCH/STS576 1 circuit pack. In the transmit direction, the OC12/STM4 port unit receives two TXI signals from the SWITCH/STS576 0 circuit pack and two TXI signals from the SWITCH/STS576 1 circuit pack. The OC12/STM4 port unit selects two TXI signals as active and the remaining two TXI signals are standby. If an active TXI signal fails, the OC12/STM4 port unit selects the associated standby TXI signal.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The OC12/STM4 port unit monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Fault detection circuitry** The OC12/STM4 port unit provides the following fault detection functions.

#### **Monitoring and testing**

The control circuit monitors all the activities on the port unit. The OC12/STM4 port unit has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed during a powerup or reset condition, or when initializing new software.

#### **Loopbacks**

In Release 5 and later releases, the OC12/STM4 port unit supports nearside and farside facility loopbacks. Nearside facility loopbacks allow an incoming OC-12 line to be looped back in the port unit to the output of the same line. Farside facility loopbacks allow an outgoing OC-12 line to be looped back in the port unit to the switch fabric and the outgoing line in the opposite direction.

**Power circuitry** The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V and +3.3 V used on the port unit.

The OC12/STM4 port unit monitors the two power sources. If the OC12/STM4 port unit detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the port unit faceplate.

**Quick reference summary** The OC12/STM4 port unit performs the following functions.

#### **Receive functions**

The OC12/STM4 port unit performs the following receive functions:

- Receives two optical 622.08 Mb/s OC-12 signals
- Converts each OC-12 signal to an electrical STS-12 signal
- Extracts and processes the transport and path overhead access bytes
- Converts each STS-12 signal into one 622.08 Mb/s TXI signal
- Sends one TXI signal to the SWITCH/STS576 0 circuit pack and one TXI signal to the SWITCH/STS576 1 circuit pack

**Transmit functions**

The OC12/STM4 port unit performs the following transmit functions:

- Receives four 622.08 Mb/s TXI signals from the SWITCH/STS576 circuit packs and selects two TXI signals
- Processes and inserts the transport and path overhead access bytes
- Converts each 622.08 Mb/s TXI signal to an STS-12 signal
- Converts the STS-12 signal to an optical 622.08 Mb/s OC-12 signal for transmission

**Timing and control functions**

The OC12/STM4 port unit performs the following timing and control functions:

- Selects the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs
- Selects the working or standby operations network and CTLI-D signals
- Performs internal fault detection and interfaces with the CTL/SYS50DM circuit packs using the operations network
- Provides nearside and farside facility loopbacks (Release 5 and later)
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the port unit faceplate FAULT and ACTIVE LEDs



## OC3/STM1 Port Unit

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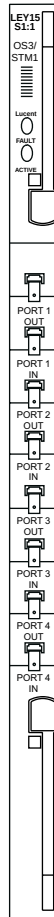
**Purpose of circuit pack** The OC3/STM1 interface (OC3/STM1) port unit provides an interface between external OC-3 signals and internal transmission signals.

**Supported OC3/STM4 port units** The following table shows the supported OC3/STM1 port units.

| Name            | Code                    | Description                                                                                         |
|-----------------|-------------------------|-----------------------------------------------------------------------------------------------------|
| OC3/STM1/1.3LR4 | LEY15<br>and<br>LEY15AE | Supports up to four standard 1.3- $\mu$ m long-reach applications (up to 51 kilometers)             |
| OC3/STM1/1.3SR4 | LEY16<br>and<br>LEY16AE | Supports up to four standard short-reach applications (up to 15 kilometers)                         |
| OC3/STM1/1.3SR8 | LEY23<br>and<br>LEY23AE | Supports up to eight standard short-reach to intermediate-reach applications (15 to 25 kilometers). |

**LEY15, LEY15AE, LEY16,  
and LEY16AE OC3/STM1  
port unit faceplate**

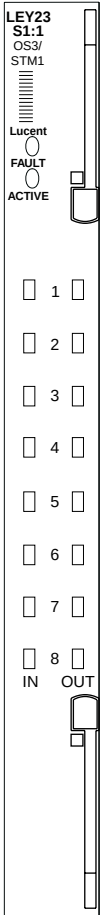
The following figure shows the LEY15, LEY15AE, LEY16, and LEY16AE OC3/STM1 port unit faceplate.



NC-USM-029

**LEY23 and LEY23AE OC3/STM1 port unit faceplate**

The following figure shows the LEY23 and LEY23AE OC3/STM1 port unit faceplate.



NC-USM-280

**Faceplate LEDs**

The OC3/STM1 port unit provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                                                                                                                                               |
|--------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a port unit failure is detected or the port unit loses one power feeder.<br><br>Flashes on and off when an incoming OC-3 signal failure from the lightguide cross-connect panel (or equivalent) is detected. |
| ACTIVE | Green | Lighted when the port unit is active/in-service.                                                                                                                                                                                       |



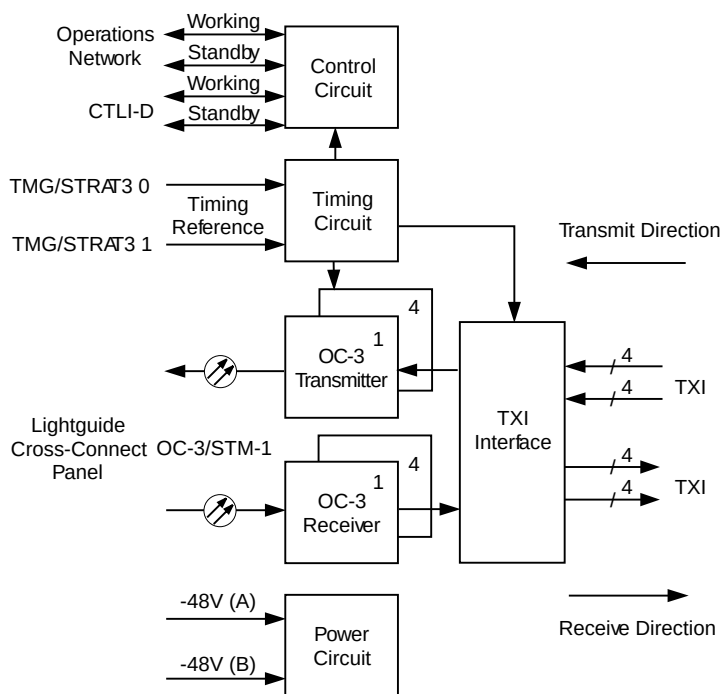
### General description of operation

The LEY15, LEY15AE, LEY16, and LEY16AE OC3/STM1 port units terminate up to four bidirectional OC-3 lines. The LEY23 and LEY23AE OC3/STM1 port units terminate up to eight bidirectional OC-3 signals. Each OC-3 signal is converted to an electrical STS-3 signal. The STS-3 signals are demultiplexed into STS-1 signals and converted to a 622.08 Mb/s internal transmission interface (TXI) signals. Each TXI signal supports up to 12 multiplexed STS-1 signals. The TXI signals are sent to the shelf 576x576 STS-1/192x192 STM-1 Switch (SWITCH/STS576) circuit packs.

In the transmit direction, the SWITCH/STS576 circuit packs send TXI signals to the OC3/STM1 port unit. The OC3/STM1 port unit converts the working 622.08 Mb/s TXI signals into STS-1 signals. The STS-1 signals are multiplexed into STS-3 signals and converted to OC-3 signals for transmission. The OC3/STM1 port unit also interfaces with the shelf Control/System 50DM (CTL/SYS50DM) circuit packs.

### LEY15, LEY15AE, LEY16, and LEY16AE OC3/STM1 port unit functional block diagram

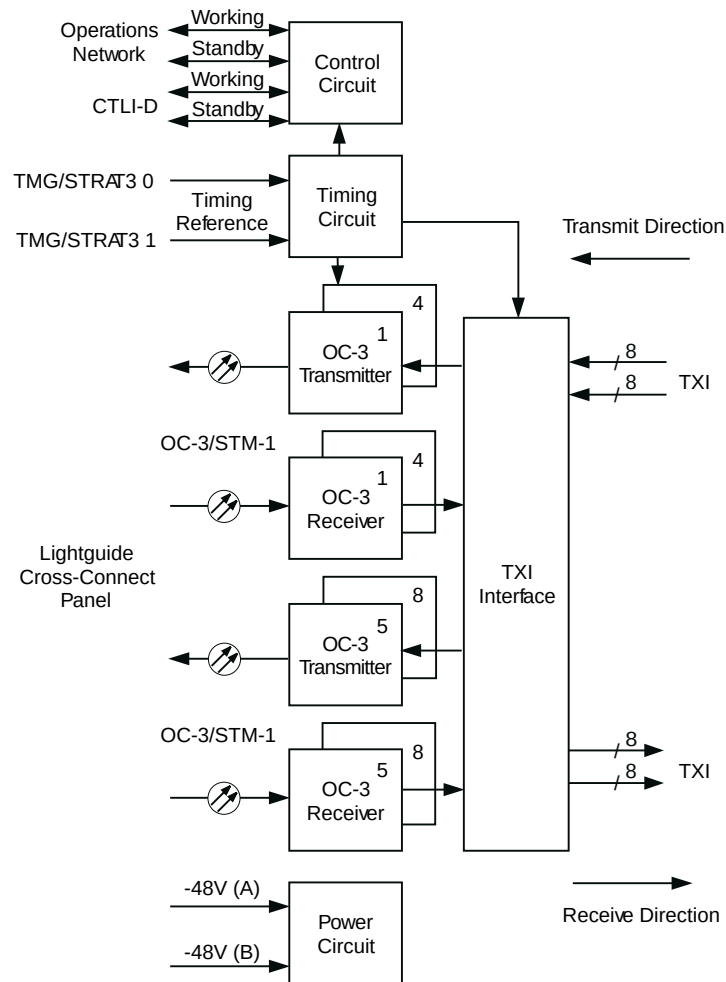
The following figure shows a functional block diagram of the LEY15, LEY15AE, LEY16, and LEY16AE OC3/STM1 port unit.



NC-USM-048

### LEY23 and LEY23AE OC3/STM1 port unit functional block diagram

The following figure shows a functional block diagram of the LEY23 and LEY23AE OC3/STM1 port unit.



NC-USM-281

#### Control circuitry

The processor is the lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the port unit. The processor also manages communication with other circuit packs via the operations network and the control interface for devices (CTLI-D) interfaces. For more information about the operations network and CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

The control circuitry also transmits/receives transport overhead bytes to/from the ADJCTL/DCCEI circuit pack via the operations network.

**Memory circuitry** The OC3/STM1 port unit provides the following memory functions.

#### **Start-up memory**

The start-up memory consists of 256 kilobytes of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

#### **Operating memory**

The operating memory consists of up to four megabytes of dynamic random access memory (DRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

#### **Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the port unit history such as the *CLEI* code and type/version information.

#### **Transmission circuitry (LEY15, LEY15AE, LEY16, and LEY16AE OC3/STM1 port units)**

The LEY15, LEY15AE, LEY16, and LEY16AE OC3/STM1 port units provide the following transmission functions.

#### **Receive direction**

In the receive direction, each OC-3/STM-1 receiver circuit accepts one incoming OC-3 optical signal. The OC-3 optical signals are converted into STS-3 electrical signals and the line clock and data is recovered. The STS-3 data and clock signals are sent to the TXI interface.

The TXI interface demultiplexes the 4 STS-3 signals into 12 STS-1 signals and processes the transport and path overhead bytes. After the overhead bytes are processed, the STS-1 signals are converted into one TXI signal. The TXI interface circuit retimes the TXI signal, adjusts the pointers, and sends one TXI signal to the SWITCH/STS576 0 circuit pack and one TXI signal to the SWITCH/STS576 1 circuit pack.

**Transmit direction**

In the transmit direction, the TXI interface circuit receives one TXI signal from the SWITCH/STS576 0 circuit pack and one TXI signal from the SWITCH/STS576 1 circuit pack. The TXI interface circuit selects the TXI signal and demultiplexes it into 12 STS-1 signals. The STS-1 signals are multiplexed into four STS-3 signals and transport and path overhead bytes are inserted. The STS-3 signals are then sent to the OC-3 transmitter circuits.

Each OC-3/STM-1 transmitter circuit converts the STS-3 signal into an optical 155.55 Mb/s OC-3/STM-1 signal for transmission.

**Transmission circuitry  
(LEY23 and LEY23AE OC3/  
STM1 port units)**

The LEY23 and LEY23AE OC3/STM1 port units provide the following transmission functions.

**Receive direction**

In the receive direction, each OC-3/STM-1 receiver circuit accepts one incoming OC-3 optical signal. The OC-3 optical signals are converted into STS-3 electrical signals and the line clock and data is recovered. The STS-3 data and clock signals are sent to the TXI interface.

The TXI interface demultiplexes the 8 STS-3 signals into 24 STS-1 signals and processes the transport and path overhead bytes. After the overhead bytes are processed, the STS-1 signals are converted into 8 TXI signals. The TXI interface circuit retimes the TXI signals, adjusts the pointers, and sends the 8 TXI signals to the SWITCH/STS576 0 circuit pack and 8 TXI signals to the SWITCH/STS576 1 circuit pack.

**Transmit direction**

In the transmit direction, the TXI interface circuit receives 8 TXI signals from the SWITCH/STS576 0 circuit pack and 8 TXI signals from the SWITCH/STS576 1 circuit pack. The TXI interface circuit selects the TXI signals and demultiplexes them into 24 STS-1 signals. The STS-1 signals are multiplexed into 8 STS-3 signals and transport and path overhead bytes are inserted. The STS-3 signals are then sent to the OC-3 transmitter circuits.

Each OC-3/STM-1 transmitter circuit converts the STS-3 signal into an optical 155.55 Mb/s OC-3/STM-1 signal for transmission.

**Timing circuitry** The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**Protection circuitry** The OC3/STM1 port unit provides the following protection functions.

**Switch fabric protection**

In the receive direction, the OC3/STM1 port unit fans out TXI signals to the SWITCH/STS576 0 and SWITCH/STS576 1 circuit packs. In the transmit direction, the OC3/STM1 port unit receives TXI signals from the SWITCH/STS576 0 and SWITCH/STS576 1 circuit packs. The OC3/STM1 port unit selects the active TXI signals and the other TXI signals are standby. If an active TXI signal fails, the OC3/STM1 port unit selects the standby TXI signal.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The OC3/STM1 port unit monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Fault detection circuitry** The OC3/STM1 port units provide the following fault detection functions.

**Monitoring and Testing**

The control circuit monitors all the activities on the port unit. The OC3/STM1 port unit has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed during a powerup or reset condition, or when initializing new software.

**Loopbacks**

In Release 5 and later releases, the OC3/STM1 port unit supports nearside and farside facility loopbacks. Nearside facility loopbacks allow an incoming OC-3 line to be looped back in the port unit to the output of the same line. Farside facility loopbacks allow an outgoing OC-3 line to be looped back in the port unit to the switch fabric and the outgoing line in the opposite direction.

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V and +3.3 V used on the port unit.

The OC3/STM1 port unit monitors the two power sources. If the OC3/STM1 port unit detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the port unit faceplate.

**Quick reference summary**

The OC3/STM1 port units perform the following functions.

**Receive functions**

The OC3/STM1 port unit performs the following receive functions:

- Receives optical 155.55 Mb/s OC-3 signals
- Converts each OC-3 signal to an electrical STS-3 signal
- Extracts and processes the transport and path overhead access bytes
- Converts the STS-3 signals into 622.08 Mb/s TXI signals
- Sends TXI signals to the SWITCH/STS576 0 and SWITCH/STS576 1 circuit packs

**Transmit functions**

The OC3/STM1 port unit performs the following transmit functions:

- Receives 622.08 Mb/s TXI signals from the SWITCH/STS576 circuit packs and selects the working TXI signals
- Processes and inserts the transport and path overhead access bytes
- Converts the 622.08 Mb/s TXI signals into STS-3 signals
- Converts each STS-3 signal to an optical 155.55 Mb/s OC-3 signal for transmission

**Timing and control functions**

The OC3/STM1 port unit performs the following timing and control functions:

- Selects the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs
- Selects the working or standby TXI signal from the SWITCH/STS576 circuit packs
- Selects the working or standby operations network and CTLI-D signals
- Performs internal fault detection and interfaces with the CTL/SYS50DM circuit packs using the operations network
- Provides nearside and farside facility loopbacks (Release 5 and later)
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the port unit faceplate FAULT and ACTIVE LEDs



## OC48/STM16 Port Unit

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**Purpose of circuit pack** The OC48/STM16 interface (OC48/STM16) port unit provides an interface between an OC-48/STM-16 signal and four internal transmission signals.

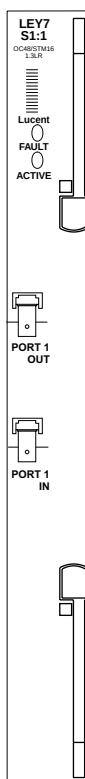
**Supported OC48/STM16 port units** The following table shows the supported OC48/STM16 port units.

| Name               | Code                                    | Description                                                                                                                   |
|--------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| OC48/STM16/1.3LR1  | LEY7 and LEY7AE                         | Supports 1.3- $\mu$ m long-reach applications                                                                                 |
| OC48/STM16/1.5LR1  | LEY8 and LEY8AE                         | Supports 1.5- $\mu$ m long-reach applications                                                                                 |
| OC48/STM16/DWDM    | LEY50 - LEY65 and LEY50AE - LEY65AE     | Supports 16 wavelengths in applications with <i>Metropolis</i> metroEON dense wavelength division multiplexing (DWDM) systems |
| OC48/STM16/POU     | LEY80 - LEY95 and LEY80AE - LEY95AE     | Supports 16 wavelengths in passive optical applications with DWDM systems                                                     |
| OC48/STM16/WDM     | LEY101 - LEY180 and LEY101AE - LEY180AE | Supports 80 wavelengths in applications with WaveStar 1.6T DWDM systems                                                       |
| OC48/STM16/1.3VSR1 | LEY182 and LEY182AE                     | Supports 1.3- $\mu$ m short reach applications of 1 to 2 kilometers.                                                          |



### OC48/STM16 port unit faceplate

The following figure shows the OC48/STM16 port unit faceplate.



NC-USM-028

### Faceplate LEDs

The OC48/STM16 port unit provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                                                                                                                                            |
|--------|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a port unit failure is detected or the port unit loses one power feeder.<br>Flashes on and off when an incoming OC-48 signal failure from the lightguide cross-connect panel (or equivalent) is detected. |
| ACTIVE | Green | Lighted when the port unit is active/in-service.                                                                                                                                                                                    |

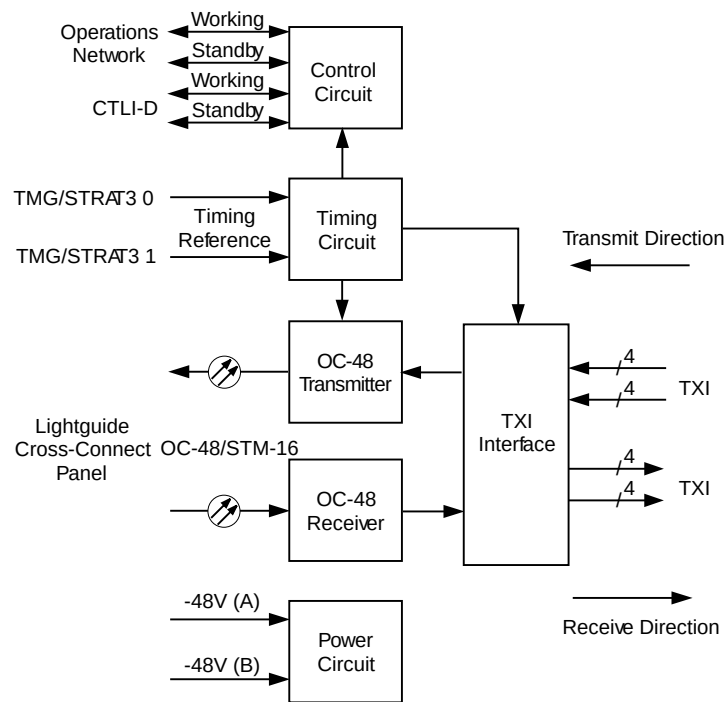
### General description of operation

The OC48/STM16 port unit terminates one bidirectional OC-48 line. The OC-48 signal is converted to an electrical STS-48 signal. The STS-48 signal is demultiplexed into four 622.08 Mb/s internal transmission interface (TXI) signals. Each TXI signal supports up to 12 multiplexed STS-1 signals. The TXI signals are sent to the shelf 576x576 STS-1 Switch (SWITCH/STS576) circuit packs.

In the opposite direction, the SWITCH/STS576 circuit packs send eight TXI signals to the OC48/STM16 port unit. The OC48/STM16 port unit selects and converts four 622.08 Mb/s TXI signal into one STS-48 signal. The STS-48 signal is converted to an OC-48 signal for transmission. The OC48/STM16 port unit also interfaces with the shelf Control/System 50DM (CTL/SYS50DM) circuit pack.

### Functional block diagram

The following figure shows a functional block diagram of the OC48/STM16 port unit.



NC-USM-049

## Control circuitry

The processor is the lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the port unit. The processor also manages communication with other circuit packs via the operations network and control interface for devices (CTLI-D) interfaces. For more information about the operations network and CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

The control circuitry also transmits/receives transport overhead bytes to/from the ADJCTL/DCCEI circuit pack via the operations network.

**Memory circuitry** The OC48/STM16 port unit provides the following memory functions.

**Start-up memory**

The start-up memory consists of one megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to four megabytes of dynamic random access memory (DRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the port unit history such as the *CLEI* code and type/version information.

**Transmission circuitry** The OC48/STM16 port unit provides the following transmission functions.

**Receive direction**

In the receive direction, the OC-48 receiver circuit accepts one incoming OC-48 optical signal. The OC-48 optical signal is converted into an STS-48 electrical signal and the line clock and data is recovered. The STS-48 signal is demultiplexed and sent to the overhead byte processor. After the overhead bytes are processed, the STS-48 signal is converted into four TXI signals and sent to the TXI interface circuit. The TXI interface circuit retimes the TXI signals, adjusts the pointers, and sends four TXI signals to the SWITCH/STS576 0 circuit pack and four TXI signals to the SWITCH/STS576 1 circuit pack.

**Transmit direction**

In the transmit direction, the TXI interface circuit receives four TXI signals from the SWITCH/STS576 0 circuit pack and four TXI signals from the SWITCH/STS576 1 circuit pack. The TXI interface circuit selects four TXI signals and sends them to the OC-48 transmitter circuit. The OC-48 transmitter circuit sends the four TXI signals to the overhead byte processor. The four TXI signals are converted into an STS-48 signal and the overhead bytes are inserted. The STS-48 signal is converted into an optical 2.488 Gb/s OC-48 signal for transmission. The LEY50 - LEY65 and LEY 80 -LEY95 OC48/STM16 port units modulate a tone signal for use with wavelength division multiplexing systems.

**Timing circuitry**

The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**Protection circuitry**

The OC48/STM16 port unit provides the following protection functions.

**Switch fabric protection**

In the receive direction, the OC48/STM16 port unit fans out four TXI signals to the SWITCH/STS576 0 circuit pack and four TXI signals to the SWITCH/STS576 1 circuit pack. In the transmit direction, the OC48/STM16 port unit receives four TXI signals from the SWITCH/STS576 0 circuit pack and four TXI signals from the SWITCH/STS576 1 circuit pack. The OC48/STM16 selects the one group of four TXI signals as active and the other group as standby. If the active group fails, the OC48/STM16 port unit selects the standby group of TXI signals.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The OC48/STM16 port unit monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Fault detection circuitry**

The OC48/STM16 port unit provides the following fault detection functions.

**Monitoring and Testing**

The control circuit monitors all the activities on the port unit. The OC48/STM16 port unit has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed during a powerup or reset condition, or when initializing new software.

**Loopbacks**

In Release 5 and later releases, the OC48/STM16 port unit supports nearside and farside facility loopbacks. Nearside facility loopbacks allow an incoming OC-48 line to be looped back in the port unit to the output of the same line. Farside facility loopbacks allow an outgoing OC-48 line to be looped back in the port unit to the switch fabric and the outgoing line in the opposite direction.

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V, +3.3 V, –3.3 V, and –5.2 V used on the port unit.

The OC48/STM16 port unit monitors the two power sources. If the OC48/STM16 port unit detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the port unit faceplate.

**Quick reference summary**

The OC48/STM16 port unit performs the following functions.

**Receive functions**

The OC48/STM16 port unit performs the following receive functions:

- Receives one optical 2.448 Mb/s OC-48 signal
- Converts the OC-48 signal to an electrical STS-48 signal
- Extracts and processes the overhead access bytes
- Demultiplexes the STS-48 signal into four 622.08 Mb/s TXI signals
- Sends four TXI signals to SWITCH/STS576 0 circuit pack and four TXI signals to SWITCH/STS576 1 circuit pack

**Transmit functions**

The OC48/STM16 port unit performs the following transmit functions:

- Receives eight 622.08 Mb/s TXI signals from the SWITCH/ STS576 circuit packs and selects four TXI signals
- Processes and inserts overhead access bytes
- Multiplexes four 622.08 Mb/s TXI signals to an STS-48 signal
- Converts the electrical STS-48 signal to an optical 2.448 Mb/s OC-48 signal for transmission

**Timing and control functions**

The OC48/STM16 port unit performs the following timing and control functions:

- Selects the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs
- Selects the working or standby TXI signals from the SWITCH/ STS576 circuit packs
- Provides a 25.92-MHz reference signal to TMG/STRAT3 circuit packs
- Selects the working or standby operations network and CTLI-D signals
- Performs internal fault detection and interfaces with the CTL/ SYS50DM circuit packs using the operations network
- Provides nearside and farside facility loopbacks (Release 5 and later)
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the port unit faceplate FAULT and ACTIVE LEDs



## OC192/STM64 Port Unit

---

### Purpose of circuit pack

The OC192/STM64 (OC192/STM64) port unit provides an interface between an OC-192 signal and sixteen internal transmission signals. The capacity of the OC192/STM64 port unit is 192 STS-1 equivalent signals or 129,024 2-way voice circuits per fiber.

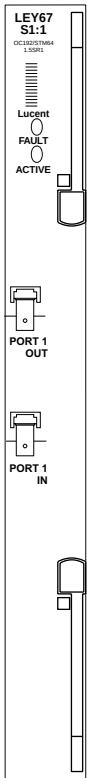
### Supported OC192/STM64 port units

The following table shows the supported OC192/STM64 port units.

| Name                | Code                                    | Description                                                                                                           |
|---------------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| OC192/STM64/1.5SR1  | LEY67 and LEY67AE                       | Supports 1.5- $\mu$ m intermediate reach applications and multibit forward error correction                           |
| OC192/STM64/1.5IR1  | LEY69 and LEY69AE                       | Supports 1.5- $\mu$ m intermediate reach applications and multibit forward error correction                           |
| OC192/STM64/1.5IRS1 | LEY97 and LEY97AE                       | Supports applications with optical amplifiers, multibit forward error correction, and strong forward error correction |
| OC192/STM64/WDM     | LEY201 - LEY240 and LEY201AE - LEY240AE | Supports 40 wavelengths in applications with WaveStar 1.6T dense wavelength division multiplexing (DWDM) systems      |
| OC192/STM64/POU     | LEY284 - LEY299 and LEY284AE - LEY299AE | Supports 16 wavelengths in passive optical applications with dense wavelength division multiplexing (DWDM) systems    |
| OC192/STM64/POU     | LEY384AE- LEY399AE                      | Supports an additional 16 wavelengths in passive optical applications with DWDM systems.                              |

**OC192/STM64 port unit faceplate**

The following figure shows the OC192/STM64 port unit faceplate.



NC-USM-193

**Faceplate LEDs**

The OC192/STM64 port unit provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                                                                                                                                             |
|--------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a port unit failure is detected or the port unit loses one power feeder.<br>Flashes on and off when an incoming OC-192 signal failure from the lightguide cross-connect panel (or equivalent) is detected. |
| ACTIVE | Green | Lighted when the port unit is active/in-service.                                                                                                                                                                                     |

**General description of operation**

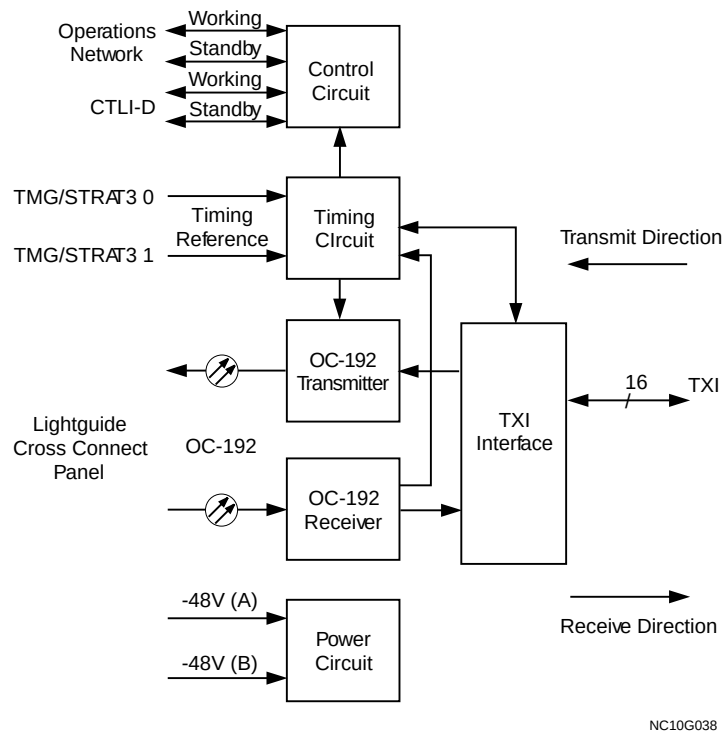
The OC192/STM64 port unit terminates one bidirectional OC-192 line. The OC-192 optical signal is converted to an electrical STS-192 signal. The STS-192 signal is demultiplexed into 16 STS-12 signals and each is converted to a 622.08 Mb/s internal transmission interface (TXI) signal. Each TXI signal supports up to 12 multiplexed STS-1 signals. The TXI signals are sent to the STS192 Pointer Processor (PPROC/ STS192) circuit pack.



In the transmit direction, the PPROC/STS192 circuit pack sends 16 working TXI signals to the OC192/STM64 port unit. The OC192/STM64 port unit converts each working 622.08 Mb/s TXI signal into 16 STS-12 signals. The STS-12 signals are multiplexed into one electrical STS-192 signal and converted to an OC-192 optical signal for transmission. The OC192/STM64 port unit also interfaces with the shelf Control/ System 50DM (CTL/SYS50DM) circuit pack.

### Functional block diagram

The following figure shows a functional block diagram of the OC192/STM64 port unit.



## Control circuitry

The processor is the lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the circuit pack. The processor also manages communication with other circuit packs via the operations network and control interface for devices (CTLI-D) interfaces. For more information about the operations network and CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

The control circuitry also transmits/receives transport overhead bytes to/from the ADJCTL/DCCEI circuit pack via the operations network.

**Memory circuitry** The OC192/STM64 port unit provides the following memory functions.

**Start-up memory**

The start-up memory consists of one megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the CTL/SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to four megabytes of dynamic random access memory (DRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the port unit history such as the *CLEI* code and type/version information.

**Transmission circuitry** The OC192/STM64 port unit provides the following transmission functions.

**Receive direction**

In the receive direction, each OC-192 receiver circuit accepts one incoming OC-192 optical signal. The 9.953 Gb/s optical signal is converted into one 9.953 Gb/s electrical STS-192 signal and the line clock and data are recovered. Multibit and strong forward error correction decoding (provisionable) is also performed. The TXI interface demultiplexes the STS-192 signal into 16 STS-12 signals and processes the transport overhead bytes. After the overhead bytes are processed, the 16 STS-12 signals are converted into TXI signals. The TXI interface circuit retimes the TXI signals, adjusts the pointers, and sends 16 TXI signals to the PPROC/STS192 circuit pack.

**Transmit direction**

In the transmit direction, the TXI interface circuit receives 16 TXI signals from the PPROC/STS192 circuit pack. The TXI interface circuit selects each working TXI signal and converts it into 16 STS-12 signals. The STS-12 signals are multiplexed into one 9.953 Gb/s STS-192 electrical signal and transport overhead bytes are inserted. Multibit and strong forward error correction encoding (provisionable) is also performed. The STS-192 signal is then sent to the OC-192 transmitter circuit. The OC-192 transmitter circuit converts the STS-192 electrical signal into an optical 9.953 Gb/s OC-192 signal for transmission. The LEY201 - LEY 240, LEY284 - LEY299, and LEY384AE - LEY399AE OC192/STM64 port units modulate a tone signal for use with dense wavelength division multiplexing systems.

**Timing circuitry**

The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**Protection circuitry**

The OC192/STM64 port unit provides the following protection functions.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The OC192/STM64 port unit monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Fault detection circuitry**

The control circuit monitors all the activities on the port unit. The OC192/STM64 port unit has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed during a powerup or reset condition, or when initializing new software.

**Power circuitry** The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V, +3.3 V, –3.3 V, –5.2 V, –8 V, and –10 V used on the circuit pack.

The OC192/STM64 port unit monitors the two power sources. If the OC192/STM64 port unit detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the circuit pack faceplate.

**Quick reference summary** The OC192/STM64 port unit performs the following functions.

#### **Receive functions**

The OC192/STM64 port unit performs the following receive functions:

- Receives one optical 9.953 Gb/s OC-192 signal
- Converts each OC-192 signal to one 9.953 Gb/s electrical STS-192 signal
- Extracts and processes the transport overhead access bytes
- Converts each STS-192 signal into sixteen 622.08 Mb/s TXI signals
- Sends 16 TXI signals to the PPROC/STS192 circuit pack

#### **Transmit functions**

The OC192/STM64 port unit performs the following transmit functions:

- Receives 16 622.08 Mb/s TXI signals from the PPROC/STS192 circuit pack
- Processes and inserts the transport overhead access bytes
- Converts the sixteen 622.08 Mb/s TXI signals to one 9.953 Gb/s electrical STS-192 signal
- Converts the STS-192 signal to an optical 9.953 Gb/s OC-192 signal for transmission

**Timing and control functions**

The OC192/STM64 port unit performs the following timing and control functions:

- Selects the working or standby timing reference signal from the shelf TMG/ STRAT3 circuit packs
- Selects the working or standby operations network and CTLI-D signals
- Performs internal fault detection and interfaces with the CTL/ SYS50DM circuit packs using the operations network
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the port unit faceplate FAULT and ACTIVE LEDs



## PPROC/STS192 Circuit Pack

---

**Purpose of circuit pack**

The STS-192 Pointer Processor (PPROC/STS192) circuit pack performs the following functions:

- Pointer processing and path monitoring for the 192 incoming STS-1 signals
- Frame delay management between SWITCH/STS576 circuit packs on the High Speed Shelf and the Low Speed Shelf in systems equipped with a 576x576 STS-1 switch fabrics

**PPROC/STS192 circuit pack faceplate**

The following figure shows the PPROC/STS192 circuit pack faceplate.



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**Faceplate LEDs**

The PPROC/STS192 circuit pack provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                                                                                                                                                                       |
|--------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a circuit pack failure is detected, the circuit pack loses one power feeder, or the on-board power converter fails.<br><br>Flashes on and off when an incoming signal failure, loss of timing signal, or a memory fault is detected. |
| ACTIVE | Green | Lighted when the circuit pack is active/in-service.                                                                                                                                                                                                            |

The FAULT and ACTIVE LEDs are controlled by the Control/System 50DM (CTL/SYS50DM) circuit packs.

**General description of operation**

The PPROC/STS192 circuit pack performs the following functions.

**Port unit function**

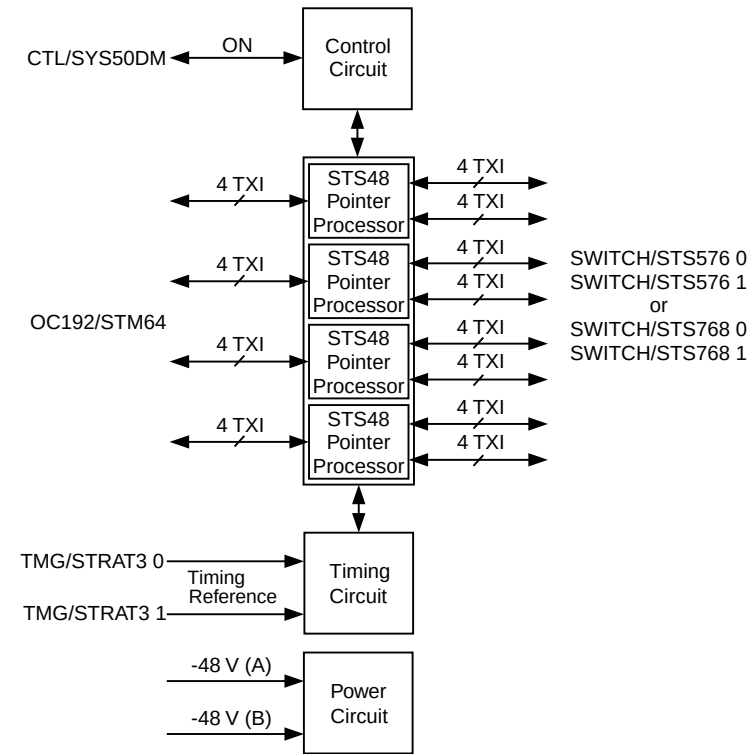
The port unit function provides pointer processing and path monitoring on an equivalent of 192 STS-1 signals and delivers system synchronized and frame aligned data to the SWITCH/STS576 or SWITCH/STS768 circuit pack. There are four bidirectional transmission devices on PPROC/STS192 circuit pack. Each bidirectional transmission device supports 48 STS-1 signals. One PPROC/STS192 circuit pack supports the east OC192/STM64 port unit, and one PPROC/STS192 circuit pack supports the west OC192/STM64 port unit.

**Switch function**

The switch function provides delay management between the SWITCH/STS576 circuit packs in the high speed and low speed shelves. This is required because different STS-1 signals within the network element take two paths of unequal delay through the network element. The PPROC/STS192 circuit pack adjusts the frame positions of the SWITCH/STS576 circuit pack outputs in the Low Speed Shelf to match the frame positions at the inputs of the SWITCH/STS576 circuit pack in the High Speed Shelf. Two PPROC/STS192 circuit packs are required to support to the redundant SWITCH/STS576 circuit packs.

Functional block diagram  
(port unit function)

The following figure shows a functional block diagram of the PPROC/ STS192 circuit pack port unit function.

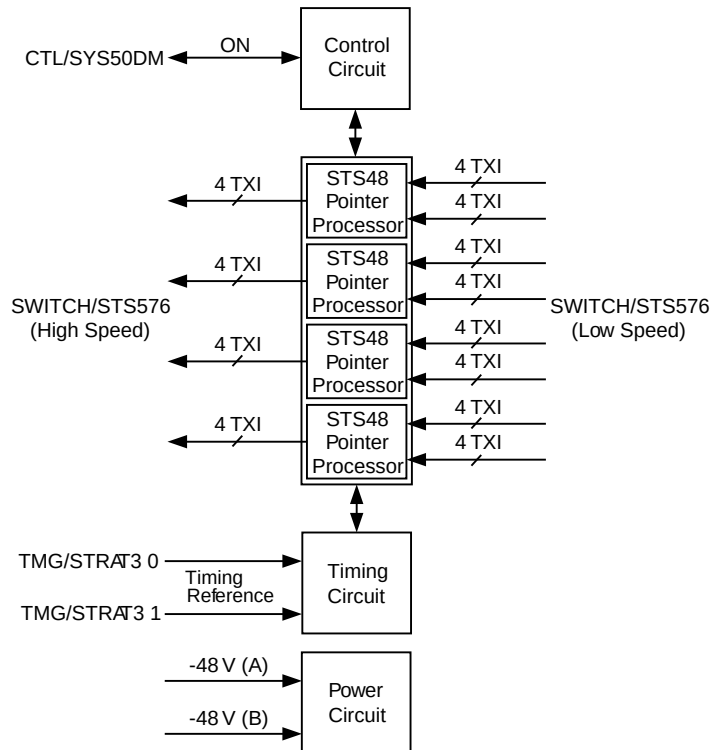


NC-USM-196



### Functional block diagram (switch function)

The following figure shows a functional block diagram of the PPROC/STS192 circuit pack switch function.



NC-USM-197

### Control circuitry

The processor is the lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the circuit pack. The processor also manages communication with other circuit packs via the operations network (ON) and control interface for devices (CTLI-D) interfaces. For more information about the operations network and CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

### Memory circuitry

The PPROC/STS192 circuit pack provides the following memory functions.

#### Start-up memory

The start-up memory consists of one megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to eight megabytes of dynamic random access memory (DRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the port unit history such as the *CLEI* code and type/version information.

**Transmission circuitry**

The PPROC/STS192 circuit pack provides the following transmission functions.

**Port unit function**

In the receive direction, the PPROC/STS192 circuit pack accepts 16 TXI signals (192 STS-1 equivalent signals), a 155.52-MHz clock and a 8-KHz frame timing signal from the associated OC192/STM64 port unit. Each STS48 pointer processor accepts four TXI signals. After passing through the STS48 pointer processor, the data is reformatted into TXI signals and transmitted to the SWITCH/STS576 0 and SWITCH/STS576 1 or the SWITCH/STS768 0 and SWITCH/STS768 1 circuit packs.

In the transmit direction, the PPROC/STS192 circuit pack receives 16 TXI signals from each SWITCH/STS576 or SWITCH/STS768 circuit pack and selects one set of TXI signals. The selected TXI signals are passed through to the associated OC192/STM64 port unit. There is no pointer processing performed in the transmit direction.

**Switch function**

The PPROC/STS192 circuit pack supports up to 16 TXI signals (192 STS-1 equivalent signals) between the SWITCH/STS576 circuit packs on the High Speed and Low Speed Shelves. On the receive side the PPROC/STS192 circuit pack receives 2 sets of 16 TXI signals from the SWITCH/STS576 circuit packs on the Low Speed Shelves and selects one set. The selected TXI signals are routed back to the PPROC/STS192 circuit pack through backplane traces to the STS48 pointer processor. The TXI signals are processed on an STS-1 basis for frame position adjustment for switching through a static pointer offset. The STS-1 signals are multiplexed to 16 TXI signals and sent to the associated SWITCH/STS576 circuit pack on the High Speed Shelf.

**Timing circuitry**

The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**Protection circuitry**

The PPROC/STS192 circuit pack provides the following protection functions.

**Switch fabric protection**

In the receive direction, the PPROC/STS192 circuit pack port function fans out 16 TXI signals to the Side 0 switch circuit pack and 16 TXI signals to the Side 1 circuit pack. In the transmit direction, the PPROC/STS192 circuit pack port function receives 16 TXI signals from the Side 0 switch circuit pack and 16 TXI signals from the Side 1 switch circuit pack. The PPROC/STS192 circuit pack port function selects 16 TXI signals as active and the remaining 16 TXI signals are standby. If the active switch circuit pack fails, the PPROC/STS192 circuit pack port function selects the 16 TXI signals from the standby switch circuit pack.

### Timing reference signal protection

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The PPROC/STS192 circuit pack monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

### Fault detection circuitry

The control circuit monitors all the activities on the circuit pack. The PPROC/STS192 circuit pack has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed during a powerup or reset condition, or when initializing new software.

### Power circuitry

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. A modular DC-to-DC converter produces +5 V and +3.3 V used on the circuit pack.

The PPROC/STS192 circuit pack monitors the two –48 V power sources. If the PPROC/STS192 circuit pack detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the circuit pack faceplate.

### Quick reference summary

The PPROC/STS192 circuit pack performs the following functions.

#### Port unit receive functions

The PPROC/STS192 circuit pack performs the following receive functions:

- Receives 16 622.08 Mb/s TXI signals from the associated OC192/STM64 port unit
- Performs pointer processing and synchronization to the system clock
- Monitors the path overhead
- Extracts and processes the TXI overhead bytes
- Fans out two sets of 16 TXI signals to the Side 0 switch circuit packs and two sets of 16 TXI signals to the Side 1 switch circuit packs

**Port unit transmit functions**

The PPROC/FO circuit pack performs the following receive functions:

- Selects 16 622.08 Mb/s TXI signals from the Side 0 switch circuit pack and 16 TXI signals from the Side 1 switch circuit pack
- Sends 16 TXI signals to the associated OC192/STM64 port unit

**Switch functions**

The PPROC/STS192 circuit pack performs the following switch functions:

- Receives 32 622.08 Mb/s TXI signals from the associated SWITCH/STS576 circuit packs on the Low Speed Shelves and selects 16 TXI signals
- Adjusts the frame positions of the selected 16 TXI signals (static pointer offset)
- Sends the 16 TXI signals to the associated SWITCH/STS576 circuit pack on the High Speed Shelf

**Timing and control functions**

The PPROC/STS192 circuit pack performs the following timing and control functions:

- Selects the working or standby timing reference signal from the shelf TMG/ STRAT3 circuit packs
- Selects the working or standby TXI signals from the SWITCH/ STS768 circuit packs on the High Speed Shelf (port unit function only)
- Performs internal fault detection and interfaces with the CTL/ SYS50DM circuit pack using the operations network
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the port unit faceplate FAULT and ACTIVE LEDs



## PPROC/STS384 Circuit Pack

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**Purpose of circuit pack** The STS-384 Pointer Processor (PPROC/STS384) circuit pack performs frame delay management between SWITCH/STS768 circuit packs on the High Speed Shelf and the SWITCH/STS576 circuit packs on up to four Low Speed Shelves.

**PPROC/STS384 circuit pack faceplate** The following figure shows the PPROC/STS384 circuit pack faceplate.



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**Faceplate LEDs**

The PPROC/STS384 circuit pack provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                                                                                                                                                                       |
|--------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a circuit pack failure is detected, the circuit pack loses one power feeder, or the on-board power converter fails.<br><br>Flashes on and off when an incoming signal failure, loss of timing signal, or a memory fault is detected. |
| ACTIVE | Green | Lighted when the circuit pack is active/in-service.                                                                                                                                                                                                            |

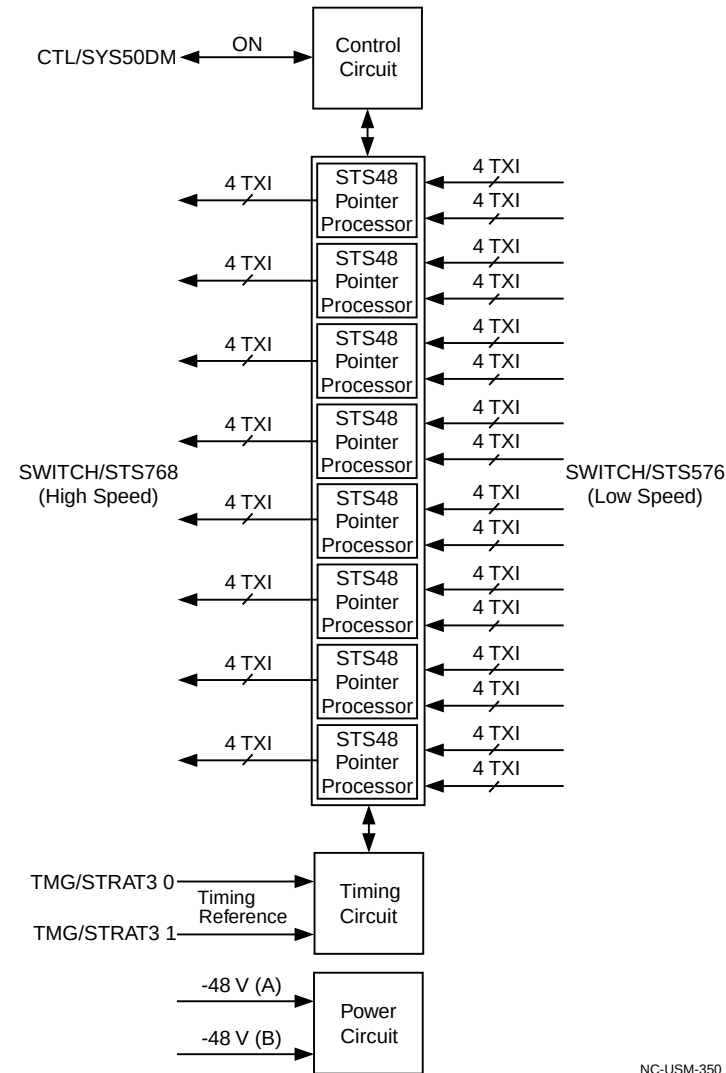
The FAULT and ACTIVE LEDs are controlled by the Control/System 50DM (CTL/SYS50DM) circuit packs.

**General description of operation**

The PPROC/STS384 circuit pack provides delay management between the SWITCH/STS768 circuit packs in the high speed shelf and the SWITCH/STS576 circuit packs in up to four low speed shelves. This is required because different STS-1 signals within the network element take two paths of unequal delay through the network element. The PPROC/STS384 circuit pack adjusts the frame positions of the SWITCH/STS576 circuit pack outputs in the Low Speed Shelf to match the frame positions at the inputs of the SWITCH/STS768 circuit pack in the High Speed Shelf. Two PPROC/STS384 circuit packs are required to support to the redundant SWITCH/STS576 and SWITCH/STS768 circuit packs.

Functional block diagram

The following figure shows a functional block diagram of the PPROC/ STS384 circuit pack.



NC-USM-350

Control circuitry

The processor is the lowest level processor in the system control hierarchy. The processor controls and monitors the operation of the circuit pack. The processor also manages communication with other circuit packs via the operations network (ON) and control interface for devices (CTLI-D) interfaces. For more information about the operations network and CTLI-D, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.



**Memory circuitry**

The PPROC/STS384 circuit pack provides the following memory functions.

**Start-up memory**

The start-up memory consists of one megabyte of flash electrically-erasable programmable read-only memory (flash EEPROM). The start-up memory contains the program that allows the processor to load the executable code and data from the SYS50DM circuit pack into the operating memory. The program allows the processor to start up operation during a powerup or reset condition, or when initializing new software.

**Operating memory**

The operating memory consists of up to eight megabytes of dynamic random access memory (DRAM). The operating memory is used to store the operating executable code (program) and data (configuration information).

**Nonvolatile inventory memory**

The nonvolatile inventory memory consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the port unit history such as the *CLEI* code and type/version information.

**Transmission circuitry**

The PPROC/STS384 circuit pack supports up to 32 TXI signals (384 STS-1 equivalent signals) between the SWITCH/STS768 circuit packs on the High Speed and the SWITCH/STS576 circuit packs on the Low Speed Shelves.

On the receive side the PPROC/STS384 circuit pack receives 64 TXI signal inputs from the SWITCH/STS576 circuit packs on the Low Speed Shelves. The transmission capacity is split between low speed shelves 1 and 3, and between low speed shelves 2 and 4. The PPROC/STS384 circuit pack provides low speed shelves 1 and 3 a transmission capacity of 16 TXI signals (192 STS-1 signals). The PPROC/STS384 circuit pack also provides low speed shelves 2 and 4 a transmission capacity of 16 TXI signals (192 STS-1 signals).

The selected TXI signals are routed to the PPROC/STS384 circuit pack through backplane traces to the STS48 pointer processor. The TXI signals are processed on an STS-1 basis for frame position adjustment for switching through a static pointer offset. The STS-1 signals are multiplexed to 32 TXI signals and sent to the associated SWITCH/STS768 circuit pack on the High Speed Shelf.

**Timing circuitry**

The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal. If both 6.48-MHz timing reference signals are not available, a free-running 6.48-MHz oscillator provides a reference signal for the timing circuit.

**Protection circuitry**

The PPROC/STS192 circuit pack provides the following protection functions.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The PPROC/STS384 circuit pack monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Fault detection circuitry**

The control circuit monitors all the activities on the circuit pack. The PPROC/STS384 circuit pack has an in-service and out-of-service built-in test capability. In-service testing is continuous. If an error occurs, the control circuit reports the error to the CTL/SYS50DM circuit pack using the operations network. An out-of-service test is performed during a powerup or reset condition, or when initializing new software.

**Power circuitry** The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. A modular DC-to-DC converter produces +5 V and +3.3 V used on the circuit pack.

The PPROC/STS384 circuit pack monitors the two –48 V power sources. If the PPROC/STS384 circuit pack detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the circuit pack faceplate.

**Quick reference summary** The PPROC/STS384 circuit pack performs the following functions.

#### Switch functions

The PPROC/STS384 circuit pack performs the following switch functions:

- Receives up to 64 622.08 Mb/s TXI signals from the associated SWITCH/STS576 circuit packs on up to four Low Speed Shelves and selects 32 TXI signals
- Adjusts the frame positions of the selected 32 TXI signals (static pointer offset)
- Sends the 32 TXI signals to the associated SWITCH/STS768 circuit pack on the High Speed Shelf

#### Timing and control functions

The PPROC/STS384 circuit pack performs the following timing and control functions:

- Selects the working or standby timing reference signal from the shelf TMG/ STRAT3 circuit packs
- Performs internal fault detection and interfaces with the CTL/ SYS50DM circuit pack using the operations network
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the port unit faceplate FAULT and ACTIVE LEDs



## SWITCH/DS3EC1 Circuit Pack

---

**Purpose of circuit pack** The DS3EC1 switch (SWITCH/DS3EC1) circuit pack is a relay switch circuit pack used to build a low speed protection bus in the transmit and receive directions for the DS3EC1/8 port units.

**SWITCH/DS3EC1 circuit pack faceplate** The following figure shows the SWITCH/DS3EC1 circuit pack faceplate.



NC-USM-025

**Faceplate LEDs** The SWITCH/DS3EC1 circuit pack provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                 |
|--------|-------|----------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a circuit pack failure is detected or the circuit pack loses one power feeder. |
| ACTIVE | Green | Lighted when the circuit pack is active/in-service.                                                      |

The red FAULT LED and the green ACTIVE LED are controlled by the protection DS3EC1/8 port unit.

**General description of operation**

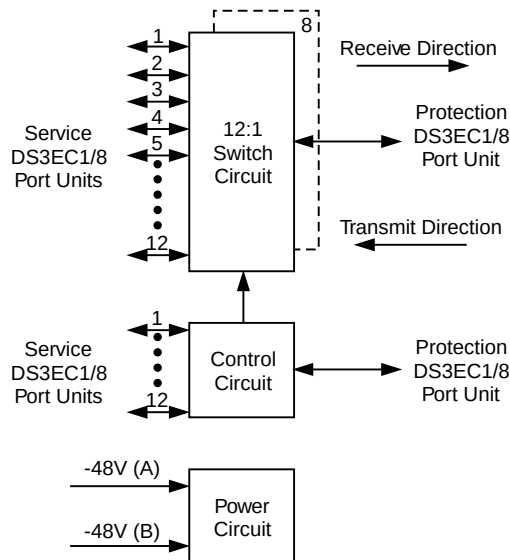
The SWITCH/DS3EC1 circuit pack interfaces with up to 12 service DS3EC1/8 port units and 1 protection DS3EC1/8 port unit.

If a service DS3EC1/8 port unit fails, the input protection switching relays on the failed DS3EC1/8 port unit route the eight electrical signals to the SWITCH/DS3EC1 circuit pack. The SWITCH/DS3EC1 circuit pack switches the eight electrical signals to the protection DS3EC1/8 port unit. In the transmit direction, the SWITCH/DS3EC1 circuit pack accepts the eight electrical signals from the protection DS3EC1/8 port unit and routes them to the output protection switching relays on the failed port unit and on to the DSX-3 panel (or equivalent).

Shorting contacts are provided in the DS3EC1/8 port unit backplane connector so that when the port unit is removed, the electrical cables short through to the SWITCH/DS3EC1 circuit pack for routing to the protection DS3EC1/8 port unit.

**Functional block diagram**

The following figure shows a functional block diagram of the SWITCH/DS3EC1 circuit pack.



NC-USM-052

**Control circuitry** The SWITCH/DS3EC1 circuit pack has no on-board processor. The control circuit interfaces with the service DS3EC1/8 port units and the protection DS3EC1/8 port unit. All control information comes from the protection DS3EC1/8 port unit. The protection DS3EC1/8 port unit receives commands from the CTL/SYS50DM circuit packs via the operations network. For more information about the operation network, refer to *Chapter 6, Control, Transmission, and Synchronization Interfaces*.

The SWITCH/DS3EC1 circuit pack also controls the protection switching relays on the service DS3EC1/8 port units.

**Memory circuitry** The memory circuitry consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the circuit pack history such as the *CLEI* code and type/version information.

**Switch circuitry** The SWITCH/DS3EC1 circuit pack provides the following switch functions.

#### **Receive direction**

In the receive direction, the SWITCH/DS3EC1 circuit pack interfaces with up to 12 service DS3EC1/8 port units and 1 protection DS3EC1/8 port unit. If a service DS3EC1/8 port unit fails, the input protection switching relays of the failed port unit feed each of the eight electrical signals to the SWITCH/DS3EC1 circuit pack. Shorting contacts are also provided in the DS3EC1/8 port unit backplane connectors so that when the port unit is removed, the electrical cables short through to the SWITCH/DS3EC1 circuit pack for routing to the protection DS3EC1/8 port unit. The eight electrical signals are routed into eight switch circuits on the SWITCH/DS3EC1 circuit pack. Each switch circuit performs a 12:1 selection of the signal needing protection and terminates the other signals. The eight electrical signals are routed to the protection DS3EC1/8 port unit.

**Transmit direction**

In the transmit direction, the SWITCH/DS3EC1 circuit pack accepts eight electrical signals from the protection DS3EC1/8 port unit. Each electrical signal is routed into a switch circuit. Each switch circuit performs a 1:12 selection to output the electrical signals to the output protection switching relays on the failed DS3EC1/8 port unit and on to the cross-connect panel (or equivalent).

When a service DS3EC1/8 port unit is reinserted in a slot, the protection switching relays remain in the protection state until the CTL/SYS50DM circuit pack determines that the port unit is good.

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V used on the circuit pack. The SWITCH/DS3EC1 circuit pack also supplies +5 V to the input and output protection relays on the service DS3EC1/8 port units.

The protection DS3EC1/8 port unit monitors the two power sources. If the protection DS3EC1/8 port unit detects a failure of an on-board fuse or power converter on the SWITCH/DS3EC1 circuit pack, the red FAULT LED is lighted on the SWITCH/DS3EC1 circuit pack faceplate.

**Quick reference summary**

The SWITCH/DS3EC1 circuit pack performs the following functions.

**Switch functions**

The SWITCH/DS3EC1 circuit pack performs the following switch functions:

- Receives eight electrical signals from a failed DS3EC1/8 port unit and switches the eight electrical signals to the protection DS3EC1/8 port unit
- Receives eight electrical signals from the protection DS3EC1/8 port unit and switches the eight electrical signals to the correct service DS3EC1/8 port unit and to the cross-connect panel (or equivalent)

**Control functions**

The SWITCH/DS3EC1 circuit pack performs the following control functions:

- Controls and powers the protection switching relays on the service DS3EC1/8 port units
- Performs internal fault detection and interfaces with the CTL/SYS50DM circuit pack via the protection DS3EC1/8 port unit
- Stores inventory information (for example, the *CLEI* code and serial number)





## SWITCH/STS576 Circuit Pack

---

**Purpose of circuit pack**

The 576x576 STS-1/192x192 STM-1 switch (SWITCH/STS576) circuit pack provides a 576x576 STS-1, single-stage, nonblocking switch. The switch allows STS-1 equivalent switching between port units on the same shelf and between port units on different shelves.

**SWITCH/STS576 circuit pack faceplate**

The following figure shows the SWITCH/STS576 circuit pack faceplate.



NC-USM-024

**Faceplate LEDs**

The SWITCH/STS576 circuit pack provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                 |
|--------|-------|----------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a circuit pack failure is detected or the circuit pack loses one power feeder. |
| ACTIVE | Green | Lighted when the circuit pack is active/in-service.                                                      |

The red FAULT LED is controlled by the CTL/SYS50DM circuit packs.

**General description of operation**

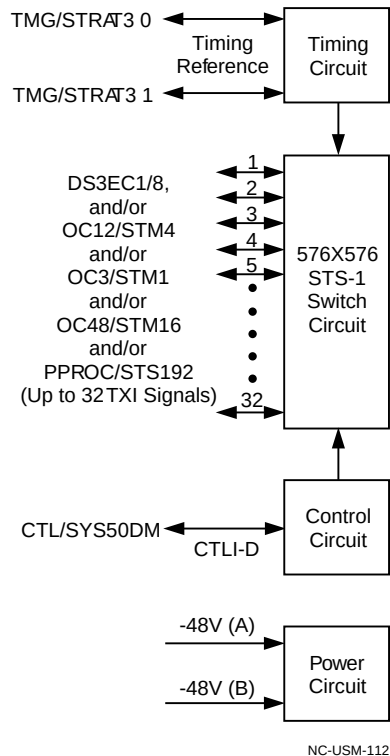
The SWITCH/STS576 circuit pack provides a 576x576 STS-1 single-stage, nonblocking switch. The SWITCH/STS576 circuit pack has up to 32 transmission interface (TXI) signal inputs and up to 32 TXI signal outputs. Any input can be routed to any output. This allows the user-specified cross-connections between port units on the same shelf and port units on different shelves.

The SWITCH/STS576 circuit pack also supports:

- 1xN DS3EC1/8 port unit protection switching
- 1+1 port protection switching
- 2-fiber bidirectional line-switched ring protection switching

**Functional block diagram**

The following figure shows a functional block diagram of the SWITCH/STS576 circuit pack.



|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Control circuitry</b> | <p>The SWITCH/STS576 circuit pack has no on-board processor. All control and switching information comes from the CTL/SYS50DM circuit packs via the control interface for devices (CTLI-D) interface. The SWITCH/STS576 circuit pack reports the status of the circuit pack and the incoming TXI signals, as well as the circuit pack inventory information (for example, the <i>CLEI</i> code and serial number). The CTL/SYS50DM circuit packs use the status information for fault detection and isolation.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Memory circuitry</b>  | <p>The memory circuitry consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the circuit pack history such as the <i>CLEI</i> code and type/version information.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Switch circuitry</b>  | <p>The switch circuit provides transmission connections between the port units on the shelf and between port units and SWITCH/STS576 circuit packs on other shelves. The SWITCH/STS576 circuit packs accept the following inputs:</p> <ul style="list-style-type: none"><li>• Up to 32 TXI signals from the DS3EC1/8, OC3/STM1, OC12/STM4, OC48/STM16, and/or PPROC/STS192 circuit packs (service and protection)</li><li>• Up to 16 TXI signals from the SWITCH circuit packs on other shelves (10G applications only)</li></ul> <p>The switch circuit forms a 576x576 STS-1/192x192 STM-1 switch that completes circuits for user-specified cross-connections and protection switching.</p> <p>The SWITCH/STS576 circuit packs provide the following outputs:</p> <ul style="list-style-type: none"><li>• Up to 32 TXI signals to the DS3EC1/8, OC3/STM1, OC12/STM4, OC48/STM16, and/or PPROC/STS192 circuit packs (service and protection)</li><li>• Up to 16 TXI signals to the SWITCH circuit packs on other shelves (10G applications only)</li></ul> |
| <b>Timing circuitry</b>  | <p>The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

**Protection circuitry**

The SWITCH/STS576 circuit pack provides the following protection functions.

**DS3EC1/8 port unit protection**

DS3EC1/8 port unit protection is accomplished by the coordinated operation of the protection DS3EC1/8 port unit and the SWITCH/STS576 circuit pack. For example, the SWITCH/STS576 circuit pack selects the TXI signal from the protection DS3EC1/8 port unit to substitute for the TXI signal from a failed service DS3EC1/8 port unit.

The SWITCH/STS576 circuit pack also routes the TXI signal for the failed service DS3EC1/8 port unit to the protection DS3EC1/8 port unit.

DS3EC1/8 port unit protection switching is performed in response to commands from the CTL/SYS50DM circuit packs via the CTLI-D interface.

**1+1 optical port protection**

The 1+1 optical port protection is accomplished by the coordinated operation of the working and standby optical ports and the SWITCH/STS576 circuit pack. For example, the SWITCH/STS576 circuit pack selects the TXI signal from the standby optical port to substitute for the TXI signal from the failed working optical port.

The SWITCH/STS576 circuit pack also routes the TXI signal for the failed working optical port to the standby optical port.

The 1+1 optical port protection switching is performed in response to commands from the CTL/SYS50DM circuit packs via the CTLI-D interface.

**2-fiber bidirectional line-switched ring protection switching**

The SWITCH/STS576 circuit pack provides all the 2-fiber ring protection switching connections. All 2-fiber ring protection switching occurs at the input and output stages of SWITCH/STS576 circuit packs. During the protection switch, the service traffic for the failed optical port unit is routed to the optical port unit in the opposite direction. For example, if the west OC48/STM16 port unit fails, the service traffic is routed to the east OC48/STM16 port unit.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The SWITCH/STS576 circuit pack monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +3.3 V, +1.4 V, +1.2 V, and +1.0 V used on the circuit pack.

The circuit pack monitors the two power sources. If the circuit pack detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the circuit pack faceplate.

**Quick reference summary**

The SWITCH/STS576 circuit pack performs the following functions.

**Switch functions**

The SWITCH/STS576 circuit pack performs the following switch functions:

- Receives up to 32 TXI signals from the DS3EC1/8, OC-3/STM-1, OC-12/STM-4, OC48/STM16, and/or PPROC/STS192 circuit packs (service and protection)
- Receives up to 16 TXI signals from SWITCH circuit packs on other shelves (10G applications only)
- Establishes cross-connections through the 576x576 STS-1 switch based on user-specified cross-connection commands
- Transmits up to 32 TXI signals to DS3EC1/8, OC-3/STM-1, OC-12/STM-4, OC48/STM16, and/or PPROC/STS192 circuit packs (service and protection)
- Transmits up to 16 TXI signals to SWITCH circuit packs on other shelves (10G applications only)

**Control functions**

The SWITCH/STS576 circuit pack performs the following control functions:

- Performs internal fault detection and interfaces with the CTL/SYS50DM circuit packs using the control interface for devices (CTLI-D) interface
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the circuit pack faceplate ACTIVE LED



## SWITCH/STS768 Circuit Pack

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**Purpose of circuit pack** The 768x768 STS-1 switch (SWITCH/STS768) circuit pack provides a 768x768 STS-1, single-stage, nonblocking switch. The switch allows STS-1 equivalent switching between port units on the high speed shelf and between port units on the high speed shelf and up to four low speed shelves.

**SWITCH/STS768 circuit pack faceplate** The following figure shows the SWITCH/STS768 circuit pack faceplate.



NC-4SM-352



**Faceplate LEDs**

The SWITCH/STS768 circuit pack provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                 |
|--------|-------|----------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a circuit pack failure is detected or the circuit pack loses one power feeder. |
| ACTIVE | Green | Lighted when the circuit pack is active/in-service.                                                      |

The red FAULT LED is controlled by the CTL/SYS50DM circuit packs.

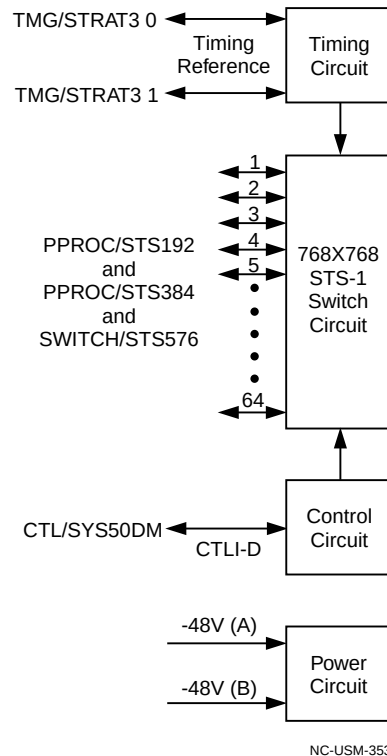
**General description of operation**

The SWITCH/STS576 circuit pack provides a 768x768 STS-1 single-stage, nonblocking switch. The SWITCH/STS768 circuit pack has up to 64 transmission interface (TXI) signal inputs and up to 64 TXI signal outputs. Any input can be routed to any output. This allows the user-specified cross-connections between port units on the high speed shelf and port units on up to four low speed shelves.

The SWITCH/STS768 circuit pack also supports 2-fiber bidirectional line-switched ring protection switching.

**Functional block diagram**

The following figure shows a functional block diagram of the SWITCH/STS768 circuit pack.

**Control circuitry**

The SWITCH/STS768 circuit pack has no on-board processor. All control and switching information comes from the CTL/SYS50DM circuit packs via the control interface for devices (CTLI-D) interface. The SWITCH/STS768 circuit pack reports the status of the circuit pack and the incoming TXI signals, as well as the circuit pack inventory information (for example, the *CLEI* code and serial number). The CTL/SYS50DM circuit packs use the status information for fault detection and isolation.

**Memory circuitry**

The memory circuitry consists of 256 bytes of electrically-erasable programmable read-only memory (EEPROM). The nonvolatile memory is used to store information about the circuit pack history such as the *CLEI* code and type/version information.

**Switch circuitry**

The switch circuit provides transmission connections between the port units on the high speed shelf and between the port units on the high speed shelf and the port units on up to four low speed shelves. The SWITCH/STS768 circuit packs accept the following inputs:

- Up to 32 TXI signals from the SWITCH/STS576 circuit packs on up to four low speed shelves via the PPROC/STS384 circuit pack
- Up to 32 TXI signals from the PPROC/STS192 circuit packs on the high speed shelf

The switch circuit forms a 768x768 STS-1 switch that completes circuits for user-specified cross-connections and protection switching.

The SWITCH/STS768 circuit packs provide the following outputs:

- Up to 32 TXI signals to the PPROC/STS192 circuit packs on the high speed shelf
- Up to 32 TXI signals to the SWITCH/STS576 circuit packs on up to four low speed shelves

**Timing circuitry**

The timing circuit receives two 6.48-MHz timing reference signals from the shelf TMG/STRAT3 circuit packs. The control circuit selects the timing reference signal that is used. The timing circuit multiplies the selected 6.48-MHz timing reference signal by 24 to generate an internal 155.52-MHz timing signal.

**Protection circuitry**

The SWITCH/STS768 circuit pack provides the following protection functions.

**2-fiber bidirectional line-switched ring protection switching**

The SWITCH/STS768 circuit pack provides all the 2-fiber ring protection switching connections. All 2-fiber ring protection switching occurs at the input and output stages of SWITCH/STS768 circuit packs. During the protection switch, the service traffic for the failed optical port unit is routed to the optical port unit in the opposite direction. For example, if the west OC192/STM64 port unit fails, the service traffic is routed to the east OC192/STM64 port unit.

**Timing reference signal protection**

Timing reference signal protection is performed by selecting the working or standby timing reference signal from the shelf TMG/STRAT3 circuit packs. The SWITCH/STS768 circuit pack monitors these timing reference signals and can select the working or standby timing reference signal until the protection algorithm of the CTL/SYS50DM circuit pack makes a selection.

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +3.3 V, +2.5 V, +1.4 V, +1.2 V, and +1.0 V used on the circuit pack.

The circuit pack monitors the two power sources. If the circuit pack detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the circuit pack faceplate.

**Quick reference summary**

The SWITCH/STS768 circuit pack performs the following functions.

**Switch functions**

The SWITCH/STS768 circuit pack performs the following switch functions:

- Receives up to 32 TXI signals from the SWITCH/STS576 circuit packs on up to four low speed shelves via the PPROC/STS384 circuit pack
- Receives up to 32 TXI signals from the PPROC/STS192 circuit packs on the high speed shelf
- Establishes cross-connections through the 768x768 STS-1 switch based on user-specified cross-connection commands
- Transmits up to 32 TXI signals to the PPROC/STS192 circuit packs on the high speed shelf
- Transmits up to 32 TXI signals to the SWITCH/STS576 circuit packs on up to four low speed shelves

**Control functions**

The SWITCH/STS768 circuit pack performs the following control functions:

- Performs internal fault detection and interfaces with the CTL/SYS50DM circuit packs using the control interface for devices (CTLI-D) interface
- Stores inventory information (for example, the *CLEI* code and serial number)
- Controls the circuit pack faceplate ACTIVE LED



## TMG/STRAT3 Circuit Pack

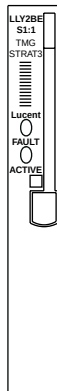
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**Purpose of circuit pack** The Stratum 3 Timing (TMG/STRAT3) circuit packs distribute redundant timing signals to the circuit packs on the shelves.

**Supported TMG/STRAT3 circuit packs** The following table shows the supported TMG/STRAT3 circuit packs.

| Name       | Code             | Description                                                                               |
|------------|------------------|-------------------------------------------------------------------------------------------|
| TMG/STRAT3 | LLY2 and LLY2A   | Supports the extended super frame (ESF) format for external DS1 timing reference signals. |
| TMG/STRAT3 | LLY2B and LLY2BE | Supports the ESF and super frame (SF) formats for external DS1 timing reference signals.  |

**TMG/STRAT3 circuit pack faceplate** The following figure shows the TMG/STRAT3 circuit pack faceplate.



NC-USM-023

**Faceplate LEDs**

The TMG/STRAT3 circuit pack provides the following faceplate LEDs.

| LED    | Color | Function                                                                                                                                                                                         |
|--------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FAULT  | Red   | Continuously lighted when a circuit pack failure is detected or the circuit pack loses one power feeder.<br>Flashes on and off when an incoming DS1 timing reference signal failure is detected. |
| ACTIVE | Green | Lighted when the circuit pack is active/in-service.                                                                                                                                              |

The red FAULT and green ACTIVE LEDs are controlled by the CTL/SYS50DM circuit packs.

**General description of operation**

The TMG/STRAT3 circuit pack supports the following timing modes.

**Free-running mode**

In the free-running mode, the TMG/STRAT3 circuit pack derives timing from a Stratum 3 oscillator.

**Locked mode**

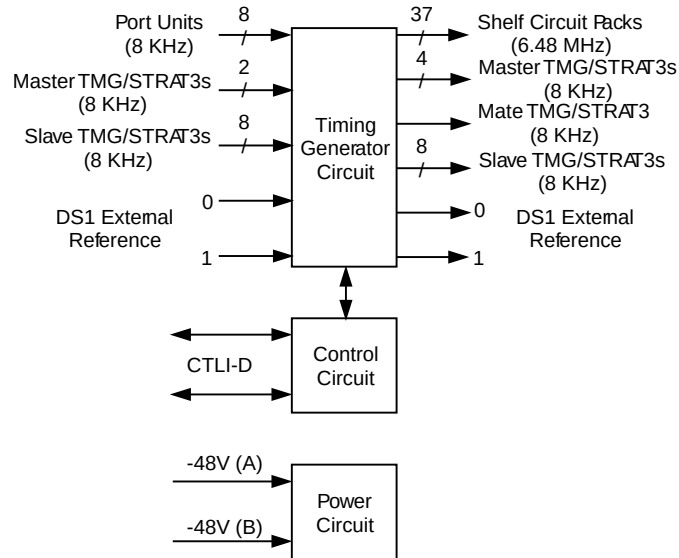
In the locked mode, the TMG/STRAT3 circuit pack derives timing from a timing reference signal input. These references synchronize the local terminal, and any others that may reference it, with other network equipment operating under the same primary clock source.

**Holdover mode**

In the holdover mode, the timing generator circuit uses storage techniques to maintain the last known good frequency of the reference signal. The holdover mode is entered when the integrity of the reference signal is considered unacceptable or by manual command. In the holdover mode, the on-board oscillator frequency will not degrade below the Stratum 3 level.

**Functional block diagram**

The figure shows a functional block diagram of the TMG/STRAT3 circuit pack.



NC-USM-057

**Control circuitry**

The TMG/STRAT3 circuit pack has no on-board processor. All control information comes from the CTL/SYS50DM circuit pack via the control interface for devices (CTLI-D) interface. The TMG/STRAT3 circuit pack reports the status of the circuit pack and the incoming timing reference signals, as well as the circuit pack inventory information (for example, the *CLEI* code and serial number). The CTL/SYS50DM circuit pack uses the status information for fault detection and isolation.

**Timing generator circuitry**

The timing generator circuit can accept the following reference inputs and selects one of the inputs as the timing reference:

- Two external DS1 reference signal (1.544 MHz) from a Stratum 3 or better source
- Up to 6 line reference signals (8 kHz)
- Two reference signals (8 KHz) from the master TMG/STRAT3 circuit packs
- Eight reference signals (8 KHz) from slave TMG/STRAT3 circuit packs

A digital phase-locked loop circuit generates the timing distribution signals.



The timing generator circuit distributes the following timing reference signals:

- 6.48-MHz reference signals to other circuit packs
- Four signals (8 MHz) to master TMG/STRAT3 circuit packs
- One signal (8 MHz) to the mate TMG/STRAT3 circuit pack
- Eight signals (8 MHz) to slave TMG/STRAT3 circuit packs
- Two external DS1 reference signals (1.544 MHz)

**Power circuitry**

The power circuit accepts two –48 V power feeders from the backplane that are diode OR'd, fused, and filtered. Modular DC-to-DC converters produce +5 V and +3.3 V used on the circuit pack.

The TMG/STRAT3 circuit pack monitors the two power sources. If the circuit pack detects a failure of an on-board fuse or power converter, the red FAULT LED is lighted on the circuit pack faceplate.

**Quick reference summary**

The TMG/STRAT3 circuit pack performs the following timing and control functions:

- Accepts external timing reference signals, timing reference signals from the port units, and timing reference signals from other TMG/STRAT3 circuit packs
- Generates timing distribution signals
- Supports system timing in the free-running, locked, or holdover modes
- Performs internal fault detection and interfaces with the CTL/SYS50DM circuit packs using the CTLI-D interface
- Stores inventory information (for example, the *CLEI* code and serial number)



# Summary

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- Introduction** The WaveStar TDM 2.5G/10G (2-Fiber) system can be equipped with the following circuit packs and port units:
- ADJCTL/DCCEI circuit pack (LEY1, LEY1AE)
  - ADJCTL/DCCEI circuit pack (LEY401)
  - CTL/SYS50DM circuit pack (LEY10B and LEY10BE)
  - DS3EC1/8 port unit (LEY17 and LEY17AE)
  - GE1/SX2 port unit (LEY309 and LEY309AE)
  - GE1/LX2 port unit (LEY310AE)
  - OBA10G circuit pack (SEN3 and SEN3AE)
  - OBPA10G circuit pack (SEN4 and SEN4AE)
  - OC12/STM4 port unit (LEY13, LEY13AE, LEY14, and LEY14AE)
  - OC3/STM1 port unit (LEY15, LEY15AE, LEY16, LEY16AE)
  - OC3/STM1/1.3SR8 (LEY23 and LEY23AE)
  - OC48/STM16/1.3LR1 port unit (LEY7 and LEY7AE)
  - OC48/STM16/1.5LR1 port unit (LEY8 and LEY8AE)
  - OC48/STM16/DWDM01 - 16 port unit (LEY50-LEY65 and LEY50AE-LEY65AE)
  - OC48/STM16/POUxxxx port unit (LEY80-LEY95 and LEY80AE-LEY95AE)
  - OC48/STM16/WDMxxxx port unit (LEY101-LEY180 and LEY101AE-LEY180AE)
  - OC48/STM16/1.3VSR1 port unit (LEY182 and LEY182AE)
  - OC192/STM64/1.5SR1 port unit (LEY67 and LEY67AE)
  - OC192/STM64/1.5IR1 port unit (LEY69 and LEY69AE)
  - OC192/STM64/1.5IRS1 port unit (LEY97 and LEY97AE)
  - OC192/STM64/WDMxxxx port unit (LEY201-LEY240 and LEY201AE-LEY240AE)
  - OC192/STM64/POUxxxx port unit (LEY284-LEY299 and LEY284AE-LEY299AE)
  - OC192/STM64/POUxxxx port unit (LEY384AE-LEY399AE)
  - PPROC/STS192 circuit pack (LEY3 and LEY3AE)

- PPROC/STS384 circuit pack (LEY47 and LEY47AE)
- SWITCH/DS3EC1 circuit pack (LEY18 and LEY18AE)
- SWITCH/STS576 circuit pack (LEY4 and LEY4AE)
- SWITCH/STS768 circuit pack (LEY73 and LEY73AE)
- TMG/STRAT3 circuit pack (LLY2, LLY2AE, LLY2B, and LLY2BE)







# 6 Control, Transmission, and Synchronization Interfaces

## Overview

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**Purpose** This chapter describes the WaveStar TDM 2.5G/10G (2-Fiber) system architecture. The system control, transmission, and synchronization architectures are described down to the circuit pack level.

**Related information** For related information see the following chapters in this guide:

- Chapter 2, Network Topologies
- Chapter 4, Operations Interfaces
- Chapter 5, Circuit Pack/Port Unit Descriptions

**Contents** This chapter describes the architecture and components that support the following system functions:

|                 |        |
|-----------------|--------|
| Control         | 6 - 2  |
| Transmission    | 6 - 5  |
| Synchronization | 6 - 9  |
| Summary         | 6 - 21 |

# Control

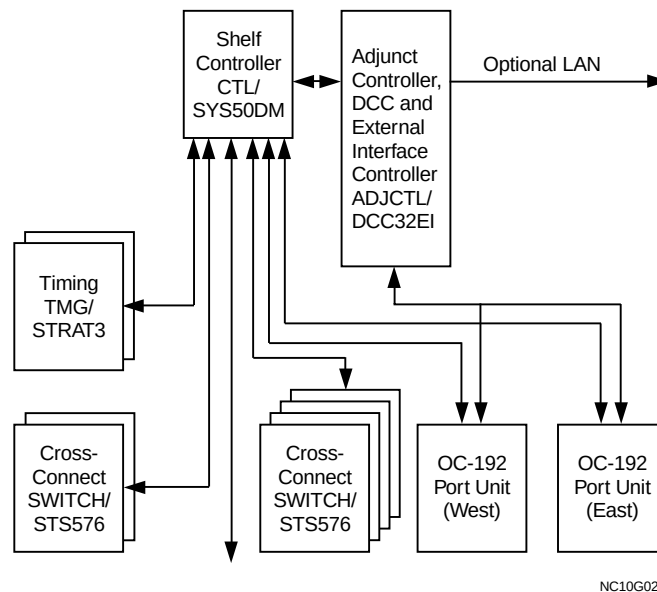
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**Overview** The WaveStar TDM 2.5G/10G (2-Fiber) system functions are controlled by shelf controller circuit packs and by function microcontrollers on the port units (transmission circuit packs). The shelf controller circuit packs control the port units, synchronization, and switching circuit packs. The switching circuit packs have no internal function controllers. Overall system operation is controlled by signals received over the SONET DCC channels or from the user interface.

The shelf controller circuit pack in the first 2.5G tributary shelf also serves as a system controller for the network element (10G shelf and 2.5G tributary shelves).

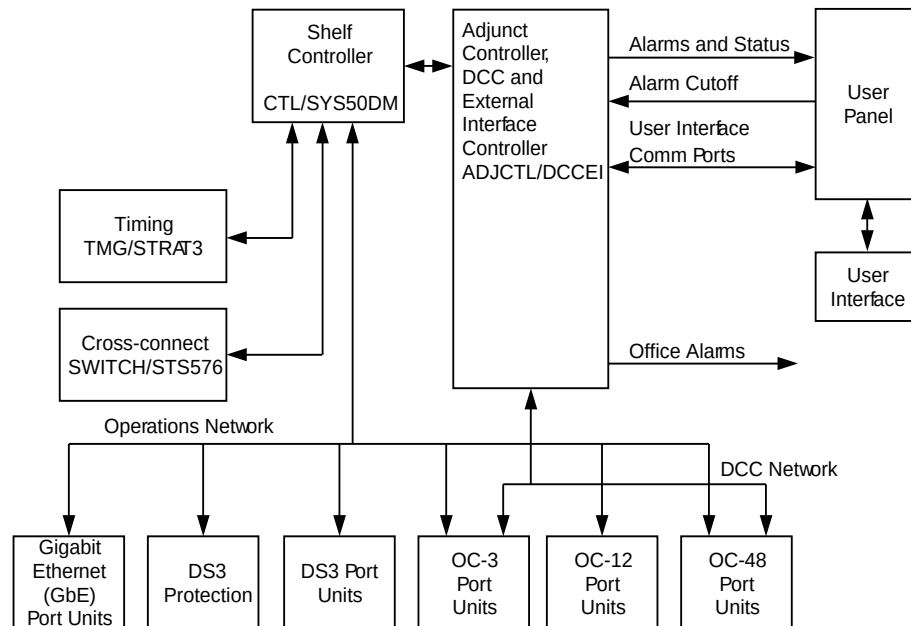
## 10G shelf control architecture

The 10G shelf interfaces with the 2.5G tributary shelves via backplane wiring. The following figure shows the 10G shelf control architecture.



### 2.5G tributary shelf control architecture

The following figure shows the control architecture for the 2.5G tributary shelf. The shelf controller circuit pack in the first 2.5G tributary shelf controls the network element (10G shelf and 2.5G tributary shelves).



NC-2.5GAPOG-047

In Release 6 and later releases, systems equipped with the 768x768 STS-1 switch fabric support up to four 2.5G tributary shelves. In Releases prior to Release 6, the system supports up to two 2.5G tributary shelves.

### Control circuit packs

The WaveStar TDM 2.5G/10G (2-Fiber) system uses the following shelf controllers and adjunct controllers:

- CTL/SYS50DM – shelf controllers
- ADJCTL/DCCEI – adjunct controllers also process DCC signals and external interfaces

**CTL/SYS50DM circuit pack** The CTL/SYS50DM shelf controller circuit packs contain the main processor and memory controlling the WaveStar TDM 2.5G/10G (2-Fiber) shelves. The CTL/SYS50DM circuit pack performs the following functions:

- Communicates with the function controllers in the port units to monitor performance and to perform provisioning and maintenance
- Directly controls the timing and switching circuit packs
- Detects the presence of circuit packs in the shelf
- Controls the transmission and reception of data via the ADJCTL/DCCEI circuit packs
- Communicates with the user interface by way of the ADJCTL/DCCEI circuit packs
- Resets circuit packs as necessary
- Monitors shelf power

**ADJCTL/DCCEI circuit packs** The ADJCTL/DCCEI circuit pack serves as an interface to the shelf controllers. The ADJCTL/DCCEI circuit packs obtain, process and store information for transfer to and from the shelf controllers. The ADJCTL/DCCEI circuit pack also supports the following:

- DCE (data communications equipment) configurations for user interface ports
- Status indicators on the user panel





# Transmission

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**Overview** The WaveStar TDM 2.5G/10G (2-Fiber) add/drop multiplexer uses two port units (transmission interface circuit packs) to connect as a node on an OC-192 2-fiber BLSR. It uses up to 16 tributary port unit circuit packs on each tributary shelf to connect add/drop traffic to other network elements. The port units in the tributary shelves connect as nodes in any mix of supported network configurations, including OC-48 BLSRs. Traffic can be connected between any of the ports.

**Optical transmission** WaveStar TDM 2.5G/10G (2-Fiber) supports the following optical transmission:

| Interface        | Fiber                                     | Protection           |
|------------------|-------------------------------------------|----------------------|
| OC-192           | 1.5 $\mu\text{m}$                         | 0x1, BLSR, UPSR      |
| OC-192           | 1.5 $\mu\text{m}$ VLR w/ OAT, OAR         | 0x1, BLSR, UPSR      |
| OC-48            | 1.3 $\mu\text{m}$ , 1.5 $\mu\text{m}$     | 0x1, 1+1, BLSR, UPSR |
| OC-12            | 1.3 $\mu\text{m}$                         | 0x1, 1+1, UPSR       |
| OC-3             | 1.3 $\mu\text{m}$                         | 0x1, 1+1             |
| Gigabit Ethernet | 10 $\mu\text{m}$ SMF                      | 0x1, 1+1             |
| Gigabit Ethernet | 50 $\mu\text{m}$ , 62.5 $\mu\text{m}$ MMF | 0x1, 1+1             |

The OC-48 ports can be used as either BLSR or add/drop interfaces. The capacity in a BLSR can also be used for add/drop traffic from another BLSR: when traffic is directly connected from one BLSR to another, each provides add/drop capacity for the other.

**DWDM** Dense Wavelength Division Multiplexing (DWDM) is also supported with the following Lucent Technologies systems:

| Interface | Fiber             | Colors | Optics                                    |
|-----------|-------------------|--------|-------------------------------------------|
| OC-192    | 1.5 $\mu\text{m}$ | 16     | Passive                                   |
|           |                   | 32     | Passive                                   |
|           |                   | 40     | WaveStar 1.6T ARM                         |
| OC-48     | 1.5 $\mu\text{m}$ | 16     | <i>Metropolis</i> metroEON<br>OLS passive |
|           |                   | 80     | WaveStar 1.6T                             |

**Electrical transmission** WaveStar TDM 2.5G/10G (2-Fiber) supports DS3/EC1 transmission over coaxial cables. It also supports ethernet LAN transmission over shielded twisted pair or Cat 5 ethernet cables.

**Configuration tips**

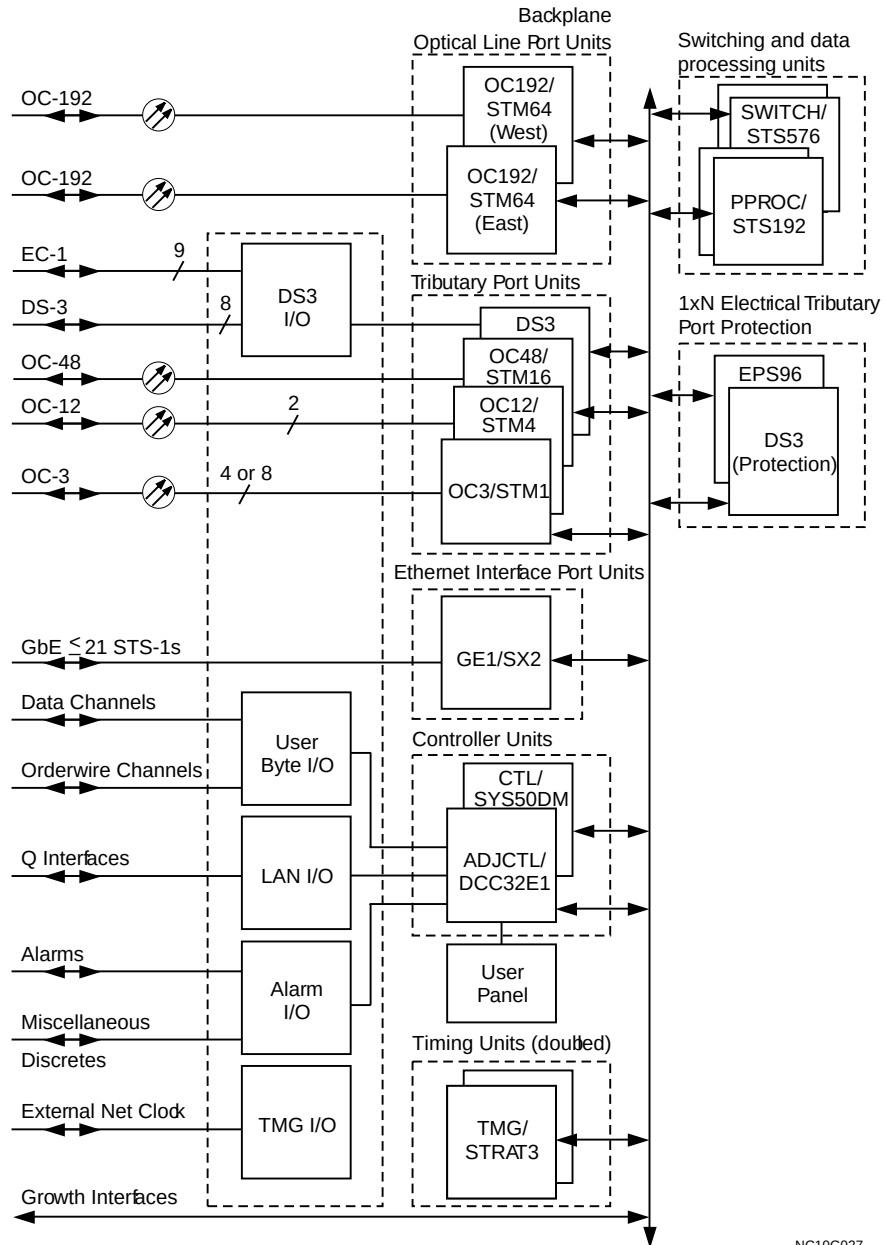
A connector panel is required either on the left side of or above the appropriate tributary shelf for any DS3EC1/8 port unit in slots 1 through 6. A panel is required either on the right side of or below the appropriate tributary shelf for any DS3EC1/8 port units in slots 11 through 16. Therefore, it is practical to keep all DS3 circuit packs in the same side of the shelf until you need to terminate more than 48 DS3 and/or EC-1 signals.

**Transmission provisioning** Provisioning transmission circuit packs, ports, and tributaries is controlled by the system controller circuit pack in response to commands received over the SONET DCC circuits or from a WaveStar Craft Interface Terminal (CIT) connected to the port on the user panel.

**Transmission architecture**

The WaveStar TDM 2.5G/10G (2-Fiber) system is a next-generation, high capacity multiplexer for applications that multiplex DS3, EC-1, OC-3, OC-12, and OC-48 and signals onto an OC-192 2-fiber bidirectional line-switched ring for transport to distant OC-192 multiplexers.

The following figure shows the overall architecture of the WaveStar TDM 2.5G/10G (2-Fiber) system, but does not show the physical distribution of functions on different shelves.



NC10G027

**Cross-connect switch**

The transmission port units connect with a 576x576 STS-1 switch via backplane wiring. The 576x576 STS-1 switch supports up to 192 STS-1 equivalent signal between the 10G shelf and up to two 2.5G shelves. The intershelf cross-connection capacity of 192 STS-1 equivalent signals can be either dedicated to one 2.5G shelf or shared by two 2.5G shelves.

In Release 6 and later releases, the WaveStar TDM 2.5G/10G (2-Fiber) system can be equipped with a 768x768 STS-1 switch in the 10G Shelf. The 768x768 STS-1 switch supports two groups of 192 STS-1 equivalent signals between the 10G shelf and up to four 2.5G shelves. The 2.5G shelves connected to PPROC Ports A and B share one group 192 STS-1 equivalent signals, and the 2.5G shelves connected to PPROC Ports C and D share the other group of 192 STS-1 equivalent signals.

**Electrical protection**

1xN electrical protection is provided by an electrical protection switch (SWITCH/DS3EC1 circuit pack). The protection switch selects between the working and the protection DS3 circuit packs.



# Synchronization

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|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                             | <p>The WaveStar TDM 2.5G/10G (2-Fiber) system synchronizes add, drop, and through signals by using one timing source for all transmission.</p> <p>The timing source is normally locked to an external reference signal from the building integrated timing source (BITS) or an internal line reference signal derived from an incoming OC-3, OC-12, OC-48, or OC-192 line.</p>                                                                                                                                                                                                                                               |
| <b>Timing Circuit Packs</b>                 | <p>Two TMG/STRAT3 circuit packs are located in each WaveStar TDM 2.5G/10G (2-Fiber) shelf. The master timing circuit packs are on the first tributary shelf (MAIN 2.5G I/O shelf). The master TMG/STRAT3 circuit packs control system timing and provide timing signals to the slave TMG/STRAT3 circuit packs on the 10G shelf and the other 2.5G tributary shelves. These timing signals are used for clock, frame, and multiframe synchronization.</p> <p>The master TMG/STRAT3 circuit packs also provide two external timing output signals which can be used to drive timing functions in other external equipment.</p> |
| <b>Control and status</b>                   | <p>The behavior of the master TMG/STRAT3 circuit packs is controlled by switching them among several defined states. As commands are issued or as failures occur and are cleared, the timing system switches from one state to another.</p> <p>The status of system timing is retrievable for user observation. The user can issue commands to obtain status reports or to change the synchronization state manually.</p>                                                                                                                                                                                                    |
| <b>Synchronization protection switching</b> | <p>The TMG/STRAT3 circuit packs and reference signals are protected against failures. Synchronization protection switching includes the following:</p> <ul style="list-style-type: none"> <li>• TMG/STRAT3 circuit pack switching</li> <li>• Synchronization reference switching</li> <li>• Synchronization mode switching</li> </ul> <p><b>Important!</b> For more information about synchronization protection switching, refer to <i>Alarm, Maintenance, and Trouble Clearing Guide</i>.</p>                                                                                                                              |

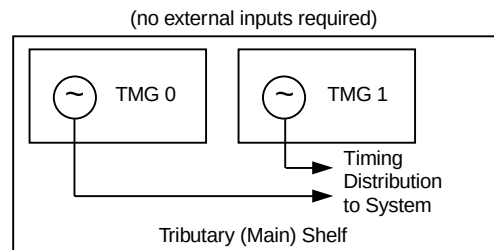
**Synchronization modes** The WaveStar TDM 2.5G/10G (2-Fiber) system operates in any of three synchronization modes:

- Free-running (provisionable)
- Locked (provisionable)
- Holdover

**Free running mode** In the free-running mode, the master TMG/STRAT3 circuit packs derive system timing from a highly-stable internal Stratum 3 oscillator. The master TMG/STRAT3 circuit packs are not locked to a reference signal.

The active master TMG/STRAT3 circuit pack distributes timing reference signals to the slave TMG/STRAT3 circuit packs on the 10G and 2.5G tributary shelves.

The following figure shows the free-running mode, in which the WaveStar TDM 2.5G/10G (2-Fiber) system is synchronized by timing signals generated in the master TMG/STRAT3 circuit packs.



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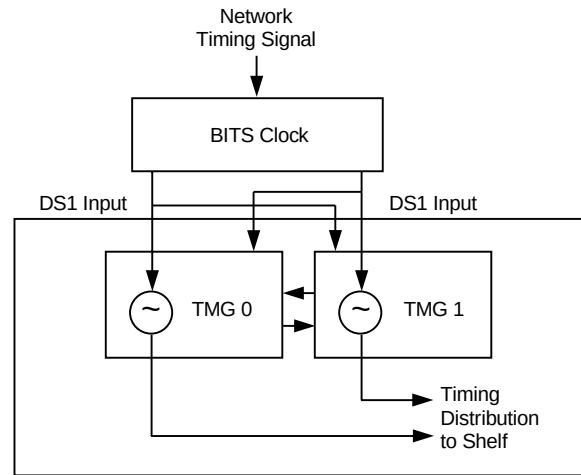
**Locked mode** In the locked mode, the master TMG/STRAT3 circuit packs derives system timing from two external DS1 input signals (EXTREF1 and EXTREF2) or from up to six incoming OC-3, OC-12, OC-48, and/or OC-192 lines (LINE1, LINE2, LINE3, LINE4, LINE5, and LINE6). Up to eight system timing references can be provisioned. The system selects one timing reference as the active timing reference for the system.

The timing reference signals typically are based on a Stratum 1 clock.

The active master TMG/STRAT3 circuit pack distributes timing reference signals to the slave TMG/STRAT3 circuit packs on the 10G and 2.5G tributary shelves.

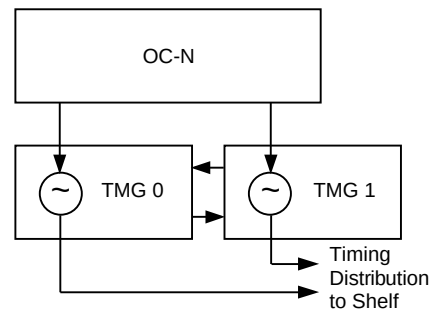
### Locked mode with external DS1 input signals

The following figure shows the locked mode with external DS1 input signals.



### Locked mode with OC-N line reference signals

The following figure shows the locked mode with incoming line reference signals.



### Timing reference frequency monitoring

The active timing reference signal is monitored and compared to the internal oscillators on the active and standby master TMG/STRAT3 circuit packs. References for standby timing and station clock are monitored compared to the active master TMG/STRAT3 circuit pack. The frequency measurements are accurate to within 0.5 ppm. If the timing reference signal deviates by 15.0 ppm from nominal, it is considered unstable. If the difference is within 12.5 ppm, the alarm is cleared. A timing reference signal which deviates more than 19.6 ppm from nominal will be declared failed.

**Error handling**

The 8-kHz synchronization line reference signal from the OC-N line is continuously monitored for error-free operation. If the timing reference signal becomes corrupted or unavailable, the TMG/STRAT3 circuit packs can select an incoming DS1 synchronization reference signal. If all external DS1 input timing reference signals are corrupted or unavailable, the active master TMG/STRAT3 circuit pack enters the holdover mode.

**Holdover mode**

The WaveStar TDM 2.5G/10G (2-Fiber) system enters the holdover mode when all timing reference signals fail. The TMG/STRAT3 timing generator circuit packs monitor the quality of the timing reference signals they receive. If one of the timing reference signals fails, the WaveStar TDM 2.5G/10G (2-Fiber) system uses another. If all timing reference signals fail, the WaveStar TDM 2.5G/10G (2-Fiber) system enters the holdover mode.

The holdover mode is not provisionable. However, it can be forced by the synchronization mode protection switch command. If it is forced, it must be cleared in order for the system to return to locked mode.

In the holdover mode, the active TMG/STRAT3 circuit pack keeps the internal Stratum 3 clock at the point at which it was synchronized to the last known good reference signal. The standby TMG/STRAT3 circuit pack remains locked to the active TMG/STRAT3 circuit pack. When the timing reference signal is restored, the active TMG/STRAT3 circuit pack returns to the locked mode.



**Timing provisioning** The following table shows the provisionable parameters for timing reference and system timing:

| Parameter                        | Values                                      | Comments                                                                                                                                                                                                                                                               |
|----------------------------------|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Provisioned Clock Mode           | Free-running<br>or locked                   |                                                                                                                                                                                                                                                                        |
| System SSM Mode                  | Enable or<br>Disable                        | If enable, SSM is stored in S1 byte in the section overhead of the outgoing port of all OC-192 and OC-48 circuit packs<br>If disable, status of STU is sent                                                                                                            |
| Timing Reference Wait-to-Restore | 0<br>20 Seconds<br>1-60 Minutes<br>Infinite | When the signal fails and is restored, the signal status will become WtR for a certain time before it becomes Normal again. That time can be provisioned.                                                                                                              |
| System Timing ASAP               | Default                                     | Alarm severity assignment profile                                                                                                                                                                                                                                      |
| Timing reference QL              | AUTO<br>PRS<br>STU<br>ST2<br>ST3<br>SIC     | See the table above for definitions.<br>If AUTO, the incoming quality level is taken.<br>If not AUTO, then the provisioned value is assigned to the signal.<br>Incoming DS1 reference signals provisioned for SSM must be provisioned with a QL level other than AUTO. |
| System Timing Reference Priority | Disable<br>1<br>2<br>3<br>4<br>5<br>6       | If Disable, the signal is not used for synchronization reference.<br>Priority 1 is highest priority.                                                                                                                                                                   |

**Synchronization status messages**

The synchronization status messages (SSM) are used for quality level (QL) controls. The Synchronization Status Message (SSM) is stored in the S1 byte (b5-b8) of the SONET Section overhead. Synchronization status messages are not available on DS1 lines.

**Incoming timing reference signal status**

The SSM on incoming timing references is used to determine the quality level of that timing reference. That quality level is compared to the provisioned or default value to determine if the timing reference should be used for synchronization. When SSM is enabled and a DS1 timing reference is to be used for synchronization, that reference must be provisioned to a QL level.

The following table shows the signal status of an incoming reference :

| Signal Status         | Meaning                                                                                                                             |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Normal                | The assigned reference signal is not failed and the wait-to-restore timer has expired.                                              |
| Wait to Restore (WtR) | The assigned reference signal is available again after a timing link fail, but the wait-to-restore (WtR) timer has not yet expired. |
| Failed                | Reference has failed. No reference signal is available.                                                                             |
| Not Connected         | The signal is not used for reference.                                                                                               |

Under Failed or Not-Connected status, there is no monitoring for SSM.

**Synchronization status messages and quality levels**

The following table summarizes the SSM status and values for incoming lines when the signal status is Normal or WtR. The table also lists the reported quality level (QL) associated with each SSM.

| Received S1/Sa value | Acronym | Reported QL |       |
|----------------------|---------|-------------|-------|
|                      |         | status      | value |
| 0000                 | STU     | VALID       | STU   |
| 0001                 | PRS     | VALID       | PRS   |
| 0010                 | PRC     | INVALID     | -     |
| 0011                 | -       | INVALID     | -     |
| 0100                 | SSU-T   | INVALID     | -     |
| 0101                 | -       | INVALID     | -     |
| 0110                 | -       | INVALID     | -     |

| Received<br>S1/Sa value | Acronym | Reported QL |       |
|-------------------------|---------|-------------|-------|
|                         |         | status      | value |
| 0111                    | ST2     | VALID       | ST2   |
| 1000                    | SSU-L   | INVALID     | -     |
| 1001                    | -       | INVALID     | -     |
| 1010                    | ST3     | VALID       | ST3   |
| 1011                    | SEC     | INVALID     | -     |
| 1100                    | SIC     | VALID       | SIC   |
| 1101                    | -       | INVALID     | -     |
| -                       | ST4     | INVALID     | ST4   |
| 1110                    | RES     | VALID       | RES   |
| 1111                    | DUS     | VALID       | DUS   |

### Synchronization status message acronyms

The status acronyms are defined in the following table:

| Status | Meaning                                   |
|--------|-------------------------------------------|
| DUS    | Don't use for synchronization             |
| PRC    | primary reference clock                   |
| PRS    | Stratum-1                                 |
| RES    | Reserved for network synchronization use  |
| SEC    | SDH equipment clock                       |
| SIC    | SONET internal clock                      |
| SSU-L  | synchronization supply unit—local node    |
| SSU-T  | synchronization supply unit—transfer node |
| ST2    | Stratum-2                                 |
| ST3    | Stratum-3                                 |
| ST4    | Stratum-4                                 |
| STU    | Synchronized—traceability unknown         |

**Timing reference selection** The master TMG/STRAT3 circuit packs select one of the provisioned timing reference signals as the active timing reference for the system.

### Provisioning options

The system selects the active timing reference signal based on the provisioned quality level (if the quality level is provisioned) and system timing reference priority parameters. System status message (SSM) and quality levels are not supported on external DS1 input: for those lines, the provisioned QL value is used.

### Active timing reference election when SSM is enabled

When SSM is enabled, the following criteria is used to select the active timing reference.

| Condition                                                                                      | Result                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Timing reference available for selection                                                       | Must meet all of the following criteria: <ul style="list-style-type: none"> <li>• enabled</li> <li>• no lockout request active</li> <li>• signal status is Normal</li> <li>• QL level higher than DUS</li> </ul>                                                                                                           |
| Active timing reference selection                                                              | Available timing reference with the highest QL is selected as the active timing reference.                                                                                                                                                                                                                                 |
| More than one available timing reference with the same QL                                      | Available timing reference with the highest provisioned System Timing Reference Priority is selected as the active timing reference.                                                                                                                                                                                       |
| More than one available timing reference with the same QL and system timing reference priority | The system selects the active timing reference according to the following (in descending order): <ul style="list-style-type: none"> <li>• EXTREF1 (highest priority)</li> <li>• EXTREF2</li> <li>• LINE1</li> <li>• LINE2</li> <li>• LINE3</li> <li>• LINE4</li> <li>• LINE5</li> <li>• LINE6 (lowest priority)</li> </ul> |
| No available timing references.                                                                | The system performs a synchronization mode switch and enters the holdover mode.                                                                                                                                                                                                                                            |

**Active timing reference selection when SSM is disabled**

When SSM is disabled, the following criteria is used to select the active timing reference.

| Condition                                                                               | Result                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Timing reference available for selection                                                | Must meet all of the following criteria: <ul style="list-style-type: none"><li>• enabled</li><li>• no lockout request active</li><li>• signal status = Normal</li></ul>                                                                                                                                           |
| Active timing reference selection                                                       | Available timing reference with the highest provisioned System TIming Reference Priority is selected as the active timing reference.                                                                                                                                                                              |
| More than one available timing reference with the same system timing reference priority | The system selects the active timing reference according to the following (in descending order): <ul style="list-style-type: none"><li>• EXTREF1 (highest priority)</li><li>• EXTREF2</li><li>• LINE1</li><li>• LINE2</li><li>• LINE3</li><li>• LINE4</li><li>• LINE5</li><li>• LINE6 (lowest priority)</li></ul> |
| No available timing references.                                                         | The system performs a synchronization mode switch and enters the holdover mode.                                                                                                                                                                                                                                   |

**Synchronization reference protection switching command priorities**

The following table shows the synchronziation reference protection switching command priorities.

| <b>Command priority</b>        | <b>Effect</b>                                                                    |
|--------------------------------|----------------------------------------------------------------------------------|
| Forced/manual switch reference | The selected reference becomes the active reference.                             |
| Clear reference switch         | The system rules (provisioned options) will determine the active reference.      |
| Lockout reference              | The selected reference will never become the active reference.                   |
| Clear lockout                  | The selected reference is again eligible to be selected as the active reference. |

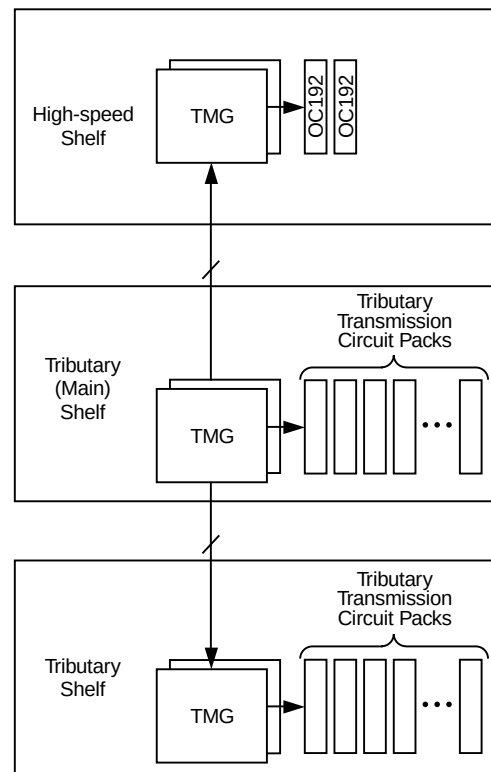
For more information about the **Fault>Timing/Sync Protection Switch>System Timing Reference Switch** command, refer to the online help available with the WaveStar CIT.

**Timing distribution**

The WaveStar TDM 2.5G/10G (2-Fiber) system distributes timing from the master TMG/STRAT3 circuit packs in the first 2.5G tributary (MAIN 2.5G I/O) shelf.

The active master TMG/STRAT3 circuit pack derives system timing from the internal stratum 3 oscillator (free running mode) or the active timing reference signal (locked mode). The standby master TMG/STRAT3 circuit pack and the TMG/STRAT3 circuit packs in the other shelves synchronize their internal Stratum 3 clocks to the active master TMG/STRAT3 circuit pack. Then all the timing generator circuit packs distribute clock signals to all the other circuit packs in the system.

The following figure shows the timing distribution for the WaveStar TDM 2.5G/10G (2-Fiber) system.



NC10G033

**External DS1 timing outputs**

The master TMG/STRAT3 circuit packs also provide external DS1 output timing signals. The external DS1 output timing signals are derived from the line timing reference of the first OC-192 line. The external DS1 output timing signals may be either DS1 SF (super frame) or DS1 ESF (extended super frame). Each master TMG/STRAT3 circuit pack provides one external DS1 output signal. The external DS1 output signals from the active and standby master TMG/STRAT3 circuit packs may be the same, or one may be DS1 SF and the other DS1 ESF. When a master TMG/STRAT3 circuit pack fails or is removed, that external DS1 output signal is no longer available.

The external DS1 output signals are designed to drive timing functions external to the WaveStar TDM 2.5G/10G (2-Fiber) system (such as a BITS clock input). They are accessible from the backplane.

The external DS1 output signals may be enabled or disabled as shown in the following table:

| <b>If the Timing Output Port is</b> | <b>Then</b>                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Disabled                            | No signal is available on the timing output port                                                                                                                                                                                                                                                                                                                        |
| Enabled                             | Output may be “not connected” or “line”                                                                                                                                                                                                                                                                                                                                 |
| Enabled—not connected               | If format is SF: AIS is sent on the output.<br>If format is ESF: All ones (1111) are sent on the output (QL = DUS).                                                                                                                                                                                                                                                     |
| Enabled—line                        | <ul style="list-style-type: none"> <li>• If the first line timing reference is connected and not failed, a correct DS1 signal is sent.</li> <li>• If the first line timing reference is not connected or is declared failed: <ul style="list-style-type: none"> <li>• If format is SF: AIS is sent</li> <li>• If format is ESF: QL = DUS is sent</li> </ul> </li> </ul> |



## Summary

---

**Overview** This chapter discussed the following elements of the WaveStar TDM 2.5G/10G (2-Fiber) system:

- Control architecture and its components
- Transmission architecture and its components
- Synchronization architecture and its components

**Control architecture** The WaveStar TDM 2.5G/10G (2-Fiber) shelf functions are controlled by shelf controller circuit packs and by function microcontrollers on the port units (transmission circuit packs). The shelf controllers control the port units and also the timing and switching circuit packs, which have no internal function controllers. Overall system operation is controlled by signals received over the SONET DCC channels or from the user interface.

**Transmission architecture** The WaveStar TDM 2.5G/10G (2-Fiber) add/drop multiplexer uses two port units (transmission interface circuit packs) to connect as a node on an OC-192 2-fiber BLSR. It uses up to 16 tributary port unit circuit packs on each tributary shelf to connect add/drop traffic to other network elements. The port units in the tributary shelves can connect as nodes in any mix of supported network configurations, including OC-48 BLSRs. Traffic can be connected between any of the ports.

**Synchronization architecture** The WaveStar TDM 2.5G/10G (2-Fiber) system can use any of three synchronization modes:

- Free-running
- Locked
- Holdover

The system also supports SSM and QL, which allow the timing selections to be based in part on the quality level of the received signals.

Using the WaveStar CIT or a remote interface, the user can switch synchronization modes and references. The user can also nonrevertively switch between the active and standby TMG/STRAT3 timing generator circuit packs.







# 7 Provisioning, Security, and Administration

## Overview

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- Objectives** On completion of this chapter, you should be knowledgeable on the following:
- Changing passwords, creating and provisioning user logins, and performing system security administration
  - Setting system parameters
  - Provisioning parameters for equipment and protection groups
  - Creating new entities
  - Deleting equipment and protection groups
  - Configuring cross-connections
  - Configuring alarm severity assignment profiles
- Purpose** This chapter provides an introduction to the administration and configuration of the system. Administration and configuration of the system consist of performing functions necessary for proper system operations and configuring parameters for local system operation. In general, the functions performed in administration and configuration are provisioning functions.

**Related information** For related information, see

- *Chapter 8, Performance Monitoring*
- *Chapter 2, Network Topologies*

For fault management information, refer to *WaveStar TDM 2.5G/10G Alarm Messages and Trouble Clearing Guide*.

**Contents** This chapter provides the following information.

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# General Provisioning

## Overview of General Provisioning

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|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose of provisioning</b>      | Provisioning is assigning values to parameters within a network element (NE) that define how you interface with a NE and how the NE operates on various installed entities. Parameters may be provisioned either locally or remotely. The values of the provisioned parameters determine many of the operating characteristics of a network element.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Provisioning data</b>            | <p>There are three complete sets of data (parameters and their values) in the system under normal conditions:</p> <ul style="list-style-type: none"><li>• The first set of data contains the system parameters and their original values (values assigned to a parameter at the factory). This set is located in the nonvolatile memory.</li><li>• The second set of data contains the system parameters and their current values (values currently being used by the system). This set is also located in the nonvolatile memory.</li><li>• The third set of data contains the system parameters and their current values. This set is located in the volatile memory.</li></ul> <p>You can retrieve the values of all provisioned parameters, all reportable system states, and all reportable system status using a view or reports command.</p> |
| <b>Local or remote provisioning</b> | System software allows local and remote provisioning of all user-provisionable parameters using the WaveStar CIT or from an operations system (OS). The provisionable parameters and values (current and original) are maintained in the nonvolatile memory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

**Types of provisioning**

There are four types of provisioning:

- Auto provisioning
- Preprovisioning
- Provisioning
- Deprovisioning

Auto-provisioning allows the NE to discover the NE hardware configuration and to create the associated entities automatically using original or preprovisioned parameters. Provisioning and preprovisioning are very similar activities that impact the configuration of an NE. Provisioning affects changes to entities known by the NE. Preprovisioning allows the user to make changes to parameters that will influence how an entity will perform in advance of the equipment being present. Deprovisioning is the removal of provisioned parameters.



## Auto provisioning

---

### **What is auto provisioning**

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

### **Original value provisioning**

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

### **Circuit pack replacement provisioning**

Replacement of a failed circuit pack is simplified by the automatic provisioning of the original circuit pack values. The System Controller circuit packs maintain a provisioning map of the current provisioning values. When a transmission and/or a timing circuit pack is replaced, the System Controller automatically downloads the previous provisioning parameters and values that are stored in the NVM to the new circuit pack.

### **Equipment removal**

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

**Items auto provisioned**

Some items that are auto-provisioned include the following:

- Two super-user logins
- System target identifier (TID) (which must be changed at initial start-up)
- Default threshold-crossing alert (TCA) profiles
- System control circuit packs
- Synchronization circuit packs
- Synchronization default mode
- Default alarm severity assignment profiles (ASAPs)

**Items not auto provisioned**

Some items that are NOT auto-provisioned include the following:

- Bays
- Shelves
- Optical port protection groups
- Cross-connections



# Preprovisioning

---

**What is preprovisioning**

Preprovisioning allows you to assign parameter values for an entity before some of the equipment is installed. Parameter modifications may be initiated locally or remotely with a WaveStar CIT or an operations system (OS). Preprovisioning requests may alter default parameter values or parameter values associated with earlier preprovisioned requests.

Preprovisioning allows you to separate the tasks associated with configuring a node to provide service from the manual tasks performed at the node.

**Preprovisioning circuit packs**

To simplify circuit pack installation, parameters can be preprovisioned before inserting the corresponding circuit pack. All system parameters and values (current and original) are preserved in the system's nonvolatile memory. The parameters and values are protected by the nonvolatile memory if a power failure occurs and are retrievable on demand regardless of the means used for provisioning. The appropriate parameters are automatically downloaded when the corresponding circuit pack is installed. If the proper circuit pack is not installed in an already preprovisioned slot, then an alarm will occur.



# Provisioning

---

**Provisioning as a type**

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

**Provisioning hierarchy**

Some provisioning parameters relate to other provisioning parameters and must be completed in a hierarchical fashion. The following is the required order of provisioning or creating new entities if supported by the system and the current software release:

1. Bay
2. Shelf
3. Slot
4. Circuit pack
5. Port
6. Port protection group
7. Tributary
8. Cross-connection

You can retrieve the values of all provisioned parameters, all reportable system states, and all reportable system status using a view or reports command.



# Deprovisioning

---

**Deprovisioning function**

Deprovisioning is the reverse-order process of provisioning. Deprovisioning modifies the NVM to remove the programmed parameters of an entity. Physically removing an entity from its current shelf slot does not remove any existing provisioning. Existing provisioning is removed by deprovisioning the entity. For example, to deprovision a circuit pack you must:

1. Remove all cross-connections from the circuit pack ports.
2. Delete any port protection group associated with any port on the circuit pack.
3. Deprovision any timing associated with the circuit pack being deleted.
4. Delete the circuit pack.



# Administration

## Overview of Administration

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|                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Objectives of administration</b>        | <p>The objectives of system administration include performing the following tasks:</p> <ul style="list-style-type: none"><li>• Changing passwords</li><li>• Changing notifications</li><li>• Performing security administration</li><li>• Viewing NE administration</li><li>• Changing the network element login banner (Release 6 and later)</li><li>• Viewing MAC addresses</li><li>• Setting TIDs</li><li>• Setting network element remote status parameters (Release 6 and later)</li><li>• Provisioning data communications</li><li>• Setting T1.245 DUA/RA</li><li>• Sending TARP PDU request</li><li>• Viewing OSI routing map</li><li>• Viewing OSI neighbor map</li></ul> |
| <b>Method of performing administration</b> | <p>The <b>Administration</b> menu on the WaveStar CIT System View window allows you to perform administration functions.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |



**Security level required**

Only users with at least an S2 security privilege code have access to the **Administration** menu.

Security administration generally requires a user who has been assigned a high enough security authorization level to enter, modify or delete user logins; to modify system security parameters; and to logout other users. The security administrator may be a Super User who has a security authorization level of 5, or it could be a non-Super User who is assigned a security level of 4 or 5. Generally, provisioning of system wide security parameters requires an S4 user privilege code. Provisioning user specific security parameters requires an S5 user privilege code. See “User Types” (7-35) and “User Privilege Codes” (7-38) for more information on authorization levels.



## Changing Passwords

---

**Method of changing passwords**

The **Administration > Change Password** command on the WaveStar CIT System View menu allows any user to change his or her own password. Only a user with the proper security authorization level can change another user's login or password. See "User Provisioning" (7-29) for information on changing other user's passwords. Any changes made to a user's provisioning takes place the next time the user logs in. If the user is currently logged in, no changes take place until that user logs off and logs back in.

**Security level required**

Any user may change his or her own password.

**Valid passwords**

A valid password consists of a sequence of characters ranging from a minimum of six characters to a maximum of ten characters. The password must start with a letter. The password must also contain at least two non-alphabetic characters, with at least one of the two non-alphabetic characters being a symbolic character. User passwords are case sensitive. For details, see "Characters Allowed in a Password" (7-17) and "Characters Not Allowed in a Password" (7-18).

**When to change password**

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



## Characters Allowed in a Password

---

### Table of allowed characters in a password

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

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



## Characters Not Allowed in a Password

---

**Table of characters not allowed in a password**

The following table shows the characters that are not allowed in a valid password.

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



## Changing Notifications

---

- What are Notifications** The NE provides a set of autonomous messages originated by the NE to advise the user of internal activities. Security provisioning allows a user to identify or change the autonomous messages that he or she receives. Autonomous messages are classified by the following types of information:
- Database changes
  - State changes
  - Protection switch notifications
  - Alarm notifications
  - Own command responses only
  - All user's command responses
  - All the notifications and responses listed above
- See "Notification Registration List" (7-41) for related information.
- Method of changing notifications** The **Administration > Change Notifications** command on the WaveStar CIT System View menu allows you to change the type of autonomous messages that you may receive. The notification registration is initially set by the system security administrator when your login is set up. You may subsequently change the notification types that you receive. Any changes made to a user's provisioning takes place the next time the user logs in. If the user is currently logged in, no changes take place until that user logs off and logs back in. See "Notification Registration List" (7-41) for related information.
- Security level required** All users, except users assigned to the user class of MEMADMIN, have access to change notifications for their own login.
- DBCHG notification sent to the MEMADMIN user class is controlled by their user class, not by the Notification Registration List. MEMADMIN users are not allowed to register for any autonomous notification classes.



## Notification Registration and Response Types

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### **Database change notification**

A DBCHG autonomous message is generated in response to any change in the system database without regard to the cause of the change. Database changes include changes in or creation of entities, changes in user provisionable parameters, or deletion of entities.

### **State change notification**

An STCHG autonomous message is generated to report changes to parameters that are not user provisionable.

### **Protection switch change notification**

A PSCHG autonomous message is generated in response to any equipment protection switch of a duplex equipment unit pair. The message indicates the equipment that was placed in the active state. There is one autonomous message for each circuit pack that becomes active.

### **Alarm notifications**

An ALARM autonomous message is generated to report each alarm that has an alarm level of critical, major, or minor. The alarm severity is included in the message. For each alarm reported in the autonomous message, there is a corresponding clearance message generated when the alarm clears.

### **All users command response notification**

A RESPON autonomous message is generated for each command received and processed by the system, whether or not the command was successful. The contents of this message is the same as the response provided to the originator. The NE checks to identify which users are subscribed to receive this message and sends it to all of them.

### **All notification registrations**

The ALL notification type allows you to subscribe to all messages for all the notification types.

### **Users own command responses only**

Users have the ability to inhibit the reception of autonomous messages to themselves by subscribing to none of the other notification types. Users subscribing to “users own command responses only” receive only messages in response to their own actions.



## Network Element (NE) Security

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**NE security administration functions**

Security administration involves the following:

- Viewing user logins
- Viewing logged-in users
- Logging out NE user
- Enabling user logins
- Disabling user logins
- User provisioning
- Changing super user login IDs (Release 5 and later)
- Security provisioning

**Method of security administration**

The **Administration > Security** command from the WaveStar CIT System View menu allows an authorized user to perform security administration.

**Security level required**

Only users with at least an S2 security privilege code have access to the security administration view screens. Only users with an S5 security privilege code have access to security administration provisioning screens.



## Viewing User Logins

---

|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>User login information</b>        | <p>The following information is available on authenticated user logins:</p> <ul style="list-style-type: none"><li>• User ID</li><li>• Authorization codes</li><li>• User type</li><li>• User priority level</li><li>• Password aging interval</li><li>• Inactivity timeout period</li><li>• Message screening codes</li><li>• User class</li><li>• Early initialization observability</li></ul> <p>See “User Login Security Information” (7-23) for a description of these parameters.</p> |
| <b>Method of viewing user logins</b> | <p>The <b>Administration &gt; Security &gt; View User Logins</b> command allows an authorized user to view information on user logins.</p>                                                                                                                                                                                                                                                                                                                                                 |
| <b>Security level required</b>       | <p>Only users with at least an S2 security privilege code have access to the administration view user logins screens.</p>                                                                                                                                                                                                                                                                                                                                                                  |





## User Login Security Information

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|                                       |                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>User ID</b>                        | User ID displays the list of valid NE user login IDs. See “User Login IDs and Passwords” (7-30) for more information.                                                                                                                                                                                                                                                              |
| <b>Authorization codes</b>            | Security types or functional job categories (M, P, PM, S, T) list the authorization level for each functional job category. See “User Types” (7-35) and “User Privilege Codes” (7-38) for more information.                                                                                                                                                                        |
| <b>User type</b>                      | User types list the type of user if the authorization levels for each job category listing fall within a predefined set of user privilege codes. See “User Types” (7-35) for more information.                                                                                                                                                                                     |
| <b>Priority level</b>                 | Priority level is the user’s priority for the execution of commands. For example, if two commands are executed at the same time for the same NE, the command from the user with the highest command priority level is executed first. The command priority level range of values is from 1 to 5. The highest command priority level is 5. The default command priority level is 1. |
| <b>Password aging</b>                 | Password aging lists the period of time in days before a user’s password expires. The time is an integer with the value of zero or in the range of 7 to 999 days. Values set to zero mean the function is disabled.                                                                                                                                                                |
| <b>User inactivity timeout period</b> | User inactivity timeout period indicates the number of minutes of session inactivity before a user is logged out. A value of zero indicates the parameter is disabled. See “User Inactivity Timeout Period” (7-34) for more information on the user inactivity timeout period.                                                                                                     |
| <b>Message screening codes</b>        | The message screening codes show the notifications and response types for which the user subscribes. See “User Notification Registration and Response Types” (7-42) for a description of the response types.                                                                                                                                                                       |

**User class** User Class indicates the class of user and may be one of the following:

- MEMADMIN
- OTHER

See “User Class” (7-32) for more information on user class.

**Early initialization observability** Early initialization observability shows whether the user can log in before the shelves finish initializing.



## Viewing Logged-In Users

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**View logged-in users**      The View Logged-In Users function allows you to view the login ID of users that are presently logged into the system.

**Method of viewing logged-in users**      The WaveStar CIT System View menu **Administration > Security > View Logged-In Users** command allows you to view the login ID of users that are presently logged into the system.

**Security level required**      Only users with at least an S2 security privilege code have access to viewing logged-in users.



## Logging Out NE Users

---

**Logout NE user**     The **Administration > Security > Logout NE User** command allows an authorized user to logout individual users or all users that are logged into the system.

**Security level required**     Only users with an S5 security privilege code have access to the Logout User Screen.



## Disabling a User Login

---

**Disable User Login**      Disabling a user login prevents the selected user from logging into the NE. If the user is currently logged into the NE, that user is logged out and cannot log back in to the NE while the login is disabled.

An authorized user can disable only a selected user login or all user logins except Super User logins. If selected users are currently logged in, the users are logged out.

**Method of disabling user logins**      The **Administration > Security > Disable User Login** command allows an authorized user to disable individually selected user logins or all user logins into the system.

**Security level required**      Only users with an S4 security privilege code have access to the Security provisioning screen. Only Super Users or users with an S5 security privilege code can provision parameters in the Security screens.



## Enabling a User Login

---

**Enable User Login**      Enabling a user login allows a previously disabled user access to the NE.

**Method of enabling user logins**      The **Administration > Security > Enable User Login** command allows an authorized user to enable individually selected user logins or all user logins into the system.

**Security level required**      Only users with an S4 security privilege code have access to the Security provisioning screen. Only Super Users or users with an S5 security privilege code can provision parameters in the Security screens.



## User Provisioning

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|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>User provisioning functions</b> | <p>User provisioning allows an authorized user to perform the following:</p> <ul style="list-style-type: none"><li>• Create a new user with proper authentication parameters</li><li>• Change an existing user's authentication parameters</li><li>• Delete an existing user</li><li>• Assign a default user type to a new or existing user</li><li>• Set user command priority levels</li><li>• Assign or modify user privilege codes</li><li>• Assign or modify user's notification registration types</li></ul> |
| <b>Method of user provisioning</b> | <p>The <b>Administration &gt; Security &gt; User Provisioning</b> command from the WaveStar CIT System View menu allows an authorized user to perform user provisioning.</p>                                                                                                                                                                                                                                                                                                                                       |
| <b>Security level required</b>     | <p>Only users with an S5 security privilege code have access to user provisioning.</p>                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>New/existing user selection</b> | <p>User provisioning allows you to create a new user login ID with associated password and security parameters. User provisioning also allows you to select an existing user in order to delete the user, change the user's password, or modify the security parameters for the existing user.</p>                                                                                                                                                                                                                 |



## User Login IDs and Passwords

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|                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>User logins and passwords</b>                     | The WaveStar CIT always tries to connect to a selected NE using the same login and password you have for the WaveStar CIT. If your login and password are the same for both the selected NE and WaveStar CIT, then you are automatically connected to the selected NE. If your login and password are different for the selected NE and WaveStar CIT, then you must enter the correct login and password to connect to the selected NE. Login and password parameters must be administered on a per-NE basis. You may have a different login and/or password on one NE than you have on other NEs. Each NE supports up to 500 logins in the NE security database. |
| <b>Method of creating or changing user login IDs</b> | The <b>Administration &gt; Security &gt; User Provisioning</b> command from the WaveStar CIT System View menu allows an authorized user to perform user provisioning.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Security level required</b>                       | Only users with an S5 security privilege code have access to user provisioning.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Default logins and passwords</b>                  | Two default Super User logins and passwords are initially installed in the WaveStar CIT and the network element (NE). The default values for the Super User logins are LUC01 and LUC02 (LUC-zero-one and LUC-zero-two). The associated passwords are LUC+01 and LUC+02 (LUC-plus sign-zero-one and LUC-plus sign-zero-two). The default password must be changed the first time a Super User logs into the NE.                                                                                                                                                                                                                                                    |
| <b>Super user logins</b>                             | The Super User logins have full privileges in all functional categories. Each user login is assigned a combination of user privilege codes for each functional category to control access to various system functions. Super User logins have the highest authorization level of five (5) for all functions. The user privilege codes for the Super User logins cannot be changed and no other user can be assigned an authorization level of 5 in <i>all</i> functional categories. See “User Class” (7-32) and “User Privilege Codes” (7-38) for more information on user types and associated user privilege codes.                                            |



|                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Changing super user login IDs</b>     | <p>The Super User login IDs cannot be removed or changed, and no other Super User logins can be added. If both Super User passwords are forgotten, you must reload the original system software and database to recover the default logins and passwords.</p> <p><b>Important!</b> Reloading the original system software and database will reset all system provisioning, including cross-connections, to the original factory default values.</p>   |
| <b>Changing non super user login IDs</b> | <p>The login IDs of non-Super Users cannot be changed, but they can be deleted. Only users with a security user privilege code of S5 can delete other user logins.</p>                                                                                                                                                                                                                                                                                |
| <b>Logging in for the first time</b>     | <p>All users, including original Super Users, must change their originally assigned password on the first log-in attempt.</p>                                                                                                                                                                                                                                                                                                                         |
| <b>Valid login</b>                       | <p>A valid login consists of any sequence of characters ranging from a minimum of one character to a maximum of ten characters. User logins are case sensitive. The following characters are allowed in a login:</p> <ul style="list-style-type: none"><li>• Uppercase letters (A to Z)</li><li>• Lowercase letters (a to z)</li><li>• Digits (0 to 9)</li></ul>                                                                                      |
| <b>Valid passwords</b>                   | <p>A valid password consists of a sequence of characters ranging from a minimum of six characters to a maximum of ten characters. The password must start with a letter. The password must also contain at least two nonalphabetic characters, with at least one of the two nonalphabetic characters being a symbolic character. User passwords are case sensitive. For detailed information on password format, see “Changing Passwords” (7-16).</p> |



## User Class

---

**User class types**      User Class indicates the class of user and may be one of the following:

- MEMADMIN
- OTHER

**Memory Administration (MEMADMIN) user**      MEMADMIN is a special user class for TL1 Memory Administration operation system (OS) users.

**Other (OTHER) users**      Users with the user class of OTHER are any other users.



## User Password Aging Interval

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|                                         |                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Password aging</b>                   | The password aging interval is the number of days allowed before a user's password expires. When a user's password expires, the user is prompted to select a new password prior to login. The values for the password aging interval are zero (0) or a range from 7 to 999 days. A value of zero (0) disables password aging. The default value is 90 days. |
| <b>Method of setting password aging</b> | The <b>Administration &gt; Security &gt; User Provisioning</b> command from the WaveStar CIT System View menu allows an authorized user to perform user provisioning.                                                                                                                                                                                       |
| <b>Security level required</b>          | Only users with an S5 security privilege code have access to user provisioning.                                                                                                                                                                                                                                                                             |



## User Inactivity Timeout Period

---

**Inactivity timeout period** The inactivity timeout period is the number of minutes after which a user with an inactive session is logged out. The range of values for the inactivity timeout period is one (1) to 999 minutes. The inactivity timeout period can also be disabled. The default value is 30 minutes.

**Method of setting inactivity timeout period** The **Administration > Security > User Provisioning** command from the WaveStar CIT System View menu allows an authorized user to perform user provisioning.

**Security level required** Only users with an S5 security privilege code have access to user provisioning.



## User Types

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|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>What are user types</b>                      | System users are categorized into various user types depending on the type of job the user performs. Some users may have full access to all functions while other users have restricted access to some functions. Each system user is assigned a user type with associated user privilege codes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Method of setting or changing user types</b> | The <b>Administration &gt; Security &gt; User Provisioning</b> command from the WaveStar CIT System View menu allows an authorized user to perform user provisioning.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Security level required</b>                  | Only users with an S5 security privilege code have access to user provisioning.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Predefined user types</b>                    | <p>There are six predefined user types. Five of the predefined user types have preassigned user privilege codes (See “User Privilege Codes” (7-38).):</p> <ul style="list-style-type: none"> <li>• Super User – M5, P5, PM5, S5, T5</li> <li>• Privileged User – M5, P5, PM5, S3, T5</li> <li>• General User – M4, P3, PM4, S1, T4</li> <li>• Maintenance User – M4, P3, PM1, S1, T4</li> <li>• Reports Only – M1, P1, PM1, S1, T1</li> <li>• Other</li> </ul> <p>Users assigned privilege codes that do not match any one of the above five predefined types are classified as “Other.” Any combination of user privilege codes may be assigned to a user classified as “Other” with the following exception: no user except the default Super User login can have an authorization level of 5 in <i>all</i> functional categories.</p> |

|                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Super User</b>       | <p>Super Users have access to all user commands including the following:</p> <ul style="list-style-type: none"><li>• Adding or deleting users</li><li>• Modifying user passwords and user priority levels</li><li>• Assigning user privilege codes and user priority levels</li><li>• Assigning and modifying the user notification registration list of other users</li><li>• Modifying NE security variables</li><li>• Forcing logout of other users</li><li>• Retrieving security logs</li></ul> |
| <b>Privileged User</b>  | <p>Privileged Users have access to all user commands, including those that are service affecting, except the security-related capabilities that are reserved for users with a security authorization level of 5.</p>                                                                                                                                                                                                                                                                                |
| <b>General User</b>     | <p>General Users have access to all user commands except:</p> <ul style="list-style-type: none"><li>• NE security administration (has capability to change own password)</li><li>• System initialization capabilities</li><li>• Software installation capabilities</li><li>• NE security access capabilities</li></ul>                                                                                                                                                                              |
| <b>Maintenance User</b> | <p>Maintenance Users have the following capabilities:</p> <ul style="list-style-type: none"><li>• Testing capability</li><li>• Retrieving NE information</li><li>• Limited service affecting commands</li><li>• Changing own password</li><li>• Modifying the set of notification types on their own User Notification Registration List within the maximum list set up by the Security Administrator.</li></ul>                                                                                    |

**Reports Only User**

Reports Only Users have access only to those capabilities which retrieve information but do not modify the system, with the following exceptions:

- Changing own password
- Modifying the set of notification types on their own User Notification Registration List within the maximum list set up by the Security Administrator.

Reports Only users do not have read access to user login information of other users.



## User Privilege Codes

---

**User privilege codes defined** User privilege codes determine the tasks you are permitted to perform. User privilege codes are one- or two-letter and one-digit numbers associated with functional job categories. The letters represent the functional job category. The one-digit number indicates your authorization level. You are given user privilege codes when your login is created or modified.

**Functional categories** The five functional job categories and associated user privilege codes are as follows:

- Maintenance (M0, M1, M2, M3, M4, M5)
- Provisioning (P0, P1, P2, P3, P4, P5)
- Performance Monitoring (PM0, PM1, PM2, PM3, PM4, PM5)
- Security (S1, S2, S3, S4, S5)
- Test (T0, T1, T2, T3, T4, T5)

**Authorization levels** The authorization level ranges from zero (0), “No Authorization”, to five (5) for all functional categories except security which ranges from 1 to 5. All users must have a security authorization level of at least 1. An authorization level of 0 disables any user privileges for the associated functional category. Authorization level 0 is displayed as “No Authorization”.

An authorization level of 1 allows the minimum level of privileges and a level of 5 allows all privileges for a functional category. You must have an authorization level that is equal to or greater than the authorization level required by the command you want to execute in each functional category. The default authorization level is 1 for all functional categories that are not associated with predefined user types.



**Typical job functions** The following table shows typical functionality for each of the functional job categories.

| Functional Category         | Typical Functionality                                                                                                                                                                                                                 | TL1 Examples                                                                                                                      |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Security (S)                | Security administration<br>Software download and install<br>Datacom/protocol provisioning<br>Time of day provisioning<br>Data backup and restore<br>System initialization                                                             | ed-dat; ent-ne-secu;<br>restore-db; cpy-mem;<br>ent-ulsdcc-l3; ent-osi;<br>init-sys                                               |
| Provisioning (P)            | Provisioning for normal transmission operations: <ul style="list-style-type: none"> <li>• Cross-connections</li> <li>• Transmission port provisioning</li> <li>• Circuit connections</li> </ul>                                       | ent-assoc; ent/ed/dlt-crs;<br>ed-eqpt; rtrv-tmslt;<br>rtrv-vc3; set-syncn;<br>ed-rdl; ed-rsvn;<br>ed-stm16                        |
| Maintenance (M)             | Fault management: <ul style="list-style-type: none"> <li>• Protection switching</li> <li>• Environmental alarms and controls</li> <li>• Synchronization switching</li> <li>• Section and line trace</li> <li>• Alarm tests</li> </ul> | test-alm; set-attr-alm;<br>set-attr-cond;<br>ent-asap-prof;<br>ent-protn-grp; inh-alm;<br>init-eqpt; opr-ext-cont;<br>opr-protnsw |
| Performance Monitoring (PM) | Provisioning and retrieving PM data                                                                                                                                                                                                   | init-reg; rtrv-pm;<br>rtrv-tca-asgnmt;<br>rtrv-tca-prof; set-pmday;<br>set-baseline-oline;<br>set-th-supr                         |
| Test (T)                    | Provisioning and operating transmission tests                                                                                                                                                                                         | opr/rls/rtrv-loopback<br>test-auto-local<br>conn/chg/disc-tacc<br>test-trmsn                                                      |



## Priority Level

---

**Priority level defined** The command priority level assigns a priority for the execution of commands. For example, if two commands are executed at the same time for the same NE, the command from the user with the highest command priority level is executed first. The command priority level range of values is from 1 to 5. The highest command priority level is five. The default command priority level is 1.

**Method of setting command priority level** The **Administration > Security > User Provisioning** command from the WaveStar CIT System View menu allows an authorized user to perform user provisioning.

**Security level required** Only users with an S5 security privilege code have access to user provisioning.



## Notification Registration List

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|                                                     |                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Notifications</b>                                | The NE provides a set of autonomous messages originated by the NE to advise the user of internal activities. User provisioning allows an authorized user to identify or change the autonomous messages that another user receives. A user may change their own notifications. See “Changing Notifications” (7-19) for more information. |
| <b>Method of setting notification registrations</b> | The <b>Administration &gt; Security &gt; User Provisioning</b> command from the WaveStar CIT System View menu allows an authorized user to perform user provisioning.                                                                                                                                                                   |
| <b>Security level required</b>                      | Only users with an S5 security privilege code have access to user provisioning.                                                                                                                                                                                                                                                         |



## User Notification Registration and Response Types

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### Notification registration types

The following table lists the Notification and Response types and related registration list values. A combination of these values may be chosen.

| Notification Response Type                       | Registration List |
|--------------------------------------------------|-------------------|
| Responses only to user's own actions             | OWN               |
| Database changes                                 | DBCHG             |
| Parameter state changes                          | STCHG             |
| Protection switch changes                        | PSCHG             |
| Alarm notifications                              | ALARMS            |
| All user's command responses                     | RESPONS           |
| All the notifications and responses listed above | ALL               |

DBCHG notification sent to the MEMADMIN user class is controlled by their user class, not by the Notification Registration List. MEMADMIN users are not registered for any autonomous notification classes.

### User responses only (OWN)

Users have the ability to inhibit the reception of autonomous messages to themselves by subscribing to none of the other notification types. Users assigned to this list only receive messages in response to their own actions.

### Database change notification (DBCHG)

A DBCHG autonomous message is generated in response to any change in the system database without regard to the cause of the change. This includes changes in entities or creation of entities, changes in user provisionable parameters, or deletion of entities.

### State change notification (STCHG)

An STCHG autonomous message is generated to report changes to parameters that are not user provisionable.

**Protection switch change  
notification (PSCHG)**

A PSCHG autonomous message is generated in response to any equipment protection switch of a duplex equipment unit pair. The message indicates the equipment that was placed in the active state. There is one autonomous message for each circuit pack that becomes active.

**Alarm notifications  
(ALARMS)**

An ALARM autonomous message is generated to report each alarm that has an alarm level of critical, major, or minor. The alarm severity is included in the message. For each alarm reported in the autonomous message, there is a corresponding clearance message generated when the alarm clears.

**Command response  
notification (RESPONS)**

A RESPONS autonomous message is generated for each command received and processed by the system, whether or not the command was successful. The contents of this message is the same as the response provided to the originator. The NE checks to identify which users are subscribed to receive this message and sends it to all the subscribed users.

**All notifications (ALL)**

The ALL notification type allows you to subscribe to all messages for all the notification types.



## Security Provisioning

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|                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NE security</b>                        | Network element security provisioning consists of provisioning intervals and thresholds relating to user login attempts and password protection. Security provisioning parameters apply to all user login IDs.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Method of provisioning NE security</b> | The <b>Administration &gt; Security &gt; Security Provisioning</b> command allows an authorized user to perform security provisioning.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Security level required</b>            | Only users with at least an S4 security privilege code have access to the Security Provisioning Screen.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>User ID lockout threshold</b>          | <p>The User ID Lockout Threshold is the number of sequential invalid login attempts after which a user id will be locked out and an intruder alert alarm is raised. The threshold value is an integer with a value ranging from 2 to 99 login attempts. The default threshold value is 5.</p> <p>Since the WaveStar CIT always attempts to login to a NE using the same login ID as for the WaveStar CIT, if the login ID is different on the NE then the first attempt to login will count as one failed login attempt. If the User ID Lockout Threshold is set to 2, then only one more failed login attempt is permitted.</p> |
| <b>User ID lockout interval</b>           | The User ID Lockout Interval is the number of minutes a user ID will be locked out of the system after the number of sequential login attempts exceeds the User ID Lockout Threshold. The number of minutes ranges in value from 1 to 99. The default value is 10. Setting the User ID Lockout Interval parameter to “Disable” eliminates user ID lockout.                                                                                                                                                                                                                                                                       |
| <b>User ID aging period</b>               | The user ID aging period is the number of days within which a non-Super User needs to log in or their login is automatically disabled. A Super User or system administrator with S5 security privileges can re-enable the login. This parameter provides a means for disabling inactive logins. The range of values is from 1 to 999 days or “Disable.” The default value is 10 days. User ID aging does not apply to Super User logins.                                                                                                                                                                                         |

**User ID logout aging period**

The user ID logout aging period is the number of minutes before the network element resets a user's invalid login attempt count. This is the time period within which the counter of invalid sequential attempts are counted and starts at the first invalid login attempt. For example, if the user has 4 sequential invalid login attempts within this aging period, the invalid attempts counter is 4 and the user has not exceeded the threshold of 5 (User ID Lockout Threshold). If the user then has another invalid login attempt within this aging period, the threshold is exceeded and the user is locked out for the period defined by the User Id Lockout Interval.

If the user does not attempt another login within the user ID logout interval, the invalid attempts counter is reset to zero. The default value shall be 60 minutes. The range shall be 1 to 999 minutes



## Viewing NE Administration

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### Access to NE administration information

General information concerning the network element may be obtained using the **Administration > View NE Administration** command from the System View menu of the WaveStar CIT.

### View of NE administration

Viewing NE administration provides the following information:

#### TID/NE Name

This is the user provisioned designation of the network element name.

#### NE Type

This is the type of network element.

#### Release

This field display the network element software release.

#### Remote NE Status

This field displays whether the remote NE status is enabled or disabled.

#### Alarm Gateway

This field displays whether the alarm gateway function is enabled or disabled at the local network element.

#### Alarm Group

This field displays the alarm group to which the local network element belongs

#### Tributary Mode Default

This field displays the current tributary rate mode. This field will display FIXED or ADAPTIVE rate.

#### AID and NSAP information

This box provides information on the relevant DCC controller addresses and NSAP addresses. NSAP address fields are also listed separately.

#### AFI

Displays the 2 character hexadecimal string representing the AFI (authority and format identifier) portion of the NSAP.



**IDI**

Displays the 4 character hexadecimal string representing the IDI (initial domain identifier) portion of the NSAP field to specify the country code.

**DFI**

Displays the 2 character hexadecimal string representing the DFI (DSP format identifier) portion of the NSAP.

**ORG**

Displays the 6 character hexadecimal string representing the ORG (organization or operator identifier) portion of the NSAP.

**RD**

Displays the 4 character hexadecimal string representing the RD (routing domain) portion of the NSAP.

**Area**

Displays the 4 character hexadecimal string representing the area identifier portion of the NSAP.

**System**

Displays the MAC address for this DCC pack, which is also the system portion of the NSAP.

**SEL**

Displays the primary DSA (directory server agent) for the NSAP.



## Changing the NE Login Banner

---

**Method of provisioning NE login banner**

The **Administration > Change NE Login Banner** command allows an authorized user to change the NE login banner to enhance system security.

**Standard or user defined banner**

In Release 6 and later releases, the system supports the standard network element legal notice banner or a user provisioned banner. The length of the user provisioned banner can not exceed 420 alphanumerical characters. A maximum of 11 lines can be entered with no line exceeding 58 characters. Standard ASCII characters are allowed in accordance with *GR-831-CORE, Issue 1*.

**Related information**

For more information about changing the NE login banner, refer to *Operation Task 252, Change Network Element Login Banner*.



## Viewing MAC Addresses

---

**MAC addresses**      The IEEE 802.3 MAC address is stored on the DCC controller (ADJCTL/DCCEI) circuit pack during the manufacturing process. The MAC address is unique for each DCC controller and is used as the system identifier in the NE's NSAP address. Therefore, when a new DCC controller is inserted, the system identifier and the NSAP address automatically changes.

**Method of viewing MAC addresses**      The **Administration > View MAC addresses** command from the WaveStar CIT System View menu allows you to view MAC addresses.



## Setting the Target Identifier (TID)

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|                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Target Identifier (TID)</b>                       | The Target Identifier (TID) is the name used to identify a local network element within a network. The TID is used in all WaveStar CIT and OS reports and is the destination NE for all remote logins. Each NE in the network must have a unique TID which is stored in nonvolatile memory (NVM). The TID is generally set at the time of installation but may be changed.                                                                                                                                                                                              |
| <b>Method of setting the target identifier (TID)</b> | The <b>Administration &gt; Set TID</b> command allows an authorized user to set or change the network element (NE) TID. The NE must be in maintenance condition before setting the TID. See “Circuit Order/Provisioning Tasks”, “Change a Node’s TID (T 329)” for the task-related function.                                                                                                                                                                                                                                                                            |
| <b>Security level required</b>                       | Only users with at least an S3 security privilege code have access to setting or changing the TID.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Characters allowed in the TID</b>                 | <p>Each NE TID must be unique within the network. The TID configuration rules are as follows:</p> <ul style="list-style-type: none"> <li>• The TID may be from 1 to 20 characters in length.</li> <li>• The TID characters may be any of the characters that are allowed in a password with the addition of the underscore “_” character. See “Characters Allowed in a Password” (7-17).</li> </ul> <p><b>Important!</b> TIDs are <i>not</i> case sensitive. Lowercase letters are translated into uppercase letters before they are stored in the network element.</p> |



## Setting the Network Element Remote Status Parameters

---

### **Method of provisioning the network element remote status parameters**

The **Administration > Set NE...** command allows an authorized user to provision the remote network element status parameters.

### **Remote network element status**

In Release 6 and later releases, the system supports remote network element status alarming. Remote network element status alarming is the ability to detect the existence of any alarm, condition, or miscellaneous discrete activation at remote network elements. Remote network element status alarming requires alarm groups to be provisioned with at least one network element provisioned as the alarm gateway network element (AGNE). Each alarm group member communicates over the data communications channel (DCC) with the AGNE. The AGNE broadcasts the information to all alarm group members.

The remote network element status may be enabled or disabled. If the remote network element status is enabled, the local network shares status information with other network elements. If the remote network element status is disabled, the local network element does not share status information with other network elements.

### **Alarm group**

The alarm group specifies the alarm group to which the local network element belongs. An alarm group is a set of network elements that share the remote network element alarm information. The alarm group may have a value of 1 to 255. The maximum number of network elements in an alarm group is limited to the number of network elements in the subnetwork (50 network elements). It is recommended that the alarm group members be in the same routing area.

Alarm group members can be nodes in a ring or any logical grouping such as a maintenance group or geographical group. All alarm group members share alarm information; however, alarm information is not shared between two alarm groups.

Alarm group members perform the following functions:

- Notifies the AGNE of any alarm or status changes
- Notifies the AGNE of any miscellaneous discrete changes
- Reports the alarm and status information of alarm group members
- Reports the miscellaneous discrete changes of alarm group members
- Lists a report of the summary alarm and status conditions of other alarm group members
- Displays composites of the highest alarm level among other alarm group members

**Alarm gateway network elements**

The alarm gateway parameter specifies whether the local network element will serve the other network elements in the alarm group as the alarm gateway. Up to two network elements (for redundancy) in the alarm group may be provisioned as the alarm gateway. The AGNE rebroadcasts alarm and status information from one network element to all network elements in the same alarm group. This information is used to activate remote far-end summary alarm reports and remote office alarms for each network element in the alarm group.

**Related information**

For more information about provisioning remote network element status alarming, refer to *Circuit Order/Provisioning Task 360, Provision Remote Network Element Status Alarming*.



## Data Communications

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|                                                   |                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Data communications functions</b>              | <p>Data communications functions provide the means to perform the following:</p> <ul style="list-style-type: none"><li>• LAN management</li><li>• Network layer provisioning</li><li>• TARP provisioning</li><li>• TARP manual adjacency provisioning</li><li>• TCP/IP provisioning</li><li>• IP Tunnel provisioning</li><li>• TCP/IP gateway provisioning</li></ul> |
| <b>Method of provisioning data communications</b> | <p>The <b>Administration &gt; Data Communications</b> command from the WaveStar CIT System View menu enables the user to perform data communications administration.</p>                                                                                                                                                                                             |
| <b>Security level required</b>                    | <p>All users with an S1 security user privilege code have access to the Administration display screens. Additional privilege codes or higher security user privilege codes may be required for displaying and provisioning the various functions of data communications.</p>                                                                                         |
| <b>Related information</b>                        | <p>See <i>Chapter 4, Operations Interfaces</i>, for detailed information on data communications concepts and arrangements.</p>                                                                                                                                                                                                                                       |



# LAN Management

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**Overview** This section provides information on LAN management provisioning, a part of data communications provisioning.

**Method of LAN management** The **Administration > Data Communication** command (LAN Management tab) from the WaveStar CIT System View menu enables you to perform LAN management for a selected DCC circuit pack.

**Security level required** Only users with at least an S4 security privilege code have access to LAN management.

**Internal LAN settings** Individual parts of a network element are interconnected through an internal LAN called the Operations Network (ON). The internal LAN is used to exchange management information.

## Internal LAN Channel

The Internal LAN Channel parameter allows you to Enable or Disable the internal LAN communications channel. The default is Enabled.

## Internal Max Link Metric

The Max Link Metric parameter specifies the number of times a TARP message can travel through the network when it is trying to find its destination NE. This limit keeps the message from creating excess overhead by continuously circling the network. The value may be from 1 to 63. The default value is 14.

**External LAN settings** The system allows access to an external LAN, the Intraoffice LAN (IAO-LAN), by means of two 10-BaseT Ethernet interfaces on 4-wire RJ-45 connectors.

## External LAN Channel

The External LAN Channel parameter allows you to Enable or Disable the external LAN communications channel. The default is Enabled.



**External Max Link Metric**

The Max Link Metric parameter specifies the number of times a TARP message can travel through the network when it is trying to find its destination NE. This limit keeps the message from creating excess overhead by continuously circling the network. The value may be from 1 to 63. The default value is 14.

**LAN router priority**

The LAN router priority parameter sets the priority of the LAN router. A higher number equals a higher priority routing. Values range from 1 to 127. The default value is 64.



# Network Layer

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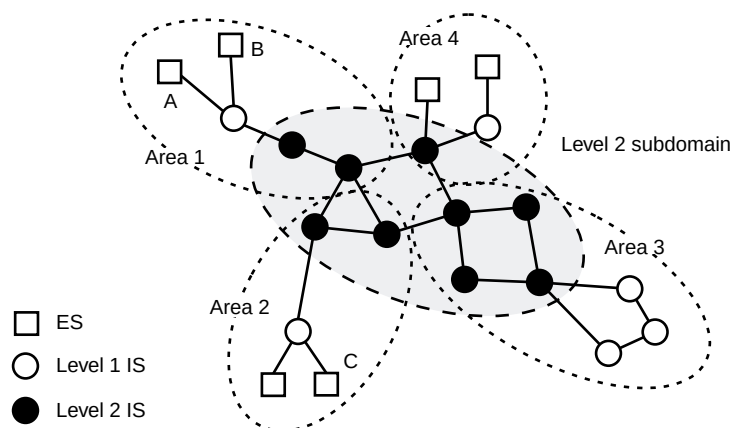
**Overview** This section provides information on network layer provisioning, a part of data communications provisioning.

**Method of provisioning the network layer** To configure network layer parameters for a selected DCC circuit pack from the WaveStar CIT System View select **Administration > Data Communications**, then select the DCC pack, then select the **Network Layer** tab. This tab is divided into frames as described below “Security level required”.

**Security level required** Only users with at least an S3 security privilege code have access to network layer parameters.

**Network Service Access Point frame** This frame displays the current NSAP address for the selected DCC circuit pack (node) and contains a **Modify** button that allows you to change the NSAP address.

**Intermediate vs. end** An intermediate node or system routes data between nodes and networks or parts of a network. An end node or system communicate with each other on an end-to-end basis via intermediate systems. A network can also be divided into areas as shown below.



nc-usm-337

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Intermediate System frame</b>             | Use this frame if the node is to be used as an intermediate system (IS). An IS can be set to function as a level 1 IS only or as both a level 1 and level 2 IS. (Level 1 IS only is the default.) A level 1 IS provides interconnectivity between nodes in an area. A level 2 IS provides interconnectivity between areas. The Configuration Timer sets the number of seconds between IS Hellos, which are messages that an IS sends to its neighbors to announce its presence. |
| <b>End System frame</b>                      | Use this frame if the node is to be used as an end system (ES). The Configuration Timer in this frame sets the number of seconds between ES Hellos, which are messages that an ES sends to its neighbors to announce its presence.                                                                                                                                                                                                                                              |
| <b>CLNP Lifetime Control Parameter frame</b> | CLNP stands for connectionless network protocol. The CLNP Control sets the maximum number of hops that a protocol data unit (PDU) can make before it will no longer be forwarded. A direct transmission link between two nodes is referred to as a hop.                                                                                                                                                                                                                         |



# TARP

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**TARP** The TID Address Resolution Protocol (TARP) according to Telcordia Technologies (formerly Bellcore) GR-253 standard provides a means to perform the TID to NSAP address translation dynamically by means of TARP Protocol Data Units (TARP PDUs), originating from an end system such as the CIT.

Three basic TARP functionalities can be distinguished:

- TARP originator functionality
- TARP propagation functionality
- TARP responder functionality

**Method of provisioning TARP** The **Administration > Data Communications** command from the WaveStar CIT System View menu enables the user to select the appropriate ADJCTL/DCCEI circuit pack and TARP tab to perform TARP administration functions.

**Security level required** All users with an S1 security user privilege code have access to the Administration display screens. Additional privilege codes or higher security user privilege codes may be required for displaying and provisioning the various functions of data communications.

**TARP propagation functionality** The TARP propagation functionality means the ability to evaluate a received TARP PDU type 1, 2 or 5 query and to further broadcast it over the OSI network if the requested TID or NSAP address does not match the NE's TID or NSAP address, and if the requested TID or NSAP address could not be found in the TARP Data Cache (TDC; cf.).

A TARP propagator decrements the lifetime of a received TARP PDU by one and broadcasts the modified PDU to all of its network neighbors (with the exception of the previous PDU sender). When the TARP PDU lifetime becomes zero, then no further propagation takes place. The TARP propagator may be enabled or disabled.

**TARP responder  
functionality**

The TARP responder functionality means the ability to respond to a TARP PDU type 1, 2 or 5 query via a type 3 response (cf.). The TARP responder may be enabled or disabled.

**Loop detection buffer  
timers**

Nodes provide a loop detection mechanism to prevent a repeated processing of previously processed TARP PDUs. A loop detection buffer (LDB) in conjunction with an LDB entry timer and an LDB flush timer is used for this purpose. A previously processed and again received TARP PDU is discarded.



## TARP Manual Adjacencies

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**Overview** This section provides information on provisioning TARP manual adjacencies, a part of data communications provisioning.

By using TARP manual adjacencies it is possible to route TARP PDUs over subnetworks which do not support the TARP functionality. However, a precondition is that the nodes within the non-TARP subnetwork are “generic routers”. A TARP manual adjacency is simply the Network Entity Title (NET) of a node that supports TARP.

**Method of provisioning TARP manual adjacencies** To configure TARP manual adjacencies for a selected DCC circuit pack from the WaveStar CIT System View select **Administration > Data Communications**, then select the DCC pack, then select the **TARP Manual Adj** tab. This tab is divided into frames as described below “Security level required”.

**Security level required** Only users with at least an S3 security privilege code have access to network layer parameters.

**TARP Manual Adjacency One frame** This frame displays the current NSAP address for TARP manual adjacency one. Use the **Modify** button to change this address.

**TARP Manual Adjacency Two frame** Use the Modify button to display or change the NSAP address for TARP manual adjacency two.



## TCP/IP

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|                                                   |                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                                   | This section provides information provisioning Internet Protocol (IP) addresses, a part of data communications provisioning.                                                                                                                                                                      |
| <b>Method of provisioning the transport layer</b> | To configure the IP addresses for a selected DCC circuit pack from the WaveStar CIT System View select <b>Administration &gt; Data Communications</b> , then select the DCC pack, then select the <b>TCP/IP</b> tab. This tab is divided into controls described below “Security level required”. |
| <b>Security level required</b>                    | Only users with at least an S3 security privilege code have access to transport layer parameters.                                                                                                                                                                                                 |
| <b>IP Address control</b>                         | The current IP address for the selected DCC circuit pack itself appears here. Click on the <b>Modify</b> button to change it. Every computer has a unique IP address used for TCP/IP communications.                                                                                              |
| <b>IP Subnet Mask control</b>                     | The current IP subnet mask for the selected DCC circuit pack appears here. Click on the <b>Modify</b> button to change it. The subnet mask allows computers on the same LAN to communicate directly, without using a router.                                                                      |
| <b>IP Default Router Address control</b>          | The current IP address for the default router appears here. Click on the <b>Modify</b> button to change it. The default router is the router used to communicate with computers on other LANs.                                                                                                    |



# IP Tunnel

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|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                                   | This section provides information about provisioning IP tunneling, a part of data communications provisioning.                                                                                                                                                                                                                                                                                                                                                  |
| <b>Method of provisioning the transport layer</b> | To configure the IP tunneling for a selected DCC circuit pack from the WaveStar CIT System View select <b>Administration &gt; Data Communications</b> , then select the DCC pack, then select the <b>IP Tunneling</b> tab. This tab is divided into controls described below “Security level required”.                                                                                                                                                         |
| <b>Security level required</b>                    | Only users with at least an S3 security privilege code have access to IP tunneling parameters.                                                                                                                                                                                                                                                                                                                                                                  |
| <b>IP tunneling status control</b>                | The IP tunneling status control enables or disables IP tunneling.                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>IP tunneling route control</b>                 | This allows the user to select the routing tables to be returned.                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>TAP properties control</b>                     | <p>The allows the following TAP property controls:</p> <ul style="list-style-type: none"> <li>• TAP advertise: This allows the user the globally enable or disable advertising routes that are provisioned to be advertised. This parameter overrules the route list.</li> <li>• TAP learn: This enables or disables the learning status for the auto provisioning protocol.</li> <li>• TAP group: This defines the TAP group the system belongs to.</li> </ul> |
| <b>Related information</b>                        | See <i>Chapter 4, Operations Interfaces</i> , for detailed information about IP tunneling concepts and arrangements.                                                                                                                                                                                                                                                                                                                                            |





## TCP/IP Gateway

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|                                                   |                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                                   | This section provides information about provisioning the TCP/IP gateway function, a part of data communications provisioning.                                                                                                                                                                             |
| <b>Method of provisioning the transport layer</b> | To configure the IP addresses for a selected DCC circuit pack from the WaveStar CIT System View select <b>Administration &gt; Data Communications</b> , then select the DCC pack, then select the <b>TCP/IP Gateway</b> tab. This tab is divided into controls described below “Security level required”. |
| <b>Security level required</b>                    | Only users with at least an S3 security privilege code have access to transport layer parameters.                                                                                                                                                                                                         |
| <b>TCP/IP gateway control</b>                     | This allows the user to enable or disable the TCP/IP gateway function.                                                                                                                                                                                                                                    |
| <b>TCP/IP gateway host list</b>                   | This allows the user to add/modify/delete a gateway host.                                                                                                                                                                                                                                                 |
| <b>Encoding mode port numbers</b>                 | This allows the user to set the port number over which the gateway function is accessible using the length value encoding method, raw-mode encoding, and the Telnet encoding mode.                                                                                                                        |
| <b>Related information</b>                        | See <i>Chapter 4, Operations Interfaces</i> , for detailed information about TCP/IP gateway function.                                                                                                                                                                                                     |



## FTAM-FTP Gateway (FT-TD)

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|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                                   | This section provides information about provisioning the FTAM-FTP gateway function, a part of data communications provisioning.                                                                                                                                                                           |
| <b>Method of provisioning the transport layer</b> | To configure the IP addresses for a selected DCC circuit pack from the WaveStar CIT System View select <b>Administration &gt; Data Communications</b> , then select the DCC pack, then select the <b>TCP/IP Gateway</b> tab. This tab is divided into controls described below “Security level required”. |
| <b>Security level required</b>                    | Only users with at least an S3 security privilege code have access to transport layer parameters.                                                                                                                                                                                                         |
| <b>TCP/IP gateway control</b>                     | This allows the user to enable or disable the FTAM-FTP gateway function. The TCP/IP gateway control parameter controls both, the TL-1 gateway and the FTAM-FTP gateway.                                                                                                                                   |
| <b>Encoding mode port numbers</b>                 | This allows the user to set the port number over which the gateway function is accessible using the length value encoding method, raw-mode encoding, and the Telnet encoding mode.                                                                                                                        |



## T1.245 Registration Manager

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|                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                                               | <p>This section provides information on provisioning the T1.245 Registration Manager.</p> <p>The T1.245 <i>Directory</i> is a collection of open systems that share information as part of Open Systems Interconnection (OSI). The information held by the Directory is called the Directory Information Base (DIB). A <i>Directory User Agent (DUA)</i> accesses the Directory on behalf of the user. A <i>Registration Agent</i> allows the node to register its DSA address and Name Prefix information in the Directory.</p> |
| <b>Method of provisioning the T1.245 registration manager</b> | To configure the T1.245 registration manager from the WaveStar CIT System View select <b>Administration &gt; Set T1.245 DUA/RA</b> .                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Security level required</b>                                | Only users with at least an S4 security privilege code have access to T1.245 Registration Manager parameters.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>T1.245 Directory Services frame</b>                        | Use this frame to enable or disable the T1.245 DUA/RA. Default the T1.245 DUA/RA is set to disable to prevent that remote NE status alarm reports will reported with unknown TID.                                                                                                                                                                                                                                                                                                                                                |
| <b>Related information</b>                                    | See <i>Chapter 4, Operations Interfaces</i> , for detailed information about T1.245 registration manager function.                                                                                                                                                                                                                                                                                                                                                                                                               |



# Configuration

## Overview of Configuration

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|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Objectives of configuration</b>               | <p>The objectives of system configuration includes performing the following functions:</p> <ul style="list-style-type: none"><li>• Provisioning parameters for protection groups or equipment</li><li>• Creating new bays, shelves, circuit packs, and port protection groups</li><li>• Exchanging circuit packs</li><li>• Deleting equipment and protection groups</li><li>• Provisioning system-level path protection parameters</li><li>• Configuring miscellaneous discretes</li><li>• Configuring DCC terminations</li><li>• Creating new cross-connections using the Cross Connection Wizard</li><li>• Provisioning timing and synchronization functions</li><li>• Performing alarm configurations and assignment of Alarm Severity Assignment Profiles</li><li>• Performing system software functions.</li></ul> |
| <b>Method of performing system configuration</b> | <p>The <b>Configuration</b> menu on the WaveStar CIT System View window allows you to perform system configuration functions.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Security level required</b>                   | <p>All users with at least a P1 provisioning user privilege code have access to the Configuration menu. However, individual configuration functions may be accessible only to users with the appropriate access level for the selected function.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |



## Access Identifiers (AIDs)

---

**Overview** This section specifies the Access Identifier (AID) parameter details for SONET TL1 command parameters.

Several of the TL1 commands allow a range of entities to be specified as input parameters in the TL1 command syntax. These entities are specified in the AID definitions shown in the following tables. This section addresses only those entities (for example, packs, ports, protection groups) that are visible to users.

The following types of SONET WaveStar TDM 2.5G/10G 2-Fiber parameters are used by the TL1 commands:

- External user AIDs specified as input parameters
- Performance monitoring (PM) parameters
- Alarm/event condition type parameters
- Password character parameters

**AID hierarchical order** The following hierarchy exists for AID entities:

- Bay
- Shelf
- Protection group
- Side/line
- Slot
- Circuit Pack (CP)
- Port
- Tributary

**Important!** Some AID entities such as system are not represented by this hierarchy and are handled separately.

**AID general format** The general format for an AID consists of the following seven fields separated by hyphens (-):

BAY-SHELF-PROTGRP-SIDE/LINE-SLOT/CP-PORT-TRIB

where:

- BAY is the number of the bay where the I/O shelf is located (for example, bay 1).
- SHELF is the number of the shelf.
- PROTGRP is the name of the protection group (for example, t01).
- SIDE/LINE is the side, east or west (e or w).
- SLOT/CP is the name of the slot (for example, dccei), number of the slot (for example, slot 02), or circuit pack (CP).
- PORT is the number of the port on the circuit pack (for example, port 1).
- TRIB is the number of the tributary on the port (for example, tributary 2).

The AID 1-1-t01-e-02-1-2 is for tributary 2, port 1, circuit pack in slot 2, associated with the east line of the two-fiber protection group (t01).

**The number (#) character** The number (#) character can be used as a placeholder in an AID field to represent a null value. Using one or more #(s) in a TL1 input command causes the AID fields (with #(s)) to be filled in appropriately in the TL1 output message.

A “u-#” will be returned in the protection group-side/line fields of the output AID only when the (optical) port protection group type is “u” for unprotected.

**Using the AID field value, “all”**

The AID definitions allow the use of the term “*all*” in one or more AID fields within a compound AID definition.

| <b>The AID value, all ...<br/>CAN be used to identify the<br/>following AID entities:</b> | <b>The AID value, all ...<br/>CANNOT be used to identify the<br/>following AID entities:</b> |
|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Bay                                                                                       | Protection Group                                                                             |
| Shelf                                                                                     | Side/Line                                                                                    |
| Slot                                                                                      |                                                                                              |
| Port                                                                                      |                                                                                              |
| Tributary                                                                                 |                                                                                              |

However, if the AID value *all* is used in

- Bay and/or Shelf AID fields, then *all* cannot be specified in any other AID field.
- Slot, Port, and/or Tributary AID fields, then *all* cannot be specified in the Bay and/or Shelf AID fields.

**Global notes on the external user AIDs tables**

The following notes apply to all external user AIDs tables.

**Note 1**

OC-48 dual slots are identified by the EVEN slot, not the ODD slot.

**Note 2**

All protection group numbers are two-character representations. All slot numbers are two-character representations. For example, slot 1 is identified as “01”.

**Note 3**

The Input AID column refers to AIDs that are input via the user and/or user interface. The Output AID column refers to AIDs that are sent from the NE (network element).

**AID parameter examples** The following table lists some general examples of AIDs. For a full listing of the AIDs of all entities, see the Operation System Engineering Guide.

| Entity                            | Input AID                                             | Output AID                                  |
|-----------------------------------|-------------------------------------------------------|---------------------------------------------|
| System                            | system                                                | system                                      |
| Universal I/O Bay                 | 1                                                     | 1                                           |
| I/O Shelf                         | 1-{1-2,all}                                           | 1-{1-2}                                     |
| 1+1 Facility Protection Group     | 1-{1-2}-o{01-99,all}                                  | 1-{1-2}-o{01-99}                            |
| 2F BLSR Facility Protection Group | 1-1-t{01-99, all}                                     | 1-1-t{01-99}                                |
| Port card slot                    | 1-1-#-#-{01-16}                                       | 1-1-#-#-{01-16}                             |
| Port unit                         | 1-1-#-#-{01-16}-cp                                    | 1-1-#-#-{01-16}-cp                          |
| OC-48 port                        | 1-1-#-#-{02, 04, 06, 08,...14, 16}-{1,all}            | 1-1-#-#-{02, 04, 06, 08,...14, 16}-1        |
| OC-48 Tributary                   | 1-1-#-#-{02, 04, 06, 08,...14, 16}-{1,all}-{1-48,all} | 1-1-#-#-{02, 04, 06, 08,...14, 16}-1-{1-48} |





# System Provisioning

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## System provisioning parameters

System equipment provisioning parameters include:

- Date
- Time
- Alarm Severity Assignment Profile

Other types of general system parameters may be found in “Administration” (7-14).

## Method of provisioning system parameters

The **Configuration** > **Provision** command from the WaveStar CIT System View menu displays the Provision Parameters for Protection Group or Equipment screen. A system AID entry or system selection in this screen displays the parameters associated with the entire system.

## Security level required

Only users with at least P3 provisioning, M3 maintenance, and S4 security user privilege codes have access to system provisioning. For more information on user privilege codes, see “User Privilege Codes” (7-38).

## Date parameters

The date parameter in system provisioning permits entry or selection of year, month, and day. The Date field displays the current PC date if no date has been set. Dates are displayed in a format specific to the country in which the WaveStar CIT is being used. The WaveStar CIT retrieves country information from the PC’s system data. For example, the date in the United States might be displayed as 1/30/98 and elsewhere as 30/01/98. Both time and date must be set by the user for either to be valid.

## Time parameters

The time parameter in system provisioning permits entry or selection of the current time in hours and minutes. The Time field displays the current PC time if no time has been set. Time is displayed in a format specific to the country in which the WaveStar CIT is being used. The WaveStar CIT retrieves country information from the PC’s system data. For example, time in the United States might be displayed as 10:44 p.m. and elsewhere as 22:44. Both time and date must be set by the user for either to be valid.



## Bay Provisioning

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**Bay provisioning  
parameters**

There is no bay provisioning at this time. Selection of a bay from the Equipment Selection Screen disables the provision command option.



## Shelf Provisioning

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|                                                 |                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Shelf provisioning parameters</b>            | Shelf provisioning includes selecting an equipment alarm severity assignment profile for the shelf.                                                                                                                                                                                                                                                                         |
| <b>Method of shelf provisioning</b>             | The <b>Configuration &gt; Provision</b> command from the WaveStar CIT System View menu displays the Provision Parameters for Protection Group or Equipment screen. A shelf AID entry or shelf selection in this screen displays the parameters associated with a shelf.                                                                                                     |
| <b>Security level required</b>                  | Only users with a security privilege code of at least P3, provisioning, have access to shelf provisioning. For more information on security privilege codes, see “User Types” (7-35).                                                                                                                                                                                       |
| <b>SS bit override</b>                          | In Release 6 and later releases, SS bit override can be enabled or disabled for a shelf. When SS bit override is enabled, the SS bits are set to 00 for all ports on a shelf. This overrides normal SS bit provisioning when interworking with non-compliant SONET network elements. When SS bit override is disabled, the SS bits are set to 10 for all ports on a shelf . |
| <b>Alarm severity assignment profile (ASAP)</b> | The ASAP parameter for shelf provisioning allows you to select an equipment ASAP to be assigned to this shelf. See Configuration — Alarms, Alarm Severity Assignment Profiles in this chapter for more information on alarm severity assignment profiles.                                                                                                                   |



## Slot/Circuit Pack Provisioning

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|                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Slot/circuit pack provisioning parameters</b> | Provisioning of slots or circuit packs involves the assignment of an Alarm Severity Assignment Profile to the slot or circuit pack.                                                                                                                                                                                                                                                                                                                                 |
| <b>Method of slot/circuit pack provisioning</b>  | The <b>Configuration &gt; Provision</b> command from the WaveStar CIT System View menu displays the Provision Parameters for Protection Group or Equipment screen. A slot or circuit pack AID entry or slot or circuit pack selection in this screen displays the parameters associated with a slot or circuit pack.                                                                                                                                                |
| <b>Security level required</b>                   | Only users with at least P3 provisioning, S3 security, and M1 maintenance user privilege codes have access to slot or circuit pack provisioning. For more information on security user privilege codes, see “User Types” (7-35).                                                                                                                                                                                                                                    |
| <b>Alarm severity assignment profile (ASAP)</b>  | The ASAP parameter for slot and circuit pack provisioning allows you to select an equipment ASAP to be assigned to slots or circuit packs. See “Alarm Severity Assignment Profiles” (7-153) for more information on alarm severity assignment profiles.                                                                                                                                                                                                             |
| <b>Unprovisioned and empty slots</b>             | ASAPs may be assigned to slots that have no circuit packs installed or to slots that have not been preprovisioned for a type of circuit pack.                                                                                                                                                                                                                                                                                                                       |
| <b>Preprovisioned or equipped slots</b>          | <p>ASAPs may be assigned to slots that are unequipped but have been preprovisioned for a type of circuit pack or to slots that are already equipped with circuit packs. In addition, when the ASAP is assigned to the preprovisioned or equipped slot, you may also elect to assign the same profile to either one of the following:</p> <ul style="list-style-type: none"> <li>• This circuit pack only, or</li> <li>• All packs, this type, this shelf</li> </ul> |



## Optical Port Provisioning

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|                                             |                                                                                                                                                                                                                                                                        |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Optical port provisioning parameters</b> | Optical port provisioning allows you to configure parameters associated with a selected optical port.                                                                                                                                                                  |
| <b>Method of optical port provisioning</b>  | The <b>Configuration &gt; Provision</b> command from the WaveStar CIT System View menu displays the Provision Parameters for Protection Group or Equipment screen. A port AID entry or port selection in this screen displays the parameters associated with the port. |
| <b>Security level required</b>              | Only users with at least P3 provisioning, S3 security, and M1 maintenance user privilege codes have access to optical port provisioning. For more information on security privilege codes, see “User Types” (7-35).                                                    |



## Optical Port Provisioning Parameters

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**Port monitoring mode** Port monitoring modes represent the monitoring state for each port in the system at any given time. Each port monitoring mode has its own characteristics for signal failure alarms and performance monitoring (PM) data collection. Transitions between modes occur due to events such as applying a good signal and WaveStar CIT commands. The detection of a fault does not affect the state of the port monitoring mode. The port modes are auto (AUTO), monitored (MON), not monitored (NMON).

### **Auto (AUTO)**

AUTO refers to a port that is available for automatic provisioning. A port transitions from the AUTO mode to the MON mode if a good signal is detected. The original port monitoring mode value is AUTO. When the port monitoring mode is AUTO, the port is not alarmed.

### **Monitored (MON)**

MON refers to a port that is fully monitored and alarmed.

### **Not monitored (NMON)**

NMON refers to a port that is not monitored and does not transition to the MON state even if a good signal is detected. Any port modes may be user-provisioned independently to the NMON state at any time, regardless of the auto-provisioned mode of the terminating interface slot. The port mode is used to suppress alarms.

**Tributary mode** Tributary mode displays the current tributary rate mode. This field displays FIXED or ADAPTIVE rate.

**Adaptive-rate tributary operation** For OC-n ports in adaptive-rate operation, supported signal rates are not preprovisioned for the ports as in fixed-rate operation. On the logical input tributaries associated with a port with Adaptive-Rate (Pipe) Tributary operation, the system allows any of the signal rates supported by the port to be received. The signal rates of the logical input tributaries are allowed to vary over time between the supported rates.

**Adaptive-rate valid signals**

The system identifies and accommodates transitions in the supported signal rates without requiring any user intervention, for example, a change in the signal rates from three STS-1s to one STS-3c. Fault monitoring and performance monitoring adjust as required.

**Tributary unequipped signal rate**

The output tributaries for signal rates used with adaptive-rate tributary operation on a port are not provisioned.

On each STS-1 logical output tributary associated with a port with adaptive-rate tributary operation, the output signal when there is no cross-connection is the STS-1 Unequipped signal only. This applies to all logical output tributaries, both working and protection.

When there is a cross-connection to a logical output tributary, the system allows any constituent signal rates supported by the associated port to be transmitted on the logical output tributary. A logical output tributary with a cross-connection may carry constituent signals at a different rate than the rate of the Unequipped signal which is transmitted when there is no cross-connection.

**Fixed-rate tributary operation for input and output ports**

In fixed-rate operation, you must provision the signal rates for the input tributaries of the port for all the supported signal rates on an optical port. The provisioned signal rates for the input tributaries are independent of any signal rates provisioned for the output tributaries of the port.

**Valid signals**

On each logical input tributary associated with a port with fixed-rate tributary operation, the system detects if a valid signal is received at the provisioned signal rate for the associated input tributary of the port. If a valid signal is not received, the system performs fault monitoring. This applies to all logical input tributaries, both working and protection. A logical input tributary in a port protection group is associated with the port tributary from which it is selected normally, in the absence of a line protection switching event.

**Protection switches**

During a protection switch in any port protection group, when a protection port tributary is selected by the working logical input tributary it is protecting, the provisioning of the working tributary determines the behavior on the protection tributary. When there is no cross-connection to the output of the working tributary, the output of the protection tributary is an unequipped signal at the same rate as the unequipped signal on the working tributary's output. When there is no protection switch active, the provisioning of the port tributary associated with the protection logical input tributary determines the behavior on a protection port tributary.

**Fault monitoring**

Fault monitoring, signal maintenance, and performance monitoring use the provisioned signal rates for the input port as the expected rates. An incoming signal composed of valid rates smaller or higher than the provisioned rate for a tributary results in generation of either Loss of Pointer (LOP) or Signal Rate Mismatch (SRM). This applies whether or not any cross-connection exists.

**Cross-connections**

Cross-connections may be provisioned only at the cross-connection rate which matches the provisioned signal rate for the associated input tributary. Cross-connection legs in opposite directions, from an input tributary and to an output tributary, may be provisioned independently and may be at different rates if the input and output tributary rates differ.

**Fixed-rate tributary input  
signal rate list**

The rate of a requested cross-connection must match the provisioned signal rate of each involved input and output tributary that is on a port provisioned for fixed-rate tributary operation. You must provision fixed rate ports for the list of expected input signal rates across the port's bandwidth. Depending on the product, software release, port unit supported, and the type of port selected, the signal rates may be a combination of supported STS-1, STS-3C, STS-12C, or STS-48C signal rates.



**SONET OCn fixed-rate  
signal rate list examples**

The fixed-rate tributary signal rate list parameter for OC-n ports is a list of STS rates across the port bandwidth. The sum of the numbers represents the number of STS-1s across the port's bandwidth. For example, the representation 91-13-112-241 for a SONET OC-48 port equals 9 STS-1s + 1 STS-3 + 1 STS-12 + 24 STS-1s for a total signal rate of 48. The default value of the tributary input signal rates is all STS-1s. Many combinations of signal rates exist. The following are only some examples of signal rate list representations.

**OC-3**

OC-3 ports support STS-1 and STS-3c rates.

- If you provision 3 STS-1s for an OC-3 port, the signal rate representation would show 31 (3 STS-1s).
- If the port is provisioned for one STS-3c, the signal rate representation would show 13 (1 STS-3c).

**OC-12**

OC-12 ports support STS-1, STS-3c, and STS-12c rates.

- If the port is provisioned for 12 STS-1s, the signal rate representation would show 121 (12 STS-1s).
- If the port is provisioned for four STS-3c signals, the signal rate representation would show 43 (4 STS-3s).
- If the port is provisioned for six STS-1s, one STS-3c, and 3 STS-1s, the signal rate representation would show 61-13-31 (6 STS-1s, 1 STS-3c, 3 STS-1s). The hyphens represent the division of signal rates.

**Important!** Port bandwidth signal rates must start on their respective boundaries. For STS-3c, the boundaries are STS#1, #4, #7, #10.

**OC-48**

OC-48 ports support STS-1, STS-3c, STS-12c, and STS-48c rates.

- If the port is provisioned for 48 STS-1s, the signal rate representation would show 481 (48 STS-1s).
- If the port is provisioned for 16 STS-3c signals, the signal rate representation would show 163 (16 STS-3c).
- If the port is provisioned for 4 STS-12c signals, the signal rate representation would show 412 (4 STS-12c).

- If the port is provisioned for 9 STS-1s, 1 STS-3c, 1 STS-12c, and 24 STS-1s, the signal rate representation would show 91-13-112-241 (9 STS-1s, 1 STS-3c, 1 STS-12c, 24 STS-1s). The hyphens represent the division of signal rates.

**Important!** Port bandwidth signal rates must start on their respective boundaries. For STS-3c, the boundaries are STS#1, #4, #7, #10, et cetera. For STS-12c, the boundaries are STS#1, #13, #25, #37.

### OC-192

OC-192 ports support STS-1, STS-3c, STS-12c, and STS-48c rates.

- If the port is provisioned for 192 STS-1s, the signal rate representation would show 1921 (192 STS-1s).
- If the port is provisioned for 64 STS-3c signals, the signal rate representation would show 643 (64 STS-3c).
- If the port is provisioned for 16 STS-12c signals, the signal rate representation would show 1612 (16 STS-12c).
- If the port is provisioned for 48 STS-1s, 4 STS-12c signals, 24 STS-1s, 1 STS-48c, and 2 STS-12c signals, the signal rate representation would show 481-412-241-148-212 (48 STS-1s, 4 STS-12s, 24 STS-1s, 1 STS-48, 2 STS-12s). The hyphens represent the division of signal rates.

**Important!** Port bandwidth signal rates must start on their respective boundaries. For STS-3c, the boundaries are STS#1, #4, #7, #10, et cetera. For STS-12c, the boundaries are STS#1, #13, #25, #37, et cetera. For STS-48c, the boundaries are STS#1, #49, #97, et cetera.

### Tributary unequipped signal rate list

The provisioned signal rates for the output tributaries determine the unequipped signal rates for tributaries without a cross-connection. Both the input and output tributary signal rates determine the allowed rates for cross-connections. See “Fixed-rate tributary input signal rate list” (7-78) for the format of signal rates.

### Force DUS

The Force DUS (do not use for synchronization) on output setting may be set to enabled or disabled. If set to enabled, a DUS signal is sent out from the port and prevents the line from being used for synchronization.

|                                                           |                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EBER AIS enable</b>                                    | The excessive bit error rate AIS enable (EBER AIS enable) or Excessive Maintenance Inhibit parameter inhibits the actions for some maintenance signals such as line signal failures and signal degrades when set to enable. When set to disable the actions will not be inhibited.                                                                           |
| <b>SONET optical line signal degrade (BER) threshold</b>  | For SONET ports, the BER threshold parameter selects the optical line bit error rate (signal degrade) threshold. Possible values are $10E^{-5}$ , $10E^{-6}$ (default), $10E^{-7}$ , $10E^{-8}$ , or $10E^{-9}$ .                                                                                                                                            |
| <b>SONET optical line signal failure (EBER) threshold</b> | For SONET ports, the EBER threshold selects the optical line excessive bit error rate (EBER signal failure) threshold. Possible values are $10E^{-3}$ (default), $10E^{-4}$ , or $10E^{-5}$ .                                                                                                                                                                |
| <b>FEC encoding/decoding</b>                              | For OC-192 ports, the FEC Encoding/Decoding parameter enables or disables forward error correction (FEC). Possible values are Enabled or Disabled.                                                                                                                                                                                                           |
| <b>FEC correction</b>                                     | For OC192 ports, the FEC Correction parameter enables or disables the correction processing <i>if</i> FEC Encoding/Decoding is enabled. If FEC Encoding/Decoding is set to Disabled, enabling FEC Correction has no effect. Possible values are Enabled or Disabled.                                                                                         |
| <b>FEC type</b>                                           | For OC192 ports, the FEC Type parameter allows you to select either In-Band or Out-Band FEC. The default is In-Band. If Out-Band is selected at one end, then it must be selected at the other end or a loss of signal (LOS) alarm will be generated. Selection of the Out-Band FEC type increases the line rate from approximately 9.95 Gbps to 10.66 Gbps. |
| <b>Alarm severity profile</b>                             | The alarm severity profile allows you to assign a port alarm severity assignment profile to the selected port.                                                                                                                                                                                                                                               |

**Apply to option**    The **Apply To** option allows you to select one of the following:

**This Port Only**

This selection applies the port parameters for the port being provisioned to only the selected port displayed on the screen.

**All Ports of this type, This Pack**

This selection allows you to apply all the parameter settings for the port being provisioned to all ports of this type on the same circuit pack.

**All Ports of this type, This Shelf**

This selection allows you to apply the parameter settings for the port being provisioned to all ports of this type on all the same circuit pack types on the shelf.



## Gigabit Ethernet Port Provisioning Parameters

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**Operational mode** This parameter allows the user to provision the operational mode of the port as a VLAN or repeater.

**Port mode** Port modes represent the monitoring state for each port in the system at any given time. Each port mode has its own characteristics for signal failure alarms and performance monitoring (PM) data collection. Transitions between modes occur due to events such as applying a good signal and WaveStar CIT commands. The detection of a fault does not affect the state of the port monitoring mode. The port modes are auto (AUTO), monitored (MON), not monitored (NMON).

### Auto (AUTO)

AUTO refers to a port that is available for automatic provisioning. A port transitions from the AUTO mode to the MON mode if a good signal is detected. The original port monitoring mode value is AUTO. When the port monitoring mode is AUTO, the port is not alarmed.

### Monitored (MON)

MON refers to a port that is fully monitored and alarmed.

### Not monitored (NMON)

NMON refers to a port that is not monitored and does not transition to the MON state even if a good signal is detected. Any port modes may be user-provisioned independently to the NMON state at any time, regardless of the auto-provisioned mode of the terminating interface slot. The port mode is used to suppress alarms.

**Alarm severity profile** The alarm severity profile allows the user to assign a port alarm severity assignment profile to the selected port.

**Flow control mode** The flow control mode parameter allows the user to provision automatic flow control or disable flow control.

**Untagged VLAN frames** The port may be provisioned to admit (Admitted) or reject (Not admitted) untagged VLAN frames. If the port is provisioned to accept untagged VLAN frames, the system tags the untagged incoming VLAN frames with the Port VLAN identifier. The Port VLAN identifier may be an integer in the range 1-4093.

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Default priority</b>   | The default priority parameter allows the user to assign a priority (high, low, or nonapplicable) to any untagged incoming frames.                                                                                                                                                                                                                                                                                                                            |
| <b>Valid tagged VLANs</b> | The list of valid tagged VLANs shows only the user tagged VLAN frames to be accepted by the LAN port. The port VLAN identifier used for untagged VLAN frames is not included in the list.                                                                                                                                                                                                                                                                     |
| <b>Edit VLAN list</b>     | The user may add or delete valid VLANs. A single VLAN, a series of VLANs separated by commas (,), or a range may be added or deleted. A VLAN range is denoted with two VLAN identifiers separated by a dash(-). Commas and dashes can be combined. A integer in the range 1-4093 may be used.                                                                                                                                                                 |
| <b>LCAS</b>               | Link capacity adjustment scheme (LCAS) allows the flexible resizing of the bundle: in-service bandwidth reprovisioning changes and automatic fall-down in case of failure on single STS-1s (due to network or equipment failures or differential delay out of range). The objective is to have only short traffic hits during LCAS bandwidth changes comparable to those imposed by path or ring switching (UPSR or BLSR). Default the LCAS is set to enable. |



## Electrical Port Provisioning

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|                                               |                                                                                                                                                                                                                                                                        |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Electrical port provisioning</b>           | Electrical port provisioning allows you to configure the DS3/EC1 or parameters associated with a selected electrical port.                                                                                                                                             |
| <b>Method of electrical port provisioning</b> | The <b>Configuration &gt; Provision</b> command from the WaveStar CIT System View menu displays the Provision Parameters for Protection Group or Equipment screen. A port AID entry or port selection in this screen displays the parameters associated with the port. |
| <b>Security level required</b>                | Only users with at least P3 provisioning, S3 security, and M1 maintenance user privilege codes have access to electrical port provisioning. For more information on security privilege codes, see “User Types” (7-35).                                                 |



## DS3 Electrical Port Provisioning Parameters

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**Electrical interface type** The electrical interface type parameter allows you to choose the port's transmission characteristic as DS3 or EC1. The default is DS3.

**PTF FM cross-connection dependency** The path termination function, fault monitoring (PTF FM) parameter creates a dependency between the existence of a cross-connection to a DS3 port and the fault behavior of the termination function. The possible values of the parameter are "yes" or "no". The default value for SONET ports is "yes".

### **PTF FM set to "Yes"**

When a cross-connection in the DS3 output direction does not exist and the PTF FM cross-connection dependency parameter is set to "Yes," the DS3 output port transmits a DS3 Idle Signal on detection of a defect that requires an action. An Unequipped defect detected at the PTF is not reported.

### **PTF FM set to "No"**

When a cross-connection in the DS3 output direction does not exist and the PTF FM cross-connection dependency parameter is set to "No," the DS3 output port transmits a DS3 AIS Signal on detection of a defect that requires an action. An Unequipped defect detected at the PTF is reported according to the assigned ASAP.

The actual signal insertion (DS3 AIS or DS3 IS) is also governed by the provisioning of the associated Output Mode for the DS3 port. When a cross-connection in the DS3 output direction exists, the system performs normal fault processing (for example, a UNEQ defect results in an UNEQ failure being declared and DS3 AIS sent downstream).

**Unconnected output maintenance signal** The unconnected output maintenance signal parameter specifies whether the port transmits AIS or an idle signal downstream when no cross-connection exists.



**PTF TP monitoring mode** The PTF (path termination function) TP tributary monitoring mode parameter sets the tributary monitoring mode of the tributary. The values may be

**Monitored (MON)**

Indicates that alarm monitoring is taking place on the port.

**Not Monitored (NMON) (initial value)**

Indicates that alarm monitoring is not occurring on the port.

**DS3 port directionality** The Port Directionality parameter allows you choose the direction of possible transmission. The values are:

**Bidirectional (default)**

Supports transmission in both directions, transmit and receive.

**Unidirectional transmit**

Supports transmission only in the transmit direction. The transmit direction is where the signal exits the system to the cable medium outside the system.

**Unidirectional receive**

Supports transmission only in the receive direction. The receive direction is where the signal enters the system from the cable medium outside the system.

**Important!** If a port is provisioned for unidirectional port operation for a single direction of transmission, then you cannot provision a cross-connection to or from a tributary in the direction which is not selected for unidirectional port operation.

**DS3 signal format** The DS3 signal format allows you to select the format of the DS3 signal. Possible values of the DS3 signal format are

**C-bit parity (initial value)**

Supports a C-bit parity channelized DS3 format. It may support full P-bit parity VMR, VM, or no VM monitoring. It may also use full C-bit parity monitoring.

**M23**

Supports the M23 channelized DS3 format. It may support full P-bit parity VMR, VM, or no VM monitoring. The C-bit monitoring is disabled for this format.

**Framed**

Supports the standard M-frame DS3 format. It may be channelized or unchannelized. It may support full P-bit parity VMR, VM or no VM monitoring;

**Unframed and Clear Channel**

When this format has been set, the system disables P-bit parity VMR, VM, and C-bit parity monitoring.

**Signal degrade BER threshold**

The signal degrade BER threshold specifies the signal degrade Bit Error Rate (BER) threshold for DS3 ports. The range is from  $10^{-3}$  to  $10^{-9}$ . The default value is  $10^{-6}$ .

**DS3 incoming alarm severity assignment profile (ASAP)**

The DS3 incoming ASAP parameter allows you to assign and view the details of an alarm severity assignment profile to be applied to the incoming port direction.

**DS3 out ASAP**

The DS3 out ASAP parameter allows you to assign and view the details of an alarm severity assignment profile to be applied to the outgoing port direction.

**Port monitoring mode**

Port monitoring mode represents the monitoring state for each port in the system at any given time. Each port's monitoring mode has its own characteristics for signal failure alarms and performance monitoring (PM) data collection. Transitions between modes occur due to events such as applying a good signal and WaveStar CIT commands. The detection of a fault does not affect the state of the port monitoring mode. The port modes in are auto (AUTO), monitored (MON), not monitored (NMON).

**Auto (AUTO)**

AUTO refers to a port that is available for automatic provisioning. A port transitions from the AUTO mode to the MON mode if a good signal is detected. The original port monitoring mode value is AUTO. When the port monitoring mode is AUTO, the port is not alarmed.

**Monitored (MON)**

MON refers to a port that is fully monitored and alarmed whether or not it is cross- connected.

**Not monitored (NMON)**

NMON refers to a port that is not monitored and does not transition to the MON state even if a good signal is detected. Any port modes may be user-provisioned independently to the NMON state at any time, regardless of the auto-provisioned mode of the terminating interface slot. The port mode is used to suppress alarms.

**Violation monitoring mode**

The violation monitoring mode parameter supports the DS3 P-bit parity violation monitoring and removal. You may select one of the following:

**VMR**

Violation monitoring and removal (VMR) supports P-bit parity violation monitoring and removal on the outgoing (toward the DSX cable interface) DS3 signals.

**VM**

Violation monitoring without removal (VM) supports P-bit parity violation monitoring on the outgoing (toward the DSX cable interface) DS3 signals, but no corrections are made.

**No VM**

Indicates no violation monitoring will occur. This is the default for the violation monitoring mode.

**Path trace generation**

The path trace parameter shows the value of the outgoing J1 byte path trace for the terminated DS3 service. It may be up to 64 ASCII characters converted from the hexadecimal representation. If a series of two hexadecimal digits cannot be converted to ASCII characters, then the WaveStar CIT displays a left bracket ([), the letters hex, the two hexadecimal digits, and a right bracket()], for each set of two hexadecimal digits which cannot be converted.

**Path trace write format**    The values for the path trace write are:

**Single byte value**

The single byte (hexadecimal format using the printable T.50/ASCII character set) is repeated over and over, with no terminating/initial sequence. The initial value is 0x00, the ASCII null character.

**16-byte**

16-byte hexadecimal format using the printable T.50/ASCII character set, with the first byte being a CRC-7. The initial value is a header byte followed by 15 0x00's (the ASCII null character). For the 16-byte format you can manually calculate the checksum by using the CRC toggle button.

**64-byte**

64-byte hexadecimal format using the printable T.50/ASCII character set. The initial value is 62 0x00's (the ASCII null character) followed by a carriage return, line feed. This is the default for SONET.

**Apply To option**    The **Apply To** option allows you to select one of the following unless the electrical interface type has been changed from the original setting for the selected port:

**This Port Only**

This selection applies the port parameters for the port being provisioned to only the selected port displayed on the screen.

**All Ports of this type, This Pack**

This selection allows you to apply all the parameter settings for the port being provisioned to all ports of this type on the same circuit pack.

**All Ports of this type, This Shelf**

This selection allows you to apply the parameter settings for the port being provisioned to all ports of this type on all the same circuit pack types on the shelf.



## EC1 Electrical Port Provisioning Parameters

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|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Electrical interface type</b>                | The electrical interface type parameter allows you to choose the port's transmission characteristic as DS3 or EC1. The default is DS3.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Signal degrade BER threshold</b>             | The signal degrade BER threshold specifies the Signal Degrade Bit Error Rate (BER) threshold for EC1 ports. The values may be $10^{-5}$ , $10^{-6}$ (default), $10^{-7}$ , $10^{-8}$ , or $10^{-9}$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Signal failure (EBER) threshold</b>          | The EBER threshold selects the excessive bit error rate (EBER signal failure) threshold. Possible values are $10E^{-3}$ (default), $10E^{-4}$ , or $10E^{-5}$ .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>EBER AIS enable</b>                          | The excessive bit error rate AIS (EBER AIS) or Excessive Maintenance Inhibit parameter inhibits the actions for some maintenance signals such as line signal failures and signal degrades when set to Disabled. When set to Enabled, the actions will not be inhibited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Alarm severity assignment profile (ASAP)</b> | The ASAP parameter allows you to assign and view the details of an alarm severity assignment profile to be applied to this port.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Port monitoring mode</b>                     | <p>Port monitoring mode represents the monitoring state for each port in the system at any given time. Each port's monitoring mode has its own characteristics for signal failure alarms and performance monitoring (PM) data collection. Transitions between modes occur due to events such as applying a good signal and WaveStar CIT commands. The detection of a fault does not affect the state of the port monitoring mode. The port modes are auto (AUTO), monitored (MON), and not monitored (NMON).</p> <p><b>Auto (AUTO)</b></p> <p>AUTO refers to a port that is available for automatic provisioning. A port transitions from the AUTO mode to the MON mode if a good signal is detected. The original port monitoring mode value is AUTO. When the port monitoring mode is AUTO, the port is not alarmed.</p> <p><b>Monitored (MON)</b></p> <p>MON refers to a port that is fully monitored and alarmed whether or not it is cross connected.</p> |

**Not monitored (NMON)**

NMON refers to a port that is not monitored and does not transition to the MON state even if a good signal is detected. Any port modes may be user-provisioned independently to the NMON state at any time, regardless of the auto-provisioned mode of the terminating interface slot. The port mode is used to suppress alarms.

**Apply To option**

The **Apply To** option allows you to select one of the following unless the electrical interface type has been changed for the selected port from the original setting:

**This Port Only**

This selection applies the port parameters for the port being provisioned to only the selected port displayed on the screen.

**All Ports of this type, This Pack**

This selection allows you to apply all the parameter settings for the port being provisioned to all ports of this type on the same circuit pack.

**All Ports of this type, This Shelf**

This selection allows you to apply the parameter settings for the port being provisioned to all ports of this type on all the same circuit pack types on the shelf.



## VCG Provisioning

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**VCG monitoring mode** The VCG monitoring mode represents the monitoring state for each VCG in the system at any given time. Each VCG's monitoring mode has its own characteristics for signal failure alarms and performance monitoring (PM) data collection. Transitions between modes occur due to events such as applying a good signal and WaveStar CIT commands. The detection of a fault does not affect the state of the port monitoring mode. The port modes are auto (AUTO), monitored (MON), and not monitored (NMON).

### **Monitored (MON)**

MON refers to a VCG that is fully monitored and alarmed whether or not it is cross connected.

### **Not monitored (NMON)**

NMON refers to a VCG that is not monitored and does not transition to the MON state even if a good signal is detected. Any VCG modes may be user-provisioned independently to the NMON state at any time, regardless of the auto-provisioned mode of the terminating interface slot. The port mode is used to suppress alarms.

### **Alarm severity assignment profile (ASAP)**

The ASAP parameter allows you to assign and view the details of an alarm severity assignment profile to be applied to this port.

### **Valid tagged VLANs**

The list of valid tagged VLANs shows only the user tagged VLAN frames to be accepted by the LAN port. The port VLAN identifier used for untagged VLAN frames is not included in the list.

### **LCAS mode**

In Release 6 and later releases, this parameter allows users to enable or disable the LCAS mode for the VCG.



## Tributary Provisioning

---

**What is tributary provisioning**

Tributary provisioning allows you to configure the tributary parameters associated with a selected port.

**Method of tributary provisioning**

The **Configuration > Provision** command from the WaveStar CIT System View menu displays the Provision Parameters for Protection Group or Equipment screen. A tributary AID entry or tributary selection in this screen displays the parameters associated with the tributary.

**Security level required**

Only users with at least P3 provisioning, S3 security, and M1 maintenance user privilege codes have access to tributary provisioning. For more information on security privilege codes, see “User Types” (7-35).





## STS Tributary Provisioning Parameters

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|                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Tributary monitoring mode</b>                | The tributary monitoring mode parameter sets the tributary monitoring mode of the tributary. The values may be                                                                                                                                                                                                                                                                                                                                                            |
|                                                 | <b>MON</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                 | Indicates that alarm monitoring is taking place on the tributary.                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                 | <b>NMON (initial value)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                 | Indicates that alarm monitoring is not occurring on the tributary.                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>DEXC threshold</b>                           | An excessive error defect (DEXC) is detected on any STS-N signal on which the B2 BER exceeds a pre-selected threshold. The DEXC threshold parameter may be provisioned with the value of $10^{-3}$ , $10^{-4}$ , or $10^{-5}$ . The default is $10^{-3}$ .                                                                                                                                                                                                                |
| <b>DEG threshold</b>                            | A degrade defect (DEG) is detected on any STS-N signal on which the B2 BER exceeds a pre-selected threshold. The MS Degrade Threshold parameter may be provisioned over the range $10^{-5}$ to $10^{-9}$ . The default value is $10^{-6}$ . Possible values are $10^{-5}$ , $10^{-6}$ , $10^{-7}$ , $10^{-8}$ or $10^{-9}$ .                                                                                                                                              |
| <b>Alarm severity assignment profile (ASAP)</b> | The ASAP parameter allows you to assign and view the details of an alarm severity assignment profile to be applied to this port.                                                                                                                                                                                                                                                                                                                                          |
| <b>Path trace generation</b>                    | The path trace parameter shows the value of the outgoing J1 byte path trace for the terminated STS-1 service. It may be up to 64 ASCII characters converted from the hexadecimal representation. If a series of two hexadecimal digits cannot be converted to ASCII characters, then the WaveStar CIT displays a left bracket ([), the letters hex, the two hexadecimal digits, and a right bracket()], for each set of two hexadecimal digits which cannot be converted. |
| <b>Path trace read format</b>                   | The values for the path trace read are:                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                 | <b>Single byte value</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                 | The single byte (hexadecimal format using the printable T.50/ASCII character set) is repeated over and over, with no terminating/initial sequence. The initial value is 0x00, the ASCII null character.                                                                                                                                                                                                                                                                   |

**16-byte**

16-byte hexadecimal format using the printable T.50/ASCII character set, with the first byte being a CRC-7. The initial value is a header byte followed by 15 0x00's (the ASCII null character). For the 16-byte format you can manually calculate the checksum by using the CRC toggle button.

**64-byte**

64-byte hexadecimal format using the printable T.50/ASCII character set. The initial value is 62 0x00's (the ASCII null character) followed by a carriage return, line feed. This is the default for SONET.

**Apply To option** The **Apply To** option allows you to select one of the following:

**This Tributary**

This selection applies the tributary parameters for the tributary being provisioned to only the selected tributary displayed on the screen.

**All Tributaries, This Port**

This selection allows you to apply all the parameter settings for the tributary being provisioned to all tributaries of the same circuit pack port.

**All Tributaries, This Pack**

This selection allows you to apply the parameter settings for the tributary being provisioned to all tributaries of this type on all the ports on the same circuit pack.



## VCG Tributary Provisioning Parameters

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|                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Tributary monitoring mode</b>                          | <p>The tributary monitoring mode parameter sets the tributary monitoring mode of the tributary. The values may be</p> <p><b>MON</b></p> <p>Indicates that alarm monitoring is taking place on the tributary.</p> <p><b>NMON (initial value)</b></p> <p>Indicates that alarm monitoring is not occurring on the tributary.</p>                                                                                                                                                                                                                                                          |
| <b>HP degraded Interval</b>                               | This allows the user to provision the measurement period for determining bursty errors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>HP degraded threshold</b>                              | This allows the user to provision the threshold value for bursty errors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Tributary alarm severity assignment profile (ASAP)</b> | The ASAP parameter allows you to assign and view the details of an alarm severity assignment profile to be applied to this port.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Transmitted path trace</b>                             | <p>The transmitted path trace parameters allow the user to provision the path trace write format (single-byte, 16-byte, or 64-byte) and the value of the outgoing J1 byte path trace for the terminated STS-1 service. It may be up to 64 ASCII characters converted from the hexadecimal representation. If a series of two hexadecimal digits cannot be converted to ASCII characters, then the WaveStar CIT displays a left bracket ([), the letters hex, the two hexadecimal digits, and a right bracket()], for each set of two hexadecimal digits which cannot be converted.</p> |
| <b>Expected path trace</b>                                | <p>The expected path trace parameters allow the user to provision the path trace read format (single-byte, 16-byte, or 64-byte) and the value of the expected J1 byte path trace for the terminated STS-1 service. It may be up to 64 ASCII characters converted from the hexadecimal representation. If a series of two hexadecimal digits cannot be converted to ASCII characters, then the WaveStar CIT displays a left bracket ([), the letters hex, the two hexadecimal digits, and a right bracket()], for each set of two hexadecimal digits which cannot be converted.</p>     |



## Provisioning Parameters for Existing Protection Groups

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### **Provisioning versus creating protection groups**

Provisioning protection groups in this section involves provisioning or changing a limited number of parameters for existing protection groups. “Creating New Optical Port Protection Groups” (7-105) enables you to create a new optical port protection group with the chosen type of protection.

### **Method of provisioning protection groups**

The **Configuration > Provision** command from the WaveStar CIT System View menu displays the Provision Parameters for Protection Group or Equipment screen. A protection group AID entry or existing protection group selection under the protection group (**Ptn Grp**) tab displays the parameters associated with the protection group.

### **Security level required**

Only users with at least an M4 maintenance user privilege code have access to protection group provisioning. For more information on security privilege codes, see “User Types” (7-35).



## Changing 1+1 Port Protection Group Parameters

---

**1+1 protection ports** An existing 1+1 protection group cannot be redefined. Instead, a user would have to delete the protection group. Deletion of the protection group automatically reassigns any port members of the group to 0x1 protection. The NE denies any request to delete a protection group which has a cross-connection established or an active protection switch on one or more of the involved ports.



## Changing 2-Fiber BLSR Port Protection Group Parameters

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|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Protection group ID and port type</b>                    | The protection group ID and port type are displayed for the selected protection group.                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>2-Fiber BLSR protection ports</b>                        | An existing 2-Fiber BLSR port protection group cannot be redefined. Instead, a user would have to delete the protection group. Deletion of the protection group automatically reassigns any port members of the group to 0x1 protection. The NE denies any request to delete a protection group which has a cross-connection established or an active protection switch on one or more of the involved ports.                                                                                                            |
| <b>Ring ID</b>                                              | Ring IDs uniquely identify all the rings in the network and identify all the nodes intended for the same ring. The Ring ID is a 1- to 15-character ASCII string that identifies a ring. The characters may be letters, digits, or hyphens, but the Ring ID cannot be zero (0). The Ring ID may be edited, but remember that the Ring ID must be unique for each ring in the network. Although the RingID must be unique for each ring in the network, each node on the same ring <b>MUST</b> have the same Ring ID.      |
| <b>Wait to Restore for revertive/nonrevertive switching</b> | The Wait to Restore parameter controls the revertive/nonrevertive functionality of protection switching. The range is from 0 to 12 minutes, plus an infinity option. Infinity is equivalent to nonrevertive. The value zero permits a revertive switch from the protection line to the working line, immediately after detecting that the working line is functional. It may be desirable to allow the line to stabilize for a number of minutes before performing the revertive switch. The default value is 5 minutes. |



## Changing 1XN Electrical Protection Group Parameters

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**Shelf AID and protection  
group ID**

The Shelf AID and protection group ID are displayed for the selected protection group.

**Wait to restore for  
revertive/nonrevertive  
switching**

The Wait to Restore parameter controls the amount of time before a working electrical interface circuit pack is switched back into service after a protection switch. The range is from 0 to 12 minutes, plus an infinity option. Infinity is equivalent to nonrevertive. The value zero (0) permits a revertive switch from the protection circuit pack to the service circuit pack immediately after detecting that the service circuit pack is functional. It may be desirable to wait a number of minutes to allow a working service circuit pack to stabilize before being switched back into service.

Any change to the Wait to Restore parameter during a protection switch will not take affect until the Wait to Restore interval is completed. The default value is 5 minutes.



## Creating New Bays

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**Overview** Creating a new bay allows you to assign an AID value to a new bay before the equipment is physically installed or after the equipment is installed. You must create the bay in the system database to define the bay's presence within the system.

**Method of creating new bays** The **Configuration > Create New > Bay** command from the WaveStar CIT System View menu allows an authorized user to create new bays.

**Security level required** Only users with a P3 provisioning privilege code have access to creating new bays.

**Bay AID values** Bay AID values range in value from 1-99.





## Creating New Shelves

---

|                                       |                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                       | Creating a new shelf allows you to assign parameter values to a new shelf in a bay before the equipment is physically installed or after the equipment is installed. You must create the shelf in the system database to define the shelf's presence within the system.                                                                                                    |
| <b>Method of creating new shelves</b> | The <b>Configuration &gt; Create New &gt; Shelf</b> command from the WaveStar CIT System View menu allows an authorized user to create new shelves.                                                                                                                                                                                                                        |
| <b>Security level required</b>        | Only users with a P3 provisioning privilege code have access to creating new shelves.                                                                                                                                                                                                                                                                                      |
| <b>Shelf parameters</b>               | Shelf parameters are as follows: <ul style="list-style-type: none"> <li>• Shelf type</li> <li>• Shelf AID</li> <li>• ON cable identifier</li> <li>• SS bit override (Release 6 and later)</li> </ul>                                                                                                                                                                       |
| <b>Shelf type</b>                     | The Shelf Type parameter allows you to select the type of shelf being created. You select the shelf type from the provisioning screen menu.                                                                                                                                                                                                                                |
| <b>Shelf AID</b>                      | The Shelf AID is the access identifier necessary to identify the shelf. See "Access Identifiers (AIDs)" (7-67) for more information on AIDs.                                                                                                                                                                                                                               |
| <b>ON cable identifier</b>            | The ON Cable Identifier parameter is an integer value from one to four (1-4). The ON cable identifier is the Operation Network Cable Port Identifier (ONCPI) value that is recorded at the time of installation and is a function of how the shelf is wired.                                                                                                               |
| <b>SS bit override</b>                | In Release 6 and later releases, SS bit override can be enabled or disabled for a shelf. When SS bit override is enabled, the SS bits are set to 00 for all ports on a shelf. This overrides normal SS bit provisioning when interworking with non-compliant SONET network elements. When SS bit override is disabled, the SS bits are set to 10 for all ports on a shelf. |



## Creating New Circuit Packs

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|                                             |                                                                                                                                                                                                                |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                             | Creating a new circuit pack allows you to preprovision an empty shelf slot for future installation of a predetermined type of circuit pack.                                                                    |
| <b>Method of creating new circuit packs</b> | The <b>Configuration &gt; Create New &gt; Circuit Pack</b> command from the WaveStar CIT System View menu allows an authorized user to create new circuit packs.                                               |
| <b>Security level required</b>              | Only users with a P3 provisioning privilege code have access to creating new circuit packs.                                                                                                                    |
| <b>New circuit pack type parameter</b>      | Circuit pack types may be chosen from a menu in which only valid circuit pack types for the selected slot are listed. You may not create or remove circuit packs that are required for proper shelf operation. |



## Creating New Optical Port Protection Groups

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|                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>What are optical port protection groups</b>               | Optical port protection groups are an association of protected optical interface ports used for line protection. The group of ports represent both a protection switching entity and a set of lines that carry services to or from another network element. Port protection groups also determine the set of logical tributaries from and to which cross-connections can be provisioned. See Chapter 2, Network Topologies and Chapter 6, Control, Transmission, and Synchronization Interfaces for more information on the behavior and features of optical port protection groups.                                                                   |
| <b>Method of creating new optical port protection groups</b> | The <b>Configuration &gt; Create New &gt; Protection Group</b> command from the WaveStar CIT System View menu allows an authorized user to create new optical port protection groups.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Security level required</b>                               | Only users with a P3 provisioning privilege code have access to creating new optical port protection groups.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Types of optical port protection groups</b>               | <p>The number of ports on each optical circuit pack depends on the type of circuit pack. Within an optical port unit circuit pack, each port may be provisioned independently. Each port may be provisioned to operate in a separate port protection group or operate as unprotected. Each port protection group consists of a specific number of ports that are assigned roles for specific lines in a specific line protection switching configuration. The types of optical port protection groups are:</p> <ul style="list-style-type: none"><li>• 1+1 optical line protection</li><li>• 2-Fiber bidirectional line-switched ring (BLSR)</li></ul> |
| <b>Default optical port protection</b>                       | The default for all optical interface ports is 0x1 unprotected operation. The user may then assign other supported protection switching states (port protection groups) to a port as required for the type of port interface. When a port is provisioned for unprotected operation, neither the input nor the output of the port is included in a port protection group. An optical interface port provisioned for unprotected operation operates independently of other ports.                                                                                                                                                                        |

**General provisioning guidelines for optical port protection groups**

The following are general provisioning guidelines for optical port protection groups:

- All selected ports in an optical port protection group must be of the same optical rate.
- All ports in the port protection group must be provisioned first before provisioning the port protection group.
- Ports in an optical port protection group must be on the same shelf but on different circuit packs.
- Ports may not be selected if they are already assigned to a port protection group.
- At least two data communication channels (DCCs) must be available for BLSR port protection groups.

**Protection group access identifiers (AIDs)**

An NE can be provisioned to provide multiple protection groups. Each protection group within the NE must have a unique ID. The protection group AID is used to distinguish the different port protection groups within one NE. Some port protection group AIDs may be assigned to non-BLSR port protection groups and may conflict with RingIDs assigned by a network manager for a BLSR port protection group.

The protection group AID consists of four subfields. These fields are bay, shelf, protection group type, and user supplied 2-digit numeric identifier. The NE automatically assigns the bay, shelf, and protection group type fields of the AID when you select a shelf and the protection type. You must assign a unique 2-digit numeric identifier. For more information on access identifiers, see Access Identifiers in this chapter.

The protection group type identifier is defined as follows:

- t – 2-Fiber BLSR
- o – 1+1
- u – unprotected



## Creating a 1+1 Optical Port Protection Group

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|                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>What is a 1+1 port protection group</b>                      | In a 1+1 port protection group, the head-end electrical signal is permanently bridged to both a working and protection line so that the same payload is transmitted identically to the tail-end working and protection equipment. At the tail-end, the working and protection optical signals are monitored independently. The receive equipment selects either the working or protection line as the one carrying service based on the protection switch criteria.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Placement of circuit packs/port units</b>                    | The NE is flexible and does not require that the working and protection circuit packs be located in adjacent slots. The NE does not require a 1-to-1 association for the ports of the working and protection circuit pack and the assignment of working and protection ports is provisionable. However, follow the recommended provisioning guidelines to simplify the network management.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Provisioning guidelines for working and protection ports</b> | <p>The following guidelines apply to provisioning working and protection port units:</p> <ul style="list-style-type: none"><li>• Whenever practical, the circuit pack containing the protection port should be in a slot adjacent to the circuit pack containing the working port.</li><li>• Create a logical association of the working port on a circuit pack to the associated protection port on another circuit pack (for example, working port #1 to protection port #1).</li><li>• All selected ports in an optical port protection group must be of the same optical rate.</li><li>• Ports in an optical port protection group must be on the same shelf but on different circuit packs.</li><li>• Avoid configurations in which multiple working-to-protection associations involve more than two circuit packs.</li><li>• Split configurations with 1+1 in one direction and 0x1 in the other direction are not permitted. Both directions of transmission are chosen simultaneously.</li></ul> |



## 1+1 Optical Port Protection Group Parameters

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**Protection type** The protection type parameter allows you to select the type of port protection group you are creating. Depending on the protection type you select, subsequent selection of parameters will differ.

**Protection group AID** The port protection group AID must be unique within the NE. The protection group AID identifies the different port protection groups within one NE.

The protection group AID consists of four subfields. These fields are bay, shelf, protection group type, and user supplied 2-digit numeric identifier from 01-99. The NE automatically assigns the bay, shelf, and protection group type fields of the AID when you select a shelf and the protection type. You must assign a unique 2-digit numeric identifier. For more information on access identifiers, see Access Identifiers in this chapter. The protection group type identifier for a 1+1 protection group is an “o” indicating one+one (1+1).

**Protocol** The protocol parameter displays the 1+1 protection switching protocol. You may be able to choose the value of bidirectional or unidirectional protection switching after selecting the ports, if supported for the selected ports and in the software release you have. If this feature is not supported, the default value of unidirectional is displayed.

**Working and protection port AIDs** The 1+1 protection switching system has two lines (pairs of optical fibers) between line terminating equipment. Physically, these optical fibers terminate on the optical interfaces at each end of the span. The transmit and receive line that carries the automatic protection switch channel is called the protection line. The other transmit and receive line is called the working line. Once the working and protection lines have been defined, the definitions of the working line and protection line cannot be changed without removing the protection group entirely.

### Working Port AID

The working port AID field allows you to select a working port for the 1+1 optical port protection group. The port selection is limited to optical ports on the shelf that are available and support this type of port protection group.

**Protection Port AID**

The protection port AID field allows you to select a protection port for the 1+1 optical port protection group. The port selection is limited to optical ports on the shelf that are available and support this type of port protection group.

**Port type**

The port type is the optical rate of the selected ports and is displayed when you select a port.

**APS alarm severity assignment profile**

You may assign an automatic protection switch (APS) alarm severity assignment profile to this protection group. For more information on alarm severity assignment profiles, see “Alarm Severity Assignment Profiles” (7-153).



## Creating a 2-Fiber BLSR Protection Group

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### What is a 2-Fiber BLSR

The system supports multiple 2-Fiber Bidirectional Line Switched Ring (BLSR) port protection groups. A 2-Fiber BLSR ring is a subnetwork which consists of a set of nodes where:

- Each node is a terminal that interfaces with two optical spans.
- Each optical span interconnects two nodes.
- Each optical span consists of one line or one bidirectional pair of fibers.
- The set of nodes is interconnected by the spans into a complete, closed loop (a closed ring).

One side of each node is called the west side and the opposite side is called the east side. You provision the ports terminating the optical spans as east or west ports. The port terminating the optical span on the west side of a node is called the west port. The port terminating the optical span on the east side of a node is called the east port.

See Chapter 2, Network Topologies in this manual for more information on a 2-Fiber BLSR port protection group.

### OC-48 port protection group slot restrictions

Each OC-48/STM16 port unit occupies two slot positions. For each OC-48 2-Fiber BLSR port protection group in the WaveStar TDM 2.5G shelf, two OC-48/STM16 circuit packs are required. The two OC-48/STM16 circuit packs (ports) must be in slots located in one of two ways, either adjacent pairs or symmetric pairs, as follows:

- Adjacent pairs
  - Slots 2 and 4 or
  - Slots 6 and 8 or
  - Slots 10 and 12 or
  - Slots 14 and 16
- Symmetric pairs
  - Slots 8 and 10 or
  - Slots 6 and 12 or
  - Slots 4 and 14 or
  - Slots 2 and 16



**OC-192 port protection  
group slot restrictions**

Since there are only two slots for the OC-192/STM64 circuit packs in the WaveStar TDM 10G shelf in the WaveStar TDM 2.5G/10G system, there are no protection group slot restrictions. These port unit slots are designated east and west in a 2-Fiber BLSR.



## 2-Fiber BLSR Protection Group Parameters

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|                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Protection type</b>               | The protection type parameter allows you to select the type of port protection group you are creating. Depending on the protection type you select, subsequent selection of parameters will differ.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Protection group AID</b>          | <p>The port protection group AID must be unique within the NE. The protection group AID identifies the different port protection groups within one NE.</p> <p>The protection group AID consists of four subfields. These fields are bay, shelf, protection group type, and user supplied 2-digit numeric identifier from 01-99. The NE automatically assigns the bay, shelf, and protection group type fields of the AID when you select a shelf and the protection type. You must assign a unique 2-digit numeric identifier. For more information on access identifiers, see Access Identifiers in this chapter. The protection group type identifier for a 2-Fiber BLSR is a “t” indicating two-fiber.</p> |
| <b>Ring ID</b>                       | Ring IDs uniquely identify all the rings in the network and identify all the nodes intended for the same ring. The Ring ID is a 1- to 15-character ASCII string that identifies the ring. The characters may be letters, digits, or hyphens, but the Ring ID cannot be zero. The Ring ID must be unique for each ring in the network. Although the RingID must be unique for each ring in the network, each node on the same ring MUST have the same Ring ID.                                                                                                                                                                                                                                                 |
| <b>Ring side and line</b>            | A 2-Fiber BLSR ring node contains two optical interface ports cabled for the same 2-Fiber BLSR ring. When an optical interface port is provisioned as a member of a 2-Fiber BLSR port protection group, the port (line) is assigned a ring side (west or east) to identify its role. A 2-Fiber BLSR has two lines identified as the west port and east port.                                                                                                                                                                                                                                                                                                                                                  |
| <b>2-Fiber BLSR port assignments</b> | <p>Port assignments for a 2-Fiber BLSR are selected from a list of available and allowable port AIDs. For a 2-Fiber BLSR, you provision the two ports as:</p> <ul style="list-style-type: none"> <li>• One port as the “West port”</li> <li>• One port as the “East port”</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                          |

|                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Wait to restore for revertive/nonrevertive switching</b> | <p>The Wait to Restore parameter controls the revertive/nonrevertive functionality of protection switching. The range is from 0 to 12 minutes, plus an infinity option. Infinity is equivalent to nonrevertive. The value zero permits a revertive switch from the protection line to the working line immediately after detecting that the working line is functional. It may be desirable to allow the line to stabilize for a number of minutes before performing the revertive switch. The default value is 5 minutes.</p>                |
| <b>Data communications channels (DCC)</b>                   | <p>The data communications channels (DCCs) are used for NE-to-NE data communications and for NE-to-subnetwork communications. A DCC channel must be enabled on each ring side of the NE to support automatic ring discovery communications. Creation of BLSR protection groups require at least two DCC channels. If no DCC channels are available, you will need to free up two DCC channels and enable the DCC on the BLSR ports.</p>                                                                                                       |
| <b>LAPD channels</b>                                        | <p>Link Access Protocol on the D-channel (LAPD) channels associated with the DCC channels must be provisioned for each side of the NE, one for the East side and another for the West side. The values are User Side or Network Side. The LAPD channels must be set opposite for each end of the optical span. The default is User Side.</p>                                                                                                                                                                                                  |
| <b>Protection attribute</b>                                 | <p>In Release 6 and later releases, the time slot protection attribute parameter allows users to:</p> <ul style="list-style-type: none"><li>• exclude a time slot(s) from 2-fiber bidirectional line-switched ring protection in OC-192 rings</li><li>• include a time slot(s) in 2-fiber bidirectional line-switched ring protection that was previously excluded</li></ul> <p>The protection attribute parameter determines whether or not the working time slot is protected, and the corresponding protection time slot is preempted.</p> |

Because each working time slot is associated with a protection time slot, provisioning the protection attribute parameter of a working time slot also affects the associated protection time slot. The following table shows how the user provisioned protection attribute of the working time slot affects the protection time slot.

| User Provisioned Protection Attribute of Working Time Slot | Auto Provisioned Protection Attribute of Protection Time Slot |
|------------------------------------------------------------|---------------------------------------------------------------|
| Protected                                                  | Preemptible                                                   |
| Not Protected                                              | Nonpreemptible                                                |
| Temporarily Not Protected                                  | Temporarily Nonpreemptible                                    |

Provisioning the protection attribute parameter as Temporarily Not Protected results in an Abnormal alarm.

### Local Network Element Nonpreemptible Unprotected Traffic (NUT) Configuration

Each network element in a ring has a local NUT configuration. The local NUT configuration consists of the:

- User provisioned protection attribute of each working time slot
- Auto provisioned protection attribute of each protection time slot

The local NUT configuration represents the user provisioning made by the user at the local network element.

### Operational NUT Configuration

The operational NUT configuration provides the NUT configuration for the ring network. The operational NUT configuration for the ring is auto provisioned based on the user provisioned local NUT configurations at each network element in the ring network.

In the operational NUT configuration, the default value of the protection attribute is *Protected/Preemptible* for each time slot in the ring network. If the protection attribute of a time slot (in the local NUT configuration) is user provisioned as *Not Protected/Nonpreemptible* at any network element in the ring network, the corresponding protection attribute in the ring operational NUT configuration is auto provisioned *Not Protected/Nonpreemptible*.

The operational NUT configuration also shows the TID (target identifier) of the network element where the local NUT configuration was provisioned *Not Protected/Nonpreemptible*. If two or more network elements in the ring have the time slot provisioned *Not Protected/Nonpreemptible*, the operational NUT configuration shows the TID of the network with the highest node identifier (NID).

The following table shows the relationship between the user provisioned local NUT configuration at each network element and the auto provisioned operational NUT configuration for the ring.

| Local NUT Node 1 |                      | Local NUT Node 2 |                        | Ring Operational NUT |                      |      |
|------------------|----------------------|------------------|------------------------|----------------------|----------------------|------|
| Time Slot        | Protection Attribute | Time Slot        | Protection Attribute   | Time Slot            | Protection Attribute | Node |
| 1                | Protected            | 1                | Protected              | 1                    | Protected            | -    |
| 2                | Not Protected        | 2                | Not Protected          | 2                    | Not Protected        | 2    |
| 3                | Not Protected        | 3                | Protected              | 3                    | Not Protected        | 1    |
| 4                | Protected            | 4                | Temp - Not Protected   | 4                    | Not Protected        | 2    |
| -                |                      | -                |                        | -                    |                      |      |
| 97               | Preemptible          | 97               | Preemptible            | 97                   | Preemptible          | -    |
| 98               | Not Preemptible      | 98               | Not Preemptible        | 98                   | Not Preemptible      | 2    |
| 99               | Not Preemptible      | 99               | Not Preemptible        | 99                   | Not Preemptible      | 1    |
| 100              | Preemptible          | 100              | Temp - Not Preemptible | 100                  | Not Preemptible      | 2    |

**Important!** To prevent provisioning errors, it is recommended that only one network element be designated and used as a central place to provision nonpreemptible unprotected traffic.



## 1XN DS3/EC1 Electrical Protection Groups

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### What is a 1XN electrical protection group

The system supports 1xN *equipment* protection for DS3/EC-1 port units. The 1xN electrical protection group is not created through software provisioning but is created through equipment provisioning. The 1xN equipment protection switching group uses one DS3/EC1 protection port unit to protect up to 12 service DS3/EC1 port units in the same shelf. An equipment defect affecting only one port or all the ports on a service DS3/EC1 circuit pack causes all the traffic on the service circuit pack to be switched to the protection circuit pack.

The system supports 0X1 unprotected operation of DS3/EC-1 port units by not equipping the shelf with a protection port unit and the associated protection switch circuit pack.

### DS3/EC1 port unit slots

DS3/EC-1 port units may be installed in any of 12 port unit slots in the WaveStar TDM 2.5G I/O interface shelf. The 12 slots are slots which can be wired to an electrical connector panel. The slots are 1 through 6, and slots 11 through 16. Slot 16 is a preferred location for a DS3/EC-1 port unit because slot 16 cannot be used for any optical port unit when the shelf is equipped for 1xN DS3/EC1 electrical equipment protection.

### DS3/EC1 protection units

The protection DS3/EC1 circuit pack is installed in the **eprn (DS3EC1/8)** slot and the DS3/EC1 protection switch circuit pack is installed in the **eprotsw (SWITCH/DS3EC1)** slots in the shelf. See the Circuit Order/Provisioning tasks in this manual to create a 1XN electrical equipment protection group.



## 1XN DS3/EC1 Electrical Protection Group Parameters

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**Method of provisioning  
1XN electrical protection  
group parameters**

The 1xN electrical protection group is created through equipment provisioning [See “1XN DS3/EC1 Electrical Protection Groups” (7-116).] The **Configuration > Provision** command from the WaveStar CIT System View menu is used to provision associated parameters. The **Configuration > Provision** command displays the Provision Parameters for Protection Group or Equipment screen. A protection group AID entry or existing protection group selection under the protection group (**Ptn Grp**) tab displays the parameters associated with the protection group.

**Security level required**

Only users with at least an M4 maintenance user privilege code have access to protection group provisioning. For more information on security privilege codes, see “User Types” (7-35).

**Wait to restore for  
revertive/nonrevertive  
switching**

The Wait to Restore parameter controls the amount of time before a working electrical interface circuit pack is switched back into service after a protection switch. The range is from 0 to 12 minutes, plus an infinity option. Infinity is equivalent to nonrevertive. The value zero permits a revertive switch from the protection circuit pack to the service circuit pack immediately after detecting that the service circuit pack is functional. It may be desirable to wait a number of minutes to allow a working service circuit pack to stabilize before being switched back into service.

Any change to the Wait to Restore parameter during a protection switch will not take affect until the Wait to Restore interval is completed. The default value is 5 minutes.



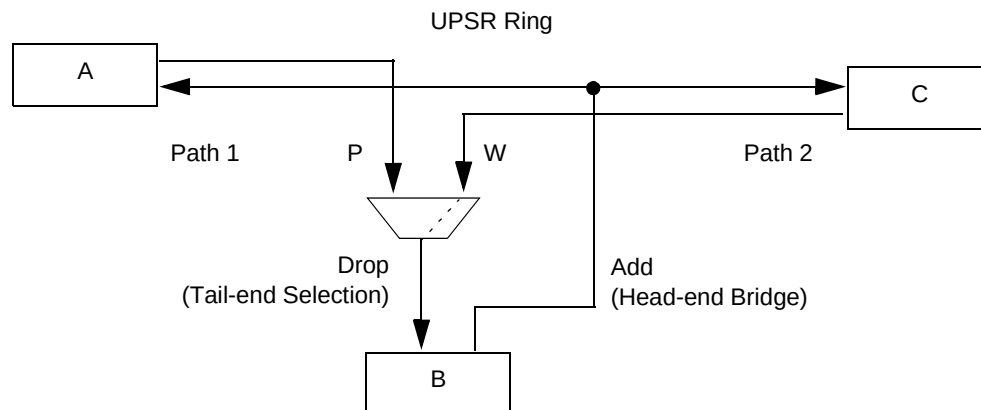
## Creating a UPSR

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**What is a UPSR** A Unidirectional Path-Switched Ring (UPSR) provides path-level protection for STS-N circuits within a physical ring network. The ring is usually comprised of unprotected (0x1) lines at the same OC-N rate which are connected in a ring topology. Typically all (or most) of the circuits within the ring are path-protected. Each direction of a circuit is bridged onto opposite tributaries at an add node (head-end), passed through intermediate nodes on both sides of the ring, and selected at a drop node (tail-end). Each two-way circuit uses a time slot of bandwidth all the way around the ring since both a working and protection path are dedicated to it. The term “unidirectional” (the U in UPSR) refers to the fact that every circuit is normally selected from the same direction (i.e., either clockwise or counter-clockwise), although the protection may typically be non-revertive.

**UPSR parameters** A UPSR is not a single protection group. Instead there is a path protection group associated with each add/drop cross-connection into/out of the ring. Each of these add/drop cross connections has parameters that you can set when you create the cross-connection or by modifying it later.

### UPSR ring add, drop cross connection





|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Rate</b>                  | The rate can be STS-1, STS-3, STS-12, or STS-48.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Path 2 NE name</b>        | You set this parameter by selecting the network element for Path 2 by selecting its target identifier (TID) from a drop-down menu. Path 2 may be set to be the working leg, as depicted above, or the protection leg.                                                                                                                                                                                                                                                                          |
| <b>Add/Drop NE name</b>      | You set this parameter by selecting the network element for the add/drop by selecting its target identifier (TID) from a drop-down menu.                                                                                                                                                                                                                                                                                                                                                       |
| <b>Path 1 NE name</b>        | You set this parameter by selecting the network element for Path 1 by selecting its target identifier (TID) from a drop-down menu. Path 1 may be set to be the working leg, as depicted above, or the protection leg.                                                                                                                                                                                                                                                                          |
| <b>Output mode</b>           | This parameter is described under “Cross-Connection Output Signal Provisioning” (7-137).                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>PP reversion behavior</b> | You set this parameter by selecting either <b>Non-Revertive</b> or <b>Revertive</b> from a drop-down menu. Non-Revertive means that if the working signal fails and the path switches to the protection side, the path will not revert to the working side even if the signal is regained. Revertive means that the path will revert the working side after the number of minutes set using the <b>Configuration &gt; Path Protection Type &gt; System Path Level Wait to Restore</b> command. |
| <b>PP holdoff behavior</b>   | You set this parameter by selecting either <b>No-Holdoff</b> or <b>With Holdoff</b> from a drop-down menu. No-Holdoff means that if the working signal fails the path switches immediately. With Holdoff means that if the working signal fails the path switches after waiting for a number of milliseconds set using the <b>Configuration &gt; Path Protection Type &gt; System Path Level Holdoff Time</b> command.                                                                         |



## Path Protection Type

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|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                                     | The path protection type option allows you to provision parameters which apply to ALL Path Protection type protection groups. Path protection type groups, such as unidirectional path switched rings (UPSR), are established by using cross-connections. This parameter from the Configuration menu allows you set two parameters which apply to all the path protection type groups on the NE. Other parameters are set when the cross-connections are made. |
| <b>Method of provisioning path protection types</b> | The <b>Configuration &gt; Path Protection Type</b> command from the WaveStar CIT System View menu displays the Path Protection Type Provisioning screen.                                                                                                                                                                                                                                                                                                       |
| <b>Security level required</b>                      | Only users with at least an M4 maintenance user privilege code have access to path protection type provisioning. For more information on security privilege codes, see “User Types” (7-35).                                                                                                                                                                                                                                                                    |
| <b>System path level wait to restore</b>            | The System Path Level Wait to Restore parameter allows you to specify the amount of time before a path protection switch is allowed to restore to the original path. The value may be set to an integer value from 0 to 12 minutes, or INFINITE. A value of INFINITE indicates that the switch will never restore automatically.                                                                                                                               |
| <b>System path level hold off time (ms)</b>         | The System Path Level Hold Off Time (ms) parameter allows you to specify the amount of time before a protection switch occurs. The value may be set to an integer value from 0 to 10000, which indicates time in one millisecond (ms) intervals from 0 to 10 seconds. Ten seconds equals 10,000 milliseconds.                                                                                                                                                  |



## Miscellaneous Discretes

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|                                                       |                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Overview</b>                                       | Miscellaneous discrete inputs and outputs allow you to use the system to monitor and control other equipment co-located with the system. For example, a Miscellaneous Discrete Input (MDI) can be connected to monitor a temperature sensor, and an Miscellaneous Discrete Output (MDO) can be connected to control a fan or generator. The system supports 8 MDIs and 8 MDOs. |
| <b>Method of provisioning miscellaneous discretes</b> | The <b>Configuration &gt; Miscellaneous Discretes</b> command from the WaveStar CIT System View menu displays the Miscellaneous Discretes Provisioning screen.                                                                                                                                                                                                                 |
| <b>Security level required</b>                        | Only users with at least an M3 maintenance user privilege code have access to miscellaneous discrete provisioning. For more information on security privilege codes, see “User Types” (7-35).                                                                                                                                                                                  |
| <b>Name field</b>                                     | The Name field allows you to enter or edit a title to be associated with an input miscellaneous discrete which has been selected or a control name to be associated with an output miscellaneous discrete. This title may be a 26 character alphanumeric string, upper and lower case, with spaces and periods allowed.                                                        |
| <b>Initial control state</b>                          | The Initial Control State allows you to specify the initial state of a miscellaneous discrete output. The value may be either Operated or Released.                                                                                                                                                                                                                            |
| <b>Duration mode</b>                                  | The Duration Mode parameter allows you to provision the duration mode of the MDO. The MDO relay may be opened or closed continuously or momentarily with a momentary fixed period of 300 ms.                                                                                                                                                                                   |
| <b>Alarm severity assignment profile</b>              | The Alarm Severity Assignment Profile (ASAP) option allows you to select or assign an Environmental ASAP to a selected MDI.                                                                                                                                                                                                                                                    |



# Cross-Connection Provisioning

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- Cross-connections** Cross-connections are defined as SONET path-level connections between logical input and output tributaries of specific ports. The logical input and output tributaries in each type of port or port protection group are the only entities from and to which the user can provision cross-connections. For a port which is not in a port protection group, such as an electrical port or unprotected optical port, a logical tributary is the same entity as a port tributary. For a port which is in a port protection group, the logical tributary refers to the port tributary used for normal transmission in the absence of a line protection switch. The transmission connectivity required for line protection switching is determined automatically by the provisioning and current state of the port protection group.
- Port tributary** A port tributary is a path-level unit of bandwidth within a port, or the constituent signal(s) being carried in this unit of bandwidth (for example, an STS-1, STS-3c, or STS-12c tributary within an OC-N port). A port tributary is an STS-1 tributary unless specified otherwise. For a port which is not in a port protection group (for example, an unprotected optical port), a port tributary is the same entity as a logical tributary.
- Logical tributary** A logical tributary is a path-level unit of bandwidth within a port or in the signal(s) being carried in the path-level unit of bandwidth. For example, a logical tributary may be an STS-1, STS-3c, or STS-12c tributary within an OC-N line in a port protection group. A logical tributary is generally an STS-1 tributary unless otherwise specified. A logical tributary is the same as the port tributary in an unprotected optical port.
- A logical tributary is associated with a particular service (unit of traffic) carried to or from another network element. The operations on a logical tributary include cross-connections and path-level fault and performance monitoring. Some operations apply to logical input and/or output tributaries, and others to logical input tributaries only. The operations which apply to a port tributary can apply to a logical tributary only when it is the same entity.

- Working tributary** A working tributary is a port tributary carrying traffic which can be protected in a port protection group. A working tributary may also be a logical tributary associated with a port tributary.
- Protection tributary** A protection tributary can be used to protect the traffic carried by a working tributary in a port protection group. A protection tributary may also be a logical tributary associated with a port tributary if protection access is supported in the port protection group.
- Protection access** Protection access is the ability to provide traffic on protection tributaries when the port tributaries are not being used to carry the protected working traffic.



## Cross-Connection Rates

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**Cross-connection rates** The system cross-connects SONET signal Synchronous Payload Envelopes (SPE) intact with no bits altered. Cross-connection rate defines the path-level bandwidth that the cross-connection can carry. SONET cross-connect rates include STS-1, STS-3, STS-12, and STS-48.

### **Fixed-rate tributary operation**

The rate of a cross-connection must match the provisioned rate of each involved input and output tributary that is on a port provisioned for fixed-rate tributary operation. See “Fixed-rate tributary operation for input and output ports” (7-77) and “Tributary unequipped signal rate” (7-77) for more information.

### **Adaptive-rate tributary operation**

On adaptive rate OC-n ports, the signal rates adapt to the supported set of signal rates. Cross-connections may be provisioned at any cross-connection rate that is supported for the logical tributaries associated with the input and output ports. A cross-connection leg can carry any set of constituent signals for which the total of the constituent signal rates does not exceed the cross-connection rate. Cross-connection legs in opposite directions, from an input tributary and to an output tributary, can be provisioned independently and at different rates. See “Adaptive-rate tributary operation” (7-76) for more information.

**DS3/STS-1 gateway cross-connections** Signals from DS3 interfaces are mapped into STS-1 payloads and are cross-connected as STS-1s. The DS3 signals are handled transparently with no bits altered.



## Cross-Connection Types

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### Cross-Connection Types

The system allows you to create these types of cross-connections:

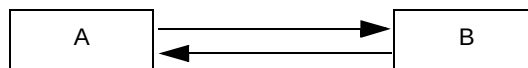
- 2-way point-to-point (default)
- 1-way point-to-point
- 1-way path protected
- 1-way adjunct path protected
- ring interworking, drop & continue, BLSR primary node
- ring interworking, drop & continue, BLSR primary nodes in same NE
- UPSR ring add, drop
- UPSR ring-to-ring, single node interconnection, same NE

### BLSR vs. UPSR

Signals in a BLSR are protected by the fact that the entire ring is a single protection group. For this reason, cross-connections within the ring are generally point-to-point instead of path-protected. Signals in a UPSR are protected by the fact that each cross-connection into or out of the ring is path-protected. Each working signal has a protection signal going around the ring in the opposite direction.

### 2-way point-to-point

A 2-way point-to-point cross-connection consists of two legs that provide a bi-directional connection between two tributaries. Each leg, or direction, must be at the same cross-connection rate. You could view a 2-way point-to-point cross-connection as two 1-way point-to-point cross-connections, except that you can set it up or take it down with a single command.

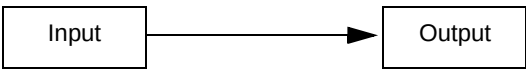


**Note on 1-way cross-connections**

If one direction of a tributary of a given port is provisioned as a 1-way cross-connection, the signal in the other direction can either be terminated with no cross-connection or it can be cross-connected independently to a tributary on another port.

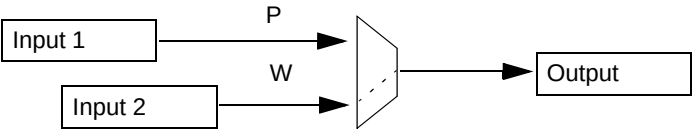
**1-way point-to-point**

A 1-way point-to-point cross-connection consists of a single leg connecting an input tributary to an output tributary at the selected cross-connection rate. A single command to the network element sets up or takes down a 1-way point-to-point cross-connection.



**1-way path protected**

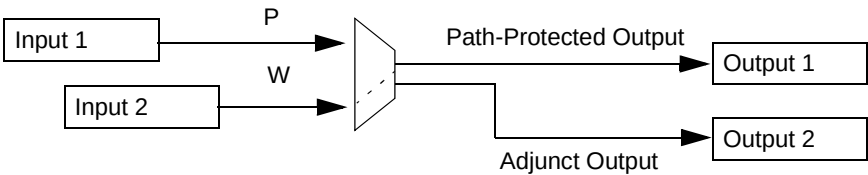
A 1-way path-protected cross-connection consists of a working leg from one input tributary and a protection leg from a second input tributary to the same output tributary. These legs make up a path protection group. Each leg must be at the same cross-connection rate.



**1-way adjunct path-protected**

A 1-way adjunct path-protected cross-connection consists of an adjunct working leg from one input tributary and an adjunct protection leg from a second input tributary to the same adjunct output tributary.

To create a 1-way adjunct path-protected cross-connection you select an existing path-protected cross-connection and then select an adjunct output tributary. The result is that the signal is going to both the original path-protected output tributary and the new adjunct path-protected output tributary.





### Ring interworking, drop & continue, BLSR primary node

A ring interworking (DNRI), drop & continue, BLSR primary node cross-connection could be viewed as one path protected cross-connection coming into a BLSR from some other ring and a point-to-point cross-connection dropping out of the BLSR into the other ring. The following two figures show the relationship between the ring interworking and the cross-connection.

**Figure 7-1 Ring Interworking (DNRI) with the Drop-and-Continue Method on Working bandwidth in a BLSR**

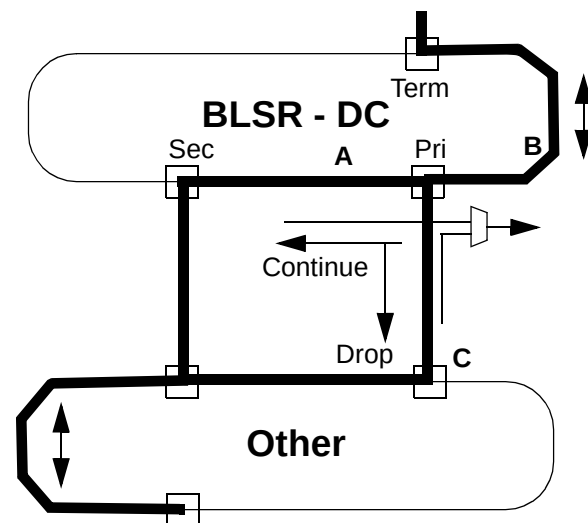
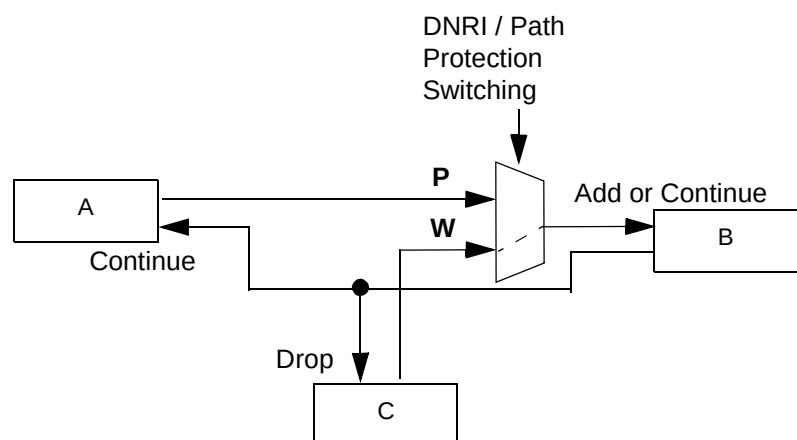


**Figure 7-2 “Ring Interworking, Drop & Continue, BLSR Primary Node” Cross-Connection**



### Ring interworking, drop & continue, BLSR primary nodes in same NE

A ring interworking, drop & continue, BLSR primary nodes in same NE cross-connection could be viewed as a path protected cross-connection from Ring 1 into Ring 2 and a path protected cross-connection from Ring 2 into Ring 1. The following two figures show the relationship between the ring interworking and the cross-connection.

**Figure 7-3 Ring Interworking with BLSRs (Drop-and-Continue, Working Bandwidth) in the Same Network Element**

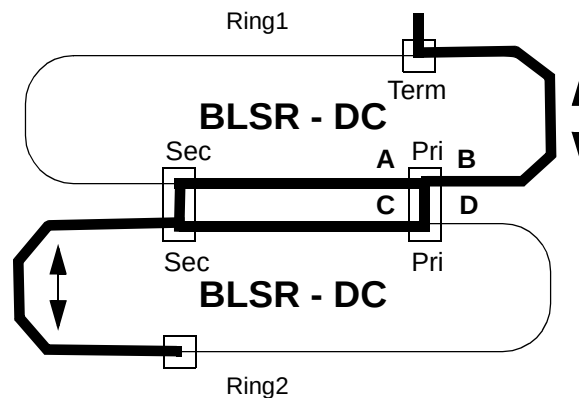
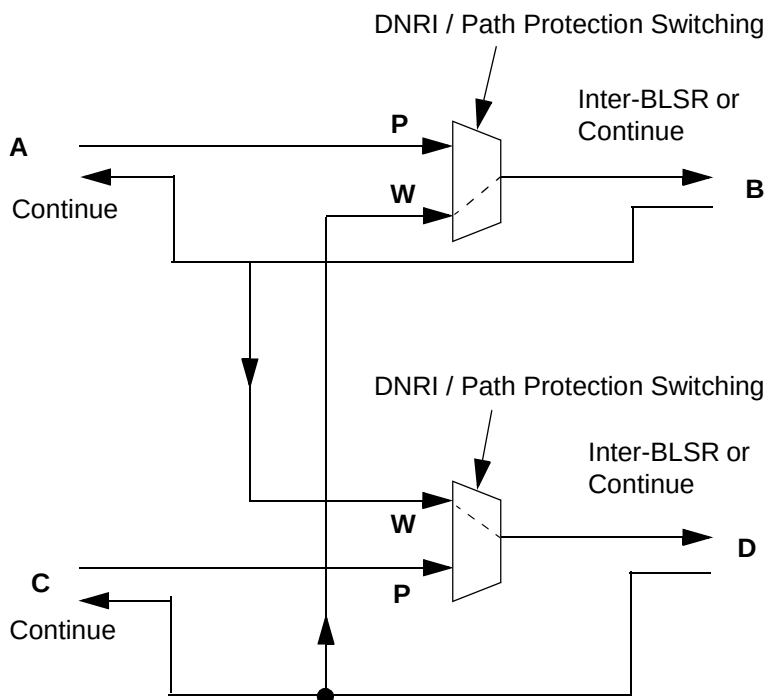


**Figure 7-4 “Ring Interworking, Drop & Continue, BLSR Primary Node” Cross-Connection**



**UPSR  
ring add, drop**

A UPSR ring add, drop cross-connection could be viewed as a combination of the following 1-way cross-connections:

- two point-to-point cross-connections into the ring (or one bridged cross-connection into the ring) – this sends an equal signal in each direction around the ring, providing the two legs of the path protection group
- one path-protected cross-connection out of the ring

To put it another way, looking at the figures below:

- the Add (sometimes called the *head-end bridge*) consists of two 1-way point-to-point cross-connections – one from B to A and one from B to C
- the Drop (sometimes called the *tail-end selection*) consists of one 1-way path-protected cross-connection with A and C as the inputs and B as the output

Note that a UPSR through cross-connection is a point-to-point cross-connection. The following two figures show the relationship between the add/drop function on the ring and the cross-connection that forms it.

**Figure 7-5 Unidirectional Path-Switched Ring**

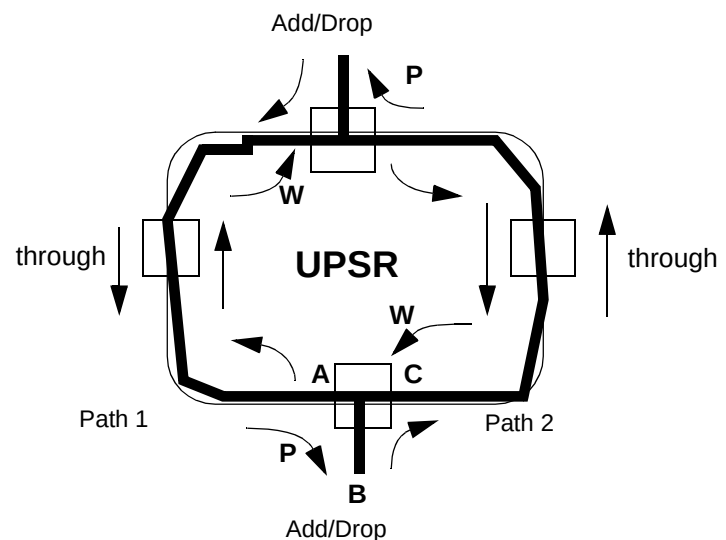
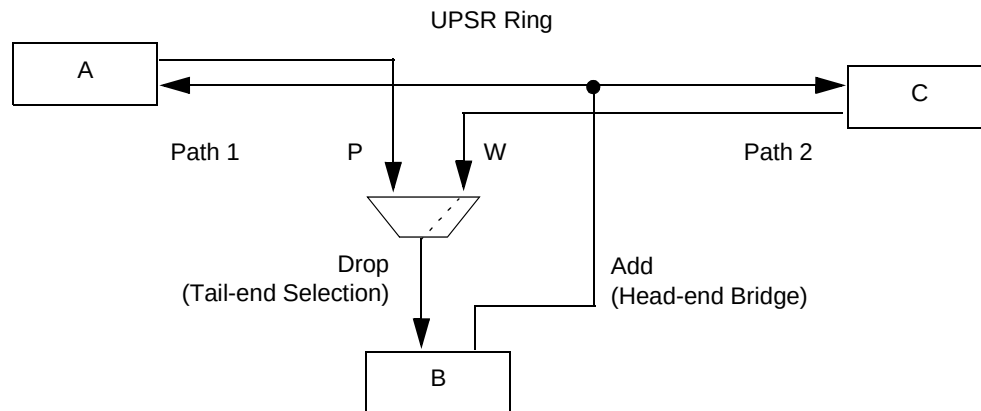


**Figure 7-6 “UPSR Ring Add, Drop” Cross-Connection**

**UPSR  
ring-to-ring,  
single node  
interconnection, same NE**

A UPSR ring-to-ring, single node interconnection, same NE cross-connection could be viewed as the following two pairs of 1-way cross-connections:

- a path-protected cross-connection plus an adjunct path-protected cross-connection from Ring 1 to Ring 2
- a path-protected cross-connection plus an adjunct path-protected cross-connection from Ring 2 to Ring 1

The following two figures show the relationship between the ring-to-ring connection and the cross-connection that forms it.

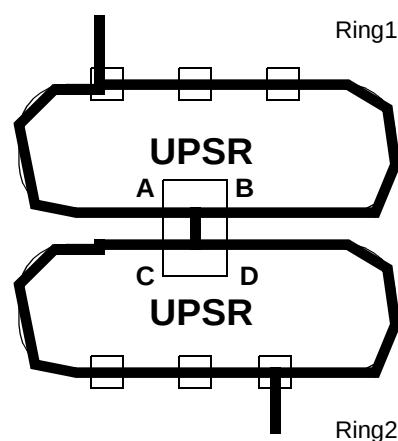
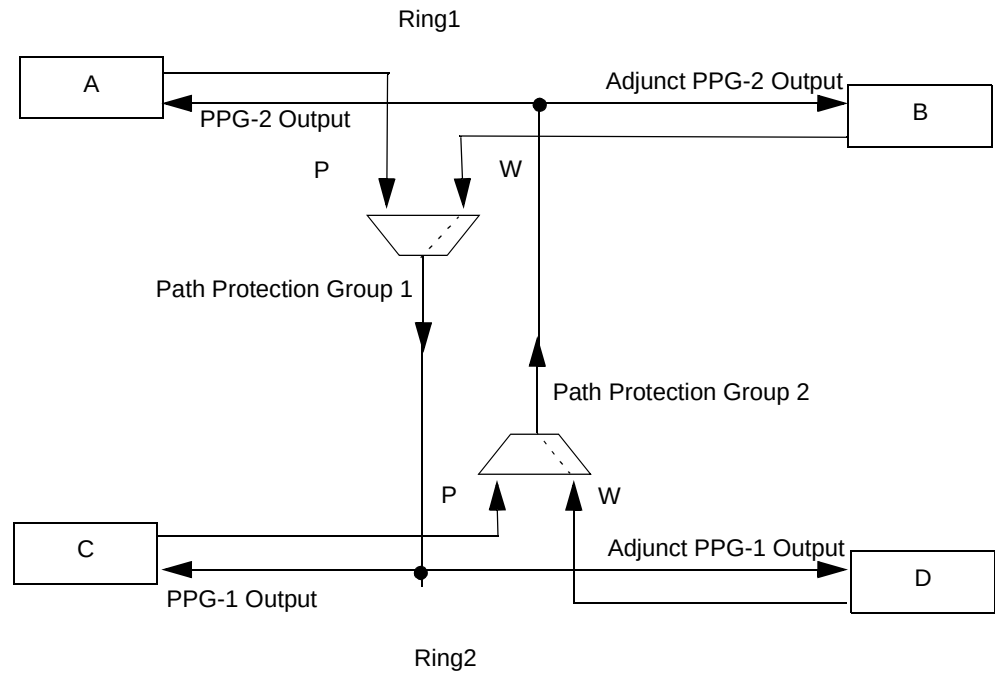
**Figure 7-7 Single Node Interconnection of UPSRs in the Same Network Element (Single Homing)**

**Figure 7-8 “UPSR Ring-to-Ring, Same NE” Cross-Connection**

□

## Bridging Cross-Connections

---

**Bridge (1X2 broadcast)** A bridge is a cross-connection leg with the same input tributary as that of an existing cross-connection leg, thereby forming a 1:2 “bridge” from an input tributary to two output tributaries.

Bridging is generally used for facility rolling and testing. Bridging is supported for each of the supported cross-connect rates. Any existing cross-connection can be bridged to a second output tributary without impairing the existing signal. Also, either half of a bridged signal may be taken down without impairing the remaining cross-connected signal.

The system supports the following requests for 1:2 bridging:

- Add a 1-way cross-connection from the input leg of an existing 1-way or 2-way cross-connection to a new output to form a 1:2 cross-connection in one direction
- Remove either leg of an existing 1:2 cross-connection, independent of the order in which the legs were originally set up in one direction
- Bridged cross-connections involving a DS3 port as the input or a DS3 port as one or both of the outputs
- Bridged cross-connections among any combinations of supported ports if the individual cross-connection legs are required to be supported between port combinations.



## Rolling Cross-Connections

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**What is rolling a cross-connection**

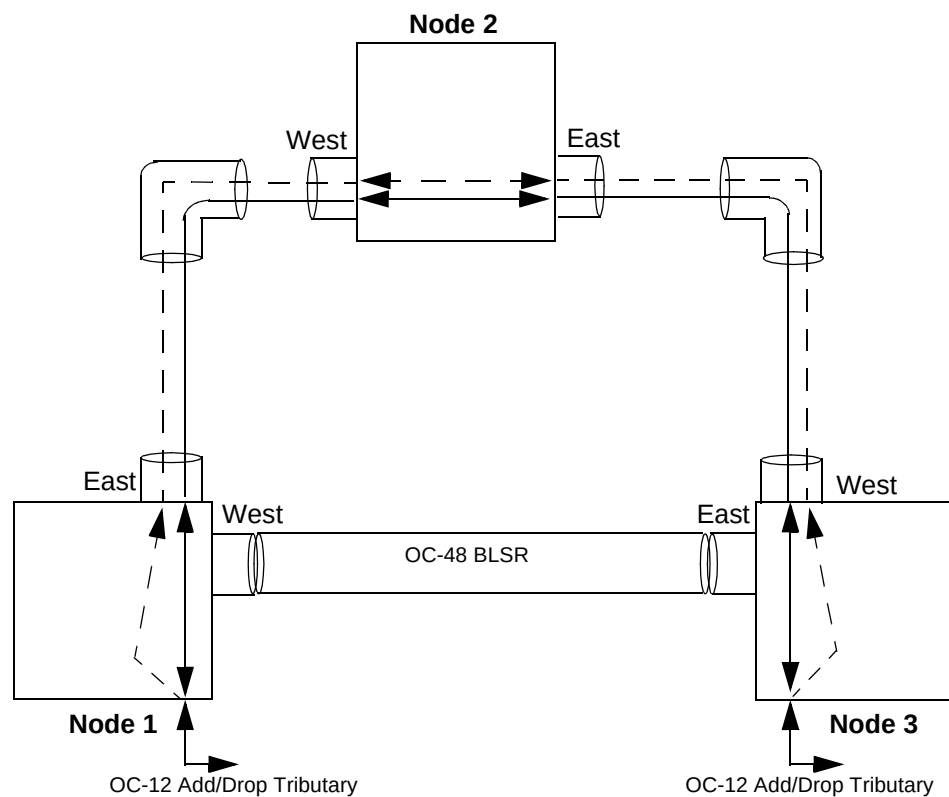
A roll operation consists of moving the input of any existing leg of any cross-connection from a given tributary to a second tributary, while leaving the output unchanged. A roll is used as a tail-end switch in a “facility or tributary rolling” operation, whereby traffic is moved from one facility to another or from one tributary to another on a facility. The head-end side of a facility or tributary roll usually has a bridge established in one NE so that the traffic flows on both the old and new facilities, minimizing the signal interruption time when the roll is carried out to that introduced by the roll itself in the other NE. All necessary cross-connection paths must be completed on the new facility before performing this operation.



## Facility or Tributary Roll

**BLSR example** One type of facility or tributary roll takes a signal that is coming into a ring on a given tributary and moves it to a different tributary on that same ring. The three stages of this type of roll are illustrated below with an example of rolling an OC-12 tributary within an OC-48 BLSR.

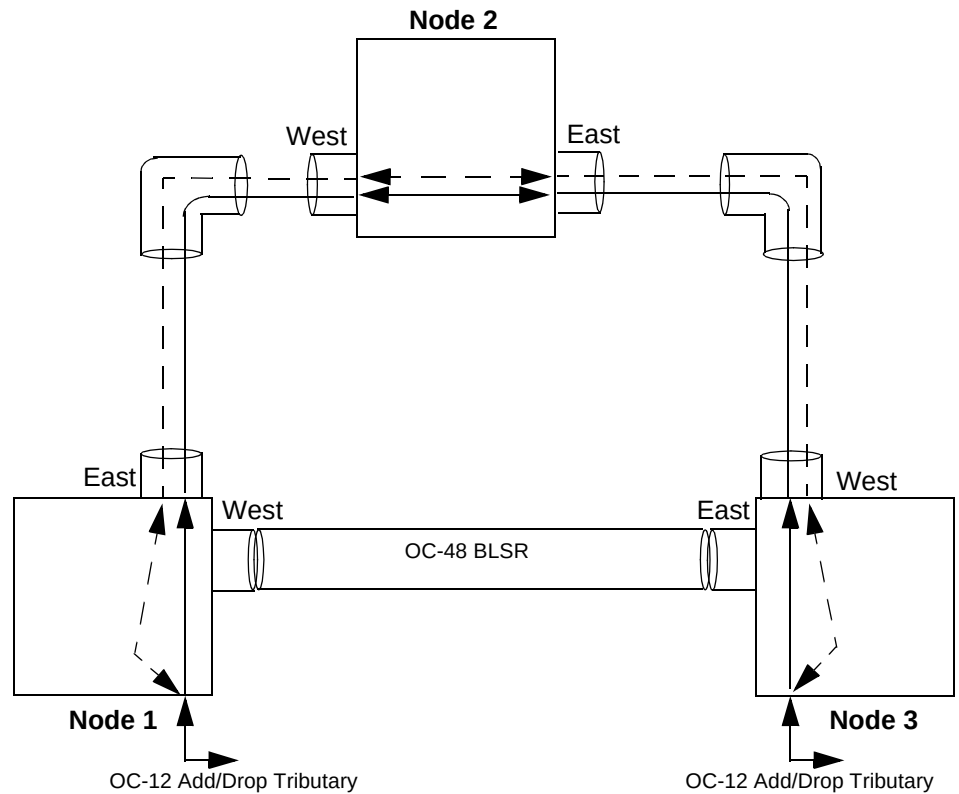
**Stage 1** The following figure shows stage 1 of the roll, which is to bridge the output from the add/drop tributary to a new BLSR tributary. The input to the add/drop still comes from the original BLSR tributary.



Solid arrows  $\Rightarrow$  Original tributaries  
Dashed arrows  $\Rightarrow$  New tributaries

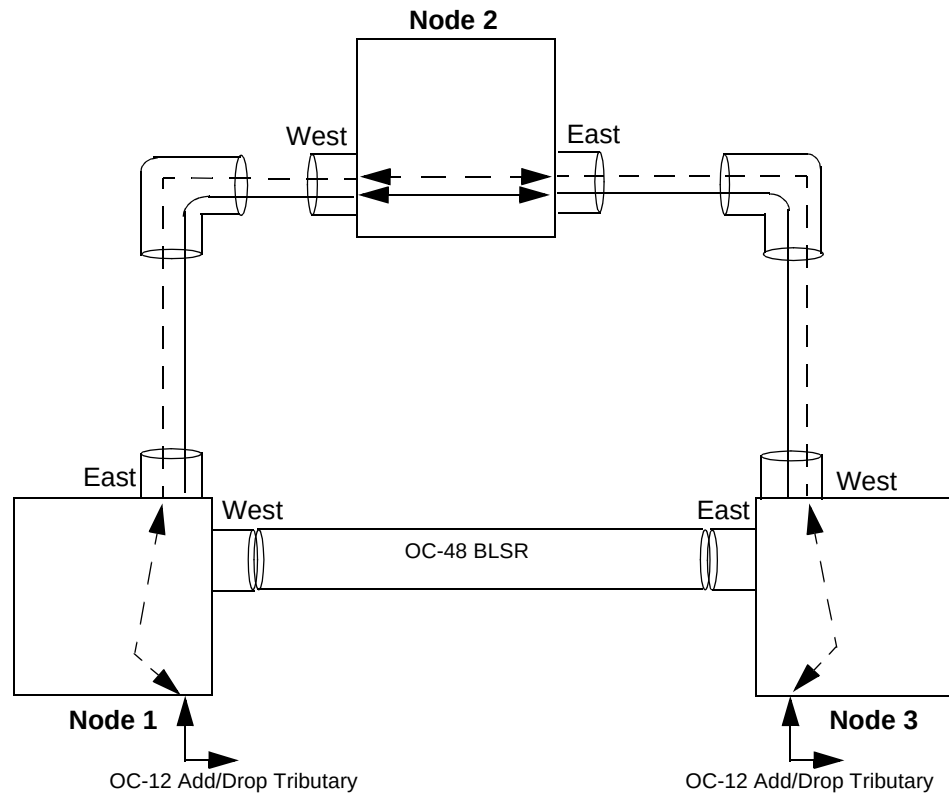


**Stage 2** The following figure shows stage 2 of the roll, which is to roll the input to the add/drop so that it comes from the new BLSR tributary instead of the original BLSR tributary. The output from the add/drop is still going to both the original and new BLSR tributaries.



Solid arrows → Original tributaries  
Dashed arrows → New tributaries

**Stage 3** The following figure shows stage 3, the final stage of the roll, which is to delete the cross-connection between the add/drop and the original BLSR tributary.



Solid arrows  $\Rightarrow$  Original tributaries  
Dashed arrows  $\Rightarrow$  New tributaries

□

## Cross-Connection Output Signal Provisioning

---

### **Cross-connection output mode**

Cross-connection output mode provisioning refers to the capability to provision whether a cross-connected signal emerges from the system (“normal” mode) or whether a signal is injected on the output instead of the cross-connected signal (“terminated” mode). This capability allows you to send keep-alive signals downstream during the process of setting up/trouble shooting an end-to-end connection through a network.

This is a per-tributary feature that can be set independently for each cross-connection at the time of the cross-connection or later. The default setting is “normal”.

You can provision the output signal content of a cross-connection on any/all port tributaries.

The provisioning options include:

- Normal mode – where the cross-connected signal is output
- Terminated mode – where a maintenance signal is output (with the cross-connection still mapped)

For DS3 ports the terminated modes are:

- DS3 idle – Output
- DS3 AIS – Output

For a SONET port the terminated modes are:

- Unequipped signal – Output
- AIS-P – Output

The default is that the cross-connected signal is output. This applies to 1-way cross-connections (including a bridge), 2-way cross-connections, rolls. The signal output is provisionable independently for each tributary of a 2-way cross-connection. This capability is available during and after the time of cross-connection setup. This capability only applies to a tributary with an existing cross-connection leg in its output direction or to a request to set up a cross-connection leg to the output of a tributary.

When you select the terminated output mode on a cross-connected tributary, it is treated as a forced condition that persists until you select the normal output mode. In the “terminated” mode, the autonomous transmission signal maintenance associated with upstream faults will not overwrite the provisioned output signal. When you select the normal output mode (cross-connected signal emerges), then the transmission signal maintenance behaves as normally expected.

Cross-connection output signal provisioning for ports provisioned for SONET and fixed-rate tributary operation apply on an STS-Nc basis. In the terminated mode the selected maintenance signal is at the STS-Nc level for tributaries associated with an STS-N cross-connection.

**Tributaries without cross-connections**

STS-N(c) unequipped signals are inserted on the output of all tributaries of a SONET-provisioned port for fixed-rate tributary operation for which there are no cross-connections provisioned in the output direction. This applies whether or not the input direction of the port is cross-connected. The rate of the unequipped signal corresponds on a per-tributary basis to the provisioned output rate of that tributary (for example, STS-1, STS-3c, STS-12c). This applies to both the service and protection bandwidths.

**DS3 tributaries without cross-connections**

A DS3 port that is equipped outputs a DS3 idle signal when there is no cross-connection provisioned in its output direction. This applies whether or not the input direction of the DS3 port is cross-connected.

A DS3 port that is equipped outputs the following maintenance signal when there is no cross-connection provisioned in its output direction:

- DS3 AIS, when the path terminating function (PTF) cross-connection dependency is disabled, meaning that the fault behavior of the DS3 egress is de-coupled from the existence/absence of a cross-connection
- DS3 IDLE, when PTF cross-connection dependency is enabled, meaning that the fault behavior of the DS3 egress is coupled to the existence/absence of a cross-connection

This applies whether or not the input direction of the DS3 port is cross-connected.



## Cross-Connection Safeguards

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### **Cross-connection mismatch**

The command structure provides safeguards against unintentional corruption of service when a mismatch exists between the topology associated with a cross-connection request and the legs of existing cross-connections between the relevant tributaries. This safeguard is shown as denials of the request.

The command structure provides safeguards for the following cases:

- A request for an operation that expects an existing cross-connection leg when no such cross-connection leg exists between the relevant tributaries such as an attempt to disconnect or roll.
- A request for a two-way operation when the relevant tributaries have only 1-way cross-connections between them such as a 2-way disconnection request.

The command structure provides the ability to take down any one-way point-to-point leg in any cross-connection via a single command to the network element. You can do this even though the leg may be a leg in a 2-way leg pair. You can do this without having to perform an extra step such as changing a 2-way cross-connection to two 1-way cross-connections.

### **Path protected cross-connections**

The command structure also provides the following safeguards against unintentional corruption of service which involves cross-connections with a path-protected cross-connection topology:

- A request for an operation on a cross-connection with a path-protected topology when the relevant tributaries have a point-to-point cross-connection between them in the specified direction (that is, an attempt to delete a path-protected connection or convert it to a point-to-point connection).
- A request for an operation on a cross-connection with a point-to-point topology when the relevant tributaries have a path-protected cross-connection between them in the specified direction (that is, an attempt to delete a point-to-point connection or convert it to a path-protected connection).
- A request to delete one leg from a path-protected cross-connection, which has two legs.

The command structure provides the ability to take down any one-way path-protected cross-connection via a single command to the network element. You can do this even though both of the legs in the path-protected connection may be in a two-way leg pair.



## Red Line Cross-Connections

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**Red Line** Normally, an established cross-connection can be modified and/or removed. However, for certain critical applications (for example, cross-connections that support traffic to/from an air traffic control center), access to cross-connections may be denied. The cross-connection parameter “Red Line” can be set to YES to deny access to cross-connections. The normal (default state) is Red Line = NO.



## Squelch Map for BLSR Cross-Connections

---

**Overview** This section contains information on source and destination nodes that need to be associated with cross-connections in order to support the squelch map for each BLSR port protection group.

**Squelch map** The network element uses the squelch map during the ring loopback protection switching that may occur in a closed BLSR. The squelch map is also distributed to all other nodes in a BLSR for use in the ring circuit audit. The ring circuit audit verifies circuit continuity, squelch map consistency, and circuit provisioning consistency for each provisioned path through a single BLSR on the same time slot. The distributed copy of the squelch map may also be used for the retrieve time slot and retrieve circuit commands which help the user locate and fix problems detected by the ring circuit audit. These additional uses of the squelch map (besides squelching the ring loopback protection) require ALL the tributaries (not only the protected service tributaries) to be included in the squelch map.

**Squelching** A bidirectional line-switched ring (BLSR) protects circuits against failures between the two nodes where the circuit is added to and dropped from the ring. If the circuit passes through a node which becomes isolated (due to node failure or due to span failures on both sides of the node), the circuit can still be protected. However, if the node which adds or drops the circuit from the ring becomes isolated, the circuit must be “squelched” in order to prevent a misconnection of this circuit with some other circuit.

Squelching is performed during a ring loopback protection switch by the switching nodes. The switching nodes are the nodes adjacent to the failure(s) and may be any nodes in the ring. The determination whether or not to squelch circuits in case of an isolated node depends on the knowledge by each node in the ring of the source and destination nodes for all cross-connections which this node itself adds to, drops from, or passes through the ring.

**Source and destination nodes** The source node is a node in the ring at which the circuit on a tributary is added to a BLSR tributary. The destination node is the node in the ring at which the circuit on the tributary is dropped from the BLSR tributary.



**Squelch map source and destination nodes**

The network element maintains a “squelch map” for each BLSR port protection group. The squelch map supports one source node TID (NE Name) for each input tributary in a BLSR port protection group and one destination node TID for each output tributary in a BLSR port protection group.

The squelch map additionally supports a destination node TID for any Drop or Inter-BLSR connection from an input tributary in a BLSR port protection group. The squelch map also supports a source node TID for any Add or Inter-BLSR connection to an output tributary in a BLSR port protection group. (These indicate the TID of the network element itself.)

Cross-connections that are not part of a BLSR port protection group do not require source or destination TIDs.

**Source/Destination nodes for add connections**

An Add connection consists of an input tributary in any port or port protection group which is NOT a BLSR, and an output tributary which is in any port protection group which IS a BLSR.

A destination node TID (Destination NE Name) must be entered for the output tributary of any Add connection from an NE to a BLSR tributary. The source node TID (Source NE Name) for the output tributary of the Add connection is that of the network element where the circuit is added and is not required to be entered.

**Source/Destination nodes for drop connections**

A Drop connection consists of an input tributary in any port protection group which IS a BLSR, and an output tributary which is in any port or port protection group which is NOT a BLSR.

A source node TID (NE name) must be entered for the input tributary of any Drop connection from a BLSR to an NE. The destination node TID for the input tributary of the Drop connection is that of the network element where the circuit is dropped and is not required to be entered.

**Source/Destination nodes for through connections**

A Through “Continue” connection consists of an input tributary from any port protection group which IS a BLSR, and an output tributary which is the tributary with the same tributary number in the opposite line of the same BLSR.

A source node TID (NE name) and a destination node TID must be entered for the input tributary and output tributary of any Through connection.

**Source/Destination nodes  
for inter-BLSR connections**

An Inter-BLSR connection consists of an input tributary in any port protection group which IS a BLSR, and an output tributary in any port protection group which IS a BLSR where the output tributary is either not in the same port protection group or is not “the one with the same tributary number in the opposite line from the input”

Inter-BLSR connections are primarily for connections between two rings but may be a connection between two different tributaries in the same ring. See “Source and Destination Nodes for Time Slot Interchange” (7-146).

A source node TID (NE name) and a destination node TID must be entered for the input tributary and output tributary of any Inter-BLSR connection.

**Source/Destination nodes  
for non-BLSR connections**

Non-BLSR connections consist of any input tributary in any port or port protection group which is NOT a BLSR and an output tributary in any port or port protection group which is NOT a BLSR.

Since neither the input tributary nor the output tributary is in a BLSR port protection group, source node TIDs and destination node TIDs are not required.

**Source/Destination nodes  
for path protected  
connections**

For either a path-protected cross-connection topology or an adjunct path-protected cross-connection topology, the destination node TIDs must be the same since there are two legs with the same output tributary. The source node TID for each leg may be different.

An example with two different source node TIDs would be a path-protected connection with two legs that are Drop connections from a BLSR. For the source node TID of a Through (Continue) or Drop cross-connection leg in a circuit where one or more upstream nodes provide an add or continue path-protected connection, the user should specify the first node in the ring at which the circuit is added into the BLSR.

**Source/Destination nodes  
for bridged connections**

In a bridging cross-connection topology, for each leg with the same input tributary, the source node TID must be the same. The destination node TID may be different.

An example with two different destination node TIDs would be a bridged connection whose two legs are Add connections into a BLSR. For an Add or Through (Continue) cross-connection leg in a circuit where one or more downstream nodes provide a drop-and-continue connection, the destination node TID should be the final node in the ring at which the circuit is dropped from the BLSR.

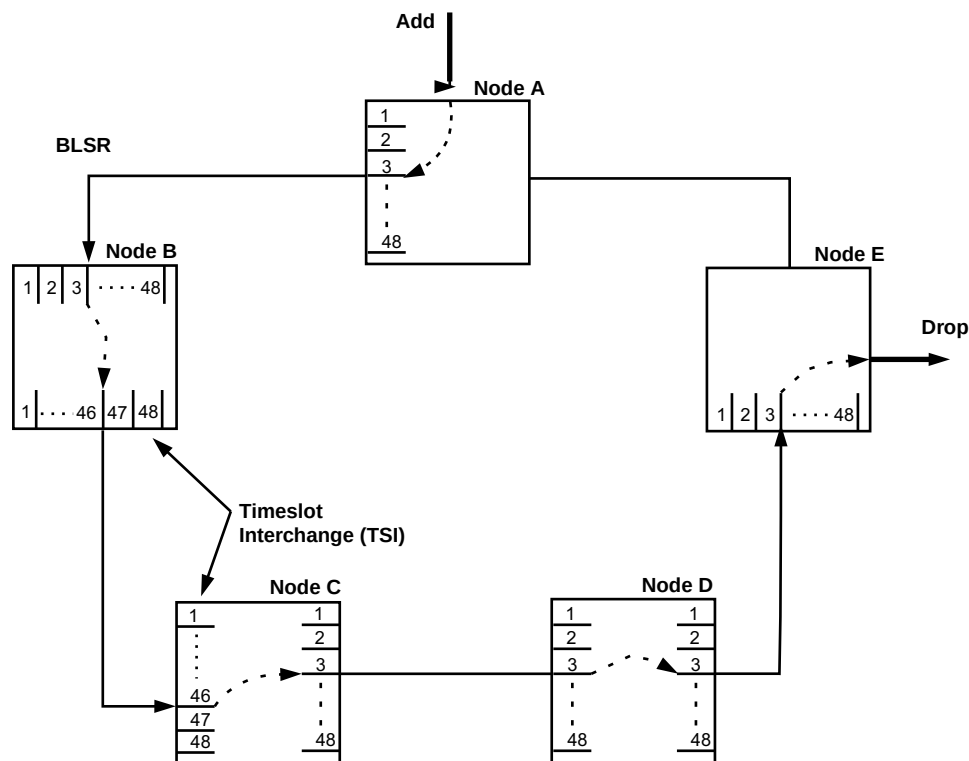


### Source and Destination Nodes for Time Slot Interchange

**Overview** This section explains how to choose the source and destination nodes for inter-BLSR cross-connections involved in a time slot interchange (TSI) between nodes in the same BLSR. See “Source/Destination nodes for inter-BLSR connections” (7-144).

**Time slot interchange** Although not normally recommended, circumstances might require that you use a different tributary time slot between a set of nodes than was used between all the other nodes. Time slot interchange is not recommended because the quality of service is not as high as in a normal BLSR connection. In a time slot interchange, each circuit is protected against failures between the add and drop nodes, but not against failures that isolate the source or destination nodes involved in the time slot interchange.

**Choosing source and destination nodes for TSI** The following figure illustrates a time slot interchange (TSI) within a BLSR at Node B and Node C.



NC2510G062

The above illustration consists of a circuit which is added to a BLSR at Node A, goes through Nodes B, C, and D, and is dropped at Node E. Although not normally recommended, a different time slot (time slot interchange) is used between Nodes B and C than was used between the other nodes. Three circuits are entered in the ring squelch maps: Node A to Node B, Node B to Node C, and Node C to Node E.

At Node A the Destination NE Name for the cross-connection is Node B because of the time slot interchange at Node B. When entering the cross-connection at Node B, the Source NE Name for the input tributary is Node A because Node A is the node where the first circuit is added to the ring. The Destination NE Name for the output tributary is Node C (not Node E) because Node C is the node at which the second circuit is dropped from the ring.

For the cross-connection at Node C for the third circuit, the Source NE Name is Node B and the Destination NE Name is Node E. At Nodes D and E, the Source NE Name is Node C.

The BLSR protects each circuit against failures between add and drop nodes, but not against failures that isolate those nodes. Thus, for traffic with TSI connections at nodes B and C (rather than a single time slot from A to E), there is no protection against failures that isolate Node B or C.

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## Cross-Connection Wizard

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**Introduction** Cross-connections may be configured using the WaveStar CIT Cross Connection Wizard. The Cross Connection Wizard is opened by selecting the menu sequence **Configuration > Cross Connection** from the System View screen of the NE. The wizard will lead you through a series of windows or screens in which you identify all the attributes of the cross-connection.

**Cross-connection sequence** Creating or modifying a cross-connection involves the following sequence:

1. Complete all port provisioning and protection provisioning before creating a cross-connection.
2. Select the rate, cross-connection type, and ports involved in the cross-connection.
3. Identify the tributaries for the cross-connection from a display of tributaries corresponding to the selected ports.
4. Complete the cross-connection by selecting cross-connection parameters and the source and destination NE TIDs needed for a ring squelch map, if applicable.

**Cross-connection wizard action screen** The cross-connection action selection screen displays first when the Cross Connection Wizard is opened. The cross-connection action selection screen allows you to select whether you want to create, modify, or delete a cross-connection. Screen options include:

- **Create New** – The Create New option causes the Create New Cross Connection screens to open where you can make the choices necessary to create a new cross-connection.
- **Modify Parameters** – The Modify Parameters option causes the Modify Cross Connection Parameters Screens to open where you make the choices necessary to modify a cross-connection.
- **Delete** – The Delete option causes the Delete Cross Connection screens to open where you make the choices necessary to delete a cross-connection.

- **Roll** – The Roll option causes the Roll Selection screens to open where you select a port and tributary to be used for a cross-connection roll. A roll consists of disconnection of the circuit cross-connect input tributary to output tributary followed within the required completion time by a cross-connection of new input tributary to output tributary.

**Signal rate auto set  
checked (on)**

The Signal Rate Auto Set option allows you to override a fixed-rate port's input or unequipped signal rate provisioning. See "Fixed-rate tributary input signal rate list" (7-78) and "Tributary unequipped signal rate" (7-77). If a selected port tributary for the source/destination tributary has a tributary mode of fixed and the Signal Rate Auto Set selection is checked (auto select), the tributary rate selections are not constrained by the port's tributary input signal rate list or unequipped output signal rate list.

**Signal rate auto set  
unchecked (off)**

If the Signal Rate Auto Set selection is unchecked (no auto select) and the input signal rate list/unequipped output signal rate list does not match your rate selection for the source/destination tributary, the fixed-rate mode will prevent the port tributary selection for your selected rate. Both the input signal rate and the output signal rate must match your rate selection. For example, if the tributary input signal rate of an OC3 port is STS3c, you cannot select that port for an STS1 cross-connection. If the tributary input signal rate of an OC3 port is STS1, STS1, you cannot select that port for an STS3c cross-connection.

**Create new Cross  
Connection screens**

The following Cross-Connection Wizard screen flow allows you to create new cross-connections:

1. **The Rate/Type screen** – The Rate/Type screen allows you to select the cross-connection rate and the cross-connection type.
2. **Source and Destination Tributary screen** – The Source and Destination Tributary screen allows you to select the source port and tributary and the destination port and tributary for a cross-connection.
3. **Cross Connection Parameter screen** – The Cross Connection Parameter screen allows you to establish or modify the provisionable parameters for an existing or new cross-connection.

**Rate/Type screen**

The Rate/Type screen allows you to select the cross-connection rate and the cross-connection type. The selection of cross-connection rates may include rates such as STS-1, STS-3, STS-12, or STS-48. The selection of cross-connection types may include:

- 2-way point-to-point (default)
- 1-way point-to-point
- 1-way path protected
- 1-way adjunct path protected
- ring interworking, drop & continue, BLSR primary node
- ring interworking, drop & continue, BLSR primary nodes in same NE
- UPSR ring add, drop
- UPSR ring-to-ring, single node interconnection, same NE

**Source and Destination Tributary screen**

Depending on whether you are selecting a source tributary or destination tributary, a Source Tributary or Destination Tributary selection screen opens.

**Source Tributary screen**

The Source Tributary screen allows you to select the source port and tributary for a cross-connection. Port selection is confined to the ports which support the previously chosen cross-connection rate. Protection ports of a 1+1 protection group or ports on the protection unit of any 1xN electrical protection group are not selectable. Protection ports or tributaries for a BLSR may be selected.

**Tributary displays**

Tributaries associated with the selected port are displayed according to the selected cross-connect rate. The following is also displayed for each tributary:

- AIDs of the tributaries in the group are displayed.
- Availability of the tributaries to be used for the cross-connection source is displayed. Availability is yes or no.
- An indication of whether the tributary is a protection tributary is displayed. The indication is yes or no. A tributary numbered 25-48 of an OC48 port which is either a West or East port of a 2-fiber BLSR is a protection tributary. A tributary numbered 97-192 of an OC192 port which is either a West or East port of a 2 Fiber BLSR is a protection tributary.



**Destination Tributary screen**

The Destination Tributary screen allows you to select the destination tributary for a cross-connection. The Destination Tributary screen is the same as the Source Tributary screen (See “Source Tributary screen” (7-150).) except for the availability field. The Destination Tributary screen availability field indicates whether the tributary or group of tributaries are available for use as a cross-connection destination.

**Source and destination tributaries on the same BLSR**

If both the source and destination tributaries are part of the same BLSR and the tributary numbers are not the same, then a confirmation message appears stating that the tributary is involved in a time slot interchange and will not have normal BLSR protection. Not having normal BLSR protection means that the traffic is protected but not against failures that isolate a node. The user can then go back and select a different tributary or click OK and continue with the selection.

**Cross Connection Parameter screen**

The Cross Connection Parameter screen allows you to modify provisionable parameters for an existing or new cross-connection. The screen may already be populated with defaults or current settings may be displayed.

The parameter screen includes the following parameters. Some parameters may not apply to the cross-connection selection and will be dimmed on the screen.

- New or existing Source AID – Displays the new or existing Source AID of the cross-connection.
- New or existing Destination AIDs – Displays the new or existing Destination AID for the cross-connection.
- Source Ring ID – The Source Ring ID displays the Ring ID associated with the source tributary on a port which is part of a BLSR.
- Source NE Name – The Source NE Name applies to a source cross-connect leg which is part of a BLSR. This field displays or lists NE TIDs (NE name) you may select to assign as the Source NE Name.
- Destination Ring ID – The Destination Ring ID field lists the Ring ID of a Destination tributary on a port which is part of a BLSR.

- Destination NE Name – The Destination NE Name applies to a destination cross-connect leg which is part of a BLSR. This field displays or lists NE TIDs (NE name) you may select to assign as the Destination NE Name.
- Source to Destination Output Mode – This field allows you to set or display the provisioned output mode for the Source to Destination leg and has the values of Normal, Terminated - AIS, and Terminated - Unequipped (SONET) or Idle (DS3).
- Destination to Source Output Mode – This field allows you to set or display the provisioned output mode for the Destination to Source leg of a 2-way cross-connection and has the values of Normal, Terminated - AIS, and Terminated - Unequipped (SONET) or Idle (DS3).
- Cross Connection Type – This field displays the selected cross-connect type such as one-way point to point or two-way point to point.
- Cross Connection Rate – This field displays the selected cross-connection rate such as STS-1 or STS-3c.
- Redline – This field allows you set the cross-connection as redlined.
- Action – This field displays the action you chose to perform.

### **Modify Cross Connection Parameters**

The Modify Cross Connection Parameter selection invokes the following sequence of wizard screen:

1. Existing Cross Connection Selection screen
2. Leg Selection screen for any point to point or path protection cross-connection
3. Cross Connection Parameter screen

### **Delete Cross Connection**

The Delete Cross Connection selection invokes the following sequence of wizard screens:

1. Existing Cross Connection Selection screen
2. Cross Connection Leg Selection screen to allow you to select one or more cross-connection legs for deletion, if applicable
3. Delete Cross Connection Summary screen



## Alarm Severity Assignment Profiles

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### **Alarm severity assignment profile (ASAP)**

The system allows you to provision (customize) alarm levels and the inhibiting of the generation/reporting of specific alarms. This process is created using alarm severity assignment profiles (ASAPs). The five alarm levels or conditions are as follows:

- Critical (CR) – An alarm notification message is reported to the management system(s) and local office alarms are generated.
- Major (MJ) – An alarm notification message is reported to the management system(s) and local office alarms are generated.
- Minor (MN) – An alarm notification message is reported to the management system(s) and local office alarms are generated.
- Not reported (NR) – No alarm notification message or local office alarms are generated/reported.
- Not alarmed (NA) – An alarm notification message is reported to the management system(s), but no local office alarms are generated.

There are two types of profiles: Service Dependent and Service Independent. Service Dependent profiles enable you to set separate alarm levels for Service Affecting and Non-Service Affecting. The anomaly condition to alarm level (for example, Loss of Signal = CR) is provisionable within one of the ASAP types. Different units of: (a) equipment, (b) types of communication facilities, (c) types of port protection groups, and (d) service applications will each have a different set of anomaly conditions – thus, the need for different groupings or profile types. Each profile type has a unique identity/profile name.

**Important!** A particular NE may interconnect to multiple different local and toll network providers. Each of these network providers may have slight differences in terms of alarm definition and alarm treatment. Therefore, the system supports multiple ASAP profile types.







# 8 Performance Monitoring

## Overview

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**Purpose** This chapter provides an overview of performance monitoring (PM), including the following:

- What is PM
- PM parameter groups
- Enabling and disabling PM for ports and tributaries
- Threshold crossing alerts (TCAs)
- Quality of service alarms
- The functions of PM TCA profiles
- What physical and transmission parameters are monitored
- Value ranges and defaults for the system threshold profiles

**Related information** For related information, see the following:

- Chapter 7, Provisioning, Security, and Administration
- *Alarm, Maintenance, and Trouble Clearing Guide*

**Contents** Below are the contents of this chapter.

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# Introduction to Performance Monitoring

---

**Definition** Performance monitoring (PM) is the in-service, nonintrusive monitoring and reporting of transmission quality.

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

**PM data registers** The following registers are provided for all parameters:

| 15-minute Registers | Day Registers |
|---------------------|---------------|
| One current         | One current   |
| One previous        | One previous  |
| 31 recent           |               |

The system retrieves and reports the contents of any parameter storage register. The WaveStar CIT may be used to initialize (set to zero) the current 15-minute and/or current 24-hour registers locally or remotely. This capability enables the user to verify that a repair to a failed facility was successful.

**How registers are updated** The following explains how registers are updated.

## 15-minute registers

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

## Day registers

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

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PM during failed conditions</b>          | When a trouble condition is detected, the system stops accumulating PM parameters affected by the failure. PM parameters are inhibited during unavailable time per GR-253-CORE. All unaffected performance parameters continue to be accumulated during a trouble condition.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Threshold profiles</b>                   | Threshold profiles hold the threshold values of PM parameters that require thresholding. PM values stored in threshold profiles determine the threshold crossing alerts of a monitored value for a port or tributary. One threshold profile of each parameter group type may be associated with each port or tributary. The Performance menu in the System View window of the WaveStar CIT allows the user to create, modify, or delete profiles; view profile information; and assign profiles to port and tributaries.                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Maximum number of threshold profiles</b> | <p>The maximum number of threshold profiles is limited to NVM space.</p> <p>The system supports the following maximum number of default and user-created profiles:</p> <ul style="list-style-type: none"><li>• 10 physical profiles</li><li>• 30 section/line port-level profiles</li><li>• 80 path-level profiles</li><li>• 80 DS3 profiles</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Enabling/disabling TCA reporting</b>     | <p>TCA reporting can be enabled or disabled either at the individual parameter or at the parameter group.</p> <p><b>Individual parameters</b></p> <p>Threshold Crossing Alert (TCA) reporting may be enabled or disabled on a parameter basis using threshold profiles. When the threshold value of a parameter is set to zero, no quality of service (QOS) alarm message is generated. Enabling/disabling the TCA reporting of an individual parameter is independent of any other parameter.</p> <p><b>Parameter groups</b></p> <p>The system supports enabling/disabling TCA reporting at a group level for a parameter grouping such as line. Reporting on such a parameter group can be disabled by setting all parameters for the parameter group to zeros in the threshold profile. For example, setting the threshold values of all line PM parameters to zero will disable the TCA reporting on the line level.</p> |



|                                              |                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Retrieving TCAs</b>                       | All TCAs are retrievable either locally or remotely via the WaveStar CIT. If provisioned for autonomous TCA reporting, the message-based operations system interface can communicate TCA reports to the operations centers.                                                                                                                |
| <b>Provisioning TCA parameter thresholds</b> | The current 15-minute and current 24-hour thresholds for each PM parameter can be provisioned according to a profile using the WaveStar CIT.                                                                                                                                                                                               |
| <b>Crossing TCA threshold</b>                | Whenever the current 15-minute or the current day (24-hour) threshold for a performance-monitoring parameter is either reached or exceeded, the system generates a threshold-crossing alert (TCA) in the form of a quality of service (QOS) alarm. The alarm condition is then entered into the appropriate performance-monitoring report. |



# Performance Monitoring Modes

---

**Overview** PM has two modes.

| Monitoring Mode | What is monitored                      |
|-----------------|----------------------------------------|
| Port            | Physical, section, and line parameters |
| Tributary       | Path parameters                        |

The two monitoring modes are enabled or disabled independently. The monitoring mode values are set during provisioning of a port or a tributary on a port unit.

**Port monitoring mode** Port monitoring mode may be set to one of three options:

| Option               | Description                                                                                                                                                                                                                                                                      |
|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AUTO (automatic)     | Enables the fault management function to continue monitoring the port and disables the PM function pending a trigger event. When a valid incoming signal is detected on a port set to AUTO, the port monitoring mode is automatically set to MON and the PM function is enabled. |
| MON (monitored)      | Enables line-level fault management and PM functions for the port.                                                                                                                                                                                                               |
| NMON (not monitored) | Disables line-level fault management and PM functions for the port.                                                                                                                                                                                                              |

**Tributary monitoring mode**

The tributary path (TP) monitoring mode may be set to one of two options:

| Option               | Description                                               |
|----------------------|-----------------------------------------------------------|
| MON (monitored)      | Enables the path-level fault management and PM functions  |
| NMON (not monitored) | Disables the path-level fault management and PM functions |

**Provisioning PM reporting**

The following provides an overview of provisioning options for PM reporting.

**Levels**

The user can enable or disable PM reporting on three levels:

- Port
- Tributary
- Parameter group

**How to enable/disable**

PM reporting is enabled or disabled using the WaveStar CIT System View Performance menu to provision a port or tributary with PM TCA profile information.

To enable PM reporting, the following must be provisioned:

- port mode or tributary mode set to monitored
- parameter group enabled

To enable TCA reporting, the following must be provisioned:

- port mode or tributary mode set to monitored
- parameter group enabled
- TCA profile selected with proper (non-zero) threshold values

**When reporting is disabled**

When the PM mode reporting is disabled, the following occur:

- Reporting for the port and tributary monitoring modes is disabled.
- PM data collection stops.
- No TCAs are reported.

**Zero suppression**

The system may be provisioned to suppress the reporting of registers that contain zeros.

The provisionable parameters may be set to the following values:

- 1-up. Registers with values of one or higher are reported. Also, registers with invalid data flags and values of zero or higher are reported.
- 0-up. Registers with values of zero or higher are reported. Registers with invalid data flags are reported.



# SONET Performance Monitoring

---

## SONET PM overview

The system monitors transmission performance parameters and physical parameters associated with SONET sections, lines, STS paths, or DS3 paths. PM also applies to service and protection lines of optical lines.

## Registers for transmission performance parameters

The system network element (NE) provides the following registers for each monitored transmission performance parameter

| 15-minute Registers | Day Registers |
|---------------------|---------------|
| One current         | One current   |
| One previous        | One previous  |
| 31 recent           |               |

## Physical performance parameters

Physical performance parameters are real-time parameters that do not require storage intervals.

## Threshold crossing

Performance parameters are thresholded. The NE notifies the Operations System that monitors the NE if a monitored transmission parameter or monitored physical parameter exceeds or crosses a provisioned threshold during a current monitored interval. The NE reports the threshold crossing alert as a Quality of Service (QOS) alarm message to all operations systems and interfaces. The QOS is not a true alarm but serves as a warning of degrading performance.

## PM parameter groups

PM parameter groups consist of:

- Physical PM
- Section/near-end line PM
- Far-end line PM
- Path PM
- Incoming DS3 PM
- Outgoing DS3 PM



## SONET Performance Parameters

---

**SONET physical-layer PM** SONET physical-layer PM applies to service and protection optical laser port units.

### Prerequisite

The optical laser circuit pack must be physically installed to activate the physical-layer PM.

### Threshold values

Physical-layer PM is measured not in time intervals, but as a snap-shot in time. The threshold values of the physical-layer PM parameters are set and cannot be changed by provisioning.

### Parameters monitored

The following table lists the parameters that are monitored to detect any degradation in the performance of the laser:

| Parameter                    | Description                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Laser Bias Current (LBC)     | Each active laser transmitter is monitored. This parameter does not vary among the optical circuit packs and is stored in system non-volatile memory (NVM). The upper limit is 150% of the initial factory value. There is no lower limit.                                                                                                                                                        |
| Optical Transmit Power (OPT) | The average OPT of each active laser transmitter is monitored. This parameter varies among the different optical circuit packs and is therefore stored in the inventory NVM of each circuit pack instead of in the system NVM. This parameter has two values, high and low. The high value is +1 dBm above the initial factory value and the low value is -1 dBm below the initial factory value. |
| Optical Power Received (OPR) | This parameter varies among the different optical circuit packs and is therefore stored in the inventory NVM of each circuit pack instead of in the system NVM. This parameter has two values, high and low. The high value is -10 dBm nominal and the low value is -29 dBm nominal.                                                                                                              |

**SONET section-layer PM** SONET section-layer PM applies to service and protection optical ports and electrical interfaces.

### Parameters monitored

The following table lists the monitored SONET section-layer parameters.

| Parameter                                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Section (B1) Coding Violations (CV-S)                | The CV-S parameter is a count of bit interleaved parity (BIP) B1 bit errors at the section layer for OC-3, OC-12, OC-48, and OC-192 sections. Up to eight section BIP errors can be detected per STS-N frame. Each error increments the CV-S current second register.                                                                                                                                                                                                                                                                                          |
| Section (B1) Errored Seconds (ES-S)                  | The ES-S parameter increments once for each second in which at least one of the following is detected: <ul style="list-style-type: none"> <li>• section-layer bit interleaved parity (BIP) error</li> <li>• a severely errored frame (SEF)</li> <li>• a loss of signal (LOS) defect is detected.</li> </ul>                                                                                                                                                                                                                                                    |
| Section (B1) Severely Errored Seconds (SES-S)        | The SES-S parameter increments once for each second in which there are any of the following: <ul style="list-style-type: none"> <li>• one or more LOS defects</li> <li>• one or more loss of frame (LOF) defects</li> <li>• the number of BIP errors for the signal rates listed below: <ul style="list-style-type: none"> <li>• EC-1 — 51 BIP errors or more</li> <li>• OC-3 — 154 BIP errors or more</li> <li>• OC-12 — 615 BIP errors or more</li> <li>• OC-48 — 2459 BIP errors or more</li> <li>• OC-192 — 9835 BIP errors or more</li> </ul> </li> </ul> |
| Section (B1) Severely Errored Frame Seconds (SEFS-S) | The SEFS-S parameter increments once for each second in which one or more near-end SEF defects are detected.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

**SONET line-layer PM** SONET line-layer PM parameters apply to optical and electrical interfaces in NEs that terminate EC-1, OC-3, OC-12, OC-48, and OC-192 lines. Both near-end and far-end parameters are monitored.

### Parameters monitored

The following table lists the monitored SONET line-layer parameters.

| Parameter                                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Near-End Line Coding Violations (CV-L)                    | The near-end CV-L parameter uses the B2 byte in the incoming SONET signal to increment once for each BIP (B2) error detected. Up to 8 times N (8 X N) BIP errors can be detected for each STS-N frame. For example, eight BIP errors can be detected for each STS-1 frame                                                                                                                                                                        |
| Far-End Line Coding Violations (CV-LFE)                   | The far-end CV-LFE parameter is a count of the number of BIP errors detected by the far-end NE and reported by the REI-L indication of the line overhead. For SONET signal rates below OC-48, up to 8 X N BIP errors per STS-N frame can be indicated. For OC-48 and OC-192 signals, up to 255 BIP errors per STS-N frame can be indicated. The CV-LFE current-second register increments for each BIP error indicated.                          |
| Near-End Line Errored Seconds (ES-L)                      | The ES-L parameter increments once for every second that contains at least one BIP error, or once for each AIS line defect.                                                                                                                                                                                                                                                                                                                      |
| Far-End Errored Seconds (ES-LFE)                          | The ES-LFE parameter increments once for every second where one or more far-end line-layer BIP errors are detected as reported by the REI-L indication of the line overhead or an RDI-L defect is detected.                                                                                                                                                                                                                                      |
| Near-end Line Forward Error Correction Corrected (FECC-L) | The FECC-L parameter is a count of corrected transmission errors at the Line Layer. Up to 72 FECC-L counts can be detected per STS-192 frame, with each event incrementing the FECC-L current second register. A single FECC-L count relates to the correction of one bit error. Two bit errors (multi-bit) can be corrected per block (36 blocks per frame) for a total of 72 bits correctable per frame. There is no far-end FECC-L parameter. |



| Parameter                                                   | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Near-end Line Forward Error Correction Uncorrected (FECU-L) | The FECU-L parameter is a count of uncorrected transmission errors at the Line Layer. Up to 36 FECU-L events can be detected per STS-192 frame, with each event incrementing the FECU-L current second register. A single FECU-L count relates to the detection of transmission errors in a block that were too severe to be corrected using the multi-bit error correction algorithm. One uncorrectable event per block is possible (36 blocks per frame) for a total of 36 per frame. There is no far-end FECU-L parameter. |
| Near-End Line Severely Errored Seconds (SES-L)              | The SES-L parameter increments once each second for any of the following: <ul style="list-style-type: none"> <li>• an AIS-L defect</li> <li>• specified BIP errors for the lines listed below: <ul style="list-style-type: none"> <li>• STS-1 -- 2400 errors</li> <li>• STS-3c -- 2400 errors</li> <li>• STS-12c -- 2400 errors</li> <li>• STS-48c -- 2400 errors</li> </ul> </li> </ul>                                                                                                                                      |
| Far-End Line Severely Errored Seconds (SES-LFE)             | The SES-LFE parameter increments once each second for each far-end AIS-L defect or once for each second that contains a number of BIP errors for the signal rates listed for the SES-L parameter.                                                                                                                                                                                                                                                                                                                             |
| Near-End Line Unavailable Seconds (UAS-L)                   | The UAS-L parameter increments once each second that the line is considered unavailable. Unavailable seconds are counted after ten consecutive severely errored seconds (SES) and continue until there are ten consecutive seconds without a severely errored second.                                                                                                                                                                                                                                                         |
| Far-End Line Unavailable Seconds (UAS-LFE)                  | The UAS-LFE parameter increments once for each second where SES-LFE is detected after ten consecutive seconds with SES-LFE detected. UAS-LFE continues to increment once for each second until ten consecutive seconds without SES-LFE are detected.                                                                                                                                                                                                                                                                          |

**Section/Line profile default values and ranges**      The following table lists the section/line default profile values and ranges.

| Parameter                  | 15 minutes |            | 1 day   |              |
|----------------------------|------------|------------|---------|--------------|
|                            | Default    | Range      | Default | Range        |
| CV-S for OC-3              | 140        | 0-16777215 | 1344    | 0-2147483647 |
| CV-S for OC-12             | 560        | 0-16777215 | 5376    | 0-2147483647 |
| CV-S for OC-48             | 2240       | 0-16777215 | 21504   | 0-2147483647 |
| CV-S for OC-192            | 8960       | 0-16777215 | 86016   | 0-2147483647 |
| ES-S                       | 25         | 0-900      | 250     | 0-86400      |
| SES-S                      | 10         | 0-810      | 40      | 0-77760      |
| SEFS-S                     | 5          | 0-900      | 10      | 0-86400      |
| CV-L and CV-LFE for EC-1   | 47         | 0-16777215 | 448     | 0-2147483647 |
| CV-L and CV-LFE for OC-3   | 140        | 0-16777215 | 1344    | 0-2147483647 |
| CV-L and CV-LFE for OC-12  | 560        | 0-16777215 | 5376    | 0-2147483647 |
| CV-L and CV-LFE for OC-48  | 2240       | 0-16777215 | 21504   | 0-2147483647 |
| CV-L and CV-LFE for OC-192 | 8960       | 0-16777215 | 86016   | 0-2147483647 |
| ES-L and ES-LFE            | 25         | 0-900      | 250     | 0-86400      |
| SES-L and SES-LFE          | 10         | 0-810      | 40      | 0-77760      |
| FECC-L for OC-192 only     | 5184       | 0-5184000  | 497664  | 0-497664000  |
| FECU-L for OC-192 only     | 2592       | 0-2592000  | 248832  | 0-248832000  |
| UAS-L and UAS-LFE          | 10         | 0-900      | 10      | 0-86400      |

**STS-1 Path PM** The system monitors both near-end and far-end path PM parameters on terminated and intermediate SONET STS-1 paths that are cross-connected through the system. For example, a SONET STS-1 path is terminated at a DS3 interface (see page STS-1/DS3 Path PM (8-18)).

### Parameters monitored

The following table lists the monitored SONET STS-1 path parameters.

| Parameter                                     | Description                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Near-end STS Path Coding Violations (CV-P)    | The CV-P parameter increments once for each BIP (B3 byte) error detected in the incoming STS path overhead. Up to eight BIP errors can be detected per frame. The near-end NE uses the remote error indicator-path (REI-P) in the path overhead to send the BIP violations count back to the far-end NE.         |
| Far-end STS Path Coding Violations (CV-PFE)   | The CV-PFE parameter increments once for each BIP error reported by the REI-P indication from the other end. This parameter is sometimes called far end bit error (FEBE).                                                                                                                                        |
| Near-end STS Path Errored Seconds (ES-P)      | The ES-P parameter increments once for each second that one or more STS path-layer BIP errors are counted or an AIS-P or LOP-P or UNEQ-P or SRM-P defect is detected. The near-end NE uses the remote error indicator-path (REI-P) in the path overhead to send the BIP violations count back to the far-end NE. |
| Far-end STS Path Errored Seconds (ES-PFE)     | The ES-PFE parameter increments once for each second that one or more far-end STS path-layer BIP errors or AIS-P or LOP-P or UNEQ-P defects are detected and reported by the RDI-P indication from the other end.                                                                                                |
| Near-end Severely Errored Seconds (SES-P)     | The SES-P parameter increments once for each second that an AIS-P or LOP-P or UNEQ-P or SRM-P defect is detected or 2400 STS path-layer BIP errors are detected.                                                                                                                                                 |
| Far-end Severely Errored Seconds (SES-PFE)    | The SES-PFE parameter increments once for each second that 2400 or more STS path-layer BIP errors or one or more AIS-P or LOP-P or UNEQ-P defects are detected and reported by the RDI-P indication from the other end.                                                                                          |
| Near-end STS Path Unavailable Seconds (UAS-P) | The UAS-P parameter increments once each second that another SES-P is detected after ten consecutive SES-Ps are detected. The UAS-P continues to increment once each second that an SES-P is detected until ten consecutive seconds occur without an SES-P being detected.                                       |

| Parameter                                               | Description                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Far-end STS Path Unavailable Seconds (UAS-PFE)          | The UAS-PFE parameter increments once each second that another SES-PFE is detected after ten consecutive SES-PFEs are detected. The UAS-PFE continues to increment once each second that an SES-PFE is detected until ten consecutive seconds occur without an SES-PFE being detected.                                                                    |
| Near-end STS Path Failure Count (FC-P)                  | The FC-P parameter increments once for the beginning of each AIS-P event (AIS-P detected and cleared), LOP-P event (LOP-P detected and cleared), UNEQ-P event (UNEQ-P detected and cleared), SRM-P event (SRM-P detected and cleared). A failure that begins in one period and ends in another period, shall be counted in the period in which it begins. |
| Far-end STS Path Failure Count (FC-PFE)                 | The FC-PFE parameter increments once for the beginning of each RFI-P event (RFI-P detected and cleared). A failure that begins in one period and ends in another period, shall be counted in the period in which it begins.                                                                                                                               |
| Positive Pointer Justifications--Generated (PPJC-PGEN)  | This parameter summarizes all Positive Pointer Justifications generated by the system.<br><br>The parameter increments each time an STS Pointer adjustment is created or absorbed by the system (e.g., due to differences in the frame rates of the incoming and outgoing SONET signals).                                                                 |
| Negative Pointer Justifications-- Generated (NPJC-PGEN) | This parameter summarizes all Negative Pointer Justifications generated by the system.<br><br>The parameter increments each time an STS Pointer adjustment is created or absorbed by the system.                                                                                                                                                          |
| Positive Pointer Justifications-- Detected (PPJC-PDET)  | This parameter summarizes all Positive Pointer Justifications detected by the system.<br><br>The parameter increments each time an STS Pointer adjustment is created or absorbed by the system                                                                                                                                                            |
| Negative Pointer Justifications-- Detected (NPJC-PDET)  | This parameter summarizes all Negative Pointer Justifications detected by the system.<br><br>The parameter increments each time an STS Pointer adjustment is created or absorbed by the system.                                                                                                                                                           |

**Path profile default values and ranges**

The following table lists the path profile default threshold values and allowable ranges.

| Parameter                   | 15 minutes |                | 1 day   |                  |
|-----------------------------|------------|----------------|---------|------------------|
|                             | Default    | Range          | Default | Range            |
| CV-P and CV-PFE for STS-1   | 15         | 0-65535 [1]    | 125     | 0-8388607 [2]    |
| CV-P and CV-PFE for STS-3c  | 25         | 0-65535 [1]    | 250     | 0-8388607 [2]    |
| CV-P and CV-PFE for STS-12c | 75         | 0-16777215 [3] | 750     | 0-2147483647 [4] |
| CV-P and CV-PFE for STS-48c | 300        | 0-16777215 [3] | 3000    | 0-2147483647 [4] |
| ES-P and ES-PFE for STS-1   | 12         | 0-900          | 100     | 0-86400          |
| ES-P and ES-PFE for STS-3c  | 20         | 0-900          | 200     | 0-86400          |
| ES-P and ES-PFE for STS-12c | 60         | 0-900          | 600     | 0-86400          |
| ES-P and ES-PFE for STS-48c | 240        | 0-900          | 2400    | 0-86400          |
| SES-P and SES-PFE           | 3          | 0-810          | 7       | 0-77760          |
| UAS-P and UAS-PFE           | 10         | 0-900          | 10      | 0-86400          |
| PPJC-PGen                   | 30         | 0-32767        | 2880    | 0-2097151        |
| NPJC-PGen                   | 30         | 0-32767        | 2880    | 0-2097151        |
| PPJC-PDet                   | 30         | 0-32767        | 2880    | 0-2097151        |
| NPJC-PDet                   | 30         | 0-32767        | 2880    | 0-2097151        |

## Notes:

[1] This value is based on 16 bit register ( $2^{16} - 1$ ).

[2] This value is based on 23 bit register ( $2^{23} - 1$ ).

[3] This value is based on 24 bit register ( $2^{24} - 1$ ).

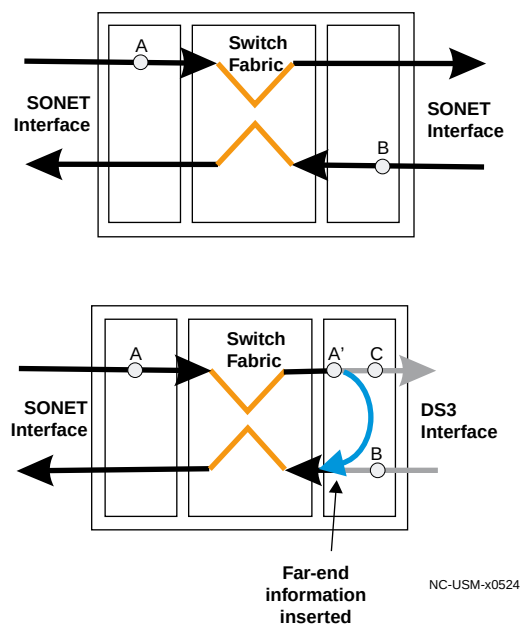
[4] This value is based on 31 bit register ( $2^{31} - 1$ ).

**STS-1/DS3 Path PM**

A path is a unit of bandwidth (STS-1, STS-3c, etc.) which is created at an NE, transverses a network that may include many transport NEs, and is terminated at another NE. If the path is not created or terminated at an NE, it is considered an intermediate path at that NE.

The WaveStar TDM 2.5G/10G system does not create or terminate DS3 signals. It does, however, map those signals to STS-1 packets for transport over the SONET network. The STS-1 path is created and terminated at the NE, but the DS3 path is not.

PM for this situation needs to treat the DS3 as intermediate, but also needs to be able to recognize that the STS-1 path may terminate. This is illustrated in the following figure.



In the upper figure above, intermediate path PM is monitored at points A and B. The DS3 signal in the lower figure is monitored at points B (incoming) and C (outgoing). The STS-1 signal, on the other hand, terminates at the DS3 interface. The FE information monitored at A (incoming) is captured at A' and loaded on the return STS-1 path so there will be an indication of the entire path in the opposite direction.



## DS3 Performance Monitoring -- Parameters

---

**DS3 line-layer PM** The system provides full-time line and path PM for both near-end and far-end PM parameters on DS3 interface ports. The system monitors the PM parameters incoming from the DS3 facility and outgoing to the DS3 facility.

### Parameters monitored

The following table lists the monitored DS3 line-layer parameters.

| Parameter                                 | Description                                                                                                                                                                                                                                                    |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DS3 Line Coding Violations (CV-L)         | The CV-L parameter increments once for each bipolar violation (BPV) and EXZ error detected at the line layer.                                                                                                                                                  |
| DS3 Line Errored Seconds (ES-L)           | The ES-L parameter increments once for each second where one or more BPV errors are detected or one or more EXZ errors or one or more LOS defects are detected.                                                                                                |
| DS3 Line Severely Errored Seconds (SES-L) | The SES-L parameter increments once for each second that has one or more LOS defects, or where 2444 BPVs or EXZs or more at a minimum BER of $7.5 \times 10^{-5}$ are detected or 44 BPVs or EXZs or more at a minimum BER of $1 \times 10^{-6}$ are detected. |
| DS3 Line Loss of Signal Seconds (LOSS-L)  | The LOSS-L parameter increments once for each second where one or more LOS defects are detected.                                                                                                                                                               |

**DS3 path-layer PM** The DS3 path is always an intermediate path in the WaveStar TDM 2.5G/10G system. See page 8 - 18 for a discussion of DS3 and STS-1 paths

### What is monitored

The system provides P-bit and CP-bit monitoring modes. Each mode supports P-bit correction (violation monitoring and removal [VMR]) on the outgoing DS3 signal toward the facility.

Bit parity errors used to derive the counts depend on the PM mode as follows:

| PM Mode | Description                                                    |
|---------|----------------------------------------------------------------|
| pbit    | DS3 P-bit parity check coding violations determine PM counts.  |
| cbit    | DS3 CP-bit parity check coding violations determine PM counts. |

### Error correction

Monitoring and correction of the P-bits are based on the VMR and PM mode provisioning of the DS3 interface. CP-bits are never corrected. CP-bits are copies of the P-bits inserted by the path originator and are not changed by any non-path terminating equipment.

### Parameters monitored

The following table lists the DS3 interface and PM provisioning parameters.

| Framing  | DS3 SF        | PM Mode | VMR Mode | Monitor P-bits | Correct P-bits | Monitor C-bits |
|----------|---------------|---------|----------|----------------|----------------|----------------|
| Framed   | Framed or M23 | pbit    | VMR      | x              | x              |                |
|          |               |         | VM       | x              |                |                |
|          |               |         | No VM    |                |                |                |
|          | C-Bit Parity  | cbit    | VMR      |                | x              | x              |
|          |               |         | VM       |                |                | x              |
|          |               |         | No VM    |                |                | x              |
| Unframed | Clear Channel | b3zs    | No VM    |                |                |                |



**Near-end DS3 path PM** The following table lists the monitored near-end DS3 path parameters.

| Parameter                                 | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DS3 Path Coding Violations (CV-P)         | The CV-P parameter increments once for each parity error detected at the path level. The CV-P parameter applies to all framed DS3 PM modes. Unidentical P-bits corresponding to the same DS-3 M-frame also increment the CV-P parameter in P-bit mode. For C-bit mode, the three C-bits in subframe 3 of a C-bit formatted DS3 frame carry the DS3 path-parity information. At the DS3 transmitter, the CP bits in the DS3 C-bit frame are set equal to the two P-bits in frame "n". These CP bits are then inserted into frame "n+1". Since the CP bits are not modified in any way while passing through the network, the DS3 high-speed receiver can determine if errors occurred in the DS3 path. The DS3 receiver computes the parity of frame "n" and compares that parity with the value received in the CP bits in frame "n+1". If the values do not match, DS3 path parity violations are counted |
| DS3 Path Errored Seconds (ES-P)           | The ES-P parameter increments once for each second that contains one or more parity errors, one or more SEF defects, or one or more AIS defects. The ES-P parameter applies to all framed DS3 PM modes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| DS3 Path Errored Seconds A (ESA-P)        | The ESA-P parameter increments once for each second where exactly one parity error is detected and no SEF or AIS defects are detected. The ESA-P parameter applies to all framed DS3 PM modes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| DS3 Path Errored Seconds B (ESB-P)        | The ESB-P parameter increments once for each second where either of the following is true: <ul style="list-style-type: none"> <li>• no SEF or AIS defects are detected</li> <li>• parity errors are detected in the following ranges (1or 2): <ol style="list-style-type: none"> <li>1. From 1 to 2444 parity errors at a minimum BER of <math>7.5 \times 10^{-5}</math></li> <li>2. From 1 to 44 parity errors at a minimum BER of <math>1 \times 10^{-6}</math></li> </ol> </li> </ul> The ESB-P parameter applies to all framed DS3 PM modes.                                                                                                                                                                                                                                                                                                                                                           |
| DS3 Path Severely Errored Seconds (SES-P) | The SES-P parameter increments once for each second where either of the following is true: <ul style="list-style-type: none"> <li>• one or more AIS or SEF defects are detected</li> <li>• more than the following number of parity errors are detected (1 OR 2): <ol style="list-style-type: none"> <li>1. 2444 parity errors at a minimum BER of <math>7.5 \times 10^{-5}</math></li> <li>2. 44 parity errors at a minimum BER of <math>1 \times 10^{-6}</math>.</li> </ol> </li> </ul> The SES-P parameter applies to all framed DS3 PM modes                                                                                                                                                                                                                                                                                                                                                           |

| Parameter                            | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DS3 SEF/AIS Seconds-Path (SAS-P)     | <p>The SAS-P parameter increments once for each second where the either of the following are detected:</p> <p>one or more AIS defects</p> <p>one or more SEF defects</p> <p>The SAS-P parameter applies to all framed DS3 PM modes.</p>                                                                                                                                                                                                                                                     |
| DS3 Path AIS Seconds (AISS-P)        | <p>The AISS-P parameter increments once for each second that has the following: one or more AIS defects.</p> <p>The AISS-P parameter applies to all framed DS3 PM modes.</p>                                                                                                                                                                                                                                                                                                                |
| DS3 Path Unavailable Seconds (UAS-P) | <p>The UAS-P parameter is a count of 1-second intervals in which the DS3 path is unavailable after ten consecutive DS3 SES-Ps. The ten SES-Ps are included in the count of unavailable time.</p> <p>Once unavailable, the UAS-P continues to increment once for each second until ten consecutive seconds occur without an SES-P detected. The 10-second period without an SES-P is not counted as unavailable time. The UAS-P parameter applies to DS3 p-bit and F&amp;M bit PM modes.</p> |
| DS3 Path Failure Counts (FC-P)       | <p>The FC-P parameter increments once for the beginning of each DS3 AIS or LOF event.</p> <p>The FC-P parameter applies to all framed DS3 PM modes.</p>                                                                                                                                                                                                                                                                                                                                     |

**Far-end DS3 path PM** Far-end DS3 path PM is only performed for C-bit parity formatted DS3 signals. The system transmits the far end bit error (FEBE) information back to the near end using the C-bits of the fourth M-subframe of the DS3 signal. Far-end PM only monitors DS3 signals that have a standard M-frame format and defined to be C-bit parity.

### Parameters monitored

The following table lists the far-end DS3 path parameters.

| Parameter                                           | Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Far-end DS3 Path Code Violation (CV-PFE)            | <p>The CV-PFE parameter increments once for each occurrence of a received FEBE message indicating one of the following path errors at the far end:</p> <ul style="list-style-type: none"> <li>• DS3 C-bit</li> <li>• F-bit</li> <li>• M-bit</li> </ul>                                                                                                                                                                                                                               |
| Far-end DS3 Path Errored Seconds (ES-PFE)           | <p>The ES-PFE parameter increments once for each second that contains one of the following:</p> <ul style="list-style-type: none"> <li>• an M-frame with three FEBE messages indicating errors</li> <li>• one or more far-end SEFs</li> <li>• one or more far-end AIS defects</li> </ul>                                                                                                                                                                                             |
| Far-end DS3 Path Errored Seconds A (ESA-PFE)        | <p>The ESA-PFE parameter increments once for each second containing both of the following:</p> <ul style="list-style-type: none"> <li>• one M-frame with three FEBE messages indicating errors</li> <li>• no far-end SEFs or AIS defects</li> </ul>                                                                                                                                                                                                                                  |
| Far-end DS3 Path Errored Seconds B (ESB-PFE)        | <p>The ESB-PFE parameter increments once for each second that contains all of the following:</p> <ul style="list-style-type: none"> <li>• no far-end SEFs or AIS defects</li> <li>• the following number of M-frames with FEBE messages indicating errors (1. or 2.):</li> </ul> <ol style="list-style-type: none"> <li>1. From 1 to 2444 at a minimum BER of <math>7.5 \times 10^{-5}</math></li> <li>2. From 1 to 44 at a minimum BER of <math>10 \times 10^{-6}</math></li> </ol> |
| Far-end DS3 Path Severely Errored Seconds (SES-PFE) | <p>The SES-PFE parameter increments once for each second that has any of the following:</p> <ul style="list-style-type: none"> <li>• a FEBE message indicating one or more far-end SEFs</li> <li>• one or more far-end AIS defects</li> <li>• more than 2444 far-end FEBE errors at a minimum BER of <math>7.5 \times 10^{-5}</math></li> <li>• more than 44 far-end FEBE at a minimum BER of <math>1 \times 10^{-6}</math></li> </ul>                                               |

| Parameter                                      | Definition                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Far-end DS3 Path SEF/AIS Seconds (SAS-PFE)     | <p>The SAS-PFE parameter increments once for each second where one or more of the following is detected:</p> <ul style="list-style-type: none"> <li>far-end SEF</li> <li>far-end AIS defects</li> </ul>                                                                                                                                                                                                                                 |
| Far-end DS3 Path Unavailable Seconds (UAS-PFE) | <p>The UAS-PFE parameter is a count of one second intervals in which the DS3 path is unavailable after ten consecutive DS3 SES-PFEs. The ten SES-PFEs are included in the count of unavailable time.</p> <p>Once unavailable, the UAS-PFE continues to increment once for each second until ten consecutive seconds occurs without an SES-PFE detected. The 10-second period without an SES-PFE is not counted in unavailable time.</p> |
| Far-end DS3 Path Failure Counts (FC-PFE)       | <p>The FC-PFE parameter increments once for each DS3 remote alarm indication (RAI).</p> <p>A failure that begins in one time period and ends in another time period is counted in the time period in which it began.</p>                                                                                                                                                                                                                |

### DS3 profile default values and ranges

The following table lists the default values and ranges for the default DS3 profile.

| Parameter         | 15 minutes |         | 1 day   |           |
|-------------------|------------|---------|---------|-----------|
|                   | Default    | Range   | Default | Range     |
| CV-L              | 387        | 0-16383 | 3865    | 0-1048575 |
| ES-L              | 25         | 0-900   | 250     | 0-86400   |
| SES-L             | 4          | 0-900   | 40      | 0-86400   |
| CV-P and CV-PFE   | 382        | 0-16383 | 3820    | 0-1048575 |
| ES-P and ES-PFE   | 25         | 0-900   | 250     | 0-86400   |
| ESA-P and ESA-PFE | 25         | 0-900   | 250     | 0-86400   |
| ESB-P and ESB-PFE | 25         | 0-900   | 250     | 0-86400   |
| SES-P and SES-PFE | 4          | 0-810   | 40      | 0-77760   |
| SAS-P and SAS-PFE | 2          | 0-900   | 8       | 0-86400   |
| UAS-P and UAS-PFE | 10         | 0-900   | 10      | 0-86400   |

# Ethernet Performance Monitoring

---

**Overview** This section describes the gigabit ethernet interface performance monitoring options.

## Ethernet performance monitoring parameters (Release 5)

The following table shows the ethernet performance monitoring parameters monitored in Release 5. These parameters are counted for the LAN ports and the WAN ports.

| Parameter                               | Definition                                                                                                                                                    |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Total number of octets received         | Counter is incremented with the number of octets in each received good packet that should be passed through the layer-2 switch.                               |
| Total number of octets sent             | Counter is incremented with the number of octets in packets, coming from the layer-2 switch, transmitted by the port.                                         |
| Total number of errored packets dropped | Counter is incremented by one (1) for each incoming packet that is not handed over to the layer-2 switch because it has a MAC layer format error of any kind. |

## Ethernet performance monitoring parameters (Release 6)

The following table shows the ethernet performance monitoring parameters monitored in Release 6. These parameters are counted for the ethernet ports and virtual container groups (VCGs).

| Parameter                            | Definition                                                                         |
|--------------------------------------|------------------------------------------------------------------------------------|
| EDFC (Dropped frames - congestion)   | Counter is incremented by one for each frame that is dropped because of congestion |
| EDFE (Dropped frames - errors)       | Counter is incremented by one for each frame that is dropped because of errors.    |
| EINB (Incoming number of Megabytes)  | Counter is incremented by one for each incoming megabyte.                          |
| EINF (Incoming number of Megaframes) | Counter is incremented by one for each incoming megaframe.                         |
| EONB (Outgoing number of Megabytes)  | Counter is incremented by one for each outgoing megabyte.                          |
| EONF (Outgoing number of Megaframes) | Counter is incremented by one for each outgoing megaframe.                         |

**PM Data Registers**

The Ethernet performance parameters, like those for other elements, are captured in 15-minute and 24-hour bins. These fixed windows are synchronized to the *bins* of the SONET/SDH PM. The counts are reset to zero at the start of a new window.

The counts accumulated at the end of a binning period are transferred to the first set of "recent" bins. The system supports a set of 32 recent 15-minute bins and one recent 24-hour bin.

**PM Thresholds**

The system supports provisionable thresholds for the 15-minute and the 24-hour accumulations of total number of errored packets dropped.

When the count reaches or exceeds the threshold, an alarm (Threshold Report) is raised. This alarm identifies the moment of occurrence of the threshold crossing with an accuracy of 1 second.

When, at the end of the first period (15 minutes or 24 hours), following a period during which a Threshold Report has been generated, if the count has not gone above the reset threshold, an alarm Reset Threshold Report is raised. This alarm effectively clears the preceding Threshold Report.

**Ethernet performance  
monitoring parameter  
maximum counts and  
default threshold values**

The following table shows the maximum counts associated with the ethernet performance monitoring parameters and the default threshold values.

| Parameter | 15 Minute     |                   | 1 Day         |                   |
|-----------|---------------|-------------------|---------------|-------------------|
|           | Maximum Count | Default Threshold | Maximum Count | Default Threshold |
| EDFC      | 4294967295    | 1875000           | 4294967295    | 9000000           |
| EDFE      | 4294967295    | 1875000           | 4294967295    | 9000000           |
| EINB      | 112500        | 1125              | 10800000      | 108000            |
| EINF      | 112500        | 1                 | 10800000      | 23                |
| EONB      | 112500        | 1125              | 10800000      | 108000            |
| EONF      | 112500        | 1                 | 10800000      | 23                |

## Invalid Parameters/Invalid Data Flags

---

**Invalid parameters** In some situations, a section, line, or path performance parameter is considered invalid and is marked invalid with a flag. The flag is attached to the data and travels with the data. The following tables summarize the conditions that may cause a parameter to be flagged as invalid and list the invalid data flags.

### Parameter invalid conditions

The following table summarizes the conditions and the parameters affected in a SONET environment.

| Condition                                                                              | parameters to be marked invalid                                                                                        |
|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| A change in (DS3) SES threshold                                                        | individual affected parameter                                                                                          |
| Automatic Laser Shutdown (ALS)                                                         | Physical parameter: LBC, LBC <sub>b</sub> , OPT, OPT <sub>b</sub>                                                      |
| Concatenated signal format change                                                      | all path parameters                                                                                                    |
| Detected read error of hardware PM register by software                                | all PM parameters of associated HW register                                                                            |
| DS3 signal format change between one that supports PM and one that does not support PM | line and near-end and far-end path parameters of incoming direction and near-end path parameters of outgoing direction |
| DS3 PM enable/disable                                                                  | line and near-end and far-end path parameters of incoming direction and near-end path parameters of outgoing direction |
| DS3 signal format change between one that supports PM and one that does not support PM | line and near-end and far-end path parameters of incoming direction and near-end path parameters of outgoing direction |
| Facility/equipment Protection due to equipment failure                                 | all path parameters                                                                                                    |
| Far end parameters inhibited due to near end defects                                   | inhibited far end line and path parameters                                                                             |
| Physical PM enable/disable                                                             | physical parameters                                                                                                    |
| PM start change (24 hour boundary, 0-23)                                               | all current day registers                                                                                              |
| register initialization                                                                | all registers being initialized                                                                                        |

| <b>Condition</b>                                                     | <b>parameters to be marked invalid</b> |
|----------------------------------------------------------------------|----------------------------------------|
| Restart of system controller software that affects the entire system | all                                    |
| SONET line far-end PM enable/disable                                 | line far-end parameters                |
| SONET path PM enable/disable                                         | near-end and far-end path parameters   |
| SONET section/line near-end PM enable/disable                        | section/line near-end parameters       |
| SW processing error                                                  | individual parameter                   |
| system/SRC/PU out of service (SRC applies to BWM only)               | all parameters of associated ports     |
| Time/date change or port unit pack (re)insertion                     | all                                    |



**Invalid Data Flags** The following table lists the conditions that can cause an invalid data flag to be generated and the flag values for those conditions.

| <b>Condition</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Invalid Flag Output Report</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| Any of the following will cause the invalid flag to be generated: <ul style="list-style-type: none"> <li>time/date change to shorter interval or earlier minute, hour, day, month, or year</li> <li>port unit pack (re)insertion</li> <li>restart of system controller software (in the middle of an interval)</li> <li>system/SRC out of service or back to service (cold boot)</li> <li>system/SRC out of service or back to service (warm boot in the middle of an interval)</li> <li>PU out of service or back to service</li> </ul> | 1-01                              |
| Any of the following will cause the invalid flag to be generated: <ul style="list-style-type: none"> <li>time/date change to longer interval or later minute, hour, day, month, or year</li> <li>restart of system controller software (at boundary between intervals)</li> <li>system/SRC out of service or back to service (warm boot at the boundary between intervals)</li> </ul>                                                                                                                                                    | 1-02                              |
| PM enable/disable or MON/NMON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1-03                              |
| Concatenated signal format change                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | I-05                              |
| SW processing error                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1-08                              |
| Far end parameters inhibited due to near end defects                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1-09                              |
| Facility/equipment protection due to equipment failure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1-10                              |
| PM start change to shorter interval                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1-11                              |
| PM start change to longer interval                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1-12                              |
| Register initialization                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1-13                              |
| Detected read error of hardware PM register by software                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1-14                              |
| DS3 signal format change from one that supports PM to one that does not                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | I-15                              |
| DS3 signal format change from one that does not support PM to one that does                                                                                                                                                                                                                                                                                                                                                                                                                                                              | I-16                              |
| A change in (SDH) SES declaration threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1-17                              |
| Automatic Laser Shutdown (ALS)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1-18                              |





# Appendix A: WaveStar<sup>®</sup> Craft Interface Terminal (WaveStar CIT) Tutorial

## Overview

---

**Objectives** Through a series of exercises, this tutorial provides a practical introduction to the primary functions of the WaveStar CIT.

**Important!** It is strongly recommended that this tutorial only be run in conjunction with a WaveStar TDM 2.5G/10G network/subnetwork that is out of service.

This tutorial provides introductory information that should prove useful when training new personnel about user operations on the WaveStar CIT.

**How to use this tutorial** Because many of the tasks in this tutorial build upon preceding tasks, this tutorial is designed to be completed in the sequence provided. For example, before you can provision cross-connections or ports, you must be able to log into the WaveStar CIT. Therefore, it is strongly recommended (especially for those users who are unfamiliar with the WaveStar CIT) that you start from the beginning and work through all tasks provided in this tutorial.

**Required port units** To complete each exercise in this tutorial, the out-of-service WaveStar TDM 2.5G/10G system that you use must be equipped with at least one each of the following port units:

- DS3EC1
- OC3STM1
- OC12STM4
- OC48STM16

For compatibility information, see the "Circuit Pack/Port Unit Descriptions" chapter of this document.

**Related information** For additional information about the Wavestar CIT and TL1 commands refer to the following documents:

- *WaveStar TDM 2.5G (OC-48)/10G (OC-192) (2-Fiber) Software Release Description (SRD)* - ships with each software release
- *WaveStar TDM 2.5G (OC-48)/10G (OC-192) (2-Fiber) Operations Systems Engineering Guide.*

**Contents** This tutorial includes the following tasks:

|                                                                             |        |
|-----------------------------------------------------------------------------|--------|
| Install the WaveStar CIT Software                                           | A - 4  |
| Login to the WaveStar CIT Application                                       | A - 6  |
| Identify the Components of the WaveStar CIT Network View Screen             | A - 9  |
| Login to an NE                                                              | A - 12 |
| Identify the Components of the WaveStar CIT System View Screen              | A - 15 |
| Identify the Software Releases from the System View Screen                  | A - 18 |
| View Equipment Details                                                      | A - 19 |
| Display Bays and Shelves                                                    | A - 26 |
| Provision the Date/Day/Time of an NE                                        | A - 39 |
| Preprovision and Provision a Circuit Pack                                   | A - 41 |
| Understand the Difference Between View of Circuit Pack Versus View of Ports | A - 47 |
| Display the Command Completion History List                                 | A - 53 |
| Display the Alarms List and Update Alarms                                   | A - 55 |
| Test the LEDs                                                               | A - 58 |
| Delete a Circuit Pack                                                       | A - 60 |
| Disconnect from the NE                                                      | A - 62 |
| Working with TL1 Commands                                                   | A - 63 |



# Install the WaveStar CIT Software

---

**Overview** This section explains how to install the WaveStar CIT software from the CD-ROM. This tutorial assumes that the WaveStar Network Element (NE) software is already loaded on all NEs within the subnetwork.

For more information about installing the WaveStar NE software, refer to Task 202.

**Uninstall an existing WaveStar CIT release** You must uninstall an existing release before installing a new release. Follow these steps to uninstall an existing WaveStar CIT release.

---

**1** Double-click the **My Computer** icon on the desktop.

---

**2** Double-click the **Control Panel** item in the resulting window.

---

**3** Double-click the **Add/Remove Programs** item in the resulting window.

---

**4**

| If "WaveStar CIT"... | Then...                                                              |
|----------------------|----------------------------------------------------------------------|
| does not appear,     | there is no previous version installed.<br><i>STOP! End of Task.</i> |
| does appear          | continue with Step 5                                                 |

---

**5** Click the **WaveStar CIT** entry in the resulting dialog box.

---

**6** Click the **Change/Remove** button in the resulting dialog box and follow the InstallShield® Wizard as it guides you through the unistall process.

---

END OF STEPS

---

## **Install the WaveStar CIT software**

Follow the steps in this section to install the WaveStar CIT software.

- 
- 1** Insert the WaveStar CIT CD-ROM into the PC CD-ROM drive and the installation process starts automatically.  
*If the process does not start automatically, go to the Start-Run menu and type the name of the CD-ROM drive (often D:).*
  - 2** After the installation process is complete, a dialog box appears asking you to reboot your computer. Select the reboot now option.
  - 3** If the installation was successful, you will see a **WaveStar CIT** icon on the desktop after rebooting. To open the WaveStar CIT software, double-click the **WaveStar CIT** icon to launch the software.

---

END OF STEPS

---

# Login to the WaveStar CIT Application

---

**Overview** This section explains how to login to the WaveStar CIT.

**Login window** Follow these steps to login to the WaveStar CIT.

---

- 1 Double-click on the **WaveStar CIT** icon that is visible on the desktop.

**Result:** The login screen appears, similar to Figure 1.

**Figure A-1 WaveStar CIT Login Screen**



- 2 Place the cursor in the **User Id** field and enter one of the default user Ids from the table below.  
The User Ids and Password are case-sensitive: they must be typed exactly as they appear below.

| User Id | Password |
|---------|----------|
| LUCØ1   | LUC+Ø1   |
| LUCØ2   | LUC+Ø2   |



- 
- 3 Place the cursor in the **Password** field. Enter the correct password for the User Id you entered.

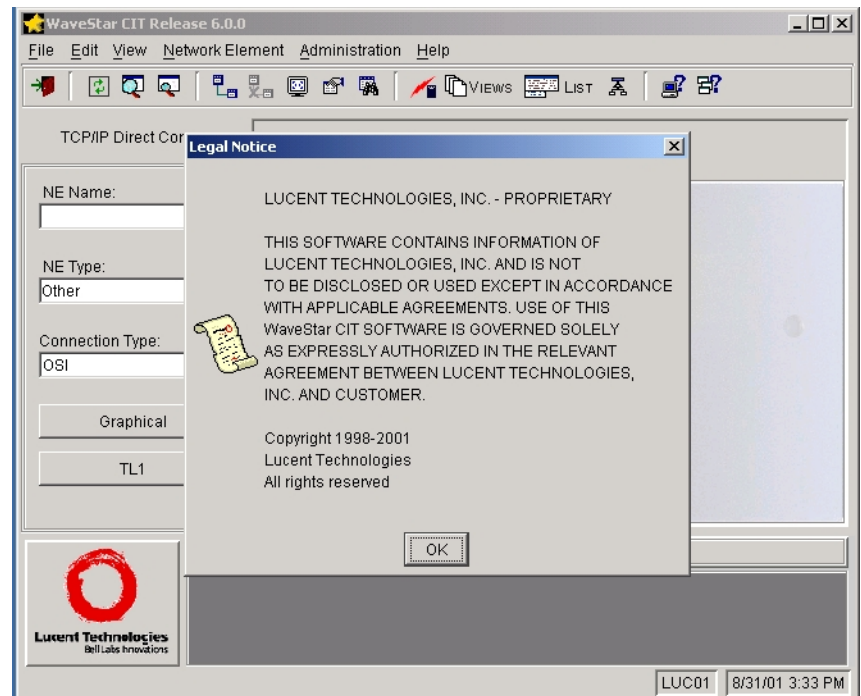
| User Id | Password |
|---------|----------|
| LUC01   | LUC+01   |
| LUC02   | LUC+02   |

---

- 4 Click **OK** button to continue.

**Result:** The Lucent Proprietary notice appears, similar to Figure 2.

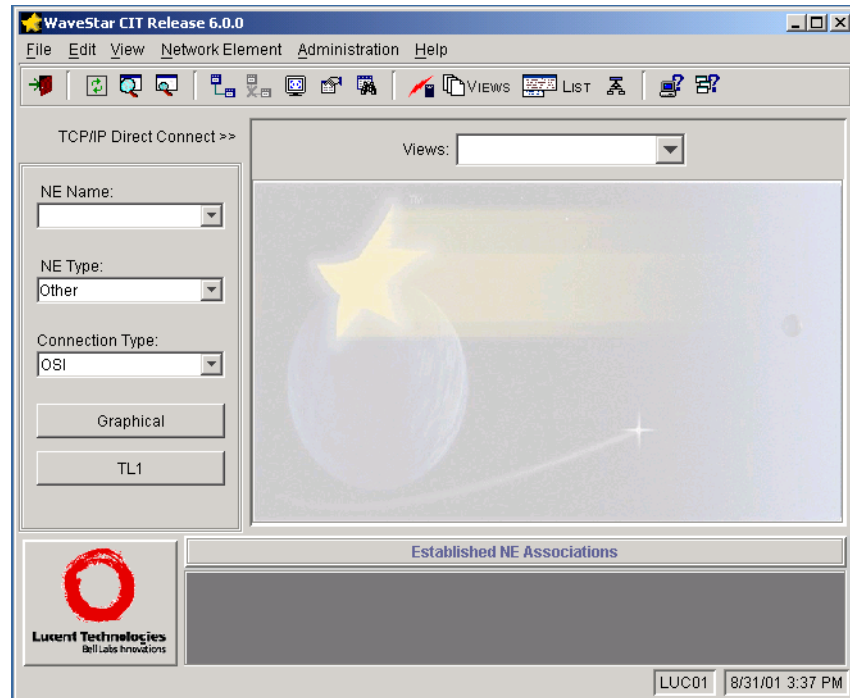
**Figure A-2 WaveStar CIT Screen with Lucent Technologies Proprietary Notice**



- 
- 5 Read the Legal Notice and click the **OK** button to continue.

**Result:** The WaveStar CIT screen appears, similar to Figure 3.

**Figure A-3 WaveStar CIT View**



# Identify the Components of the WaveStar CIT Network View Screen

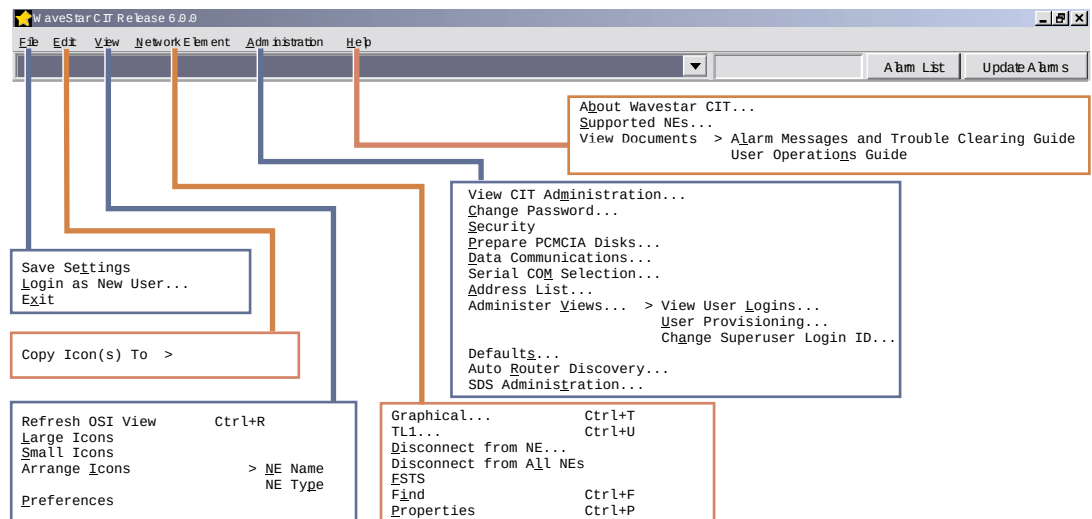
**Overview** Similar to other Windows applications, the WaveStar CIT has a menu bar across the top of the screen, a toolbar immediately below the menu bar, and status indicators across the bottom of the screen. Each menu bar item has a pull-down menu, and some menu options lead to submenus.

**Use the menu bar** Figure 4 is a functional illustration of the WaveStar CIT Network View menu bar with the pull-down menus.

- 1 Click on each menu item on your screen to see the pull-down menus for yourself.

Observe that the menu items have an associated short-cut key. For example, the shortcut key for the **File** menu item is **Alt+F**. The short-cut keys for a pull-down menu item are either simply the underlined letter of that item or the **Alt+key** combination shown.

**Figure A-4 WaveStar CIT Network View Menu Bar**



nc-2510g-074

- 
- 2 Repeat **Step 1** for each menu item on the menu bar.

---

END OF STEPS

---

**Use the tool tips** The WaveStar CIT applications software supports tool tips. Follow the steps below to see tool tips.

- 
- 1 To determine the meaning of a particular toolbar item, place the cursor over that item, hold for two seconds, and its name/function is displayed.

**Important!** In Figure 3, the time and date shown at the lower right-hand corner is the time and date of the PC. This point is emphasized to make it clear that the CIT time/date is separate from an NE time/date. Changing an NE time/date is distinct from changing it on the PC.

- 
- 2 Repeat **Step 1** for each item on the toolbar.

---

END OF STEPS

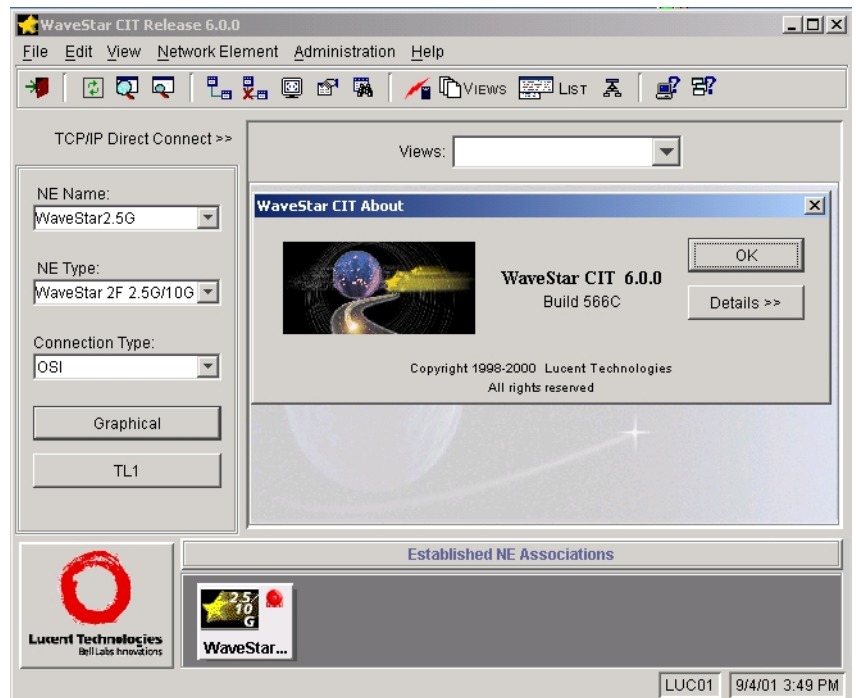
---

**Identify the WaveStar CIT software release** Follow the steps below to identify the release of CIT software running on your PC.

- 
- 1 From the menu bar, select **Help > About WaveStar CIT** to display the release and build number (BLD####) of the WaveStar CIT software currently running on the PC.

Your PC may be running a later (higher build number) than indicated in the Figure 5, in which case your screens may look slightly different.

**Figure A-5 WaveStar CIT Screen with Software Release Displayed**



2 Click the **OK** button.

END OF STEPS

# Login to an NE

---

**Overview** This section explains how to login to an NE.

**Display the System View of an NE** Follow the steps below to display the System View of an NE.

---

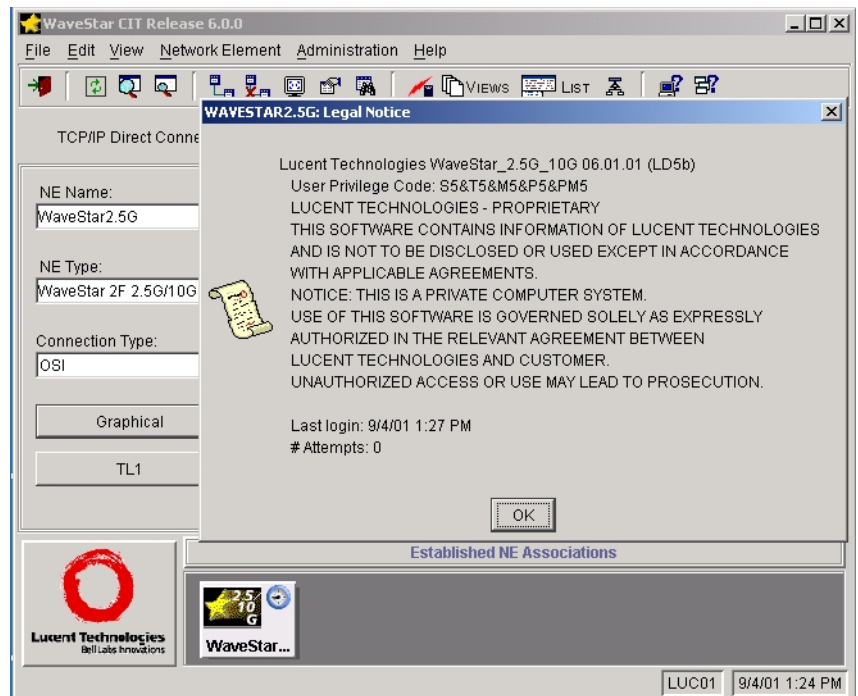
- 1 Select the **Connection Type**, select the **NE Type**, and select or enter the **NE Name** and then click on the **Graphical** button.

**Result:** The Legal Notice for the NE software appears, similar to Figure 6.

Observe that

- The first line indicates the type of product.
- The second line indicates the release number of the NE software.
- The third line lists the user privilege codes (P5&M5&T5&S5&PM5) for login LUC01. A detailed explanation of User Privilege Codes is contained in the chapter called “Provisioning, Security, and Administration.
- Near the bottom appears the date and time of last login.
- The bottom line indicates the number of previous/failed login attempts. A user is denied login access after 3 failed login attempts. The login denied counter will reset after a 10-minute timeout.

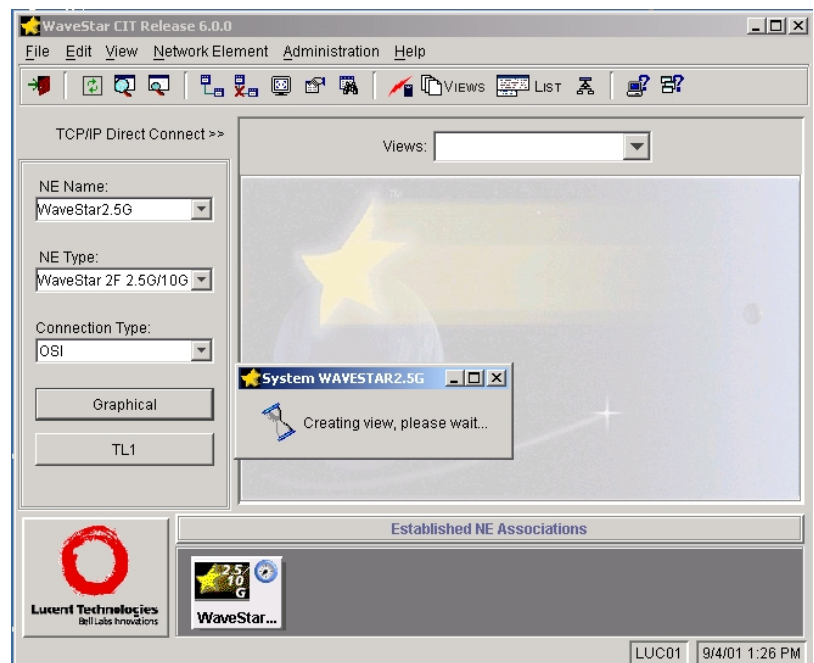
**Figure A-6 WaveStar TDM 2.5G/10G Software Legal Notice**



- 2 Read the notice and click **OK** to continue.

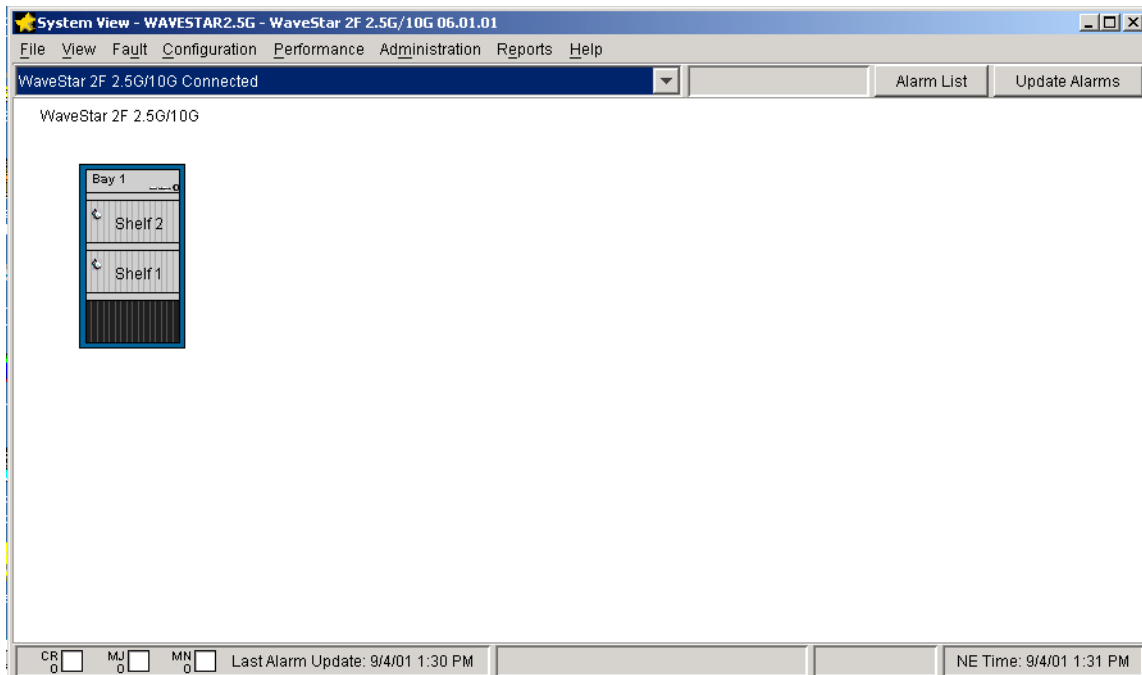
**Result:** The creating view screen appears, similar to Figure 7.

**Figure A-7 Creating System View Screen**



- 3 When the system finishes loading an additional WaveStar CIT screen appears, similar to Figure 8. Select this system view screen and confirm that you are connected to the correct NE.

**Figure A-8 System View Screen**



END OF STEPS



# Identify the Components of the WaveStar CIT System View Screen

---

**Overview** The System View consists of a graphical representation of the bays, shelves, and alarms. You can interact with these components by using your cursor. The number of bays, shelf equipage, alarms, and so forth, may be different for your displayed NE.

In the System View, each shelf is functionally depicted with a shelf-level alarm LED. This LED serves to indicate the highest level of alarm for that shelf. Similarly, each bay is functionally depicted with a bay level alarm LED. This LED serves to indicate the highest level of alarm for all shelves within that bay. Also, the System View includes (in the lower left corner of the display) three alarm indicators. When alarms are present anywhere within the NE, these alarm indicators serve to indicate the alarm level and number of occurrences.

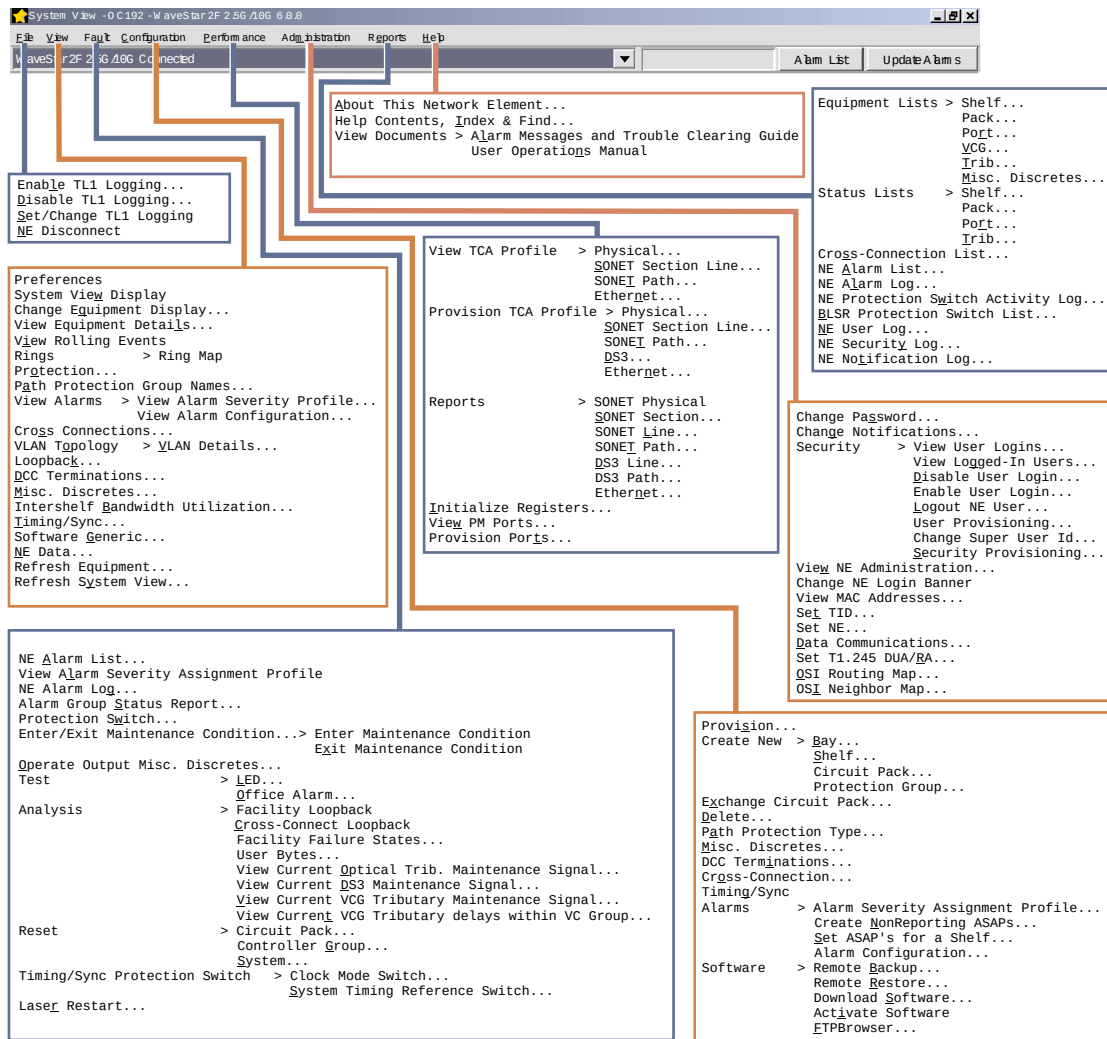
**Use the menu bar** Figure 9 is a functional illustration of the WaveStar CIT System View menu bar with its pull-down menus.

- 
- 1** Click on each menu item on your screen to see the pull-down menus for yourself.

Depending on the particular software release/BLD#### that you are using, there may be some variations in the contents of some menus. If a menu option is visible but "greyed out" either (a) you cannot select that option from the current environment or (b) the greyed out option may not be selectable at anytime from this particular WaveStar product.

Figure 9 is a functional illustration of the System View menu items for WaveStar TDM 2.5G/10G.

**Figure A-9 WaveStar TDM 2.5G/10G – System View Menus**



nc-2510g-073

**2 Repeat Step 1 for each menu item on the menu bar.**

END OF STEPS

**Use the tool tips**

As previously mentioned, the WaveStar CIT applications software supports tool tips. Follow the steps below to see tool tips.

- 
- 1** To determine the meaning of a particular toolbar item, place the cursor over that item, hold for two seconds, and its name/function is displayed.
- 
- 2** Repeat **Step 1** for each item on the toolbar.

END OF STEPS

---

# Identify the Software Releases from the System View Screen

---

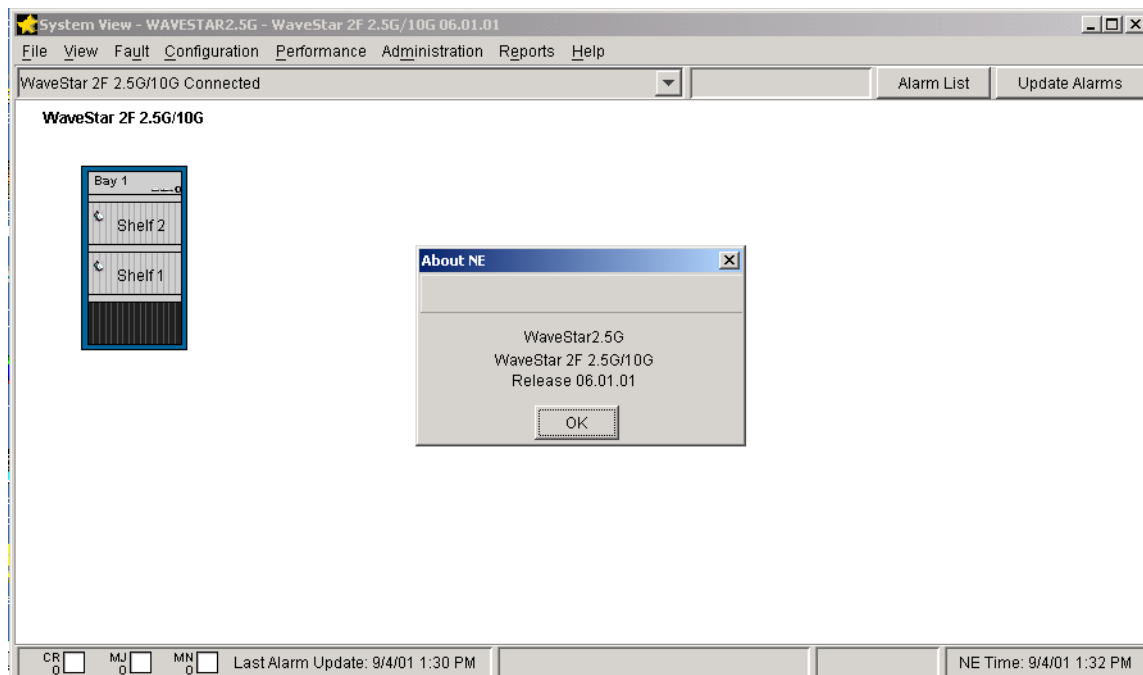
## Identify the NE software release currently running

Follow the steps below to identify the NE software release currently running on WaveStar TDM 2.5G/10G.

---

- 1 From the menu bar, select **Help > About This Network Element**. This command generates a screen similar to Figure 10.

**Figure A-10 WaveStar TDM 2.5G/10G Screen with NE Software Release Displayed**



- 2 Click the **OK** button to continue.

END OF STEPS

---

# View Equipment Details

---

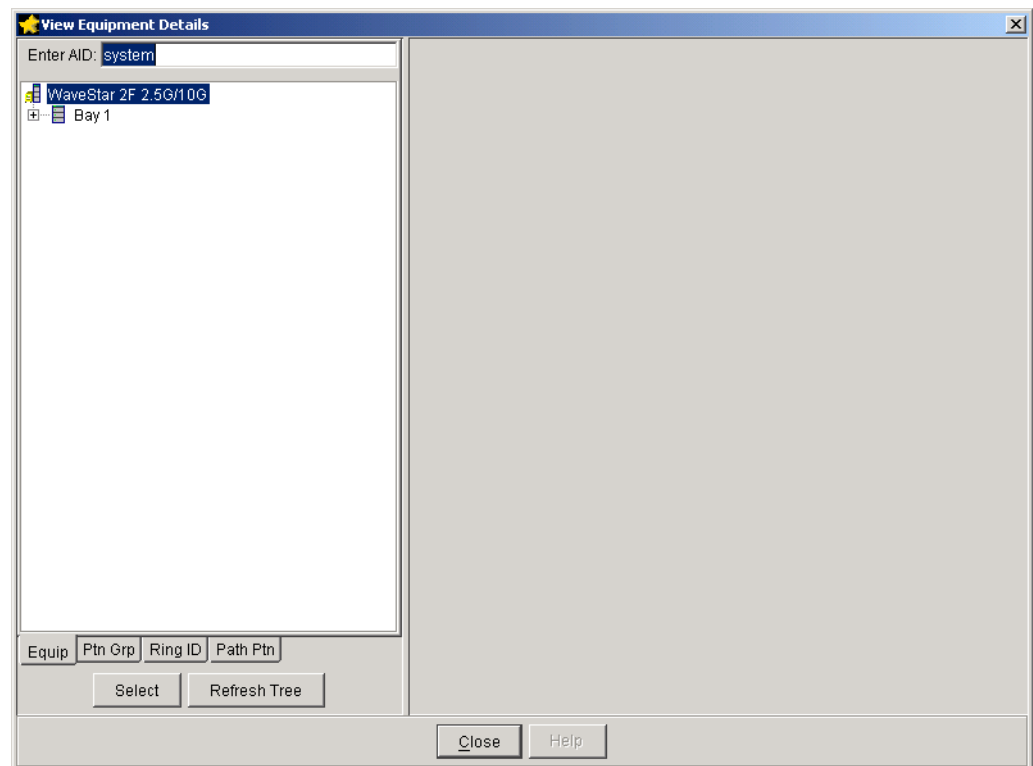
**Overview** This section explains how to view the equipment details and understand the AIDs.

**View the equipment details** Follow the steps in this section to view the equipment details.

---

- 1 From the System View menu bar, select **View > View Equipment Details....** This command generates a screen similar to Figure 11.

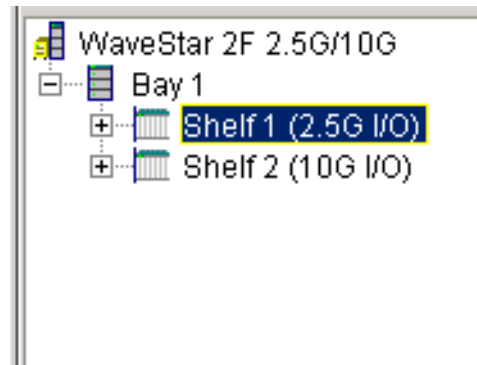
**Figure A-11 View Equipment Details Screen**



- 
- 2 Click the + sign that precedes the bay.

**Result:** The + sign changes to a - sign and the list expands to include the shelves in the bay, similar to Figure 12.

**Figure A-12 List Expansion to include the Shelves**



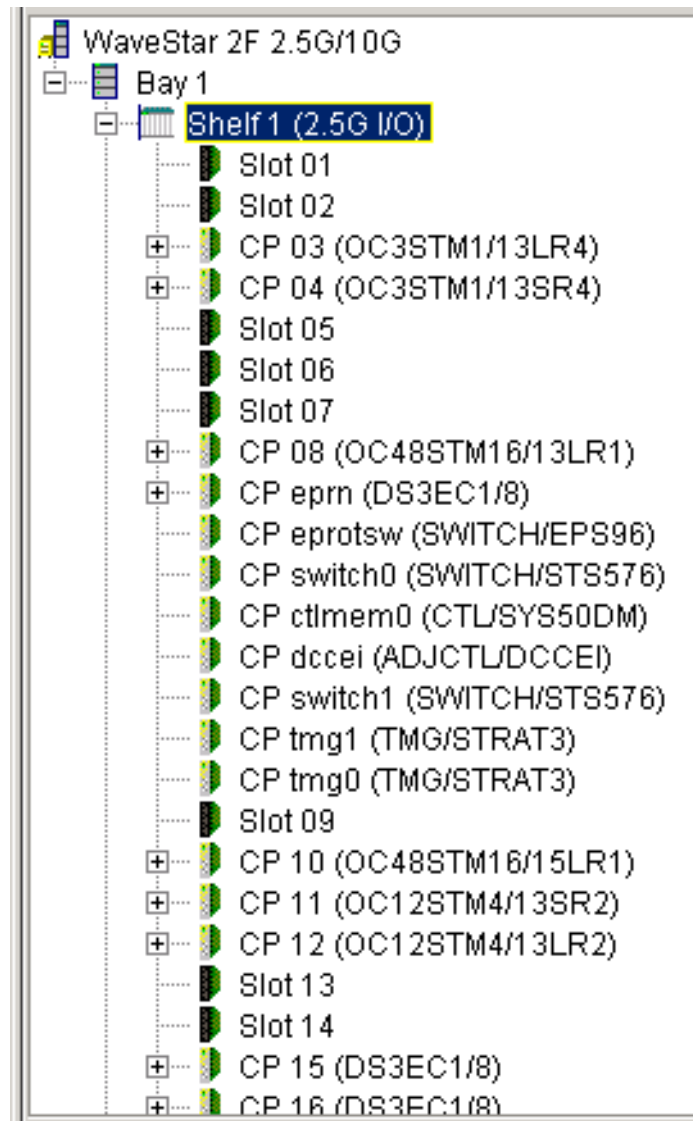
- 
- 3 Click the title of each shelf, and notice the AID that appears in **Enter AID** box at the top of the screen. Refer to the table below for a sample list of the AIDs.

| Equipment | AID |
|-----------|-----|
| Bay 1     | 1   |
| Shelf 1   | 1-1 |
| Shelf 2   | 1-2 |

- 
- 4 Click each + sign that preceeds **Shelf 1 (2.5G I/O)**.

**Result:** The + sign changes to a - sign and list expands to include the circuit packs and equipment in that shelf, similar to Figure 13.

**Figure A-13 List Expansion to include the Circuit Packs**



END OF STEPS

---

## View port an trib details

The View Equipment Details window is similar to the Windows Explorer screen. The equipment hierarchy, from the top down, is as follows:

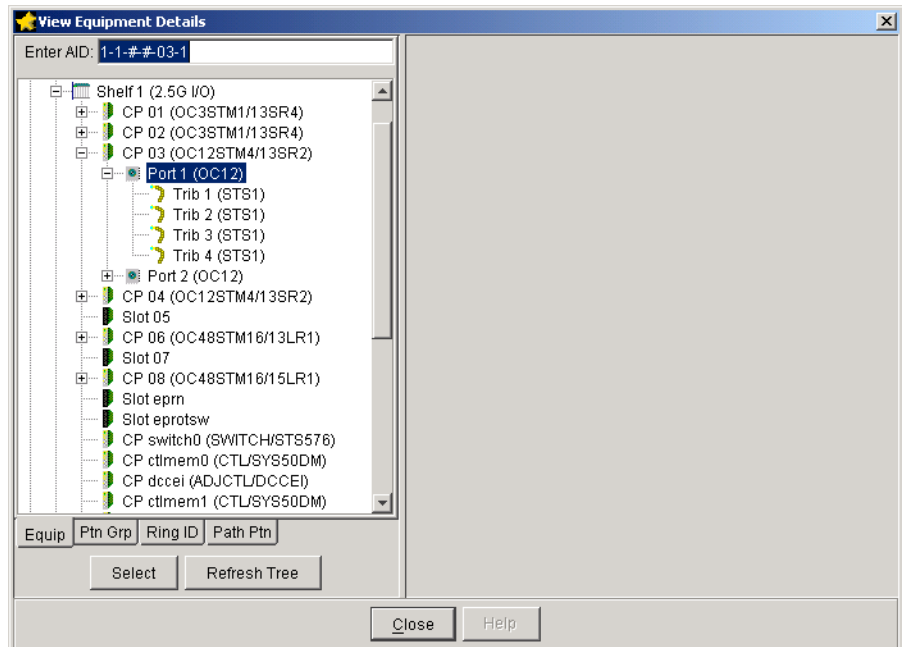
System  
Bay  
Shelf  
Circuit pack  
Port  
Trib

- 
- 1 Click on the  sign to the left of Bay 1 – to expand to the Bay 1 Shelf 1 level.
  - 2 Click on the  sign to the left of CP \_\_ (OC3STM1.....) – to expand to the Port level.
-



- 
- 3 Click on the  sign to the left of Port 1 – to expand to the Trib level. Your screen should look similar to the following figure.

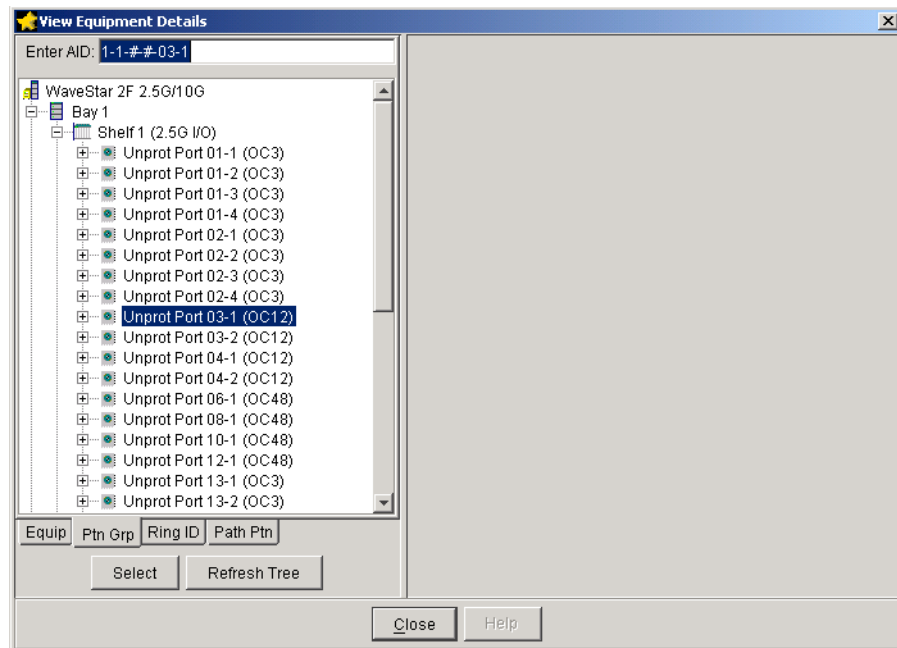
**Figure A-14 Screen to view the equipment details – Trib level depicted**



- 
- 4 Located at the bottom of the View Equipment Details window are three tabs. Click on the tab labeled **Ptn Grp**.

**Result:** Your screen should look somewhat like the following figure.

**Figure A-15 Screen to view the equipment details – protection groups depicted**



The WaveStar TDM 2.5G/10G supports the following types of Port Protection Groups: Unprotected (0x1), Protected (1+1), Equipment Protected (1xN), and 2F-BLSR. How your node is equipped with circuit packs and what provisioning already exists will determine what Protection Groups are displayed.

---

**5** Click on the tab **Ring ID**. Any 2F-BLSRs that have been provisioned appear here.

---

**6** Click on the Close button.

---

E N D O F S T E P S

---

# Display Bays and Shelves

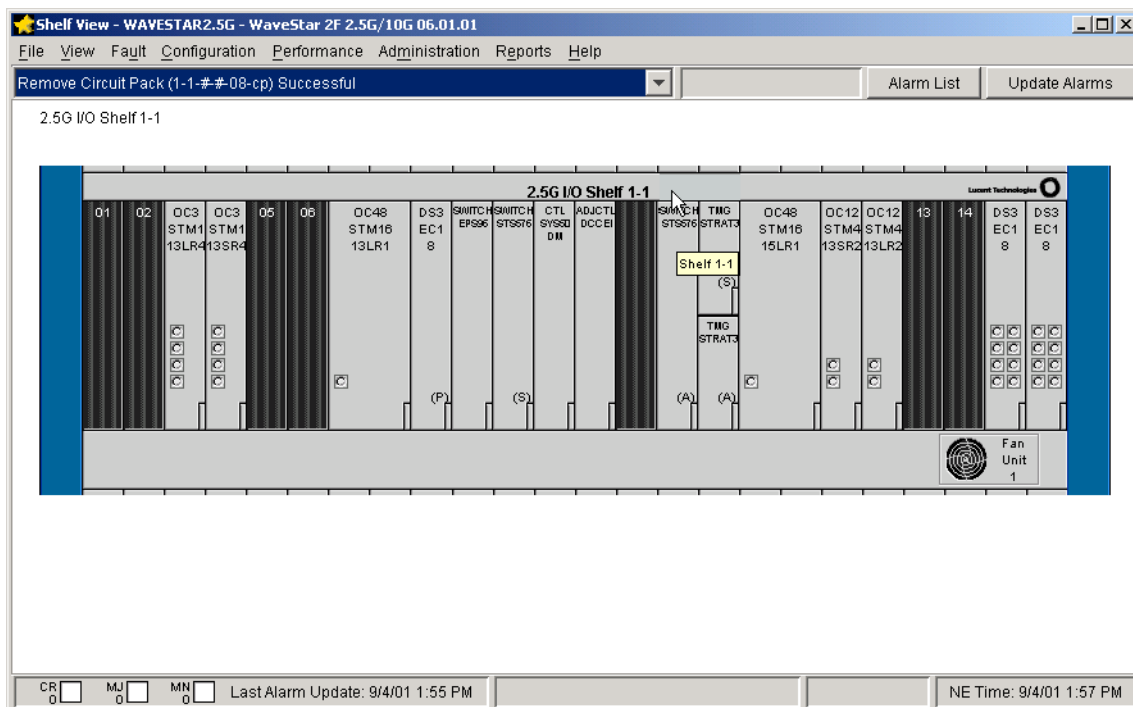
---

**Overview** This section explains how to display the detailed components of the individual bays and shelves.

**Display Bay 1, Shelf 2** Follow the steps below to display Bay 1, Shelf 1.

- 1 Double-click on Shelf 1 within Bay 1, which is identified as Shelf 1-1.
- 2 Place your cursor on the shelf panel and observe that tool tips displays Shelf 1-1. Your screen should look similar to the following figure.

**Figure A-16 System View Screen for Bay 1, Shelf 1 (2.5G I/O Shelf 1-1)**



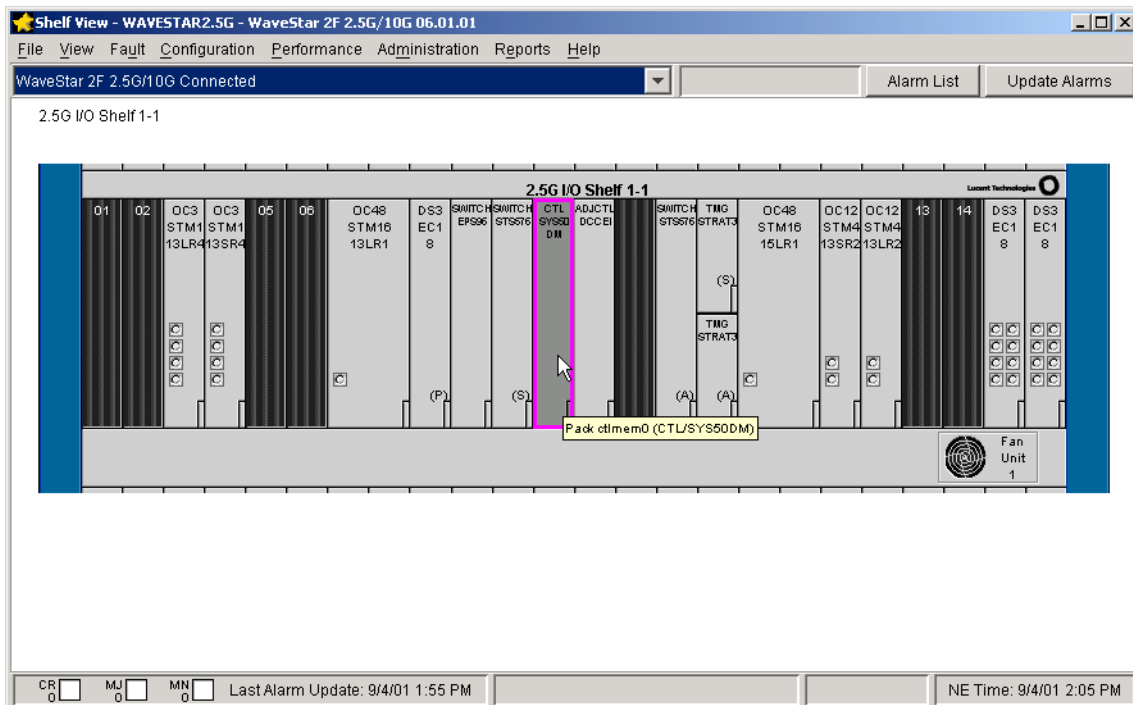
---

**3** Observe the following:

- The type of shelf, bay number, and shelf number appear above the shelf on the left side.
- Equipped slots are shown with the label of the occupying circuit pack or port unit (DS3/EC1, OC3, and so forth).
- Empty slots (for example, Slots 13 and 14) that have NOT been provisioned appear black.
- Empty slots show the number of the slot position.
- Empty slots that have already been provisioned (or preprovisioned) appear similar to equipped slots except they show dark gray diagonal stripes. Also the latch mechanism, which is located in the lower right-hand corner of the slot, shows a red dot to indicate that it is open, and a question mark appears to the left of the latch to indicate that the slot is not operational.

- 4 Place your cursor over the circuit pack faceplate that is labeled CTL/SYS50DM. Hold until “Pack ctlmem0 (CTL/SYS50DM)” is displayed. Your display should look similar to the following figure.

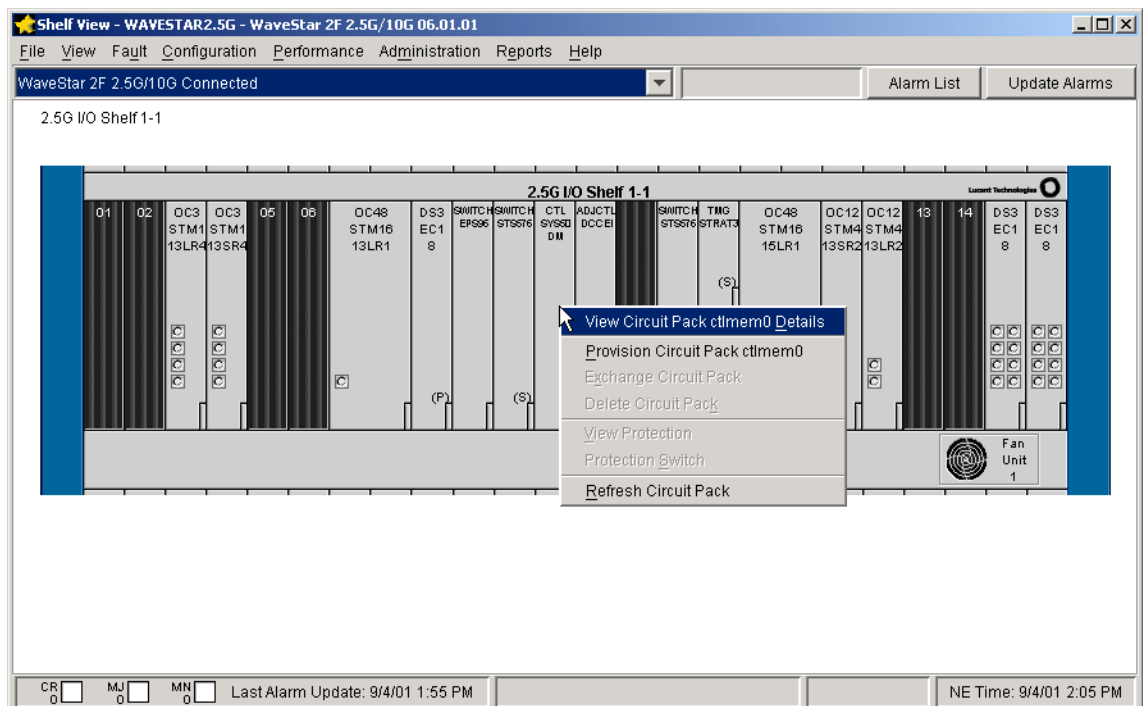
**Figure A-17 Screen to Select Circuit Pack ctlmem0**



5 Right-click on this slot and bring-up the pop-up menu that provides the following menu options:

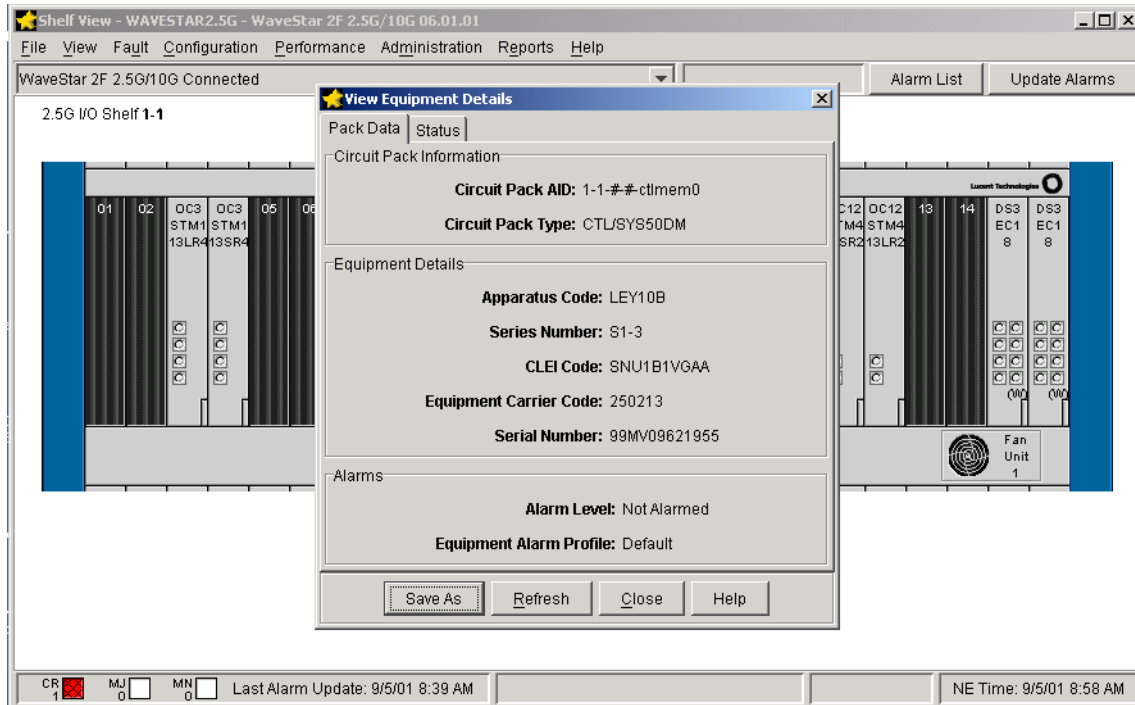
- View Circuit Pack ctmem0 Details
- Provision Circuit Pack
- Delete Circuit Pack
- View Protection
- Protection Switch
- Refresh Circuit Pack

**Figure A-18 Screen to select and view details of circuit pack ctmem0**



- 6 Click on menu option **View Circuit Pack ctlmem0 Details**. Your display should look similar to the following figure.

**Figure A-19 Details of “pack ctlmem0 (CTL/SYS50DM)”**



- 7 Observe that the information (circuit pack details) is layered under the two tabs as follows:
  - Pack Data (which has the following three sub-categories)
    - Circuit Pack Information
    - Equipment Details
    - Alarms.
  - Status (which has the following two sub-categories)
    - Slot Status
    - Pack Status.



- 
- 8** Click on the **Status** tab and observe the displayed information.

**Result:** This operational status of the circuit pack is Enabled its Flashdisk Equipage is Valid, and its Flashdisk Acceptability Status is Enabled.

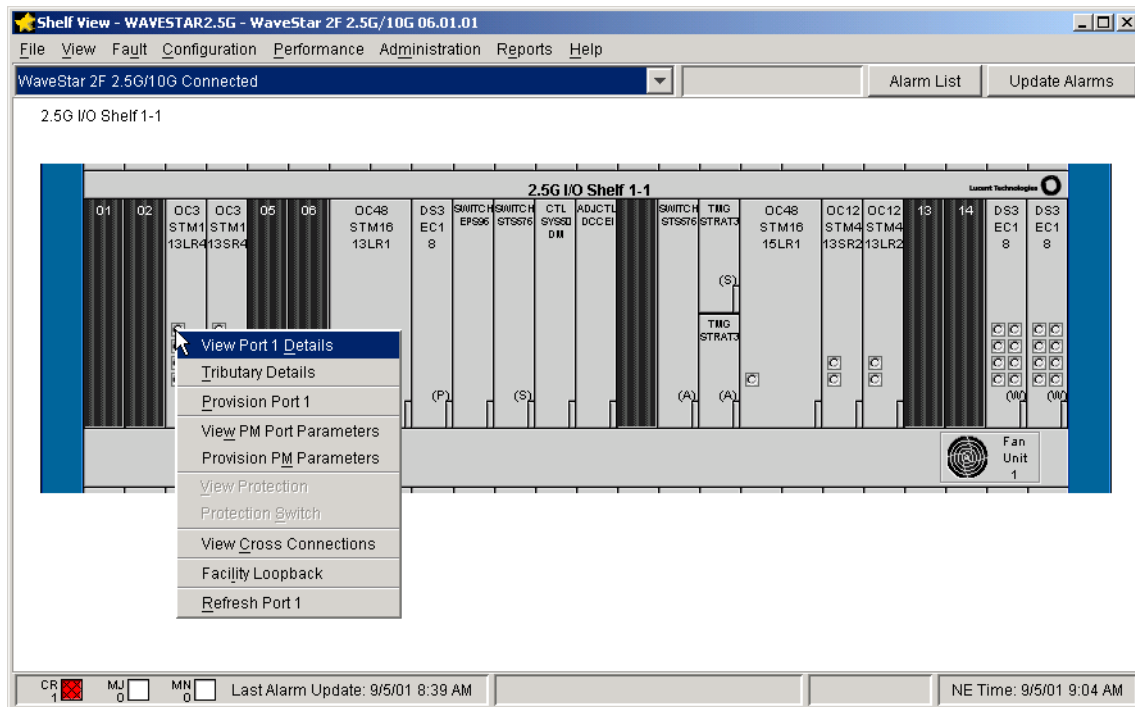
---

- 9** Click the **Close** button.
- 

- 10** Observe that circuit packs with ports display an individual faceplate LED for each port on that circuit pack. A port ID (for example, Port 1) and alarm status is indicated by the color of the LED (White = no alarm, Red = critical alarm, Yellow = major alarm, or Cyan = no alarm).

- 11 For your displayed shelf, locate an optical circuit pack (for example, choose the first OC3), place your cursor over the top LED (which is Port 1), and right-click. Your screen should look similar to the following figure.

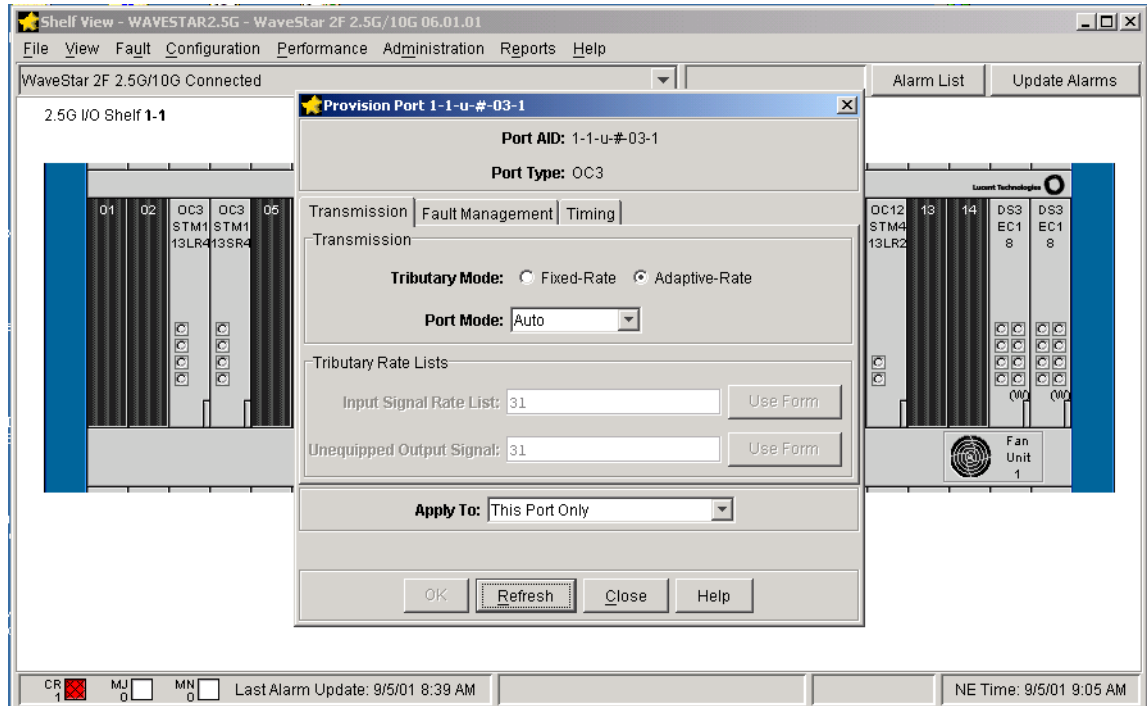
**Figure A-20** Screen of view details of circuit pack OC3 port 1



**Result:** With this pop-up menu, you can: (a) view details – a list for this port, (b) view tributary details, (c) view and provision PM parameters, (d) view protection and protection switching status, (e) view cross-connections for the identified port, and (f) refresh circuit pack port 1 – which will result in updating the CIT information with that contained in the NE’s NVM.

- 12 Click on pop-up menu option **Provision Port 1**. Your display should look similar to the following figure.

**Figure A-21 Provision Port 1 for the circuit pack in slot 01**

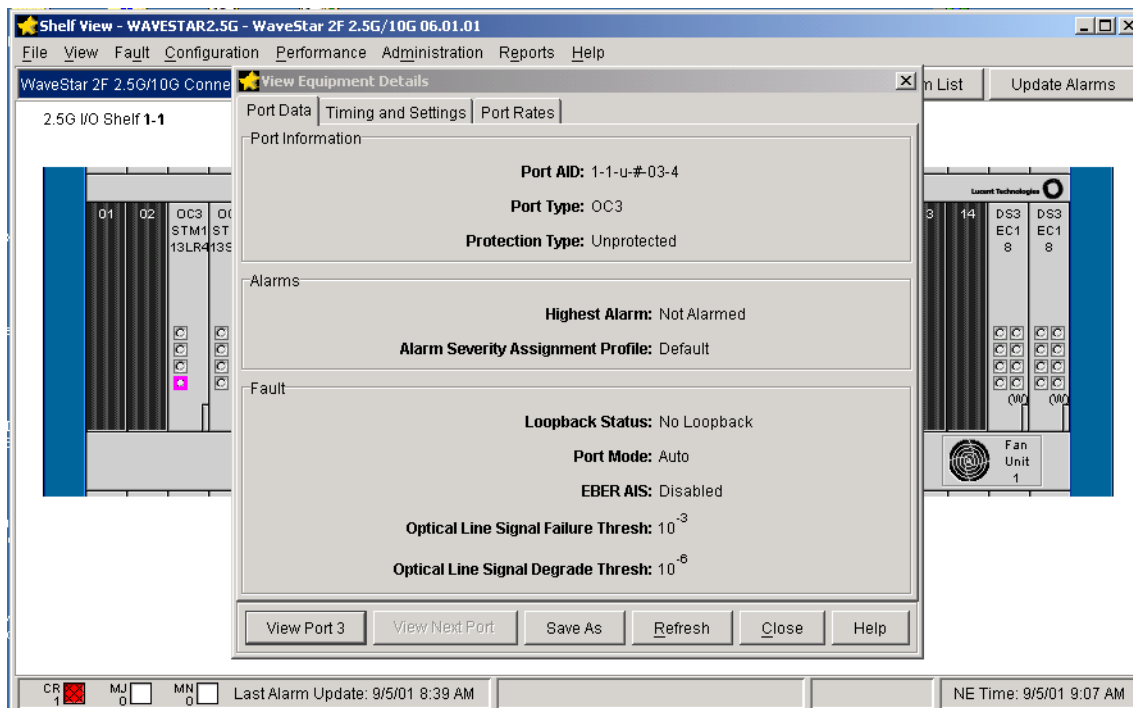


The point of showing this screen is to show that you can use this method to provision a port or to display its provisionable parameters and their default values.

- 13 Observe that there are three separate tabs: Transmission (open in the figure above), Fault Management, and Timing.
- 14 Click on each of the other two tabs, if desired, to view them.
- 15 Click on the **Close** button (or on the boxed “X” at upper right-hand corner of screen).

- 
- 16 For this same OC3/STM1 circuit pack port, right-click on the bottom LED to bring up the pop-up menu.
- 
- 17 Click on the **View Port 4 Details** menu option. Your screen should look similar to the following figure.
- 

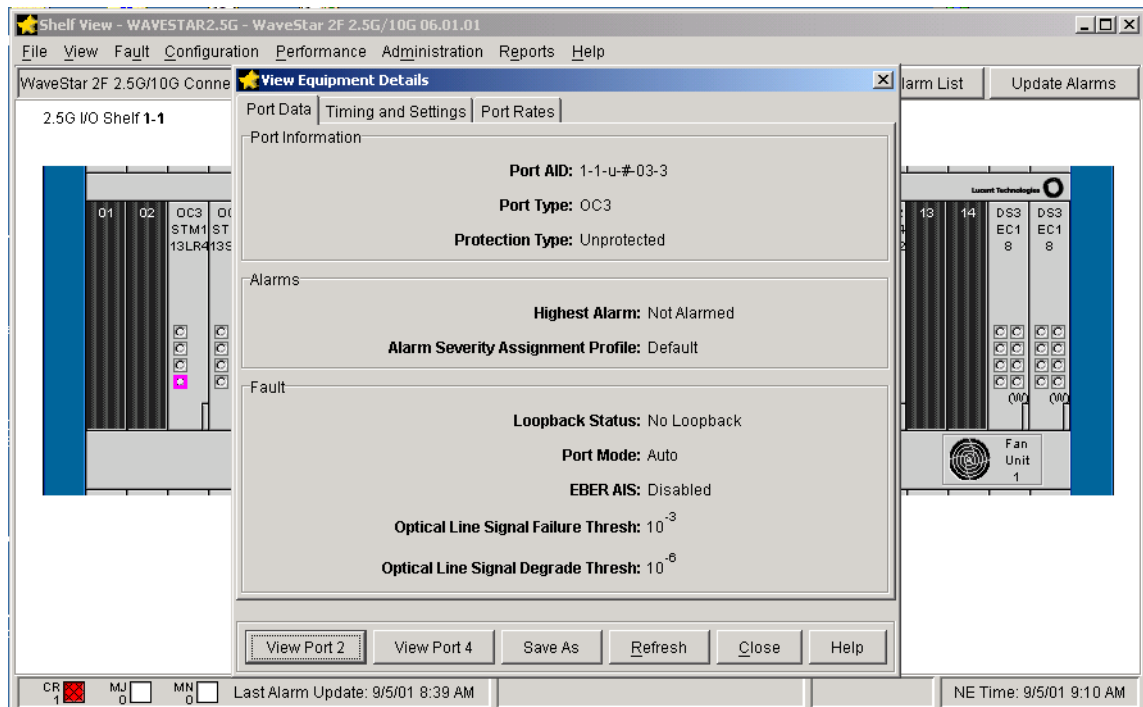
**Figure A-22 Optical port “view details” for AID = 1-1-u-#-03-4**



- 
- 18 Note that the last three digits (03-4) refer to Slot 03 and Port 4. Also, observe that the information is layered under three separate tabs.
-

- 19 Click on the button **View Port 3** to view the details for Port 3. Your screen should look similar to the following figure.

**Figure A-23 Optical port “view details” for AID = 1-1-u-#-03-3**

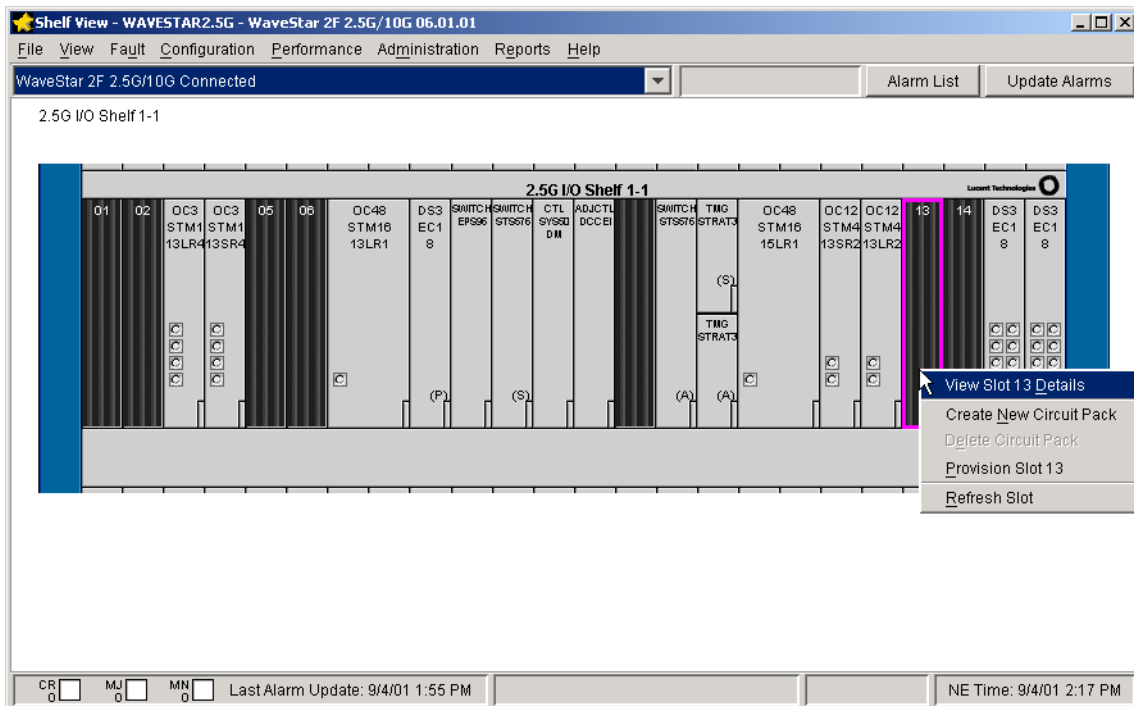


- 20 Observe the changes between Port 4 and Port 3.

- 21 Click on the **Close** button.

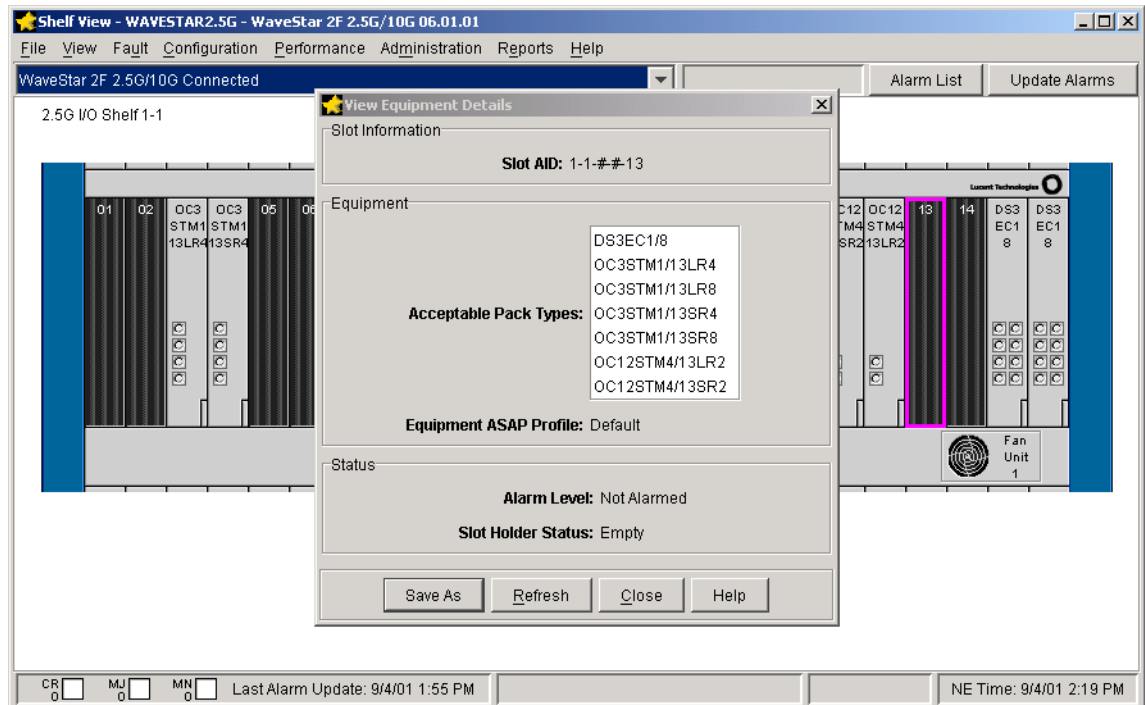
- 22 Right-click on an empty slot (for example, Slot 13) and bring up a pop-up menu that will allow you to view/display details for that slot (see the following figure).

**Figure A-24 View slot 13 details (AID = 1-1-#-#-13)**



- 23 Click on the **View slot 13 Details** option. Your screen should look similar to the following figure.

**Figure A-25 View details for “empty slot 1-1-#-13”**



- 24 Observe that in the field **Acceptable Pack Types** for this slot you can establish any one of the following circuit pack types:

- DS3EC1/8
- OC3STM1/13LR4
- OC3STM1/13LR8
- OC3STM1/13SR4
- OC3STM1/13SR8
- OC12STM4/13LR2
- OC12STM4/13SR2

---

**25** Click on the **Close** button.

END OF STEPS

---



# Provision the Date/Day/Time of an NE

---

## Provision the date/day/time of an NE

You can provision the NE's system clock from the System View screen.

- 1 From the menu bar, select **Configuration > Provision**.
- 2 Click on the field **Enter AID**. Type the word **system** and click **Provision**. Your screen should look similar to the following figure.

**Figure A-26 Screen to Provision the Date/Time and ASAP of the NE**

**Provision Parameters for Protection Group or Equipment**

Enter AID: system

System AID: system

Date

Year: 2001 Month: September

| Sun | Mon | Tue | Wed | Thu | Fri | Sat |
|-----|-----|-----|-----|-----|-----|-----|
| 2   | 3   | 4   | 5   | 6   | 7   | 1   |
| 9   | 10  | 11  | 12  | 13  | 14  | 8   |
| 16  | 17  | 18  | 19  | 20  | 21  | 15  |
| 23  | 24  | 25  | 26  | 27  | 28  | 22  |
| 30  |     |     |     |     |     | 29  |

Time

Hour: 3 Minute: 22

☐ am ☒ pm

System Settings

These parameters may only be set in Maintenance:

Tributary Mode Default: ☒ Adaptive-Rate ☐ Fixed-Rate

Equip Ptn Grp Ring ID Path Ptn

Provision Refresh Tree

Refresh

Apply Close Help

You could achieve this same result by clicking on the directory label **WaveStar TDM 2.5G/10G** instead of typing **system**.

- 
- 3** Observe the fields **Year**, **Month**, **Hour**, **Minute**, **am** and **pm**, as well as the calendar for the selected month and year. Click on the drop-down arrows, radio buttons, and calendar dates, as necessary, to make them correct.
- 

- 4** Click on the **Apply** button.

**Result:** You see the message: Execution of Provision may affect the NE service. Do you want to execute this command?

---

- 5** Click on **Yes**.
- 

- 6** Click on **Close**.
- 

END OF STEPS

---

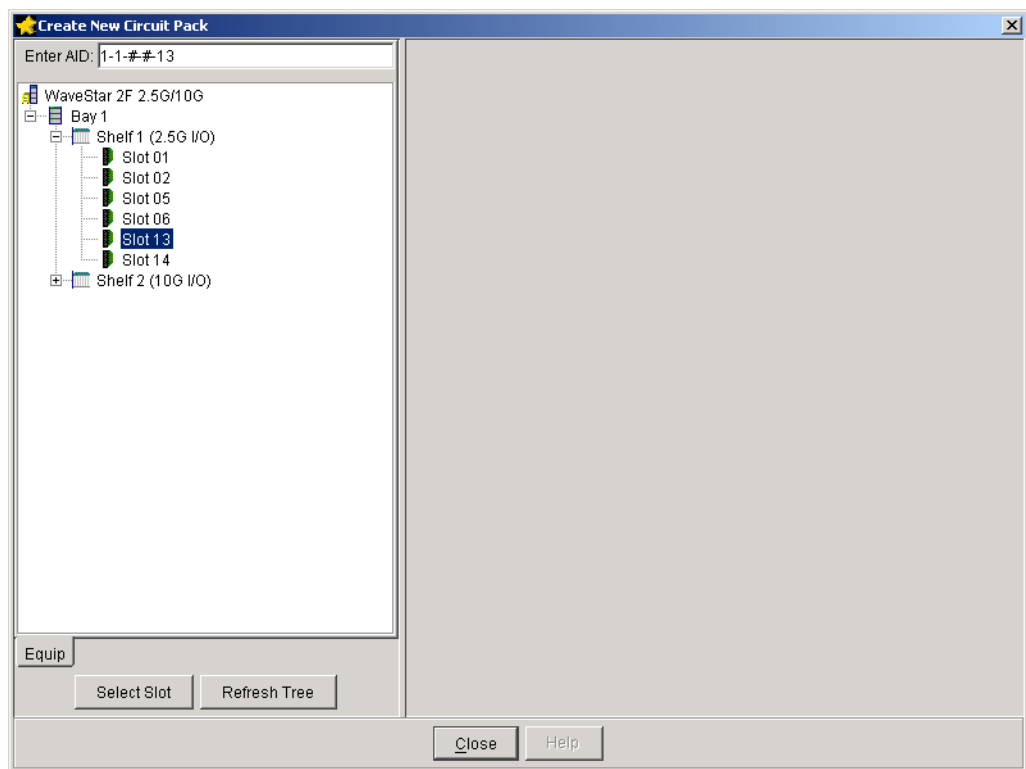
# Preprovision and Provision a Circuit Pack

---

**Preprovision a circuit pack** Follow the steps below to preprovision a circuit pack.

- 1 Create (add) a DS3EC1/8 circuit pack in Bay 1, Shelf 2, Slot 13 (AID = 1-1-#-#-13) by selecting the menu sequence **Configuration > Create New > Circuit Pack** and click. Your screen should look similar to the following figure.

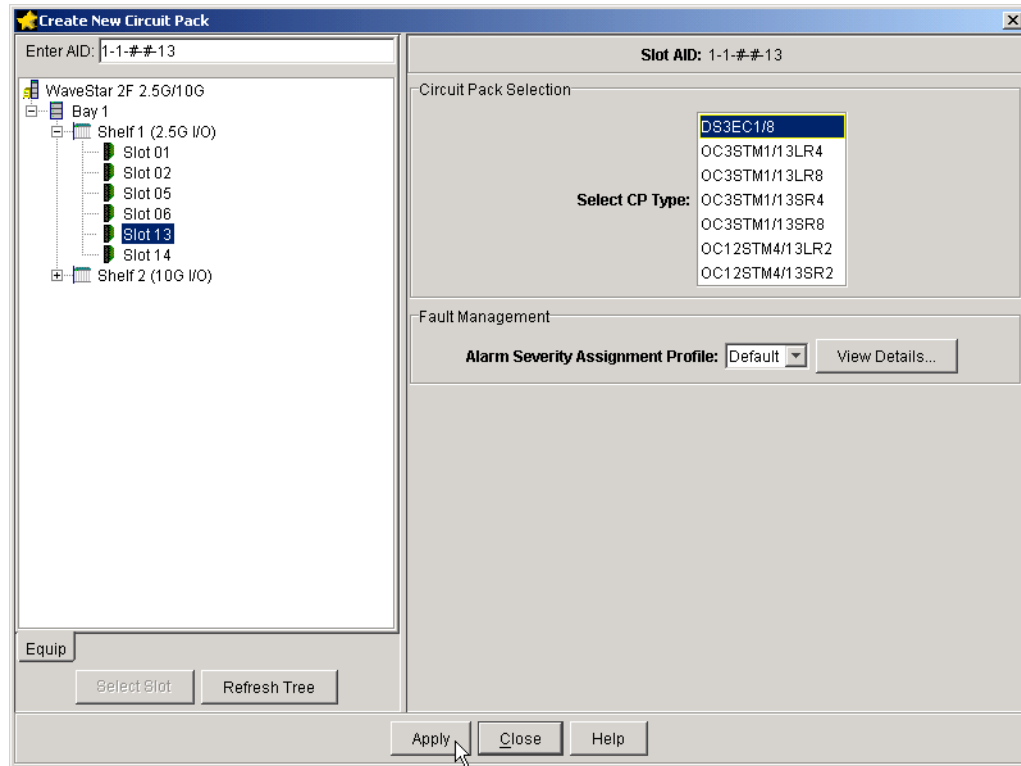
**Figure A-27 Screen to select slot 13**



- 2 Expand Bay 1 and Shelf 2 and select slot 13.

- 
- 3 Click on the **Select Slot** button to continue. Your screen should be similar to the following figure.

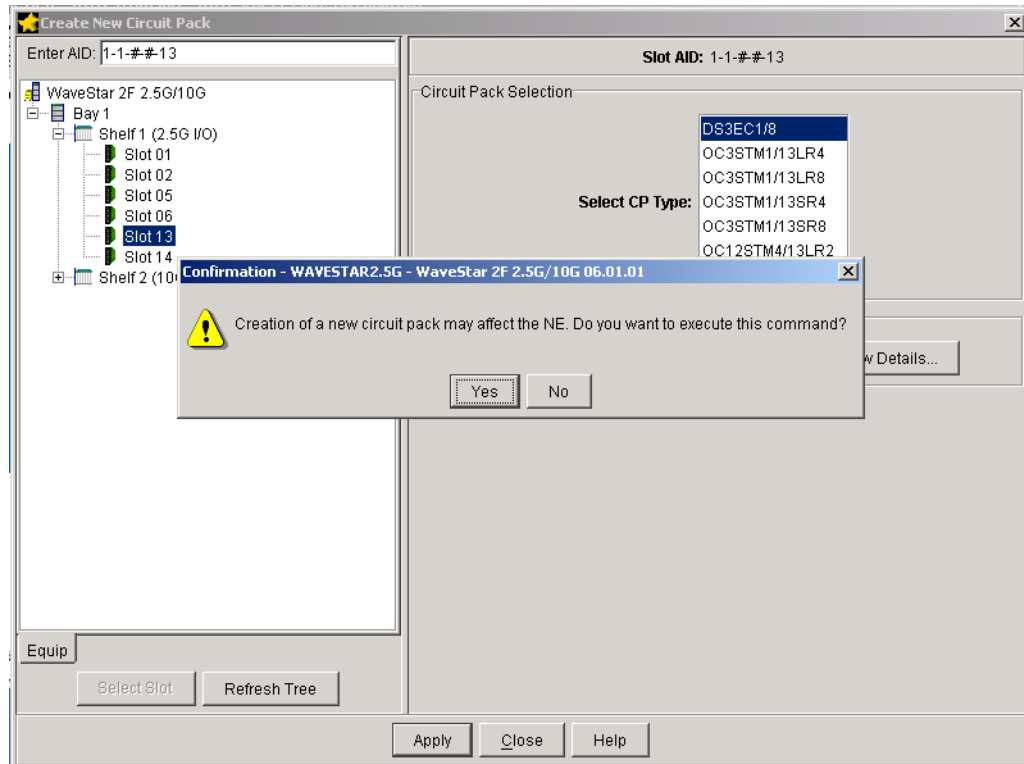
**Figure A-28 Screen to select the DS3EC1/8 type circuit pack**



- 
- 4 From the list labeled **Select CP Type**, select option **DS3EC1/8** (if it is not already selected).

- 
- 5 Click on the **Apply** button. Your screen should look similar to the following figure.
- 

**Figure A-29 Screen to add a DS3/EC1 circuit pack to slot 13**

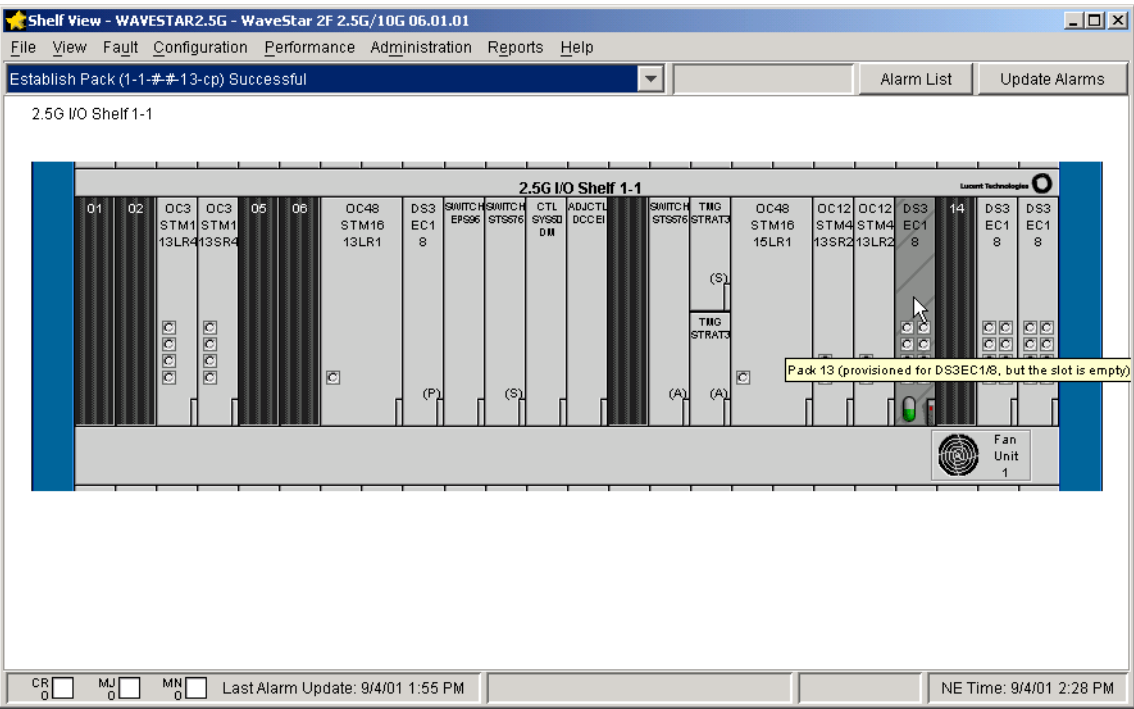


- 
- 6 Click on the **Yes** button.
- 

- 7 Click **Close**.
-

8 Your screen should look similar to the following figure.

**Figure A-30 Preprovisioned circuit pack DS3/EC1 in slot (1-1-##-13) successful**



END OF STEPS

## Provision an I/O port without viewing the shelf

One method to provision an I/O port involves displaying the shelf, which may take a couple of minutes. The method below allows you to provision an I/O port without viewing the shelf.

---

- 1 In the System View, go to the menu bar and click on **Configuration > Provision**.

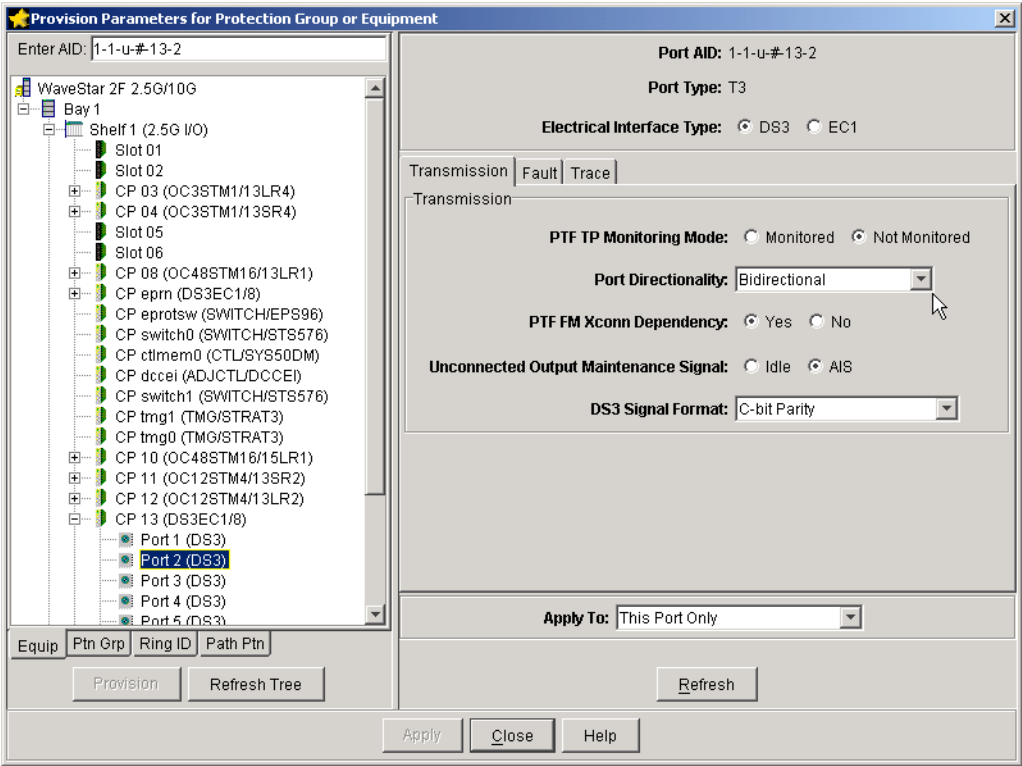
**Important!** There are two methods to select a particular circuit pack. First, you can make multiple selections following down the directory tree until finally selecting the desired circuit pack. Secondly, if you know the AID of the circuit pack, then you can enter it directly into the field labeled **Enter Aid**. As you make each selection, the directory tree will display that entry.

Assume, for purposes of this tutorial, that you will provision a DS3/EC1 circuit pack in the following equipment location: Bay 1, Shelf 1, Slot 1 and Port 13. The AID for this location is 1-1-#-#-01-13.

---

- 2 Go to the field labeled **Enter AID** and type 1-1-#-#-01-13 and click on the **Provision** button. Your screen should look similar to the following figure.

Figure A-31 Screen to Provision Port 2 of Bay 1, Shelf 1, Slot 13



The whole point of this step was to demonstrate a second way to provision a circuit pack.

3 Click on the **Close** button.

END OF STEPS



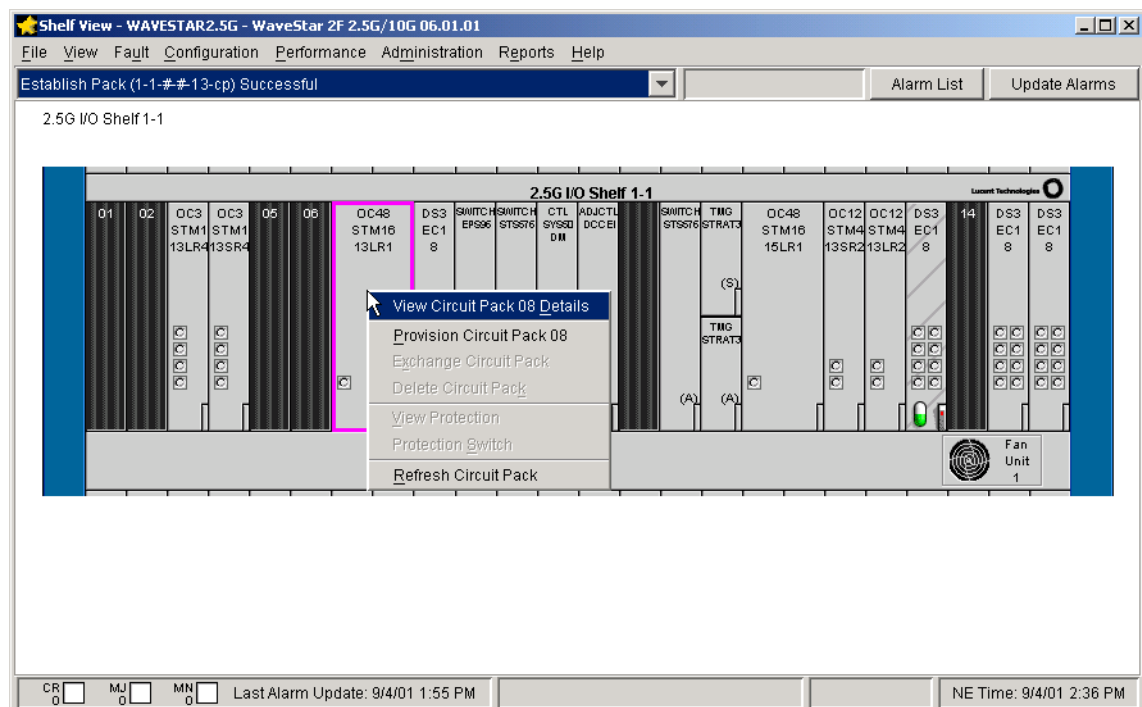
# Understand the Difference Between View of Circuit Pack Versus View of Ports

## Details view of a circuit pack versus details view of that circuit pack's port(s)

You should understand the difference between circuit pack details and a circuit pack's ports details.

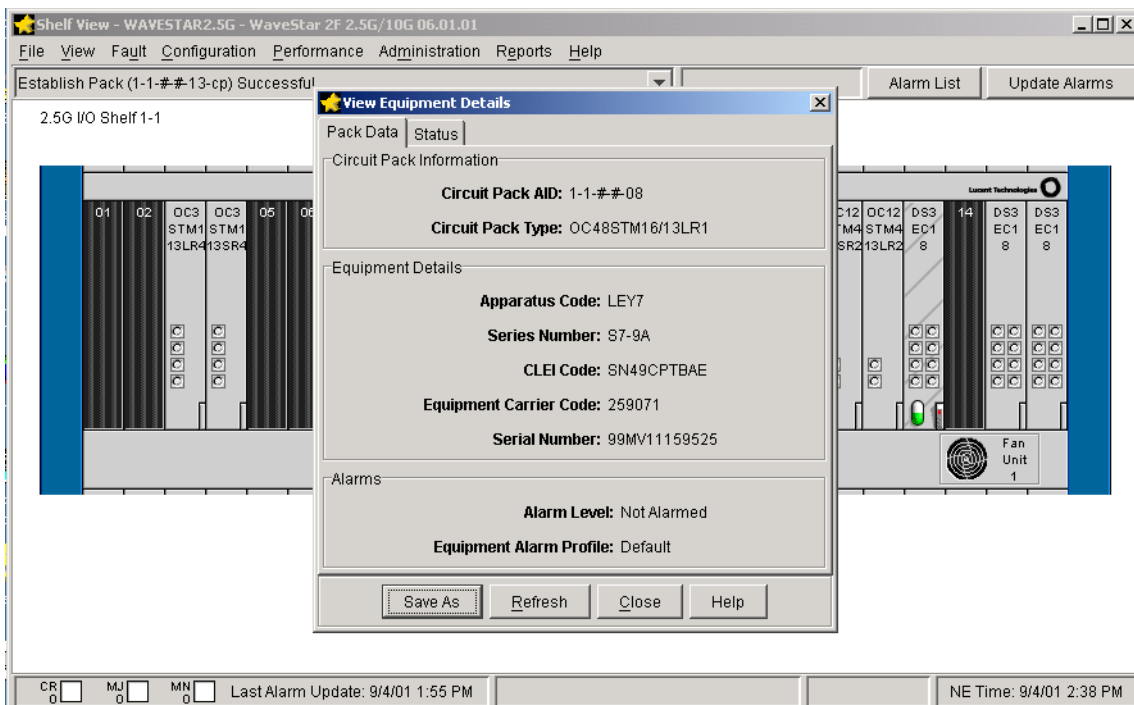
- 1 Place your cursor on one of the slots that already contains an OC48 circuit pack and right-click. Your screen should look similar to the following figure.

**Figure A-32 Screen to view circuit pack details**



- 
- 2 Click on the **View Circuit Pack 8 Details** option. Your screen should look similar to the following figure.

**Figure A-33 Details view of the OC48STM16/13LR1 circuit pack**

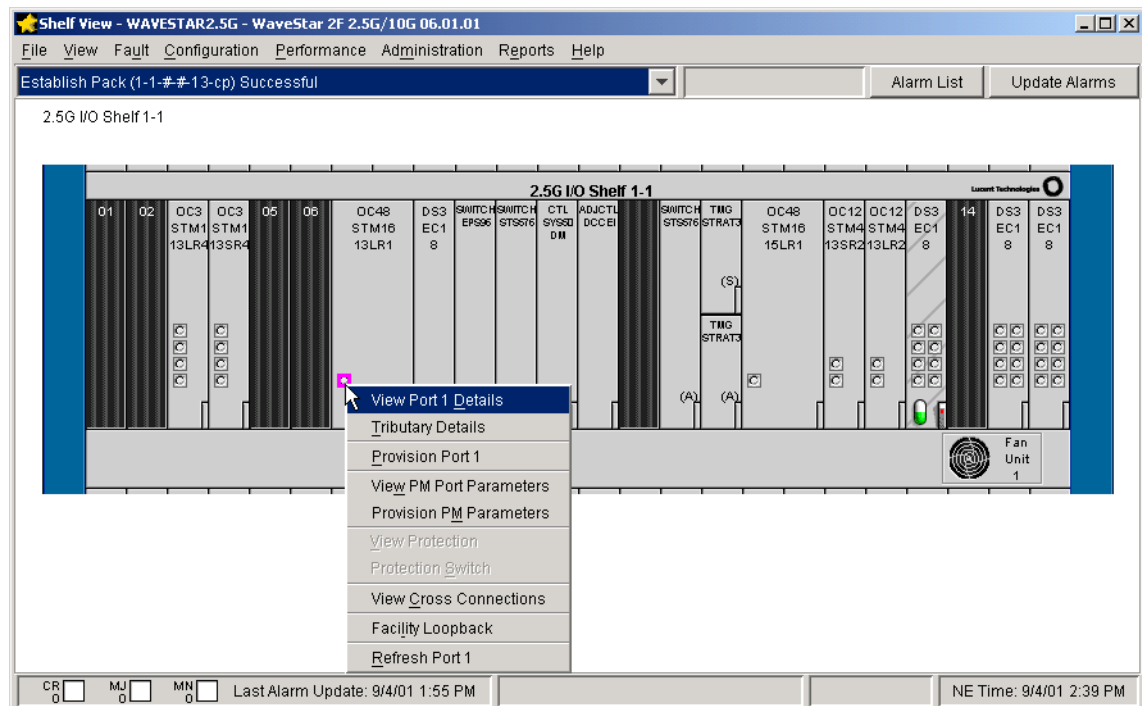


**Important!** The main things to observe in are (a) that the information is layered under two separate tabs, (b) that this information is strictly about the circuit pack and not about the port.

- 
- 3 Click on the **Close** button.

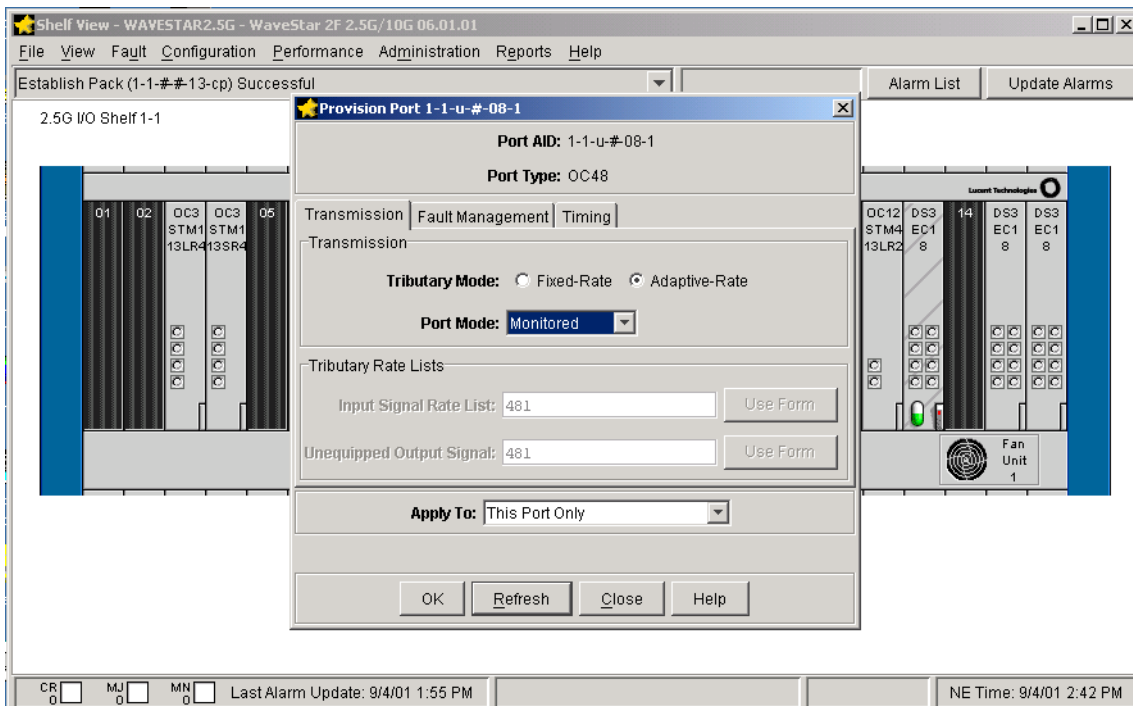
- 4 Place your cursor over the LED indicator for the OC48 circuit pack port and right-click. Your screen should look similar to the following figure.

**Figure A-34 Right-click menu for a circuit pack port**



- 
- 5 Select option **Provision Port 1**. Your screen should look similar to the following figure.

**Figure A-35 Provision Port screen for an optical port**

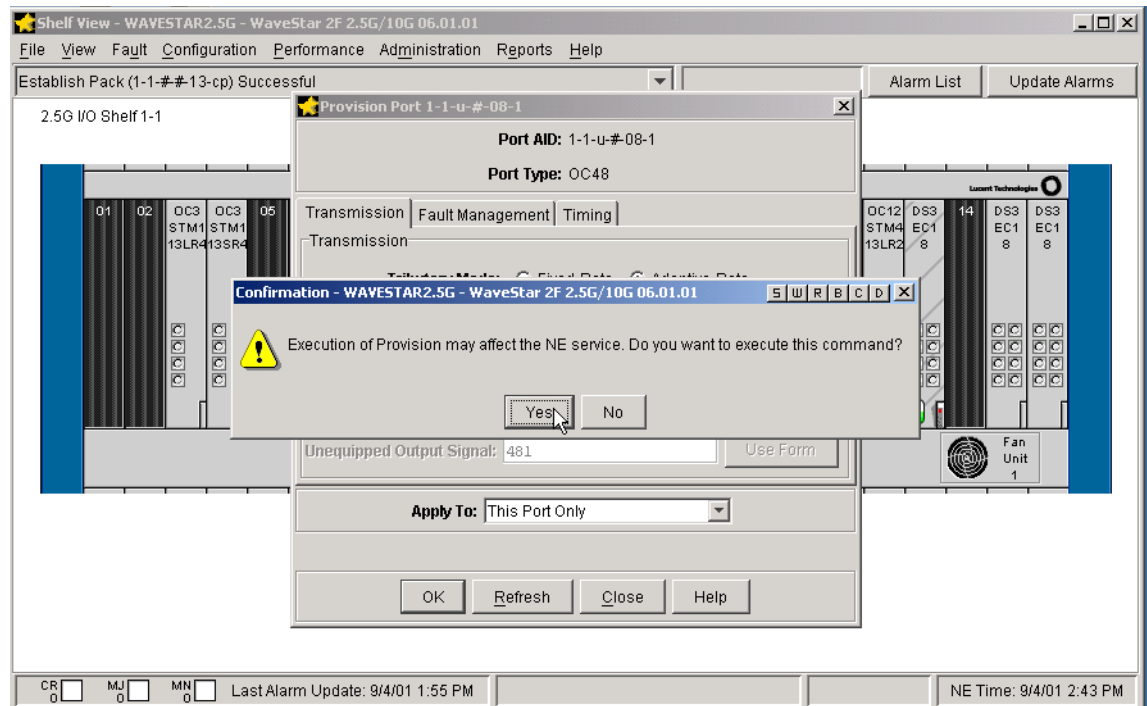


- 
- 6 Place your cursor on the drop-down arrow for the **Port Mode** field and click on option **Monitored**. Your screen should look similar to the following figure.

- 
- 7 Click **OK**.

**Result:** Your screen should now display the confirmation dialog box similar to the following figure.

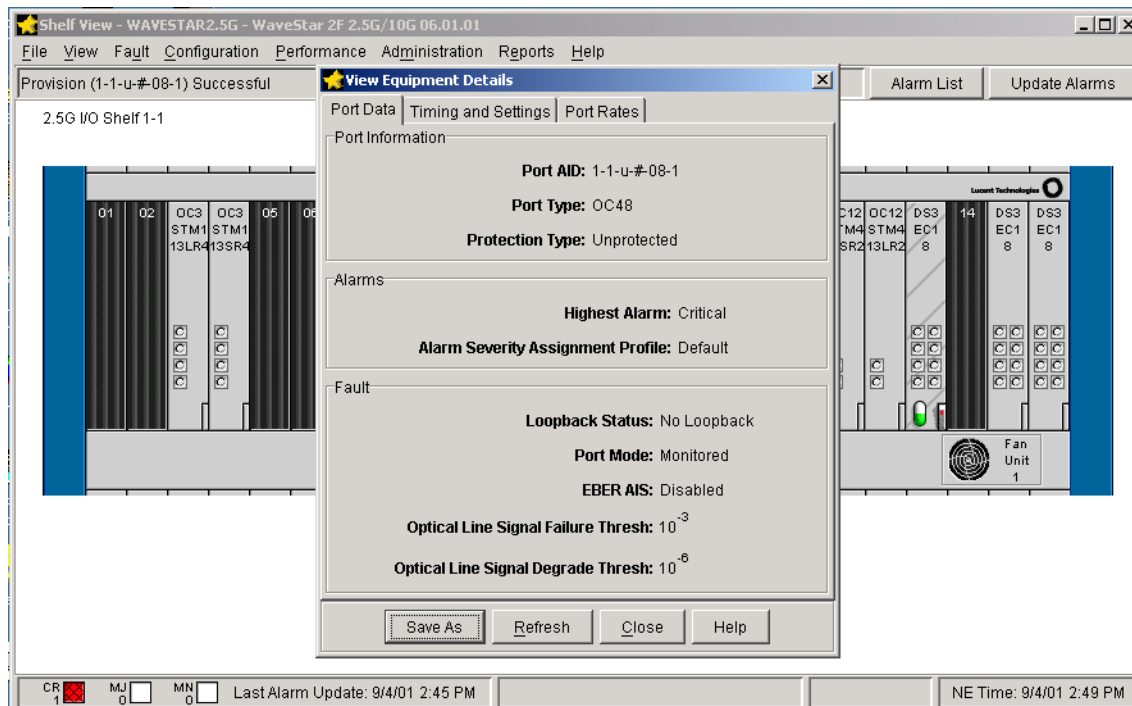
**Figure A-36 Verify and confirm screen**



- 8 Verify that all provisioned changes are appropriate and then click on the **Yes** button.
- 9 Again, place your cursor on the same OC48 circuit pack LED indicator and right-click.

- 
- 10 Select the option **View Port 1 Details**. Your screen should look similar to the following figure.

**Figure A-37 Details view of an optical port**



Observe that the provisioned parameter for the field **Port Mode** has been changed to indicate **Monitored**.

- 
- 11 Click on the **Close** button.

END OF STEPS

---

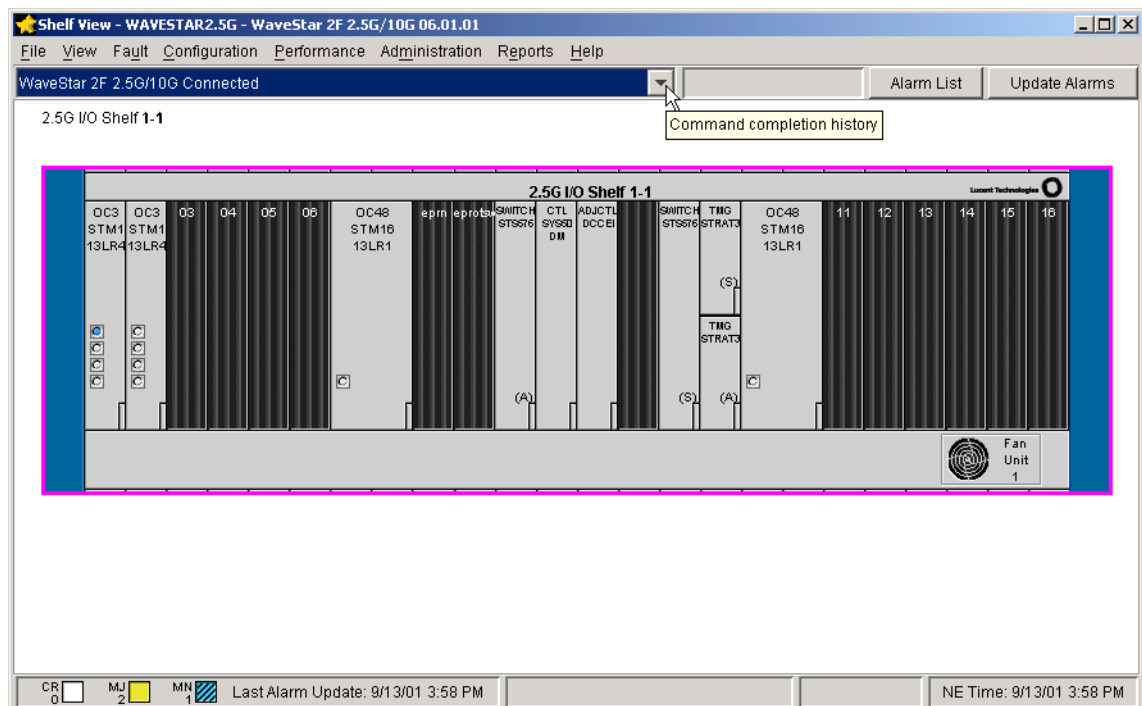
# Display the Command Completion History List

## Display the command completion history list

Follow the steps below to display the command completion history list.

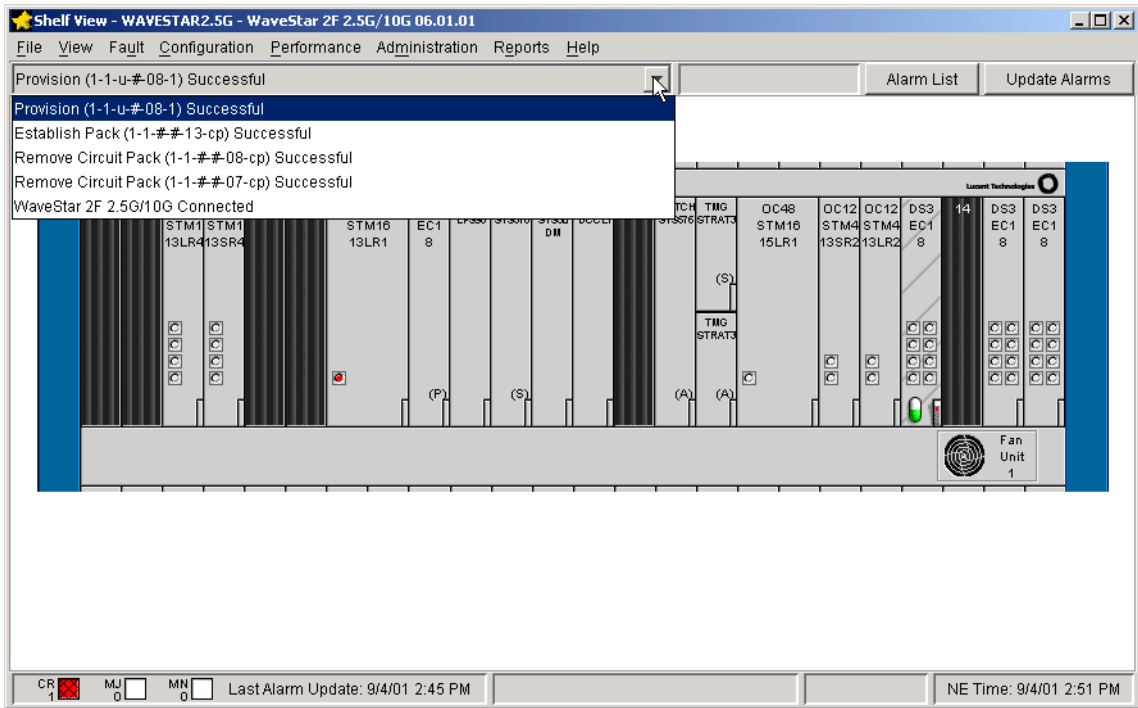
- 1 In the figure below and on your own screen, observe that the most recently executed command appears on a command line near the top of the System View screen.

**Figure A-38 Screen view to display the last NE command**



- 2 Click on the “drop-down” arrow to display a list of the last attempted commands, both those that were executed successfully and unsuccessfully. Your screen should look similar to the following figure.

**Figure A-39 Screen view to display the drop-down list of completed NE commands**



- 3 Click on this same drop-down arrow to collapse the command completion history list.

END OF STEPS



# Display the Alarms List and Update Alarms

---

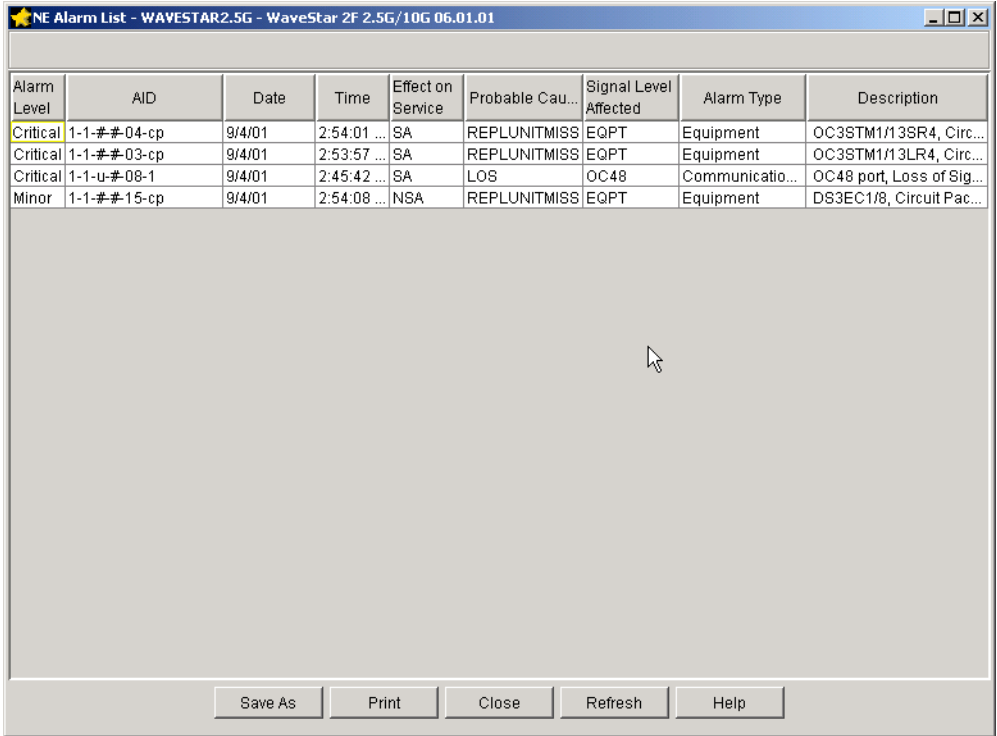
**Display the alarm list**    The Alarm List is accessible via a single click from the System View screen.

---

- 1 To the right of command completion history list is the **Alarm List** button. Click on this button to display a list of all currently active alarms.

**Result:** Your screen should look similar to the following figure, but your list of alarms will be different.

**Figure A-40 Screen view of the NE alarm list**



The screenshot shows a window titled "NE Alarm List - WAVESTAR2.5G - WaveStar 2F 2.5G/10G 06.01.01". It contains a table with the following data:

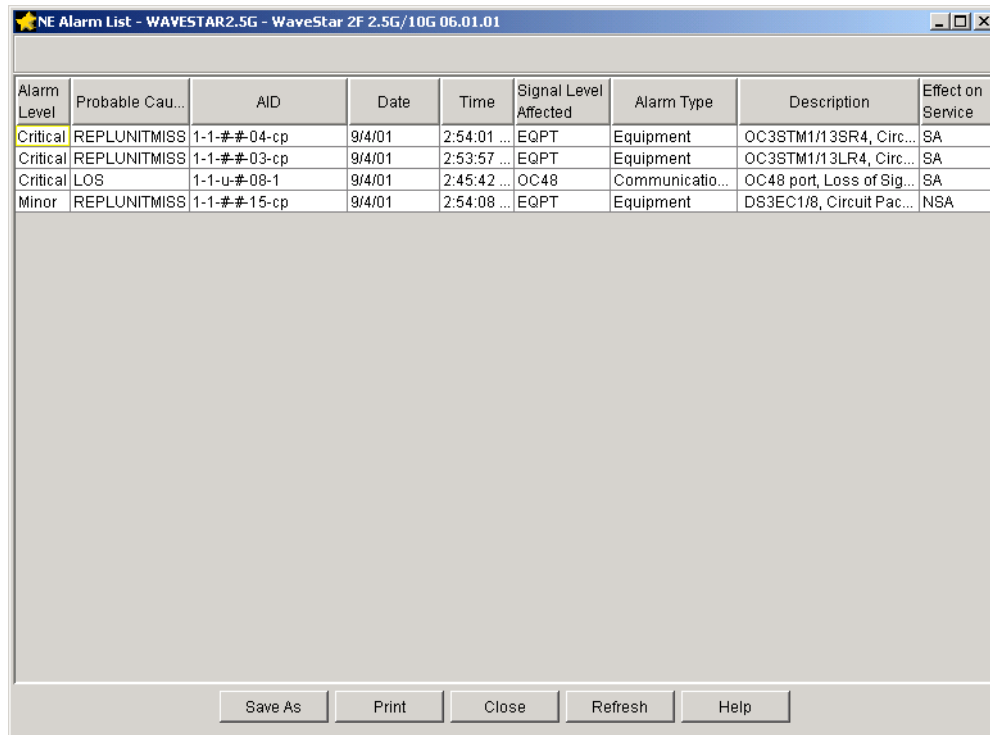
| Alarm Level | AID         | Date   | Time        | Effect on Service | Probable Cau... | Signal Level Affected | Alarm Type      | Description               |
|-------------|-------------|--------|-------------|-------------------|-----------------|-----------------------|-----------------|---------------------------|
| Critical    | 1-1-#-04-cp | 9/4/01 | 2:54:01 ... | SA                | REPLUNITMISS    | EQPT                  | Equipment       | OC3STM1/13SR4, Circ...    |
| Critical    | 1-1-#-03-cp | 9/4/01 | 2:53:57 ... | SA                | REPLUNITMISS    | EQPT                  | Equipment       | OC3STM1/13LR4, Circ...    |
| Critical    | 1-1-u-08-1  | 9/4/01 | 2:45:42 ... | SA                | LOS             | OC48                  | Communicatio... | OC48 port, Loss of Sig... |
| Minor       | 1-1-#-15-cp | 9/4/01 | 2:54:08 ... | NSA               | REPLUNITMISS    | EQPT                  | Equipment       | DS3EC1/8, Circuit Pac...  |

Below the table, there is a large empty area and a mouse cursor. At the bottom of the window, there are buttons for "Save As", "Print", "Close", "Refresh", and "Help".

The Alarm List column headings are selectable. This permits the data to be sorted (top-to-bottom) according to the selected column heading (that is, by alarm level, effect on service, and so forth). Also, the individual columns may be re-sized (expanded or contracted) and rearranged according to your preference.

- 
- 2 Arrange the column headers (click, hold, drag-and-drop) so that they appear in the same order as in the following figure.

**Figure A-41 Re-ordered alarm list**



| Alarm Level | Probable Cau... | AID          | Date   | Time        | Signal Level Affected | Alarm Type      | Description               | Effect on Service |
|-------------|-----------------|--------------|--------|-------------|-----------------------|-----------------|---------------------------|-------------------|
| Critical    | REPLUNITMISS    | 1-1-##-04-cp | 9/4/01 | 2:54:01 ... | EQPT                  | Equipment       | OC3STM1/13SR4, Circ...    | SA                |
| Critical    | REPLUNITMISS    | 1-1-##-03-cp | 9/4/01 | 2:53:57 ... | EQPT                  | Equipment       | OC3STM1/13LR4, Circ...    | SA                |
| Critical    | LOS             | 1-1-u-#-08-1 | 9/4/01 | 2:45:42 ... | OC48                  | Communicatio... | OC48 port, Loss of Sig... | SA                |
| Minor       | REPLUNITMISS    | 1-1-##-15-cp | 9/4/01 | 2:54:08 ... | EQPT                  | Equipment       | DS3EC1/8, Circuit Pac...  | NSA               |

Save As   Print   Close   Refresh   Help

**Important!** You can save the displayed alarm list to a file by clicking on the **Save** button and specifying the file name. Or, you can obtain a paper copy of the alarm list by clicking on the **Print** button.

- 
- 3 Click on the **Close** button or on the **Cancel** button (or the boxed “X” at top right corner of menu bar).

END OF STEPS

---

### **Update alarms now**

Whenever an activity has occurred that would result in clearing or generating an alarm, you may want to manually update the alarms. Otherwise, there may be a number of minutes before the alarm list is automatically updated.

---

- 1** Click on the **Update Alarms** button immediately to the right of the Alarm List.

END OF STEPS

---

# Test the LEDs

---

**Test LED(s) feature** You can, from the CIT, issue a command that will result in flashing all LEDs for all circuit packs within a particular shelf. One reason to do this is that you suspect that one of the LEDs on a circuit pack is defective. Another reason is that flashing the LEDs may help you locate a particular shelf.

---

- 1 Identify the AID of the circuit pack or shelf whose LEDs you wish to test.

**Important!** The current software implementation of this feature limits the AID selection to the shelf level. Thus, when you flash the LEDs you will be flashing the LEDs for *all* equipped circuit packs within the selected shelf.

---

- 2 On the System View screen menu bar, select **Fault > Test > LED**.
- 

- 3 In the Test LED window expand on the desired Bay [click on the  sign – which is located to the left of the desired bay]. For this exercise select **Bay 1**.
- 

- 4 Click to highlight the desired shelf. For this exercise select **Shelf 1**.
- 

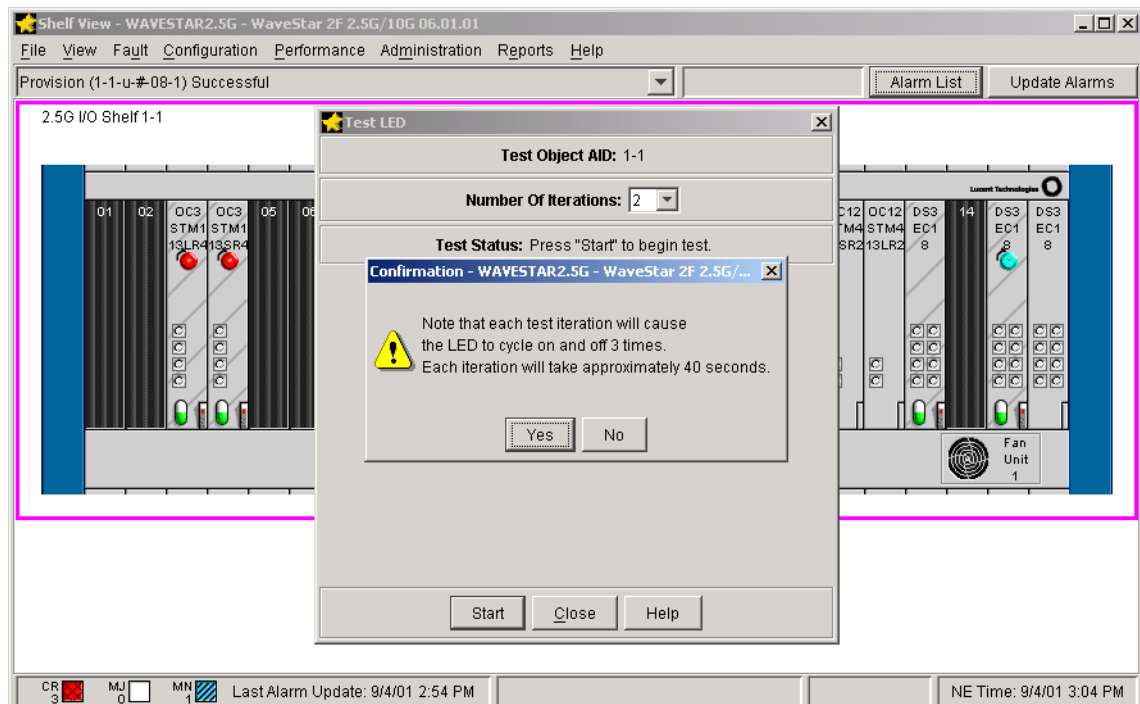
- 5 Click on the **Select** button.
- 

- 6 For the field **Number of Iterations** click on the drop-down arrow and select a number from 1-to-60. For this exercise, select the number 2.

**Important!** Each iteration will cycle the LEDs ON and OFF three times and will take approximately 40 seconds to complete. Thus, if the number of iterations is 2, then the test will take 80 seconds.

- 
- 7 Click on the **Start** button. Your screen should look similar to the following figure.

**Figure A-42 Test LED selection screen**



- 
- 8 Click on the **Yes** button.

END OF STEPS

---

## Delete a Circuit Pack

---

### Delete the DS3EC1/8 circuit pack that was added earlier

You should return the NE to its original equipment configuration by deleting all equipment that has been added during this tutorial. Follow the steps below to delete the DS3EC1/8 circuit pack via the Shelf View. This port unit is in Slot 13. Note that this can also be accomplished via the System View by selecting **Configuration > Delete**.

---

- 1 Display Bay 1, Shelf 1 by double-clicking on its graphical representation in the System View.

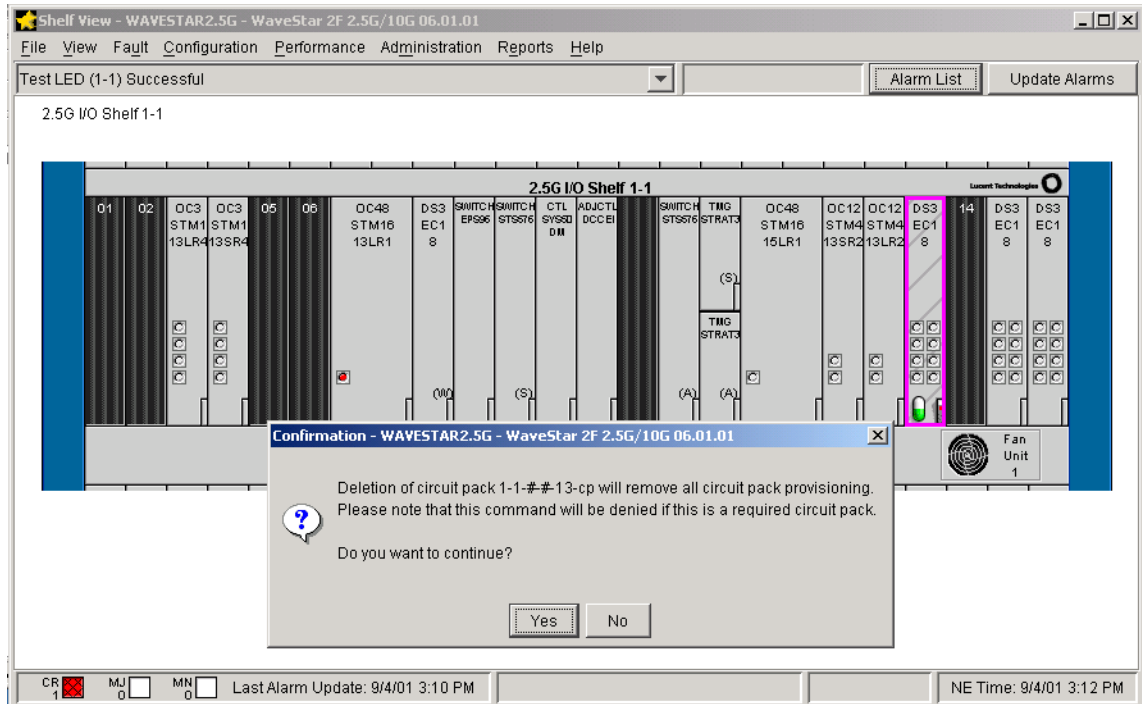
**Result:** The Shelf View for Bay 1, Shelf 1 appears.

---

- 2 From the Shelf View display:
  1. Right-click on **CP 13 (DS3EC1/8)**.
  2. Select **Delete Circuit Pack** from the menu that appears.

**Result:** A confirmation dialog box appears similar to the following figure.

**Figure A-43 Screen to Delete the Circuit Pack in Slot 13 of Shelf 1 and Bay 1**



- 3 Click **Yes** to confirm that you want to delete the circuit pack.

END OF STEPS

## Disconnect from the NE

---

**Disconnect from the NE** This concludes the series of activities for the “Graphical” System View. Disconnect now from this NE.

---

- 1** Go to the menu bar and click on **File > NE Disconnect**.

**Result:** A confirmation dialog box appears.

---

- 2** Click on **Yes** to confirm that you want to disconnect.

END OF STEPS

---





## Working with TL1 Commands

---

**Cut Through view** As an alternative to using the graphical user interface (GUI) based System View, the WaveStar TDM 2.5G/10G provides a Cut Through to TL1 capability. With Cut Through the user can execute TL1 commands on a one-at-a-time basis or in a series/script.

---

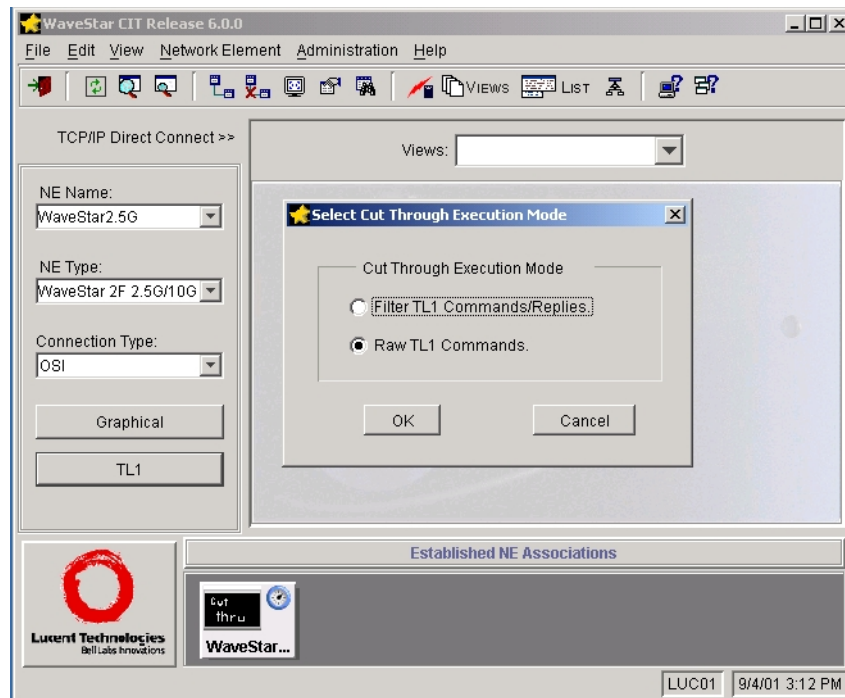


### CAUTION

*While in System View, users are alerted with a warning message to inform them that if they follow through with their command, it could impact service. As a contrast, Cut Through mode does not provide any warning message and thus the user does not get a second opportunity to consider the consequences of his/her command.*

- 1** From the WaveStar CIT View screen:
  1. Enter or select the TID of the NE with which you wish to establish a Cut Through session (in this example, the TID is WaveStar2.5G).
  2. Click the **Cut Through** option.
  3. Click on the **Connect** button. Your screen should now look like the following figure.

**Figure A-44 Screen for Selecting the Cut Through Execution Mode**



END OF STEPS

### Select Cut Through Execution Mode

As an option you may select either the: (a) Raw mode, or (b) Filtered mode to execute your TL1 commands.

- 1 Click on the **Filter TL1 Commands/Replies** option, then click on the **OK** button.

**Result:** The **Cut Through** screen appears (see the following figure).

END OF STEPS

### Filtered Mode

The Filtered Mode provides separation between the user's input commands and the NE's responses/outputs. Some pre-processing (for example, syntax parsing) is performed on the user's inputs.

## Raw Mode

The Raw Mode is somewhat equivalent to a “de-bug” mode. Exactly what the user enters in the form of a TL1 command is sent to the subject NE. Inputs and outputs are grouped together – there is no separation between a user’s commands and the NE’s responses.

## Interactive – execute TL1 commands one-at-a-time

Follow the steps below to execute TL1 commands one-at-a-time.

- 1 You can execute TL1 commands on an interactive (one-at-a-time) basis. Two methods are available:
  1. Click on the drop-down arrow, which is located at the end of the command line (see the first of the two following figures) to see a listing of the commands. Your screen should look similar to the following figure.
  - or
  2. If you know the exact TL1 command, enter the command on a blank command line (shown in the second of the two following figures).

**Figure A-45 Cut Through Screen Showing TL1 Command Drop-Down List**

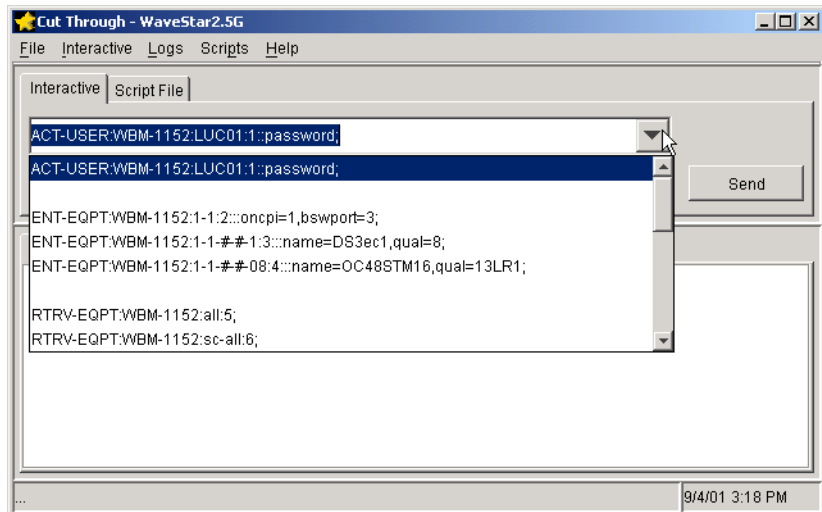
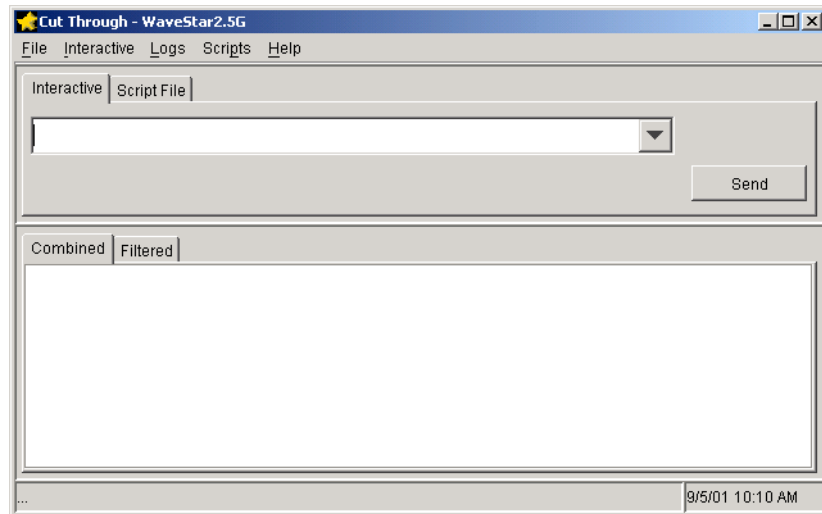


**Figure A-46 Cut Through Screen for Entering TL1 Commands on the Command Line**

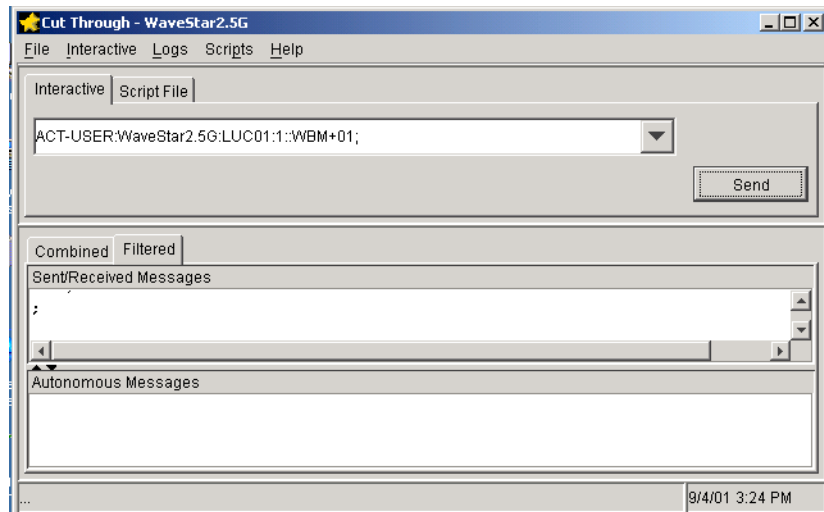


- 
- 2** Scroll down the list until you see the command that you want to send to the NE or a command that is similar and which can be easily changed from the command line.

For example, let us assume that you want to log in as LUC01 to the NE that has TID = WaveStar2.5G. This can be accomplished by selecting and modifying the very first TL1 command in the drop-down list

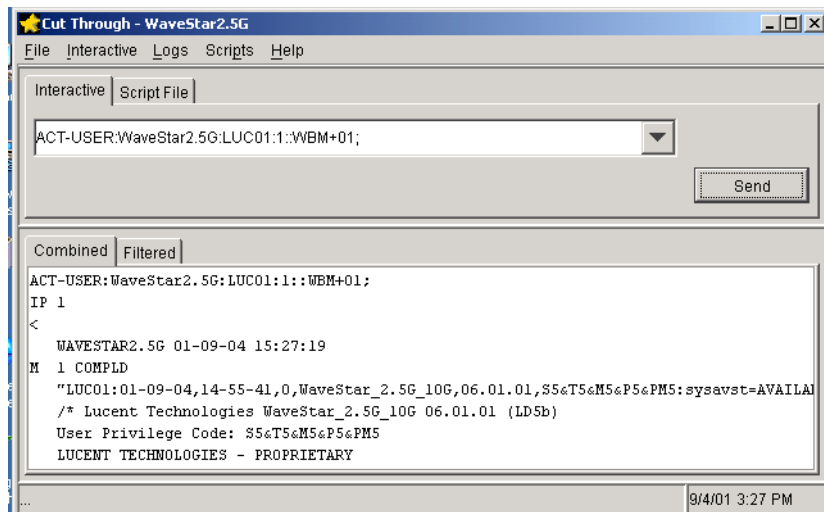
- 
- 3** Click on the first command to place it on the command line.
- 
- 4** Place the cursor into the command line and edit the command so that the TID, username, and password are correct. Your screen should look similar to the following figure.

**Figure A-47 Cut Through Screen for Interactive Command Mode**



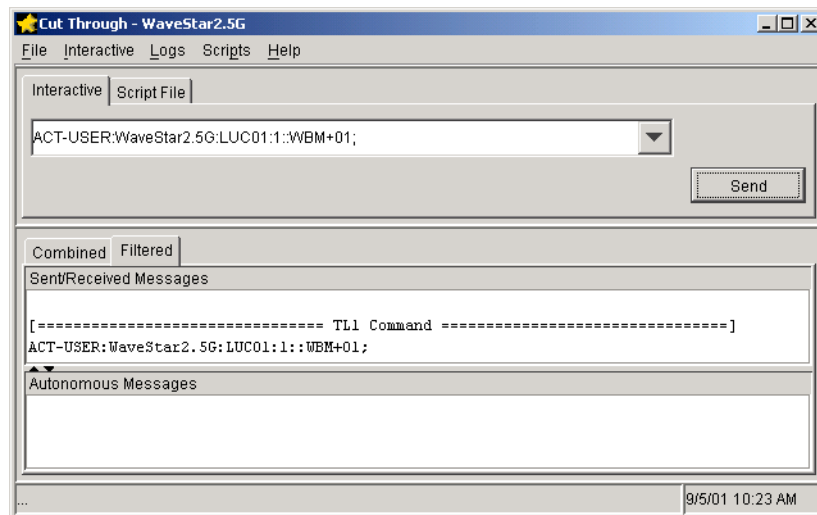
- 5 Click on the **Send** button. Your screen should look like the following figure.

**Figure A-48 Cut Through Screen with TL1 Login Command Response**



- 
- 6 As desired, the user may view the system response in a combined format, as in the previous figure, or a filtered format. Click on the tab labeled **Filtered**. Your screen should look similar to the following figure.

**Figure A-49 Cut Through Screen Showing the Filtered Response**



**Important!** The combined format displays commands, in the order that they are sent along, with the received responses. Because of delays, a command and its received response may be separated by other commands and responses from other commands. This is especially true when sending commands from a script file where the commands are sent in rapid succession. The filtered format separates autonomous messages from the sent commands and their received responses. A sent command will not be displayed until its corresponding response is received. Demarcation banners are added to help distinguish between sent/received messages.

---

END OF STEPS

---

## Interactive – manage a listbox file

The listbox file is a text file that contains the TL1 commands that you see when you click on the drop-down arrow to the right of the command line.

---

- 1** From the menu bar, select **Interactive**, then select each of the following options to try them out:

- 1. Select TL1 Listbox File**

Then select a text file from the listbox file directory. (The default directory for listbox files is C:\Program Files\Lucent Technologies\WaveStar CIT\bin\)

The text contained within the newly selected file will replace the previous text displayed in the interactive TL1 listbox.

- 2. Edit TL1 Listbox File**

The Wordpad application opens the file selected above, or defaults to the originally displayed TL1 listbox. The user may also manually overwrite the TL1-listbox.txt file outside of the CIT application so that it becomes the new default.

- 3. Add last TL1 command TL1 Listbox & File**

No NE operations are performed in this step.

The last command sent from the interactive command line will be added to the interactive TL1 listbox.

---

END OF STEPS

---

## Working with logs

A log is a text file that records all commands and responses from the time it is started until it is stopped.

---

- 1** From the menu bar, select **Logs > Start**, then you will be prompted to:
    - 1.** Select an existing directory and log file to start or enter a new filename to be created and started.
    - 2.** Select **Open** to start recording all TL1 commands and responses in a filtered format.
  - 2** Once TL1 logging is started, the next time that menu **Logs** is selected, the **Start** menu option will toggle to **Stop**. Select **Stop** to stop logging TL1 commands and close the log file.
-

- 
- 3 From the menu bar, select **Logs > View**, and enter the name of an existing log file that you wish to view.

The selected log file is displayed using Wordpad. You can view and/or print the log file.

---

- 4 From the menu bar, select **Logs > Time/Date Stamp** to toggle (on/off) the time and date stamp. The time and date stamp, when on, is listed at the beginning of the command head for both the filtered view and the log file.

---

END OF STEPS

---

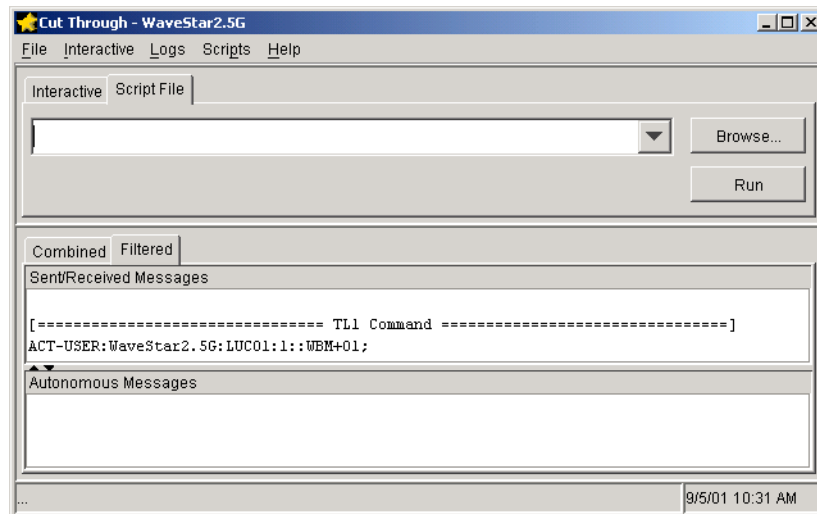
### Working with script files

A script file is a text file consisting of TL1 commands. The entire script of TL1 commands can then be run with one CIT command.

---

- 1 Select the **Script File** tab. Your screen should look similar to the following figure.

**Figure A-50 WaveStar Screen to Select and Run Script Files**





At this point you can select the **New**, **Edit**, **Run**, and **Stop** commands from the **Scripts** menu to use scripts, but keep in mind the following:

- A script file can contain any number lines of ASCII text.
- Any line not containing a valid command will be displayed in an Invalid TL1 message box.
- Lines beginning with forward-slash forward-slash // are ignored.
- A log file can be created (automatically) for each script file by inserting `#logfile=on` on any single line. This can be inserted/turned-on at anytime during the script file and can be turned on multiple times. Each time that a new `#logfile=on` command is executed, the previous logfile is closed. The generated log file will have a unique name consisting of the current time/date-stamp plus the name of the current script file.
- A log file can also change the interval at which a command is sent by having `#delayP00` on a single line where 5000, in this case, is 5 seconds. This delay may be increased or decreased as often as desired.
- A script file may be edited from the script menu, and a script may be stopped at any time by selecting **Stop** from the script menu.

When beginning to execute a script file, you are prompted once to select one of the following three execution modes: **Stop on deny from NE**, **Pause and Prompt each command**, and **Send all commands**.

---

**2** Having previously located and selected a script file, you can now execute that file with the **Run** button.

---

**3** Select **File > Exit**.

**Result:** You see the message: Are you sure you want to exit?

---

**4** Click on **Yes**.

---

**5** From the WaveStar CIT View screen, select **File > Exit**.

**Result:** You see the message: Are you sure you want to exit?

---

**6** Click on **Yes**.

---

**7** STOP! You have completed this tutorial.

---

END OF STEPS

---





# Appendix B: Technical Specifications

## Overview

---

**Purpose** This appendix provides the technical specifications for WaveStar TDM 2.5G/10G (2-Fiber). This data is necessary for planning the use of a WaveStar TDM 2.5G/10G (2-Fiber) in an existing or new network.

**References** For information about the following reliability specifications, refer to *WaveStar TDM 2.5G/10G Applications and Planning Guide*.

- Port unit unavailability
- System unavailability
- Circuit pack FIT rates
- Mean time between maintenance activities

**Contents** This appendix provides the following information:

|                              |        |
|------------------------------|--------|
| System Specifications        | B - 2  |
| Port Unit Specifications     | B - 3  |
| Power Specifications         | B - 10 |
| Equipment Dimensions         | B - 11 |
| Environmental Specifications | B - 15 |
| WaveStar CIT Requirements    | B - 17 |

# System Specifications

---

**Overview** This section provides specifications for the transmission medium, cabling, and access to WaveStar TDM 2.5G/10G (2-Fiber).

**Transmission fibers** WaveStar TDM 2.5G/10G (2-Fiber) uses the following transmission fibers:

- Standard single-mode non-dispersion shifted fiber
- TrueWave™ non-zero dispersion shifted fiber

**Connectorized cabling** All connections are by means of connectorized cabling, except the DS1 external timing reference, which comes equipped with a wire-wrapped termination. This termination consists of a DSub9 Connector converted to a 5-pin wire-wrapped post.

**Front access** Front access is provided for all circuit pack insertions and removals, all external connections and cabling to transmission interfaces, and the WaveStar® CIT port.

**Rear access** Rear access is provided for cabling to shelf inputs and outputs.



## Port Unit Specifications

---

**Introduction** The optical specifications provided in this section apply to the optical port units in WaveStar TDM 2.5G/10G (2-Fiber), (OC192/STM64, OC48/STM16, OC12/STM4, and OC3/STM1).

### Line rate

#### **OC192/STM64**

The optical line rate for the OC192/STM64 port units is 9.953 Gb/s.

#### **OC48/STM16**

The optical line rate for the OC48/STM16 port units is 2.488 Gb/s.

#### **OC12/STM4**

The optical line rate for the OC12/STM4 port units is 622.08 Mb/s.

#### **OC3/STM1**

The optical line rate for the OC3/STM1 port units is 155.52 Mb/s.

**Line code** The optical line code for the optical port units is scrambled nonreturn to zero (NRZ).

**Connector interfaces** LEY23/LEY23AE, LEY101/LEY101AE - LEY180/LEY180AE, and LEY201/LEY201AE - LEY240/LEY240AE use LC-type lightguide build-out (LBO) connectors optical attenuation. All other optical port units may be equipped with either ST-type, FC-type, or SC-type LBOs for optical attenuation.

**Lightguide jumpers** Single-mode lightguide jumpers are used on all optical interfaces in WaveStar TDM 2.5G/10G (2-Fiber).

## Optical source

### **OC192/STM64**

The optical source for the OC192/STM64/1.5SR1, OC192/STM64/1.5LR1, and OC192/STM/IRS1 port units is the Electro-absorptive Modulated Laser (EML).

The optical source for the OC192/STM64/1.5IR1, OC192/STM64/POU, and the OC192/STM64/WDM port units is a Continuous Wave Laser with a Mach Zender Modulator (MZM).

The optical source for the OC192/STM64/1.5VLR1 port units is an EML if OC192/STM/IRS1 is used or MZM if the OC192/STM64/IR1 is used.

### **OC48/STM16**

The optical source for the OC48/STM16/1.3VSR1, OC48/STM16/1.3LR1, OC48/STM16/1.5LR1, OC48/STM16/1.3LR1 (Transponder Module), and OC48/STM16/1.5LR1 (Transponder Module) port units is a distributed feedback (DFB) laser.

The optical source for the and OC48/STM16/DWDM01-16, OC48/STM16/WDM, OC48/STM16/POU port units is an Electro-absorptive Modulated Laser (EML).

### **OC12/STM4/1.3SR2**

The optical source for the OC12/STM4/1.3SR2 port units is a DFB laser.

### **OC12/STM4/1.3LR2**

The optical source for the OC12/STM4/1.3LR2 port units is a DFB laser.

### **OC3/STM1/1.3SR4**

The optical source for the OC3/STM1/1.3SR4 port units can be either a DFB laser or a Fabre-Perot laser.

### **OC3/STM1/1.3LR4 and OC3/STM1/1.3IR-SR8**

The optical source for the OC3/STM1/1.3LR4 and the OC3/STM1/1.3IR-SR8 port units is a DFB laser.

**GE1**

The optical source for GE1/SX2 port unit is a Vertical Cavity Surface Emitting Laser (VSCEL).

The optical source for the GE1/LX2 port unit is a Fabry-Perot (FP) laser.

**Capacity****OC192/STM64**

Each OC192/STM64 port unit supports either one OC-192 or one STM-64 (user-provisionable) bidirectional (one receive and one transmit) line.

**OC48/STM16**

Each OC48/STM16 port unit supports either one OC-48 or one STM-16 (user-provisionable) bidirectional (one receive and one transmit) line.

**OC12/STM4**

Each OC12/STM4 port unit supports either two OC-12 or two STM-4 (user-provisionable) bidirectional (one receive and one transmit) lines.

**OC3/STM1**

OC3/STM1 port units have either four or eight OC-3 or STM-1 ports, depending on the specific port unit selected. Therefore, either four or eight OC-3 or STM-1 (user-provisionable) bidirectional (one receive and one transmit) lines are supported.

**GE1**

Each GE1 port unit supports two Gigabit Ethernet bidirectional (one receive and one transmit) lines. The capacity per line is user provisionable (maximum of 21 STS1s).

- Optical detector** The optical detector for the OC192/STM64/1.5LR1 and the OC192/STM64/1.5VLR1 is a Pin Diode.
- The optical detector for all other optical port units is an avalanche photodiode (APD).
- The optical detector for the GE1 port units is a Silicon PIN photodiode.
- Optical safety** Optical safety data on laser-containing port units
- Class IIIB in the FDA/CDRH Classification System (applies to the 1.3 micron units)
  - Class I in the FDA/CDRH Classification System (applies to the 1.5 micron units and GE1 units)
- Protection** This section lists the protection schemes available for each optical port.
- OC192**
- The protection mode for the OC192 ports in WaveStar TDM 2.5G/10G (2-Fiber) may be provisioned as
- 2-Fiber BLSR
    - Span capacity is 96 STS-1 equivalent working tributaries and 96 STS-1 equivalent protection tributaries.
    - Add/drop capacity at each node is up to 192 STS-1 equivalents of working traffic (west and east) plus 192 STS-1 equivalents of preemptible protection access traffic (west and east).
    - Non-preemptible Unprotected Traffic (NUT) can be provisioned for STS-1 timeslots around a 2-Fiber BLSR to exclude individual working tributaries and their corresponding protection tributaries from BLSR protection switching.
  - UPSR (STS-1 path)
    - Ring capacity is 192 STS-1 equivalent tributaries
    - Add/drop capacity at each node is up to 192 STS-1 equivalents of working traffic
  - 0x1 (unprotected) ports



**OC48**

The protection mode for the OC48 ports in WaveStar TDM 2.5G/10G (2-Fiber) may be provisioned as

- 2-Fiber BLSR
  - Span capacity is 24 STS-1 equivalent working tributaries and 24 STS-1 equivalent protection tributaries.
  - Add/drop capacity at each node is up to 48 STS-1 equivalents of working traffic (west and east) plus 48 STS-1 equivalents of preemptible protection access traffic (west and east).
- UPSR (STS-1 path)
  - Ring capacity is 48 STS-1 equivalent tributaries
  - Add/drop capacity at each node is up to 48 STS-1 equivalents of working traffic
- 1+1 line protection (unidirectional non-revertive, bidirectional non-revertive, or bidirectional revertive)
- 0x1 (unprotected) ports

**OC12**

The protection mode for the OC12/STM4 ports in WaveStar TDM 2.5G/10G (2-Fiber) may be provisioned as

- UPSR (STS-1 path)
  - Ring capacity is 12 STS-1 equivalent tributaries
  - Add/drop capacity at each node is up to 12 STS-1 equivalents of working traffic
- 1+1 line protection (unidirectional non-revertive, bidirectional non-revertive, or bidirectional revertive)
- 0x1 (unprotected) ports

**OC3**

The protection mode for the OC3 ports in WaveStar TDM 2.5G/10G (2-Fiber) may be provisioned as

- 1+1 line protection (unidirectional non-revertive, bidirectional non-revertive, or bidirectional revertive)
- 0x1 (unprotected) ports

**GE1**

The protection mode for the GE1 ports in WaveStar TDM 2.5G/10G (2-Fiber) is 0x1.

**Dispersion** WaveStar TDM 2.5G/10G (2-Fiber) can accommodate the following types of dispersion:

**Chromatic dispersion**

See Table B-1 for port unit chromatic dispersion information.

**Group delay dispersion for PMD**

The receiver can accommodate up to 75 ps/nm of group delay dispersion due to polarization mode dispersion (PMD) with an optical path penalty of no more than 2 dB when measured at 1x10<sup>-10</sup> BER.

**Table B-1 Optical Port Unit Dispersion**

| Port Unit                                                                                            | Standard Apparatus Code | NEBS Level 3 Apparatus Code             | Dispersion                       |
|------------------------------------------------------------------------------------------------------|-------------------------|-----------------------------------------|----------------------------------|
| OC192/STM64/1.5SR1 (This port unit has been discontinued.)                                           | LEY67                   | LEY67AE                                 | 800 ps/nm                        |
| OC192/STM64/1.5IR1                                                                                   | LEY69                   | LEY69AE                                 | 1200 ps/nm                       |
| OC192/STM64/1.5IRs1                                                                                  | LEY97                   | LEY97AE                                 | 800 ps/nm                        |
| OC192/STM64/1.5LR1 (LEY69AE plus SEN3AE)                                                             |                         | SEN3AE (OBA) plus LEY69AE               | 1600 ps/nm (SEN3AE plus LEY69AE) |
| OC192/STM64/1.5VLR1 (LEY228AE + SEN4AE + DCM-40 as pre-compensation and DCM-50 as post compensation) |                         | SEN4AE (OBPA) plus LEY228AE or LEY295AE | 2400 ps/nm                       |
| OC192/STM64/1.5VLR1 [LEY228AE + SEN4AE (without DCMs)]                                               |                         | SEN4AE (OBPA) plus LEY228AE or LEY295AE | 1200 ps/nm                       |
| OC192/STM64/WDM (all)                                                                                | LEY201-240              | LEY201AE-240AE                          | See Note 2 below                 |
| OC192/STM64/POU (all)                                                                                | LEY284-299              | LEY284AE-299AE and LEY384AE-399AE       | 1200 ps/nm                       |
| OC48/STM16/1.3VSR1                                                                                   | LEY182                  | LEY182AE                                | 300 ps/nm                        |
| OC48/STM16/1.3LR1                                                                                    | LEY7                    | LEY7AE                                  | 200 ps/nm                        |
| OC48/STM16/1.5LR1                                                                                    | LEY8                    | LEY8AE                                  | 1800 ps/nm                       |
| OC48/STM16/DWDM01-16                                                                                 | LEY50-65                | LEY50AE-65AE                            | See Note 1 below                 |

| Port Unit                                             | Standard Apparatus Code | NEBS Level 3 Apparatus Code | Dispersion       |
|-------------------------------------------------------|-------------------------|-----------------------------|------------------|
| OC48/STM16/WDM (all)                                  | LEY101-180              | LEY101AE-180AE              | See Note 2 below |
| OC48/STM16/POU (all)                                  | LEY80-95                | LEY80-95AE                  | 1800 ps/nm       |
| OC12/STM4/1.3SR2                                      | LEY13                   | LEY13AE                     | 200 ps/nm        |
| OC12/STM4/1.3LR2                                      | LEY14                   | LEY14AE                     | 200 ps/nm        |
| OC3/STM1/1.3SR4                                       | LEY16                   | LEY16AE                     | 300 ps/nm        |
| OC3/STM1/1.3IR/SR8                                    | LEY23                   | LEY23AE                     | 300 ps/nm        |
| OC3/STM1/1.3LR4                                       | LEY15                   | LEY15AE                     | 300 ps/nm        |
| Gigabit Ethernet Interface port unit (GE1/SX2 2 port) | LEY309                  | LEY309AE                    | See Note 3 below |
| Gigabit Ethernet Interface port unit (GE1/LX2 2 port) |                         | LEY310AE                    | See Note 3 below |

## Notes:

1. The optical dispersion for the OC192 port units is compatible with Metropolis EON. For additional information, refer to the *Metropolis EON Applications and Planning Guide*.
2. The optical dispersion for OC192/STM64/WDM and OC48/STM16/WDM port units is compatible with the WaveStar OLS 1.6T. For additional information, refer to the *WaveStar Optical Line System (OLS) 1.6T Applications Planning Guide* and the *WaveStar Optical Line System (OLS) 1.6T Applications Ordering Guide*.
3. The fiber optic cable requirements for Gigabit Ethernet are described in IEEE 802.z, section 38.11.1.



## Power Specifications

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**Overview** This section provides specifications about the power supply, heat dissipation, and current drain in WaveStar TDM 2.5G/10G (2-Fiber).

**Power supply** The table below lists WaveStar TDM 2.5G/10G (2-Fiber) power requirements.

**Table B-2 Power Supply Requirements**

| Item                             | Description                                             |
|----------------------------------|---------------------------------------------------------|
| Voltage range, all components    | –40.0V to –72V                                          |
| Power Feeders                    | two –48V power feeders<br>[BREAKER (A) and BREAKER (B)] |
| Circuit Breakers (two per shelf) | 25.0A                                                   |

**Power planning** The heat dissipation of a WaveStar TDM 2.5G/10G (2-Fiber) bay is approximately 1600 watts.

**Current drain** The table below provides the **maximum** current drain requirements for a WaveStar TDM 2.5G/10G (2-Fiber) shelf. For a bay that will contain three WaveStar TDM 2.5G/10G (2-Fiber) shelves, the power feeders should provide at least 70A for the bay.

**Table B-3 WaveStar TDM 2.5G/10G (2-Fiber) Current Drains**

| Shelf                                                               | Current Drains per Feeder in Amperes |           |          |
|---------------------------------------------------------------------|--------------------------------------|-----------|----------|
|                                                                     | List 1                               | List 2    |          |
|                                                                     | @ –48V                               | @ –42.75V | @ –39.5V |
| High-speed shelf (10G)                                              | 10.7                                 | 11.3      | 11.6     |
| Low-speed shelf (2.5G application)                                  | 11.3                                 | 12.9      | 14.0     |
| 10G 2-Fiber Bay (bay with one high-speed and two low-speed shelves) | 33.3                                 | 37.1      | 39.6     |



# Equipment Dimensions

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**Overview** This section provides the height, width, and depth of major WaveStar TDM 2.5G/10G (2-Fiber) components.

**Circuit Pack Dimensions** The table below lists the dimensions for all the circuit packs in WaveStar TDM 2.5G/10G (2-Fiber).

**Table B-4 Circuit Pack Dimensions**

| Circuit Pack                        | Dimensions (mm/inches) |         |          | 2.5 G Application | 10G System |
|-------------------------------------|------------------------|---------|----------|-------------------|------------|
|                                     | Height                 | Width   | Depth    |                   |            |
| PPROC/STS192                        | 336/13.1               | 25/.98  | 270/10.6 |                   | X          |
| PPROC/STS384                        | 336/13.1               | 25/.98  | 270/10.6 |                   | X          |
| PPROC/FO (2.5G Shelf)               | 336/13.1               | 25/.98  | 270/10.6 | X                 |            |
| CTL/SYS50DM                         | 336/13.1               | 32/1.25 | 270/10.6 | X                 | X          |
| ADJCTL/DCCEI                        | 336/13.1               | 20/.79  | 270/10.6 | X                 | X          |
| TMG/STRAT3                          | 168/6.6                | 25/.98  | 270/10.6 | X                 | X          |
| SWITCH/STS576                       | 336/13.1               | 30/1.2  | 270/10.6 | X                 | X          |
| SWITCH/STS768                       | 336/13.1               | 30/1.2  | 270/10.6 |                   | X          |
| SWITCH/DS3EC1                       | 336/13.1               | 20/.79  | 270/10.6 | X                 | X          |
| DS3EC1/8                            | 336/13.1               | 30/1.2  | 270/10.6 | X                 | X          |
| OC192/STM64/1.5SR1                  | 336/13.1               | 60/2.4  | 270/10.6 |                   | X          |
| OC192/STM64/1.5IR1                  | 336/13.1               | 60/2.4  | 270/10.6 |                   | X          |
| OC192/STM64/1.5IRS1                 | 336/13.1               | 60/2.4  | 270/10.6 |                   | X          |
| OC192/STM64/1.5LR1                  | See Note below         |         |          |                   | X          |
| OC192/STM64/1.5VLR1                 | See Note below         |         |          |                   | X          |
| Optical Booster Amplifier (OBA)     | 336/13.1               | 41/1.6  | 270/10.6 |                   | X          |
| Optical Booster Pre-Amplifier (OBA) | 336/13.1               | 41/1.6  | 270/10.6 |                   | X          |
| OC192/STM64/POU                     | 336/13.1               | 60/2.4  | 270/10.6 |                   | X          |
| OC192/STM64/WDM                     | 336/13.1               | 60/2.4  | 270/10.6 |                   | X          |

| Circuit Pack                                          | Dimensions (mm/inches) |        |          | 2.5 G Application | 10G System |
|-------------------------------------------------------|------------------------|--------|----------|-------------------|------------|
|                                                       | Height                 | Width  | Depth    |                   |            |
| OC48/STM16/1.3VSR1                                    | 336/13.1               | 38/1.5 | 270/10.6 | X                 | X          |
| OC48/STM16/1.3LR1                                     | 336/13.1               | 38/1.5 | 270/10.6 | X                 | X          |
| OC48/STM16/1.5LR1                                     | 336/13.1               | 38/1.5 | 270/10.6 | X                 | X          |
| OC48/STM16/DWDM                                       | 336/13.1               | 38/1.5 | 270/10.6 | X                 | X          |
| OC48/STM16/POU                                        | 336/13.1               | 38/1.5 | 270/10.6 | X                 | X          |
| OC48/STM16/WDM                                        | 336/13.1               | 38/1.5 | 270/10.6 | X                 | X          |
| OC12/STM4/1.3LR2                                      | 336/13.1               | 20/.79 | 270/10.6 | X                 | X          |
| OC12/STM4/1.3SR2                                      | 336/13.1               | 20/.79 | 270/10.6 | X                 | X          |
| OC3/STM1/1.3LR4                                       | 336/13.1               | 20/.79 | 270/10.6 | X                 | X          |
| OC3/STM1/1.3IR/SR8                                    | 336/13.1               | 20/.79 | 270/10.6 | X                 | X          |
| OC3/STM1/1.3SR4                                       | 336/13.1               | 20/.79 | 270/10.6 | X                 | X          |
| Gigabit Ethernet Interface port unit (GE1/SX2 2 port) | 336/13.1               | 40/1.6 | 270/10.6 | X                 | X          |
| Gigabit Ethernet Interface port unit (GE1/LX2 2 port) | 336/13.1               | 40/1.6 | 270/10.6 | X                 | X          |

## Notes:

- The OC192/STM64/1.5LR1 port unit is a combination of the SEN3AE (OBA) and the LEY69/LEY69AE (or one of various other OC192/STM64 port units). The SEN3AE should not be used with the LEY67/LEY67AE OC192/STM64 port unit. The SEN3AE can be used with the LEY97/LEY97AE, but it will not meet standard dispersion requirements for an OC-192 long reach interface.
- The OC192/STM64/1.5VLR1 port unit is a combination of the SEN4AE (OBPA) and the LEY228/LEY228AE (or LEY295/LEY295AE) OC192/STM64 port unit.
- The automatic laser shutdown (ALS) feature is only supported by the LEY69AE, LEY97AE, and LEY228AE OC192/STM64 port units.

**Shelf Dimensions**

The table below lists the dimensions of a WaveStar TDM 2.5G/10G (2-Fiber) shelf. These dimensions do not include the heat baffles (see Table B-9 “Cooling Equipment Dimensions” and, *WaveStar TDM 2.5G/10G Applications and Planning Guide*).

**Table B-5 Shelf Dimensions**

|                                                                              | Dimensions (mm/inches) |          |           |
|------------------------------------------------------------------------------|------------------------|----------|-----------|
|                                                                              | Height                 | Width    | Depth     |
| Shelf only                                                                   | 575/22.6               | 543/21.4 | 400/15.7  |
| With one DS3 externally attached connector panel (for tributary shelf only)  | 575/22.6               | 649/25.6 | 400/15.7  |
| With two DS3 externally attached connector panels (for tributary shelf only) | 575/22.6               | 755/29.7 | 400/15.7  |
| With one DS3 internally attached connector panel (for tributary shelf only)  | 690/27.2               | 543/21.4 | 400/15.7  |
| With two DS3 internally attached connector panels (for tributary shelf only) | 805/31.7               | 543/21.4 | 400/15.7  |
| With one or two rear mounted DS3 panel                                       | 575/22.6               | 543/21.4 | 570/19.15 |

**DS3 connector panel dimensions**

The table below lists the dimensions of an externally attached DS3 connector panel.

**Table B-6 External Connector Panel Dimensions**

| Dimensions (mm/inches) |         |          |
|------------------------|---------|----------|
| Height                 | Width   | Depth    |
| 546.1/21.5             | 101.6/4 | 57.2/2.3 |

The table below lists the dimensions of an internally attached DS3 connector panel.

**Table B-7 Internal Connector Panel Dimensions**

| Dimensions (mm/inches) |          |            |
|------------------------|----------|------------|
| Height                 | Width    | Depth      |
| 115/4.5                | 543/21.4 | 347.5/13.7 |

The table below lists the dimensions of an rear mounted DS3 connector panel.

**Table B-8 Rear Mounted Connector Panel Dimensions**

| Dimensions (mm/inches) |         |          |
|------------------------|---------|----------|
| Height                 | Width   | Depth    |
| 546.1/21.5             | 101.6/4 | 57.2/2.3 |

**Cooling equipment**

The table below lists the dimensions of the cooling equipment.

**Table B-9 Cooling Equipment Dimensions**

| Equipment   | Dimensions (mm/inches) |          |          |
|-------------|------------------------|----------|----------|
|             | Height                 | Width    | Depth    |
| Fan Unit    | 48/1.9                 | 543/21.4 | 380/14.9 |
| Fan Filter  | 13.5/.5                | 543/21.4 | 380/14.9 |
| Heat Baffle | 70/2.75                | 543/21.4 | 380/14.9 |





# Environmental Specifications

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**Overview** This section provides the specific environmental conditions that WaveStar TDM 2.5G/10G (2-Fiber) is designed to withstand without detrimentally affecting operation.

**Conditions** WaveStar TDM 2.5G/10G (2-Fiber) is designed to operate in a controlled environment that complies with the environmental requirements listed in the following table.

**Table B-10 Temperature and Humidity Requirements**

| Operating Condition                | Normal                                  |                | Short-term <sup>(a)</sup> |                |
|------------------------------------|-----------------------------------------|----------------|---------------------------|----------------|
|                                    | Celsius (C)                             | Fahrenheit (F) | Celsius (C)               | Fahrenheit (F) |
| Ambient temperature <sup>(b)</sup> | 5° to 40°                               | 41° to 104°    | –5° to 50°                | 23° to 122°    |
| Maximum temperature rate of change | 30°/hour                                | 54°/hour       | 30°/hour                  | 54°/hour       |
| Ambient relative humidity          | 5% to 85%                               |                | 5% to 90% <sup>(c)</sup>  |                |
| Altitude                           | (–61m to 1982m)<br>(–200 ft to 6500 ft) |                | NA                        |                |

## Notes

**(a)** Short-term refers to a period of time  $\leq 90$  consecutive hours and a total of  $\leq 15$  days in one year. The time may total 360 hours in any given year, but may not exceed 15 individual occurrences during that one year.

**(b)** Ambient refers to conditions at the specific location of 1.5 m (59 in) above the floor and 400 mm (15.8 in) in front of the equipment.

**(c)** Not to exceed 0.024 kg of water per kg of dry air.

**Storage and transportation conditions**

WaveStar TDM 2.5G/10G (2-Fiber) is designed to be fully operational after being subjected to the environmental conditions listed in the table below during storage and transportation.

**Table B-11 Storage and Transportation Requirements**

| Condition                          | Range                                  |
|------------------------------------|----------------------------------------|
| Temperature                        | –40°C to 70°C (–40°F to 158°F)         |
| Maximum temperature rate of change | 30°C/hour (54°F/hour)                  |
| Relative humidity                  | 5% to 95%                              |
| Maximum absolute humidity          | 0.024 kg of water/ kg of dry air       |
| Altitude                           | –61m to 12,195m (–200 ft to 40,000 ft) |



## WaveStar CIT Requirements

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**Overview** This section provides the table below and other information regarding the minimum and recommended WaveStar CIT requirements.

It is anticipated that most customers will dedicate a laptop personal computer (PC) to run the WaveStar CIT applications software. However, you can use a properly configured desktop PC. Recommended requirements are intended as a general guideline to optimize performance. As the CIT is used with multiple NE connections and multiple NE types, the processor type and speed and the memory size will all factor into CIT performance.

| Description                      | Minimum Requirement<br>(see Note 1)                                                                                                                                     | Recommended                                                                                                                                                             |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Processor                        | Pentium® 266 Mhz                                                                                                                                                        | Pentium III 500 Mhz                                                                                                                                                     |
| RAM                              | 128 MB (see Note 1)                                                                                                                                                     | 256 MB (see Note 2)                                                                                                                                                     |
| Virtual Memory                   | 139 MB (see Note 1)                                                                                                                                                     | 500 MB (see Note 2)                                                                                                                                                     |
| Disk space                       | 1-GB hard drive with at least 250 MB free space<br>(see Note 3)                                                                                                         | 6-GB hard drive with at least 500 MB free space (see Note 3)                                                                                                            |
| CD-ROM Drive                     | CD-ROM drive compatible with the PC                                                                                                                                     | CD-ROM drive compatible with the PC.                                                                                                                                    |
| Floppy Disk Drive                | 3.5-inch, 1.44 MB                                                                                                                                                       |                                                                                                                                                                         |
| Video (SVGA)                     | 800 x 600                                                                                                                                                               | 1024 x 768                                                                                                                                                              |
| Network Interface                | 10/100 Base T LAN NIC<br>The pin designations/signals are: <ul style="list-style-type: none"> <li>• 1 TD+</li> <li>• 2 TD-</li> <li>• 3 RD+</li> <li>• 6 RD-</li> </ul> | 10/100 Base T LAN NIC<br>The pin designations/signals are: <ul style="list-style-type: none"> <li>• 1 TD+</li> <li>• 2 TD-</li> <li>• 3 RD+</li> <li>• 6 RD-</li> </ul> |
| Operating System<br>(see Note 4) | Microsoft® Windows 2000<br>or<br>Microsoft® Windows NT 4.0<br>with service pack 6A                                                                                      | Microsoft® Windows 2000<br>or<br>Microsoft® Windows NT 4.0<br>with service pack 6A                                                                                      |

| <b>Description</b>                                                    | <b>Minimum Requirement<br/>(see Note 1)</b>                                                                                            | <b>Recommended</b>                                                                                                                     |
|-----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| PDF File Reader                                                       | Adobe Acrobat Reader™ for Windows™ (version 3.01 or later)                                                                             |                                                                                                                                        |
| Personal Computer Memory Card International Association (PCMCIA) slot | Type II slot with driver software that supports read/write of PCMCIA flash disk cards (see Note 5 and the “PCMCIA flash disk” section) | Type II slot with driver software that supports read/write of PCMCIA flash disk cards (see Note 5 and the “PCMCIA flash disk” section) |
| System Backup Drive (Optional)                                        | Removable hard drive for system backups                                                                                                | Removable hard drive for system backups                                                                                                |

## Notes:

1. The minimum RAM and minimum virtual memory are sufficient for configuring only one system at a time.
  2. The recommended RAM and virtual memory are sufficient to configure up to five systems at a time.
  3. The 250 MB of free disk space is required for installation of the WaveStar CIT application (130 MB) and NE software (64 MB). During installation 70 MB of free memory is needed.
- The WaveStar CIT application supports multiple releases of the WaveStar 2.5G/10G. This capability may be necessary when using a single PC to connect to multiple rings that are using different releases of NE software. In this case, an additional 130 MB must be allotted for each copy of the NE software and NE database.
4. The customer is responsible for ensuring that the operating system remains virus-free
  5. Regarding the user-supplied PCMCIA NVM card reader/writer, there are no vendor specific requirements. However, Lucent has tested the two products (a) Card Executive 2.0, from Softex Inc. and (b) Card Wizard from SystemSoft Corp, and found them to work properly for this application.

**PCMCIA flash disk**

Each WaveStar NE uses at least one PCMCIA flash disk as removable memory. The PC that functions as the WaveStar CIT must be able to read and write PCMCIA flash disk memory cards.

**Laptop computers**

Laptop computers contain 2 PCMCIA Type II card slots. One PCMCIA slot must be equipped with a 10/100 BaseT interface network card to support WaveStar CIT communications with the NE over the OSI LAN.

The other PCMCIA Type II slot is used to copy the NE installation generic from the laptop to the PCMCIA flash disk (NVM memory). The NVM is then installed (inserted into a controller circuit pack) in the NE.

**Desktop computers**

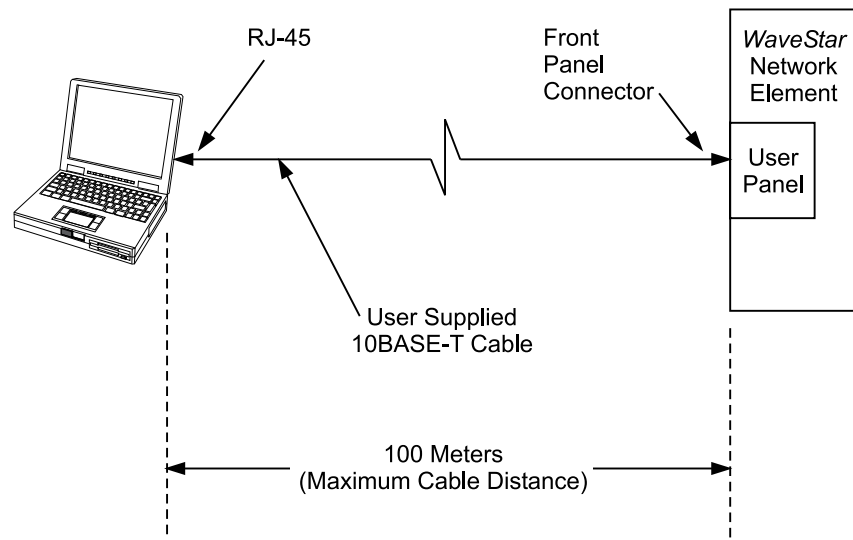
If a desktop computer is used for the NE installation process, the desktop computer must have one PCMCIA Type II card slot to copy the NE installation generic from the desktop to the PCMCIA flash disk (NVM memory). The NVM is then installed (inserted into a controller circuit pack) in the NE.

**Physical “cable connections”**

The PC connects to the WaveStar network via a 10/100 Base-T LAN cable. You can use a direct connection or an intraoffice (IAO) LAN connection.

**Direct Connection:**

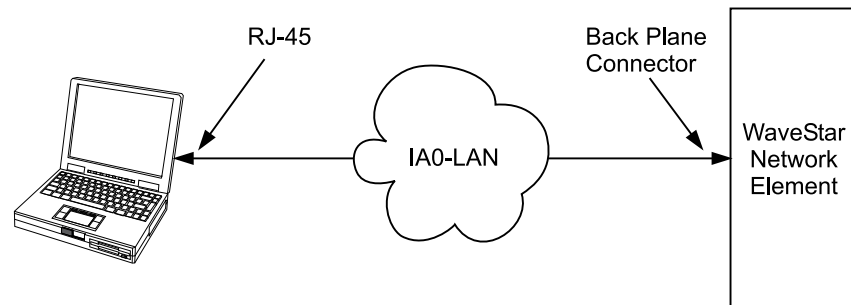
The following figure depicts a direct connection using a short cable (straight cable and NOT a cross-over cable) to connect directly into the front of the user panel.

**Figure A-1 WaveStar CIT with Direct Connection to the NE User Panel**

NC-USM-009

**Intraoffice LAN (IAO-LAN) Connection:**

The following figure depicts a network connection using the Intraoffice LAN (IAO-LAN). The cable from the PC to the backplane connector is a straight cable and NOT a cross-over cable.

**Figure A-2 WaveStar CIT with IAO-LAN Network Connection**

NC-USM-008

**Important!** If the WaveStar NE consists of multiple shelves – then each shelf is physically connected via backplane cabling to a central hub. These cables (shelf-to-hub) are cross-over cables, installed by the installers, and should not be confused with that one cable going directly from the PC to the node’s backplane “CIT” connector.

The communication protocol between the WaveStar CIT and the NE is mostly TL1 messages.









# Appendix C: Task Lists

## Overview

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**Purpose** This appendix provides lists of tasks that are included in the User Operations Guide. The tasks are provided to help the reader locate tasks. The tasks in this guide are those associated with provisioning and operations. Additional tasks appear in the Alarm Messages and Troubleclearing Guide.

Two tables are provided in this appendix:

- The first lists the tasks in alphabetical sequence by name.
- The second lists the tasks in numerical sequence by task number

**Related information** For tasks associated with alarm messages and trouble clearing procedures, refer to WaveStar TDM 2.5G/10G (2-Fiber) Alarm Messages and Troubleclearing Guide.



## Alphabetical Task List

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The following table lists the tasks from this User Operations Guide in alphabetical order by name.

**Table C-1 Alphabetical Task List**

| Task Number | Title                                                                                    | Category   |
|-------------|------------------------------------------------------------------------------------------|------------|
| T106        | Accept Dual Ring Interworking (DRI) Connections                                          | Acceptance |
| T103        | Accept New Electrical Cables to a Port                                                   | Acceptance |
| T102        | Accept New Optical Fibers to a Port                                                      | Acceptance |
| T105        | Accept WaveStar TDM 10G (2-Fiber) Ring Network                                           | Acceptance |
| T104        | Accept WaveStar TDM 10G (2-Fiber) System                                                 | Acceptance |
| T101        | Accept WaveStar TDM 2.5G (2-Fiber) Ring Network                                          | Acceptance |
| T100        | Accept WaveStar TDM 2.5G (2-Fiber) System                                                | Acceptance |
| T300        | Add DS1 Timing Reference                                                                 | COProv     |
| T361        | Add IP Tunnel(s) Through Network                                                         | COProv     |
| T325        | Add Node to In-Service 2-Fiber BLSR                                                      | COProv     |
| T363        | Add TCP/IP Gateway to Network                                                            | COProv     |
| T354        | Add WaveStar TDM 2.5G Shelf to In-Service WaveStar TDM 10G System (576x576 STS-1 Switch) | COProv     |
| T356        | Add WaveStar TDM 2.5G Shelf to In-Service WaveStar TDM 10G System (768x768 STS-1 Switch) | COProv     |
| T315        | Alarm Severity Assignment Profile (ASAP) — Create/Modify                                 | COProv     |
| T248        | AssignManual TARP Adjacencies                                                            | Operation  |
| T241        | Change Maximum Number of Backups to WaveStar CIT                                         | Operation  |
| T329        | Change NE's TID                                                                          | COProv     |
| T224        | Change Network Element Date/Time                                                         | Operation  |
| T252        | Change Network Element Login Banner                                                      | Operation  |
| T218        | Change Network Element Security Parameters                                               | Operation  |

| Task Number | Title                                                                      | Category   |
|-------------|----------------------------------------------------------------------------|------------|
| T359        | Change Nonpreemptible Unprotected Traffic (NUT) Configuration of Time Slot | COProv     |
| T247        | Change Super User Login ID                                                 | Operation  |
| T301        | Change System Timing Configuration                                         | COProv     |
| T340        | Change System Timing Reference Priority                                    | COProv     |
| T216        | Change (Your Own) Notification Registration List                           | Operation  |
| T201        | Change (Your Own) Password                                                 | Operation  |
| T703        | Clean Optical Fibers and Connectors                                        | Supporting |
| T234        | Configuring Basic DCN Parameters for an NE                                 | Operation  |
| T231        | Configuring Basic DCN Parameters for the WaveStar CIT                      | Operation  |
| T235        | Configuring Data Communications Channels                                   | Operation  |
| T230        | Configuring Data Communications Network                                    | Operation  |
| T236        | Configuring TARP Parameters                                                | Operation  |
| T350        | Configure Ethernet Ports and VLANs for Service                             | COProv     |
| T349        | Configure Miscellaneous Discrete Inputs and Outputs                        | COProv     |
| T355        | Create New Optical Port Protection Group                                   | COProv     |
| T302        | Convert In-Service WaveStar TDM 2.5G System to WaveStar TDM 10G System     | COProv     |
| T313        | Create 1xN Electrical Equipment Protection Group                           | COProv     |
| T320        | Create, Modify, or Delete Threshold Crossing Alert (TCA) Profile           | COProv     |
| T302        | Create New Optical Port Protection Group                                   | COProv     |
| T336        | Create NonReporting Alarm Severity Assignment Profiles (ASAPs)             | COProv     |
| T303        | Cross Connections — Create New                                             | COProv     |
| T304        | Cross Connections — Modify/Delete/Roll                                     | COProv     |
| T326        | Delete Node from In-Service 2-Fiber BLSR                                   | COProv     |
| T308        | Delete Optical Port Protection Group                                       | COProv     |
| T353        | Delete Shelf                                                               | COProv     |
| T352        | Delete Transmission Circuit Pack                                           | COProv     |

| Task Number | Title                                                                                        | Category   |
|-------------|----------------------------------------------------------------------------------------------|------------|
| T220        | Disconnect Dual Ring Interworking (DRI) Connections                                          | Operation  |
| T324        | Display and Save PM Register Values                                                          | COProv     |
| T305        | Enable/Disable DCC Terminations                                                              | COProv     |
| T323        | Enable/Disable PM Data Collection                                                            | COProv     |
| T364        | Enable/Disable SS Bit Override                                                               | COProv     |
| T221        | Enable/Disable User Login(s)                                                                 | Operation  |
| T219        | Establish Dual Ring Interworking (DRI) Connections                                           | Operation  |
| T249        | Establish TCP/IP Gateway Access for WaveStar CIT                                             | Operation  |
| T344        | Example of Bridging and Rolling an Existing Cross-Connection                                 | COProv     |
| T700        | Identify Source of Incoming Signal                                                           | Supporting |
| T321        | Initialize Performance Monitoring (PM) Registers                                             | COProv     |
| T306        | Install and Provision Transmission Circuit Pack/Port Units                                   | COProv     |
| T202        | Install Software (Initial Installation/Upgrade/Change) into WaveStar CIT and Network Element | Operation  |
| T707        | Install/Remove Lightguide Buildout                                                           | Supporting |
| T223        | Log in/Log out of Network Element                                                            | Operation  |
| T217        | Log Out Other User Session(s)                                                                | Operation  |
| T203        | Loop Back Circuit(s) for Testing                                                             | Operation  |
| T226        | Loop Back Line(s) for Testing                                                                | Operation  |
| T708        | Make a Manual Optical Loopback                                                               | Supporting |
| T205        | Manually Backup Database to WaveStar CIT                                                     | Operation  |
| T206        | Manually Restore Database from WaveStar CIT                                                  | Operation  |
| T712        | Measure Received Optical Power                                                               | Supporting |
| T309        | Modify Existing Optical Port Protection Group                                                | COProv     |
| T200        | Modify, Delete, or Add a User's Login Parameters                                             | Operation  |
| T339        | Provision Alarm Configurations                                                               | COProv     |
| T314        | Provision Path Trace                                                                         | COProv     |
| T318        | Provision Performance Monitoring (PM) Function                                               | COProv     |

| Task Number | Title                                                                                        | Category   |
|-------------|----------------------------------------------------------------------------------------------|------------|
| T322        | Provision Ports or Tributaries with PM TCA Profiles                                          | COProv     |
| T360        | Provision Remote Network Element Status Alarming                                             | COProv     |
| T358        | Provision Section Trace                                                                      | COProv     |
| T362        | Provision TCP/IP Address of Network Element                                                  | COProv     |
| T307        | Provision Transmission Circuit Pack Ports                                                    | COProv     |
| T209        | Release Looped Back Circuit(s)                                                               | Operation  |
| T227        | Release Looped Back Line(s)                                                                  | Operation  |
| T702        | Remove/Insert a PCMCIA ( NVM) Card                                                           | Supporting |
| T705        | Remove/Replace Shelf Cover                                                                   | Supporting |
| T357        | Replace Circuit Pack with Circuit Pack having Different Code                                 | COProv     |
| T706        | Replace Defective Power Filter                                                               | Supporting |
| T207        | Replace Fan Filter                                                                           | Operation  |
| T709        | Replace Fan Unit                                                                             | Supporting |
| T228        | Replace LLY2A (LLY2AE) TMG/STRAT3 Circuit Packs with LLY2B (LLY2BE) TMG/STRAT3 Circuit Packs | Operation  |
| T711        | Select Lightguide Buildout                                                                   | Supporting |
| T338        | Set NonReporting Alarm Severity Assignment Profiles (ASAPs)                                  | COProv     |
| T328        | Turn-Up and Verify Correct Operation of a Ring                                               | COProv     |
| T250        | Upgrade In-Service 576x576 STS-1 Switch to 768x768 STS-1 Switch                              | Operation  |
| T208        | Verify Receive Path Trace                                                                    | Operation  |
| T251        | Verify Section Trace                                                                         | Operation  |
| T337        | View Alarm Severity Assignment Profiles (ASAPs)                                              | COProv     |
| T341        | View PM Parameters for Selected Ports or Tributaries                                         | COProv     |
| T319        | View PM Threshold Crossing Alert (TCA) Profiles                                              | COProv     |
| T351        | View VLAN Data                                                                               | COProv     |

## Numerical Task List

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The following table lists the tasks from this User Operation Guide in numerical order by task number.

**Table C-2 Numerical Task List**

| Task Number | Title                                                                                        | Category   |
|-------------|----------------------------------------------------------------------------------------------|------------|
| T100        | Accept WaveStar TDM 2.5G System                                                              | Acceptance |
| T101        | Accept WaveStar TDM 2.5G (2-Fiber) Ring Network                                              | Acceptance |
| T102        | Accept New Optical Fibers to a Port                                                          | Acceptance |
| T103        | Accept New Electrical Cables to a Port                                                       | Acceptance |
| T104        | Accept WaveStar TDM 10G (2-Fiber) System                                                     | Acceptance |
| T105        | Accept WaveStar TDM 10G (2-Fiber) Ring Network                                               | Acceptance |
| T106        | Accept Dual Ring Interworking (DRI) Connections                                              | Acceptance |
| T200        | Modify, Delete, or Add a User's Login Parameters                                             | Operation  |
| T201        | Change (Your Own) Password                                                                   | Operation  |
| T202        | Install Software (Initial Installation/Upgrade/Change) into WaveStar CIT and Network Element | Operation  |
| T203        | Loop Back Circuit(s) for Testing                                                             | Operation  |
| T205        | Manually Backup Database to WaveStar CIT                                                     | Operation  |
| T206        | Manually Restore Database from WaveStar CIT                                                  | Operation  |
| T207        | Replace Fan Filter                                                                           | Operation  |
| T208        | Verify Receive Path Trace                                                                    | Operation  |
| T209        | Release Looped Back Circuit(s)                                                               | Operation  |
| T216        | Change (Your Own) Notification Registration List                                             | Operation  |
| T217        | Log Out Other User Session(s)                                                                | Operation  |
| T218        | Change Network Element Security Parameters                                                   | Operation  |
| T219        | Establish Dual Ring Interworking (DRI) Connections                                           | Operation  |
| T220        | Disconnect Dual Ring Interworking (DRI) Connections                                          | Operation  |

| Task Number | Title                                                                                        | Category  |
|-------------|----------------------------------------------------------------------------------------------|-----------|
| T221        | Enable or Disable User Login(s)                                                              | Operation |
| T223        | Log in/Log out of Network Element                                                            | Operation |
| T224        | Change Network Element Date/Time                                                             | Operation |
| T226        | Loop Back Line(s) for Testing                                                                | Operation |
| T227        | Release Looped Back Line(s)                                                                  | Operation |
| T228        | Replace LLY2A (LLY2AE) TMG/STRAT3 Circuit Packs with LLY2B (LLY2BE) TMG/STRAT3 Circuit Packs | Operation |
| T230        | Configuring the Data Communication Network                                                   | Operation |
| T231        | Configuring the Basic DCN Parameters for the Wave-Star CIT                                   | Operation |
| T234        | Configuring the Basic DCN Parameters for an NE                                               | Operation |
| T235        | Configuring Data Communication Channels                                                      | Operation |
| T236        | Configuring the TARP Parameters                                                              | Operation |
| T241        | Change Maximum Number of Backups to WaveStar CIT                                             | Operation |
| T247        | Change Super User Login ID                                                                   | Operation |
| T248        | Assigning TARP Manual Adjacencies                                                            | Operation |
| T249        | Establish TCP/IP Gateway Access for WaveStar CIT                                             | Operation |
| T250        | Upgrade In-Service 576x576 STS-1 Switch to 768x768 STS-1 Switch                              | Operation |
| T251        | Verify Receive Section Trace                                                                 | Operation |
| T252        | Change Network Element Login Banner                                                          | Operation |
| T300        | Add DS1 Timing Reference                                                                     | COProv    |
| T301        | Change System Timing Configuration                                                           | COProv    |
| T302        | Create New Optical Port Protection Group                                                     | COProv    |
| T303        | Cross Connections — Create New                                                               | COProv    |
| T304        | Cross Connections — Modify/Delete/Roll                                                       | COProv    |
| T305        | Enable/Disable DCC Terminations                                                              | COProv    |

| Task Number | Title                                                            | Category |
|-------------|------------------------------------------------------------------|----------|
| T306        | Install and Provision Transmission Circuit Pack/Port Units       | COProv   |
| T307        | Provision Transmission Circuit Pack Ports                        | COProv   |
| T308        | Delete Optical Port Protection Group                             | COProv   |
| T309        | Modify Existing Optical Port Protection Group                    | COProv   |
| T313        | Create 1xN Electrical Equipment Protection Group                 | COProv   |
| T314        | Provision Path Trace                                             | COProv   |
| T315        | Alarm Severity Assignment Profile (ASAP) — Create/Modify         | COProv   |
| T318        | Provision Performance Monitoring (PM) Function                   | COProv   |
| T319        | View PM Threshold Crossing Alert (TCA) Profiles                  | COProv   |
| T320        | Create, Modify, or Delete Threshold Crossing Alert (TCA) Profile | COProv   |
| T321        | Initialize Performance Monitoring (PM) Registers                 | COProv   |
| T323        | Enable/Disable PM Data Collection                                | COProv   |
| T324        | Display and Save PM Register Values                              | COProv   |
| T325        | Add Node to In-Service 2-Fiber BLSR                              | COProv   |
| T326        | Delete Node from In-Service 2-Fiber BLSR                         | COProv   |
| T328        | Turn-Up and Verify Correct Operation of a Ring                   | COProv   |
| T329        | Change NE's TID                                                  | COProv   |
| T336        | Create NonReporting Alarm Severity Assignment Profiles (ASAPs)   | COProv   |
| T337        | View Alarm Severity Assignment Profiles (ASAPs)                  | COProv   |
| T338        | Set NonReporting Alarm Severity Assignment Profiles (ASAPs)      | COProv   |
| T339        | Provision Alarm Configurations                                   | COProv   |
| T340        | Change System Timing Reference Priority                          | COProv   |
| T341        | View PM Parameters for Selected Ports or Tributaries             | COProv   |



| Task Number | Title                                                                                    | Category   |
|-------------|------------------------------------------------------------------------------------------|------------|
| T344        | Example of Bridging and Rolling an Existing Cross-Connection                             | COProv     |
| T349        | Configure Miscellaneous Discrete Inputs and Outputs                                      | COProv     |
| T350        | Configure Gigabit Ethernet Ports and VLANs for Service                                   | COProv     |
| T351        | View VLAN Data                                                                           | COProv     |
| T352        | Delete Transmission Circuit Pack                                                         | COProv     |
| T353        | Delete Shelf                                                                             | COProv     |
| T354        | Add WaveStar TDM 2.5G Shelf to In-Service WaveStar TDM 10G System (576x576 STS-1 Switch) | COProv     |
| T355        | Convert In-Service WaveStar TDM 2.5G System to WaveStar TDM 2.5G/10G System              | COProv     |
| T356        | Add WaveStar TDM 2.5G Shelf to In-Service WaveStar TDM 10G System (768x768 STS-1 Switch) | COProv     |
| T357        | Replace Circuit Pack with Circuit Pack having Different Code                             | COProv     |
| T358        | Provision Section Trace                                                                  | COProv     |
| T359        | Change Nonpreemptible Unprotected Traffic (NUT) Configuration of Time Slot               | COProv     |
| T360        | Provision Remote Network Element Status Alarming                                         | COProv     |
| T361        | Add IP Tunnel(s) through Network                                                         | COProv     |
| T362        | Provision TCP/IP Address of Network Element                                              | COProv     |
| T363        | Add TCP/IP Gateway to Network                                                            | COProv     |
| T364        | Enable/Disable SS Bit Override                                                           | COProv     |
| T700        | Identify Source of Incoming Signal                                                       | Supporting |
| T702        | Remove/Insert a PCMCIA ( NVM) Card                                                       | Supporting |
| T703        | Clean Optical Fibers and Connectors                                                      | Supporting |
| T705        | Remove/Replace Shelf Cover                                                               | Supporting |
| T706        | Replace a Defective Power Filter                                                         | Supporting |
| T707        | Install/Remove Lightguide Buildout                                                       | Supporting |

| Task Number | Title                          | Category   |
|-------------|--------------------------------|------------|
| T708        | Make a Manual Optical Loopback | Supporting |
| T709        | Replace Fan Unit               | Supporting |
| T711        | Select Lightguide Buildout     | Supporting |
| T712        | Measure Received Optical Power | Supporting |



# Appendix D : Safety

## Overview

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**Purpose** This chapter provides important safety instructions for the *WaveStar*<sup>TM</sup> TDM 2.5G/10G (2-Fiber) User Operations Guide.

**Contents** This appendix provides the following information.

|                                                                               |        |
|-------------------------------------------------------------------------------|--------|
| General notes on safety                                                       | D - 2  |
| Laser safety                                                                  | D - 6  |
| Laser product classification                                                  | D - 9  |
| Electrostatic discharge                                                       | D - 11 |
| Important safety instructions for WaveStar <sup>TM</sup> TDM 2.5G/10G systems | D - 12 |



# General notes on safety

## Overview

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**Purpose** This chapter on safety *must* be read by the responsible technical personnel before carrying out relevant work on the system. The valid version of this document must always be kept close to the equipment.

Not only must the general instructions in this chapter on safety be observed, but also the specific safety instructions in the individual chapters.

All safety instructions have a uniform appearance. Please refer to Structures of safety instructions.

The equipment has been developed in line with the present state-of-the-art and fulfils the current national and international safety requirements. It is provided with a high degree of operational safety resulting from many years of development experience and continuous stringent quality checks in our company.

The equipment is safe in normal operation. There are, however, some potential sources of danger that cannot be completely eliminated. In particular, these arise during the

- opening of housings or equipment covers,
- manipulation of any kind within the equipment, even if it has been disconnected from the power supply,
- disconnection of optical or electrical connections, through possible contact with:
  - live parts,
  - laser light,
  - hot surfaces,
  - sharp edges, or
  - components sensitive to electrostatic discharge.

**Structure of safety instructions**

All safety instructions include a *warning symbol* and a *signal word* that classify the danger and a *text block* that contains descriptions of the type and cause of the danger, the consequences of ignoring the safety instruction and the measures that can be taken to minimize the danger.

**Example:****DANGER****Arcing on removing or inserting a live power supply**

plug.

*Arcing can cause serious burns to the hands and damage to the eyes.*

*Ensure that the line circuit-breaker on the Rack Connection Panel (RCP) is in the "OFF" position before removing or inserting the power supply plug.*

**Danger classification**

There are three classes of safety instructions: *Danger*, *Warning* and *Caution*; which class is relevant depends on the consequences of ignoring the safety instruction:

|         |                                                                                                                                      |
|---------|--------------------------------------------------------------------------------------------------------------------------------------|
| DANGER  | Serious injury is definite or likely.                                                                                                |
| WARNING | Serious injury is possible.                                                                                                          |
| CAUTION | Minor injury is definite, likely or possible, or material damage to the product or in the product environment is definite or likely. |

**Special safety instructions**

The aspects of *laser safety* and *handling of components sensitive to electrostatic discharge (ESD)* are of vital importance for the equipment. Therefore, the key safety instructions for these subjects are summarized in the sections: *Laser safety* and *Electrostatic discharge*.

**General safety requirements**

In order to keep the technically unavoidable residual risk to a minimum, it is imperative to observe the following rules.

- Transport, storage and operation of the unit/system must be under the *permissible conditions only*

See accompanying documentation and information on the unit/system.

- Installation, configuration and disassembly must be carried out only by expert personnel and with reference to the respective documentation.

Due to the complexity of the unit/system, the personnel requires special training.

- The unit/system must be operated by *expert and authorized users only*.

The user must operate the unit/system only after having *read and understood* the chapter on safety and the parts of the documentation relevant to operation. For complex systems, additional training is recommended. Any obligatory training for operating and service personnel must be carried out and documented.

- The unit/system must not be operated unless it is in perfect working order.

Any faults and errors that might affect safety must be reported *immediately* by the user to a person in responsibility.

- The unit/system must be operated only with the connections and under the environmental conditions as described in the documentation.

- Any conversions or changes to the system or parts of the system (including the software) must be carried out by qualified Lucent Technologies personnel or by expert personnel authorized by Lucent Technologies.

All changes carried out by other persons lead to a *complete exemption from liability*.

No components/spare parts must be used other than those recommended by the manufacturer and those listed in the procurement documents.

- The removal or disabling of safety facilities, the clearing of faults and errors, and the maintenance of the equipment must be carried out by *specially qualified personnel only*.

The respective parts of the documentation must be strictly observed. The documentation must also be consulted during the selection of measuring and test equipment.

- Calibrations, special tests after repairs and regular safety checks must be carried out, documented and archived.
- Non-system software is used at one's *own risk*. The use/installation of non-system software can adversely affect the normal functioning of the unit/system.
- Only use *tested and virus-free* floppy disks and streamer tapes.



## Laser safety

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**System design** The Lucent Technologies system complies with FDA/CDRH 21 CFR 1040.10 and 1040.11 as a Class I and with IEC 60825-1 as a Class 1 Optical Fiber Telecommunication laser product. The system has been designed to ensure that the operating personnel is not endangered by laser radiation during normal system operation. The safety measures specified in the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) regulations and the international standards IEC-60825 or DIN/EN 60825 are met. Please also refer to Laser product classification (D-9),

**Potential sources of danger** Beware of the following potential sources of danger which will remain despite all safety measures taken

- Laser radiation can cause damage to the skin and eyes.
- Laser radiation from optical transmission systems is in a wavelength range that is invisible to the human eye.

**Laser classes** The maximum output power of laser radiation depends on the type of laser diode used. The international standards IEC-60825 or DIN/EN 60825 define the maximum output power of laser radiation for each laser class.

| Laser class | Wavelength | Maximum output power of laser radiation |
|-------------|------------|-----------------------------------------|
| 1           | 1310 nm    | 8.85 mW                                 |
|             | 1550 nm    | 10 mW                                   |
| 3A          | 1310 nm    | 24 mW                                   |
|             | 1550 nm    | 50 mW                                   |
| 3B          | 1310 nm    | 0.5 W                                   |
|             | 1550 nm    | 0.5 W                                   |



**Laser warning labels**

The laser warning labels indicate either the laser class or both the laser class and the maximum output power of laser radiation.

The following figure shows the laser warning symbol.



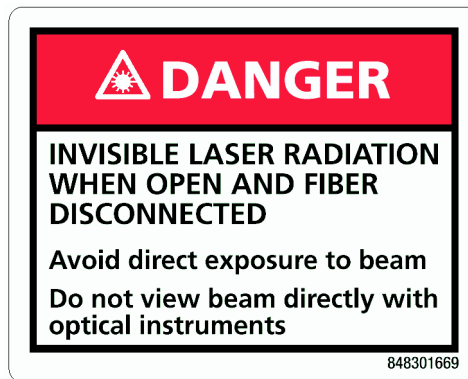
nc-usm-307

The following figure shows the laser warning label that is mounted outside the front cover. It always refers to normal operation.



nc-usm-308

The following figure shows the laser warning label that is affixed inside the subrack.



848301669

nc-usm-309

**Laser safety instructions**

Observe the following instructions to avoid exposing yourself and others to risk.

- Read the relevant descriptions in the manuals before taking equipment into operation or carrying out any installation and maintenance work on the optical port units, and follow the instructions. Ignoring the instructions can result in exposure to dangerous radiation.
- Do not view directly into the laser beam with optical instruments such as a fiber microscope, because viewing of laser emission in excess of Class 1 limits significantly increases the risk of eye damage.
- Never look into the end of an exposed fiber or an open connector as long as the optical source is still switched on.
- Ensure that the optical source is switched off before disconnecting optical fiber connectors.
- In the event of doubt, check that the optical source is switched off by measuring with an optical power meter.



## Laser product classification

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**Standards compliance** The product complies with both IEC standards and the Food and Drug Administration's Center for Devices and Radiological Health (FDA/CDRH) regulations.

**FDA/CDRH regulations** Laser products are classified in accordance with the FDA/CDRH - 21 CFR 1010 and 1040. The classification scheme is based on the ability of the laser emission to cause injury to eye or skin during normal operating conditions

In the United States, lasers and laser systems in the infrared wavelength range (greater than 700 nm) are assigned to one of the following classes:

- Class I,
- Class IIb, or
- Class IV.

Laser classification is dependent upon operating wavelength, output power and fiber mode field diameter (core diameter).

**IEC requirements** The International Electro-Technical Commission (IEC) establishes standards for the electrical and electronic industries. IEC-60825 has been established for the worldwide safety of laser products.

According to the IEC classification, lasers and laser systems in the infrared wavelength range (greater than 700 nm) are assigned to one of the following classes:

According to the IEC classification, lasers and laser systems in the infrared wavelength range (greater than 700 nm) are assigned to one of the following classes:

- Class 1,
- Class 3A,
- Class 3B, or
- Class 4.

There are some major differences between the FDA/CDRJ regulations and IEC.

1. The Accessible Emission Limits (AEL) are different.
2. Class 3A applies to all wavelengths.
3. Class 3B requires strict engineering controls.
4. Classification is under single fault conditions.

#### **Hazard level assignment**

*Hazard level* refers to the potential hazard from laser emission at any location in an end-to-end optical fiber communication system that may be accessible during service or in the event of a failure. The assignment of hazard level uses the AELs for the classes.

Hazard levels for optical transmission equipment are assigned in either of the following two ways:

- actual output power from the connector or fiber cut.
- if automatic power reduction is used, output power at the connector or fiber cut at one second after automatic power reduction takes place provided that maximum output and restart conditions are met.

These are covered by a front panel to ensure protection against emissions from any energized, unterminated transmitter.

The circuit packs themselves, however, may be IEC Class 1 or 3A or FDA/CDRH Class I or IIIb



# Electrostatic discharge

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**Overview** Electrostatic discharge (ESD) (for example, caused by touching with the hand) can destroy semiconductor components. The correct operation of the complete system is then no longer assured

*All semiconductor components are basically sensitive to electrostatic discharge. The electrostatic discharge can also affect the components indirectly using contacts or conductor tracks.*

**Barred-hand symbol** Circuit packs containing components that are especially sensitive to electrostatic discharge are identified by warning labels bearing the barred-hand symbol.



**ESD instructions** Observe the following ESD instructions to avoid damage to electrostatic-sensitive components:

- Wear working garment made of 100% cotton to avoid electrostatic discharge.
- Touch the circuit packs at the edges or the insertion and removal facilities only.
- Ensure that the rack is grounded.
- Wear conductively connected wrist straps and connect them to the rack ESP bonding point.
- Work in an area which is protected against electrostatic discharge. Use conducting floor and bench mats which are conductively connected to the rack ESP bonding point.
- Conductively connect all test equipment and trolleys to the rack ESP bonding point.
- Store and ship circuit packs and components in their shipping packing. Circuit packs and components must be packed and unpacked only at workplaces suitably protected against build-up of charge.



## Important safety instructions for WaveStar™ TDM 2.5G/10G systems

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**Instructions** Especially observe the following safety instructions, they are of particular importance for WaveStar™ TDM 2.5G/10G systems:

### Invisible laser radiation



#### **DANGER**

**Injury to eyes caused by invisible laser radiation.**

*WaveStar TDM 2.5G/10G systems operate with invisible laser radiation. Laser radiation can cause considerable injuries to the eyes.*

*Never look into the end of an exposed fiber or plug-in optical connectors as long as the optical source is switched on.  
Always observe the laser warning instructions.*

### Power supply plug



#### **DANGER**

**Arcing on removing or inserting a live power supply**

*Arcing can cause serious burns to the hands and damage to the eyes.*

*Ensure that the line circuit-breaker on the Rack Connection Panel (RCP) is in the “OFF” position before removing or inserting the power supply plug.*

### Shielded 10BaseT LAN cables



#### **DANGER**

##### **Risk of electrical shock and/or serious injury**

*There is a risk of electrical shock and/or serious injury if shielded 10BaseT LAN cables are used, and the applicable national safety requirements have not been met*

*The usage of shielded 10BaseT LAN cables is only allowed if the applicable national safety requirements have been met by the user. Otherwise, there is a risk of electrical shock and/or serious injury.*

### Electrostatic discharge (ESD)



#### **CAUTION**

##### **Destruction of components by electrostatic**

*Electronic components can be destroyed by electrostatic discharge.*

*Plug-in units must therefore always be kept in antistatic covers. Use the original packaging if possible. Always observe the ESD instructions.*

*This page is intentionally blank.*



**READ AND UNDERSTAND ALL INSTRUCTIONS**

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

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

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

15. Never install telecommunications wiring during a lightning storm.
16. Never install telecommunications connections in wet locations.
17. Never touch uninsulated telecommunications wires or terminals unless the telecommunications line has been disconnected at the network interface.
18. Never touch uninsulated wiring or terminals carrying direct current or ringing current, or leave this wiring exposed. Protect and tape uninsulated wiring and terminals to avoid risk of fire, electric shock, and injury to service personnel.
19. Never push objects of any kind into this product through slots as they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquids of any kind on the product.
20. Slots and openings in the unit are provided for ventilations, to protect it from overheating, and these openings must not be blocked or covered. This product should not be placed in a built-in installation unless proper ventilation is provided.
21. To reduce the risk of an electrical shock, do not disassemble this product. Service should be performed by trained personnel only. Opening or removing covers and/or circuit packs may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electrical shock when the unit is subsequently used.
22. Some of the WaveStar TDM 2.5G/10G (2-Fiber) system circuit packs contain FDA/CDRH Class I/IEC Class 1 single-mode laser products that are enclosed lightwave transmission systems. Under normal operating conditions, lightwave transmission systems are completely enclosed; nonetheless, the following precaution must be observed because of the potential for eye damage:
  - Do not disconnect any lightwave cable or splice and stare into the optical connectors terminating the cables.
  - Lightwave/lightguide operations should not be performed by a technician who has not satisfactorily completed an approved training course.
  - Do not use optical instruments such as an eye loupe to view a fiber or unterminated connector.
  - More information about laser safety can be found in the Installation

**SAVE THESE INSTRUCTIONS!**





# Abbreviations and Acronyms

**Numerics    5ESS®    Number 5 Electronic Switching System)**

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**A    ABN    Abnormal (condition)**

**ABS    Absent)**

**AC    Alternating Current)**

**ACO    Alarm Cut-Off)**

**ACT    Active)**

**ADM    Add/Drop Multiplexer)**

**ADR    Add/Drop Ring)**

**AGNE    Alarm Gateway Network Element)**

**AID    Access Identifier)**

**AIS    Alarm Indication Signal)**

**ITS    Acknowledged Information Transfer Service)**  
Confirmed mode of operation of the LAPD protocol.

**AMI    Alternate Mark Inversion)**

**ANSI    American National Standards Institute)**

**APD** Avalanche PhotoDiode)

**APS** Automatic Protection Switch)

**AS&C** Alarm, Status, and Control)

**APSD** Automatic Power Shutdown)

**ASCII** American Standard Code for Information Interchange)

**ASN.1** Abstract Syntax Notation 1)

**ATM** Asynchronous Transfer Mode)

**AUTO** Automatic)

**AVAIL** Available)

---

**B B3ZS** Bipolar 3-Zero Substitution)

**B8ZS** Bipolar 8-Zero Substitution)

**BCLAN** Board Controller Local Area Network)

**BDFB** Battery Distribution and Fuse Bay)

**BER** Bit Error Rate)

**BITS** Building Integrated Timing Supply)

**BLK** Blank)

**BLSR** Bidirectional Line-Switched Ring)

**BOC** Bell Operating Company)

---

**C CCITT** Comité Consultatif International Télégraphique & Téléphonique)

**CDRH** Center for Devices and Radiological Health)

**CEPT** Conférence Européenne des Administrations des Postes et des Télécommunications)

**CIT** Craft Interface Terminal)

**CL** Clear)

**CLEI** Common Language Equipment Identifier)

**CLLI** Common Language Location Identifier)

**CMIP** Common Management Information Protocol.)

OSI standard protocol for OAM&P information exchange.

**CMISE** Common Management Information Service Element)

**CO** Central Office)

**CP** Circuit Pack)

**CPE** Customer Premises Equipment)

**CR** Critical (alarm )

**CSMA/CD** Carrier Sense Multiple Access with Collision Detection)

**CS&O** Lucent Technologies Customer Support and Operations)

**CSU** Channel Service Unit)

**CTIP** Customer Training and Information Products)

**CTS** Customer Technical Support within Lucent Technologies)

**CV** Coding Violation)

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**D    DACS    Digital Access Cross-Connect System)**

**dB    Decibels)**

**DC    Direct Current)**

**DCC    Data Communications Channel)**

**DCCr    Data Communications Channel (section)**

**DCCm    Data Communications Channel (line)**

**DCE    Data Communications Equipment)**

**DCN    Data Communications Network)**

**DCS    Digital Cross-Connect System)**

**DPLL    Digital Phase Locked Loop)**

**DRI    Dual Ring Interworking)**

**DRAM    Dynamic Random Access Memory)**

**DS0, DS1, DS3    Digital Signal Levels 0, 1, 3)**

**DS-N    Digital Signal, Level N)**

**DS-NE    Directory Service Network Element )**

**DSX    Digital Cross-Connect Frame)**

**DTE    Data Terminating Equipment)**

**DTMF    Dual Tone Multifrequency)**

**DWDM    Dense Wavelength Division Multiplexing)**

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**E    EBER    Equivalent Bit Error Rate)**

**EC    Echo Cancellor)**

**EC-1, EC-N    Electrical Carrier, Levels 1 and N)**

**ECI    Equipment Catalog Item)**

**EEPROM    Electrically Erasable Programmable Read-Only Memory)**

**EF    Equipment Fail)**

**EIA    Electronic Industries Association )**

**EM    Event Management)**

**EMC    Electromagnetic Compatibility)**

**EMI    Electromagnetic Interference)**

**EMS    Element Management System)**

**EPROM    Erasable Programmable Read-Only Memory)**

**EQ    Equipped)**

**EQPT    Equipment)**

**ES    Errored Seconds)**

**ESD    Electrostatic Discharge)**

**ESF    Extended Super Frame (DS1 signal format)**

**ETSI    European Telecommunications Standards Institute)**

**EVT    Event)**

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**F    FCC   Federal Communications Commission)**

**FDA   Food and Drug Administration)**

**FDDI   Fiber Distributed Data Interface )**

**FE   Far End)**

**FEBE   Far End Block Error)**

**FEPROM   Flash EPROM)**

**FIT   Failure in Time)**

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**G    GB   Gigabytes)**

**GbE   (Gigabit Ethernet)**

**Gb/s   Gigabits per second)**

**GHz   Gigahertz)**

**GNE   Gateway Network Element)**

**GR-XXX   Telcordia (Bellcore) General Requirement-XXX)**

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**H    HDLC   High-Level Data Link Control)**

**HS   High Speed)**

**HW   Hardware)**

**Hz   Hertz)**



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**I IAO LAN Intraoffice Local Area Network)**

**ID Identifier)**

**IEC International Electrotechnical Commission)**

**IEEE Institute of Electrical and Electronics Engineers)**

**I/O Input/Output)**

**IMF Infant Mortality Factor)**

**“ Inches)**

**INTFC Interface)**

**IS In Service)**

**ISDN Integrated Services Digital Network)**

**ITCO Independent Telephone Company)**

**ITM Integrated Transport Management)**

**ITM-NM Integrated Transport Management Network Module)**

**ITM SNC Integrated Transport Management SubNetwork Controller)**

**ITU International Telecommunications Union)**

**ITU-R International Telecommunications Union — Radio  
standardization sector. Formerly known as CCIR: Comité Consultatif  
International Radio; International Radio Consultative Committee.)**

**ITU-T International Telecommunications Union — Telecommunication  
standardization sector. Formerly known as CCITT: Comité Consultatif  
International Télégraphique & Téléphonique; International Telegraph and  
Telephone Consultative Committee.)**

**IXC Interexchange Carrier)**

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**K Kb/s Kilobits per second)**

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**L LAN Local Area Network)**

**LATA Local Access and Transport Area)**

**LBC Laser Bias Current)**

**LBFC Laser Backface Currents)**

**LBO Lightguide Build-Out)**

**LCN Local Communications Network)**

**LCT Large Capacity Terminal)**

**LEC Local Exchange Carrier)**

**LED Light-Emitting Diode)**

**LGX Lightguide Cross-Connect)**

**LOF Loss of Frame)**

**LOP Loss of Pointer )**

**LOS Loss of Signal)**

**LPBK Loopback)**

**LS Low Speed)**

**LTE Line Terminating Equipment)**

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**M     $\mu$    Microns)**

**$\mu$ m   micrometer)**

**MB   Megabytes)**

**Mb/s   Megabits per second)**

**MCOND   Maintenance Condition)**

**MEM   Memory)**

**MIPS   Millions of Instructions Per Second)**

**MJ   Major (alarm)**

**MML   Human-Machine Language )**

**MN   Minor (alarm)**

**ms   Millisecond)**

**MTBF   Mean Time Between Failures)**

**MTBMA   Mean Time Between Maintenance Activities )**

**MTTR   Mean Time To Repair)**

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**N    NA   Not Applicable)**

**NCC   Network Communication Controller)**

**NE   Network Element)**

**NEBS   Network Equipment-Building System)**

**nm   Nanometer (10<sup>-9</sup> meters)**

**NMA** Network Monitoring and Analysis System)

**NMON** Not Monitored)

**NMS** Network Management System)

**NORM** Normal)

**NPPA** Non-Preemptible Protection Access)

**NRZ** Nonreturn to Zero)

**NSA** Non-Service Affecting)

**NSAP Address** Network Service Access Point Address (used in the OSI network layer 3)

**NTF** No Trouble Found)

**NVM** Non-Volatile Memory)

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**O O&M** Operation and Maintenance)

**OA** Optical Amplifier)

**OALAN** Overhead Access Local Area Network)

**OAM&P** Operations, Administration, Maintenance, and Provisioning)

**OBA** (Optical Booster Amplifier)

**OBPA** (Optical Booster Pre-Amplifier)

**OC, OC-N** Optical Carrier)

**OC-1** Optical Carrier, Level 1 Signal (51.84 Mb/s)

**OC-3** Optical Carrier, Level 3 Signal (155.52 Mb/s)

**OC-3c Optical Carrier, Level 3 Concatenated Signal (155.52 Mb/s)**

**OC-12 Optical Carrier, Level 12 Signal (622.08 Mb/s)**

**OC-48 Optical Carrier, Level 48 (2488.32 Mb/s) (2.5 Gb/s)**

**OC-192 Optical Carrier, Level 192 (9953.28 Mb/s) (10 Gb/s)**

**OC3/STM1/1.3LR4 Optical Carrier 3/Synchronous Transport Module 1 port unit in the 1.3 $\mu$  range with four bidirectional long reach ports.)**

**OC3/STM1/1.3LR4 Optical Carrier 3/Synchronous Transport Module 1 port unit in the 1.3 $\mu$  range with four bidirectional long reach ports.)**

**OC3/STM1/1.3SR4 Optical Carrier 3/Synchronous Transport Module 1 port unit in the 1.3 $\mu$  range with four bidirectional short reach ports.)**

**OC3/STM1/1.3SR4 Optical Carrier 3/Synchronous Transport Module 1 port unit in the 1.3 $\mu$  range with four bidirectional short reach ports.)**

**OC12/STM4/1.3LR2 Optical Carrier 12/Synchronous Transport Module 4 port unit in the 1.3 $\mu$  range with two bidirectional long reach ports.)**

**OC12/STM4/1.3LR2 Optical Carrier 12/Synchronous Transport Module 4 port unit in the 1.3 $\mu$  range with two bidirectional long reach ports.)**

**OC12/STM4/1.3SR2 Optical Carrier 12/Synchronous Transport Module 4 port unit in the 1.3 $\mu$  range with two bidirectional short reach ports.)**

**OC48/STM16/1.3LR1 Optical Carrier 48/Synchronous Transport Module 16 port unit in the 1.3 $\mu$  range with one bidirectional long reach port.)**

**OC48/STM16/1.3LR1 Optical Carrier 48/Synchronous Transport Module 16 port unit in the 1.3 $\mu$  range with one bidirectional long reach port.)**

**OC48/STM16/1.5LR1 Optical Carrier 48/Synchronous Transport Module 16 port unit in the 1.5 $\mu$  range with one bidirectional long reach port.)**

**OC48/STM16/1.5LR1 Optical Carrier 48/Synchronous Transport Module 16 port unit in the 1.5 $\mu$  range with one bidirectional long reach port.)**

**OC48/STM16/DWDM01-16 Optical Carrier 48/Synchronous Transport Module 16 port unit in 16 different wavelengths that are compatible with**

ITU wavelengths.)

**OC48/STM16/DWDM01-16** Optical Carrier 48/Synchronous Transport Module 16 port unit in 16 different wavelengths that are compatible with ITU wavelengths.)

**OC192/STM64/1.5SR1** Optical Carrier 192/Synchronous Transport Module 64 port unit in the 1.5 $\mu$  range with one bidirectional short/intermediate reach port.)

**OI** Operations Interworking)

**OLS** Optical Line System)

**OOF** Out-of-Frame)

**OOS** Out-of-Service)

**OPS/INE** Operations System for Intelligent Network Elements)

**OS** Operations System)

**OSI** Open Systems Interconnect)

**OSMINE** Operations Systems Modifications for the Integration of Network Elements)

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**P** **PCB** Printed Circuit Board)

**PCM** Pulse Code Modulation)

**PCMCIA** Personal Computer Memory Card International Association)

**PDH** Plesiochronous Digital Hierarchy)

**PM** Performance Monitoring)

**PMD** Polarization Mode Dispersion)

**POH** Path Overhead )

**POP** Point of Presence)

**POTS** Plain Old Telephone Service)

**PRI** Primary)

**PROTN** Protection)

**PROV** Provisioned)

**PSDN** Public Switched Data Network)

**PSTN** Public Switched Telephone Network)

**PTE** Path Terminating Equipment)

**PTY** Parity)

**PVC** Permanent Virtual Circuit)

**PWR** Power)

**PWR ON** Power On)

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**Q QOS** Quality of Service)

**QRSS** Quasi-Random Signal Source)

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**R RAM** Random Access Memory)

**RCV** Receive)

**RCVR** Receiver)

**RDI Remote Defect Indication)**

**RF Radio Frequency)**

**RFI Remote Failure Indication)**

**RPP Reliability Prediction Procedure )**

**RT Remote Terminal )**

**RTAC Regional Technical Assistance Center )**

**RTRV Retrieve)**

**RZ Return to Zero)**

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**S SA Service Affecting)**

**SDH Synchronous Digital Hierarchy)**

**SDS Standard Directory Service based on ANSI recommendation  
T1.245)**

**SEC Secondary)**

**SES Severely Errored Seconds)**

**SF Super Frame (DS1 signal format)**

**SNMS SubNetwork Management System)**

**SNR Signal-to-Noise Ratio)**

**SOH Section Overhead)**

**SONET Synchronous Optical Network )**

**SPE Synchronous Payload Envelope)**



**STBY** Standby)

**STS** Synchronous Transport Signal)

**STS-1, STS-N** Synchronous Transport Signal, Levels 1 and N)

**STS-3** Synchronous Transport, Level 3)

**STS-3c** Synchronous Transport, Level 3 Concatenated Signal)

**STS-12** Synchronous Transport, Level 12)

**STS-12c** Synchronous Transport, Level 12Concatenated Signal)

**SVC** Switched Virtual Circuit)

**SYNC** Synchronizer)

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**T TA** Technical Advisory)

**TABS** Telemetry Asynchronous Byte Serial (Protocol)

**TARP** Target Identifiers Address Resolution Protocol)

**TBD** To Be Determined)

**TBOS** Telemetry Byte-Oriented Serial (Protocol)

**TCA** Threshold-Crossing Alert)

**TCP/IP** Transmission Control Protocol/Internet Protocol)

**TDM** Time Division Multiplexing)

**THz** Terrahertz (10<sup>12</sup> Hz)

**TID** Target Identifier)

**TIRKS** Trunks Integrated Records Keeping System)

**TL1** Transaction Language 1)

**TR** Technical Requirement)

**TSA** Time Slot Assignment)

**TSI** Time Slot Interchange)

**TSO** Technical Support Organization)

**TU** Tributary Unit)

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**U UAS** Unavailable Seconds)

**UITS** Unacknowledged Information Transfer Service. Unconfirmed mode of LAPD operation.)

**UNEQ** Path Unequipped)

**UPSR** Unidirectional Path-Switched Ring)

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**V V** Volts)

**VAC** Volts Alternating Current)

**VDC** Volts Direct Current)

**VF** Voice frequency)

**VM** Violation Monitor )

**VMR** Violation, Monitor, and Removal)

**VT** Virtual Tributary)

**VT1.5 Virtual Tributary, Level 1.5)**

**VT-G Virtual Tributary Group)**

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**W WAD Wavelength Add/Drop)**

**WAN Wide Area Network)**

***WaveStar<sup>TM</sup>* OLS 40G/80G/400G *WaveStar<sup>TM</sup>* Optical Line System  
40G/80G/400G)**

**WDCS Wideband Digital Cross-Connect System)**

**WDM Wavelength Division Multiplexing)**

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**X X.25 An ITU standard defining the connection between a terminal and a  
public packet-switched network)**





# Glossary

## **Numerics    0×1 Line Operation**

0×1 means unprotected operation. The connection between network elements has one bidirectional line (no protection line).

## **1+1 Line Protection**

A protection architecture in which the transmitting equipment transmits a valid signal on both the working and protection lines. The receiving equipment monitors both lines. Based on performance criteria and OS control, the receiving equipment chooses one line as the active line and designates the other as the standby line.

## **576×576 STS-1 Switch (SWITCH/STS576)**

The SWITCH/STS576 circuit pack provides a 576×576 STS-1 equivalent cross-connect function.

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## **A    Absent (ABS)**

Used to indicate that a given circuit pack is not installed.

## **Access Identifier (AID)**

A technical specification for explicitly naming entities (both physical and logical) of an NE using a grammar comprised of ASCII text, keywords, and grammar rules.

## **Active (ACT)**

Used to indicate that a circuit pack or module is in-service and currently providing service functions.

**Add/Drop Multiplexer (ADM)**

The term for a synchronous network element capable of combining signals of different rates and having those signals added to or dropped from the stream.

**Alarm**

Visible or audible signal indicating that an equipment failure or significant event/condition has occurred.

**Alarm Correlation**

The search for a directly-reported alarm that can account for a given symptomatic condition.

**Alarm Cut-Off (ACO)**

A button on the user panel used to silence audible alarms.

**Alarm Cut-Off and Test (ACO/TST)**

The name of a pushbutton on the user panel used to silence audible alarms.

**Alarm Indication Signal (AIS)**

A code transmitted downstream in a digital network that indicates that an upstream failure has been detected and alarmed, if the upstream alarm has not been suppressed.

**Alarm Severity**

An attribute defining the priority of the alarm message. The way alarms are processed depends on the severity.

**Alarm Suppression**

Selective removal of alarm messages from being forwarded to the GUI or to network management layer OSs.

**Alarm Throttling**

A feature that automatically or manually suppresses autonomous messages that are not priority alarms.

**Alternate Mark Inversion (AMI)**

A line code that employs a ternary signal to convert binary digits, in which successive binary ones are represented by signal elements that are normally of alternative positive and negative polarity but equal in amplitude, and in which binary zeros are represented by signal elements that have zero amplitude.

**American Standard Code for Information Interchange (ASCII)**

A standard 7-bit code that represents letters, numbers, punctuation marks, and special characters in the interchange of data among computing and communications equipment.

**Association**

A logical connection between manager and agent through which management information can be exchanged.

**Asynchronous**

The essential characteristic of time-scales or signals such that their corresponding significant instants do not necessarily occur at the same average rate.

**Asynchronous Transfer Mode (ATM)**

A high-speed transmission technology characterized by high bandwidth and low delay. It utilizes a packet switching and multiplexing technique which allocates bandwidth on demand.

**Attribute**

Alarm indication level: critical, major, minor, or no alarm.

**Autolock**

Action taken by the system in the event of circuit pack failure/trouble. System switches to protection and prevents a return to the working circuit pack even if the trouble clears. Multiple protection switches on a circuit pack during a short period of time cause the system to autolock the pack.

**Automatic (AUTO)**

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

**Automatic Protection Switch**

A protection switch that occurs automatically in response to an automatically detected fault condition.

**Autonomous Message**

A message transmitted from the controlled Network Element to the ITM-SC which was not a response to an ITM-SC originated command.

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**B Backup**

The backup and restoration features provide the capability to recover from loss of NE data because of such factors as human error, power failure, NE design flaws, and software bugs.

**Bandwidth**

The difference in Hz between the highest and lowest frequencies in a transmission channel. The data rate that can be carried by a given communications circuit.

**Baud Rate**

Transmission rate of data (bits per second) on a network link.

**Bidirectional Line**

A transmission path consisting of two fibers that handle traffic in both the transmit and receive directions.

**Bidirectional Line-Switched Ring (BLSR)**

A bidirectional ring in which protection switching is accomplished by switching working traffic into protection time slots in the line going in the opposite direction around the ring. BLSRs are functionally equivalent to SDH Multiplexer Section Shared Protection Rings (MS-SPRings).



**Bidirectional Ring**

A ring in which both directions of traffic between any two nodes travel through the same network elements (although in opposite directions).

**Bidirectional Switch**

Protection switching performed in both the transmit and receive directions.

**Bipolar 3-Zero Substitution (B3ZS)**

A line coding technique that replaces three consecutive zeros with a bit sequence having special characteristics accomplishing two objectives: first, this bit sequence accommodates the density requirements of the ones for digital T3 carrier, second, the sequence is recognizable at the destination (due to deliberate bipolar violations) and is removed to produce the original signal.

**Bipolar 8-Zero Substitution (B8ZS)**

A line coding technique that replaces eight consecutive zeros with a bit sequence having special characteristics accomplishing two objectives: First, this bit sequence accommodates the density requirements of the ones for digital T1 carrier; Second, the sequence is recognizable at the destination (due to deliberate bipolar violations) and is removed to produce the original signal.

**Bit**

The smallest unit of information in a computer, with a value of either 0 or 1.

**Bit Error Rate (BER)**

The ratio of error bits received to the total number of bits transmitted.

**Bit Error Rate Threshold**

The point at which an alarm is issued for bit errors.

**Bit Interleaved Parity-N(BIP-N)**

A method of error monitoring over a specified number of bits (BIP-3 or BIP-8).

**Blank (BLK)**

The status of a circuit pack slot that contains a bus extender (blank) circuit pack.

**Board Controller Local Area Network (BCLAN)**

The internal local area network that provides communications between the line and board controllers on the circuit packs associated with a high-speed line.

**Bridge Cross-Connection**

The setting up of a cross-connection leg with the same input tributary as that of an existing cross-connection leg. Thus, forming a 1:2 bridge from an input tributary to two output tributaries.

**Broadband Communications**

Voice, data, and/or video communications at greater than 2 Mb/s rates.

**Building Integrated Timing Supply (BITS)**

A single clock that provides all the DS1 and/or composite clock timing reference to all other clocks in that building.

**Byte**

Refers to a group of eight consecutive binary digits.

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**C C-Bit**

A framing format used for DS3 signals produced by multiplexing 28 DS1s into a DS3. This format provides for enhanced performance monitoring of both near-end and far-end entities.

**Cell Relay**

Fixed length cells. For example, ATM with 53 octets.

**Central Office (CO)**

A building where common carriers terminate customer circuits.

**Channel**

A sub-unit of transmission capacity within a defined higher level of transmission capacity.

**Channel State Provisioning**

A feature that allows a user to suppress reporting of alarms and events during provisioning by supporting multiple states (automatic, in-service, and not monitored) for VT1.5 and STS-1 channels.

**Circuit**

A set of transmission channels through one or more network elements that provides transmission of signals between two points, to support a single communications path.

**Clear Channel (CC)**

A digital circuit where no framing or control bits are required, thus making the full bandwidth available for communications.

**Closed Ring Network**

A network formed of a ring-shaped configuration of network elements. Each network element connects to two others, one on each side.

**Coding Violation (CV)**

A performance monitoring parameter indicating that bipolar violations of the signal have occurred.

**Collocated**

System elements that are located in the same location.

**Command Group**

An administrator-defined group that defines commands to which a user has access.

**Concatenation**

A procedure whereby multiple virtual containers are associated one with each other resulting in a combined capacity that can be used as a single container across which bit sequence integrity is maintained.

**Consultative Committee for the International Telephone and Telegraph (CCITT)**

International Telephone and Telegraph Consultative Committee — An international advisory committee under United Nations' sponsorship that has composed and recommended for adoption worldwide standards for international communications. Recently changed to the International Telecommunications Union Telecommunications Standards Sector (ITU-TSS).

**Co-Resident**

A hardware configuration where two applications can be active at the same time independently on the same hardware and software platform without interfering with each others functioning.

**Correlation**

A process where related hard failure alarms are identified.

**Craft Interface Terminal (CIT)**

The user interface terminal used by craft personnel to communicate with a network element.

**Critical (CR)**

Alarm that indicates a severe, service-affecting condition.

**Cross-Connection**

Path-level connections between input and output tributaries or specific ports within a single NE. Cross-connections are made in a consistent way even though there are various types of ports and various types of port protection. Cross-Connections are reconfigurable interconnections between tributaries of transmission interfaces.

**Crosstalk**

An unwanted signal introduced into one transmission line from another.

**Current Value**

The value currently assigned to a provisionable parameter.

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**D Data**

A collection of system parameters and their associated values.

**Database Administrator**

A user who administers the database of the application.

**Data Communications Channel (DCC)**

The embedded overhead communications channel in the synchronous line, used for end-to-end communications and maintenance. The DCC carries alarm, control, and status information between network elements in a synchronous network.

**Data Communications Equipment (DCE)**

The equipment that provides signal conversion and coding between the data terminating equipment (DTE) and the line. The DCE may be separate equipment or an integral part of the DTE or of intermediate equipment. A DCE may perform other functions usually performed at the network end of the line.

**Data Terminating Equipment (DTE)**

The equipment that originates data for transmission and accepts transmitted data.

**DDM-1000**

Lucent Technologies' Dual DS3 Multiplexer – A digital multiplexer that multiplexes DS1, DS1C, or DS2 signals into a DS3 signal or a 90 Mb/s or 180 Mb/s optical signal.

**DDM-2000**

Lucent Technologies SONET-ready network multiplexer that can function as a lightwave terminal. It is designed primarily for loop feeder and interoffice applications that work in existing asynchronous as well as the emerging SONET networks. Multiplexers that multiplex DS1, DS3, or EC-1 inputs into EC-1, OC-1, OC-3, or OC-12 outputs.

**Default**

An operation or value that the system or application assumes, unless a user makes an explicit choice.

**Default Provisioning**

The parameter values that are preprogrammed as shipped from the factory.

**Defect**

A limited interruption of the ability of an item to perform a required function. It may or may not lead to maintenance action depending on the results of additional analysis.

**Demultiplexer**

A device that splits a combined signal into individual signals at the receiver end of transmission.

**Demultiplexing**

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

**Dense Wavelength Division Multiplexing (DWDM)**

Transmitting two or more signals of different wavelengths simultaneously over a single fiber.

**Deprovisioning**

The inverse order of provisioning. To manually remove/delete a parameter that has (or parameters that have) previously been provisioned.

**Digital Cross-Connect Panel (DSX)**

A panel designed to interconnect equipment that operates at a designated rate. For example, a DSX-3 interconnects equipment operating at the DS3 rate.

**Digital Cross-Connect System (DCS)**

An electronic switching system, found in telephone central offices, that switches groups of signals from one route to another without the need to demultiplex them. An optical cross-connect is an optical switch that routes wavelength channels from one fiber route to another without first converting them into electricity and back.

**Digital Multiplexer**

Equipment that combines several digital signals into a single composite digital signal by time-division multiplexing.

**Digital Signal Levels 0, 1, 3 (DS0, DS1, DS3)**

An ANSI-defined signal or service level corresponding to the following: DS0 is 64 Kb/s, DS1 is 1.544 Mb/s (equivalent to T1), and DS3 is 44.736 Mb/s (equivalent to 28 T1 channels or T3).

**Directory Service Network Element (DSNE)**

A designated network element that is responsible for administering a database that maps network element names (TIDs) to addresses [NSAPs (network service access points)] in an OSI subnetwork. There can be one DSNE per ring. A DSNE can also be a GNE.

**Dispersion**

Time-broadening of a transmitted light pulse.

**Dispersion Shifted Optical Fiber**

1330/1550 nm minimum dispersion wavelength.

**Divergence**

When there is unequal amplification of incoming wavelengths, the result is a power divergence between wavelengths.

**Doping**

The addition of impurities to a substance in order to attain desired properties.

**Downstream**

At or towards the destination of the considered transmission stream, for example, looking in the same direction of transmission.

**Drop and Continue**

A circuit configuration that provides redundant signal appearances at the outputs of two network elements in a ring. Can be used for Dual Ring Interworking (DRI) and for video distribution applications.

**Drop-Down Menu**

A menu that is displayed from a menu bar.

**DS1 Signal**

Signal with a data rate of 1.544 Mb/s.

**DS3EC1/8**

Port unit that provides 8 bidirectional ports at the DS3-rate or EC-1-rate.

**DS3EC1/8**

Port unit that provides 8 bidirectional ports at the DS3-rate or EC-1-rate.

**DS3EC1 Connector Panel**

The two panels on one or both sides of a shelf containing DS3EC1/8 port units. The DS3EC1 Connector Panels provide an interface between the DS3EC1/8 port units and the backplane via BNC connectors.

**DS3EC1 Connector Panel**

The DS3EC1 Connector Panels provide an interface between the DS3EC1/8 port units and the backplane via BNC connectors.

**DS3 Format**

Specifies the line format of a DS3 interface port, such as M23 or C-bit parity.



**DS3 Idle Signal**

A signal that can be applied to any output port that is not cross-connected to an input port. This signal lets downstream network elements know that the facility is operating normally even though it is not sending a normal DS3 signal.

**DS3 Interface Port**

Port on a circuit pack for DS3 connectors.

**DS3 Signal**

A logical or electrical B3ZS signal with a data rate of 44.736 Mb/s.

**DSX-1, 2, 3**

Digital cross-connect used to interconnect equipment, provide patch capability, and provide test access at the DS1, DS2, or DS3 level.

**Dual Ring Interworking (DRI)**

A topology in which two rings are interconnected at two nodes on each ring and operate so that inter-ring traffic is not lost in the event of a node or link failure at an interconnecting point.

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**E Electrical Carrier, Level 1 (EC-1)**

An electrical interface signal at the SONET rate of STS-1.

**Electromagnetic Compatibility (EMC)**

A measure of equipment tolerance to external electromagnetic fields.

**Electromagnetic Interference (EMI)**

High-energy, electrically induced magnetic fields that cause data corruption in cables passing through the fields.

**Electronic Industries Association (EIA)**

A trade association of the electronic industry that establishes electrical and functional standards.

**Electrostatic Discharge (ESD)**

Static electrical energy potentially harmful to circuit packs and humans.

**Entity**

A specific piece of hardware (usually a circuit pack, slot, or module) that has been assigned a name recognized by the system.

**Entity Identifier**

The name used by the system to refer to a circuit pack, memory device, or communications link.

**Equipment Protection**

Relates to the DS3 electrical interfaces, which are protected by 1xN equipment protection. This means that protection switching for electrical interfaces is supported at the level of the port unit (circuit pack).

**Equipment Protection**

Relates to the DS3 electrical interfaces, which are protected by 1xN equipment protection. This means that protection switching for electrical interfaces is supported at the level of the port unit (circuit pack).

**Equipped (EQ)**

Status of a circuit pack or interface module that is in the system database and physically in the frame, but not yet provisioned.

**Erbium**

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

**Erbium Doped Fiber Amplifier (EDFA)**

An amplifier that performs by having a light signal pass through a section of erbium-doped fiber and using the laser pump diode to amplify the signal.

**Errored Seconds (ES)**

A performance monitoring parameter. ES “type A” is a second with exactly one error; ES “type B” is a second with more than one and less than the number of errors in a severely errored second for the given signal. ES by itself means the sum of the type A and type B ESs.

**Establish**

A user initiated command, at the *WaveStar™* CIT, to create an entity and its associated attributes in the absence of certain hardware.

**Event**

A significant change. Events in controlled Network Elements include signal failures, equipment failures, signals exceeding thresholds, and protection switch activity. When an event occurs in a controlled Network Element, the controlled Network Element will generate an alarm or status message and send it to the management system.

**Event Driven**

A required characteristic of a network element or software system: NEs are reactive systems, primarily viewed as systems that wait for and then handle events. Events are provided by the external interface packages, the hardware resource packages, and also by the software itself.

**Express Ring**

One of multiple applications provided by the WaveStar 10G (OC-192) product. An express ring is a 10G-bit 2-fiber BLSR that is built using spare (available) fibers at an existing OC-48 NE which has exhausted its STS-1 capacity. The express ring is physically parallel to the existing OC-48 ring. As a contrast and where spare fibers are not available, an express ring cannot be constructed and the existing OC-48 ring must be upgraded to an OC-192 ring.

**Externally Timed**

An operating condition of a clock in which it is locked to an external reference and is using time constants that are altered to quickly bring the local oscillator's frequency into approximate agreement with the synchronization reference frequency.

**Extra traffic**

Unprotected traffic that is carried over protection channels when their capacity is not used for the protection of working traffic.

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**F Facility**

A one- or two-way circuit that carries a transmission signal.

**Failures in Time (FIT)**

Circuit pack failure rates per  $10^9$  hours as calculated using the method described in *Reliability Prediction Procedure for Electronic Equipment*, Telcordia Method I, Issue 5, September 1995.

**Far End (FE)**

Any other network element in a maintenance subnetwork other than the one the user is at or working on. Also called remote.

**Far-End Block Error (FEBE)**

An indication returned to the transmitting node that an errored block has been detected at the receiving node. A block is a specified grouping of bits.

**Far-End Receive Failure (FERF)**

An indication returned to a transmitting Network Element that the receiving Network Element has detected an incoming section failure. Also known as RDI (Remote Detect Indication).

**Fault**

Term used when a circuit pack has a hard (not temporary) fault and cannot perform its normal function.

**Fault Management**

Collecting, processing, and forwarding of autonomous messages from network elements.

**Fiber Distributed Data Interface (FDDI)**

Fiber interface that connects computers and distributes data among them.

**Flash EPROM**

A technology that combines the nonvolatility of EPROM with the in-circuit reprogrammability of EEPROM (electrically-erasable PROM).

**Folded Rings**

Folded (collapsed) rings are rings without fiber diversity. The terminology derives from the image of folding a ring into a linear segment.

**Forced**

Term used when a circuit pack (either working or protection) has been locked into a service-providing state by user command.

**Frame**

The smallest block of digital data being transmitted.

**Frame Relay (FR)**

A form of packet switching that relies on high-quality phone lines to minimize errors. It is very good at handling high-speed, bursty data over wide area networks. The frames are variable lengths and error checking is done at the end points.

**Framework**

An assembly of equipment units, such as a rack, that is capable of housing .

**Free Running**

An operating condition of a clock in which its local oscillator is not locked to an internal synchronization reference and is using no storage techniques to sustain its accuracy.

**FT-2000 ADR**

Lucent Technologies' OC-48 rate Add/Drop Rings lightwave Terminal for 2-fiber BLSRs. It is designed primarily for interoffice applications. It supports adds, drop, and through connections for DS3/EC-1, OC-3, IS-3, and OC-12.

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**G Gateway Network Element (GNE)**

A network element that passes information between other network elements and management systems through a data communication network.

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## **H Hairpinning**

A network topology in which tributary traffic is routed into and then back out of a single network element without being placed on a ring for transport. This cross-connection capability can bring traffic in from one remote site, cross-connect it at a different signal level, and transmit it to other remote sites without consuming any of the ring's capacity.

### **Hard Failure**

An unrecoverable nonsymptomatic (primary) failure that causes signal impairment or interferes with critical network functions, such as DCC operation.

### **High Level Data Link Control (HDLC)**

OSI reference model datalink layer protocol.

### **Holdover**

An operating condition of a clock in which its local oscillator is not locked to an external reference but is using storage techniques to maintain its accuracy with respect to the last known frequency comparison with a synchronization reference.

### **Hot Standby**

A circuit pack ready for fast, automatic placement into operation to replace an active circuit pack. It has the same signal as the service going through it, so that choice is all that is required.

### **Human Machine Language (MML)**

A standard language developed by the ITU for describing the interaction between humans and dumb terminals.

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## **I Idle**

An output port not cross-connected to an input port.

### **Idle Code**

A signal transmitted downstream automatically from an idle output port. It can also be transmitted downstream by a manual command from a cross-connected output port.

**Insert**

To physically insert a circuit pack into a slot, thus causing a system-initiated restoral of an entity into service and/or creation of an entity and associated attributes.

**In-Service (IS)**

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

**Integrated Transport Management Network Module (ITM NM)**

Lucent Technologies' integrated network management system that provides a broad end-to-end view of the SONET network.

**Integrated Transport Management SubNetwork Controller (ITM SNC)**

Lucent Technologies' SONET element management layer system that provides fault, configuration, and security functions through the use of a GUI.

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**J Jitter**

Short term variations of amplitude and frequency components of a digital signal from their ideal position in time.

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**L Lead Time**

The time interval between placement of a product order and receipt of the product.

**Lightguide Build-Out (LBO)**

An attenuating (signal-reducing) element used to keep an optical output signal strength within desired limits.

**Line**

A transmission medium, together with the associated equipment, required to provide the means of transporting information between two consecutive network elements. One network element originates the line signal; the other terminates it.

**Line Build Out (LBO)**

An equalizer network that guarantees the proper signal level and shape at the DSX panel.

**Line Controller Local Area Network (LCLAN)**

The internal local area network that provides communications between the controlled circuit packs.

**Line Protection**

The optical interfaces can be protected by line protection. Line protection switching protects against failures of line facilities, including the interfaces at both ends of a line, the optical fibers, and any equipment between the two ends. Line protection includes protection of equipment failures.

**Line Timing**

Refers to a network element that derives its timing from an incoming OC-N signal.

**Link**

The mapping between in-ports and out-ports. It specifies how components are connected to one another.

**Literal Character**

A letter, digit, or symbol that is entered in a command. The first hyphen in UNIT-{1-64} is a literal character; the braces and the second hyphen are not literal characters.

**Local Area Network (LAN)**

A communications network that covers a limited geographic area, is privately owned and user administered, is mostly used for internal transfer of information within a business, is normally contained within a single building or adjacent group of buildings, and transmits data at a very rapid speed.

**Location**

An identifier for a specific circuit pack, interface module, interface port, or communications link.



**Loopback**

Type of diagnostic test used to compare an original transmitted signal with the resulting received signal. A loopback is established when the received optical or electrical external transmission signal is sent from a port or tributary input directly back toward the output.

**Loop Timing**

A special case of line timing. It applies to network elements that have only one OC-N/STM-N interface. For example, terminating nodes in a linear network are loop timed.

**Loss Budget**

Loss (in dB) of optical power due to the span transmission medium (includes fiber loss and splice losses).

**Loss of Frame (LOF)**

A failure to synchronize to an incoming signal.

**Loss of Pointer (LOP)**

A failure to extract good data from a signal payload.

**Loss of Signal (LOS)**

The complete absence of an incoming signal.

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**M M23-Format**

A standard framing format used for DS3 signals produced by multiplexing 28 DS1s into a DS3 (sometimes referred to as M13-format, without C-bit parity).

**Major**

Indicates a service-affecting failure, main or unit controller failure, or power supply failure.

**Maintenance Condition**

An equipment state in which some normal service functions are suspended, either because of a problem or to perform special functions (copy memory) that can not be performed while normal service is being provided.

**Manual Switch State**

A protection group shall enter the Manual Switch State upon the initiation and successful completion of the Manual Switch command. The protection group leaves the Manual Switch state by means of the Clear or Forced Switch commands. While in the Manual Switch state the system may switch the active unit automatically if required for protection switching.

**Mapping**

The logical association of one set of values, such as addresses on one network, with quantities or values of another set, such as devices or addresses on another network.

**Mediation Device (MD)**

Allows for exchange of management information between Operations System and Network Elements.

**Mesh Network**

A standard topology used in Wide Area Networks to allow multiple routes between hosts in a network. Mesh topologies are relatively immune to bottleneck and component failure due to the variety of paths traffic can be routed around failed or busy components. The design is relatively expensive in terms of the cabling costs. A mesh network where every node is connected to every other node is known as a fully connected network.

**Mid-Span Meet**

The capability to interface between two lightwave network elements of different vendors. This applies to high-speed optical interfaces.

**Minor (MN)**

Indicates a non-service-affecting failure of equipment or facility.

**Miscellaneous Discrete Interface**

Allows an operations system to control and monitor equipment collocated within a set of input and output contact closures.

**Multiplexer**

A device (circuit pack) that combines two or more transmission signals into a combined signal on a shared medium.

**Multiplexing**

The process of combining multiple signals into a larger signal at the transmitter by a multiplexer. The large signal is then split into the original smaller signals at the receiver by a demultiplexer.

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**N Network Element (NE)**

A node in a telecommunication network that supports network transport services and is directly manageable by a management system.

**Network Monitoring and Analysis (NMA)**

An operations system designed by Telcordia which is used to monitor network facilities.

**Network Service Access Point (NSAP) Address**

Network Service Access Point Address (used in the OSI network layer 3). An automatically assigned number that uniquely identifies a Network Element for the purposes of routing DCC messages.

**Node**

A network element in a ring or, more generally, in any type of network. In a network element supporting interfaces to more than one ring, node refers to an interface that is in a particular ring. Node is also defined as all equipment that is controlled by one system controller. A node is not always directly manageable by a management system.

**Non-Preemptible Protection Access (NPPA)**

Non-preemptible protection access increases the available span capacity for traffic which does not require protection by a ring, but which cannot be preempted.

**Non-Revertive Switching**

In non-revertive switching, an active and standby line exist on the network. When a protection switch occurs, the standby line is selected to support traffic, thereby becoming the active line. The original active line then becomes the standby line. This status remains in effect even when the fault clears. That is, there is no automatic switch back to the original status.

**Non-Volatile Memory (NVM)**

Memory that retains its stored data after power has been removed. An example of NVM would be a hard disk.

**No Request State**

This is the routine-operation quiet state in which no external command activities are occurring.

**Not Monitored (NMON)**

A provisioning state for equipment that is not monitored or alarmed.

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**O Open Ring Network**

A network formed of a linear chain-shaped configuration of network elements. Each network element connects to two others, one on each side, except for two network elements at the ends which are connected on only one side. A closed ring can be formed by adding a connection between the two end nodes.

**Open Systems Interconnection (OSI)**

Referring to the OSI reference model, a logical structure for network operations standardized by the International Standards Organization (ISO).

**Operations Interface**

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

**Operations Interworking (OI)**

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

**Operations System (OS)**

A central computer-based system used to provide operations, administration, and maintenance functions.

**Operations System for Intelligent Network Elements (OPS/INE)**

A Telcordia configuration management operations system.

**Operator**

A user of the system with operator-level user privileges.

**Optical Carrier 3/Synchronous Transport Module 1 (OC3/STM1)**

The OC3/STM1 port unit provides a bidirectional port at the OC-3 rate.

**Optical Carrier 3/Synchronous Transport Module 1 (OC3/STM1)**

The OC3/STM1 port unit provides a bidirectional port which is provisionable at either the OC-12- or STM-1-rate.

**Optical Carrier 12/Synchronous Transport Module 4 (OC12/STM4)**

The OC12/STM4 port unit provides a bidirectional port at the OC-12 rate.

**Optical Carrier 12/Synchronous Transport Module 4 (OC12/STM4)**

The OC12/STM4 port unit provides a bidirectional port which is provisionable at either the OC-12- or STM-4-rate.

**Optical Carrier 48/Synchronous Transport Module 16 (OC48/STM16)**

The OC48/STM16 port unit provides a bidirectional port at the OC-48 rate.

**Optical Carrier 48/Synchronous Transport Module 16 (OC48/STM16)**

The OC48/STM16 port unit provides a bidirectional port which is provisionable at either the OC-48- or STM-16-rate.

**Optical Carrier 192/Synchronous Transport Module 64 (OC192/STM64)**

The OC192/STM64 port unit provides a bidirectional port which is provisionable at either the OC-192- or STM-64-rate.

**Optical Carrier N (OC-N)**

An optical carrier signal at the SONET rate of N, where N equals 1, 3, 12, 48, or 192. The basic rate of an OC-1 signal is 51.84 Mb/s, equivalent to an STS-1, with other values of N direct multiples of this basic rate.

**Optical Channel**

An OC-N/STM-N wavelength within an optical line signal. Multiple channels, differing by 1.5 $\mu$  in wavelength, are multiplexed into one signal.

**Optical Line Signal**

A multiplexed optical signal containing multiple wavelengths or channels.

**Orderwire (OW)**

A dedicated voice-grade line for communications between maintenance and repair personnel.

**Original Value Provisioning**

Preprogramming of a system's original values at the factory. These values can be overridden using local or remote provisioning.

**Outage**

A disruption of service that lasts for more than 1 second.

**Out-of-Service**

The circuit pack is not providing its normal service function (removed from either the working or protection state) either because of a system problem or because the pack has been removed from service.

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**P Parameter**

A variable that is given a value for a specified application. A constant, variable, or expression that is used to pass values between components.

**Parity Check**

Tests whether the number of ones (or zeros) in an array of binary bits is odd or even; used to determine that the received signal is the same as the transmitted signal.

**Pass-Through**

Paths that are cross-connected directly across an intermediate node in a network.

**Path**

A logical connection between the point at which a standard frame format for the signal at the given rate is assembled, and the point at which the standard frame format for the signal is disassembled.

**Path Overhead (POH)**

Informational bytes assigned to, and transported with the payload until the payload is demultiplexed. It provides for integrity of communication between the point of assembly of a virtual container and its point of disassembly.

**Path Terminating Equipment**

Network elements in which the path overhead is terminated.

**Performance Monitoring (PM)**

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

**Peripheral Control and Timing Facility Interface (PCTFI)**

A proprietary physical link interface supporting the transport of 21×2 Mb/s signals.

**Platform**

A family of equipment and software configurations designed to support a particular application.

**Plesiochronous Network**

A network that contains multiple subnetworks, each internally synchronous and all operating at the same nominal frequency, but whose timing may be slightly different at any particular instant.

**Polarization Mode Dispersion (PMD)**

Output pulse broadening due to random coupling of the two polarization modes in an optical fiber.

**Port (also called Line)**

The physical interface, consisting of both an input and output, where an electrical or optical transmission interface is connected to the system and may be used to carry traffic between network elements. The words “port” and “line” may often be used synonymously. “Port” emphasizes the physical interface, and “line” emphasizes the interconnection. Either may be used to identify the signal being carried.

**Port State Provisioning**

A feature that allows a user to suppress alarm reporting and performance monitoring during provisioning by supporting multiple states (automatic, in-service, and not monitored) for low-speed ports.

**Port Unit**

An interface circuit pack that receives and transmits optical and electrical signals.



**Preprovisioning**

The process by which the user specifies parameter values for an entity in advance of some of the equipment being present. These parameters are maintained only in NVM. These modifications are initiated locally or remotely by either a CIT or an OS. Preprovisioning provides for the decoupling of manual intervention tasks (for example, install circuit packs) from those tasks associated with configuring the node to provide services (for example, specifying the entities to be cross-connected).

**Proactive Maintenance**

Refers to the process of detecting degrading conditions not severe enough to initiate protection switching or alarming, but indicative of an impending signal failure or signal degrade defect.

**Protection**

Extra capacity (channels, circuit packs) in transmission equipment that is not intended to be used for service, but rather to serve as backup against equipment failures.

**Protection Access**

To provision traffic to be carried by protection tributaries when the port tributaries are not being used to carry the protected working traffic.

**Protection Group Configuration**

The members of a group and their roles, for example, working protection, line number, etc.

**Protection Path**

One of two signals entering a path selector used for path protection switching or dual ring interworking. The other is the working path. The designations working and protection are provisioned by the user, whereas the terms active path and standby path indicate the current protection state.

**Protection State**

When the working unit is currently considered active by the system and that it is carrying traffic. The “active unit state” specifically refers to the receive direction of operation — since protection switching is unidirectional.

**Provisioned (PROV)**

Indicating that a circuit pack is ready to perform its intended function. A provisioned circuit pack can be active (ACT), in-service (IS), standby (STBY), provisioned out-of-service (POS), or out-of-service (OOS).

**Provisioning**

The modification of certain programmable parameters that define how the node functions with various installed entities. These modifications are initiated locally or remotely by either a CIT or an OS. They may arrive at the node via the IAO LAN, CIT port, or any DCC channel. The provisioned data is maintained in NVM and/or hardware registers.

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**R Reactive Maintenance**

Refers to detecting defects/failures and clearing them.

**Receive-Direction**

The direction towards the Network Element.

**Regeneration**

The process of reconstructing a digital signal to eliminate the effects of noise and distortion.

**Reliability**

The ability of a software system performing its required functions under stated conditions for a stated period of time. The probability for an equipment to fulfill its function. Some of the ways in which reliability is measured are: MTBF (Mean Time Between Failures) expressed in hours; Availability =  $(MTBF)/(MTBF+MTTR)(\%)$  [where MTTR = mean time to restore]; outage in minutes per year; failures per hour; percentage of failures per 1,000 hours.

**Remote Defect Indication (RDI)**

An indication returned to a transmitting terminal that the receiving terminal has detected an incoming section failure. [Previously called far-end-receive failure (FERF).]

**Remote Failure Indication (RFI)**

A signal that alerts upstream path-terminating equipment that a downstream failure has been alarmed along the path. This action prevents multiple alarms from being activated for the same failure and ensures that a technician is dispatched to correct the failure. (Previously called yellow signals.)

**Remote Network Element**

Any Network Element that is connected to the referenced Network Element through either an electrical or optical link. It may be the adjacent node on a ring, or N nodes away from the reference. It also may be at the same physical location but is usually at another (remote) site.

**Return to Zero**

A code form having two information states (termed zero and one) and having a third state or an at-rest condition to which the signal returns during each period.

**Revertive**

A protection switching mode in which, after a protection switch occurs, the equipment returns to the nominal configuration (that is, the working equipment is active, and the protection equipment is standby) after any failure conditions that caused a protection switch to occur, clear, or after any external switch commands are reset. (See “Non-Revertive.”)

**Revertive Switching**

In revertive switching, there is a working and protection high-speed line, circuit pack, etc. When a protection switch occurs, the protection line, circuit pack, etc. is selected. When the fault clears, service “reverts” to the working line.

**Ring**

A configuration of nodes comprised of network elements connected in a circular fashion. Under normal conditions, each node is interconnected with its neighbor and includes capacity for transmission in either direction between adjacent nodes. Path switched rings use a head-end bridge and tail-end switch. Line switched rings actively reroute traffic over the protection capacity.

**Router**

An interface between two networks. While routers are like bridges, they work differently. Routers provide more functionality than bridges. For example, they can find the best route between any two networks, even if there are several different networks in between. Routers also provide network management capabilities such as load balancing, partitioning of the network, and trouble-shooting.

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**S Section**

The portion of a transmission facility, including terminating points, between a terminal network element and a line-terminating network element, or two line-terminating network elements.

**Section Layer**

The second of the four levels in a standard SONET signal, used to transport an STS frame across a physical medium. This layer uses the photonic layer to form the physical transport.

**Self-Healing**

A network's ability to automatically recover from the failure of one or more of its components.

**Server**

Computer in a computer network that performs dedicated main tasks which generally require sufficient performance.

**Severely Errored Seconds (SES)**

This performance monitoring parameter is a second in which a signal failure occurs, or more than a preset amount of coding violations (dependent on the type of signal) occur.

**Service**

The operational mode of a physical entity that indicates that the entity is providing service. This designation will change with each switch action.

**Signal-to-Noise Ratio (SNR)**

The relative strength of signal compared to noise.

**Signal Rate**

An attribute that defines the bit-rate and format of the signal. The signal rate is defined by the STS-N path-level signal bit-rate and format including the presence or absence of concatenation.

**Single-Ended Operations**

Provides operations support from a single location to remote Network Elements in the same SONET subnetwork. With this capability you can perform operations, administration, maintenance, and provisioning on a centralized basis. The remote Network Elements can be those that are specified for the current release.

**Single-Mode Fiber (SM)**

An 8- $\mu$  diameter low-loss, long-span optical fiber typically operating at either 1310 nm, 1550 nm, or both.

**Site Address**

The unique address for a Network Element.

**Slot**

A physical position in a shelf designed for holding a circuit pack and connecting it to the backplane. This term is also used loosely to refer to the collection of ports or tributaries connected to a physical circuit pack placed in a slot.

**Software Backup**

The process of saving an image of the current network element's databases, which are contained in its NVM, to a remote location. The remote location could be the WaveStar CIT or an OS.

**Software Download**

The process of transferring a generic (full or partial) or provisioned database from a remote entity to the target network element's memory. The remote entity may be the WaveStar CIT or an OS. The download procedure uses bulk transfer to move an uninterpreted binary file into the network element.

**Software ID**

Number that provides the software version information for the system.

**Span**

An uninterrupted bidirectional fiber section between two network elements.

**Span Growth**

A type of growth in which one wavelength is added to all lines before the next wavelength is added.

**Squelch Map**

This map contains information for each cross-connection in a ring and indicates the source and destination nodes for the low-speed circuit that is part of the cross-connection. This information is used to prevent traffic misconnection in rings with isolated nodes or segments.

**Standby**

The circuit pack is in service but is not providing service functions. It is ready to be used to replace a similar circuit pack either by protection or by duplex switching.

**Standby Path**

One of two signals entering a constituent path selector, the standby path is the path not currently being selected.

**State**

The state of a circuit pack indicates whether it is defective or normal (ready for normal use).

**Status**

The indication of a short-term change in the system.

**STS-1E**

Now referred to as EC-1. A signal typically carried by coaxial cables from one equipment location to another. The term EC-1 refers to the organization and data rate of the signal and also to the voltage template the signal must conform to and the impedances for which the voltage template is valid.

**STS-1**

The basic building block logical signal in the SONET standard with a data rate of 51.84 Mb/s.

**Subnetwork**

A group of interconnected/interrelated Network Elements. The most common connotation is a synchronous network in which the Network Elements have data communications channel (DCC) connectivity.

**SubNetwork Management System (SNMS)**

An Element Management System providing centralized, remote support for Lucent's WaveStar network elements. SNMS functions include configuration, fault, performance, and security management. This system can administer single NEs or subnetworks.

**Suppression**

A process where service-affecting alarms that have been identified as an "effect" are not displayed to a user.

**Synchronization Messaging**

Synchronization messaging is used to communicate the quality of network timing, internal timing status, and timing states throughout a subnetwork.

**Synchronous**

The essential characteristic of time scales or signals such that their corresponding significant instances occur at precisely the same average rate, generally traceable to a single Stratum-1 source.

**Synchronous Digital Hierarchy (SDH)**

A hierarchical set of digital transport structures, standardized for the transport of suitable adapted payloads over transmission networks.

**Synchronous Network**

The synchronization of transmission systems with synchronous payloads to a master (network) clock that can be traced to a reference clock.

**Synchronous Optical Network (SONET)**

The North American standard for the rates and formats that defines optical signals and their constituents.

**Synchronous Payload**

Payloads that can be derived from a network transmission signal by removing integral numbers of bits from every frame. Therefore, no variable bit-stuffing rate adjustments are required to fit the payload in the transmission signal.

**Synchronous Payload Envelope (SPE)**

The combined payload and path overhead of an STS-1, STS-3c, STS-12c or STS-48c signal.

**Synchronous Transport Signal (STS, STS-N)**

The basic logical building block signal for SONET with a rate of 51.84 Mb/s for an STS-1 signal and a rate of N times 51.84 Mb/s for an STS-N signal.

**Synchronous Transport Signal, Level N, Concatenated (STS-Nc)**

A concatenated SONET payload signal at the STS-N rate, where N equals 3, 12, or 48. For example, an STS-3c signal is constructed by concatenating three STS-1 signals into a signal that uses a single path overhead, rather than three.



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**T T1**

A carrier system that transmits at the rate of 1.544 Mb/s (a DS1 signal).

**T2**

A carrier system that transmits at the rate of 6.312 Mbps (a DS2 signal).

**T3**

A carrier system that transmits at the rate of 44.736 Mbps (a DS3 signal).

**Target Identifier (TID)**

A provisionable parameter that is used to identify a particular Network Element within a network. It is a character string of up to 20 characters where the characters are letters, digits, or hyphens (-).

**Transmission Control Protocol/Internet Protocol (TCP/IP)**

An open network standard that defines how devices from different manufacturers communicate with each other over interconnected networks. TCP/IP protocols are the foundation of the Internet.

**Telcordia Technologies**

Telcordia Technologies (formerly Bellcore) is a well-recognized telecommunications' standards organization.

**Through (or Continue) Cross-Connection**

A cross-connection within a ring, where the input and output tributaries have the same tributary number but are in lines opposite each other.

**Threshold-Crossing Alert (TCA)**

A message type sent from a Network Element that indicates that a certain performance monitoring parameter has exceeded a specified threshold.

**Through Timing**

Refers to a network element that derives its transmit timing in the east direction from a received line signal in the east direction and its transmit timing in the west direction from a received line signal in the west direction.

**Time Division Multiplexing (TDM)**

A technique for transmitting a number of separate data, voice, and/or video signals simultaneously over one communications medium by interleaving a portion of each signal one after another.

**Time Slot Assignment (TSA)**

A capability that allows any tributary in a ring to be cross-connected to any tributary in any lower-rate, non-ring interface or to the same-numbered tributary in the opposite side of the ring.

**Time Slot Interchange (TSI)**

The ability of the user to assign cross-connections between any tributaries of any lines within a Network Element. Three types of TSI can be defined: Hairpin TSI, Interring TSI (between rings), and Intraring TSI (within rings).

**Transaction Language One (TL1)**

A machine-to-machine communications language that is a subset of ITU's human-machine language.

**Transmit-Direction**

The direction outwards from the Network Element.

**Tributary**

A path-level unit of bandwidth within a port, or the constituent signal(s) being carried in this unit of bandwidth, for example, an STS-1 tributary within an OC-N port.

**True Wave™ Optical Fiber**

Lucent Technologies' fiber generally called non-zero dispersion-shift fiber, with a controlled amount of chromatic dispersion designed for amplified systems in the 1550/1310 nm range.

**Two-Way Point-to-Point Cross-Connection**

A two-legged interconnection, that supports two-way transmission, between two and only two tributaries.

**Two-Way Roll**

The operation which moves a two-way cross-connection between tributary i and tributary j to a two-way cross-connection between the same tributary i and a new tributary k with a single user command.

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**U    Unavailable Seconds (UAS)**

In performance monitoring, the count of seconds in which a signal is declared failed or in which 10 consecutively severely errored seconds (SES) occurred, until the time when 10 consecutive non-SES occur.

**Upstream**

At or towards the source of the considered transmission stream, for example, looking in the opposite direction of transmission.

**User Privilege**

Permits a user must perform on the computer system on which the system software runs.

**User-to-Network Interface (UNI)**

The specifications for the procedures and protocols between a user and the Asynchronous Transfer Mode (ATM) network.

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**V    Value**

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

**Variable**

An item of data named by an identifier. Each variable has a type, such as Int or Object, and a scope.

**Violation Monitor and Removal (VMR)**

A provisionable mode for DS3 output that causes parity violations to be monitored and corrected before the DS3 signal is B3ZS encoded.

**Virtual**

Refers to artificial objects created by a computer to help the system control shared resources.

**Virtual Circuit**

A logical connection through a data communication (for example, X.25) network.

**Virtual Concatenation**

SONET or SDH implementation of inverse multiplexing that allows the characteristic information of a virtual concatenated STS-n-Xv or VC-n-Xv layer network to be transported via a bundle of X STS-n or VC-n network connections.

**Virtual Concatenated Group**

A group of X individual STS-n or VC-n network connections that are virtually concatenated to offer larger payload bandwidth. The notation STS-n-Xv or VC-n-Xv is used to refer to virtual concatenation.

**Virtual Tributary (VT)**

A structure designed for transport and switching of sub-STS-1 payloads. There are currently four sizes: VT1.5 (1.728 Mb/s), VT2 (2.304 Mb/s), VT3 (3.456 Mb/s), and VT6 (6.912 Mb/s).

**Virtual Tributary Group (VT-G)**

A 9-row by 12-column structure (108 bytes) that carries one or more VTs of the same size. Seven VT groups (756 bytes) are byte interleaved with the VT-organized synchronous payload envelope.

**Voice Frequency (VF) Circuit**

A 64 kilobit per second digitized signal.

**Volatile Memory**

Type of memory that is lost if electrical power is interrupted.

**VT1.5 Tributary**

A SONET logical signal with a data rate of 1.728 Mbps. In the 9-row structure of the STS-1 SPE, a VT1.5 occupies three columns. VT-structured STS-1 SPEs are divided into seven VT groups. Each VT group occupies twelve columns of the 9-row structure and, for VT1.5s, contains four VTs per group.

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**W Wait-to-Restore (WTR)**

Applies to revertive switching operation. The protection group enters the WTR state when all Equipment Fail (EF) conditions are cleared, but the system has not yet reverted back to its working line. The protection group remains in the WTR state until the Wait-to-Restore timer completes the WTR time interval.

**Wait to Restore Time (WRT)**

Corresponds to the time to wait before switching back after a failure has cleared (in a revertive protection scheme). The WRT can be between 0 and 15 minutes, in increments of one minute.

**Wavelength Add/Drop (WAD)**

The process of adding and dropping wavelengths to provide more efficient transmission.

**Wavelength Division Multiplexing (WDM)**

A means of increasing the information-carrying capacity of an optical fiber by simultaneously transmitting signals at different wavelengths.

**Wavelength Interchange**

The ability to change the wavelength associated with an OC-N signal into another wavelength.

**WaveStar Optical Line System**

Lucent Technologies' lightwave transmission system. Utilizing DWDM technology, the system combines multiple signals of different wavelengths, transmits the resulting signal over a single fiber, and then demultiplexes the signal at the receive end.

**Wide Area Network (WAN)**

A communication network that uses common-carrier provided lines and covers an extended geographical area.

**Wideband Communications**

Voice, data, and/or video communication at digital rates from 64 kb/s to 2 Mb/s.

**Working**

Label attached to a physical entity. In case of revertive switching the working line or unit is the entity that is carrying service under normal operation. In case of nonrevertive switching the label has no particular meaning.

**Working State**

A working unit that is currently considered active by the system and is carrying traffic in the working state.

---

**X X.25 Interface/Protocol**

The ITU packet-switched interface standard for terminal access that specifies three protocol layers: physical, link, and packet for connection to a packet-switched data network.

**X-Terminal**

Workstation that can support an X-Windows interface.

---

**Z Zero Code Suppression**

A technique used to reduce the number of consecutive zeros in a line-coded signal (B3ZS, B8ZS).



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