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Test & Measurement

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Complimentary Reference Material

This PDF has been made available as a complimentary service for you to assist in evaluating this model for your testing requirements.

TMG offers a wide range of test equipment solutions, from renting short to long term, buying refurbished and purchasing new. Financing options, such as Financial Rental, and Leasing are also available on application.

TMG will assist if you are unsure whether this model will suit your requirements.

Call TMG if you need to organise repair and/or calibrate your unit.

If you click on the "Click-to-Call" logo below, you can call us for FREE!

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Product Lifecycle Management System

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NIC 10G Online Help User's Guide

July 2003

Document No. CO 002656K – Version 3.2

This document is provided so that you can print specific online help topics. It contains the same information that appears in the unit's online help file, which is accessed by selecting the HELP tab on the unit's screen.



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Introduction



Welcome!

Digital Lightwave, Inc. is pleased to present the Network Information Computer (NIC) Online Help.

To view and select topics, press the folder icons and topics on the left. Use your finger or a blunt object, such as a pencil eraser or the back of a pen, to select touch screen items.

Have questions regarding your NIC unit? Contact our Technical Support personnel.

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15 July 2003

Version Information

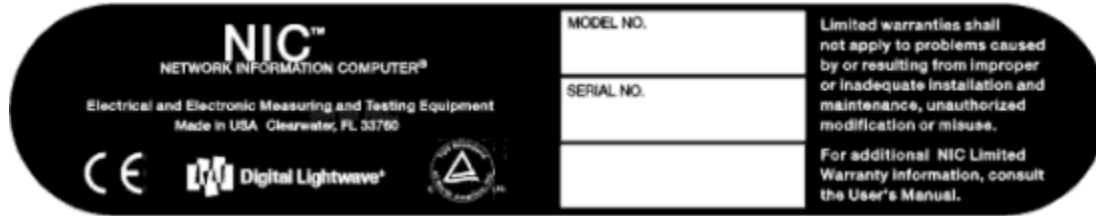
NIC 10G™ Online Help Version: 3.2

Last updated: 15 July 2003

Document Number: CO 002656K

For unit's hardware serial number and software release information, see How to Display Serial Numbers and Software Revision.

In addition, more information is available on the unit's label:



Product Overview

The NIC 10G includes substantial advantages that have made the NIC platform the product of choice for many leading telecommunications service providers and equipment manufacturers. The NIC 10G is:

- **Easy to use.** An intuitive, touch-sensitive graphical user interface facilitates fast, easy configuration, enabling technicians of any experience level to perform sophisticated network testing.
- **Truly portable.** The NIC is the size of a laptop computer (weighing only 11 pounds), making it significantly lighter and easier to transport than other competing test devices.
- **Affordable.** The NIC 10G is the lowest cost solution on the market.
- **Upgradable.** With its flexible software/firmware design, it is configurable to meet current needs and easily upgradable as network environments advance.
- **Interoperable.** The NIC 10G is fully compatible with the entire NIC product line.

With the installation and maintenance testing capability of the SONET/SDH product, the NIC can be used to perform functional real-time testing on DWDM systems, line regenerators, and synchronous line multiplexers. In addition, the NIC 10G allows technicians to observe and even modify the SONET and SDH overhead to verify that their network operates correctly and responds in cases of trouble. The NIC 10G's internal power meter function also gives technicians the ability to ensure that proper optical power levels are being received and transmitted.

Features

The NIC 10G provides the following features and enhancements:

- OC-192 SONET protocol processor (includes Transmit and Receive mode STS-192c)
- STM-64 SDH protocol processor
- OC-48 Add and Drop capability
- SONET 1310 or 1550 nm wavelength laser option

- Conforms to the following ANSI, ITU, and Telcordia/Bellcore specifications:
 - ANSI T1.105
 - Bellcore GR-253-CORE and GR-1377-CORE
 - ITU-T G.783, G.707, O.151
- Supports alarm/error generation and analysis
- Active matrix color touch screen display
- PC Card (PCMCIA) interface for modem and memory storage
- Built-in optical power and frequency measurement

Technical Specifications

The following is a list of technical specifications for the NIC 10G.

Specifications are subject to change without notice.

Physical Characteristics

Operating Temperature:	0° to 40° C @ 85% Relative Humidity
Storage Temperature:	-20° to 60° C @ 95% Relative Humidity
Power Requirements:	90-132, 180-264 VAC, 47-63 Hz, 130 watts max.
Dimensions:	10.1" H x 12.3" W x 4.7" D (257 mm x 312 mm x 120 mm)
Weight:	Approximately 11 pounds (4.99 Kg.)

Auxiliary Interfaces

Optical Connectors:	SC (standard), FC, ST (optional)
RS-232:	DB-9 male
Parallel Port:	DB-25 female
USB:	For future use
Input/Output Trigger:	SMA
Clock Out:	SMA
BITS/SETS Clock:	Bantam
PC Card (PCMCIA):	Dual-slot PC Card slot; accepts two Type II PC Cards or one Type III PC Card
10BaseT:	8-pin RJ45

Specifications

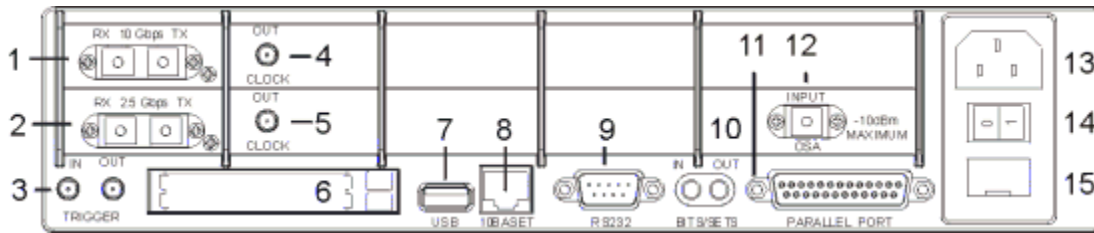
NIC 10G Online Help

Line Code:	NRZ (SONET)
	NRZ (SDH)
Mapping:	STS-192c, STS-48c (SONET)
	AU-4-64c, AU-4-16c (SDH)
Framing:	A1 and A2 bytes
Line Rate:	Stratum III compliant, offset capability \pm 100.0 ppm
Input Signal Measurement for OC-192/STM-64:	Optical Power meter: 0 to -26 dBm \pm 1.5 dB Frequency measurement range: N x 51.84 MHz, \pm 100 ppm
Input Signal Measurement for OC-48/STM-16:	Optical Power meter: 0 to -26 dBm \pm 1.5 dB Frequency measurement range: 2.48832 GHz, \pm 50 ppm
Synchronization:	Internal, received SONET or SDH signal, BITS (1.544 Mb/s), SETS (2.048 Mb/s)
Level (Tx) for OC-192/STM-64:	1550: Intermediate range compliant 1330: Short reach compliant
Level (Rx) for OC-192/STM-64:	1 dBm to -14 dBm
Level (Tx) for OC-48/STM-16:	1310: Single mode, Long Reach compliant, 1260-1360 nm, 1308 nm typical 1550: Single mode, Long Reach compliant, 1480-1580 nm, 1554 nm typical Dual 1310/1550: Comprised of 1310 nm and 1550 nm laser options listed above and additional 1 dB power reduction.
Level (Rx) for OC-48/STM-16:	-2 dBm to -26 dBm, -30 dBm typical minimum at 10^{-10} BER with $2^{23}-1$ PRBS pattern
Connectors:	Optical: SC (standard), FC-PC, ST (optional)
Error Measurements:	B1, B2, B3, REI-L, REI-P, BIT, NDF-P (SONET) B1, B2, B3, MS-REI, HP-REI, BIT, NDF (SDH)

Alarm Detection / Generation:	Section (SONET): LOF, LOS, SEF Line (SONET): AIS-L, RDI-L Path (SONET): AIS-P, LOP-P, RDI-P, UNEQ-P, Pattern Sync
	Regenerator Section (SDH): LOF, LOS, OOF Multiplex Section (SDH): MS-AIS, MS-RDI Higher-Order Path (SDH): AU-MIS, AU-LOP, HP-UNEQ, HP-RDI, Pattern Sync, AU-AIS, RS-TIM, HP-TIM, HP-PLM
Patterns:	2 ¹⁵ -1 PRBS, 2 ¹⁵ -1 PRBS Inverted, 2 ²³ -1 PRBS, 2 ²³ -1 PRBS Inverted, 2 ³¹ -1 PRBS, 2 ³¹ -1 PRBS Inverted, all zeros, all ones, 32-Bit User Defined
APS Commands:	Support of Linear and Ring Mode commands
Control and Monitoring:	Control (transmit) of SONET Transport OH and Path OH bytes Monitoring of all SONET Transport OH and Path OH bytes Control (transmit) of SDH Regenerator Section, Multiplex Section, and Higher-Order Path OH bytes Monitoring of all SDH RS, MS, and HP OH bytes
Error Insertion:	B1, B2, B3, REI-L, REI-P, BIT, NDF-P (SONET) B1, B2, B3, MS-REI, HP-REI, BIT, AU-NDF (SDH)
Error Insertion Rate:	Bit: Single, 10 ⁹ to 10 ³ , User Programmable Other Errors: Single 10 ⁹ to 10 ³ maximum, User Programmable

Connector Panel

The NIC 10G connector panel contains a variety of auxiliary interfaces as described below.



	Connector	Description
1	10 Gbps RX and TX	Optical output and input connectors for OC-192 and STM-64 optical rates. The NIC supports the following optical connectors: SC, ST, and FC.
2	2.5 Gbps RX and TX	Optical output and input connectors for OC-48 and STM-16 optical rates. The NIC supports the following optical connectors: SC, ST, and FC. Note: These connectors only appear if the unit is configured with the OC-48/STM-16 hardware.
3	Trigger In and Out	SMA connectors used for trigger operation.
4	Clock Out	SMA connector that allows a trigger output for use of optical OC-192/STM-64 eye diagram analysis.
5	Clock Out	SMA connector that allows a trigger output for use of optical OC-48/STM-16 eye diagram analysis. Note: This connector only appears if the unit is configured with the OC-48/STM-16 hardware.
6	PCMCIA (PC Card)	Dual-slot PC Card slot that can accept: <ul style="list-style-type: none"> • Two Type II PC Cards (typically modems or SRAM Flash cards) • One Type III PC Card (typically mass storage)
7	USB	Universal Serial Bus for future expansion of USB product support.
8	10BaseT	8-pin modular jack for Ethernet

		connection.
9	RS232	9-pin male modular connector for modem, direct serial connection, or serial printer.
10	BITS/SETS In and Out	Bantam jacks for external timing equipment. BITS clocking supports 1.544 Mhz. SETS clocking supports 2.048 Mhz.
11	Parallel Port	25-pin female connector for parallel printer.
12	OSA Input	SC optical input connector for Optical Spectrum Analyzer operation. (This connector is not available if the 2.5G TX/RX hardware is installed.) Note: To avoid damaging the unit, do not exceed the maximum input power of -10 dBm.
13	Power Cord Connector	AC input connector. Accepts a 3-prong, grounded Type 13 connector.
14	Power Switch	Turns unit on or off (0=off, 1=on).
15	Fuse Compartment	Contains two 1.5 amp Slo-Blo fuses. Note: Fuses are not field serviceable.

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Overview

This section includes information to help you to use your system. It is broken into the following topics:

- Getting Started: Contains sections on screen components, powering on and off the unit, and product information.
- Common Tasks: Includes general tasks.
- Troubleshooting: Includes resolutions to common user interface problems.

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Getting Started

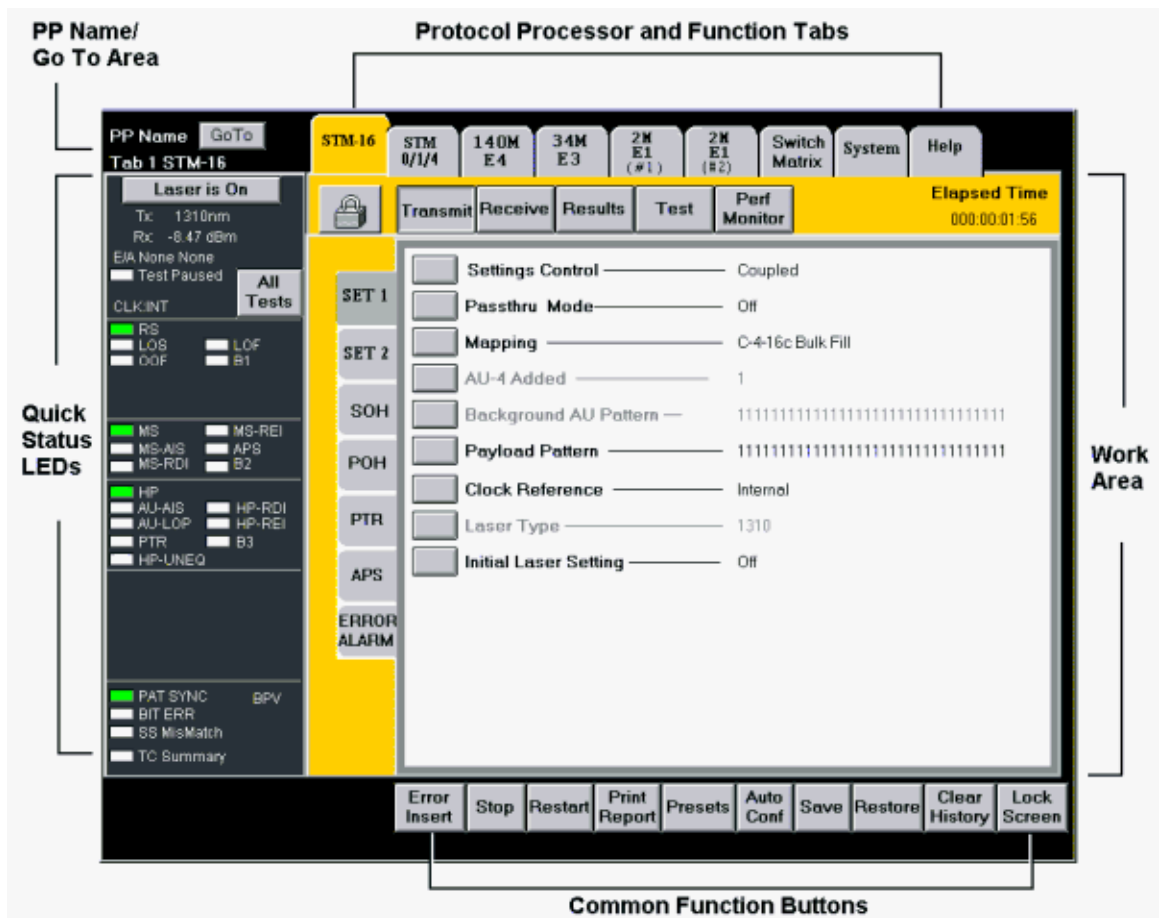
Screen Components

The main screen is the user interface to the system. Through this display, you can view the configuration of the test unit, start and stop numerous tests, and collect a variety of statistics about test unit performance.

If you are using a portable product that has a touch screen, place your finger directly onto the screen to select tabs and buttons associated with a specific function. **A blunt object, such as the back of a pen or pencil eraser, can also be used to select touch screen functions.**

Warning: Avoid using sharp instruments, such as pen tips, pencil tips, keys, and paper clips. These objects may scratch and mark the touch screen.

The following is an example of the main screen (STM-16 mode is shown) with the main regions labeled.



The main screen contains five main regions:

Common Tasks and Functions Online Help

- Quick Status LEDs
- Protocol Processor and Function Tabs
- PP Name/Go To Area
- Work Area
- Common Function Buttons

Technical Support

Our Technical Support representatives are available to help at the following toll-free numbers:

- 1-877-929-HELP (4357)
- 1-800-548-9283

Note: International customers, call 1-727-519-2860.

Standard Service Hours

8:00 am to 6:30 pm ET, Monday through Friday.

Extended Service Hours

24 hours a day, 7 days a week

Note: Extended Service is available to all premier accounts free of charge. Ask your account manager for details.

Email

You may also contact our Technical Support reps via email at support@lightwave.com

Agency Approvals



TUV Rheinland of North America is the test laboratory used.

For NIC 2.5G and NIC 10G:

TUV Safety File No. E2073411.01/E2073412.01/E2073414.01/.02

EMC Report File (NIC 10G) P2071068.01

EMC Report File (NIC 2.5G) P2071251.01/.02

CU License No. CU2071103.01

CDRH Accession No. 0021615

For NIC Plus:

TUV Safety File No. E2173656.01/E2173655.01

EMC Report File No. P2171264.01

CE Report File No. E2173659.01

CB Report File No. E2173657.01

CU License No. CU2173522.01

For NAA IV:

TUV Safety File No. E2171119.01/E2171120.01/E2171121.01

EMC Report No. P2171118.01

CU License No. CU2173727

GS License No. S2173726

CDRH Accession No. 9922616

For DCA 425:

Common Tasks and Functions Online Help

TUV Safety File No. E2173405.01/E2173406.01

EMC Report File No. P2171005.01

CU License No. CU2179070.01/.02

CDRH Accession No. 9922616

Standards products were tested to:

EMC Standards

- EN 55024
- EN 55022
- EN 61326-1
- EN 55011
- EN 300386-2 (NAA IV only)

Safety Standards

- EN 60950
- IEC950/UL1950/IEC60950
- CSA 22.2 No. 950

Safety Guidelines for Portable Products

The following safety precautions are provided to avoid injury and prevent damage to this product or any products connected to it during normal operation. Only qualified maintenance personnel should perform service procedures.


- **Use Proper Power Cord:** To avoid fire hazard, only use the power cord specified for this instrument. For use in North America, use a power cord (maximum 6-foot length) with a type SJT, 18 AWG, two conductor with ground, IEC 320 connector on one end and a NEMA 5-15 connector on the other end.

For use outside of North America, use an HO5VV-F power cord with a 1-mm², two conductor plus ground, IEC 320 connector on one end, and a wall-socket plug on the other end that is certified for use in the country of installation.



The entire cord set must be certified for use in the country of installation.

- **Avoid electric overload.** This unit is designed to be powered from 100–120 and 200–240 VAC, 50–60 Hz. To avoid electric shock, fire hazard, or damage to the instrument, do not apply a higher voltage.
- **Ground the instrument.** The unit is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the instrument, ensure that the product is properly grounded.
- **Do Not Operate in Hazardous Conditions.** To avoid injury or fire hazard, do not operate this instrument in wet, damp, or other hazardous condition. Do not operate this instrument in an explosive atmosphere.
- **Eye Protection.** Users should never stare into unterminated connectors or broken fibers. In addition, fiber cables and interfaces should always be handled as if they were emitting laser light. Always leave protective covers on optical connectors to prevent damage and prevent laser emissions.
- **Field Service:** This equipment is not intended to be serviced in the field. All service is intended to be completed by Digital Lightwave, Inc.

 **Warning:** This is a Class A product per EN55022. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures. Cables used should be less than 3-meters long for compliance with EMC directive.

- **Environmental Statement:** This product may contain lead-based solder materials and a lithium battery for computer support. Please return all Digital Lightwave products to the factory for proper disposal. Operation of this product is not hazardous to the environment.
- **Laser Safety:** The unit contains Class 1 laser devices (21 CFR 1040.10 and 1040.11 Compliant; EN60825-1:1993+A11+A2). Never look into an unterminated fiber. Always place dust caps on the optical ports when fiber is not attached to the optical ports.



Class 1 Laser Product

NOTICE
Unterminated optical connectors may emit laser radiation. Do not view with optical instruments.

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

CDRH Accession Numbers

NIC10G/NIC 2.5G: 0021615

DCA 425: 9922616

Safety Guidelines for Rackmount Products

Read and follow all warnings, cautions, and instructions marked on the product and included in this document. Only qualified personnel should perform installation or service.

This unit is designed to be NEBS Level 3 Conformant per Telcordia/Bellcore GR-1089-CORE and GR-63-CORE.

1. Always wear an ESD wriststrap and follow appropriate ESD procedures when installing or servicing the unit and its components.
2. The unit is suitable for connection to intra-building or non-exposed cabling only per Telcordia/Bellcore NEBS GR-1089-CORE.
3. Turn off the unit's subpanel circuit breakers when making power input connections.
4. Verify that the input power requirements (-42 VDC to -56 VDC) are correct before installing the unit. This product is intended to operate from a -48 VDC source derived from batteries, SELV, or an NEC Class II device.
5. Do not attempt to lift and install the unit alone. A fully configured unit can weigh up to 58 pounds (26.31 kgs.).
6. The unit is configured and shipped to mount into a 23- or 19-inch rack. A minimum of four mounting screws are required to attach the unit to a rack's mounting rails. Eight mounting screws are recommended. Mounting screws are the responsibility of the customer.
7. Always make sure that a component is installed into the correct slot. (Use the label, visible when components are removed, to verify the slot position.)
8. An empty slot should never be exposed. Always have an empty slot covered by the appropriate blank faceplate when a component is removed for any period of time. This is required for NEBS GR-1089-CORE and EMC conformance.
9. The optical circuit packs contain Class 1 laser devices. Never look into an unterminated fiber. Always place shutters on the optical ports when fiber is not attached to the optical ports. The unit contains Class 1 laser devices CDRH Accession Number: 9922616; 21CFR 1040.10 and 1040.11 compliant; EN60825-1:1993+A11+A2.



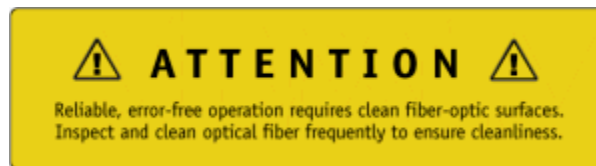
Class 1 Laser Product

NOTICE

Unterminated optical connectors may emit laser radiation. Do not view with optical instruments.

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

Fiber-Optic Cleaning Procedure



With fiber optics, the tolerance to dirt is near zero. Oils, greases, airborne particles of dust, lint, and other debris are all very harmful to fiber-optic cables. They can scratch and damage fiber-optic connectors if not removed. Not only can scratches and debris harm the connectors, but they also can jeopardize the integrity and accuracy of the optical signal.

The ferrule end faces of fiber optic patch cords and receptacle connectors are some of the most critical components for fiber optical networks. *Prior to inserting any patch cord into the test equipment's receptacle connector, clean and examine the patch cord's and the receptacle's connectors to verify the quality of each.*

Inspect the Ferrule End Face of a Patch Cord Connector

⚠ WARNING: Never look into the end of a fiber, through a microscope or your bare eye, if the other end is connected to an operating piece of network or test equipment!

1. Prior to inserting any patch cord into the microscope, verify that the other end is not connected to an operating piece of network equipment.
2. Visually examine the end face of the connector using a fiber-optic microscope.
3. If the end face of the connector is unacceptable, properly clean the connector prior to use.
4. If the end faces are acceptable, then use the fiber-optical patch cord as intended. If the end faces are not acceptable, then clean the connectors and reexamine them again.

To Clean a Patch Cord Connector Using Lint-Free Tissue and Alcohol


1. Using the pressurized canned air, blow away any dust particles that may be on the exterior surface of the connector, particularly the sides and end face of the ferrule. Hold the can approximately two inches from the surface to be cleaned and apply three to five short blasts of air.
2. Next, using an Optic Prep (or any lens-grade lint-free tissue moistened with isopropyl alcohol), gently and slowly slide the tissue across the tip of the ferrule end face in one sweeping move.
3. Repeat the last step again using a clean section of the tissue.

 **WARNING: Only isopropyl alcohol should be used because some solvents might attack epoxy.**


Performing Periodic Maintenance on the Patch Cord Connector Using a CLETOP Cleaner

CLETOP cleaners provide a thorough and easy method of cleaning optical connectors. It uses a reel-type cassette of dry, woven polyester, alcohol-free, cloth film. It is a fast and reliable remover of dirt, lint, and debris from the ferrule end face of the optical connector. This cleaner should be used on the patch cord periodically if the patch cord is frequently inserted and removed from the test equipment.

1. To clean the ferrule end face of the connector, advance a clean portion of the reel by depressing the side lever with your thumb.
2. Gently stroke the tip of the connector along the exposed film in the manner according to the directions on the label.
3. While sliding the connector along the blue film, slightly twist the connector between your thumb and finger to assure a thorough cleaning.

 If the end-face of the patch cord is damaged or scratched beyond cleaning or repair, replace the patch cord with a new one whose end faces are acceptable.

4. Inspect the connector receptacle of the network test equipment.

 **WARNING: Always turn the test equipment's laser OFF before inserting the video micro-scope into the receptacle, or looking directly into the receptacle of the test equipment!**

5. Prior to inserting the video microscope, verify that either the unit or its laser is turned OFF.

6. Using the pressurized canned air, blow away any dust particles that may be on the interior surface of the receptacle. If dirt is present inside the receptacle, it can scratch the lens of the video microscope, or the end-face of the connector.
7. Insert the video microscope into the receptacle. Using the monitor, visually examine the receptacle's end face of the connector.
8. If the receptacle's end face has a build up of dust, dirt, or any debris, clean the receptacle according to the next procedure.

To Clean a Connector Receptacle (also referred to as a bulkhead or adapter)

1. Using the pressurized canned air, blow away any dust particles that may be on the interior surface of the receptacle, particularly the inside walls of the alignment sleeve. Hold the can approximately two inches from the receptacle to be cleaned and apply three to five short blasts of air.
2. Moisten the end of a 2.5-mm foam swab with isopropyl alcohol, and insert it into one side of the receptacle. Move the swab in and out two or three times and then remove it.
3. Moisten the end of a NEW swab with alcohol, and insert it into the open side of the receptacle. Rotate the swab back and forth 90-degrees twice and then remove it.
4. Dry the inside of the receptacle by holding the pressurized canned air approximately two inches from the end of the receptacle and applying three to five short blasts of air.



Only use foam swabs; cotton swabs leave particles and threads behind.

Return Shipping Instructions

If it is necessary to return the unit, obtain a **Return Material Authorization (RMA)** number and return shipping address by contacting Customer Service between 8:30 A.M. and 6:30 P.M. eastern time, Monday through Friday.

Please enclose a letter that briefly describes the reason for returning the unit and include the following information:

- Unit Serial Number
- Customer name and shipping address
- Customer contact name and telephone number
- Secondary customer contact name and telephone number
- Customer supplied purchase order number (if applicable)

Shipping with the Original Container

If you have the original shipping container (box):

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1. Place the unit (and letter that describes the reason for the return) into the canvas carry bag, and pack it into the original Digital Lightwave, Inc. shipping container. Do **not** include personal items such as jumper cords or connectors. Digital Lightwave, Inc. will not be responsible for these items. Use the original foam inserts to protect all six sides of the unit.
2. Securely seal the shipping container and mark **FRAGILE** on the container to ensure careful handling.
3. Include the RMA number on the outside of the shipping container.
4. Contact Technical Support for the Repair Department's return shipping address.

Shipping Without the Original Container

If you do not have the original shipping container:

- You may purchase a shipping container from Digital Lightwave, or
- You can pack the unit (and letter describing the reason for return) into the canvas carry bag, and use the following general instructions to repack the unit using commercially available materials:
 1. Use a strong shipping container, similar to the original unit shipping box. Verify that the substitute container is rated at 350 lbs. per square inch pressure durable.
 2. Make sure that the unit is satisfactorily protected by using a layer of ESD-protected short absorbing foam material. The foam padding must be three to four inches in thickness (70 to 100 mm) and applied to all six sides of the unit to provide adequate protection. Make sure that the canvas bag and unit cannot move or shift within the container.
 3. Securely seal the shipping container and mark **FRAGILE** on the container to ensure careful handling.
 4. Include the RMA number on the outside of the shipping container.
 5. Contact Technical Support for the Repair Department's return shipping address.

When service is complete, your unit will be returned to you postage paid if the shipment is within the United States. You are responsible for paying all shipping charges, duties, taxes, and other charges for products returned to Digital Lightwave, Inc. from any location within or outside of the United States.

Warranty and Repair

Limited Warranty for Equipment

Seller warrants to the first purchaser of this Digital Lightwave, Inc. product that all components of the product will function in accordance with Seller's published specifications under normal conditions of use for a period of three (3) years from the date of shipment. Seller warrants to the first purchaser of this Digital

Lightwave, Inc. product that the laser transmitter unit will function in accordance with Seller's published specifications under normal conditions of use for a period of three (3) years from the date of shipment. During the warranty period, Seller's liability is expressly limited, at Seller's election, to repairing or replacing the product or component not complying with this Limited warranty as determined by Seller's inspection, or to the repayment of, or crediting the first purchaser with, an amount equal to the purchase price of the product, whether the first purchaser's claims are for breach of warranty or negligence. The foregoing remedy as provided herein shall be the sole and exclusive remedy of the first purchaser.

Limited Warranty for Software and Firmware

Seller warrants to the first purchaser of this Digital Lightwave, Inc. product that each item of Software and Firmware included in the Product, in its unaltered form, will conform substantially to the then-current functional specifications for three (3) years from its installation date, provided such Software or Firmware is used in a manner consistent with Seller's applicable minimum equipment and software or firmware configuration specifications. Seller will make reasonable efforts to correct any errors reflecting significant deviations from the functional specifications as are reported by first purchaser to Seller during such warranty period. Because not all errors in Software or Firmware can or need be corrected, Seller does not warrant that all Software or Firmware defects will be corrected. Similarly, Seller does not warrant that the Software or Firmware will meet first purchaser's requirements or that the Software or Firmware will operate in combinations selected for use by first purchaser.

Limitations of all Warranties

All Equipment, Software and Firmware Limited Warranties apply only to the first purchaser of this Digital Lightwave, Inc. product and are not transferable without the express written permission of Seller. Any claim under any of these Limited Warranties shall be deemed waived unless submitted to Seller in writing within one hundred eighty (180) days from the date the first purchaser discovered, or should have discovered, the facts giving rise to the claim.

The foregoing Limited Warranties shall not apply to problems caused by or resulting from improper or inadequate maintenance, acts or omissions of first purchaser, first purchaser supplied software or interfacing, unauthorized modification or misuse, breaking the seals or otherwise attempting to open the plastic and/or metal housing, operation outside of the environment specifications for the products, improper site preparation or maintenance. Seller is not responsible for any damages caused by any person or entity through misuse, neglect or accident.

For warranty service or repair, this product must be returned in accordance with the Seller's Return Policies to a service facility designated by Seller. The first purchaser shall prepay shipping charges to Digital Lightwave, and if Digital

Lightwave discovers a breach of the Limited Warranty, Digital Lightwave shall pay shipping charges to return the product to first purchaser. However, first purchaser shall pay all shipping charges, duties and taxes for products returned by Digital Lightwave to first purchaser outside the United States.

Return Policies

Approval must be obtained from Seller, prior to return of any merchandise. All material returned without a Seller Return Material Authorization (RMA) number will be refused automatically. The first purchaser must return the product in original package and in good condition, without its serial numbers or any part thereof altered, defaced or removed and accompanied by a specification in writing of the defects involved. The first purchaser shall notify Seller in each instance when first purchaser intends to return goods which first purchaser believes are not in accordance with this Limited Warranty and Seller shall be entitled, at Seller's option, to examine such goods at first purchaser's facilities prior to return.

EXCEPT FOR THE WARRANTIES EXPRESSLY SET FORTH IN WRITING IN THIS LIMITED WARRANTY AND IN OUR TERMS AND CONDITIONS OF SALE, SELLER MAKES NO OTHER WARRANTY, WHETHER WRITTEN, ORAL OR IMPLIED. ANY IMPLIED WARRANTY OF MERCHANTABILITY, TITLE, NON-INFRINGEMENT OR FITNESS FOR A PARTICULAR PURPOSE IS HEREBY DISCLAIMED BY SELLER AND EXCLUDED FROM THE AGREEMENT.

SELLER SHALL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL LOSSES, DAMAGES OR EXPENSES, DIRECTLY OR INDIRECTLY ARISING FROM THE SALE, HANDLING OR USE OF THE PRODUCTS, OR FROM ANY OTHER CAUSE WITH RESPECT TO THE PRODUCTS OR THIS LIMITED WARRANTY. WHETHER SUCH CLAIM IS BASED UPON BREACH OF CONTRACT, BREACH OF WARRANTY, NEGLIGENCE, STRICT LIABILITY IN TORT OR OTHER LEGAL THEORY. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

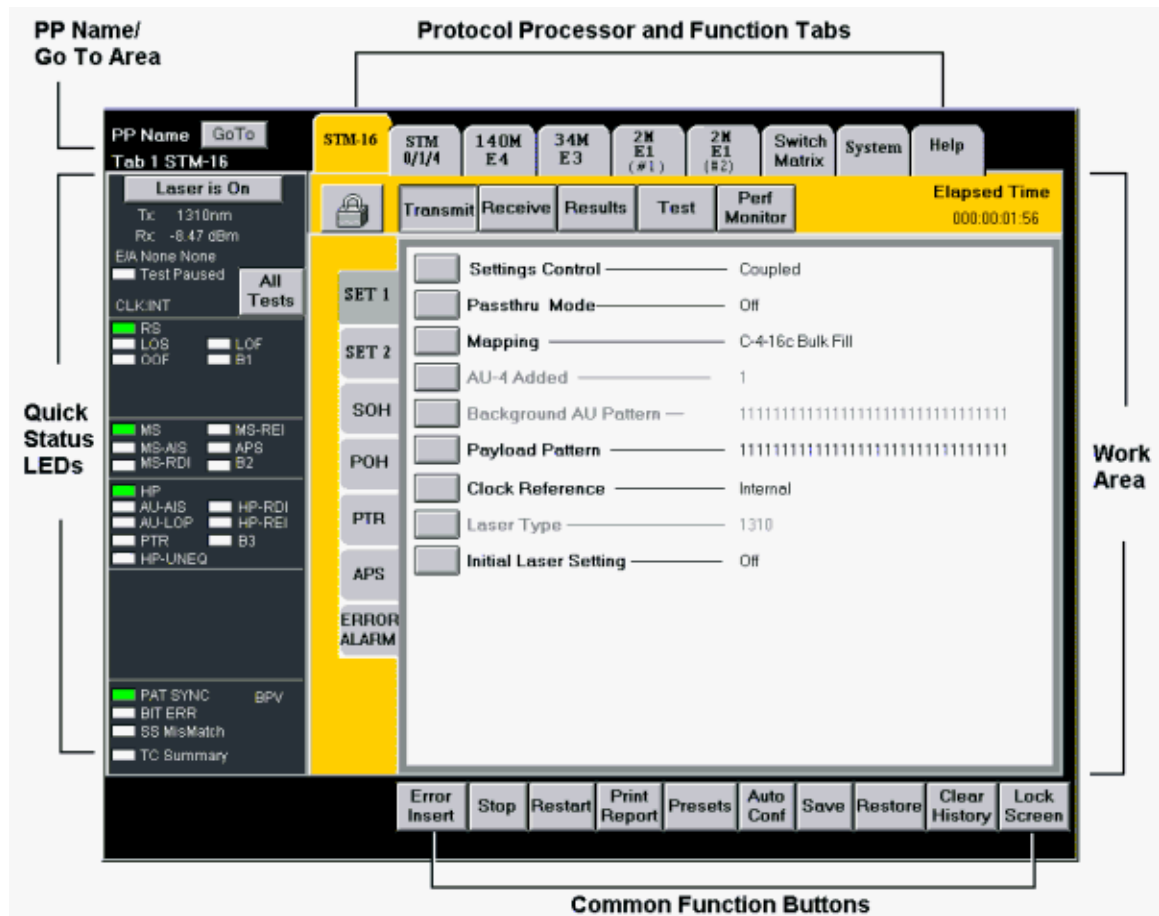
Screen Components

The main screen is the user interface to the system. Through this display, you can view the configuration of the test unit, start and stop numerous tests, and collect a variety of statistics about test unit performance.

If you are using a portable product that has a touch screen, place your finger directly onto the screen to select tabs and buttons associated with a specific function. **A blunt object, such as the back of a pen or pencil eraser, can also be used to select touch screen functions.**

Warning: Avoid using sharp instruments, such as pen tips, pencil tips, keys, and paper clips. These objects may scratch and mark the touch screen.

The following is an example of the main screen (STM-16 mode is shown) with the main regions labeled.



The main screen contains five main regions:

- Quick Status LEDs
- Protocol Processor and Function Tabs
- PP Name/Go To Area
- Work Area
- Common Function Buttons

Lock Icon





Overview




The unit's multi-user functionality allows up to four simultaneous users to be connected to a portable unit. This includes one local user, via the unit's touch screen, and three remote users using the Remote Control Application (remote GUI), SCPI commands, or TL1 commands.

To prevent users from interfering with each other, an individual user can "lock" and take control of a test set. This is done using the Lock icon that appears on the GUI. Permission levels determine the user's ability to lock and unlock a test set. When you lock the test set, you can configure protocol processors, start tests, and perform general product functions without the worry of contending for resources with another user.

Using the Lock Icon

The following guidelines describe how to lock and unlock a test set using the Lock icon. (For additional configuration procedures, select Configuring the Lock on Startup.)

If I see this icon on my GUI,	It means
	The test set is unlocked and available. No individual user has control of it. I can lock the test set by selecting this icon.
	I have the test set locked. I currently control the test set and can configure protocol processors. Other users will see  on their GUI.
	The test set is locked by another user, and I can only view protocol processor screens. If I have Admin or Write privileges – I can select this icon to take control of the test set. The Lock Override message will appear and prompt me to unlock it from the current owner. For example, " <i>User X</i> currently has it locked. Do you wish to force an Unlock and then Lock? Yes. No." (<i>User X</i> is the name of the current

	<p>owner.)</p> <p>By selecting Yes,  now appears on my GUI.</p> <p>The previous owner (User X) will receive a High Priority Message stating that I removed the lock. For example, "[User Y] Your lock on the unit has been removed." (<i>User Y</i> is my user name.)</p> <p>Other users will see  on their GUI.</p> <p>If I do not have the proper user privilege – A message appears stating that the protocol processor is locked by the current owner. For example, "Protocol Processor locked by User X."</p>
	<p>The circuit pack (and its associated protocol processors) is out of service. A counter appears indicating how long the circuit pack has been out of service. A fault is also logged.</p>

Configuring the Lock on Startup

To control the Lock's default state when the unit is started:

1. Select **System**.
2. Select **User Preference**.
3. Select **Startup Locking State**.
 - Select **Lock** to automatically lock the unit when it is started.
 - Select **Unlock** to make the unit available to anyone when it is started.

System Tab

Common Tasks and Functions Online Help

The System tab contains functions used to establish unit preferences, set up tests, and configure input and output settings in order to perform software upgrades, file transfers, and I/O port configurations.

The System screen contains the following function tabs:

- Misc
- I/O Settings
- File Services
- Security
- User Preference
- All Test Status
- Monitor
- Chat
- Faults

Turning a Portable Unit On and Off

To turn the unit on:

1. Connect the proper power cord to the AC receptacle in the connector panel and then plug into an AC power source.
2. Press the power switch to the **On** (1) position.
3. After powering on the unit, listen for fan rotation to make sure that the cooling fans are operating properly.
4. As the unit boots, it performs internal diagnostics.
5. When this is complete, a colorful user interface appears on the touch screen.
6. Verify that the touch screen is operational. For example, select the Help tab located at the top of the touch screen.

To turn the unit off:

- Press the power switch to the **Off** (0) position.

Common Tasks

Common Tasks Overview

This section lists common tasks that are performed the same for each protocol processor mode. For tasks that are protocol processor specific, refer to the appropriate protocol processor section.

Please use the **Contents** tab and window (left side of the screen) to select, open, and view both common tasks and protocol specific tasks.

Common Tasks Overview

This section lists common tasks that are performed the same for each protocol processor mode. For tasks that are protocol processor specific, refer to the appropriate protocol processor section.


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Add a New User



If the System Lock function is enabled, only one user with Read and Write permissions (this includes Calibration and Admin users) can be logged in at a time. If a user with Read and Write permissions is already logged in, a window will appear giving you the option of logging in with Read permissions only.

1. Select **System**.
2. Select **Security**. The Security screen appears.
3. From the User Name column, select **NEW USER**.
4. Under Account Information, select , which is next to the User ID field. A keypad appears.
5. Enter the user ID.
6. Select , which is next to the Password field. A keypad appears.
7. Enter a password.

8. Select , which is next to the Permissions field. The Select User Permissions window appears with the following options:
 - **Read:** Allows the user read-only privileges.
 - **Read/Write:** Allows the user to read and update information.
 - **Calibrate:** Allows the user read and write privileges and the ability to perform calibration procedures on the unit.
 - **Admin:** Allows the user to perform network administrator tasks such as calibrating, adding, deleting, and updating user profiles.
9. Select a user permission option.
10. Select **Update**. The new user profile is added and appears on the User List.

Add/Drop SDH and PDH Signals

1. Select **Presets**. The Presets menu appears. For example:
 - To add an STM-4 signal into an STM-16 signal, select **STM-16/STM-4 D/I**.
 - To add an E1 into an E3, select **E3/E1 #1 D/I** (for E1 #2) or **E3/E1 #2 D/I** (for E1 #2) .

The unit is configured for Add/Drop mode. Go to the next section to specify different frames and patterns for the added signal.

Specify Frames and Patterns for the Added Signal

If you have added an STM-4 signal into an STM-16 signal:

1. Select **STM-4**.
2. Select **Transmit**.
3. Select **SET 2**. The Mapping options appears.
4. Select the options on the screen to specify the foreground and background AU and TUG patterns and HP and LP signal labels to be added to the signal.

If you have added an E3 signal to an E4 signal:

1. Select **E3**.
2. Select **Transmit**.
3. Select **SET 2**. The E3 Transmit Mapping screen appears.
4. Select **E1 Channel Inserted 1** and select from channels 1 through 16 for E1 #1.
5. Select **E1 Channel Inserted 2** and select from channels 1 through 16 for E1 #2.

6. Select **E1 Background Frame** and select the background frame (Unframed, PCM30, PCM30CRC, PCM31, PCM31CRC) for the specified channel.
7. Select **E1 Background Pattern** and select up to a 32-bit background pattern for the specified channel.

Adjust Touch Screen Brightness

To adjust a portable unit's touch screen intensity:

1. Select **System**.
2. Select **MISC**.
3. Select **Backlight Intensity**. A keypad appears. It accepts values ranging from **0** (brightest setting) to **255** (dimmiest setting).
4. Using the keypad, enter a value, and select **OK** when you are done.

Using Alarm Beeper Status

This function associates a WAV file sound with an alarm event. When using the unit's touch screen, a total of 10 sounds are available. When using the remote GUI, up to a total of 16 sounds can be used. This includes customized WAV files that you can add by copying these files to your remote GUI installation directory.

To assign an audible notification to an alarm:

1. Select **System**.
2. Select **User Preference**.
3. Select **Alarm Beeper Status**.
4. Select **On**. The Alarm Beep definitions appear.

The alarm definitions that appear use the WAV file's name. For example, chord.wav appears as CHORD.

5. Select an alarm and then associate a sound with that alarm.



Select **Test** to hear the sound and determine if this is the sound you want to associate with this alarm.

6. Select **Apply**.

To turn off all alarm sounds:

Common Tasks and Functions Online Help

1. Select **Alarm Beeper Status**.
2. Select **Off**.

To add WAV files when using the remote GUI on your PC:

1. Make sure that your remote GUI is closed.
2. Copy WAV files on your PC to your remote GUI's installation directory. (The default directory is C:\Program Files\RemoteNIC).
3. Run your remote GUI.
4. Select **System**.
5. Select **User Preference**.
6. Select **Alarm Beeper Status**.
7. Select **On**.

The Alarm Beep definitions appear and include the new WAV files copied into the remote GUI's installation directory. Only the first 16 sounds will appear in the selection window. The alarm definitions that appear use the WAV file's name.

8. Select an alarm and then associate a sound with that alarm.
9. Select **Apply**.

Auto Config

The Auto Config function allows you to quickly configure the unit to match the parameters of an incoming signal. This function uses the same mapping, framing, line coding, and pattern characteristics as the incoming signal without having to manually configure the unit.

To automatically configure the unit:

1. Make sure that the unit is receiving a valid input signal.
2. Select a Protocol Processor mode that corresponds to the network and the incoming signal. (The Protocol function appears under the Misc tab when the System tab is selected.)
3. Select the protocol processor tab (located at the top of the screen) that corresponds to the signal that you want to configure.
4. Select **Auto Config**. (This button is part of the Common Function Buttons that appear at the bottom of the touch screen.)
5. Select the type of auto configuration to perform.

The unit starts detecting parameters about the incoming signal, such as signal rate, mapping, and payload pattern, and configures the unit accordingly. This process may take a few minutes to complete.

The following is a list of auto configuration types; availability is based on your unit's hardware configuration.

Auto Config Type	Description
Master Configuration	<p>The unit detects the highest line rate, mapping, framing, and pattern of the incoming signal and configures the protocol processor to match these parameters. If successful, the unit then attempts to drop a signal to tributary protocol processors. This process continues until the lowest tributary is configured. If the auto configuration process is unsuccessful, the process terminates.</p> <p>Note: For the STM-0/1/4 and the OC-1/3/12 protocol processors, Master Configuration detection starts with the incoming optical signals. For auto configuration of STM-0/1/4 and OC-1/3/12 electrical signals, refer to Master Electrical.</p>
Configure STM-64 Only	Detects the parameters of the incoming STM-64 signal, and configures the STM-64 protocol processor to these parameters.
Configure STM-16 Only	Detects the parameters of the incoming STM-16 signal, and configures the STM-16 protocol processor to these parameters.
Configure OC-192 Only	Detects the parameters of the incoming OC-192 signal, and configures the OC-192 protocol processor to these parameters.
Configure OC-48 Only	Detects the parameters of the incoming OC-48 signal, and configures the OC-48 protocol processor to these parameters.
SDH Only	Detects the parameters of the incoming STM-0/1/4 optical signals, and configures the protocol processors to these parameters.
SDH Electrical	Detects the parameters of the

	incoming STM-1e or STM-0e electrical signals, and configures the protocol processors to these parameters.
SONET Only	Detects the parameters of the incoming OC-1/3/12 optical signals, and configures the protocol processors to these parameters.
SONET Electrical	Detects the parameters of the incoming STS-3 or STS-1 electrical signals, and configures the protocol processors to these parameters
Master Electrical	Detects the parameters of the incoming SDH or SONET electrical signal, and configures the protocol processor to match these parameters. If successful, the unit then attempts to drop a signal to the E3, E1, DS3, or DS1 protocol processors. This process continues until the lowest tributary is configured. If the auto configuration process is unsuccessful, the process terminates.
E4 Only	Detects the parameters of the incoming E4 signal, and configures the E4 protocol processor to these parameters.
E3 Only	Detects the parameters of the incoming E3 signal, and configures the E3 protocol processor to these parameters.
DS3 Only	Detects the parameters of the incoming DS3 signal, and configures the DS3 protocol processor to these parameters.

Automating the Remote Control Application Icon

The Remote Control Application software is a graphical user interface that allows you to remotely control portable and rackmount products from a PC. An icon for the Remote Control Application software is created and placed on your desktop when the software is installed.

You can add IP address, user ID, and password parameters to the icon to automate the log on process.

1. From the desktop, right click on the Remote Control Application icon.
2. Select **Properties**, and then select the **Shortcut** tab.
3. Place the cursor at the end of the **Target** text box.
4. Press the space bar and type:

ip=x.x.x.x,uid=y,pw=z

where, x.x.x.x is the system's IP address
y is the system's user ID (case sensitive)
z is the system's password (case sensitive)

5. Click **OK**.
6. When you double click the Remote Control Application's icon, a connection is made and the remote system's GUI appears.



If an invalid parameter is entered, the automatic log on will fail, and you must enter the appropriate data.

Calibration

Each protocol processor has its own calibration procedure.

To view a calibration procedure described in the online help file:


1. Select a protocol processor using the **Contents** tab and window (located on the left side of the online-help screen).
2. Select the protocol processor's **Specific Tasks** section.
3. Select the Calibration topic.




For local touch screen calibration procedures, select Touch Screen Calibration.

Touch Screen Calibration

Touch screen calibration is performed on all portable units prior to shipping from the factory. However, if your unit's touch screen requires recalibration, perform the following:

 Although touch screen calibration can be performed using your finger, a pointing device, such as a stylus, is recommended for greater accuracy.

1. Select **System**.
2. Select **Misc**.
3. Select **Recalibrate Touch Screen**. This button appears in the touch screen's lower right corner. (It does not appear when you are remotely connected to the unit using the Remote Control Application software.)
4. The Calibration dialog appears.

 When the Recalibrate Touch Screen button is selected, the Calibration dialog appears. If another area of the touch screen is pressed while this dialog is open, the main System screen appears, and the Calibration dialog moves to the background. To restore the Calibration dialog (and return it to the foreground), select the Recalibrate Touch Screen button again. To exit the Calibration dialog, use the Close button that appears in the dialog's upper right corner.


5. Select **5-point Calibration**.

Five touch screen targets (calibration points) appear on the screen.



The hand icon indicates which target to select.

6. Place and hold your pointing device as close to the center of the target as possible.
7. The message **Touch Enabled** appears when calibration for that specific point is complete.
8. The hand icon moves to the next target. Repeat steps 6 and 7 for the four remaining targets.

 If the screen is not touched for a 20-second period or longer, the current calibration process is canceled. The calibration must be restarted using the first touch screen target.

- When touch screen calibration is complete, a completion message briefly appears on the screen, and the Calibration dialog closes.

Change SONET and SDH Overhead Bytes



The following only applies to SDH and SONET protocol processors.

The SOH and POH functions allow you to stress a SONET or SDH network by directly editing overhead (OH) bytes to simulate errors, alarms, and other stress conditions.

A specific slot can be selected, and its OH bytes can be changed for transmission out of the system. **SONET overhead** includes Section, Line and Path overhead bytes. **SDH overhead** includes Regenerator Section (RS), Multiplex Section (MS), and Higher-Order Path (HP) overhead bytes. By altering the OH bytes, this allows other equipment to detect, and if necessary, react to these changes.

To change overhead bytes:

- Select an SDH or SONET protocol processor mode.
- Select the **Transmit** button.
- Select the **SOH** or **POH** button to display OH bytes.
- In *SDH* mode, select a slot using the **SOH Slot** function.

In *SONET* mode, select a slot using the **STS-1 Slot** function.

- Select an OH byte.

A keypad appears allowing the byte's 8-bit pattern to be edited. The byte appears in binary notation by default. Use the keypad's 1 and 0 buttons to change the bit value. Bit values are changed from the least significant bit to the most significant bit (from right to left).

The byte can also appear in HEX or decimal notation by select the **HEX** or **DEC** button on the keypad.



The bit value can also be erased from the keypad using the **Clear** button.

- When editing is complete, select **OK** to save the new value. (**Cancel** discards any changes made to the byte and restores the previous value.)

Change SDH and SONET Overhead Bytes in Passthru Mode



The following only applies to SDH and SONET protocol processors.

Passthru mode allows an incoming signal to pass through the unit without altering the data in the signal. However, the overhead bytes (A1/A2, K1/K2, D1-D3, D4-D12, E1, F1, M1, and E2) can be changed to simulate errors, alarms, and other stress conditions such as Pointer Adjustments. This lets you verify if equipment in the SONET or SDH network can detect changed overhead bytes.

To configure the unit for Passthru mode:

1. Select an SDH or SONET protocol processor mode.
2. Select the **Transmit** button.
3. Select the **SET 1** button.
4. Select the **Passthru Mode** function. The **Select Passthru Mode** window appears.
5. For STM-64/16 or OC-192/48, select **On** to enable Passthru mode.

For STM-4 or OC-12, select **Intrusive** or **Intrusive Add/Drop** to enable Passthru mode.

To change Overhead bytes in Passthru mode:

1. Select the **SOH** or **POH** button.

When Passthru mode is enabled:

- The OH bytes are passed-through (looped) the system without being altered. (These bytes are disabled on the touch screen.)
 - The **Intrusive Overhead** buttons appear. These buttons allow you to select a specific OH byte and change its value.
2. Select an **Intrusive Overhead** button. For example, select F1 Pass.

The selected Intrusive Overhead button changes to indicate that a specific byte has been selected. For example, F1 Pass now appears as F1 Intrude. In addition, the OH byte is now enabled and displays its value.

3. Select the same OH byte (from the left side of the touch screen) that you selected for Passthru mode (on the right side of the touch screen). For example, select the F1 byte.


A touch screen keypad appears allowing the byte's 8-bit pattern to be edited. The byte appears in binary notation by default. Use the keypad's 1 and 0 buttons to change the bit value. Bit values are changed from the least significant bit to the most significant bit (from right to left).

The byte can also appear in HEX or decimal notation by selecting the **HEX** or **DEC** button on the keypad.

4. When editing is complete, select **OK** to save the new value which will be transmitted out of the unit.
5. Repeat steps 2-4 to reconfigure other OH bytes.

Change Tab Name

1. Select **System**.
2. Select **User Preference**. The User Preference screen appears.
3. Under Label Preferences, select **User** or **Circuit Pack**.
 - User – Only changes the Tab Label name for your session. Other users will not see the tab name that you enter.
 - Circuit Pack – Changes the Tab Label name on the unit so that all users see the same tab name that you enter.
4. Select a tab (or slot) from the Assigned Name list.
5. Under PP Label Information, enter a name in the **Assigned Name** field.


(When using the touch screen on a portable unit, select , which is next to the Assigned Name field to open a keypad.)
6. Select **Update List Entry** to add the name to the User Defined Name list.
7. Repeat steps 3 through 6 to add names for the remaining tabs.
8. Select **Save All List Entries**. The new tab names appear in the PP Name/Go To area of the screen when a protocol processor tab is selected.

To restore tab names, select Restoring Default Tab Names.

Chat

Use the Chat function to send brief messages to other networked units.

To send a message:

1. Select **System**.
2. Select **Chat**
3. Enter your message in the **Input Message** window.
 - Select  if using the touch screen on a portable unit. A keypad appears allowing you to enter the message. Select **Enter** when done. The message appears in the Input Message window.
 - If using the Remote Control Application, to control a remote or rackmount unit, place your mouse cursor in to the Input Message window, and type the message.

Note: Pressing the Enter key on your keyboard will delete the

message. To avoid this, select **Multi Lines**.

In addition, if you have a long message, select **Multi Lines** so that you can use the **Enter** key to keep your message within the **Input Message** window.

4. You can assign a priority level to the message (**High Priority**), or you can require that the recipient respond to the message (**Reply Required**).
5. Select **Send**.

Clear History and Results

The unit uses the following functions to log event, alarm, and error activity monitored on the incoming signal:

- LEDs as displayed in the **Quick Status LEDs** area and the **Large LEDs** tab
- The **Results** function

To only clear LEDs and Status Indicator history:

- Select the **Clear History** button that appears at the bottom of the touch screen.

To clear recorded history (results):

- Select the **Restart** button that appears at the bottom of the touch screen. The LEDs' history will clear, and the statistics collected under the **Results** function will reset to 0.

Communications Port Assignment

The unit has Ethernet, serial, and GPIB ports that can be assigned for a specific operation (for example, SCPI commands, TL1 commands, or serial printing).


When an operation is assigned to a port, that specific operation cannot be used by other ports.

Select the following links for:

- Ethernet port configuration and assignment procedures
- GPIB port configuration and assignment procedures test
- Serial port configuration and assignment procedures


Configure and Assign the Ethernet Port

The unit can be controlled using SCPI or TL1 commands through the unit's Ethernet port. The unit supports dynamic IP addressing, using Dynamic Host Connection Protocol (DHCP), and static IP addressing.

 If Ethernet port parameters are changed, the unit must be rebooted for the changes to take affect.

To configure the Ethernet port for a static IP address:

1. Select **System**.
2. Select **I/O Settings**.
3. Select **Ethernet**.
4. Select **Specify an IP address** from the Ethernet Configuration functions.
5. Enter the unit's **IP Address**, **Subnet Address**, and **Router Address**.

 IP addresses **192.168.138.000 through 192.168.138.255** are reserved and should not be used. A system conflict can occur if these IP addresses are entered.

If you must use an IP address in the range of **192.168.x.x**, then you **must** set the Subnet Address to **255.255.255.0**.


6. Reboot the unit for changes to take affect.

To configure the Ethernet port for a dynamic IP address using DHCP:

1. Select **System**.
2. Select **I/O Settings**.
3. Select **Obtain an IP address from a DHCP server**. The unit will use the network's DHCP server to dynamically assign it an IP address.
4. Reboot the unit for changes to take affect.

To assign the Ethernet port:


1. Select **System**.
2. Select **I/O Settings**.
3. Select **Ethernet** from the Communication Port Assignments section.
4. Select an Ethernet port assignment option.

 Once an option is selected for Ethernet, it is not available for serial or GPIB port assignment.


Configure and Assign the GPIB Port

The unit can be controlled using SCPI commands through the unit's GPIB port.

To configure and assign the GPIB port:

 If GPIB port address is changed, the unit must be rebooted for the change to take affect.

1. Select **System**.
2. Select **I/O Settings**.
3. Select **GPIB**.
4. Select **GPIB Port** and enter the primary address for the GPIB interface.
5. Select **GPIB** from the Communications Port Assignments section.
6. Select a GPIB port assignment option.

 Once an option is selected for GPIB, it is not available for serial or Ethernet port assignment.

7. Reboot the unit for changes to take affect.

Configure a RAS Port

You can use Remote Access Service (RAS) on your PC to dial-up and access the unit. This will establish a dedicated connection between your PC and the remotely located unit using a telephone line. The unit must first be configured for RAS operation before you can dial-in to it using RAS. Click **here** when remotely connecting to a unit that has a PCMCIA modem installed. For information about the RAS parameters listed below, select RAS Configuration.

To configure the unit for RAS operation:

1. Select **System**.
2. Select **I/O Settings**.
3. Select **RAS**. The RAS configuration screen appears.
4. Select or deselect **Allow remote clients to request a predetermined IP address**.

If **selected**, this function allows the unit to use the static IP address assigned in the dial-up networking properties configuration on your PC.

If **deselected**, RAS will assign the unit an IP address within the range of

0.0.0.0 to 127.255.255.255 or 128.0.0.0 to 255.255.255.255. The range is assigned using **Start IP Address** and **End IP Address**. Enter the Start IP Address and End IP Address values.

Configure and Assign the Serial Port

The unit's serial port is a physical interface that can be used to:

- Transfer SCPI or TL1 commands to and from the unit.
- Connect a serial printer to the unit.

To configure and assign the serial port:

1. Select **System**.
2. Select **I/O Settings**.
3. Select **Serial**.
4. If necessary, select the **Baud Rate**, **Parity**, **Data Bits**, and **Stop Bits** serial configuration parameters and make the appropriate changes for the connection between the unit and PC or serial printer.
5. Select **Serial** from the Communication Port Assignments section.
6. Select an serial port assignment option.



Once an option is selected for serial, it is not available for Ethernet or GPIB port assignment.

Configure the Wireless Port



The unit only supports the HP 11-Mbps Wireless LAN PC Card. This card is inserted into the unit's PCMCIA slot.

The unit can connect to a wireless network using an 802.11 compliant wireless LAN PC card. The unit supports static IP addressing and dynamic IP addressing, using Dynamic Host Connection Protocol (DHCP). For information about the wireless parameters listed below, select Wireless Configuration.


Initial wireless configuration:

1. Insert the wireless LAN PC card into the unit's PCMCIA slot. An audible tone indicates that the LAN card and PCMCIA drivers are initialized.
2. Select **System**.

3. Select **I/O Settings**.
4. Select **Wireless**. The wireless configuration parameters appear.
5. Select **Access Point ID** and enter the wireless LAN's name/ID.

To configure the wireless port for a **static** IP address:

1. Select **Specify an IP address**.
2. Enter the unit's:
 - **IP Address**
 - **Subnet Address**
 - **Router Address**
 - **Host Name** (optional)
 - **Domain Name** (optional)

 IP addresses **192.168.138.000 through 192.168.138.255** are reserved and should not be used. A serious system conflict can occur if these IP addresses are entered.

If you must use an IP address in the range of **192.168.x.y** (where x is not equal to 138), then you must set the Subnet Address to **255.255.255.0**.


To configure the wireless port for a **dynamic** IP address using DHCP:

1. Select **Obtain an IP address** from a DHCP server. The unit will use the network's DHCP server to dynamically assign it an IP address.

The remaining wireless parameters that appear on the screen are disabled.

Configure a Protocol Mode

The unit can be configured to operate in SONET, SDH, PDH, or DS3/DS1 networks.

 The options that appear on this screen are determined by your hardware configuration.

1. Select **System**.
2. Select **Misc**.
3. Select the **Protocols** button.

4. The following options appear:
 - **SONET, SDH:** These options appear if your unit contains one or more SONET/SDH boards, but no PDH board.
 - **DS1/DS3, E1/DS3, E1/E3:** These options appear if your unit contains a PDH board, but no SONET/SDH boards.
 - **SONET/DS1/DS3, SONET/E1/DS3, SDH/E1/E3, SDH/E1/DS3, SDH/DS1/DS3:** These options appear if your unit contains a PDH board and one or more SONET/SDH boards.
5. Select a protocol mode. The screen is updated to reflect the mode selected.

Configure and Transmit APS Commands for OC-1/3/12 or STM-0/1/4

For OC-1/3/12 and STM-0/1/4 mode, the APS function appears on a multifunctional screen that displays both Transmit and Receive APS commands.

To configure K1 and K2 byte values:

1. Select **STM 0/1/4** or **OC 1/3/12**.
2. Select **Transmit**.
3. Select **APS**. The initial APS screen appears containing a table of the K1 and K2 byte sequences that can be transmitted.

The three columns (User Setup, Transmit, and Receive) on the screen display the current bit value for the K1 and K2 bytes. Any changes made to the K1 and K2 bytes are automatically updated in the User Setup column.

The Transmit column displays the bit values transmitted when you select either **Transmit User**, **Transmit Default**, or **Transmit Illegal**. The Receive Column displays the bit values received for the K1 and K2 bytes.

4. Select **APS Mode** to configure APS commands for Linear protection switching mode or Ring APS signaling mode.
5. Edit the K1 byte. The K1 byte is a request for switch action. There are three functions that allow you to edit the K1 byte.
6. Edit the K2 byte. The K2 byte provides additional information about SONET or SDH network architecture and alarm conditions. There are four functions that allow you to edit the K2 byte.

7. Select the **Transmit User** button to transmit the bit values that appear in the User Setup column. When pressed, the User Setup values are transmitted and appear in the Transmit column. You can edit the transmitted K1 and K2 bytes directly from the SOH function screen.

You may also transmit default APS commands by selecting the **Transmit Default** button to transmit the default bit values (10101010) for the K1 and K2 bytes. When pressed, the default bit values appear in the Transmit column.

You may transmit illegal APS commands by selecting the **Transmit Illegal** button to transmit the illegal bit values (11111111) for the K1 and K2 bytes. When pressed, the illegal bit values appear in the Transmit column.

Configure SONET and SDH APS Commands



The following only applies to SDH and SONET protocol processors.

Automatic Protection Switching (APS) is a function that allows an LTE to switch to a backup (or protection) channel in case errors or failures occur on the working channel. APS commands can be configured for either Linear- or Ring-based SONET and SDH networks and are transmitted using the K1 and K2 bytes of the Line Overhead.

You can test your network's APS response by generating a condition that is likely to cause APS switching. You also have the capability to generate specific APS messages and monitor the response by configuring the K1 and K2 bytes.

You can create up to 16 different K1 and K2 byte configurations (known as byte sequences) to measure and stress your equipment's APS switching capabilities.

To configure K1 and K2 byte values:

1. Select a protocol processor mode.
2. Select the **Transmit** button.
3. Select the **APS** button. The initial APS screen appears containing a table of the K1 and K2 byte sequences that can be transmitted. A total of 16 K1 and K2 byte sequences can appear in the table.
4. Select a byte sequence button (for example,).

The **Apply Maintenance to Entry** screen appears. It contains functions used to configure and set the measurement criteria of the K1 and K2 bytes.

5. Use the **APS Mode** function to configure APS commands for Linear protection switching mode or Ring APS signaling mode.
6. Edit the K1 byte.

The K1 byte is a request for switch action. There are three functions that allow you to edit the K1 byte:

- Use the **K1 Full Byte** function to set all eight bits of the K1 byte at once.
 - Use the **K1 Bits 1-4** function to set the first four bits of the K1 byte.
 - Use the **K1 Bits 5-8** function to set the last four bits of the K1 byte.
7. Edit the K2 byte.

The K2 byte provides additional information about SONET network architecture and alarm conditions. There are four functions that allow you to edit the K2 byte:

- Use the **K2 Full Byte** function to set all eight bits of the K2 byte at once.
 - Use the **K2 Bits 1-4** function to set the first four bits of the K2 byte.
 - Use the **K2 Bit 5 (provisioned)** function to set the fifth bit of the K2 byte.
 - Use the **K2 Bits 6-8** function to set the last three bits of the K2 byte.
8. Select **Duration in Frames** to determine how many frames will be transmitted containing the newly configured K1 and K2 bytes.
 9. Select **Update**. The initial APS screen appears on the touch screen.
 10. To configure additional K1 and K2 bytes, repeat steps 3-8 as described above. Otherwise, proceed to the next section to transmit K1 and K2 bytes.

To transmit K1 and K2 bytes:

1. Make sure that K1 and K2 byte sequences are configured as described above.
2. Select **Start** to transmit the K1 and K2 bytes.

To stop transmitting K1 and K2 bytes:


1. Select a protocol processor mode.
2. Select the **Transmit** button.
3. Select the **APS** button. The initial APS screen appears.
4. Select **Stop**.

Create a New Directory

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1. From the System tab, select **File Services**.
2. Select **New Dir**. A keypad appears.
3. Enter a directory name (do not use spaces in directory or file names) and select **Enter**. The new directory appears at the bottom of the File List box.

Delete a User


 If the System Lock function is enabled, only one user with Read and Write permissions (this includes Calibration and Admin users) can be logged in at a time. If a user with Read and Write permissions is already logged in, a window will appear giving you the option of logging in with Read permissions only.

1. Select **System**.
2. Select **Security**. The Security screen appears.
3. From the User List, select the user ID to be deleted.
4. With the user ID highlighted, select **Delete**. The user is removed from the User List.

Display All Test Status

Use the All Test Status function to view the current status of all protocol processors installed in the unit.

1. Select **System**.
2. Select **All Test Status**. A general summary screen appears. A maximum of 12 protocol processor tabs can appear on the screen. The elapsed time (in minutes) and general status Summary LED for each protocol processor appears.

 If the Summary LED text is selected (the word Summary), the LEDs associated with that specific protocol processor tab appear. To clear the LED window, select **Close**.

3. If the unit contains more than 12 circuit packs (protocol processor tabs), the protocol processor tabs appear in groups of 12. Select the All Test button (**All Test (1 to 12)**) to scroll through the various groups. The scrolling process can also be automated using the All Test Refresh Rate function.

For information about current and past events for specific protocol processors, refer to Display History.

Display History

The system maintains a log of errors and alarms detected on the incoming protocol processor's signal. This history of past and current events can be viewed using the **LEDs** or **Results** button.

The LEDs provide a visual indicator of current and past activity, and are used to quickly narrow the focus of what is received and possible problem areas of the network.

The **Results** button provides broad details of error and alarm activity.

To display history using the Results button:

1. Select a protocol processor mode.
2. Select the **Results** button. The **Scan** button functions appear.
3. To view other events, select the **Errors**, **Alarms**, **PTR**, or **Graphs** buttons.

The **Scan** button displays a list of received alarms and errors, along with the number of seconds that the event occurred. This summary identifies a general area to investigate when an error or alarm is detected.

The **Errors** button provides the following details about received errors:

- Error count using an 11-digit format
- Average error rate over the error duration using an N.NNe-N format
- Current error rate using an N.NNe-N format
- Error free seconds using an 8-digit format
- Errored seconds using an 8-digit format
- Severely errored seconds
- Unavailable errored seconds

The **Alarm** button displays the number of seconds that an alarm was present.

The **PTR** button provides the following details about received Pointer adjustments:

- Positive Justification: Indicates the number of positive Pointer adjustments
- Negative Justification: Indicates the number of negative Pointer adjustments
- Pointer Justification Seconds: Indicates the duration of a Pointer adjustment in seconds
- NDF Count: Indicates the number of New Data Flags received
- Receive Pointer Value: Indicates the Pointer value

The **Graphs** button provides an additional view of error and alarm results for the selected protocol processor. Graphs show the test history for either the current test or a previously saved test.

Display Large LEDs

1. Select a protocol processor tab.
2. Select the **Results** button.
3. Select **Large LEDs**.

Display Serial Numbers and Software Revision

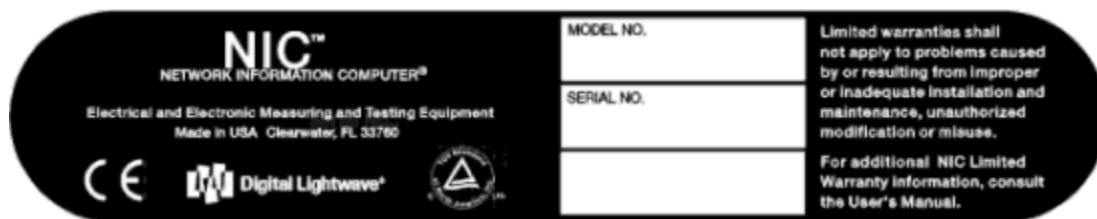
This function displays the following information:

- Copyright Information
- Feature set number
- Graphical User Interface Version
- Customer Service Information
- Circuit Pack Information
 - Product Serial Number
 - Kit Number
 - Version
 - SCPI Version
 - TL1 Version

To view this information:

1. Select **System**.
2. Select **About this product**. The software revision number and hardware serial numbers appear.
3. To close the **About this product** box, select **OK**.

You may obtain some of the product information by viewing the product label located on the unit. For example:



Display SDH and SONET Overhead Bytes



The following only applies to SDH and SONET protocol processors.

The system allows you to view Overhead bytes that are transmitted and received on the SDH or SONET signal.

To view transmitted Overhead bytes:

1. Select an SDH or SONET protocol processor mode.
2. Select the **Transmit** button.
3. Select the **SOH** or **POH** button to display OH bytes.

The Overhead bytes for the current SOH slot or STS-1 slot appear.

From this screen, the Overhead bytes can be edited as described in **Change SONET and SDH Overhead Bytes**.

4. To view Overhead bytes for other slots, select the **SOH Slot** or **STS-1 Slot** function and enter a slot (1 to 192 for OC-192 or STM-64; 1 to 48 for OC-48 or STM-16; 1 to 12 for OC-12 or STM-4, and so on). Select **OK**, and the bytes for that specific slot appear.

To monitor incoming Overhead bytes:

1. Select an SDH or SONET protocol processor mode.
2. Select the **Receive** button.
3. Select the **SOH** or **POH** button to display OH bytes.

The Overhead bytes for the selected slot (of the incoming SONET or SDH signal) appear.

Use the **SOH Slot** or **STS-1 Slot** function to view Overhead bytes for other slots.



Overhead bytes and trace bytes cannot be edited from this screen.

Dropping and Inserting an STM-64/16/4



This procedure is applicable to systems configured with STM-64/16/4 or OC-192/48/12 protocol processors.

This function allows you to drop an STM-16 signal from an STM-64 signal, and then an STM-4 signal from an STM-16 signal. Conversely, this procedure can also be performed in SONET mode (i.e., drop an OC-48 signal from an OC-192, and an OC-12 from an OC-48). Dropping signals does not need to be performed in any particular protocol processor order.

1. Select **Presets**. The Apply Presets window appears.
2. Select **Interface**. All line interfaces available for your unit appear.
3. Select **STM-64** as the interface starting point.
4. Select **Configuration**. The protocols available for the selected interface appear.
5. Select **STM-4 Payload**.



If you make a mistake while creating connections, simply select **Interface** and reenter the interface value. This action erases any previously entered interface or configuration values.

7. Select **Apply**. The unit takes a few moments to apply the new protocol connections. Use the Switch Matrix to view the new connections.

To disengage the configured protocol connections:

- Select **All to Tx/Rx**. This globally disconnects any internal connections between multiple protocol processors. All protocol processors will now expect to receive a signal using its line interface.

Edit the S1 Byte

The S1 byte is a synchronization byte in SDH and SONET networks.

To edit the S1 byte:

1. Select **Transmit**.
2. Select **SOH**.
3. Select the **S1** byte and choose one of the following:
 - Quality Unknown: Sets byte value to 00000000.
 - Rec. G.811: Sets byte value to 00000010.
 - Rec. G.812 Transmit: Sets byte value to 00000100.
 - Rec. G.812 Local: Sets byte value to 00001000.
 - Sync Equip Timing Src: 00001011.
 - User Defined
4. The S1 byte is changed to the selected value.

Enable/Disable Beep on Touch

1. Select **System**.
2. Select **Misc**.
3. Select **Beep on touch**.
4. To hear a beep when selections on the touch screen are made, select **On**.
To disable the beep, select **Off**.

Enable/Disable Security System Lock

This function allows an administrator to enable a Security System Lock that only allows one user with Read and Write permissions (this includes Calibration and Admin users) to be logged in at a time. If a user with Read and Write permissions is already logged in, a window will appear giving you the option of logging in with Read Only permissions only. When the user logs on with Read Only permissions, all functionality will be disabled with the exception of the online help and the About this product function.

To enable Security System Lock:

1. Select **System**.
2. Select **Security**.
3. Under the Default Entry portion of the screen, select the **Security System Lock** check box. A check appears in the check box indicating that the Security System Lock function is enabled.

To disable Security System Lock:

1. Select **System**.
2. Select **Security**.
3. Under the Default Entry portion of the screen, select the **Security System Lock** check box. The check is removed from the check box indicating that the Security System Lock function is disabled.

Enter a License Key

The License Key function allows you to enable functionality that you may not have initially purchased. If you wish to obtain more functionality for your NIC unit, contact your Digital Lightwave sales representative for a PO number. Then contact Digital Lightwave Customer Service for a License Key that will activate the requested features.

To enter a new license key:

1. Select **System**.
2. Select **Misc**.

3. Select **License Key**. A keypad appears.
4. Enter the new license key into the text box.
5. Select **Enter** when done.
6. Reboot the unit for the new functions to take effect.

Establish a Default Login

This function allows an administrator to establish a default login, which results in users not having to enter a user ID and password each time they use the unit.

To establish a default login:

1. Select **System**.
2. Select **Security**.
3. From the Users List, select the user that you wish to make the default login.
4. Select the **Set as Default** button. Under the Default User column, a "Yes" appears, indicating that the user has been established as default user.

To disable a default login:

1. Select **System**.
2. Select **Misc**.
3. Under Local Settings, deselect the **User Login Required** check box. A check appears in the box, indicating that User Login Required is now enabled.
4. Reboot the unit for changes to take affect.
When the unit restarts, a login box will now appear.

If you do not wish to reset a Default Login user, there is no need to continue to the next step.

5. If you wish to set another default user, log in as an Admin user and repeat the steps above under *To establish a default login*.

Establish a Required User Login

This function allows an administrator to establish a required login, which results in user having to enter a user ID and password each time they use the unit.

To establish a required login:

1. Select **System**.
2. Select **Misc**.

3. Under the Local Setting portion of the screen, select the **User Login Required** check box. A check appears in the check box indicating that a required login has been established.

Use the Event Log

The Event Log is a table that displays events recorded by the unit. A scroll bar is available, allowing you to scroll up and down to view an extended history.

To use the Event Log:

1. Select a protocol processor tab.
2. Select the **Results** button.
3. Select **Event**. As events occur (such as alarms, errors, or Pointer activity) they appear and continuously scroll in the table.

Events display in an ascending order from the most recent event to the oldest event. The Descending button indicates that events appear in descending order. (This button switches between descending event order appearance and ascending event order appearance. The current label of the button indicates the event order.)

4. Select **Pause** to stop the scrolling action and then use the scroll bar to view events. Select **Resume** to restart the event log.
5. To display events in an ascending order, select **Descending**. The button changes to Ascending and the events appear from the oldest event to the most recent event.
6. Select **Resume** to continue Event Log reporting.

Delete a File


1. Select **System**.
2. Select **File Services**. The File Services screen appears.
3. Select a file from the File List box.
4. Select **Delete**. A confirmation message appears.
5. Select **Yes**. The file is deleted.



If you do not have authorization to delete files, the **Access Denied** message appears.

Download a File

A file can be transferred from a remote device (for example, a PC) to the unit or from a local device (a PCMCIA storage card). If using the FTP function, make sure you have the IP address of the receiving device.

1. From the System tab, select **File Services**.
2. From the right File List box, select the download method (**FTP** or **PCMCIA**).
 - If using *FTP*, enter the IP Address of the device that will receive the file (unless you are using the Remote Control Software; then enter the test set address). If this device is secured with a User ID and Password, then enter this information. Enter an FTP session on the connecting device.
 - If using *PCMCIA*, make sure the PC Card is installed in the PCMCIA slot before selecting the File Services button. When the PC card is inserted, an audible tone indicates that the care and PCMCIA drivers are qualified.
3. From the left File List box, select the destination directory.
4. Select  (download). The file is transferred to the unit.

 **When the unit is powered off, the FTP directory is automatically purged.**

Rename a File

1. From the System tab, select **Files Services**.
2. Select a file from the File List box.
3. Select **Rename**. A keyboard appears. Enter the new file name with extension. (Do not use spaces in file names.)
 - SET is the default extension for a Settings report.
 - STAT is the default extension for a Statistics report. (This includes tests produced using the Act/Duration button.)
 - EVT is the default extension for an Event report.
 - APS is the default extension for an APS report.
 - GRP is the default extension for a Graph report.
 - BMP is the default extension for a Print Screen image.

4. Select **Enter** from the keyboard. The file is renamed.




The extensions above are default file extensions. You are able change these to .txt (text) files using the **Rename** function.

Upload a File



A file can be transferred from the unit to a remote device (for example a PC) or to a local device (a PCMCIA storage card). If using the FTP function, make sure you have the IP address of the receiving device. If using the PCMCIA function, make sure that a PC Card is installed in the PCMCIA slot before selecting the File Services button. When the PC card is inserted, an audible tone indicates that the card and PCMCIA drivers are qualified.

1. From the System tab, select **Files Services**.
2. From the right File List box, select the upload method (**FTP** or **PCMCIA**).
 - If using *FTP*, enter the IP Address of the device that will receive the file (unless you are using the Remote Control Software; then enter the test set address). If this device is secured with a User ID and Password, then enter this information. Enter an FTP session on the connecting device.
 - If *PCMCIA* is selected, select a target directory from the File List box.
3. From the left File List box, select the current location of the file (**Disk** or **PCMCIA**).
4. Select a file from the File List box.
5. Select  (upload). The file is transferred.



When the unit is powered off, the FTP directory is automatically purged.

View a File

1. From the System tab, select **Files Services**.
2. Select a file from the File List box.
3. Select **View**. The contents of the file appear in the View window.
4. Use the **Display Hex / Display ASCII** toggle button to display the file in Hex or ASCII format.

View File Details

1. From the System tab, select **Files Services**.
2. Select a file from the File List box. The file name, file size, modification date, and file attributes appear below the File List box.

FTP

File Transfer Protocol can be used to copy files to and from the unit.

- If using the Remote Control Application or DLI Software Upgrade program, make sure that FTP service is enabled.
- To upload files using FTP, select Upload a File
- To download files using FTP, select Download a File.

Use Graphs

Use the **Graph** button to view error and alarm results for the selected protocol processor. Graphs show the test history for either the current test or a previously saved test.

To use graphs:

1. Select a protocol processor tab.
2. Select **Results**.
3. Select **Graph**.

The Graph screen appears. It contains two graphs which allow you to display incoming alarms and errors.

4. Use the following buttons to control graphing parameters:
 - Change Scale
 - Change Upper
 - Change Lower
 - Shift Left and Shift Right
 - Print a Graph Report
 - Save Graphs
 - Replay Graphs/Stop Replay

Increase or Decrease Speaker Volume

This function allows you to increase or decrease the speaker volume in order to hear the touch screen beep.

To increase or decrease speaker volume:

1. From the Protocol Processor and Function tabs row, select **System**.
2. Select **Misc**.
3. Select **Speaker Volume**.
4. Select **Low** to decrease speaker volume, or select **High** to increase speaker volume.

Insert Payload Patterns

The system supports a number of PRBS patterns for transmission in the signal's payload.

To insert a payload pattern:

1. Select a protocol processor mode.
2. Select **Transmit**.
3. For *SONET*, *SDH* and *E1*, select **SET 1**. For *E3* and *E4*, select **SET 2**.
4. Select **Payload Pattern**. The **Select Payload Pattern** window appears.
5. Select a pattern. The system will transmit this pattern as the payload.

To insert a user-defined pattern:

1. Select a protocol processor mode.
2. Select **Transmit**.
3. For *SONET*, *SDH*, and *E1*, select **SET 1**. For *E3* and *E4*, select **SET 2**.
4. Select **Payload Pattern**.
5. Select **User Defined**. A touch screen keypad appears. Use the keypad to enter a pattern up to 32-bits in length.
6. Select **Confirm**. The system will transmit this pattern as the payload.

Insert Alarms

The system can transmit alarms to simulate various alarm conditions. One reason for transmitting alarms is to determine if the receiving equipment can detect an alarm in the incoming signal.

To insert alarms:

1. Select a protocol processor mode.
2. Select **Transmit**.
3. Select **Error Alarm**.
4. Select **Alarm Generated**. The **Select Alarm to Insert** window appears.
5. Select an alarm. The system starts transmitting alarms.

To stop alarm transmission:

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1. Select the protocol processor mode.
2. Select **Transmit**.
3. Select **Error Alarm**.
4. Select **Alarm Generated**. The **Select Alarm to Insert** window appears.
5. Select **Off**. Alarm transmission stops.

Insert Errors

Various errors can be transmitted by the system. One reason for transmitting errors is to determine if the receiving equipment can detect an error in the incoming signal.

To insert errors:

1. Select a protocol processor mode.
2. Select **Transmit**.
3. Select **Error Alarm**.
4. Select **Error to Insert**. The **Select Error to Insert** window appears.
5. Select an error.
6. Select **Error Insert Rate**. The **Select Error Insert Rate** window appears.
7. Select an error rate. The system starts transmitting errors.

To stop error transmission:

1. Select a protocol processor mode.
2. Select **Transmit**.
3. Select **Error Alarm**.
4. Select **Error Insert Rate**.
5. Select **None**. Error transmission stops.

Insert Single Errors

The **Error Insert** button injects single errors into the transmitted protocol processor's signal. Error parameters are defined using the **Error to Insert** command.

To insert single errors using the Error Insert button:

1. Select a protocol processor mode.

2. Select **Transmit**.
3. Select **Error Alarm**.
4. Select **Error to Insert**. The **Select Error to Insert** window appears.
5. Select an error.
6. Select the **Error Insert** button at the bottom of the screen to inject the error.

Using LEDs

The system uses LEDs to report alarm, error, and event activity. These visual cues help to narrow the focus if problems are detected on the incoming protocol processors' signals and provide a starting point when trying to diagnose problems.

There are two ways to view LEDs from the screen: the **Quick Status LEDs**, which are located on the left side of the screen, and the **Large LEDs** tab. The following tables describe what is indicated by the LED color.



For LED descriptions for a specific protocol processor, go to the appropriate protocol processor section of the online help and navigate to **Screen Functions and Definitions > LEDs**.

Quick Status LEDs Color Description

If the LED is ...	Then this indicates ...
Green with white text	Normal operation. The LED is used as a status indicator.
White with white text	Normal operation, no errors or alarms. The LED is used as an error and alarm indicator.
Red with red text	An error or alarm event is in progress. The LED is used as an error and alarm indicator.
White with red text	An error or alarm event was detected, but is now cleared. The text serves as a history indicator.

Large LED Tab Color Description



If the LED color is ...	Then this indicates ...
Green with black text	The specific function is active and OK.
Red with black text	An error or alarm event is in

	progress.
White with red text	This function experienced an error or alarm event. This event is cleared by selecting Restart .
White with black text	No activity from this specific function.


Locking/Unlocking the Screen



The unit's screen can be disabled to prevent user access by others. This function requires a user ID and password to lock and unlock the screen. When unlocking the screen, the unit will only accept the last user ID and password entered, or the unit's original user ID and password.

To lock the screen:

1. Select **Lock Screen** from the Common Function Button row.
2. Enter your user ID.
On a portable unit, press  to open a keyboard to enter the user ID.
3. Enter your password.
On a portable unit, press  to open a keyboard to enter the password.
4. Select **OK**.
5. The Lock Screen window appears on the screen.

To unlock the screen:

 The unit will only accept the last user ID and password entered or the unit's original user ID and password. An error message appears if an invalid ID or password is entered.

1. Select the **Unlock** button that appears on the screen.
2. Enter the user ID.
On a portable unit, press  to open a keyboard to enter the user ID.
3. Enter your password.
On a portable unit, press  to open a keyboard to enter the password.
4. Select **OK**.

Make Pointer Adjustments

The beginning of a SONET or SDH payload is identified by a **Pointer**. It consists of the H1 and H2 Pointer bytes. You can stress a network by manually adjusting the Pointer using the Increment and Decrement Pointer buttons. By performing

this task, you can stress your SONET or SDH equipment to verify if it can tolerate Pointer adjustments, and how your equipment will react and report these adjustments.

There are several Pointer parameters that must be configured before making a positive or negative Pointer adjustment.

To make Pointer adjustments:

1. Select a protocol processor mode.
2. Select the **Transmit** button.
3. Select the **PTR** button. The PTR screen appears.
4. Configure the Pointer Adjustment parameters. For example,
 - In SONET mode, use the **Pointer Action** function to select the type of Pointer activity that occurs when the Increment Pointer or Decrement Pointer buttons are selected. (This function does not appear in STM-4 mode.)
 - Use the **New Transmit Pointer Value** function to change the Pointer value from 0 to 782.
 - Use **Burst Count** to set the number of repetitions for Pointer adjustments.
 - Use **NDF on New Pointer** to allow a New Data Flag to be set when a new Pointer value has been transmitted.
 - Use **SPE** (for SONET) or **AU** (for SDH) **Frequency Offset** to increase or decrease the speed of the Pointer adjustments.
5. Select **Increment Pointer** to make a positive pointer adjustment, or select **Decrement Pointer** to make a negative pointer adjustment.

These buttons generate and control Pointer movements within the transmitted signal. You can stress test a network by changing pointers or introducing an offset that continuously adjusts the STS or AU Pointer.

Frequency Calibration

ⓘ Important: The following procedure is for use by qualified Digital Lightwave personnel. It is used to tune the exact frequency of the unit's Stratum III clock. It is assumed that you have already measured the frequency offset that must be entered into the unit.

To enter and adjust the frequency of the Stratum III clock:

1. From the **System** tab, select **Misc**.
2. Select **Oscillator Value**. A keypad appears. The unit's internal clock frequency can be adjusted in 255 steps, where **0** is the lowest frequency, **128** is the center frequency, and **255** is the highest frequency.

3. Using the keypad, enter a value, and select **OK** when you are done. The new Oscillator Value is set.

Measure APS Activity



The following only applies to SDH and SONET protocol processors.

The system can measure APS switching intervals in your network. The unit can be configured to monitor for a specific event that will cause an APS switch. When this event occurs, the duration in both seconds and frames is logged. These statistics can be used to determine how long it takes for your network equipment to react to an APS event and switch to a backup path.

This function allows you to set a specific event as a trigger for APS activity. The APS measurement has an accuracy of 0.5 milliseconds.

To measure APS activity:

1. Select an SDH or SONET protocol processor.
2. Select the **Test** button.
3. Select the **APS** button. The APS measurement screen appears.
4. Select **Protection Switch Criteria**. The alarms, errors, and patterns that can be used to trigger an APS event appear.
5. Select **Consecutive Good Time Required** or **Consecutive Good Frames Required** (these parameters are coupled). A key pad appears.
 - If *Consecutive Good Time Required* was selected, enter the duration (in milliseconds) of valid frames to occur before Protection Switching is confirmed to be activated. The range is 0.125 to 2047.875 milliseconds.
 - If *Consecutive Good Frames Required* was selected, enter the number of valid frames to occur before Protection Switching is confirmed to be activated. The range is 1 to 16383 frames.
6. Select **State**. The APS options appear.
7. Select **Single APS** or **Continuous APS** to begin measuring. The unit will begin monitoring the incoming signal for this event. If it occurs, the protection switch state and time will appear in both seconds and frames present. The results will not include the number of good frames, but the number of frames that elapsed before the first good frame, meeting the entered criteria, occurred.

To stop monitoring APS measurement activity:

1. Select **State**.

2. Select **Stop APS**.

View the Incoming J0, J1, or J2 Trace



Select Monitoring the TC Trace for information about the TC Trace.

1. Select an SDH or SONET protocol processor mode.
2. Select **Receive**.
3. Select **SOH** to view the incoming J0 Trace, which appears at the bottom of the screen.
4. Select **POH** to view the incoming J1 Trace or J2 Trace, which appears at the bottom of the screen.

(The J2 Trace only applies to the STM-4 and OC-12 protocol processors.)

Monitor Incoming Errors, Alarms, or Pointer Activity

1. Select a protocol processor mode.
2. Select **Results**.
3. The **Scan** button functions appear on the touch screen. A summary count of current error, alarm, and event activity is reported. If no activity is reported, the message "No Errors or Alarms" appears.
4. Select **Errors** to view more details about incoming errors. This function reports the following:
 - o Error count using an 11-digit format
 - o Average error rate over the total error duration using an N.NNe-N format
 - o Current error rate using an N.NNe-N format
 - o Errored seconds using an 8-digit format
 - o The percentage of seconds in which the error was present
 - o The total number of error-free seconds using an 8-digit format
 - o The percentage of seconds that the error was not present
5. Select **Alarms** to view more details about incoming alarms. This function reports the number of seconds that an alarm is present.

6. Select **PTR** to view more details about incoming Pointer events (this function is only applicable to SONET/SDH protocol processors). This function reports the following:
 - The number of positive Pointer adjustments
 - The number of negative Pointer adjustments
 - The duration of a Pointer adjustment (in seconds)
 - The number of New Data Flags (NDF)
 - The number of invalid NDFs
7. Select **Event** to view a summary of events (alarms, errors, and Pointer activity) recorded by the unit. For more information, refer to the Use the Event Log section.
8. Select APS to display the incoming bit values of the K1 and K2 bytes. For more information, refer to the Monitor APS Commands section.
9. Select Graph displays incoming errors and alarms in the form of a line or bar graph.
10. Select Large LEDs displays LED error and alarm indicators in a large, easy-to-read format, which covers the entire touch screen area. This is useful for viewing errors or alarms from a long distance, such as across the room from a test bay.

Monitor Signal Status

1. Select **Receive**.
2. Select **Signal Status**. The Receive Signal Status window appears.
 - In *PDH* mode, Peak Positive and Negative Pulse voltage, power in dBm and dBdsx, line frequency, and line frequency offset information appears.
 - In *SDH* and *SONET* mode, frequency, optical power, and line frequency offset received information appears.

Monitor

Displays a command monitor that allows you to view SCPI or TL1 commands issued to the unit. The monitor will also show the command response (for valid commands entered) or the error code (if an invalid command is entered).

To use the monitor, you must first configure a communications port for SCPI or TL1 operation and then open the monitor.

To configure a port:

1. Select **System**.
2. Select **I/O Setting**.
3. Under **Communication Port Assignments**, select the unit's port (Serial, Ethernet, or GPIB) and configure it for SCPI or TL1 command mode. (GPIB does not support TL1 mode.)

To open the monitor:

1. Select **System**.
2. Select **Monitor**.
3. Use the **Select Command Processor** function to configure the monitor for SCPI or TL1 mode. The monitor is now configured to view and display SCPI or TL1 commands.

To issue SCPI commands to the unit, refer to the *SCPI Command Reference Guide* for SCPI procedures.

To issue TL1 commands to the unit, refer to the *TL1 Command Reference Guide* for TL1 procedures.

Monitor SONET and SDH APS Commands



The following only applies to SDH and SONET protocol processors.

When testing APS functionality, the system can log and display the bit values of the incoming K1 and K2 bytes.

The following information appears in the APS report for the last 16 K1 and K2 byte sequences received by the unit:


- The HEX value of the K1 byte.
- The HEX value of the K2 byte.

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- The number of frames received that contain the K1 and K2 bytes.
- The elapsed time of the frames that contain the K1 and K2 bytes.

To monitor APS commands:

1. Select a protocol processor mode.
2. Select the **Results** button.
3. Select the **APS** button. The incoming K1 and K2 byte values appear. A total of 16 byte sequences can appear.

 Per GR-253-CORE, only the upper 12 bits of the K1/K2 bytes (K1 bits 1-8 and the K2 bits 1-4) are used for APS operation. K2 bit 5 sets the APS mode type (1+1, 1:n) and cannot be changed during operation. K2 bits 6-8 are for alarms. Any changes to the lower four bits of the K2 byte do not affect APS operation. The Results APS table only starts and displays a new entry item if the upper 12 K1/K2 bits stabilize on a new value for a minimum of three consecutive frames.

Pause/Resume a Test

To pause a test:


1. Select **Test**.
2. Select **Pause Test**. When Pause is selected, the system stops collecting data, but the Elapsed Time counter continues. Additionally, when Pause is selected, a red **Test Paused** LED appears in the LEDs/Quick Status area.

To resume a test:

- Select **Resume Test**.
The Test Paused LED turns white with red text, indicating that the test was paused earlier. A restart or new test will clear the LED's history.

The events occurring while in pause mode will be recorded in the Event Log.


Print a File

 If you want to print a report directly from the unit, make sure that a printer is attached to the unit's parallel port.

1. From the System tab, select **File Services**.
2. Select a file from the File List box.
3. Select **Print**. A confirmation message appears.
4. Select **Yes**. The report is printed to the attached printer or to your PC's default printer.

Print Report (Graph)

To print a graph report:

 If you want to print a report directly from the unit, make sure that a printer is attached to the unit's parallel port.


1. From the **Results** tab, select **Graph**.
2. Select **Print Report**.

The **Report Setup** menu appears.


- Use the Destination Printer functions to print reports to a printer.
 - Use the Destination File functions to print reports to a file.
3. Select **Graphs** or **Graphs to File**.
 4. Select **OK**.

 If printing to a file, the **File Browser** appears. Enter a filename and select **OK**. The file extension for a graph is GRP.

Print a Real-Time Test

 Real-time test reporting is only available locally (from the touch screen) on portable units.

A real-time test records and generates a report of any events (alarms, errors, or power interruptions) that occur while the unit is monitoring a customer's circuit. The reports, generated in real time, can be sent to an attached printer, a file, or both.

 The attached printer must support dot matrix printer technology. The Epson Stylus Color 200 is an example of such a printer. The real-time test feature will not work if the printer only supports page printing.

The report contains the following information:

- A user-defined header
- A brief list of product settings
- Test start time and date
- Event activity as it occurs during the test
- A "print alive" message, which can be configured at a specified time to ensure the user that the real-time test is still active
- A statistical report, produced at the conclusion of the test, providing a summary of reported events. If no events occur during the test duration, a completion message, indicating that no problems were found, is printed.


Real-time test settings and accumulated results are not discarded if a power interruption occurs. The results are saved in 15-minute increments. When power is restored to the unit, the real-time test will continue from where it was prior to the power interruption. The power interruption event will appear in the real-time report.

Important: Before starting a real-time test, set the Security System Lock. This will prevent remote users from accessing the unit while a test is in progress.


To set up and start a real-time test:

1. Select **Test**.
2. Select **SET1**. The Duration and Action After Duration functions appear.
3. Select **Action After Duration**, and then select **Realtime Actions**.
4. Select a real-time test option:
 - Print Events and Repeat Test
 - Record Events and Repeat Test
 - Print and Record Events and Repeat Test
 - Print Events
 - Record Events
 - Print and Record Events
3. The Realtime Setup Parameters window appears. Enter a user-defined header. The header, which can be up to 64-bytes in length, serves as a brief description of the test. After entering a header using the keypad, select **Enter**.
4. Determine if and when a **Print Alive** message is generated. The test can be configured to issue the Print Alive message from 1 to 60 minutes. A value of 0 disables the messaging function.
5. Select **OK**. The Realtime Setup Parameters window closes, and the SET1 functions appear.

6. Select **Duration** and enter how long a test will run.
7. Select **Restart**. The real-time test starts. The Elapsed Time counter resets to 0.
8. A screen lock message appears once the test begins to alert others that the unit is involved in a test.

 **Important: When a real-time test begins, the unit is locked as indicated by the screen lock message. Other users cannot access the unit and change settings. However, if the Unlock button is selected during a test, anyone can then access the touch screen and change product settings. This action can disrupt real-time test results.**


Print Report


 If you want to print a report directly from the unit, make sure that a printer is attached to the unit's parallel port or serial port.

1. Select **Print Report**. (This button is part of the Common Function Buttons that appear at the bottom of the touch screen.) The Report Setup menu appears.
 - Use the Destination Printer functions to print reports to a printer.
 - Use the Destination File functions to print reports to a file.
2. Select Settings, Statistics, Events Report, APS, or Performance.
 - If **Settings** is selected, then the current values for all Set functions, for both Transmit and Receive, are printed.
 - If **Statistics** is selected, then results for the Scan, Errors, Alarms, and PTR function buttons are printed.
 - If **Events** is selected, then a detailed summary of events, such as alarms, errors, and Pointer activity, is printed. This report includes the event, the number of events logged, the start and stop time of the event, and the duration of the event.
 - If **APS** is selected, results of the K1 and K2 byte sequences received by the unit are printed.
 - If **Performance** is selected, the Performance Monitor results are printed.

(Select Print Report (Graph) for graph printing procedures.)

3. Select **OK**.

 If printing to a file, the File Browser appears. Enter a filename and select OK.

 **Files that are created when using the Remote Control Application are saved on your PC in the Remote Control's compatibility directory. This directory can be overwritten when connecting to other remote units that have the same compatibility level, but are different models (for example, a NIC Plus, a NIC 10G, and so on).**

If you want to keep these files, copy and save the following to a backup directory on your PC that is not in the compatibility directory's path:

- **Any file with the .set, .stat, .evt, .aps, .perf, or .rep extension.**
- **The client.prop file. Changes to this file are only needed if the remote unit uses a PCMCIA modem for its dial-up connection.**

Printer Port Configuration

The unit supports both parallel and serial printers.

For Parallel Printing:

- Attach a parallel printer cable (with a 25-pin male connector on one end) to the unit's **Parallel Port** connector. This is a DB-25 female connector.


For Serial Printing:

1. Attach a serial printer cable (with a 9-pin female connector on one end) to the unit's **RS-232** port connector. This is a DB-9 male connector.
2. Select **System**.
3. Select **I/O Settings**.
4. From the Communication Port Assignments section, select the **Serial** function and set it to **Printer**.

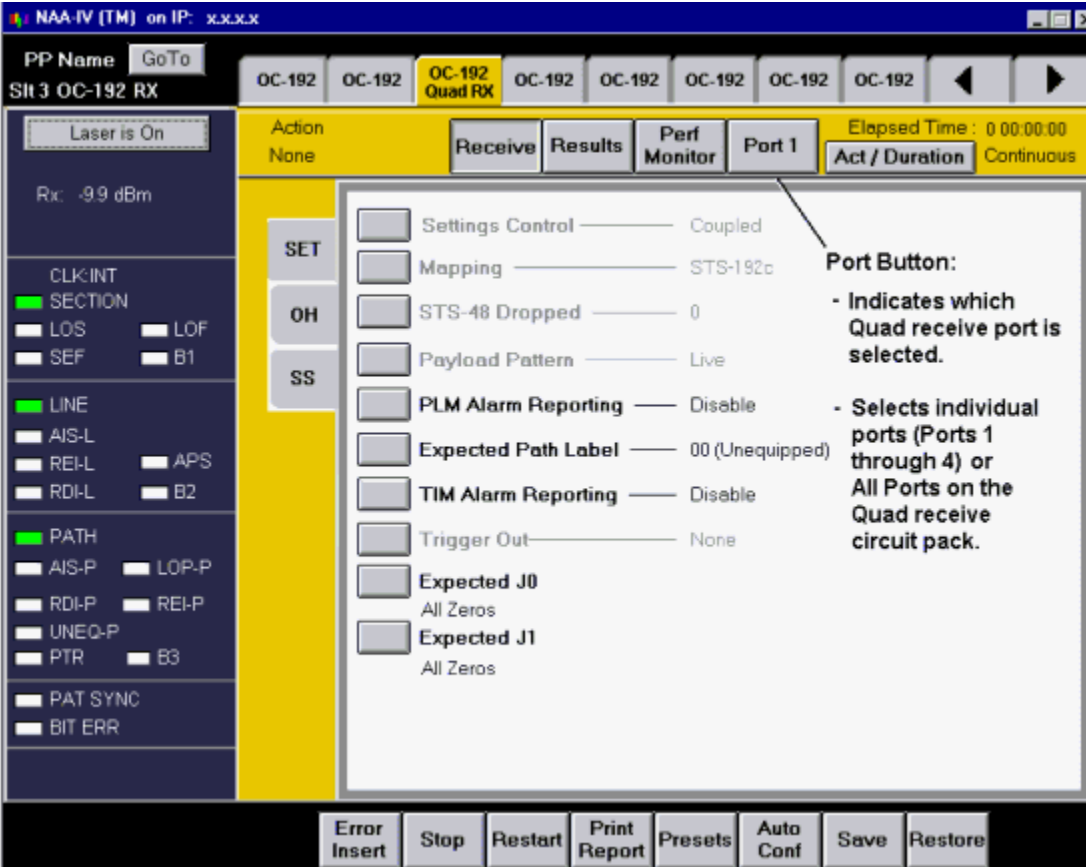
 If it is necessary to change the serial port parameters:

- Set the Serial function to **None**.
- Change the serial port parameters.
- Set the Serial function to **Printer**.

Quad Port Selection

 This procedure is only valid for units that have a Quad receive circuit pack installed.

A Quad receive circuit pack can accept up to four separate incoming optical channels. The following example illustrates a Quad receive circuit pack configured for SONET.



To select one of four Quad receive ports:

1. Select the **Quad RX** tab. The protocol processor's receive functions appear.
2. Use the **Port** button to select one of the four ports on the Quad receive circuit pack. (The receive functions associated with that port appear.)

The **All Ports** option allows changes to be made simultaneously to all ports on a Quad receive circuit pack. However, the results that appear when **Results** is selected only apply to the current port. The current port appears on the Port button, for example, All (Port 1)



When a Quad receive circuit pack is selected, the **Transmit** button and **APS** functions are not available.

Re-Boot Unit

This button reboots the unit. This can be performed locally from a portable unit's touch screen or remotely using the Remote Control Application software.

To reboot the unit:

1. Select **System**.
2. Select **Re-Boot Unit**, which appears on the **Misc** screen.
3. Select **Yes** to continue or **No** to cancel.

Replay Graphs/Stop Replay

Use the **Replay Graphs** button to open any previously saved graph (GRP) that is stored on the system.

Use the **Stop Replay** button to close the graph file.

Remote Control Application

The Remote Control Application software is a graphical user interface that allows you to remotely connect to and control portable and rackmount products from a PC.

Before using the Remote Control Application:

- Verify the minimum software and hardware requirements.
- Verify that the Ethernet parameters have been entered into your unit.
- Verify that you have security access to the unit.
- Verify that FTP service is enabled on the unit.

- Install the Remote Control Application on to your PC.
- If the remote unit uses a PCMCIA modem for dial-up connectivity, configure the Remote Control Application for PCMCIA operation.

To start the Remote Control Application:

1. Select the Remote Control Application shortcut icon that appears on your PC's desktop.
2. Enter the remote unit's IP address, and your user ID and password.
3. Select **OK**.
4. Once the connection is made, the remote unit's GUI appears. The title bar contains the product name and connection method. Use your mouse to select functions.

To automate the log on process, select Automating the Remote Control Icon for more information.

Files that are created when using the Remote Control Application are saved on your PC in the Remote Control's compatibility directory. This directory can be overwritten when connecting to other remote units that have the same compatibility level, but are different models (for example, a NIC Plus, a NIC 10G, and so on).

If you want to keep these files, copy and save the following to a backup directory on your PC that is not in the compatibility directory's path:

- Any file with the .set, .stat, .evt, .aps, .perf, or .rep extension.
- The client.prop file. Changes to this file are only needed if the remote unit uses a PCMCIA modem for its dial-up connection.

Reset System

This Administrator function clears and restores default settings to the following:

- User Accounts - deletes all user accounts and restores the default Admin account.
- FTP Administrator - deletes the FTP account and restores the default FTP user ID and password.
- System Services - restores all default system service settings.



User files, such as the protocol processor's transmit and receive settings,

report statistics, graphs, and test results, are not deleted. These files are managed using File Services.

To reset the system:

1. Select **System**.
2. Select **Security**. The Security screen appears.
3. Select the **Reset System** button.
4. A message confirming that you want to reset the system appears. Select **Yes**.
5. A message stating that the system must be rebooted for changes to take affect appears. Select **OK**.
6. Reboot the system.

Restart an Error, Alarm, or Event

The Restart button performs the following activities:

- Starts error, alarm, or event activity that was stopped using the Stop button.
- Clears and resets error, alarm, and event activity counters, statistics, and LEDs for the current protocol processor.

To restart a test or reset statistics:

- Select the **Restart** button located at the bottom of the touch screen. The current protocol processor is restarted.

Restore Default Tab Names

1. Select **System**.
2. Select **User Preferences**.
3. Under Label Preferences, select **Default**.
4. Select **Save All List Entries**. The default tab names are restored.

To change tab names, select Changing a Tab Name.

Restore a Settings Configuration or Factory Defaults

This function allows you to perform the following actions:

- Restore the unit's factory default settings.
- Restores or recalls any saved configurations for all protocol processors' Receive or Transmit settings.

To restore a settings configuration:

1. Select **Restore** from the Common Function Buttons. The Select Type of Restore window appears with the following options:
 - **Factory Defaults:** Restores the unit's default settings. If this option is selected, the default settings are immediately restored. (See Factory Default Mode to set the unit's default Protocol Processor mode.)
 - **User File:** Recalls any saved configurations for a protocol processor's Receive or Transmit settings. If this option is selected, go to step 2.
2. If User File is selected, the File Browser window appears. From the File list, select the name of the settings configuration to be restored.
3. Click **OK**. The User File settings configuration selected is restored.

Round-Trip Delay

The round-trip delay function allows you to transmit a known frame into your network and measure how long it takes for the frame to return to the unit.

To generate and measure round-trip delay:

1. Select an SDH or SONET protocol processor.
2. Select **Test**.
3. Select **RTD**. The Round-Trip Delay screen appears.
4. To fine-tune the measurement, select **Consecutive Good Time Required** or **Consecutive Good Frames Required** (these parameters are coupled). Otherwise, continue to step 5.

If selected, a keypad appears.

- If *Consecutive Good Time Required* is selected, enter the duration (in milliseconds) of valid frames to occur before the round-trip delay function is confirmed to be activated. The range is 0.125 to 2047.875 milliseconds.
 - If *Consecutive Good Frames Required* is selected, enter the number of valid frames to occur before the round-trip delay function is confirmed to be activated. The range is 1 to 16383 frames.
5. Select **Action State**. The round-trip delay options appear.

6. Select **Single Round-Trip Delay** or **Continuous Round-Trip Delay** to start the round-trip delay function.
 - If *Single Round-Trip Delay* is selected, an AIS alarm is inserted into a frame and transmitted once through your network. The frame's transmission through the network is measured in frame counts and milliseconds. Frame counts indicates the number of frames received before the AIS frame is received by the unit. Milliseconds indicates how long it took for the AIS frame to travel out and return to the unit.
 - If *Continuous Round-Trip Delay* is selected, an AIS alarm is inserted into a frame and continuously transmitted through your network. The current frame count and duration appear in the **Current** column. The fastest round trip appears in the **Minimum** column and the slowest round trip appears in the **Maximum** column.

To stop the round-trip delay function:

1. Select **Action State**.
2. Select **Stop Round-Trip Delay**.

Save a Customized Settings Configuration

Saves a customized configuration for all protocol processors' Transmit or Receive settings.

To save a configuration:

1. Create a test configuration using the Transmit and Receive Settings screens.
2. Once you are done, select **Save** from the Common Function Buttons. The File Browser window appears.
3. Select **File Name**.
4. Enter the name of the setting configuration to be saved, and select **Enter** when done. The file is saved with an automatic file extension of .set.

Save Graphs


Use this button to save the current or previously graphed results to a file for later retrieval and viewing.

Screen Capture

This function allows you to print the current screen displayed and converts it to a bitmap (.bmp) image, which is saved to your unit or PC's hard drive.

To capture a screen:

1. Select **Print Report**. (This button is part of the Common Function Buttons that appear at the bottom of the touch screen.)
2. Select **Screen Capture**. The image is saved as Screen.bmp.

 A screen capture image will automatically overwrite an existing Screen.bmp file. To save previous screen capture images, use the File Services' Rename function.

3. If you are capturing screens using a portable unit, you must transfer the file from the unit to your PC to print the bitmap image. Refer to Uploading a File for file transfer procedures. After the file is copied to your PC, it can be opened and printed using Microsoft Paint.

SDH/SONET Signal Notification

 The following only applies to SDH and SONET protocol processors.

The unit can use SS bits to determine if it is receiving an SDH or SONET signal. If the received signal does not match the expected signal, the SS Bits Mismatch LED turns red. The SS bits are bits 5 and 6 of the H1 Pointer byte. These bits determine if the H1 byte is configured for SDH or SONET operation.

To configure the unit for SDH/SONET signal detection:

1. Select an SDH or SONET protocol processor.
2. Select **Receive**.
3. Select **SET 1**.
4. Select the **Expected SS Bits** function. The Select Expected SS Bit window appears.
5. Select an SS bits option.
6. Select the **SS Bits Alarm Reporting** function and select **Enable**.

An alarm is reported if the incoming SS bits on the received signal do not match the expected SS bits.

Security

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Security is an administrative function and only appears if you are logged on as an Administrator. This screen is divided into the following main sections: User Security Information, System Services/FTP Administrator, and Reset System.

User Security Information

This function allows you to view the following security information on system users:

- User Name
- Permissions: Read Only, Read/Write, Calibrate, or Admin
- Active User: Displays the user's current status.
- Current Permissions: If Security System Lock is enabled, shows users that may temporarily have read only privileges.
- Default User

The Security function also enables a user with administrator privileges to perform the following tasks:

- Add a User
- Delete a User
- Update a User Profile
- Enable/Disable Security System Lock
- Establish a Default Login
- Establish a Required Login



If the Security System Lock function is enabled, only one user with Read and Write permissions (this includes Calibration and Admin users) can be logged in at a time. If a user with Read and Write permissions is already logged in, a window will appear giving you the option of logging in with Read-Only permissions only. When the user logs on with Read-Only permissions, all functionality will be disabled with the exception of the online help and the About this product function.

System Services and FTP Administrator

- **System Services:** Allows an administrator to disable specific network services to meet their network's security policies. To enable a system service, select its checkbox. To disable a system service, remove the check so that the checkbox is blank.
- **FTP Administrator:** Assigns a user ID and password so that a user can log in to a remote computer and transfer files using the file transfer protocol service.

Reset System

- Restores default Security settings.

Set Oscillator Value

1. Select **System**.
2. Select **Misc**.
3. Select **Oscillator Value**.
4. Using the touch screen key pad, enter a value between 1 and 255.
5. Click **Ok** to accept the value.

Set the External Clock

This function allows you to set the external clock to Bits or SETS.

To set the external clock:

1. Select **System**.
2. Select **Misc**.
3. Select **External Clock**.
4. Select **Bits** or **SETS**.

Set Time and Date

The system uses touch screen keypads for time and date configuration. Time is entered in a **HH/MM/SS** format. Date is entered in a **DD/MM/YYYY** format.

To set the time:

1. Select **System**.
2. Select **Set Unit's Date and Time**. The Set Date and Time window appear.
3. Select the **Time** button.
4. Select **Hour** and enter the hour using 2-digit, 24-hour, military time format.
5. Select **Minutes** and enter the minutes using a 2-digit format.
6. Select **Seconds** and enter the seconds using a 2-digit format.
7. Select **Set**. The time change appears in the LED/Quick Status area.

To set the date:

1. Select **System**.
2. Select **Set Unit's Date and Time**. The Set Date and Time window appear.
3. Select the **Date** button.
4. Select **Month** and enter the month using a 2-digit format.
5. Select **Day** and enter the day using a 2-digit format.
6. Select **Year** and enter the year using a 4-digit format.

7. Select **Set**. The date change appears next to the Set Unit's Date and Time field.

Start a Test

The Duration and Action After Duration functions determine how long a test runs and what activities occur at the end of the test.

To start a test:

1. Select **Test**. The Duration and Action After Duration functions appear under **SET 1**.
2. Select Duration and enter how long the test runs.
3. Select Action After Duration and select what will occur at the end of the test.
4. After selecting an Action, the test starts. The Elapsed Time counter resets to 0.

To stop a test before the test duration expires, select **Stop** (from the bottom of the touch screen). All statistics and events logged and reported by the Performance Monitoring and Results functions stop. In addition, the Elapsed Time and Duration counts stop.

To restart a test, select **Restart** (from the bottom of the touch screen). The test and statistics restart.

To pause a test, select **Pause Test**.

To resume a paused test, select **Resume Test**.

Start the Screen Saver

To enable the screen saver:

1. Select **System**.
2. Select **Start Screen Saver**. The banner appears.


(*Off* is the default setting of this function. It changes to *On* when **Start Screen Saver** is selected.)

To clear the screen saver, touch any where on the touch screen.

To disable the screen saver:

1. Select **System**.
2. Select **Start Screen Saver**.

The setting of this function changes to Off.

 An idle time duration setting, necessary to automatically activate the screen saver, will be available in a future release.

Stop a Test

The Stop button stops the reporting of received data and takes a snapshot of error, alarm, and event activity.

When the Stop button is selected, the following occurs:

- All statistics logged and reported by the Performance Monitoring function stop.
- All alarm, error, and event statistics logged and reported by the Results function stop.
- All elapsed time and duration counters stop.

 The LEDs will continue to update and indicate current activity.

To stop a test:

- Select the **Stop** button located at the bottom of the touch screen.

To restart test activity and statistic reporting, select the **Restart** button.

Using the Switch Matrix

The **Switch Matrix** is a graphical display of the unit's current interface and mapping connections. It allows you to configure the unit from a single screen using the following methods:

- Switch Matrix components
- Presets button

To configure the unit using the Switch Matrix components:

1. Select the **Switch Matrix** tab.
2. Starting from the left, select an **Interface** button.
After selecting an interface, the appropriate Mapping, Container, and Payload buttons are enabled on the Switch Matrix. This will help you create a valid configuration.
3. Select the available **Mapping** and **Payload** buttons.
4. Select **Apply**. The unit applies the new configuration. Signal lines appear to illustrate the new data flow.

To configure the unit using the Presets button:

1. Select the **Switch Matrix** tab.
2. Select the **Presets** button located below the Switch Matrix. The Presets window appears.
3. Select the **Interface** button and choose an interface as a starting point.
4. Select the **Configuration** button and choose a protocol to connect to the selected interface. If necessary, select the Configuration button again to create additional connections.
5. Select the **Apply** button. The unit takes a few moments to apply the new protocol connections. When complete, the mappings and configurations associated with the selected Preset are automatically made. Signal lines appear to illustrate the new data flow.

For more information, see Presets function.

TCM


The unit supports Tandem Connection Monitoring (TCM) mode for SDH and SONET protocol processors. When configured for TCM mode, the unit can transmit and monitor errors, alarms, and trace pattern activity between your network's TC equipment.

For more information about TCM transmit and receive procedures:

- Select **Configuring TCM for Transmit Mode** for transmit preparation procedures and links to error, alarm, and trace generation.
- Select **Configuring TCM for Receive Mode** for receive preparation procedures and links to error, alarm, trace, and overhead monitoring.

For information about TCM LEDs, select **TC Summary**.

Turn Laser On or Off

 **Warning:** The optical Transmit output is produced by a laser device. You should never, under any circumstances, look into an unterminated fiber.

Laser operation is controlled from the **Quick Status LEDs** area. The **Laser** button indicates if the laser is on or off. When the unit is powered on, the laser is off by default.

Laser Safety

The unit contains Class 1 laser devices. Never look into an unterminated fiber. Always place dustcaps on the optical ports when fiber is not attached to the optical ports. CDRH Accession numbers are listed in Agency Approvals.



Class 1 Laser Product

NOTICE


Unterminated optical connectors may emit laser radiation. Do not view with optical instruments.

To turn the laser on:

- Select the **Laser** button in the **Quick Status LEDs** area. The laser status indicates **ON**.

To turn the laser off:

- Select the **Laser** button. The laser status indicates **OFF**.

 SDH and SONET laser operation can be defined using the Initial Laser Setting function which controls whether the laser is on or off when the unit is turned on.

- Off – The unit's laser will be off when the unit is turned on.
- On – The unit's laser will be on when the unit is turned on.
- Restore Previous State – When the unit is turned on, the laser will be on or off based on its previous setting before the unit was turned off.

Transmit SONET and SDH APS Commands

 The following only applies to SDH and SONET protocol processors.

Common Tasks and Functions Online Help

The system allows you to send a series of K1 and K2 bytes to stress and test a variety of APS switching scenarios.

To transmit K1 and K2 bytes:

1. Make sure that the K1 and K2 bytes have been configured as described in the How to Configure APS Commands section.
2. Select protocol processor mode.
3. Select the **Transmit** button.
4. Select the **APS** button. The initial APS screen appears containing a table of the K1 and K2 byte sequences that can be transmitted.
5. Select **Start** to transmit the K1 and K2 bytes.


To stop transmitting K1 and K2 bytes:

1. Select protocol processor mode.
2. Select the **Transmit** button.
3. Select the **APS** button. The initial APS screen appears.
4. Select **Stop**.

Update a User Profile



If the System Lock function is enabled, only one user with Read and Write permissions (this includes Calibration and Admin users) can be logged in at a time. If a user with Read and Write permissions is already logged in, a window will appear giving you the option of logging in with Read permissions only.

1. Select **System**.
2. Select **Security**. The Security screen appears.
3. From the User List, select the user profile to be updated. The user ID, password, and permissions appears in the Account Information portion of the screen.
4. Select , which is next to the field to be updated.
 - If the *User ID* or *Password* was selected, a keypad appears, allowing you to modify the current information. Press **Enter** when you are done.
 - If *Permissions* was selected, the Select User Permissions window appears. Select the updated permissions that you wish to apply.
5. When you are done updating the user's profile, select **Update**. The updated information appears on the User List.

Upgrade Software

The I/O Settings function allows you to configure your unit with the ability to upgrade your software using Digital Lightwave's Software Upgrade System, which is provided to you on a separate installation CD-ROM or via the DLI Software Upgrade web site.



The unit's FTP service must be enabled to successfully perform an upgrade.

To set up your unit to perform software upgrades using the Software Upgrade System:

1. Select **System**.
2. Select **I/O Settings**.
3. Select the **IP Address** button. A keypad appears.
4. Using the keypad, enter the IP address of your unit, and select **Enter** when you are done.



IP addresses **192.168.138.000 through 192.168.138.255** are reserved and should not be used. A system conflict can occur if these IP addresses are entered.

5. Select the **Subnet Address** button. A keypad appears.
6. Using the keypad, enter the Subnet address, and select **Enter** when you are done.
7. Select the **Router** button. A keypad appears.
8. Using the keypad, enter the router address, and select **Enter** when you are done.
9. Power the unit off and then on again so that these changes take affect.
10. The unit is now set up to perform software upgrades using the Software Upgrade System.



Information on Digital Lightwave's Software Upgrade System is available through the Help button located on the Software Upgrade System. The application is available via CD-ROM or the DLI Software Upgrade web site.

View Activity of Add/Dropped Signals

1. Select **Results**.
2. Select **Scan** to view a summary of the error and alarm counts that have occurred.

Common Tasks and Functions Online Help

3. Select **Err** to view the count, average rate, and current rate of the errors that have occurred.
4. Select **Alarm** to view the alarms (in seconds) that have occurred.
5. Select **Events** to view a list of the events that have occurred.
6. Select **Large LED** to view errors and alarms in the form of LEDs.

Troubleshooting

Troubleshooting

This topic is intended to aid in resolving common user interface problems. For additional assistance, please contact Customer Service.

Interface	Symptom	Resolution
Power	No power (fans silent)	<ul style="list-style-type: none">• Check input power cord seating on both ends.• Ensure input voltage and frequency is correct (100-120 VAC and 200-240 VAC, 50-60Hz).• Check the fuse. If fuse is blown, contact Customer Service.
Touch Screen	Will not respond	Remove anything resting against the screen (cables, etc.) and reboot the unit if it is still not responding.
Touch Screen	Too much or too little sensitivity.	Adjust desired sensitivity in the System, Misc screen.
Speaker	Volume too loud or too soft	Adjust desired volume in the System, Misc screen

<p>Optical</p>	<p>SONET B1, B2 errors appearing when locally looped.</p>	<ul style="list-style-type: none"> • Inspect and clean fiber-optic surfaces. • Check the Receive signal status and ensure that the optical power is -2dBm to -14dBm for OC-192/STM-64 and -2dBm to -26dBm for OC-48/STM-16. Also that the frequency is within +/- 100ppm. <p>Note: Attenuation is required for local loopback of OC-48/STM-16.</p>
<p>Optical</p>	<p>Loss of signal or power level low</p>	<p>Check for optical connector tightness and eliminate any fiber kinks or knots.</p>
<p>Ethernet</p>	<p>Device not communicating</p>	<ul style="list-style-type: none"> • Ensure cable is the correct type (<i>Direct</i> if connected to a LAN, and <i>Crossover</i> connected to a computer). • Set up a valid IP address in the System, I/O, Settings screen. • IP addresses 192.168.138.000 through 192.168.138.255 are reserved and should not be used. A system conflict can occur if these IP addresses are

		entered.
Serial RS232	Device not communicating	<ul style="list-style-type: none"> • Ensure the connecting cable is a null modem cable. • Ensure communication settings of baud, bit, stop, and parity are set up correctly in the System, I/O, Settings screen.
Printer	Printing device will not print	<ul style="list-style-type: none"> • Verify that the printer is in "standard text" print mode. • Check that the cable is a "standard printer" cable.
PCMCIA	Card will not function in slot	This interface is not currently implemented. A future software upgrade will support GPIB and memory card devices. Call for software upgrade status and a list of supported devices.

BITS	Unit not synchronizing up to timing source	<ul style="list-style-type: none"> • Check that the cables are connected correctly (IN/OUT). • Ensure the clock source is set to "BITS" on the System, Misc screen and enabled in the Transmit Clock reference screen • Verify that the input clock source is a clean signal with a frequency of 1.544 MHz into a 100-ohm termination.
Clock out	Not triggering properly	<ul style="list-style-type: none"> • Ensure that "trigger out" options are properly enabled. • Ensure that the clock signal is terminated into a 50-ohm load.
SETS	Unit not synchronizing up to timing source	<ul style="list-style-type: none"> • Check that the cables are connected correctly (IN/OUT). • Ensure the clock source is set to "SETS" in the System, Misc screen and enabled in the Transmit Clock reference screen. • Verify that the input clock source is a clean signal with a frequency of 2.048

		MHz into a 120-ohm termination.
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Troubleshooting

This topic is intended to aid in resolving common user interface problems. For additional assistance, please contact Customer Service.

Interface	Symptom	Resolution
Power	No power (fans silent)	<ul style="list-style-type: none"> • Check input power cord seating on both ends. • Ensure input voltage and frequency is correct (100-120 VAC and 200-240 VAC, 50-60Hz). • Check the fuse. If fuse is blown, contact Customer Service.

Common Tasks and Functions Online Help

Touch Screen	Will not respond	Remove anything resting against the screen (cables, etc.) and reboot the unit if it is still not responding.
Touch Screen	Too much or too little sensitivity.	Adjust desired sensitivity in the System, Misc screen.
Speaker	Volume too loud or too soft	Adjust desired volume in the System, Misc screen
Optical	SONET B1, B2 errors appearing when locally looped.	<ul style="list-style-type: none"> Inspect and clean fiber-optic surfaces. Check the Receive signal status and ensure that the optical power is -2dBm to -14dBm for OC-192/STM-64 and -2dBm to -26dBm for OC-48/STM-16. Also that the frequency is within +/- 100ppm. <p>Note: Attenuation is required for local loopback of OC-48/STM-16.</p>
Optical	Loss of signal or power level low	Check for optical connector tightness and eliminate any fiber kinks or knots.

<p>Ethernet</p>	<p>Device not communicating</p>	<ul style="list-style-type: none"> • Ensure cable is the correct type (<i>Direct</i> if connected to a LAN, and <i>Crossover</i> connected to a computer. • Set up a valid IP address in the System, I/O, Settings screen. • IP addresses 192.168.138.000 through 192.168.138.255 are reserved and should not be used. A system conflict can occur if these IP addresses are entered.
<p>Serial RS232</p>	<p>Device not communicating</p>	<ul style="list-style-type: none"> • Ensure the connecting cable is a null modem cable. • Ensure communication settings of baud, bit, stop, and parity are set up correctly in the System, I/O, Settings screen.
<p>Printer</p>	<p>Printing device will not print</p>	<ul style="list-style-type: none"> • Verify that the printer is in "standard text" print mode. • Check that the cable is a "standard printer" cable.

Common Tasks and Functions Online Help

PCMCIA	Card will not function in slot	This interface is not currently implemented. A future software upgrade will support GPIB and memory card devices. Call for software upgrade status and a list of supported devices.
BITS	Unit not synchronizing up to timing source	<ul style="list-style-type: none"> • Check that the cables are connected correctly (IN/OUT). • Ensure the clock source is set to "BITS" on the System, Misc screen and enabled in the Transmit Clock reference screen • Verify that the input clock source is a clean signal with a frequency of 1.544 MHz into a 100-ohm termination.
Clock out	Not triggering properly	<ul style="list-style-type: none"> • Ensure that "trigger out" options are properly enabled. • Ensure that the clock signal is terminated into a 50-ohm load.

<p>SETS</p>	<p>Unit not synchronizing up to timing source</p>	<ul style="list-style-type: none"> • Check that the cables are connected correctly (IN/OUT). • Ensure the clock source is set to "SETS" in the System, Misc screen and enabled in the Transmit Clock reference screen. • Verify that the input clock source is a clean signal with a frequency of 2.048 MHz into a 120-ohm termination.
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OTN Online Help

Optical Transport Network (OTN) G.709 Overview

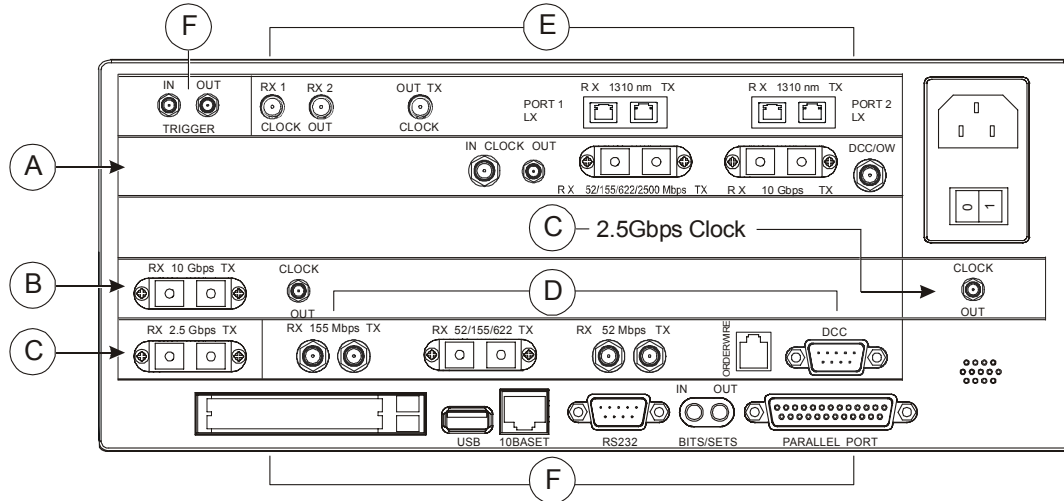
This section of the online help document has topics that discuss:

- OTN LEDs
- OTN Specific Tasks
- OTN Screen and Function Descriptions
- OTN Connector Panel

15 July 03

OTN Connector Panel

Use the following image and table to locate Optical Multirate connectors.






-
- A Optical Multirate connectors for OTN, SONET and SDH tabs.
 - B 10 Gbps TX and RX optical connectors and Clock Out connector for STM-64 and OC-192 tabs.
 - C 2.5 Gbps TX and RX optical connectors and Clock Out connector for STM-16 and OC-48 tabs.
 - D Optical and electrical connectors for STM-0/1/4 and OC-1/3/12 tabs.
 - E Gigabit Ethernet connectors.
 - F General system connectors.
-

Configuring the Unit for OTN (G.709) Mode

The Optical Multirate circuit pack supports testing and verification of OTN (G.709) optical networks.

To configure the unit for OTN (G.709) mode:

1. Select .
2. Select .
3. Select .
4. Select the **Interface** function and select either the **G.709 10G (10.709 GHz)** or the **G.709 2.5G (2.666 GHz)** option.

This configures the unit for OTN operation, using G.709 mapping with a line rate of 10.709 Gbps or 2.666 Gbps.

Configuring OTN Mappings and Payloads



The ITU G.709 standard allows the mapping of a pattern directly into an OTN payload.

Use the following procedures to select an OTN mapping and OTN payload.

Before generating OTN traffic:

- Make sure the unit is configured for OTN operation as described in *Configuring the Unit for OTN (G.709) Mode*.

To configure an OTN mapping:

1. Select .
2. Select .
3. Select **Mapping**. The following options are available:
 - PRBS
 - Null Client
 - Unframed BERT
 - SONET/SDH Synchronous
 - SDH/SONET Asynchronous (available at 2.666 Gbps line rate only)

To configure an OTN payload:

1. If Mapping is set to:
 - **PRBS** – Select **Payload Pattern** and choose a PRBS pattern to fill the payload. This will be a framed OTN signal. (Use the functions that appear on the OTN screen to insert errors/alarms or change OTN overhead bytes.)

- **Null Client** – The OTN payload is filled with an All Zeros pattern. (Use the functions that appear on the OTN screen to insert errors/alarms or change OTN overhead bytes.)
- **Unframed BERT** – Select **Payload Pattern** and choose a PRBS pattern to fill the payload. This will be an unframed OTN signal. (Use the functions that appear on the OTN screen to insert errors/alarms or change OTN overhead bytes.)
- **SONET/SDH Synchronous** -- Configures the unit for OTN synchronous SONET/SDH mappings. Refer to the OC-192/STM-64 Online Help Guide or the NIC Quick Reference Guide for configuring settings underneath the SONET/SDH tab.
- **SONET/SDH Asynchronous** -- Configures the unit for OTN asynchronous SONET/SDH mappings. Refer to the OC-192/STM-64 Online Help Guide or the NIC Quick Reference Guide for configuring settings underneath the SONET/SDH tab.

OTN Transmit Functions

Under *Set 1*, the following options are available:

Settings Control - The 2 options available are Coupled and Independent.

Passthru Mode - The 2 options available are On or Off.

Interface - The available options are:

- G.707/GR-253
- G.709 10G (10.709 GHz) 1550.000 nm
- G.709 2.5G (2.666 GHz) 1550.000 nm
- G.709 2.5G (2.666 GHz) 1310.000 nm

Clock Reference - The available options are:

- Internal
- Recovered
- BITS/SETS
- External 8 KHz
- External 1.544 MHz
- External 2.048 MHz
- External 10 MHz

Mapping - See previous “Configuring OTN Mappings” section.

Payload Pattern - The following options are available:

PRBS 9, PRBS 9 Inv, PRBS 11, PRBS 11 Inv, PRBS 15, PRBS 15 Inv, PRBS 20, PRBS 20 Inv, PRBS 23, PRBS 23 Inv, PRBS 31, PRBS 31 Inv and User Defined.

Line Frequency Offset - Input value (maximum value: 100; minimum value -100).

OTN Transmit Functions

OPU Frequency Offset - Available when using asynchronous mapping. Input value (maximum value: 65.7, minimum value: -65.7)

Initial Laser Setting - The 3 options available are On, Off, and Restore Previous State.

Under **Set 2**, the following options are available:

Trigger In - The 3 options are None, Restart, and Insert Error.

Scramble - The 2 options are Enable and Disable.

Forward Error Correction - The 2 options are Enable and Disable.

Under **OTN OH** (Overhead), the following options are available:

OTU - Optical Transport Unit

ODU 1 - Optical Data Unit (Screen 1)

ODU 2 - Optical Data Unit (Screen 2)

TCM - Tandem Connection Monitoring




OPU - Optical Payload Unit

The following procedures describe basic OTN transmit functions.

Inserting OTN Alarms




The unit can transmit OTN alarms to simulate various alarm conditions. One reason for transmitting alarms is to determine if the receiving equipment can detect an alarm in the incoming signal.

To insert alarms:

1. Select  .
2. Select  .
3. Select  .
4. Select **Alarm Generated**. The **Select Alarm to Insert** window appears.
Alarm options are: LOS, LOF, OOF, LOM, OOM, OTU:AIS, OTU:IAE, OTU:BDI, ODU:AIS, ODU:LCK, ODU:OCI, ODU:BDI, TCM1:BDI, TCM2:BDI, TCM3:BDI, TCM4:BDI, TCM5:BDI, and TCM6:BDI

5. Select an alarm. The system starts transmitting alarms.




To stop alarm transmission:

1. Select  .
2. Select  .
3. Select  .
4. Select **Alarm Generated**. The **Select Alarm to Insert** window appears.
5. Select **NONE**. Alarm transmission stops.



Inserting OTN Errors

Various errors can be transmitted in the OTN signal. One reason for transmitting errors is to determine if the receiving equipment can detect an error in the incoming signal.

To insert errors:

1. Select  .
2. Select  .
3. Select  .
4. Select **Error to Insert**. The **Select Error to Insert** window appears.
Error options are: FEC:UNCOR, FEC:COR, FRAME, MFAS, OTU:BIP8, OTU:BEI, ODU: BIP8, ODU:BEI, BIT, TCM1:BIP8, TCM2:BIP8, TCM3:BIP8, TCM4:BIP8, TCM5:BIP8, TCM6:BIP8, TCM1:BEI, TCM2:BEI, TCM3:BEI, TCM4:BEI, TCM5:BEI, and TCM6:BEI
5. Select an error.
6. Select **Error Insert Rate**. The **Select Error Insert Rate** window appears.
7. Select an error rate. The system starts transmitting errors.

To stop error transmission:

1. Select a protocol processor mode.
2. Select  .
3. Select  .
4. Select **Error Insert Rate**.
5. Select **None**. Error transmission stops.




To insert single errors, press the Error Insert button at the bottom of the GUI.

Select  .

Inserting Bursts of OTN Errors and Alarms

The optical multirate board allows bursts of errors and alarms to be generated.

To configure the unit for error/alarm burst generation:

1. Select  .
2. Select  .
3. Select  .
4. Select **Error to Insert**. The **Select Error to Insert** window appears.
Select the **More** option.
5. The **Select Alarm to Burst** window appears.
6. Select the error or alarm that you want to generate. Options are: OTU:IAE, OTU:BDI, ODU:BDI, TCM1:BIP8, TCM2:BIP8, TCM3:BIP8, TCM4:BIP8, TCM5:BIP8, TCM6:BIP8, TCM1:BEI, TCM2:BEI, TCM3:BEI, TCM4:BEI, TCM5:BEI, and TCM6:BEI
7. The error insert rate displays Periodic Bursts.
8. Select **Error Burst Size**. Options are:

Off - Disables Error/Alarm Burst Generation.

Frames - Sets the burst size as the number of frames (minimum: 0, maximum: 65535).

Milliseconds - Sets the burst size as a duration in milliseconds (minimum: 0, maximum: 3209.35).

Select an error burst size. The error burst size is displayed in frames and milliseconds.

9. Select **Error Burst Period**. The error burst period is the interval between the start of an error burst and the start of the subsequent error burst.

As such it should always be configured to be longer than the **Error Burst Size**.

Frames - Minimum: 0, maximum: 1048575.

Milliseconds - Minimum: 0, maximum: 51350.39.

OTN Receive Functions

The OTN Receive functions configure the unit for the expected OTN traffic. If the received signal's criteria does not match the configured receive criteria, an error is logged under the Results functions.

Under **Set 1**, the following options are available:

Settings Control - The 2 options available are Coupled and Independent.

Interface - The available options are:

- G.707/GR-253
- G.709 10G (10.709 GHz) 1550.000 nm
- G.709 2.5G (2.666 GHz) 1550.000 nm
- G.709 2.5G (2.666 GHz) 1310.000 nm

Mapping - See previous “Configuring OTN Mappings” section.

Payload Pattern - The following options are available:

PRBS 9, PRBS 9 Inv, PRBS 11, PRBS 11 Inv, PRBS 15, PRBS 15 Inv, PRBS 20, PRBS 20 Inv, PRBS 23, PRBS 23 Inv, PRBS 31, PRBS 31 Inv, Live, and User Defined.

Power Low Threshold - Minimum: -100 dBm, Maximum: -0 dBm. An alarm is raised when the measured optical power drops below this threshold. -100 disables power low alarm monitoring.

Out of Frequency Threshold - Minimum: 0 ppm, Maximum: -100 ppm. An alarm is raised when the measured Rx line frequency offset exceeds this volume. 0 disables out of frequency monitoring.

Scramble - The 2 options are Enable and Disable.

Forward Error Correction - The 2 options are Enable and Disable.

Trigger Out - The options are as follows: OTU Frame Pulse, LOS, OTU LOF, OTU OOF, OTU LOM, OTU OOM, OTU AIS, OTU IAE, OTU BDI, ODU AIS, ODU OCI, ODU LCK, ODU BDI, OTU BIP8, OTU BEI, ODU SM BIP8, ODU SM BEI, Positive Justification, Negative Justification, Payload Bit Error, FEC Block Error, and FEC Bit Error.

Under **Set 2**, the following options are available:

OTU SM TIM Alarm Reporting - The 2 options are Enable and Disable.

ODU PM TIM Alarm Reporting - The 2 options are Enable and Disable.

TCM #1 Alarm Reporting - The 3 options are Enable with TIM, no TIM, and Disable.

TCM #2 Alarm Reporting - The 3 options are Enable with TIM, no TIM, and Disable.

TCM #3 Alarm Reporting - The 3 options are Enable with TIM, no TIM, and Disable.

TCM #4 Alarm Reporting - The 3 options are Enable with TIM, no TIM, and Disable.

TCM #5 Alarm Reporting - The 3 options are Enable with TIM, no TIM, and Disable.

TCM #6 Alarm Reporting - The 3 options are Enable with TIM, no TIM, and Disable.

OPU PLM Alarm Reporting - The 2 options are Enable and Disable.

Under **OTN OH** (Overhead), the following options are available:

OTU - Optical Transport Unit

ODU 1 - Optical Data Unit (Screen 1)

ODU 2 - Optical Data Unit (Screen 2)

TCM - Tandem Connection Monitoring

OPU - Optical Payload Unit



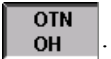



Note: **Receiver Overload Monitoring** - The optical multirate board features receiver overload monitoring to prevent damage to the optical receiver. An alarm is raised when the measured received power exceeds the receivers maximum input power.

Monitoring the OTN SAPI or DAPI Traces

Before monitoring an OTN trace:

- Make sure the unit is configured for OTN operation as described in *Configuring the Unit for OTN (G.709) Mode*.

To view an OTN trace:




1. Select .
2. Select .
3. Select .
4. Select one of the following OTN structures: , , or .
5. The incoming SAPI, DAPI, and Operator Specific traces appear at the bottom of the

screen.

NOTE:

A SAPI or DAPI alarm occurs if the incoming trace does not match the expected trace. The alarm's duration appears on the **Results'** Alarm screen.

Monitoring OTN Signal Status

1. Select  .
2. Select  .
3. Select  .

The Receive Signal Status window appears, and displays the frequency, optical power, OPU frequency offset, and line frequency offset received values.

OTN Results

The Results button provides broad details of error and alarm activity.

To display history using the Results button:

1. Select the OTN tab.
2. Select the **Results** button and then select **ERR**. The **Scan** button functions will appear.
3. To view other events, select the **Scan, Alarms, Graphs** or **Counts** buttons.

The **Scan** button displays a list of received alarms and errors, along with the number of seconds that the event occurred. This summary identifies a general area to investigate when an error or alarm is detected.

The **Errors** button provides the following details about received errors:

- Error count
- Average error rate over the error duration using an N.NNe-N format
- Current error rate using an N.NNe-N format
- Error free seconds
- Severely errored seconds
- Unavailable errored seconds

The **Alarm** button displays the number of seconds that an alarm was present.

The **Graphs** button provides an additional view of error and alarm results for the OTN mode. Graphs show the test history for either the current test or a previously saved test.

OTN Test Function

It contains two graphs which allow you to display incoming alarms and errors. For instance, Graph 1 could display Set 1 Alarms (Pause, LOS, LOF, OOF, LOM, and OOM) The second graph could display Set 2 Alarms (OTU:AIS, OTU:AIE, OTU: BDI, ODU:AIS, ODU:LCK, ODU:OCI, ODU:BDI, Pat Sync). Both graphs are displayed in 30 minute intervals or periods.

Use the following buttons to control graphing parameters:

- Change scale
- Change upper
- Change lower
- Shift left and shift right
- Print a graph report
- Save graphs
- Replay graphs/stop replay

The **Events** button displays the recently occurred events in ascending or descending order, indicating the count, time and duration of each event.

Display Large LEDs

1. Select the OTN tab.
2. Select the **Results** button.
3. Select **Large LEDs**.

OTN Test Function

Under **Set 1**, the following options are available:

Duration - The options are as follows:

- Continuous
- 5 Minutes
- 15 Minutes
- 1 Hour
- 2 Hours
- 24 Hours
- 72 Hours
- 1 Week
- 2 Weeks
- User Defined

Action after Duration - The 3 options are:

- Record Current Statistics
- Print Current Statistics
- Repeat Actions

Under **APS**, the following options are available:

Protection Switch Criteria - Available options are: OOF, OTU:AIS, OTU:BIP8, ODU:AIS, ODU:BIP8, and BIT.

State (Protection Switch Time: milliSec and Protection Switch Time: Frames) - Available options are: Stop APS, Single APS, and Continuous APS.

Consecutive Good Time Required - Input value

Consecutive Good Frames Required - Input user data

Under **RTD**, the following options are available:

State (Round Trip Delay: milliSec and Protection Switch Time: Frames) - Available options are: Stop Round-Trip Delay, Single Round-Trip Delay, and Continuous Round-Trip Delay.

Consecutive Good Time Required - Input value

Consecutive Good Frames Required - Input user data

OTN LEDs

When the OTN tab is selected, the following appears in the LEDs/Quick Status Area or when the **Large LEDs** button is selected. The OTN LEDs are divided into the following groups:

- OTU LEDs
- ODU LEDs
- General OTN LEDs/Quick Status Indicators

OTU LEDs

LED/Quick Status	Description
OTU	Optical Channel Transport Unit. Indicates current error, alarm, and event activity for the OTU. This is a status LED.

OTN LEDs

LED/Quick Status	Description
LOS	Loss of Signal. Indicates that a valid OTN signal is not being received. This is an alarm LED.
LOF	Loss of Frame. Indicates that a frame alignment problem with the incoming signal has been detected. This is an alarm LED.
OOF	Out of Frame. Indicates that four consecutive frames have been received with invalid or errored framing patterns. This is an alarm LED.
LOM	Loss of Multiframe. This is an alarm LED.
OOM	Out of Multiframe. This is an alarm LED.
BIP8	Section Monitoring error detection code. This is an error LED.
BEI	Section Monitoring Backward Error Indication. This is an error LED.
AIS	Alarm Indication Signal.
IAE	Section Monitoring Incoming Alignment Error. This is an alarm LED.
BDI	Section Monitoring Backward Defect Indication. This is an alarm LED.
COR	FEC Corrected. This is an error LED.
UNCOR	FEC Uncorrected. This is an error LED.

ODU LEDs

ODU LED/Quick Status	Description
ODU	Optical Channel Data Unit. Indicates current error, alarm, and event activity for the ODU. This is a status LED.
BIP8	Path Monitoring error detection code. This is an error LED.
BEI	Path Monitoring Backward Error Indication. This is an error LED.
AIS	ODU Alarm Indication Signal.
LCK	ODU Lock Indication. This is an alarm LED.
OCI	ODU Open Connection Indication. This is an alarm LED.
BDI	Path Monitoring Backward Defect Indication. This is an alarm LED.

*** Select TCM Summary text to display these LEDs.**

ODU LED/Quick Status	Description
TCM Summary	Tandem Connection Monitoring Summary. Indicates if a TCM error or alarm has been detected. <i>If this LED is red, select the LED text (TCM Summary) to display the LEDs for TCM1 to TCM6.</i>
TCM BIP8*	Error detection LED for the selected TCM.
TCM BEI*	Backward Error Indication LED for the selected TCM. This is an error LED.
TCM BDI*	Backward Defect Indication LED for the selected TCM. This is an alarm LED.

*** Select TCM Summary text to display these LEDs.**

General OTN LEDs

LED/Quick Status	Description
TX:	Indicates current OTN transmit interface setting. If the OTN interface is configured for G.709, the laser value appears.
E/A	Indicates the current error/alarm configured for transmission in the OTN signal. This is a status indicator.
Test Paused	If red, indicates that the current test has been paused.
CLK	Indicates the value of the Transmit Clock Reference function. This is a status indicator.
All Test	Displays a general status summary for all circuit packs (which appear as protocol processor tabs) installed in the unit.

OTN Specifications

Optical Power Requirements

Supported for all optical receive rates.

Ranges:

10/10.71 Gbps: -1 dBm to -14 dBm

2.5/2.67 Gbps: -9 dBm to -28 dBm

Accuracy: ± 1.5 dB

OTN Specifications

Optical Line Rates

Framed:

OTU2, OTU1

OC-192, OC-48

STM-64, STM-16

Unframed:

10.71/9.95/2.666/2.488 Gbps

Stratum III compliant, offset capability ± 100 ppm

Wavelength (2.5/2.67 Gbps)

1550 nm and/or 1310 nm

Wavelength (10/10.71 Gbps)

1550 nm

Connectors

FC/PC

SC

ST

Line Code

NRZ

Test Patterns

2^{15} -1, 2^{15} -1 inverted, 2^{23} -1, 2^{23} -1 inverted, 2^{31} -1, 2^{31} -1 inverted (future support for PRBS: 2^9 -1, 2^9 -1 inverted, 2^{11} -1, 2^{11} -1 inverted, 2^{20} -1, 2^{20} -1 inverted)

Clock References

Internal, recovered, external clock inputs BITS (1.5 Mbps), SETS (2 Mbps): Bantam (100 ohm balanced), 8KHz, 1.544 KHz, 2.048 KHz and 10 MHz via a shared, 75 ohm, unbalanced BNC connector

Frequency Offset

Offset capability ± 100 ppm

Service Disruption

Supported for OTN and all SONET/SDH optical mappings; Supports transmission and reception of linear and ring-mode command sequences (OTN compliant with G.783, G.784)

Automatic Protection Switching

Accuracy is one frame duration (OTN or SONET/SDH)

Round Trip Delay Measurement

Accuracy is one frame duration (OTN or SONET/SDH)

Drop/Insert Functionality

SONET/SDH payload drop/insert capabilities

SONET/SDH Control and Monitoring

OC-192/OC-48: Overhead: Transmit control over bytes: Transport OH: A1, A2, C1, Z0,

D1-D12, E1, E2, F1, K1, K2, J0 (Trace), Z1, Z2: Path OH: C2, F2, G1, J1 (Trace), Z3, Z4, Z5: Receive monitor: Transport OH: All bytes; Path OH: All bytes

STM-64/STM-16: Overhead: Transmit control over bytes: MSOH: A1, A2, Z0, D1-D12, E1, E2, F1, K1, K2, J0 (Trace), Z1, Z2; HP OH: C2, F2, G1, J1 (Trace), F3, K3, N1; Receive monitor: RSOH: All bytes; HP OH: All bytes

SONET/SDH Pointer Adjustment Control

The following pointer adjustment controls are provided as standard for STS-Nc/AU-4-Nc and STS/AU payload pointers: Single bursts, Increment/decrement, T1X1 sequences, pointer with NDF, pointer without NDF, SPE offset AU: New value, single adjustments (increment or decrement), increment-decrement, decrement-increment, NDF control, AU frequency offset: +100 ppm

Alarm Detection and Measurement

G.709 OTN:

Physical: LOS

OTU: LOF, OOF, OOM, LOM, AIS, IAE, BDI

ODU: AIS, OCI, LCK, BDI

TCM: BDI for all six TCM channels

SONET:

Physical: LOS

Transport O/H: LOF, SEF, AIS-L, RDI-L, K1/K2 change

Path O/H: AIS-P, LOP-P, RDI-P, UNEQ-P, STS pointer change

SDH:

Physical: LOS

Section O/H: LOF, OOF, MS-AIS, MS-RDI, K1/K2 change

Path O/H: AU-AIS, AU-LOP, HP-RDI, HP-UNEQ, AU pointer change

Error Detection and Measurement

G.709 OTN:

OTU: Frame (OA1, OA2), MFAS, SM BIP, SM BEI, corrected FEC errors, uncorrectable FEC blocks

ODU: PM BIP, PM BEI, Bit

TCM: BIP and BEI for all six TCM channels

SONET:

Transport O/H: Frame (A1, A2), B1, B2, REI-L

STS Path O/H: B3, REI-P, Bit

SDH:

Section O/H: Frame (A1, A2), B1 BIP, B2 BIP, MS-REI

HO Path O/H: B3 BIP, HP-REI, Bit

Error/Alarm Generation

Event triggers outputs: OTN/SONET/SDH transmit triggers;

Error/alarm bursts supported:

G.709 OTN Alarms:

Physical: LOS

OTU: LOF, OOF, LOM, OOM, AIS, IAE, BDI

ODU: AIS, OCI, LCK, BDI

OTN Specifications

TCM: BDI for each of the six TCM channels

G.709 OTN Errors:

OTU: Frame (OA1,OA2), MFAS, BIP, BEI, FEC

ODU: BIP, BEI

TCM: BIP, BEI for each of the six TCM channels

SONET Alarms:

Physical: LOS

Transport O/H: LOF, SEF, AIS-L, RDI-L, K1/K2 change

Path O/H: AIS-P, LOP-P, RDI-P, UNEQ-P, STS pointer change

SONET Errors:

Transport O/H: Frame (A1, A2), B1, B2, REI-L

STS Path O/H: B3, REI-P, Bit

SDH Alarms:

Physical: LOS

Section O/H: LOF, OOF, MS-AIS, MS-RDI, K1/K2 change

Path O/H: AU-AIS, AU-LOP, HP-RDI, HP-UNEQ, AU pointer change

SDH Errors:

Section O/H: Frame (A1, A2), B1 BIP, B2 BIP, MS-REI

HO Path O/H: B3 BIP, HP-REI, Bit

Printing / Beep Requirements

Printing: Supports printing of logged results and screen captures via FTP, serial and USB ports

Beep-on-error: User selectable, audible waveform beep emitted on detection of any valid error-type

User controlled volume

Controller Interfaces

Remote control interfaces: LAN (10BaseT), RS-232, GPIB

Peripheral interfaces: USB and/or serial printer

PCMCIA modem; 802.11B wireless LAN PCMCIA support

Physical Requirements

AC power voltage range: 90 to 260 Vac nominal

Frequency range: 47 to 63 Hz

Total Power Consumption by fully loaded NIC Plus: <350 VA

Environmental

Operating temperature: 0 to 40°C (32 to 113 °F).

Storage temperature: -20 to 70°C (-4 to 158 °F).

Humidity: 15% to 95% relative humidity at 40°C (104 °F)

Board Dimensions

Single slot width within NIC platforms

Module Weight

0.68 kg (<1.5 lbs)--covers all rates to 10.71 Gbps

Calibrating G.709 10G Interface or G.707/GR-253 STM-64/OC-192 Interface

The following procedures describe the optical power calibration. While performing this task, you will measure, record, and enter the Zero optical power input and the optical power readings for -15 dBm and -5 dBm.

Before You Begin

- Read these procedures before trying to calibrate the system.

WARNING:

Power the system off before removing the optical connector dust caps to clean the unit's fiber optic ports.

- Before performing optical power calibration, use a fiber-optics cleaning kit to clean the fiber-optic ports on the unit, the optical power meter, the optical attenuator, and the fiber cables. Dirty optical fibers will affect optical measurements.
- The following equipment is required for optical calibration:
 - Two singlemode, fiber-optic cables
 - Variable optical attenuator
 - Optical power meter
 - Fiber-optics cleaning kit
 - Pencil and paper to record optical power measurements

Restoring Raw Power Readings

The following restores the raw (unconverted) power readings.

1. Make sure that the dust caps are on the unit's TX and RX optical ports.
2. Turn the unit on.
3. From the **SDH** or **SONET** tab, select the **Receive** button (verify the STM-64 or OC-192 interface is enabled).
4. Select the **SIG** button, and then **Update Signal Calibration**.
5. Select **Zero power reading**. A keypad appears. Enter 0 and select **OK**.
6. Select the **Save** button to restore the raw (unconverted) power reading.

Obtaining Zero Optical Power Input

1. Make sure that the dust caps are on the unit's TX and RX optical ports, and that the unit is turned on.
2. Make sure that the laser is off.
3. Record the Optical Power reading that appears on the SIG screen. This value is the **Zero power reading**.

Obtaining -15 dBm Power Reading

1. With the system turned on, connect a fiber-optic cable from the **10 Gbps TX** optical port to the optical attenuator's input connector.
2. Attach a fiber-optic cable from the attenuator's output port to the optical power meter.
3. Turn the laser on.
4. Adjust the attenuator so that the optical power meter reads -15 dBm.
5. Disconnect the fiber-optic cable from the optical power meter, and attach it to the **10 Gbps RX** optical port.
6. Record the Optical Power reading that appears on the SIG screen. This value is the **-15 dBm power reading**.

Obtaining -5 dBm Power Reading

1. Disconnect the fiber-optic cable from the unit's **10 Gbps RX** optical port and attach it to the optical power meter. (You have a direct fiber-optic cable connection from the optical attenuator to the optical power meter.)
2. Adjust the attenuator so that the power meter reads -5 dBm.
3. Disconnect the fiber-optic cable from the optical power meter, and attach it to the **10 Gbps RX** optical port.
4. Record the Optical Power reading that appears on the SIG screen. This value is the **-5 dBm power reading**.

Entering Optical Power Readings for STM-64 or OC-192

1. Select **Zero power reading**. A keypad appears. Enter the value recorded earlier for the Zero Power Reading and select **OK**.
2. Select **-15 dBm power reading**. A keypad appears. Enter the value recorded earlier for the -15 dBm Power Reading and select **OK**.
3. Select **-5 dBm power reading**. A keypad appears. Enter the value recorded earlier for the -5 dBm Power Reading and select **OK**.
4. Select the **Save** button to save the new calibration values. This completes the optical calibration procedure.

Procedure for Calibrating G.709 10G Interface

1. From the OTN tab, verify that the G.709 10G interface is enabled.
2. For the remaining steps, follow the same procedure as above.

Calibrating G.709 2.5G Interface or G.707/GR-253 STM-16/OC-48 Interface

The following procedures describe the optical power calibration. While performing this task, you will measure, record, and enter the Zero optical power input and the optical power readings for -25 dBm and -10 dBm.

Before You Begin

- Read these procedures before trying to calibrate the system.

WARNING:

Power the system off before removing the optical connector dust caps to clean the unit's fiber optic ports.

- Before performing optical power calibration, use a fiber-optics cleaning kit to clean the fiber-optic ports on the unit, the optical power meter, the optical attenuator, and the fiber cables. Dirty optical fibers will affect optical measurements.
- The following equipment is required for optical calibration:
 - Two singlemode, fiber-optic cables
 - Variable optical attenuator
 - Optical power meter
 - Fiber-optics cleaning kit
 - Pencil and paper to record optical power measurements

Restoring Raw Power Readings

The following restores the raw (unconverted) power readings.

1. Make sure that the dust caps are on the unit's TX and RX optical ports.
2. Turn the unit on.
3. From the **SDH** or **SONET** tab, select the **Receive** button (verify the STM-16 or OC-48 interface is enabled).
4. Select the **SIG** button, and then **Update Signal Calibration**.
5. Select **Zero power reading**. A keypad appears. Enter 0 and select **OK**.
6. Select the **Save** button to restore the raw (unconverted) power reading.

Obtaining Zero Optical Power Input

1. Make sure that the dust caps are on the unit's TX and RX optical ports, and that the unit is turned on.
2. Make sure that the laser is off.
3. Record the Optical Power reading that appears on the SIG screen. This value is the **Zero power reading**.

Obtaining -25 dBm Power Reading

1. With the system turned on, connect a fiber-optic cable from the **2.5 Gbps TX** optical port to the optical attenuator's input connector.
2. Attach a fiber-optic cable from the attenuator's output port to the optical power meter.
3. Turn the laser on.
4. Adjust the attenuator so that the optical power meter reads -25 dBm.
5. Disconnect the fiber-optic cable from the optical power meter, and attach it to the **2.5 Gbps RX** optical port.
6. Record the Optical Power reading that appears on the SIG screen. This value is the **-25 dBm power reading**.

Obtaining -10 dBm Power Reading

1. Disconnect the fiber-optic cable from the unit's **2.5 Gbps RX** optical port and attach it to the optical power meter. (You have a direct fiber-optic cable connection from the optical attenuator to the optical power meter.)
2. Adjust the attenuator so that the power meter reads -10 dBm.
3. Disconnect the fiber-optic cable from the optical power meter, and attach it to the **2.5 Gbps RX** optical port.
4. Record the Optical Power reading that appears on the SIG screen. This value is the **-10 dBm power reading**.

Entering Optical Power Readings for STM-16 or OC-48

1. Select **Zero power reading**. A keypad appears. Enter the value recorded earlier for the Zero Power Reading and select **OK**.
2. Select **-25 dBm power reading**. A keypad appears. Enter the value recorded earlier for the -25 dBm Power Reading and select **OK**.
3. Select **-10 dBm power reading**. A keypad appears. Enter the value recorded earlier for the -10 dBm Power Reading and select **OK**.
4. Select the **Save** button to save the new calibration values. This completes the optical calibration procedure.

Procedure for Calibrating G.709 2.5G Interface

1. From the OTN tab, verify that the G.709 10G interface is enabled.
2. For the remaining steps, follow the same procedure as above.

SONET OC-192 / SDH STM-64

Support for the SONET and SDH functions on the OTN module are controlled from the tabs directly to the right of the OTN button (labeled either SONET or SDH).

For detailed information on the SONET and SDH functions, please refer to the OC-192 and STM-64 Online Help/User's Guides.

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OC-192 Overview

This section of the online help system has topics that discuss:

- OC-192 Specific Tasks
- OC-192 Screen and Function Descriptions

You may also navigate through the topics by using the **Contents** tab and window that appear on the left side of the screen.

2 December 02

OC-192 Specific Tasks

OC-192 Specific Tasks


This section includes tasks that are specific to the OC-192 protocol processor. For general tasks, refer to Common Tasks located in the Getting Started section.

Calibrate Optical Power

The following procedures describe the optical power calibration. While performing this task, you will measure, record, and enter the Zero optical power input and the optical power readings for -20 dBm and -10 dBm.

Before You Begin

- Read these procedures before trying to calibrate the system.

 **WARNING: Power the system off before removing the optical connector dust caps to clean the unit's fiber optic ports.**

- Before performing optical power calibration, use a fiber-optics cleaning kit to clean the fiber-optic ports on the unit, the optical power meter, the optical attenuator, and the fiber cables. Dirty optical fibers will affect optical measurements.
- The following equipment is required for optical calibration:
 - Two three-foot singlemode, fiber-optic cables
 - Variable optical attenuator
 - Optical power meter
 - Fiber-optics cleaning kit
 - Pencil and paper to record optical power measurements

Restoring Raw Power Readings

The following restores the raw (unconverted) power readings.

1. Make sure that the dust caps are on the unit's TX and RX optical ports.
2. Turn the unit on.
3. From the **OC-192** tab, select the **Receive** button.
4. Select the **Signal Status** button, and then **Update Signal Calibration**.
5. Select **Zero power reading**. A touch screen keypad appears. Enter 0 and select **OK**.
6. Select the **Save** button to restore the raw (unconverted) power reading.

Obtaining Zero Optical Power Input

1. Make sure that the dust caps are on the unit's TX and RX optical ports, and that the unit is turned on.
2. Make sure that the laser is off.
3. From the **OC-192** tab, select the **Receive** button.
4. Select the **Signal Status** button. Record the **Optical Power** reading. This value is the **Zero power reading**.

Obtaining -20 dBm Power Reading

1. With the system turned on, connect a fiber-optic cable from the **10 Gbps TX** optical port to the optical attenuator's input connector.
2. Attach a fiber-optic cable from the attenuator's output port to the optical power meter.
3. Turn the laser on.
4. Adjust the attenuator so that the optical power meter reads -20 dBm.
5. Disconnect the fiber-optic cable from the optical power meter, and attach it to the **10 Gbps RX** optical port.
6. From the **OC-192** tab, select the **RX** button.
7. Select the **Signal Status** button. Record the **Optical Power** reading. This value is the **-20 dBm power reading**.

Obtaining -10 dBm Power Reading

1. Disconnect the fiber-optic cable from the unit's **10 Gbps RX** optical port and attach it to the optical power meter. (You have a direct fiber-optic cable connection from the optical attenuator to the optical power meter.)
2. Adjust the attenuator so that the power meter reads -10 dBm.
3. Disconnect the fiber-optic cable from the optical power meter, and attach it to the **10 Gbps RX** optical port.
4. From the **OC-192** tab, select the **Receive** button.
5. Select the **Signal Status** button. Record the **Optical Power** reading. This value is the **-10 dBm power reading**.

Entering Optical Power Readings

1. From the **OC-192** tab, select the **Receive** button.
2. Select the **Signal Status** button, and then **Update Signal Calibration**.
3. Select **Zero power reading**. A touch screen keypad appears. Enter the value recorded earlier for the Zero Power Reading and select **OK**.
4. Select **-20 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -20 dBm Power Reading and select **OK**.
5. Select **-10 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -10 dBm Power Reading and select **OK**.
6. Select the **Save** button to save the new calibration values. This completes the optical calibration procedure.

Screen and Function Descriptions

OC-192 Screen and Function Descriptions Overview

This section describes the various functions that control OC-192 configuration and operation:

- OC-192 LEDs
- OC-192 Transmit
- OC-192 Receive
- OC-192 Results
- OC-192 Test
- OC-192 Performance Monitoring

OC-192 LED Definitions

This section defines the SONET LEDs that appear on the touch screen's **LED area** and when the **Large LEDs** button is selected.

 To view TCM LEDs, select the **TC Summary** text that appears in the LED/Quick Status area.

LED	Description
AIS-L	Line Alarm Indication Signal. Indicates if an alarm is being received from upstream Line terminating equipment. This is an alarm LED.
AIS-P	STS Path Alarm Indication Signal. Indicates if an alarm is being received from upstream Path terminating equipment. This is an alarm LED.
APS	Automatic Protection Switching. Indicates that the K1 and K2 bytes on the incoming SONET signal have changed.
B1 ERR	Section BIP-8 Code Violation. Indicates an error in the SONET frame. B1 errors are parity errors. The B1 byte carries the parity information, so a B1 error is a Section error that applies not only to the Section OH, but the entire frame.

	Any error in the frame will result in a B1 error. This is an error LED.
B2 ERR	Line Overhead BIP-8 Code Violation. Indicates that parity errors were detected at the Line layer of the incoming SONET signal. This is calculated over the Line OH, Path OH, and payload of each STS-1. This is an error LED.
B3 ERR	Path Overhead BIP-8 Code Violations. Indicates that parity errors were detected at the Path layer of the incoming SONET signal. This is calculated over the Path OH and payload of each STS-1. This is an error LED.
BIT ERR	BIT Error. Indicates a Bit error was detected in the payload. This is an error LED.
CLK	Clock. Indicates the timing source for the SONET transmit signal. The timing source is set using the Clock Reference function. This is a status LED.
LINE	Line Status. Indicates if errors or alarms are being received from upstream Line terminating equipment. This is a status LED.
LOF	Loss of Frame. Indicates that a frame alignment problem with the incoming SONET signal has been detected. An LOF is reported if a severely errored framing (SEF) defect continues for 3 milliseconds or longer. This is an alarm LED.
LOP-P	Loss of STS Pointer. Indicates that an invalid Pointer has been received or a Pointer loss has been detected on the incoming SONET signal. This is an alarm LED.
LOS	Loss of Signal. Indicates that a valid SONET signal is not being received. If an all zeros pattern exists for 100

Screen and Function Descriptions

	milliseconds or longer on the incoming SONET signal, then an LOS is reported. This is an alarm LED.
PAT SYNC	Pattern Sync. Indicates a loss of pattern synchronization. This is an alarm LED.
PATH	Path Status. Indicates if errors or alarms are being received from upstream Path terminating equipment. This is a status LED.
PLM-P	STS Payload Label Mismatch. Indicates that a mismatch has been detected for the Path Signal Label . This is an alarm LED. Note: This function will be available in a future release.
PTR ADJ	Pointer Adjustment. Indicates that a Pointer Adjustment has been received. This LED flashes red during a Pointer Adjustment event. It is an event LED.
RDI-L	Line Remote Defect Indicator. Indicates that a downstream defect has occurred along the Line layer. (An RDI is also known as a Far-End Remote Failure, FERF). This is an alarm LED.
RDI-P	STS Path Remote Defect Indicator. Indicates that a remote alarm is being received from downstream Path terminating equipment. The G1 byte of the SONET Path Overhead is used for this indicator. This is an alarm LED.
REI-L	Line Remote Error Indicator. Indicates that an error is occurring at downstream Line terminating equipment. An REI is also known as a Far-End Block Error (FEBE). The M0 and M1 bytes of the SONET Line Overhead are used for this indicator. This is an error LED.
REI-P	Path Remote Error Indicator. Indicates that an error count is being received from downstream Path terminating equipment. An REI is also known as a

	Far-End Block Error (FEBE). This is an error LED.
RX	Receive Signal. Indicates the value of the received optical signal in dBm. For OC-192, the optimum input range is from -2 dBm to -14 dBm. A value of -25 dBm or below indicates no signal. This is a status LED.
SECTION	Section Status. Indicates current error, alarm, and event activity for the Section layer on the incoming SONET signal. This is a status LED.
SEF	Severely Errored Frame. Declared when four or more consecutive errored frames are detected on the incoming SONET signal. This is an alarm LED.
TC-AIS	Tandem Connection-Alarm Indication Signal. Indicates if IEC bits 1110 are being received from upstream TCM equipment. (Bits 1-4 of the N1 byte are the IEC bits.) This is an alarm LED.
TC-IEC	Tandem Connection-Incoming Error Count. Indicates a B3 error count is being received from downstream TCM equipment. Bits 1-4 of the N1 byte are used for this indicator. This is an error LED.
TC-LOF	Tandem Connection-Loss of Frame. Indicates the loss of a valid multiframe frame alignment signal (FAS) pattern from upstream TCM equipment. This is an alarm LED.
TC-ODI	Tandem Connection-Outgoing Defect Indicator. Indicates that the unit is sending an ODI alarm to upstream TCM equipment. Bit 7 in multiframe 74 of the N1 byte is used for this indicator. This is an alarm LED.
TC-OEI	Tandem Connection-Outgoing Error Indication. Indicates that the unit is sending an OEI error to upstream TCM equipment. Bit 6 of the N1 byte is used for this indicator. This is an error LED.

TC-RDI	Tandem Connection-Remote Defect Indication. Indicates that a defect has occurred at the downstream TCM equipment. The unit is receiving an alarm. Bit 8 in multiframe 73 of the N1 byte is used for this indicator. This is an alarm LED.
TC-REI	Tandem Connection-Remote Error Indication. Indicates that an error has occurred at the downstream TCM equipment. The unit is receiving an error. Bit 5 of the N1 byte is used for this indicator. This is an error LED.
TC SUMMARY	Tandem Connection Summary. Indicates if a TCM error or alarm has been detected. If this LED is red, select the LED text (TC Summary) to display the TC LEDs.
TC-UNEQ	Tandem Connection-Unequipped. Indicates that a 00h pattern has been detected in the N1 byte of a Tandem Connection. This is an alarm LED.
UNEQ-P	Unequipped STS Payload. Indicates that a 00h pattern has been detected in the C2 byte. This byte is being received from Path terminating equipment. This is an alarm LED.

OC-192 Transmit

The Transmit screen contains the following functions:

- OC-192 Transmit Settings 1
- OC-192 Transmit Settings 2
- OC-192 Transmit Overhead
- OC-192 Transmit Pointer Generation
- OC-192 Transmit APS
- OC-192 Transmit Error Alarm

OC-192 Transmit APS

The OC-192 Transmit APS functions are used to configure APS transmit activity.

The following APS Transmit functions are available:

- Linear Mode
- Ring Mode
- Duration in Frames

APS is a feature that allows the LTE to switch to a backup line in case of errors or failures on the main line. APS commands can be configured for either Linear- or Ring-based networks and are transmitted using bytes K1 and K2 of the Line overhead.

You can test the network's APS response by generating a condition that is likely to cause APS switching. You also have the capability to generate specific APS messages and monitor the response.

Linear Mode

This function configures the system to transmit APS functions for a Linear (span) network.

- K1 Full Byte (Linear Mode)
- K1 Bits 1-4 (Linear Mode)
- K1 Bits 5-8 (Linear Mode)
- K2 Full Byte (Linear Mode)
- K2 Bits 1-4 (Linear Mode)
- K2 Bit 5 (Provisioned) (Linear Mode)
- K2 Bits 6-8 (Linear Mode)

Ring Mode

- K1 Full Byte (Ring Mode)
- K1 Bits 1-4 (Ring Mode)
- K1 Bits 5-8 (Ring Mode)
- K2 Full Byte (Ring Mode)
- K2 Bits 1-4 (Ring Mode)
- K2 Bit 5 (Provisioned) (Ring Mode)
- K2 Bits 6-8 (Ring Mode)

Duration in Frames

This function determines the number of frames transmitted that contain specific K1 and K2 bytes. These bytes are configured using the functionality located on the transmit APS screen.

Frame count is entered using a keypad. Values ranging from **1 to 65535** frames can be entered.

APS Mode

This is an **APS (TX)** function used to configure APS transmit activity.

APS is a feature that allows the LTE to switch to a backup line in case of errors or failures on the main line. APS commands can be configured for either Linear- or Ring-based networks and are transmitted using bytes K1 and K2 of the Line overhead.

You can test the network's APS response by generating a condition that is likely to cause APS switching. You also have the capability to generate specific APS messages and monitor the response.

The following options are available:

Options	Description
Linear	Configures the NIC 10G to transmit APS functions for a Linear (span) network.
Ring	Configures the NIC 10G to transmit APS functions for a Ring network.

APS Overview

APS is a feature that allows the LTE to switch to a backup line in case of errors or failures on the main line. APS functions can be configured for either Linear- or Ring-based networks and are transmitted using bytes K1 and K2 of the Line OH.

You can test the network's APS response by generating a condition that is likely to cause APS switching. You also have the capability to monitor and measure incoming APS switching activity.

This function is located in three general areas of the touch screen:

- The **APS (TX)** button configures the K1 and K2 byte parameters used to create an APS event.
 - APS functions for Linear mode are described in the **Linear APS Mode Functions** section.
 - APS functions for Ring mode are described in the **Ring APS Mode Functions** section.
- The **APS (RX)** button configures and measures criteria used for an APS switching event.
- The **APS (Results)** button monitors K1 and K2 byte activity on an incoming signal that can cause an APS event.

Duration in Frames

This is an **APS (TX)** function used to configure APS transmit activity.

The **Duration in Frames** function determines the number of frames transmitted that contain specific K1 and K2 bytes. These bytes are configured using the functionality located on the transmit APS screen.

Frame count is entered using a keypad. Values ranging from **1 to 65535** frames can be entered.

OC-192 Transmit Error Alarm

The unit can transmit errors and alarms to simulate various defects and anomalies. One reason for transmitting these defects is to determine if the receiving equipment can detect an error or alarm in the incoming signal.

- Error to Insert
- Error Insert Rate
- Alarm Generated

Alarm Generated

This function configures the system to generate an alarm in the transmit SONET signal. Alarm generation by the system is one way to test if downstream SONET equipment reacts properly to the alarm it receives in the incoming SONET signal.

The following alarms are available:

Option	Description
None	No alarms are generated. Turns alarms off.
LOS	Loss of Signal. An all-zeros pattern is transmitted to simulate a loss of signal or loss of optical power. This forces the downstream SONET equipment to (1) generate an AIS alarm to its downstream network elements (NE), and (2) generate an RDI alarm to its upstream NEs.
LOF	Loss of Frame. An all-zeros pattern is inserted into the A1 and A2 framing bytes of the Section OH. This simulates the absence of a valid framing pattern. This forces the downstream SONET

Screen and Function Descriptions

	<p>equipment to generate an AIS alarm to its downstream network elements (NE), and generate an RDI alarm to its upstream NEs.</p>
LOP-P	<p>STS Path Loss of Pointer. This simulates a loss of a valid STS Pointer. When the downstream NE receives an LOP-P, it generates a DS_n AIS alarm to its downstream equipment and an RDI-P alarm to its upstream equipment.</p>
AIS-L	<p>Line Alarm Indication Signal. The transmission of an AIS-L to a downstream NE forces that NE to send an AIS-P alarm to the next downstream NE. The NE will also send an RDI-L alarm to its upstream equipment.</p> <p>An AIS-L simulates an alarm generated by Line terminating equipment (LTE).</p>
RDI-L	<p>Line Remote Defect Indicator. This generates an RDI-L condition using the K2 byte of the Line OH.</p> <p>This simulates a downstream NE (in this case the NIC) at the Line layer, reporting a failure to an upstream NE. The downstream NE (NIC 10G) has encountered a downstream failure and is alerting upstream SONET equipment.</p> <p>To do this, the NIC 10G changes the pattern of the K2 byte. The NE receiving the RDI-L alarm should detect a change to the K2 byte on the incoming SONET signal. This forces the NE to generate a Remote Alarm Indicator (RAI) to its upstream NEs.</p>
AIS-P	<p>Path Alarm Indication Signal. The transmission of an AIS-P to a downstream NE forces that NE to send an AIS alarm to the next downstream NE. The NE will also send an RDI</p>

	<p>alarm to its upstream equipment.</p> <p>An AIS-P simulates an alarm generated by Path terminating equipment (PTE).</p>
RDI-P	<p>Path Remote Defect Indicator. This generates an RDI-P condition using the G1 byte of the Path OH.</p> <p>This simulates a downstream NE (in this case, the NIC), at the Path layer, reporting a failure to an upstream NE.</p> <p>To do this, the system changes the pattern of the G1 byte in the Path OH. The NE receiving the RDI-P alarm should detect a change to the G1 byte on the incoming SONET signal.</p>
UNEQ-P	<p>Path Unequipped Alarm. An all-zeros pattern is inserted into the C2 byte of the Path OH. The C2 byte is the STS Path Signal Label. (This type of error is used between Path terminating equipment - PTE)</p> <p>When a PTE receives this alarm, it will generate an AIS to downstream NEs.</p>
TC-RDI	<p>Tandem Connection-Remote Defect Indicator. Generates an alarm to upstream equipment indicating that defects have been detected within the Tandem Connection. The TCM equipment receiving this alarm should detect a change to Bit 8 in multiframe 73 of the N1 byte.</p>
TC-ODI	<p>Tandem Connection-Outgoing Defect Indicator. Generates an alarm to upstream TCM equipment indicating that defects have been detected within the Tandem Connection. The TCM equipment receiving this alarm should detect a change to Bit 7 in multiframe 74 of the N1 byte.</p>
TC-AIS	<p>Tandem Connection-Alarm Indication</p>

	Signal. Generates an AIS alarm to downstream TCM equipment by setting Bits 1-4 of the N1 byte to 1110.
TC-UNEQ	Tandem Connection-Unequipped. An all-zeros pattern is inserted into the N1 byte of the Path OH.
TC-LOF	Tandem Connection-Loss of Frame. Generates a loss of a valid multiframe pattern to downstream equipment.

After selecting an alarm, the alarm continues until one of the following occurs:

- The alarm is turned off using the **None** option.
- A **Mapping** change occurs.

Error Insert Rate (SONET)

This function sets the error rate for the selected error. The system starts transmitting errors after the insertion rate is selected.



The **Error to Insert** function determines the type of error transmitted.

The following **Error Insert Rate** options are available:

Options	Descriptions
Off	Turns error transmission off.
1e-X,	X is a value from 3 to 10; for example, 1e-3 through 1e-10. X will vary based on the type of error selected.
Maximum	Generates errors at the maximum rate listed below.

If this error is inserted...	Then this range of rates is available...
B1 error	1e-6 to 1e-10; maximum rate is 6.43e-6
B2 error	1e-3 to 1e-10; maximum rate is 1.25e-3
B3 error	1e-6 to 1e-10; maximum rate is 6.65e-6
REI-L error	1e-4 to 1e-10; maximum rate is 2.07e-4
REI-P error	1e-6 to 1e-10; maximum rate is 6.65e-6

BIT error	1e-3 to 1e-10; maximum rate selection is not available
TC-IEC error	1e-6 to 1e-10; maximum rate is 6.65e-6
TC-REI error	1e-7 to 1e-10; maximum rate is 8.31e-7
TC-OEI error	1e-7 to 1e-10; maximum rate is 8.31e-7

Error to Insert (SONET)

This function determines the type of error transmitted by the unit.

The purpose of generating an error with the unit is to stress the network element that is receiving the error by testing if it can detect the incoming error and then report error statistics such as error counts and rates.

The following options are available:

Options	Descriptions
None	No errors are generated. Turns errors off.
B1 Error	<p>Generates a BIP-8 (Bit Interleaved Parity, 8-bit) error over the Section layer. Bits in the B1 byte are toggled to create an error.</p> <p>This type of simulation allows an NE (in this case, the downstream equipment) to be tested to verify if (1) it can detect incoming errors, and (2) then conduct performance monitoring such as error counts and rates.</p>
B2 Error	<p>Generates a BIP-8 error over the Line layer. Bits in the B2 byte are toggled to create an error.</p> <p>This type of simulation allows an NE (in this case, the downstream equipment) to be tested to verify if (1) it can detect incoming errors, and (2) then conduct performance monitoring such as error counts and rates.</p>
B3 Error	Generates a BIP-8 error over the STS Path layer. Bits in the B3 byte are

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	<p>toggled to create an error.</p> <p>This type of simulation allows an NE (in this case, the downstream equipment) to be tested to verify if (1) it can detect incoming errors, and (2) then conduct performance monitoring such as error counts and rates.</p>
<p>REI-L Error</p>	<p>Generates a Remote Error Indicator over the Line layer. An REI-L is a count of B2 errors received at the far end.</p> <p>When the system transmits this error, it simulates a downstream NE sending an error count back to the source of its incoming SONET signal. The system uses the M1 byte of the Line OH to transmit the error count. This type of simulation allows an NE (in this case, the upstream equipment) to be tested to verify if (1) it can detect incoming remote errors, and (2) then conduct performance monitoring such as error counts and rates.</p> <p>(This type of error was formerly called a Line Far End Block Error - FEBE-L.)</p>
<p>REI-P Error</p>	<p>Generates a Remote Error Indicator over the Path layer. An REI-P is a count of B3 errors received at the far end.</p> <p>When the system transmits this error, it simulates an NE sending an error count back to the source of its incoming SONET signal. The system uses the G1 byte of the Path OH to transmit the error count. This type of simulation allows an NE (in this case, the upstream equipment) to be tested to verify if (1) it can detect incoming remote errors, and (2) then conduct performance monitoring such as error counts and error rates.</p>

	(This type of error was formerly called a Path Far End Block Error - FEBE-P.)
BIT Error	Generates bit errors. This type of simulation allows an NE (in this case, the downstream equipment) to be tested to verify if (1) it can detect incoming errors, and (2) then conduct performance monitoring such as error counts and error rates.
TC-IEC	Generates a Tandem Connection Incoming Error Count over the Path layer. A TC-IEC is a count of B3 errors received by TCM equipment at the far end. Bits 1-4 of the N1 byte are the IEC bits.
TC-REI	Generates a Tandem Connection Remote Error Indicator over the Path layer between TCM equipment. Bit 5 of the N1 byte is used for this error.
TC-OEI	Generates a Tandem Connection Outgoing Error Indicator over the Path layer between TCM equipment. Bit 6 of the N1 byte is used for this error.

OC-192 Transmit Overhead

The OC-192 Transmit Overhead screen contains the following functions.

Functions	Description
STS-1	Selects a specific STS-1 slot within the OC-192 signal. The overhead bytes that appear on the OH screen are associated with this slot. There are 192 STS-1 slots available in an OC-192 signal.
STS-48 Added	Select 1 to 4, All, or None as the foreground channel.
Section OH	Select and edit the following Overhead bytes: A1, A2, Z0, B1, E1, F1, D1, D2, and D3.
Line OH	Select and edit the following Overhead bytes: H1, H2, H3, B2, K1,

	K2, D4-D12, Z1, Z2, and E2.
Path OH	Select and edit the following Overhead bytes: B3, J1, C2, G1, F2, H4, Z3, Z4, and Z5.
J0 Trace	Selects a default or customized pattern to be used as the J0 trace.
J1 Trace	Selects a default or customized pattern to be used as the J1 trace.
TC Trace	Selects a default or customized pattern to be used as the Tandem Connection Monitoring trace.

OC-192 Transmit Pointer Generation

The OC-192 Transmit Pointer screen contains the following functions.

Functions	Description
Pointer Action	Determines the type of Pointer activity that occurs when the Inc Pointer and Dec Pointer buttons are selected.
NDF on New Pointer	Specifies whether the New Data Flag bits are set when a new Pointer is present in the generated signal.
Pointer Value	Allows a new Pointer value to be entered. A valid Pointer value is a binary number ranging from 0 to 782.
Burst Count	Determines the number of Pointer location movements that occur when the Inc Pointer or Dec Pointer buttons are pressed. The Pointer burst count ranges from 1 to 8.
SPE Frequency Offset	Adjusts the rate at which Pointer adjustments are needed in the Synchronous Payload Envelope (the payload).
Increment/Decrement	Alternates the Pointer insertion


Pointer	from increment to decrement with a 200-msec delay in between.
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Related Topic:

For information about making Pointer adjustments, refer to *Make Pointer Adjustments* in the Common Tasks section of the online help.

OC-192 Transmit Settings 1

The OC-192 Transmit Settings 1 screen contains the following functions.

 Options marked with an asterisk (*) indicate that the function is coupled with the Receive settings if Setting Control is set to "Coupled."

Functions	Description
*Settings Control	If Coupled is selected, settings changed on the Transmit screen will automatically change on the Receive screen as well. If Independent is selected, settings established on the Transmit screen will only affect Transmit mode.
Passthru Mode	Activates or deactivates pass-thru mode, allowing an incoming STS signal to pass through the unit without altering the data in the signal. The following options are available: On and Off .
*Mapping	Defines the type of signals that are combined to create an OC-192 signal. For example, four STS-48s can be mapped into an OC-192 signal. If the unit is not licensed for 10 Gbps mapping, the following options appear and are described below: STS-192c Bulk, STS-48 A/D, STS-48 A/D LI, and STS-192c POS.

	<p>If the unit is licensed for 10 Gbps mapping, it can perform the following mappings using only the 10 Gbps circuit pack (OC-192 protocol processor): STS-192c Bulk, STS-12c Bulk, STS-3c Bulk, STS-1 Bulk, and STS-192c POS.</p> <ul style="list-style-type: none"> • STS-192c Bulk. Maps a concatenated STS-192 signal into an OC-192. • STS-48 A/D. Maps four STS-48s into an OC-192. The STS-48s are generated internally from the OC-48 protocol processor. Note: This option appears if a separate 2.5G circuit pack (an OC-48 protocol processor) is installed in the unit. • STS-48 A/D LI: Maps four STS-48s into an OC-192. The STS-48s are derived externally and enter the unit using the line interface connectors. Note: This option appears if a separate 2.5G circuit pack (an OC-48 protocol processor) is installed in the unit. • STS-48c Bulk. Maps a concatenated STS-48 signal into an OC-192. Four STS-48s make up an OC-192. Note: This option only appears if the unit is licensed for 10 Gbps mapping. • STS-12c Bulk. Maps a concatenated STS-12 signal into an OC-192. Sixteen STS-12s make up an OC-192. Note: This option only appears if the unit is licensed for 10 Gbps mapping. • STS-3c Bulk. Maps a concatenated STS-3 signal into an OC-192. Sixty-four
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	<p>STS-3s make up an OC-192. Note: This option only appears if the unit is licensed for 10 Gbps mapping.</p> <ul style="list-style-type: none"> • STS-1 Bulk. Maps 192 STS-1s into an OC-192 signal. Note: This option only appears if the unit is licensed for 10 Gbps mapping. • STS-192c POS. Configures the unit for Packet Over SONET/SDH operation.
<p>STS-48 Added</p> <p>Note: STS-48 Added only appears when Mapping is set to STS-48c Bulk.</p>	<p>Selects a specific STS-48 signal as the foreground (or source) channel in the STS-192 signal. The source channel can be used to transmit alarms, errors, or patterns. The unit multiplexes four STS-48 signals into a single STS-192 signal.</p> <ul style="list-style-type: none"> • 1 - 4. Selects a specific STS-48 (STS-48 #1 through STS-48 #4) to transmit as the source channel. • ALL. Transmit the foreground channel across all four STS-48 channels. • None. No foreground channel is selected.
<p>STS-12 Added</p> <p>Note: STS-12 Added only appears when Mapping is set to STS-12c Bulk.</p>	<p>Selects one of 16 STS-12 signals as the foreground channel in the STS-192 signal.</p> <ul style="list-style-type: none"> • 1 - 16. Selects a specific STS-12 (STS-12 #1 through STS-12 #16) as the foreground channel. • ALL. Transmits the foreground channel across all 16 STS-12 channels. • None. No foreground channel is selected.

<p>STS-3 Added</p> <p>Note: STS-3 Added only appears when Mapping is set to STS-3c Bulk.</p>	<p>Selects one of 64 STS-3 signals as the foreground channel in the STS-192 signal.</p> <ul style="list-style-type: none"> • 1 - 64. Selects a specific STS-3 (STS-3 #1 through STS-3 #64) as the foreground channel. • ALL. Transmits the foreground channel across all 64 STS-3 channels. • None. No foreground channel is selected.
<p>STS-1 Added</p> <p>Note: STS-1 Added only appears when Mapping is set to STS-1 Bulk.</p>	<p>Selects one of 192 STS-1 signals as the foreground channel in the STS-192 signal.</p> <ul style="list-style-type: none"> • 1 - 192. Selects a specific STS-1 (STS-1 #1 through STS-1 #192) as the foreground channel. • ALL. Transmits the foreground channel across all 192 STS-1 channels. • None. No foreground channel is selected.
<p>Background STS-48 Pattern</p> <p>Note: Only appears when Mapping is set to STS-48c Bulk.</p>	<p>Determines the type of pattern inserted into the three remaining STS-48 background channels of an OC-192 signal. The pattern can range from 1 bit to 32 bits and is entered using screen keypad. It can be entered in Hex, decimal, or binary format.</p>
<p>Background STS-12 Pattern</p> <p>Note: Only appears when Mapping is set to STS-12c Bulk.</p>	<p>Determines the type of pattern inserted into the 15 remaining STS-12 background channels of an OC-192 signal. The pattern can range from 1 bit to 32 bits and is entered using screen keypad. It can be entered in Hex, decimal, or binary format.</p>
<p>Background STS-3 Pattern</p>	<p>Determines the type of pattern inserted into the 63 remaining STS-3</p>

<p>Note: Only appears when Mapping is set to STS-3c Bulk.</p>	<p>background channels of an OC-192 signal. The pattern can range from 1 bit to 32 bits and is entered using screen keypad. It can be entered in Hex, decimal, or binary format.</p>
<p>Background STS-1 Pattern</p> <p>Note: Only appears when Mapping is set to STS-1 Bulk.</p>	<p>Determines the type of pattern inserted into the 191 remaining STS-1 background channels of an OC-192 signal. The pattern can range from 1 bit to 32 bits and is entered using screen keypad. It can be entered in Hex, decimal, or binary format.</p>
<p>Payload Pattern</p>	<p>Select User-defined (32 bit value), PRBS 15, PRBS 15 INV, PRBS 23, PRBS 23 INV, PRBS 31, or PRBS 31 INV.</p>
<p>Clock Reference</p>	<p>Select Internal, Recovered, or Bits/Sets.</p>
<p>Laser Type</p>	<p>Selects either the 1310 nm laser or the 1550 nm laser on the 10G circuit pack (OC-192/STM-64).</p>
<p>Initial Laser Setting</p>	<p>Controls whether the laser is on or off when the unit is turned on.</p> <ul style="list-style-type: none"> • Off. The unit's laser will be off when the unit is turned on. • On. The unit's laser will be on when the unit is turned on. • Restore Previous State. When the unit is turned on, the laser will be on or off based on its previous setting before the unit was turned off.

OC-192 Transmit Settings 2

The OC-192 Transmit Settings 2 screen contains the following functions.

Functions	Description
Line Frequency Offset	Adjusts the offset of the signal

	<p>frequency of the transmitted SONET signal. The frequency can be adjusted in parts per million (PPM). The following options are available:</p> <p>Off = 0: The frequency cannot be adjusted.</p> <p>Edit: Adjusts the signal frequency in PPM. Use the + and - arrow keys to adjust the 00.0 decimal place. The frequency offset ranges from -100.0 to 100.0 in increments of 0.1. The default value is 00.0. After an offset value is entered, the Confirm button on the touch screen keypad must be selected for the new offset value to be accepted.</p>
<p>SS Bits in H1 Label</p>	<p>Set to SONET (00) or SDH (10).</p>
<p>Path Signal Label</p>	<p>Set the C2 byte to:</p> <ul style="list-style-type: none"> • Unequipped (00) • Equipped (01) • VT Structured STS (02) • Lock VT Mode (03) • Asyn Mapping for DS3 (04) • Asyn Mapping for DS4NA (12) • Mapping for ATM (13) • Mapping for DQDB (14) • HDLC Over SONET Mapping (16) • O.181 Test Signal Mapping (FE) • User Defined (any eight bit pattern 0 to FF). <p>Note: This option is coupled with the C2 byte option in the Transmit Overhead screen. If it is changed in this screen, it will change in the Overhead screen as well.</p>
<p>Synchronization Status (S1)</p>	<p>Sets the S1 byte to:</p> <ul style="list-style-type: none"> • Quality Unknown: Sets byte value to 00000000. • Rec. G.811: Sets byte value to

	<p>00000010.</p> <ul style="list-style-type: none"> • Rec. G.812 Transmit: Sets byte value to 00000100. • Rec. G.812 Local: Sets byte value to 00001000. • Sync Equip Timing Src: Sets byte value to 00001011. • User Defined (any eight bit pattern 0 to FF.
Trigger In	Determines how the protocol processor responds when an external pulse is received.
TC Overhead Processing	<p>Enables Tandem Connection Monitoring (TCM) transmit mode.</p> <ul style="list-style-type: none"> • Enable: For SDH, the unit uses its TCM circuitry and the N1 byte to generate errors and alarms between TCM equipment. For SONET, the unit uses the Z5 byte. • Disable: TCM mode is disabled, and the N1 and Z5 bytes follow normal operation.

OC-192 Receive

The Receive screen contains the following functions:

- OC-192 Receive Settings 1
- OC-192 Receive Settings 2
- OC-192 Receive Overhead
- OC-192 Receive Signal Status

OC-192 Receive Overhead

The OC-192 Receive Overhead screen contains the following functions.

Function	Options
STS-1	Selects a specific STS-1 slot within the OC-192 signal. The overhead

	bytes that appear on the OH screen are associated with this slot. There are 192 STS-1 slots available in an OC-192 signal.
STS-48 Dropped	Selects a specific STS-48 signal to monitor in the STS-192 signal.
Section OH	Displays the Section Overhead bytes for the selected STS-1 on the incoming OC-192 signal. This is a read-only function.
Line OH	Displays the Line Overhead bytes for the selected STS-1 on the incoming OC-192 signal. This is a read-only function.
Path OH	Displays the Path Overhead for the selected STS-1 on the incoming OC-192 signal. This is a read-only function.
J0 Trace	Displays the J0 trace received on the incoming OC-192 signal. This is a read-only function.
J1 Trace	Displays the J1 trace received on the incoming OC-192 signal. This is a read-only function.
TC Trace	Displays the Tandem Connection trace received on the incoming OC-192 signal. This is a read-only function.

OC-192 Receive Settings 1

This function allows you to configure the unit's receive parameters for your OC-192 environment.



Options marked with an asterisk (*) indicate that the function is coupled with the Transmit settings if Setting Control is set to "Coupled."

The OC-192 Receive Settings screen contains the following functions.

Function	Description
*Settings Control	If Coupled is selected, settings

	<p>changed on the Receive screen will automatically change on the Transmit screen as well.</p> <p>If Independent is selected, settings established on the Receive screen will only affect Receive mode.</p>
<p>*Mapping</p>	<p>Defines the type of signals that are combined to create an OC-192 signal. For example, four STS-48s can be mapped into an OC-192 signal.</p> <p>If the unit is not licensed for 10 Gbps mapping, the following options appear and are described below: STS-192c Bulk, STS-48 A/D, STS-48 A/D LI, and STS-192c POS.</p> <p>If the unit is licensed for 10 Gbps mapping, it can perform the following mappings using only the 10 Gbps circuit pack (OC-192 protocol processor): STS-192c Bulk, STS-12c Bulk, STS-3c Bulk, STS-1 Bulk, and STS-192c POS.</p> <ul style="list-style-type: none"> • STS-192c Bulk. Maps a concatenated STS-192 signal into an OC-192. • STS-48 A/D. Maps four STS-48s into an OC-192. The STS-48s are generated internally from the OC-48 protocol processor. Note: This option appears if a separate 2.5G circuit pack (an OC-48 protocol processor) is installed in the unit. • STS-48 A/D LI: Maps four STS-48s into an OC-192. The STS-48s are derived externally and enter the unit using the line interface connectors. Note: This option appears if a separate 2.5G circuit pack (an

	<p>OC-48 protocol processor) is installed in the unit.</p> <ul style="list-style-type: none"> • STS-48c Bulk. Maps a concatenated STS-48 signal into an OC-192. Four STS-48s make up an OC-192. Note: This option only appears if the unit is licensed for 10 Gbps mapping. • STS-12c Bulk. Maps a concatenated STS-12 signal into an OC-192. Sixteen STS-12s make up an OC-192. Note: This option only appears if the unit is licensed for 10 Gbps mapping. • STS-3c Bulk. Maps a concatenated STS-3 signal into an OC-192. Sixty-four STS-3s make up an OC-192. Note: This option only appears if the unit is licensed for 10 Gbps mapping. • STS-1 Bulk. Maps 192 STS-1s into an OC-192 signal. Note: This option only appears if the unit is licensed for 10 Gbps mapping. • STS-192c POS. Configures the unit for Packet Over SONET/SDH operation.
<p>STS-48 Dropped</p> <p>Note: STS-48 Dropped only appears when Mapping is set to STS-48c Bulk.</p>	<p>Selects a specific STS-48 signal to monitor in the STS-192 signal. The unit receives an STS-192 signal that is demuxed into four STS-48 signals and then processed.</p> <ul style="list-style-type: none"> • 1 - 4. Selects a specific STS-48 (STS-48 #1 through STS-48 #4) as the dropped and monitored channel. • None. No STS-48s are selected.

<p>STS-12 Dropped</p> <p>Note: STS-12 Dropped only appears when Mapping is set to STS-12c Bulk.</p>	<p>Selects a specific STS-12 signal to monitor in the STS-192 signal. The unit receives an STS-192 signal that is demuxed into 16 STS-12 signals and then processed.</p> <ul style="list-style-type: none"> • 1 - 16. Selects a specific STS-12 (STS-12 #1 through STS-12 #16) as the dropped and monitored channel. • None. No STS-12s are selected.
<p>STS-3 Dropped</p> <p>Note: STS-3 Dropped only appears when Mapping is set to STS-3c Bulk.</p>	<p>Selects a specific STS-3 signal to monitor in the STS-192 signal. The unit receives an STS-192 signal that is demuxed into 64 STS-3 signals and then processed.</p> <ul style="list-style-type: none"> • 1 - 64. Selects a specific STS-3 (STS-3 #1 through STS-3 #64) as the dropped and monitored channel. • None. No STS-3s are selected.
<p>STS-1 Dropped</p> <p>Note: STS-1 Dropped only appears when Mapping is set to STS-1 Bulk.</p>	<p>Selects a specific STS-1 signal to monitor in the STS-192 signal. The unit receives an STS-192 signal that is demuxed into 192 STS-1 signals and then processed.</p> <ul style="list-style-type: none"> • 1 - 192. Selects a specific STS-1 (STS-1 #1 through STS-1 #192) as the dropped and monitored channel. • None. No STS-1s are selected.
<p>Payload Pattern</p>	<p>Selects the type of pattern that the unit expects to receive on the incoming SONET signal.</p> <p>The following options are available: Live (user data is received; no pattern is used), User Defined (range from 1</p>

	bit to 32 bits and is entered using a touch screen keypad), PRBS 2 ¹⁵ -1, PRBS 2 ¹⁵ -1 Inverted, PRBS 2 ²³ -1, PRBS 2 ²³ -1 Inverted, PRBS 2 ³¹ -1, and PRBS 2 ³¹ -1 Inverted.
Trigger Out	Allows the protocol processor to respond to an external "pulse" received. The following options can be selected: None, LOF, LOP, B1, B2, B3, BIT, Frame, RDI-L, RDI-P, REI-L, REI-P, or Ptr Increment, Ptr Decrement, New Ptr with NDF, or New Ptr without NDF.

OC-192 Receive Settings 2 (SET 2)

This function configures the OC-192 Receive mapping, which maps a pattern into the OC-192 interface.

The following options appear on the OC-192 Receive SET 2 screen.

Options	Description
PLM Alarm Reporting	<p>This function enables PLM-P alarm reporting. An STS Payload Label Mismatch (PLM-P) alarm occurs when the incoming Higher-Order Path Signal Label (C2 byte) does not match the expected Higher-Order Path Signal Label (C2 byte). The following options are available:</p> <ul style="list-style-type: none"> • Enabled: PLM-P alarms are recognized and reported. • Disabled: PLM-P alarms are ignored.
Expected Path Signal Label	<p>Configure to receive a specific value for the C2 byte. The following options are available:</p> <ul style="list-style-type: none"> • Unequipped (00): The

	<p>expected C2 byte is 00000000.</p> <ul style="list-style-type: none"> • Equipped (01): The expected C2 byte is 00000001. • VT Structured STS (02): The expected C2 byte is 00000010. • Lock VT Mode (03): The expected C2 byte is 00000011. • Asyn Mapping for DS3 (04): The expected C2 byte is 00000100. • Asyn Mapping for DS4NA (12): The expected C2 byte is 00010010. • Mapping for ATM (13): The expected C2 byte is 00010011. • Mapping for DQDB (14): The expected C2 byte is 00010100. • HDLC Over SONET Mapping (16): The expected C2 byte is 00010110. • O.181 Test Signal Mapping (FE): The expected C2 byte is 11111110. • User Defined: Allows an 8-bit Path Signal Label, from 00h to FFh, to be entered for the C2 byte value.
<p>TIM Alarm Reporting</p>	<p>An STS Path Trace Identifier Mismatch (TIM-P) alarm occurs when the incoming J1 trace does not match the expected J1 trace. A Section Trace Identifier Mismatch (TIM-S) alarm occurs when the incoming J0 trace does not match the expected J0 trace. A Tandem Connection Trace Identifier Mismatch (TC-TIM) alarm occurs when the incoming TC trace does not match the expected TC trace. The following options are</p>

	<p>available:</p> <ul style="list-style-type: none"> • Enabled: TIM alarms are recognized and reported. • Disabled: TIM alarms are ignored.
<p>Expected J0</p>	<p>Defines the expected J0 trace received on the incoming SONET signal. The following options are available:</p> <ul style="list-style-type: none"> • Default (64 byte): Selects the Digital Lightwave ASCII message as the expected J0 trace pattern. The message consists of 62 characters appended with a CR and LF. • User Defined (64 byte): Selects a user-defined ASCII message as the expected J0 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 64 characters in length (62 characters plus CR and LF). • All Ones: Selects an All Ones pattern as the expected J0 trace pattern. • All Zeros: Selects an All Zeros pattern as the expected J0 trace pattern. • Default (16 byte): Selects the Digital Lightwave ASCII message as the expected J0 trace pattern. The message consists of 16 characters. • User Defined (16 byte): Selects a user-defined ASCII message as the expected J0 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 16

	characters in length.
Expected J1	<p>Defines the expected J1 trace received on the incoming SONET signal. The following options are available:</p> <ul style="list-style-type: none"> • Default (64 byte): Selects the Digital Lightwave ASCII message as the expected J1 trace pattern. The message consists of 62 characters appended with a CR and LF. • User Defined (64 byte): Selects a user-defined ASCII message as the expected J1 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 64 characters in length (62 characters plus CR and LF). • All Ones: Selects an All Ones pattern as the expected J1 trace pattern. • All Zeros: Selects an All Zeros pattern as the expected J1 trace pattern. • Default (16 byte): Selects the Digital Lightwave ASCII message as the expected J1 trace pattern. The message consists of 16 characters. • User Defined (16 byte): Selects a user-defined ASCII message as the expected J1 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 16 characters in length.
SS Bits Alarm Reporting	<p>Disables or enables SS bits reporting. This function is used in conjunction with the Expected SS Bits function. If enabled, and an SS Bits mismatch is</p>

	<p>detected on the received signal, the duration in seconds will appear under the Results Scan function.</p>
<p>Expected SS Bits</p>	<p>Selects one of the following as the expected SS Bits value:</p> <ul style="list-style-type: none"> • 00 (SONET) • 01 (Undefined) • 10 (SDH) • 11 (Undefined)
<p>TC Error/Alarm Processing</p>	<p>Enables or disables Tandem Connection Monitoring (TCM) mode. This function is used in conjunction with the Expected TC Trace and TIM Alarm Reporting functions.</p> <p>The TC Summary LED turns red if a TCM error or alarm is reported. Select the TC Summary text for more details.</p> <ul style="list-style-type: none"> • Enable: Turns on TCM error and alarm reporting mode. • Disable: Turns off TCM error and alarm reporting mode. (Note: Disable this option if you are not performing TCM testing. This will prevent false error and alarm reporting.)
<p>Expected TC Trace</p>	<p>Defines the expected TC trace received on the incoming signal. For SONET, this is in the Z5 byte. For SDH, this is in the N1 byte. The following options are available:</p> <ul style="list-style-type: none"> • Default: Selects the 16-byte Digital Lightwave ASCII message at the expected TC trace pattern. • All Ones (16 byte): Selects a 16-byte All Ones pattern as the expected TC trace pattern. • All Zeros (16 byte): Selects a

	<p>16-byte All Zeros pattern as the expected TC trace pattern.</p> <ul style="list-style-type: none">• User Defined: Selects a 16-byte user-defined ASCII message as the expected TC trace pattern. The message is entered and saved using a screen keypad.
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OC-192 Receive Signal Status

Displays the following measurements of the incoming SONET signal:

- Received optical power in dBm
- Line Frequency in MHz for OC-192
- Frequency offset received in KHz and ppm
- Update Signal Calibration allows you to update the following calibrations:
 - Zero power reading
 - -20 dBm power reading
 - -10 dBm power reading

Select the **Save** button to update the signal calibration.

Related Topics:

Calibrate Optical Power

Line Frequency Offset

OC-192 Results

All monitored activity that the system receives is eventually reported to the Results screen. This screen provides several layers of granularity for analyzing the incoming signal, pattern, errors, and alarms.

The OC-192 Results screen contains the following functions:

- Scan
- Errors
- Alarms
- PTR
- Event Log
- APS

- Large LEDs
- Graphs

APS Results

The APS results monitor incoming APS activity. It logs and displays the K1 and K2 byte sequences received by the unit. A maximum of 15 byte sequences can appear on the touch screen.

The following information appears in the APS report for the last 15 K1 and K2 byte sequences received:

- The HEX value of the K1 byte.
- The HEX value of the K2 byte.
- The number of frames received that contain the K1 and K2 bytes.
- The elapsed time of the frames that contain the K1 and K2 bytes.



Per GR-253-CORE, only the upper 12 bits of the K1/K2 bytes (K1 bits 1-8 and the K2 bits 1-4) are used for APS operation. K2 bit 5 sets the APS mode type (1+1, 1:n) and cannot be changed during operation. K2 bits 6-8 are for alarms. Any changes to the lower four bits of the K2 byte do not affect APS operation. The Results APS table only starts and displays a new entry item if the upper 12 K1/K2 bits stabilize on a new value for a minimum of three consecutive frames.

Alarms

The system can monitor and report alarms and their duration on the incoming SONET signal. The **Alarms** function lists the duration of the alarm in seconds.

The following alarms can be monitored:

- Clock Sync
- LOS (Loss of Signal)
- LOF (Loss of Frame)
- SEF (Severely Errored Frame)
- TIM-S (Section Trace Identifier Mismatch for the J0 byte)
- AIS-L (Line Alarm Indication Signal)
- RDI-L (Line Remote Defect Indicator)
- APS (Automatic Protection Switching)
- AIS-P (Path Alarm Indication Signal)
- LOP-P (Path Loss of Pointer)
- UNEQ-P (Unequipped STS Payload)
- RDI-P (Path Remote Defect Indicator)
- TIM-P (STS Path Trace Identifier Mismatch for the J1 byte)

- PLM-P (STS Payload Label Mismatch)
- Pattern Sync
- TC-RDI (Tandem Connection-Remote Defect Indicator)
- TC-ODI (Tandem Connection-Outgoing Defect Indicator)
- TC-AIS (Tandem Connection-Alarm Indication Signal)
- TC-UNEQ (Tandem Connection-Unequipped)
- TC-TIM (Tandem Connection-Trace Identifier Mismatch)
- TC-LOF (Tandem Connection-Loss of Frame)

Errors

The system can monitor and report errors on the incoming SONET signal. The **Errors** function provides a detailed analysis of the incoming error as described below.

The errors reported are a result of:

- Incoming errors that are generated by the SONET network, or
- Errors being intentionally generated by the system when it is used in a loopback environment

The following errors can be monitored:

- B1 (Section BIP-8, also known as a Section Coding Violation - CV-S)
- B2 (Line BIP-8, also known as a Line Coding Violation - CV-L)
- B3 (Path BIP-8, also known as an STS Path Coding Violation - CV-P)
- REI-L (Line Remote Error Indicator; also known as a Line Far End Block Error - FEBE-L)
- REI-P (Path Remote Error Indicator; also known as a Path Far End Block Error - FEBE-P)
- BIT (BIT errors reported in the payload)
- NDF-P (Path New Data Flag counts)
- TC-IEC (Tandem Connection-Incoming Error Count)
- TC-REI (Tandem Connection-Remote Error Indicator)
- TC-OEI (Tandem Connection-Outgoing Error Indicator)

The following parameters are measured for these incoming errors:

- Error count using an 11-digit format
- Average error rate using an N.NNe-N format
- Current error rate using an N.NNe-N format
- Error-free seconds using an 8-digit format
- Errored seconds
- Severely Errored seconds
- Unavailable errored seconds

Related Topics:

How to Display History

Scan

LED Definitions

Section Analysis

Event Log

The Event Log provides a detailed summary of alarm, error, Pointer events, and APS activity that have occurred and have been recorded by the unit.

The events appear in a table that lists events, the number of events logged, the start and stop time of the event, and the duration of the event.

Graphs

This function allows incoming errors and alarms to be graphed. The graphs can be saved, recalled, and printed from a history file.

For more information about graphs, select *Use Graphs* in the Common Tasks section of the online help.

Large LEDs Overview

This function displays the SONET LEDs in a large, easy-to-read format that covers the entire touch screen area. This is useful for viewing any errors or alarms from a long distance, such as across the room from a test bay.

This function also allows:

- On/Off control of the unit's laser
- Single error insertion into the transmit SONET signal

PTR (SONET)

This function monitors and reports received STS Pointer statistics. A count of the following Pointer statistics appear:

- Pointer Justification (STS Path Positive Pointer Justification count)
- Negative Justification (STS Path Negative Pointer Justification count)
- Positive Justification Seconds. Indicates the duration of a Pointer adjustment.
- NDF Count. Indicates the STS Path New Data Flag count.
- Receive Pointer Value (in decimal). Valid Pointers range from 0 to 782.

Scan

This function displays a list of received errors and alarms. For **alarms**, the duration is reported as a count in seconds. For **errors**, an error count is reported.

The message **No Errors or Alarms** appears if no events are received by the system.

This function provides a quick summary of incoming errors and alarms. It is effective in identifying a general area to investigate when error or alarm activity is detected.

OC-192 Test

The Test screen configures test parameters associated with a protocol processor.

The Test screen contains the following functions:

- SET 1
- APS
- RTD

Action After Duration

This function defines what activities occur at the conclusion of a timed test. To determine how long a test will run, refer to the Duration function section. The following options are available.

Options	Description
None	No action occurs at the end of the test duration.
Print Current Statistics	Test results are printed to the attached printer at the end of a timed test. The timed test is not repeated.

Screen and Function Descriptions

Record Current Statistics	Test results are printed to a file at the end of a timed test. Test results appear in a columned report format.
Record Current Statistics Using a Delimiter	Test results are printed to a file at the end of a timed test. Test results appear in a quote/comma-report format, meaning that error and/or alarm values are enclosed in quotes (") and separated by commas (,).
Print Statistics and Repeat Test	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, test statistics (which are results for the Scan, Errors, Alarms, and PTR functions) are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function.</p>
Record Statistics and Repeat Test	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmss.stat where,</p> <p>xx indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4).</p> <p>hmmss indicates the current time in hours, minutes, and seconds.</p> <p>stat indicates the Statistics file extension.</p>
Print Events and Repeat Test	Note: This option appears when

	<p>Repeat Actions is selected.</p> <p>At the conclusion of a timed test, test events (which are a detailed summary of alarms, errors, and Pointer activity) are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function</p>
<p>Record Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmss.stat.</p>
<p>Print Statistics/Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function</p>
<p>Record Statistics/Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics and events are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmssE.stat (E indicates the file contains both statistics and events).</p>
<p>Print Events and Repeat Test</p>	<p>Enables real-time reporting. Any</p>

	<p>event that occurs during a real-time test is automatically sent to the attached printer. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Record Events and Repeat Test	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Print and Record Events and Repeat Test	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to both the attached printer and a report file. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Print Events	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Record Events	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>

<p>Print and Record Events</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to both the attached printer and a report file.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
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Duration

This function configures how long a timed test runs. The following options are available:

Options	Description
Continuous	Test is untimed, and unit is always collecting data.
5 Minutes	Test runs for 5 minutes.
15 Minutes	Test runs for 15 minutes.
1 Hour	Test runs for 1 hour.
2 Hours	Test runs for 2 hours.
24 Hours	Test runs for 24 hours.
72 Hours	Test runs for 72 hours.
1 Week	Test runs for 1 week.
2 Weeks	Test runs for 2 weeks.
User Defined	Allows a specific test duration to be entered using a touch screen keypad. The minimum duration is 1 minute. The maximum duration is 99 days, 23 hours, and 59 minutes.

Protection Switch Criteria

This is an **APS (RX)** function that is used to measure APS activity. The **Protection Switch Criteria** function determines the type of alarm, error, or pattern event that is used as a trigger to generate APS activity in your network. The unit monitors the incoming signal for the specified event. If it occurs, its duration in both seconds and frames is measured and logged. The APS measurement has an accuracy of 0.5 milliseconds.

The following options are available:

Options	Description
B1	An APS is generated if a B1 error is received. The duration in seconds and frames is measured and logged.
SEF	An APS is generated if a Severely Errored Frame is received. The duration in seconds and frames is measured and logged.
AIS-L	An APS is generated if a Line AIS alarm is received. The duration in seconds and frames is measured and logged.
AIS-P	An APS is generated if a Path AIS alarm is received. The duration in seconds and frames is measured and logged.
PRBS	An APS is generated if a PRBS pattern is received with errors. The duration in seconds and frames is measured and logged.

For information about measuring APS activity, select *Measure SDH and SONET APS Activity* in the Common Tasks section of the online help.

APS (Automatic Protection Switch)

The unit can measure APS switching intervals in your network. The unit can be configured to monitor for a specific event that will cause an APS switch. When this event occurs, the duration in both seconds and frames is logged. These statistics can be used to determine how long it takes for your network equipment to react to an APS event and switch to a backup path.

Using the Test APS functionality, you can set a specific event as a trigger for APS activity. The APS measurement has an accuracy of 0.5 milliseconds.

Test APS functions include:

- **Protection Switch Criteria**
- **State:** Starts and stops Automatic Protection Switching mode. The unit will begin monitoring the incoming signal for a single or continuous APS event. If an APS event occurs, the protection switch time will appear in both seconds and frames present. The results will not include the number of good frames, but the number of frames that elapsed before the first good frame, meeting the entered criteria, occurred.

Single APS - Monitors for a single APS event. Seconds and frames are reported and the State returns to Inactive.

Continuous APS - Constantly monitors for APS events, and updates the seconds and frames reported.

Stop APS - Stops APS monitoring. The State returns to Inactive.

- **Protection Switch Time (Frames):** Indicates the number of frames received during the APS switching event.
- **Protection Switch Time (Seconds):** Indicates the duration in seconds that it took for the APS switch event to occur.
- **Consecutive Good Time Required:** This function allows you to enter the duration (in milliseconds) of valid frames to occur before Protection Switching is confirmed to be activated. The range is 0.125 to 2047.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of valid frames to occur before Protection Switching is confirmed to be activated. The range is 1 to 16383 frames and is entered using a keypad.

For more information about monitoring APS activity, select *Measuring SDH and SONET APS Activity* in the Common Tasks section of the online help.

RTD (Round-Trip Delay)

The round-trip delay function allows you to transmit a known frame into your network and measure how long it takes for the frame to return to the unit.

Test RTD functions include:

- **State:** Starts and stops round-trip delay mode.

Single Round-Trip Delay - If selected, an AIS alarm is inserted into a

frame and transmitted once through your network. The frame's transmission through the network is measured in frame counts and milliseconds. Frame counts indicates the number of frames received before the AIS frame is received by the unit. Milliseconds indicates how long it took for the AIS frame to travel out and return to the unit.

Continuous Round-Trip Delay - If selected, an AIS alarm is inserted into a frame and continuously transmitted through your network. The current frame count and duration appear in the **Current** column. The fastest round trip appears in the **Minimum** column and the slowest round trip appears in the **Maximum** column.

Stop Round-Trip Delay - Stops round-trip delay activity. The State returns to Inactive.

- **Round-trip Delay Time (Frames):** Indicates the number of frames received during the measurement.
- **Round-trip Delay Time (Seconds):** Indicates the duration in seconds that it took for the known frame to return to the unit.
- **Consecutive Good Time Required:** This function allows you to enter the duration (in milliseconds) of valid frames to occur before the round-trip delay function is confirmed to be activated. It is used to fine-tune the measurement. The range is 0.125 to 2047.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of valid frames to occur before the round-trip delay function is confirmed to be activated. It is used to fine-tune the measurement. The range is 1 to 16383 frames and is entered using a keypad.

For more information about round-trip delay, select *Round-Trip Delay* in the Common Tasks section of the online help.

SET 1

The SET 1 functions determine how long a protocol processor's test runs and what activities occur at the end of the test.

The following appears on the SET 1 screen.

- **Duration**
- **Action After Duration**
- **Pause Test/Resume Test:** This button switches between pausing an active test and continuing an active test. The button's label indicates the action that will happen when it is selected.

For more information about tests, select *Start a Test* in the Common Tasks section of the online help.

OC-192 Performance Monitoring

Performance Monitoring provides greater detail about incoming Section, Line, and Path errors.

- Section Analysis
- Line Analysis
- Path Analysis

Line Analysis

This function displays a detailed breakdown of incoming **B2** (Line BIP-8, also known as Coding Violations) and Line Remote Error Indicator (REI-L) errors.

The following statistics are reported:

Statistic	Description
Near End Coding Violations (CV-L)	This is an error count of incoming B2 errors.
Near End Errored Seconds (ES-L)	This reports the duration of the incoming B2 errors (in seconds). This statistic also reports the percentage of errored seconds compared to the duration of error-free seconds.
Near End Severely Errored Seconds (SES-L)	This reports the duration of Severely Errored Seconds (SES) on the incoming SONET signal. An SES is reported when 9835 or more B2 errors occur in one second, or when a Severely Errored Frame (SEF) alarm, Loss of Frame (LOF) alarm, Loss of Signal (LOS) alarm, or Line Alarm Indication Signal (AIS-L) alarm occurs.
Near End Unavailable Seconds (UAS-L)	This reports the number of seconds that the Line layer was considered unavailable. A Line is unavailable when 10 consecutive seconds that qualify as SES-L seconds occur.
Far End Coding Violations (CV-LFE or REI-L)	This is an error count of the number of B2 errors detected by the far-end Line Terminating Equipment (LTE). These errors are reported back to the NIC 10G using the M1 byte of the Line overhead. The M1 byte is also

	known as the Line Remote Error Indicator - REI-L . (A CV-LFE was formerly known as a Line FEBE.)
Far End Errored Seconds (ES-LFE)	This is a counter that indicates the number of seconds that an REI-L alarm is reported.
Far End Severely Errored Seconds (SES-LFE)	This reports the duration when 9835 or more REI-L errors are present at the far-end LTE, or when a Line Remote Defect Indicator (RDI-L) alarm is present.
Far End Unavailable Seconds (UAS-LFE)	This is a counter that indicates the number of seconds that an SES-LFE error was present at the far-end LTE. At least 10 consecutive errored seconds of SES-LFE errors must be present before a UAS-LFE is declared.

Related Topics:

Errors

Alarms

LED Definitions

What causes a B2 error?

Path Analysis

This function displays a detailed breakdown of incoming **B3** (Path BIP-8, also known as Path Coding Violations) and STS Path Remote Error Indicator (REI-P) errors.

The following statistics are reported:

Statistics	Description
Near End Coding Violations (CV-P)	This is an error count of incoming B3 errors.
Near End Errored Seconds (ES-P)	This reports the duration of the incoming B3 errors (in seconds). This

	<p>statistic also reports the percentage of errored seconds compared to the duration of error-free seconds.</p>
<p>Near End Severely Errored Seconds (SES-P)</p>	<p>This reports the duration of Severely Errored Seconds (SES) on the incoming SONET signal. An SES is reported when 2400 or more B3 errors occur in one second, or when an AIS-P alarm, UNEQ-P alarm, LOS alarm, LOF alarm, AIS-L alarm, or LOP-P alarm occurs.</p>
<p>Near End Unavailable Seconds (UAS-P)</p>	<p>This reports the number of seconds that the STS Path layer was considered unavailable. A Path is unavailable when 10 consecutive seconds that qualify as SES-P seconds occur.</p>
<p>Far End Coding Violations (CV-PFE or REI-P)</p>	<p>This is an error count of the number of B3 errors detected by the far-end STS Path Terminating Equipment (PTE). These errors are reported back to the NIC 10G using the G1 byte of the STS Path overhead. The G1 byte is also known as the STS Path Remote Error Indicator - REI-P. (A CV-PFE was formerly known as an STS Path FEBE.)</p>
<p>Far End Errored Seconds (ES-PFE)</p>	<p>This is a counter that indicates the number of seconds that an REI-P alarm is reported.</p>
<p>Far End Severely Errored Seconds (SES-PFE)</p>	<p>This reports the duration when 2400 or more REI-P errors are present at the far-end LTE, or when a Line Remote Defect Indicator (RDI-P) alarm is present.</p>
<p>Far End Unavailable Seconds (UAS-PFE)</p>	<p>This is a counter that indicates the number of seconds that an SES-PFE error was present at the far-end LTE. At least 10 consecutive errored seconds of SES-PFE errors must be present before a UAS-PFE is declared.</p>

Related Topics:

Errors

Alarms

LED Definitions

What causes a B3 error?

Section Analysis

This function displays a detailed breakdown of incoming **B1** errors (Section BIP-8, also known as Coding Violations).

The following statistics are reported:

Statistics	Description
Near End Coding Violations	This is an error count of incoming B1 errors.
Near End Errored Seconds	This reports the duration of the incoming B1 errors in seconds. This statistic also reports the percentage of errored seconds compared to the duration of error-free seconds.
Near End Severely Errored Seconds	This reports the duration of Severely Errored Seconds (SES) on the incoming SONET signal. An SES is reported when 8554 or more B1 errors occur in one second, or when a Severely Errored Frame (SEF) alarm, Loss of Frame (LOF) alarm, or Loss of Signal (LOS) alarm occurs.

Related Topics:

Errors

Alarms

LED Definitions

What causes a B1 error?

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OC-48 Overview

This section of the online help system has topics that discuss:

- OC-48 Specific Tasks
- OC-48 Screen and Function Descriptions

You may also navigate through the topics by using the **Contents** tab and window that appear on the left side of the screen.

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OC-48 Specific Tasks

OC-48 Specific Tasks

This section describes tasks that are specific to the OC-48 protocol processor. For a list of general tasks that relate to all protocol processor modes, see Common Tasks located in the Getting Started section.

Calibrate Optical Power

The following procedures describe the unit's optical power calibration. While performing this task, you will measure, record, and enter the Zero optical power input and the optical power readings for -20 dBm and -10 dBm.

Before You Begin

- Read these procedures before trying to calibrate the unit.

 **WARNING: Power the unit off before removing the optical connector dust caps to clean the unit's fiber optic ports.**

- Before performing optical power calibration, use a fiber-optics cleaning kit to clean the fiber-optic ports on the unit, the optical power meter, the optical attenuator, and the fiber cables. Dirty optical fibers will affect optical measurements.
- The following equipment is required for unit optical calibration:
 - Two three-foot singlemode, fiber-optic cables
 - Variable optical attenuator
 - Optical power meter
 - Fiber-optics cleaning kit
 - Pencil and paper to record optical power measurements

Restoring Raw Power Readings

The following restores the unit's raw (unconverted) power readings.

1. Make sure that the dust caps are on the unit's TX and RX optical ports.
2. Turn the unit on.
3. From the **OC-48** tab, select the **Receive** button.
4. Select the **Signal Status** button, and then **Update Signal Calibration**.
5. Select **Zero power reading**. A touch screen keypad appears. Enter 0 and select **OK**.
6. Select the **Save** button to restore the raw (unconverted) power reading.

Obtaining Zero Optical Power Input

1. Make sure that the dust caps are on the unit's TX and RX optical ports, and that the unit is turned on.
2. Make sure that the unit's laser is off.
3. From the **OC-48** tab, select the **Receive** button.
4. Select the **Signal Status** button. Record the **Optical Power** reading. This value is the **Zero power reading**.

Obtaining -20 dBm Power Reading

1. With the unit turned on, connect a fiber-optic cable from the unit's **2.5 Gbps TX** optical port to the optical attenuator's input connector.
2. Attach a fiber-optic cable from the attenuator's output port to the optical power meter.
3. Turn the unit's laser on.
4. Adjust the attenuator so that the optical power meter reads -20 dBm.
5. Disconnect the fiber-optic cable from the optical power meter, and attach it to the unit's **2.5 Gbps RX** optical port.
6. From the **OC-48** tab on the unit, select the **Receive** button.
7. Select the **Signal Status** button. Record the **Optical Power** reading. This value is the **-20 dBm power reading**.

Obtaining -10 dBm Power Reading

1. Disconnect the fiber-optic cable from the unit's **2.5 Gbps RX** optical port and attach it to the optical power meter. (You have a direct fiber-optic cable connection from the optical attenuator to the optical power meter.)
2. Adjust the attenuator so that the power meter reads -10 dBm.
3. Disconnect the fiber-optic cable from the optical power meter, and attach it to the unit's **2.5 Gbps RX** optical port.
4. From the **OC-48** tab on the unit, select the **Receive** button.
5. Select the **Signal Status** button. Record the **Optical Power** reading. This value is the **-10 dBm power reading**.

Entering Optical Power Readings

1. From the **OC-48** tab on the unit, select the **Receive** button.
2. Select the **Signal Status** button, and then **Update Signal Calibration**.
3. Select **Zero power reading**. A touch screen keypad appears. Enter the value recorded earlier for the Zero Power Reading and select **OK**.
4. Select **-20 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -20 dBm Power Reading and select **OK**.
5. Select **-10 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -10 dBm Power Reading and select **OK**.
6. Select **Save** to save the new calibration values. This completes the optical calibration procedure.

Screen and Function Descriptions

OC-48 Screen and Function Descriptions Overview

This section of the online help system describes the various functions, buttons, and tabs that control OC-48 configuration and operation:

- OC-48 LEDs
- OC-48 Transmit
- OC-48 Receive
- OC-48 Results
- OC-48 Test
- OC-48 Performance Monitoring

OC-48 Transmit

The Transmit screen contains the following functions:

- OC-48 Transmit Settings 1
- OC-48 Transmit Settings 2
- OC-48 Transmit Overhead
- OC-48 Transmit Pointer Generation
- OC-48 Transmit APS
- OC-48 Transmit Error Alarm

OC-48 Transmit APS

The OC-48 Transmit APS functions are used to configure APS transmit activity.

The following APS Transmit functions are available:

- Linear Mode
- Ring Mode
- Duration in Frames

APS is a feature that allows the LTE to switch to a backup line in case of errors or failures on the main line. APS commands can be configured for either Linear- or Ring-based networks and are transmitted using bytes K1 and K2 of the Line overhead.

You can test the network's APS response by generating a condition that is likely to cause APS switching. You also have the capability to generate specific APS messages and monitor the response.

Linear Mode

This function configures the system to transmit APS functions for a Linear (span) network.

- K1 Full Byte (Linear Mode)
- K1 Bits 1-4 (Linear Mode)
- K1 Bits 5-8 (Linear Mode)
- K2 Full Byte (Linear Mode)
- K2 Bits 1-4 (Linear Mode)
- K2 Bit 5 (Provisioned) (Linear Mode)
- K2 Bits 6-8 (Linear Mode)

Ring Mode

This function configures the system to transmit APS functions for a Ring network.

- K1 Full Byte (Ring Mode)
- K1 Bits 1-4 (Ring Mode)
- K1 Bits 5-8 (Ring Mode)
- K2 Full Byte (Ring Mode)
- K2 Bits 1-4 (Ring Mode)
- K2 Bit 5 (Provisioned) (Ring Mode)
- K2 Bits 6-8 (Ring Mode)

Duration in Frames

This function determines the number of frames transmitted that contain specific K1 and K2 bytes. These bytes are configured using the functionality located on the transmit APS screen.

Frame count is entered using a keypad. Values ranging from **1 to 65535** frames can be entered.

Duration in Frames (SONET)

This is an **APS (TX)** function used to configure APS transmit activity.

The **Duration in Frames** function determines the number of frames transmitted that contain specific K1 and K2 bytes. These bytes are configured using the functionality located on the transmit APS screen.

Frame count is entered using a keypad. Values ranging from **1 to 65535** frames can be entered.

Protection Switch Criteria (SONET)

This is an **APS (RX)** function that is used to measure APS activity.

The **Protection Switch Criteria** function determines the type of alarm, error, or pattern event that is used as a trigger to generate APS activity in your network. The unit monitors the incoming signal for the specified event. If it occurs, its duration in both seconds and frames is measured and logged. The APS measurement has an accuracy of 0.5 milliseconds.

The following options are available:

Options	Description
B1	An APS is generated if a B1 error is received. The duration in seconds and frames is measured and logged.
SEF	An APS is generated if a Severely Errored Frame is received. The duration in seconds and frames is measured and logged.
AIS-L	An APS is generated if a Line AIS alarm is received. The duration in seconds and frames is measured and logged.
AIS-P	An APS is generated if a Path AIS alarm is received. The duration in seconds and frames is measured and logged.
PRBS	An APS is generated if a PRBS pattern is received with errors. The duration in seconds and frames is measured and logged.

OC-48 Transmit Error Alarm

The unit can transmit errors and alarms to simulate various defects and anomalies. One reason for transmitting these defects is to determine if the receiving equipment can detect an error or alarm in the incoming signal.

- Error to Insert

- Error Insert Rate
- Alarm Generated

OC-48 Transmit Overhead

The OC-48 Transmit Overhead screen contains the following functions.

Functions	Description
STS-1	Selects a specific STS-1 slot within the OC-48 signal. The overhead bytes that appear on the OH screen are associated with this slot. There are 48 STS-1 slots available in an OC-48 signal.
STS-12 Added	Select 1 to 4, All, or None as the foreground channel.
Section OH	Select and edit the following Overhead bytes: A1, A2, Z0, B1, E1, F1, D1, D2, and D3.
Line OH	Select and edit the following Overhead bytes: H1, H2, H3, B2, K1, K2, D4-D12, Z1, Z2, and E2.
Path OH	Select and edit the following Overhead bytes: B3, J1, C2, G1, F2, H4, Z3, Z4, and Z5.
J0 Trace	Selects a default or customized pattern to be used as the J0 trace.
J1 Trace	Selects a default or customized pattern to be used as the J1 trace.
TC Trace	Selects a default or customized pattern to be used as the Tandem Connection Monitoring trace.

OC-48 Transmit Pointer Generation

The OC-48 Transmit Pointer screen contains the following functions.

Functions	Description
Pointer Action	Determines the type of Pointer activity that occurs when the Inc Pointer and Dec Pointer buttons are

	selected.
NDF on New Pointer	Specifies whether the New Data Flag bits are set when a new Pointer is present in the generated signal.
Pointer Value	Allows a new Pointer value to be entered. A valid Pointer value is a binary number ranging from 0 to 782.
Burst Count	Determines the number of Pointer location movements that occur when the Inc Pointer or Dec Pointer buttons are pressed. The Pointer burst count ranges from 1 to 8.
SPE Frequency Offset	Adjusts the rate at which Pointer adjustments are needed in the Synchronous Payload Envelope (the payload).
Increment/Decrement Pointer	Alternates the Pointer insertion from increment to decrement with a 200-msec delay in between.

Related Topic:

For information about making Pointer adjustments, refer to *Make Pointer Adjustments* in the Common Tasks section of the online help.

OC-48 Transmit Settings 1

The OC-48 Transmit Settings 1 screen contains the following functions.

Function	Description
Settings Control	If Coupled is selected, settings changed on the Transmit screen will automatically change on the Receive screen as well. If Independent is selected, settings established on the Transmit screen will only affect Transmit mode.
Passthru Mode	Activates or deactivates pass-thru mode, allowing an incoming STS

	<p>signal to pass through the unit without altering the data in the signal. The following options are available: On and Off.</p>
Mapping	<p>Sets mapping to STS-12 or STS-48c.</p> <p>Note: This function is not available in systems that do not contain circuit packs (cards) lower than 2.5G (OC-48/STM-16).</p>
STS-12 Added	<p>Select 1 to 4, All, or None as the foreground channel.</p> <p>Note: This function is not available in systems that do not contain circuit packs lower than 2.5G.</p>
Background STS-12 Pattern	<p>Enter any 32 bit value for the background channel.</p> <p>Note: This function is not available in systems that do not contain circuit packs lower than 2.5G.</p>
Payload Pattern	<p>Select User-defined (32 bit value), PRBS 15, PRBS 15 INV, PRBS 23, PRBS 23 INV, PRBS 31, or PRBS 31 INV.</p>
Clock Reference	<p>Select Internal, Recovered, or Bits/Sets.</p>
Laser Type	<p>Select 1310 nm or 1550 nm laser type on the 2.5G circuit pack (OC-48/STM-16).</p>
Initial Laser Setting	<p>Controls whether the laser is on or off when the unit is turned on.</p> <ul style="list-style-type: none"> • Off. The unit's laser will be off when the unit is turned on. • On. The unit's laser will be on when the unit is turned on. • Restore Previous State. When the unit is turned on, the laser will be on or off based on its previous setting before the unit was turned off.
TC Overhead Processing	<p>Enables Tandem Connection Monitoring (TCM) transmit mode.</p>

	<ul style="list-style-type: none"> • Enable: For SDH, the unit uses its TCM circuitry and the N1 byte to generate errors and alarms between TCM equipment. For SONET, the unit uses the Z5 byte. • Disable: TCM mode is disabled, and the N1 and Z5 bytes follow normal operation.
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OC-48 Transmit Settings 2

The OC-48 Transmit Settings 2 screen contains the following functions.

Function	Description
Line Frequency Offset	<p>Adjusts the offset of the signal frequency of the transmitted SONET signal. The frequency can be adjusted in parts per million (PPM). The following options are available:</p> <p>Off = 0: The frequency cannot be adjusted.</p> <p>Edit: Adjusts the signal frequency in PPM. Use the + and - arrow keys to adjust the 00.0 decimal place. The frequency offset ranges from -100.0 to 100.0 in increments of 0.1. The default value is 00.0. After an offset value is entered, the Confirm button on the touch screen keypad must be selected for the new offset value to be accepted.</p>
SS Bits in H1 Label	Set to SONET (00) or SDH (10).
Path Signal Label	<p>Set the C2 byte to:</p> <ul style="list-style-type: none"> • Unequipped (00) • Equipped (01) • VT Structured STS (02) • Lock VT Mode (03)

	<ul style="list-style-type: none"> • Asyn Mapping for DS3 (04) • Asyn Mapping for DS4NA (12) • Mapping for ATM (13) • Mapping for DQDB (14) • HDLC Over SONET Mapping (16) • O.181 Test Signal Mapping (FE) • User Defined (any eight bit pattern 0 to FF. <p>Note: This option is coupled with the C2 byte option in the Transmit Overhead screen. If it is changed in this screen, it will change in the Overhead screen as well.</p>
Synchronization Status (S1)	<p>Sets the S1 byte to:</p> <ul style="list-style-type: none"> • Quality Unknown: Sets byte value to 00000000. • Rec. G.811: Sets byte value to 00000010. • Rec. G.812 Transmit: Sets byte value to 00000100. • Rec. G.812 Local: Sets byte value to 00001000. • Sync Equip Timing Src: Sets byte value to 00001011. • User Defined (any eight bit pattern 0 to FF.
Trigger In	<p>Determines how the protocol processor responds when an external pulse is received.</p>

OC-48 Receive

The Receive screen contains the following functions:

- OC-48 Receive Settings 1
- OC-48 Receive Settings 2
- OC-48 Receive Overhead
- OC-48 Receive Signal Status

OC-48 Receive APS

The unit can measure APS switching intervals in your network. The unit can be configured to monitor for a specific event that will cause an APS switch. When this event occurs, the duration in both seconds and frames is logged. These statistics can be used to determine how long it takes for your network equipment to react to an APS event and switch to a backup path.

Using the Receive APS functionality, you can set a specific event as a trigger for APS activity. The APS measurement has an accuracy of 0.5 milliseconds.

Receive APS functions include:

- **Protection Switch Criteria**
- **State:** Indicates the current condition when monitoring and measuring received APS activity.
- **Protection Switch Time (Frames):** Indicates the number of frames received during the APS switching event.
- **Protection Switch Time (Seconds):** Indicates the duration in seconds that it took for the APS switch event to occur.
- **Consecutive Good Time Required:** This function allows you to enter the duration (in milliseconds) of valid frames to occur before Protection Switching is confirmed to be activated. The range is 0.125 to 2047.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of valid frames to occur before Protection Switching is confirmed to be activated. The range is 1 to 16383 frames and is entered using a keypad.
- **Start Button:** Starts the Automatic Protection Switching mode. The unit will begin monitoring the incoming signal for this event. If it occurs, the protection switch state and time will appear in both seconds and frames present. The results will not include the number of good frames, but the number of frames that elapsed before the first good frame, meeting the entered criteria, occurred.

Consecutive Good Frames Required

This field indicates the number of valid frames to occur before Protection Switching is confirmed to be activated. The range is 1 to 16383 frames.

Consecutive Good Time Required

This function indicates the duration (in milliseconds) of valid frames to occur before Protection Switching is confirmed to be activated. The range is 0.125 to 2047.875 milliseconds.

Protection Switch Time (Frames)

Indicates the number of frames received during the APS switching event.

Protection Switch Time (Seconds)

Indicates the duration in seconds that it took for the APS switch event to occur.

State

Indicates the current condition when monitoring and measuring received APS activity.

OC-48 Receive Overhead


The OC-48 Receive Overhead screen contains the following functions.

Function	Options
STS-1	Selects a specific STS-1 slot within the OC-48 signal. The overhead bytes that appear on the OH screen are associated with this slot. There are 48 STS-1 slots available in an OC-48 signal.
STS-12 Dropped	Selects a specific STS-12 signal to monitor in the STS-48 signal.
Section OH	Displays the Section Overhead bytes for the selected STS-1 on the incoming OC-48 signal. This is a read-only function.
Line OH	Displays the Line Overhead bytes for the selected STS-1 on the incoming OC-48 signal. This is a read-only function.
Path OH	Displays the Path Overhead for the selected STS-1 on the incoming OC-48 signal. This is a read-only function.
J0 Trace	Displays the J0 trace received on the incoming OC-48 signal. This is a read-only function.
J1 Trace	Displays the J1 trace received on the incoming OC-48 signal. This is a read-only function.

TC Trace	Displays the Tandem Connection trace received on the incoming OC-48 signal. This is a read-only function.
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OC-48 Receive Settings 1

This function allows you to configure the unit's receive parameters for your OC-48 environment.

 Options marked with an asterisk (*) indicate that the function is coupled with the Transmit settings if Setting Control is set to "Coupled."

The OC-48 Receive Settings screen contains the following functions.

Function	Description
*Settings Control	If Coupled is selected, settings changed on the Receive screen will automatically change on the Transmit screen as well. If Independent is selected, settings established on the Receive screen will only affect Receive mode.
*Mapping	Configures the SONET transmit and receive mapping. This maps an STS-12 or STS-48c. Note: This function is not available in systems that do not contain circuit packs (cards) lower than 2.5G (OC-48/STM-16).
STS-12 Dropped	Selects a specific STS-12 signal to monitor in the STS-48 signal. Note: This function is not available in systems that do not contain circuit packs lower than 2.5G.
Payload Pattern	Selects the type of pattern that the unit expects to receive on the incoming SONET signal. The following options are available: Live (user data is received; no pattern is used), User Defined (range from 1 bit to 32 bits and is entered using a

	touch screen keypad), PRBS 2 ¹⁵ -1, PRBS 2 ¹⁵ -1 Inverted, PRBS 2 ²³ -1, PRBS 2 ²³ -1 Inverted, PRBS 2 ³¹ -1, and PRBS 2 ³¹ -1 Inverted.
Trigger Out	Allows the protocol processor to respond to an external "pulse" received. The following options can be selected: None, LOF, LOP, B1, B2, B3, BIT, Frame, RDI-L, RDI-P, REI-L, REI-P, or Ptr Increment, Ptr Decrement, New Ptr with NDF, or New Ptr without NDF.

OC-48 Receive Settings 2

This function allows you to configure the unit's receive parameters for your OC-48 environment.

The following options appear on the OC-48 Receive SET 2 screen.

Option	Description
PLM Alarm Reporting	<p>This function enables PLM-P alarm reporting. An STS Payload Label Mismatch (PLM-P) alarm occurs when the incoming Higher-Order Path Signal Label (C2 byte) does not match the expected Higher-Order Path Signal Label (C2 byte). The following options are available:</p> <ul style="list-style-type: none"> • Enabled: PLM-P alarms are recognized and reported. • Disabled: PLM-P alarms are ignored.
Expected Path Signal (C2) Label	<p>Configure to receive a specific value for the C2 byte. The following options are available:</p> <ul style="list-style-type: none"> • Unequipped (00): The expected C2 byte is 00000000. • Equipped (01): The expected

	<p>C2 byte is 00000001.</p> <ul style="list-style-type: none"> • VT Structured STS (02): The expected C2 byte is 00000010. • Lock VT Mode (03): The expected C2 byte is 00000011. • Asyn Mapping for DS3 (04): The expected C2 byte is 00000100. • Asyn Mapping for DS4NA (12): The expected C2 byte is 00010010. • Mapping for ATM (13): The expected C2 byte is 00010011. • Mapping for DQDB (14): The expected C2 byte is 00010100. • HDLC Over SONET Mapping (16): The expected C2 byte is 00010110. • O.181 Test Signal Mapping (FE): The expected C2 byte is 11111110. • User Defined: Allows an 8-bit Path Signal Label, from 00h to FFh, to be entered for the C2 byte value.
<p>TIM Alarm Reporting</p>	<p>An STS Path Trace Identifier Mismatch (TIM-P) alarm occurs when the incoming J1 trace does not match the expected J1 trace. A Section Trace Identifier Mismatch (TIM-S) alarm occurs when the incoming J0 trace does not match the expected J0 trace. The following options are available:</p> <ul style="list-style-type: none"> • Enabled: TIM alarms are recognized and reported. • Disabled: TIM alarms are ignored.
<p>Expected J0</p>	<p>Defines the expected J0 trace</p>

	<p>received on the incoming SONET signal. The following options are available:</p> <ul style="list-style-type: none"> • Default (64 byte): Selects the Digital Lightwave ASCII message as the expected J0 trace pattern. The message consists of 62 characters appended with a CR and LF. • User Defined (64 byte): Selects a user-defined ASCII message as the expected J0 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 64 characters in length (62 characters plus CR and LF). • All Ones: Selects an All Ones pattern as the expected J0 trace pattern. • All Zeros: Selects an All Zeros pattern as the expected J0 trace pattern. • Default (16 byte): Selects the Digital Lightwave ASCII message as the expected J0 trace pattern. The message consists of 16 characters. • User Defined (16 byte): Selects a user-defined ASCII message as the expected J0 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 16 characters in length.
<p>Expected J1</p>	<p>Defines the expected J1 trace received on the incoming SONET signal. The following options are available:</p> <p>Defines the expected J1 trace received on the incoming SONET</p>

	<p>signal. The following options are available:</p> <ul style="list-style-type: none"> • Default (64 byte): Selects the Digital Lightwave ASCII message as the expected J1 trace pattern. The message consists of 62 characters appended with a CR and LF. • User Defined (64 byte): Selects a user-defined ASCII message as the expected J1 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 64 characters in length (62 characters plus CR and LF). • All Ones: Selects an All Ones pattern as the expected J1 trace pattern. • All Zeros: Selects an All Zeros pattern as the expected J1 trace pattern. • Default (16 byte): Selects the Digital Lightwave ASCII message as the expected J1 trace pattern. The message consists of 16 characters. • User Defined (16 byte): Selects a user-defined ASCII message as the expected J1 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 16 characters in length.
<p>SS Bits Alarm Reporting</p>	<p>Disables or enables SS bits reporting. This function is used in conjunction with the Expected SS Bits function. If enabled, and an SS Bits mismatch is detected on the received signal, the duration in seconds will appear under the Results Scan function.</p>
<p>Expected SS Bits</p>	<p>Selects one of the following as the</p>

	<p>expected SS Bits value:</p> <ul style="list-style-type: none"> • 00 (SONET) • 01 (Undefined) • 10 (SDH) • 11 (Undefined)
<p>TC Error/Alarm Processing</p>	<p>Enables or disables Tandem Connection Monitoring (TCM) mode. This function is used in conjunction with the Expected TC Trace function.</p> <p>The TC Summary LED turns red if a TCM error or alarm is reported.</p> <ul style="list-style-type: none"> • Enable: Turns on TCM error and alarm reporting mode. • Disable: Turns off TCM error and alarm reporting mode. (Note: Disable this option if you are not performing TCM testing. This will prevent false error and alarm reporting.)
<p>Expected TC Trace</p>	<p>Defines the expected TC trace received on the incoming signal. For SONET, this is in the Z5 byte. For SDH, this is in the N1 byte. The following options are available:</p> <ul style="list-style-type: none"> • Default: Selects the 16-byte Digital Lightwave ASCII message at the expected TC trace pattern. • User Defined: Selects a 16-byte user-defined ASCII message as the expected TC trace pattern. The message is entered and saved using a screen keypad.

OC-48 Receive Signal Status

Displays the following measurements of the incoming SONET signal:

- Received optical power in dBm
- Line Frequency in MHz for OC-48
- Frequency offset received in KHz and ppm
- Update Signal Calibration allows you to update the following calibrations:
 - Zero power reading
 - -20 dBm power reading
 - -10 dBm power reading

Select the **Save** button to update the signal calibration.

Related Topics:

Calibrate Optical Power

Line Frequency Offset

OC-48 Results

All monitored activity that the system receives is eventually reported to the Results screen. This screen provides several layers of granularity for analyzing the incoming signal, pattern, errors, and alarms.

The OC-48 Results screen contains the following functions:

- Scan
- Errors
- Alarms
- PTR
- Event Log
- APS
- Large LEDs
- Graphs

APS Results

The APS results monitor incoming APS activity. It logs and displays the K1 and K2 byte sequences received by the unit. A maximum of 15 byte sequences can appear on the touch screen.

The following information appears in the APS report for the last 15 K1 and K2 byte sequences received:

- The HEX value of the K1 byte.
- The HEX value of the K2 byte.

- The number of frames received that contain the K1 and K2 bytes.
- The elapsed time of the frames that contain the K1 and K2 bytes.



Per GR-253-CORE, only the upper 12 bits of the K1/K2 bytes (K1 bits 1-8 and the K2 bits 1-4) are used for APS operation. K2 bit 5 sets the APS mode type (1+1, 1:n) and cannot be changed during operation. K2 bits 6-8 are for alarms. Any changes to the lower four bits of the K2 byte do not affect APS operation. The Results APS table only starts and displays a new entry item if the upper 12 K1/K2 bits stabilize on a new value for a minimum of three consecutive frames.

Alarms

The unit can monitor and report alarms and their duration on the incoming SONET signal. The **Alarms** function lists the duration of the alarm in seconds.

The following alarms can be monitored:

- Clock Sync
- LOS (Loss of Signal)
- LOF (Loss of Frame)
- SEF (Severely Errored Frame)
- TIM-S (Section Trace Identifier Mismatch for the J0 byte)
- AIS-L (Line Alarm Indication Signal)
- RDI-L (Line Remote Defect Indicator)
- APS (Automatic Protection Switching)
- AIS-P (Path Alarm Indication Signal)
- LOP-P (Path Loss of Pointer)
- UNEQ-P (Unequipped STS Payload)
- RDI-P (Path Remote Defect Indicator)
- TIM-P (STS Path Trace Identifier Mismatch for the J1 byte)
- PLM-P (STS Payload Label Mismatch)
- Pattern Sync
- TC-RDI (Tandem Connection-Remote Defect Indicator)
- TC-ODI (Tandem Connection-Outgoing Defect Indicator)
- TC-AIS (Tandem Connection-Alarm Indication Signal)
- TC-UNEQ (Tandem Connection-Unequipped Signal)
- TC-TIM (Tandem Connection-Trace Identifier Mismatch)
- TC-LOF (Tandem Connection-Loss of Frame)

Errors

The unit can monitor and report errors on the incoming SONET signal. The **Errors** function provides a detailed analysis of the incoming error as described below.

The errors reported are a result of:

- Incoming errors that are generated by the SONET network, or
- Errors being intentionally generated by the system when it is used in a loopback environment

The following errors can be monitored:

- B1 (Section BIP-8, also known as a Section Coding Violation - CV-S)
- B2 (Line BIP-8, also known as a Line Coding Violation - CV-L)
- B3 (Path BIP-8, also known as an STS Path Coding Violation - CV-P)
- REI-L (Line Remote Error Indicator; also known as a Line Far End Block Error - FEBE-L)
- REI-P (Path Remote Error Indicator; also known as a Path Far End Block Error - FEBE-P)
- BIT (BIT errors reported in the payload)
- NDF-P (Path New Data Flag counts)
- TC-IEC (Tandem Connection-Incoming Error Count)
- TC-REI (Tandem Connection-Remote Error Indicator)
- TC-OEI (Tandem Connection-Outgoing Error Indicator)

The following parameters are measured for these incoming errors:

- Error count using an 11-digit format
- Average error rate using an N.NNe-N format
- Current error rate using an N.NNe-N format
- Error-free seconds using an 8-digit format
- Errored seconds
- Severely Errored seconds
- Unavailable errored seconds

Event Log

The Event Log provides a detailed summary of alarm, error, Pointer events, and APS activity that have occurred and have been recorded by the unit.

The events appear in a table that lists events, the number of events logged, the start and stop time of the event, and the duration of the event.

Graphs

This function allows incoming errors and alarms to be graphed. The graphs can be saved, recalled, and printed from a history file.

For more information about graphs, select *Use Graphs* in the Common Tasks section of the online help.

Large LEDs Overview

This function displays the SONET LEDs in a large, easy-to-read format that covers the entire touch screen area. This is useful for viewing any errors or alarms from a long distance, such as across the room from a test bay.

This function also allows:

- On/Off control of the unit's laser
- Single error insertion into the transmit SONET signal

Related Topics:

LED Definitions

PTR

This function monitors and reports received STS Pointer statistics. A count of the following Pointer statistics appear:

- Pointer Justification (STS Path Positive Pointer Justification count)
- Negative Justification (STS Path Negative Pointer Justification count)
- Positive Justification Seconds. Indicates the duration of a Pointer adjustment.
- NDF Count. Indicates the STS Path New Data Flag count.
- Receive Pointer Value (in decimal). Valid Pointers range from 0 to 782.

Scan

This function displays a list of received errors and alarms. For **alarms**, the duration is reported as a count in seconds. For **errors**, an error count is reported.

The message **No Errors or Alarms** appears if no events are received by the system.

This function provides a quick summary of incoming errors and alarms. It is effective in identifying a general area to investigate when error or alarm activity is detected.

OC-48 Test

The Test screen configures test parameters associated with a protocol processor.

The Test screen contains the following functions:

- SET 1
- APS
- RTD

Action After Duration

This function defines what activities occur at the conclusion of a timed test. To determine how long a test will run, refer to the Duration function section. The following options are available.

Options	Description
None	No action occurs at the end of the test duration.
Print Current Statistics	Test results are printed to the attached printer at the end of a timed test. The timed test is not repeated.
Record Current Statistics	Test results are printed to a file at the end of a timed test. Test results appear in a columned report format.
Record Current Statistics Using a Delimiter	Test results are printed to a file at the end of a timed test. Test results appear in a quote/comma-report format, meaning that error and/or alarm values are enclosed in quotes (") and separated by commas (,).
Print Statistics and Repeat Test	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, test statistics (which are results for the Scan, Errors, Alarms, and PTR functions) are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function.</p>
Record Statistics and Repeat Test	<p>Note: This option appears when Repeat Actions is selected.</p>

	<p>Test statistics are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmss.stat where,</p> <p>xx indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4).</p> <p>hmmss indicates the current time in hours, minutes, and seconds.</p> <p>stat indicates the Statistics file extension.</p>
<p>Print Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, test events (which are a detailed summary of alarms, errors, and Pointer activity) are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function</p>
<p>Record Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmss.stat.</p>
<p>Print Statistics/Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and</p>

Screen and Function Descriptions

	<p>the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function</p>
Record Statistics/Events and Repeat Test	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics and events are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmssE.stat (E indicates the file contains both statistics and events).</p>
Print Events and Repeat Test	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Record Events and Repeat Test	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Print and Record Events and Repeat Test	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to both the attached printer and a report file. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units</p>

	when Realtime Actions is selected.
Print Events	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Record Events	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Print and Record Events	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to both the attached printer and a report file.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>

Duration

This function configures how long a timed test runs. The following options are available:

Options	Description
Continuous	Test is untimed, and unit is always collecting data.
5 Minutes	Test runs for 5 minutes.
15 Minutes	Test runs for 15 minutes.
1 Hour	Test runs for 1 hour.
2 Hours	Test runs for 2 hours.

24 Hours	Test runs for 24 hours.
72 Hours	Test runs for 72 hours.
1 Week	Test runs for 1 week.
2 Weeks	Test runs for 2 weeks.
User Defined	Allows a specific test duration to be entered using a touch screen keypad. The minimum duration is 1 minute. The maximum duration is 99 days, 23 hours, and 59 minutes.

Protection Switch Criteria

This is an **APS (RX)** function that is used to measure APS activity.

The **Protection Switch Criteria** function determines the type of alarm, error, or pattern event that is used as a trigger to generate APS activity in your network. The unit monitors the incoming signal for the specified event. If it occurs, its duration in both seconds and frames is measured and logged. The APS measurement has an accuracy of 0.5 milliseconds.

The following options are available:

Options	Description
B1	An APS is generated if a B1 error is received. The duration in seconds and frames is measured and logged.
SEF	An APS is generated if a Severely Errored Frame is received. The duration in seconds and frames is measured and logged.
AIS-L	An APS is generated if a Line AIS alarm is received. The duration in seconds and frames is measured and logged.
AIS-P	An APS is generated if a Path AIS alarm is received. The duration in seconds and frames is measured and logged.
PRBS	An APS is generated if a PRBS pattern

	is received with errors. The duration in seconds and frames is measured and logged.
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APS (Automatic Protection Switch)

The unit can measure APS switching intervals in your network. The unit can be configured to monitor for a specific event that will cause an APS switch. When this event occurs, the duration in both seconds and frames is logged. These statistics can be used to determine how long it takes for your network equipment to react to an APS event and switch to a backup path.

Using the Test APS functionality, you can set a specific event as a trigger for APS activity. The APS measurement has an accuracy of 0.5 milliseconds.

Test APS functions include:

- **Protection Switch Criteria**
- **State:** Starts and stops Automatic Protection Switching mode. The unit will begin monitoring the incoming signal for a single or continuous APS event. If an APS event occurs, the protection switch time will appear in both seconds and frames present. The results will not include the number of good frames, but the number of frames that elapsed before the first good frame, meeting the entered criteria, occurred.

Single APS - Monitors for a single APS event. Seconds and frames are reported and the State returns to Inactive.

Continuous APS - Constantly monitors for APS events, and updates the seconds and frames reported.

Stop APS - Stops APS monitoring. The State returns to Inactive.

- **Protection Switch Time (Frames):** Indicates the number of frames received during the APS switching event.
- **Protection Switch Time (Seconds):** Indicates the duration in seconds that it took for the APS switch event to occur.
- **Consecutive Good Time Required:** This function allows you to enter the duration (in milliseconds) of valid frames to occur before Protection Switching is confirmed to be activated. The range is 0.125 to 2047.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of valid frames to occur before Protection Switching is confirmed to be activated. The range is 1 to 16383 frames and is entered using a keypad.

For more information about monitoring APS activity, select *Measuring SDH and SONET APS Activity* in the Common Tasks section of the online help.

RTD (Round-Trip Delay)

The round-trip delay function allows you to transmit a known frame into your network and measure how long it takes for the frame to return to the unit.

Test RTD functions include:

- **State:** Starts and stops round-trip delay mode.

Single Round-Trip Delay - If selected, an AIS alarm is inserted into a frame and transmitted once through your network. The frame's transmission through the network is measured in frame counts and milliseconds. Frame counts indicates the number of frames received before the AIS frame is received by the unit. Milliseconds indicates how long it took for the AIS frame to travel out and return to the unit.

Continuous Round-Trip Delay - If selected, an AIS alarm is inserted into a frame and continuously transmitted through your network. The current frame count and duration appear in the **Current** column. The fastest round trip appears in the **Minimum** column and the slowest round trip appears in the **Maximum** column.

Stop Round-Trip Delay - Stops round-trip delay activity. The State returns to Inactive.

- **Round-trip Delay Time (Frames):** Indicates the number of frames received during the measurement.
- **Round-trip Delay Time (Seconds):** Indicates the duration in seconds that it took for the known frame to return to the unit.
- **Consecutive Good Time Required:** This function allows you to enter the duration (in milliseconds) of valid frames to occur before the round-trip delay function is confirmed to be activated. It is used to fine-tune the measurement. The range is 0.125 to 2047.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of valid frames to occur before the round-trip delay function is confirmed to be activated. It is used to fine-tune the measurement. The range is 1 to 16383 frames and is entered using a keypad.

For more information about round-trip delay, select *Round-Trip Delay* in the Common Tasks section of the online help.

SET 1

The SET 1 functions determine how long a protocol processor's test runs and what activities occur at the end of the test.

The following appears on the SET 1 screen.

- **Duration**
- **Action After Duration**
- **Pause Test/Resume Test:** This button switches between pausing an active test and continuing an active test. The button's label indicates the action that will happen when it is selected.

For more information about tests, select *Start a Test* in the Common Tasks section of the online help.

OC-48 Performance Monitoring

Performance Monitoring provides greater detail about incoming Section, Line, and Path errors.

- Section Analysis
- Line Analysis
- Path Analysis

Line Analysis

This function displays a detailed breakdown of incoming B2 (Line BIP-8, also known as Coding Violations) and Line Remote Error Indicator (REI-L) errors.

The following statistics are reported:

Near End Coding Violations (CV-L)	This is an error count of incoming B2 errors.
Near End Errored Seconds (ES-L)	This reports the duration of the incoming B2 errors (in seconds). This statistic also reports the percentage of errored seconds compared to the duration of error-free seconds.
Near End Severely Errored Seconds (SES-L)	This reports the duration of Severely Errored Seconds (SES) on the incoming SONET signal. An SES is reported when 9835 or more B2 errors occur in one second, or when a Severely Errored Frame (SEF) alarm, Loss of Frame (LOF) alarm, Loss of Signal (LOS) alarm, or Line Alarm Indication Signal (AIS-L) alarm occurs.

Near End Unavailable Seconds (UAS-L)	This reports the number of seconds that the Line layer was considered unavailable. A Line is unavailable when 10 consecutive seconds that qualify as SES-L seconds occur.
Far End Coding Violations (CV-LFE or REI-L)	This is an error count of the number of B2 errors detected by the far-end Line Terminating Equipment (LTE). These errors are reported back to the unit using the M1 byte of the Line overhead. The M1 byte is also known as the Line Remote Error Indicator - REI-L . (A CV-LFE was formerly known as a Line FEBE.)
Far End Errored Seconds (ES-LFE)	This is a counter that indicates the number of seconds that an REI-L alarm is reported.
Far End Severely Errored Seconds (SES-LFE)	This reports the duration when 9835 or more REI-L errors are present at the far-end LTE, or when a Line Remote Defect Indicator (RDI-L) alarm is present.
Far End Unavailable Seconds (UAS-LFE)	This is a counter that indicates the number of seconds that an SES-LFE error was present at the far-end LTE. At least 10 consecutive errored seconds of SES-LFE errors must be present before a UAS-LFE is declared.

Path Analysis

This function displays a detailed breakdown of incoming B3 (Path BIP-8, also known as Path Coding Violations) and STS Path Remote Error Indicator (REI-P) errors.

The following statistics are reported:

Near End Coding Violations (CV-P)	This is an error count of incoming B3 errors.
Near End Errored Seconds (ES-P)	This reports the duration of the incoming B3 errors (in seconds). This statistic also reports the percentage of errored seconds compared to the duration of error-free seconds.
Near End Severely Errored Seconds	This reports the duration of Severely

(SES-P)

Errored Seconds (SES) on the incoming SONET signal. An SES is reported when 2400 or more B3 errors occur in one second, or when an AIS-P alarm, UNEQ-P alarm, LOS alarm, LOF alarm, AIS-L alarm, or LOP-P alarm occurs.

Near End Unavailable Seconds (UAS-P)

This reports the number of seconds that the STS Path layer was considered unavailable. A Path is unavailable when 10 consecutive seconds that qualify as SES-P seconds occur.

Far End Coding Violations (CV-PFE or REI-P)

This is an error count of the number of B3 errors detected by the far-end STS Path Terminating Equipment (PTE). These errors are reported back to the unit using the G1 byte of the STS Path overhead. The **G1** byte is also known as the STS Path Remote Error Indicator - **REI-P**. (A CV-PFE was formerly known as an STS Path FEBE.)

Far End Errored Seconds (ES-PFE)

This is a counter that indicates the number of seconds that an **REI-P** alarm is reported.

Far End Severely Errored Seconds (SES-PFE)

This reports the duration when 2400 or more REI-P errors are present at the far-end LTE, or when a Line Remote Defect Indicator (**RDI-P**) alarm is present.

Far End Unavailable Seconds (UAS-PFE)

This is a counter that indicates the number of seconds that an **SES-PFE** error was present at the far-end LTE. At least 10 consecutive errored seconds of SES-PFE errors must be present before a UAS-PFE is declared.

Section Analysis

This function displays a detailed breakdown of incoming B1 errors (Section BIP-8, also known as Coding Violations).

The following statistics are reported:

Near End Coding Violations	This is an error count of incoming B1
-----------------------------------	---------------------------------------

	errors.
Near End Errored Seconds	This reports the duration of the incoming B1 errors in seconds. This statistic also reports the percentage of errored seconds compared to the duration of error-free seconds.
Near End Severely Errored Seconds	This reports the duration of Severely Errored Seconds (SES) on the incoming SONET signal. An SES is reported when 8554 or more B1 errors occur in one second, or when a Severely Errored Frame (SEF) alarm, Loss of Frame (LOF) alarm, or Loss of Signal (LOS) alarm occurs.

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STM-64 Overview

This section of the online help system has topics that discuss:

- STM-64 Specific Tasks
- STM-64 Screen and Function Descriptions

You may also navigate through the topics by using the **Contents** tab and window that appear on the left side of the screen.

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STM-64 Specific Tasks

STM-64 Specific Tasks

This section includes tasks that are specific to STM-64 protocol processor. For a list of general tasks, which apply to all protocol processor modes, see Common Tasks located in the Getting Started section.

Calibrate Optical Power (SDH)

The following procedures describe the system's optical power calibration. While performing this task, you will measure, record, and enter the Zero optical power input and the optical power readings for -20 dBm and -10 dBm.

Before You Begin

- Read these procedures before trying to calibrate the system.

 **WARNING: Power the unit off before removing the optical connector dust caps to clean the unit's fiber optic ports.**

- Before performing optical power calibration, use a fiber-optics cleaning kit to clean the fiber-optic ports on the unit, the optical power meter, the optical attenuator, and the fiber cables. Dirty optical fibers will affect optical measurements.
- The following equipment is required for optical calibration:
 - Two three-foot singlemode, fiber-optic cables
 - Variable optical attenuator
 - Optical power meter
 - Fiber-optics cleaning kit
 - Pencil and paper to record optical power measurements

Restoring Raw Power Readings

The following restores the unit's raw (unconverted) power readings.

1. Make sure that the dust caps are on the unit's TX and RX optical ports.
2. Turn the unit on.
3. From the **STM-64** tab, select the **Receive** button.
4. Select the **Signal Status** button, and then **Update Signal Calibration**.
5. Select **Zero power reading**. A touch screen keypad appears. Enter 0 and select **OK**.
6. Select the **Save** button to restore the raw (unconverted) power reading.

Obtaining Zero Optical Power Input

1. Make sure that the dust caps are on the unit's TX and RX optical ports, and that the unit is turned on.
2. Make sure that the unit's laser is off.
3. From the **STM-64** tab, select the **Receive** button.
4. Select the **Signal Status** button. Record the **Optical Power** reading. This value is the **Zero power reading**.

Obtaining -20 dBm Power Reading

1. With the unit turned on, connect a fiber-optic cable from the unit's **10 Gbps TX** optical port to the optical attenuator's input connector.
2. Attach a fiber-optic cable from the attenuator's output port to the optical power meter.
3. Turn the unit's laser on.
4. Adjust the attenuator so that the optical power meter reads -20 dBm.
5. Disconnect the fiber-optic cable from the optical power meter, and attach it to the unit's **10 Gbps RX** optical port.
6. From the **STM-64** tab on the unit, select the **RX** button.
7. Select the **Signal Status** button. Record the **Optical Power** reading. This value is the **-20 dBm power reading**.

Obtaining -10 dBm Power Reading

1. Disconnect the fiber-optic cable from the unit's **10 Gbps RX** optical port and attach it to the optical power meter. (You have a direct fiber-optic cable connection from the optical attenuator to the optical power meter.)
2. Adjust the attenuator so that the power meter reads -10 dBm.
3. Disconnect the fiber-optic cable from the optical power meter, and attach it to the unit's **10 Gbps RX** optical port.
4. From the **STM-64** tab on the unit, select the **Receive** button.
5. Select the **Signal Status** button. Record the **Optical Power** reading. This value is the **-10 dBm power reading**.

Entering Optical Power Readings

1. From the **STM-64** tab on the unit, select the **Receive** button.
2. Select the **Signal Status** button and then **Update Signal Calibration**.
3. Select **Zero power reading**. A touch screen keypad appears. Enter the value recorded earlier for the Zero Power Reading and select **OK**.
4. Select **-20 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -20 dBm Power Reading and select **OK**.
5. Select **-10 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -10 dBm Power Reading and select **OK**.
6. Select **Save** to save the new calibration values. This completes the optical calibration procedure.

Screen and Function Descriptions

STM-64 Screen and Function Descriptions Overview

This section of the online help system describes the various functions, buttons, and tabs that control STM-64 configuration and operation.

- STM-64 LEDs
- STM-64 Transmit
- STM-64 Receive
- STM-64 Results
- STM-64 Test
- STM-64 Performance Monitoring

STM-64 LEDs

This section defines the SDH LEDs that appear on the touch screen's **LED area** and when the **Large LEDs** tab is selected.

LED	Definition
APS	Automated Protection Switching. Indicates that the K1 and K2 bytes on the incoming STM signal have changed. This is an alarm LED.
AU-AIS	Administrative Unit - Alarm Indication Signal. Indicates an all-ones characteristic or adapted information signal was detected on the AU. It is generated to replace the normal traffic signal when it contains a defect condition in order to prevent consequential downstream failures being declared or alarms being raised. This is an alarm LED.
AU-LOP	Administrative Unit - Loss of Pointer. Indicates that a consecutive number of invalid pointers or NDFs were received on the AU. This is an alarm LED.
B1 ERR	Regenerator Section BIP-8 Code Violation. Indicates parity errors occurred on one of the eight parity checks when evaluated by byte 1 of the SDH frame. This is an error LED.
B2 ERR	Multiplex Section BIP-8 Code Violation.

	Indicates that parity errors occurred on any of the parity checks when evaluated by the B2 byte of the SDH frame. This is an error LED.
B3 ERR	Higher-Order Path BIP-8 Code Violation. This is a parity code (even) used to determine if a transmission error has occurred over a path. Its value is calculated over all the bits of the previous virtual container before scrambling and placed in the B3 byte of the current frame. This is an error LED.
BIT ERR	BIT Error. Indicates a bit error was detected in the payload. This is an error LED.
CLK	Clock. Displays the type of transmit clock specified in the setting. Clock settings include: SETS, Bits, Internal, or RCVD. This is an alarm LED.
HP OK	Higher-Order Path OK. This is a status LED.
HP-RDI	Higher-Order Path - Remote Defect Indicator. Indicates a signal was returned to the transmitting HP Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect. This is an alarm LED.
HP-REI	Higher-Order Path - Remote Error Indication. Indicates to the transmitting node that an errored block has been detected at the HP receiving node. This is an error LED.
HP-UNEQ	Higher-Order Path - Unequipped. Indicates that an all-zeros patterns was detected in the C2 byte. This byte is received from the HP terminating equipment. This is an alarm LED.
LOF	Loss of Frame. Indicates that a frame alignment problem with the incoming signal has been detected. An LOF is reported if an Out of Frame (OOF) defect continues for three milliseconds or longer. This is an alarm LED.

Screen and Function Descriptions

LOS	Loss of Signal. Indicates that a valid STM-4 signal is not being received. If an all-zeros pattern exists for 100 milliseconds or longer on the incoming STM signal, then an LOS is reported. This is an alarm LED.
MS-AIS	Multiplex Section - Alarm Indication Signal. Indicates an all-ones characteristic or adapted information signal was detected on the MS. It is generated to replace the normal traffic signal when it contains a defect condition in order to prevent consequential downstream failures being declared or alarms being raised. This is an alarm LED.
MS OK	Multiplex Section Overhead OK. This is a status LED.
MS-RDI	Multiplex Section - Remote Defect Indicator. Indicates a signal returned to the transmitting MS Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect. This is an alarm LED.
MS-REI	Multiplex Section - Remote Error Indication. An indication returned to a transmitting node that an errored block has been detected at the MS receiving node. This is an error LED.
OOF	Out of Frame. Indicates that four consecutive frames have been received with invalid or errored framing patterns. This is an alarm LED.
PAT SYNC	Indicates a loss of pattern synchronization. This is an alarm LED.
PTR-ADJ	Administrative Unit - Pointer Adjustment. Indicates that there was pointer movement occurring on the AU. This LED flashes red during a Pointer Adjustment event. It is an event LED.
RS OK	Regenerator Section Overhead OK. This is a status LED.

RX	Displays the received optical power in dBm. For STM-64, the optimum input range is from -2 dBm to -14 dBm. A value of -25 dBm or below indicates no signal. This is a status LED.
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STM-64 Transmit

The Transmit screen contains the following functions:

- STM-64 Transmit Settings 1
- STM-64 Transmit Settings 2
- STM-64 Transmit Overhead
- STM-64 Transmit Pointer Generation
- STM-64 Transmit APS
- STM-64 Transmit Error Alarm

STM-64 Transmit APS

The STM-64 Transmit APS functions are used to configure APS transmit activity.

The following APS Transmit functions are available:

- Linear Mode
- Ring Mode
- Duration in Frames

APS is a feature that allows the LTE to switch to a backup line in case of errors or failures on the main line. APS commands can be configured for either Linear- or Ring-based networks and are transmitted using bytes K1 and K2 of the Line overhead.

You can test the network's APS response by generating a condition that is likely to cause APS switching. You also have the capability to generate specific APS messages and monitor the response.

Linear Mode

This function configures the system to transmit APS functions for a Linear (span) network.

- K1 Full Byte (Linear Mode)
- K1 Bits 1-4 (Linear Mode)
- K1 Bits 5-8 (Linear Mode)
- K2 Full Byte (Linear Mode)
- K2 Bits 1-4 (Linear Mode)

- K2 Bit 5 (Provisioned) (Linear Mode)
- K2 Bits 6-8 (Linear Mode)

Ring Mode

- K1 Full Byte (Ring Mode)
- K1 Bits 1-4 (Ring Mode)
- K1 Bits 5-8 (Ring Mode)
- K2 Full Byte (Ring Mode)
- K2 Bits 1-4 (Ring Mode)
- K2 Bit 5 (Provisioned) (Ring Mode)
- K2 Bits 6-8 (Ring Mode)

Duration in Frames

This function determines the number of frames transmitted that contain specific K1 and K2 bytes. These bytes are configured using the functionality located on the transmit APS screen.

Frame count is entered using a keypad. Values ranging from **1 to 65535** frames can be entered.

STM-64 Transmit Error Alarm

The unit can transmit errors and alarms to simulate various defects and anomalies. One reason for transmitting these defects is to determine if the receiving equipment can detect an error or alarm in the incoming signal.

- Error to Insert
- Error Insert Rate
- Alarm Generated

STM-64 Transmit Overhead

The STM-64 Transmit Overhead screen contains the following functions.

Functions	Description
SOH Slot	Selects a specific Overhead slot within the STM-64 signal. The overhead bytes that appear on the OH screen are associated with this slot. There are 192 SOH slots available in an STM-64 signal.

AU-4-16c Added	Select 1 to 4, All, or None as the foreground channel.
RSOH	Select and edit the following Overhead bytes: A1, A2, Z0, B1, E1, F1, D1, D2, and D3.
MSOH	Select and edit the following Overhead bytes: H1, H2, H3, B2, K1, K2, D4-D12, Z1, Z2, and E2.
HPOH	Select and edit the following Overhead bytes: B3, J1, C2, G1, F2, H4, Z3, Z4, and Z5.
J0 Trace	Selects a default or customized pattern to be used as the J0 trace.
J1 Trace	Selects a default or customized pattern to be used as the J1 trace.
TC Trace	Selects a default or customized pattern to be used as the Tandem Connection Monitoring trace.

STM-64 Transmit Pointer Generation

The STM-64 Transmit Pointer screen contains the following functions.

Functions	Description
Pointer Action	Determines the type of Pointer activity that occurs when the Inc Pointer and Dec Pointer buttons are selected.
NDF on New Pointer	Specifies whether the New Data Flag bits are set when a new Pointer is present in the generated signal.
Pointer Value	Allows a new Pointer value to be entered. A valid Pointer value is a binary number ranging from 0 to 782.
Burst Count	Determines the number of Pointer location movements that occur when the Inc Pointer or Dec Pointer buttons are pressed. The Pointer burst count ranges from 1 to 8.

AU Frequency Offset	Adjusts the rate at which Pointer adjustments are needed in the Administrative Unit (the payload).
Increment/Decrement Pointer	Alternates the Pointer insertion from increment to decrement with a 200-msec delay in between.

Related Topics:

For information about making Pointer adjustments, select *Make Pointer Adjustments* in the Common Tasks section of the online help.

STM-64 Transmit Settings 1

The STM-64 Transmit Settings 1 screen configures the unit's transmit parameters. It contains the following functions.

Functions	Description
Settings Control	If Coupled is selected, settings changed on the Transmit screen will automatically change on the Receive screen as well. If Independent is selected, settings established on the Transmit screen will only affect Transmit mode.
Passthru Mode	Activates or deactivates pass-thru mode, allowing an incoming STM signal to pass through the unit without altering the data in the signal. The following options are available: On and Off .
Mapping	Defines the type of signals that are combined to create an STM-64 signal. For example, four C-4-16s can be mapped into an STM-64 signal. If the unit is not licensed for 10 Gbps mapping, the following options appear and are described below: C-4-64c Bulk , C-4-16 A/D , C-4-16 A/D LI , and C-4-64c POS .

	<p>If the unit is licensed for 10 Gbps mapping, it can perform the following mappings using only the 10 Gbps circuit pack (STM-64 protocol processor): C-4-64c Bulk, C-4-16c Bulk, C-4-4c Bulk, C-4 Bulk, C-3 Bulk, and C-4-64c POS.</p> <ul style="list-style-type: none">• C-4-64c Bulk. Maps a concatenated C-4-64c signal into an STM-64.• C-4-16 A/D. Maps four C-4-16s into an STM-64. The C-4-16s are generated internally from the STM-16 protocol processor. (Note: This option appears if a separate 2.5G circuit pack (an STM-16 protocol processor) is installed in the unit.)• C-4-16 A/D LI. Maps four C-4-16s into an STM-64. The C-4-16s are derived externally and enter the unit using the line interface connectors. (Note: This option appears if a separate 2.5G circuit pack (an STM-16 protocol processor) is installed in the unit.)• C-4-16c Bulk. Maps a concatenated C-4-16c signal into an STM-64. Four C-4-16s make up an STM-64. (Note: This option only appears if the unit is licensed for 10 Gbps mapping.)• C-4-4c Bulk. Maps a concatenated C-4-4c signal into an STM-64. Sixteen C-4-4s make up an STM-64. (Note: This option only appears if the unit is licensed for 10 Gbps mapping.)• C-4 Bulk. Maps a concatenated C-4 signal into an STM-64. Sixty-four C-4s
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	<p>make up an STM-64. (Note: This option only appears if the unit is licensed for 10 Gbps mapping.)</p> <ul style="list-style-type: none"> • C-3 Bulk. Maps 192 C-3s into an STM-64 signal. (Note: This option only appears if the unit is licensed for 10 Gbps mapping.) • C-4-64c POS. Configures the unit for Packet Over SONET/SDH operation.
<p>AU-4-16 Added</p> <p>Note: AU-4-16 Added only appears when Mapping is set to C-4-16c Bulk.</p>	<p>Selects a specific AU-4-16 signal as the foreground (or source) channel in the STM-64 signal. The source channel can be used to transmit alarms, errors, or patterns. The unit multiplexes four AU-4-16 signals into a single STM-64 signal.</p> <ul style="list-style-type: none"> • 1 - 4. Selects a specific AU-4-16 (AU-4-16 #1 through AU-4-16 #4) as the foreground channel. • ALL. Transmit the foreground channel across all four AU-4-16 channels. • None. No foreground channel is selected.
<p>AU-4-4 Added</p> <p>Note: AU-4-4Added only appears when Mapping is set to C-4-4c Bulk.</p>	<p>Selects a specific AU-4-4 signal as the foreground (or source) channel in the STM-64 signal. The source channel can be used to transmit alarms, errors, or patterns. The unit multiplexes four AU-4-4 signals into a single STM-64 signal.</p> <ul style="list-style-type: none"> • 1 - 16. Selects a specific AU-4-4 (AU-4-4 #1 through AU-4-4 #16) as the foreground channel. • ALL. Transmit the foreground channel across all 16AU-4-4 channels.

	<ul style="list-style-type: none"> • None. No foreground channel is selected.
<p>AU-4 Added</p> <p>Note: AU-4 Added only appears when Mapping is set to C-4 Bulk.</p>	<p>Selects a specific AU-4-16 signal as the foreground (or source) channel in the STM-64 signal. The source channel can be used to transmit alarms, errors, or patterns. The unit multiplexes four AU-4-16 signals into a single STM-64 signal.</p> <ul style="list-style-type: none"> • 1 - 64. Selects a specific AU-4 (AU-4 #1 through AU-4 #64) as the foreground channel. • ALL. Transmit the foreground channel across all 64 AU-4 channels. • None. No foreground channel is selected.
<p>AU-3 Added</p> <p>Note: AU-3 Added only appears when Mapping is set to C-3 Bulk.</p>	<p>Selects one of 192 AU-3 signals as the foreground channel in the STM-64 signal.</p> <ul style="list-style-type: none"> • 1 - 192. Selects a specific AU-3 (AU-3 #1 through AU-3 #192) as the foreground channel. • ALL. Transmits the foreground channel across all 192 AU-3 channels. • None. No foreground channel is selected.
<p>Background AU-4-16 Pattern</p> <p>Note: Only appears when Mapping is set to C-4-16c Bulk.</p>	<p>Determines the type of pattern inserted into the three remaining AU-4-16 background channels of an STM-64 signal. The pattern can range from 1 bit to 32 bits and is entered using screen keypad. It can be entered in Hex, decimal, or binary format.</p>
<p>Background AU-4-4 Pattern</p> <p>Note: Only appears when Mapping is set to C-4-4c Bulk.</p>	<p>Determines the type of pattern inserted into the 15 remaining AU-4-4 background channels of an STM-64 signal. The pattern can range from 1</p>

	bit to 32 bits and is entered using screen keypad. It can be entered in Hex, decimal, or binary format.
<p>Background AU-4 Pattern</p> <p>Note: Only appears when Mapping is set to AU-4.</p>	Determines the type of pattern inserted into the 63 remaining AU-4 background channels of an STM-64 signal. The pattern can range from 1 bit to 32 bits and is entered using screen keypad. It can be entered in Hex, decimal, or binary format.
<p>Background AU-3 Pattern</p> <p>Note: Only appears when Mapping is set to AU-3</p>	Determines the type of pattern inserted into the 191 remaining AU-3 background channels of an STM-64 signal. The pattern can range from 1 bit to 32 bits and is entered using screen keypad. It can be entered in Hex, decimal, or binary format.
Payload Pattern	Select User-defined (32 bit value), PRBS 15, PRBS 15 INV, PRBS 23, PRBS 23 INV, PRBS 31, or PRBS 31 INV.
Clock Reference	Select Internal, Recovered, or Bits/Sets.
Laser Type	Selects either the 1310 nm laser or the 1550 nm laser on the 10G circuit pack (OC-192/STM-64).
Initial Laser Setting	<p>Controls whether the laser is on or off when the unit is turned on.</p> <ul style="list-style-type: none"> • Off. The unit's laser will be off when the unit is turned on. • On. The unit's laser will be on when the unit is turned on. • Restore Previous State. When the unit is turned on, the laser will be on or off based on its previous setting before the unit was turned off.

The STM-64 Transmit Settings 2 screen contains the following functions.

Functions	Description
Line Frequency Offset	<p>Adjusts the offset of the signal frequency of the transmitted SDHsignal. The frequency can be adjusted in parts per million (PPM). The following options are available:</p> <p>Off = 0: The frequency cannot be adjusted.</p> <p>Edit: Adjusts the signal frequency in PPM. Use the + and - arrow keys to adjust the 00.0 decimal place. The frequency offset ranges from -100.0 to 100.0 in increments of 0.1. The default value is 00.0. After an offset value is entered, the Confirm button on the touch screen keypad must be selected for the new offset value to be accepted.</p>
SS Bits in H1 Label	Set to SONET (00) or SDH (10).
* HP Signal Label	<p>Set the C2 byte to:</p> <ul style="list-style-type: none"> • Unequipped (00) • Equipped (01) • TUG Structured (02) • Lock TU Mode (03) • Asyn Mapping for 34368 KB (04) • Asyn Mapping for 139264 KB (12) • Map for ATM (13) • Map for DQDB (14) • Map for FDDI (15) • O.181 Test Signal Mapping (FE) • VC-AIS (FF) • User Defined (any eight bit pattern 0 to FF). <p>Note: This option is coupled with the</p>

	C2 byte option in the Transmit Overhead screen. If it is changed in this screen, it will change in the Overhead screen as well.
Synchronization Status (S1)	<p>Sets the S1 byte to:</p> <ul style="list-style-type: none"> • Quality Unknown: Sets byte value to 00000000. • Rec. G.811: Sets byte value to 00000010. • Rec. G.812 Transmit: Sets byte value to 00000100. • Rec. G.812 Local: Sets byte value to 00001000. • Sync Equip Timing Src: Sets byte value to 00001011. • User Defined (any eight bit pattern 0 to FF).
Trigger In	Determines how the protocol processor responds when an external pulse is received.
TC Overhead Processing	<p>Enables Tandem Connection Monitoring (TCM) transmit mode.</p> <ul style="list-style-type: none"> • Enable: For SDH, the unit uses its TCM circuitry and the N1 byte to generate errors and alarms between TCM equipment. For SONET, the unit uses the Z5 byte. • Disable: TCM mode is disabled, and the N1 and Z5 bytes follow normal operation.

STM-64 Receive

The Receive screen contains the following functions:

- STM-64 Receive Settings 1
- STM-64 Receive Settings 2
- STM-64 Receive Overhead

- STM-64 Receive Signal Status

STM-64 Receive APS

The unit can measure APS switching intervals in your network. The unit can be configured to monitor for a specific event that will cause an APS switch. When this event occurs, the duration in both seconds and frames is logged. These statistics can be used to determine how long it takes for your network equipment to react to an APS event and switch to a backup path.

Using the Receive APS functionality, you can set a specific event as a trigger for APS activity. The APS measurement has an accuracy of 0.5 milliseconds.

Receive APS functions include:

- **Protection Switch Criteria**
- **State:** Indicates the current condition when monitoring and measuring received APS activity.
- **Protection Switch Time (Frames):** Indicates the number of frames received during the APS switching event.
- **Protection Switch Time (Seconds):** Indicates the duration in seconds that it took for the APS switch event to occur.
- **Consecutive Good Time Required:** This function allows you to enter the duration (in milliseconds) of valid frames to occur before Protection Switching is confirmed to be activated. The range is 0.125 to 2047.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of valid frames to occur before Protection Switching is confirmed to be activated. The range is 1 to 16383 frames and is entered using a keypad.
- **Start Button:** Starts the Automatic Protection Switching mode. The unit will begin monitoring the incoming signal for this event. If it occurs, the protection switch state and time will appear in both seconds and frames present. The results will not include the number of good frames, but the number of frames that elapsed before the first good frame, meeting the entered criteria, occurred.

For information about measuring APS activity, select *Measure SDH and SONET APS Activity* in the Common Tasks section of the online help.

STM-64 Receive Overhead


The STM-64 Receive Overhead screen contains the following functions.

Function	Options
SOH Slot	Selects a specific SOH slot within the

	STM-64 signal. The overhead bytes that appear on the OH screen are associated with this slot. There are 192 SOH slots available in an STM-64 signal.
AU-4-16c Dropped	Selects a specific STM-16 signal to monitor in the STM-64 signal.
Regenerator Section OH	Displays the RS Overhead bytes for the selected SOH slot on the incoming STM-64 signal. This is a read-only function.
Multiplex Section OH	Displays the MS Overhead bytes for the selected SOH slot on the incoming STM-64 signal. This is a read-only function.
Higher-Order Path OH	Displays the HP Overhead for the selected SOH slot on the incoming STM-64 signal. This is a read-only function.
J0 Trace	Displays the J0 trace received on the incoming STM-64 signal.
J1 Trace	Displays the J1 trace received on the incoming STM-64 signal.
TC Trace	Displays the TC trace received on the incoming STM-64 signal.

STM-64 Receive Settings 1

This function configures the STM-64 receive mapping, which maps a pattern into the STM-64 interface.

 Options marked with an asterisk (*) indicate that the function is coupled with the Transmit settings if Setting Control is set to "Coupled."

The following options appear on the STM-64 Receive SET 1 screen.

Options	Description
*Settings Control	If Coupled is selected, settings changed on the Receive screen will automatically change on the Transmit screen as well.

	<p>If Independent is selected, settings established on the Receive screen will only affect Receive mode.</p>
*Mapping	<p>Defines the type of signals that are combined to create an STM-64 signal. For example, four C-4-16s can be mapped into an STM-64 signal.</p> <p>If the unit is not licensed for 10 Gbps mapping, the following options appear and are described below: C-4-64c Bulk, C-4-16 A/D, C-4-16 A/D LI, and C-4-64c POS.</p> <p>If the unit is licensed for 10 Gbps mapping, it can perform the following mappings using only the 10 Gbps circuit pack (STM-64 protocol processor): C-4-64c Bulk, C-4-16c Bulk, C-4-4c Bulk, C-4 Bulk, C-3 Bulk, and C-4-64c POS.</p> <ul style="list-style-type: none"> • C-4-64c Bulk. Maps a concatenated C-4-64c signal into an STM-64. • C-4-16 A/D. Maps four C-4-16s into an STM-64. The C-4-16s are generated internally from the STM-16 protocol processor. (Note: This option appears if a separate 2.5G circuit pack (an STM-16 protocol processor) is installed in the unit.) • C-4-16 A/D LI. Maps four C-4-16s into an STM-64. The C-4-16s are derived externally and enter the unit using the line interface connectors. (Note: This option appears if a separate 2.5G circuit pack (an STM-16 protocol processor) is installed in the unit.) • C-4-16c Bulk. Maps a concatenated C-4-16c signal

	<p>into an STM-64. Four C-4-16s make up an STM-64. (Note: This option only appears if the unit is licensed for 10 Gbps mapping.)</p> <ul style="list-style-type: none"> • C-4-4c Bulk. Maps a concatenated C-4-4c signal into an STM-64. Sixteen C-4-4s make up an STM-64. (Note: This option only appears if the unit is licensed for 10 Gbps mapping.) • C-4 Bulk. Maps a concatenated C-4 signal into an STM-64. Sixty-four C-4s make up an STM-64. (Note: This option only appears if the unit is licensed for 10 Gbps mapping.) • C-3 Bulk. Maps 192 C-3s into an STM-64 signal. (Note: This option only appears if the unit is licensed for 10 Gbps mapping.) • C-4-64c POS. Configures the unit for Packet Over SONET/SDH operation. <p>Configures the SDH transmit and receive mapping. This maps an AU-4-64c pattern or AU-4-16 pattern into an STM-64 interface.</p>
<p>AU-4-16 Dropped</p> <p>Note: AU-4-16 Dropped only appears when Mapping is set to C-4-16c Bulk.</p>	<p>Selects a specific AU-4-16 signal to monitor in the STM-64 signal. The unit receives an STM-64 signal that is demuxed into four AU-4-16 signals and then processed.</p> <ul style="list-style-type: none"> • 1 - 4. Selects a specific AU-4-16 (AU-4-16 #1 through AU-4-16 #4) as the dropped and monitored channel. • None. No AU-4-16s are selected.

<p>AU-4-4 Dropped</p> <p>Note: AU-4-4 Dropped only appears when Mapping is set to C-4-4c Bulk.</p>	<p>Selects a specific AU-4-4 signal to monitor in the STM-64 signal. The unit receives an STM-64 signal that is demuxed into 16 AU-4-4 signals and then processed.</p> <ul style="list-style-type: none"> • 1 - 16. Selects a specific AU-4-4 (AU-4-4 #1 through AU-4-4 #16) as the dropped and monitored channel. • None. No AU-4-4s are selected.
<p>AU-4 Dropped</p> <p>Note: AU-4 Dropped only appears when Mapping is set to C-4 Bulk.</p>	<p>Selects a specific AU-4 signal to monitor in the STM-64 signal. The unit receives an STM-64 signal that is demuxed into 64 AU-4 signals and then processed.</p> <ul style="list-style-type: none"> • 1 - 64. Selects a specific AU-4 (AU-4 #1 through AU-4 #64) as the dropped and monitored channel. • None. No AU-4s are selected.
<p>AU-3 Dropped</p> <p>Note: AU-3 Dropped only appears when Mapping is set to C-3 Bulk.</p>	<p>Selects a specific AU-3 signal to monitor in the STM-64 signal. The unit receives an STM-64 signal that is demuxed into 192 AU-3 signals and then processed.</p> <ul style="list-style-type: none"> • 1 - 192. Selects a specific AU-3 (AU-3 #1 through AU-3 #192) as the dropped and monitored channel. • None. No AU-3s are selected.
<p>Payload Pattern</p>	<p>Selects the type of pattern that the unit expects to receive on the incoming SDH signal.</p> <p>The following options are available: Live (user data is received; no pattern is used), User Defined (range from 1 bit to 32 bits and is entered using a touch screen keypad), PRBS 2¹⁵-1,</p>

	PRBS 2 ¹⁵ -1 Inverted, PRBS 2 ²³ -1, PRBS 2 ²³ -1 Inverted, PRBS 2 ³¹ -1, and PRBS 2 ³¹ -1 Inverted.
Trigger Out	Allows the protocol processor to respond to an external "pulse" received. The following options can be selected: None, LOF, OOF, B1, B2, B3, BIT, Frame, MS-RDI, HP-RDI, MS-REI, HP-REI, or Ptr Increment, Ptr Decrement, New Ptr with NDF, or New Ptr without NDF.

STM-64 Receive Settings 2

This function configures the unit's receive STM-64 parameters.

Function	Description
PLM Alarm Reporting	<p>This function enables Higher-Order Path Payload Label Mismatch (HP-PLM) alarm reporting. An HP-PLM alarm occurs when the incoming Higher-Order Path Signal Label (C2 byte) does not match the expected Higher-Order Path Signal Label (C2 byte). The following options are available:</p> <ul style="list-style-type: none"> • Enabled: HP-PLM alarms are recognized and reported. • Disabled: HP-PLM alarms are ignored.
Expected HP Signal (C2) Label	<p>Configure to receive a specific value for the C2 byte. The following options are available:</p> <ul style="list-style-type: none"> • Unequipped (00): The expected C2 byte is 00000000. • Equipped (01): The expected C2 byte is 00000001. • TUG Structured (02): The

	<p>expected C2 byte is 00000010.</p> <ul style="list-style-type: none"> • Lock TU Mode (03): The expected C2 byte is 00000011. • Asyn Mapping for 34368 KB (04): The expected C2 byte is 00000100. • Asyn Mapping for 139264 KB (12): The expected C2 byte is 00010010. • Mapping for ATM (13): The expected C2 byte is 00010011. • Mapping for DQDB (14): The expected C2 byte is 00010100. • Asyn Mapping for FDDI (15): The expected C2 byte is 00010110. • O.181 Test Signal Mapping (FE): The expected C2 byte is 11111110. • VC-AIS (FF): The expected C2 byte is 11111111. • User Defined: Allows an 8-bit Path Signal Label, from 00h to FFh, to be entered for the C2 byte value.
<p>TIM Alarm Reporting</p>	<p>An HP Path Trace Identifier Mismatch (HP-TIM) alarm occurs when the incoming J1 trace does not match the expected J1 trace. A Regenerator Section Trace Identifier Mismatch (RS-TIM) alarm occurs when the incoming J0 trace does not match the expected J0 trace. A Tandem Connection Trace Identifier Mismatch (TC-TIM) alarm occurs when the incoming TC trace does not match the expected TC trace. The following options are available:</p> <ul style="list-style-type: none"> • Enabled: TIM alarms are recognized and reported.

	<ul style="list-style-type: none"> • Disabled: TIM alarms are ignored.
Expected J0	<p>Defines the expected J0 trace received on the incoming SDH signal. The following options are available: Default (64 byte), User Defined (64 byte), All Ones, All Zeros, Default (16 byte), or User Defined (16 byte).</p>
Expected J1	<p>Defines the expected J1 trace received on the incoming SDH signal. The following options are available: Default (64 byte), User Defined (64 byte), All Ones, All Zeros, Default (16 byte), or User Defined (16 byte).</p>
SS Bits Alarm Reporting	<p>Disables or enables SS bits reporting. This function is used in conjunction with the Expected SS Bits function. If enabled, and an SS Bits mismatch is detected on the received signal, the duration in seconds will appear under the Results Scan function.</p>
Expected SS Bits	<p>Selects one of the following as the expected SS Bits value:</p> <ul style="list-style-type: none"> • 00 (SONET) • 01 (Undefined) • 10 (SDH) • 11 (Undefined)
TC Error/Alarm Processing	<p>Enables or disables Tandem Connection Monitoring (TCM) mode. This function is used in conjunction with the Expected TC Trace and TIM Alarm Reporting functions.</p> <p>The TC Summary LED turns red if a TCM error or alarm is reported. Select the TC Summary text for more details.</p> <ul style="list-style-type: none"> • Enable: Turns on TCM error and alarm reporting mode. • Disable: Turns off TCM error and alarm reporting mode.

	<p>(Note: Disable this option if you are not performing TCM testing. This will prevent false error and alarm reporting.)</p>
<p>Expected TC Trace</p>	<p>Defines the expected TC trace received on the incoming signal. For SONET, this is in the Z5 byte. For SDH, this is in the N1 byte. The following options are available:</p> <ul style="list-style-type: none"> • Default: Selects a 16-byte Digital Lightwave ASCII message at the expected TC trace pattern. • All Ones (16 byte): Selects a 16-byte All Ones pattern as the TC trace pattern. • All Zeros (16 byte): Selects a 16-byte All Zeros pattern as the TC trace pattern. • User Defined: Selects a 16-byte user-defined ASCII message as the expected TC trace pattern. The message is entered and saved using a screen keypad.

STM-64 Receive Signal Status

Displays the following measurements of the incoming SDH signal:

- Received optical power in dBm
- Line Frequency in MHz for STM-64
- Frequency offset received in KHz and ppm
- Update Signal Calibration allows you to update the following calibrations:
 - Zero power reading
 - -20 dBm power reading
 - -10 dBm power reading

Select the **Save** button to update the signal calibration.

Related Topics:

Calibrate Optical Power

Line Frequency Offset

STM-64 Results

All monitored activity that the system receives is eventually reported to the Results screen. This screen provides several layers of granularity for analyzing the incoming signal, pattern, errors, and alarms.

The STM-64 Results screen contains the following functions:


- Scan
- Errors
- Alarms
- PTR
- Event Log
- APS
- Graphs
- Large LEDs

APS Results

The APS results monitor incoming APS activity. It logs and displays the K1 and K2 byte sequences received by the unit. A maximum of 15 byte sequences can appear on the screen.

The following information appears in the APS report for the last 15 K1 and K2 byte sequences received:

- The HEX value of the K1 byte.
- The HEX value of the K2 byte.
- The number of frames received that contain the K1 and K2 bytes.
- The elapsed time of the frames that contain the K1 and K2 bytes.

 Per GR-253-CORE, only the upper 12 bits of the K1/K2 bytes (K1 bits 1-8 and the K2 bits 1-4) are used for APS operation. K2 bit 5 sets the APS mode type (1+1, 1:n) and cannot be changed during operation. K2 bits 6-8 are for alarms. Any changes to the lower four bits of the K2 byte do not affect APS operation. The Results APS table only starts and displays a new entry item if the upper 12 K1/K2 bits stabilize on a new value for a minimum of three consecutive frames.

Alarms

The system can monitor and report alarms and their duration on the incoming SDH signal. The **Alarms** function lists the duration of the alarm in seconds.

The following alarms can be monitored:

- Clock Sync
- LOS (Loss of Signal)
- LOF (Loss of Frame)
- OOF (Out of Frame)
- RS-TIM (Regenerator Section Trace Identifier Mismatch for the J0 byte)
- MS-AIS (Multiplex Section Alarm Indication Signal)
- MS-RDI (Multiplex Section Remote Defect Indicator)
- APS (Automatic Protection Switching)
- AU-AIS (Administrative Unit Alarm Indication Signal)
- AU-LOP (Administrative Unit Loss of Pointer)
- HP-UNEQ (Higher-Order Path Unequipped Payload)
- HP-RDI (Higher-Order Path Remote Defect Indicator)
- HP-TIM (Higher-Order Path Trace Identifier Mismatch for the J1 byte)
- HP-PLM (Higher-Order Path Payload Label Mismatch)
- Pattern Sync
- TC-RDI (Tandem Connection-Remote Defect Indicator)
- TC-ODI (Tandem Connection-Outgoing Defect Indicator)
- TC-AIS (Tandem Connection-Alarm Indication Signal)
- TC-UNEQ (Tandem Connection-Unequipped)
- TC-TIM (Tandem Connection-Trace Identifier Mismatch)
- TC-LOF (Tandem Connection-Loss of Frame)

Errors

The system can monitor and report errors on the incoming SDH signal. The **Errors** function provides a detailed analysis of the incoming error as described below.

The errors reported are a result of:

- Incoming errors that are generated by the SDH network, or
- Errors being intentionally generated by the system when it is used in a loopback environment

The following errors can be monitored:

- B1 (Regenerator Section BIP-8)
- B2 (Multiplex Section BIP-8)
- B3 (Higher-Order Path BIP-8)
- MS-REI (Multiplex Section Remote Error Indicator)
- HP-REI (Higher-Order Path Remote Error Indicator)

- BIT (BIT errors reported in the payload)
- NDF-P (Path New Data Flag counts)
- TC-IEC (Tandem Connection-Incoming Error Count)
- TC-REI (Tandem Connection-Remote Error Indicator)
- TC-OEI (Tandem Connection-Outgoing Error Indicator)

The following parameters are measured for these incoming errors:

- Error count using an 11-digit format
- Average error rate using an N.NNe-N format
- Current error rate using an N.NNe-N format
- Error-free seconds using an 8-digit format
- Errored seconds
- Severely Errored seconds
- Unavailable errored seconds

Event Log

The Event Log provides a detailed summary of alarm, error, Pointer events, and APS activity that have occurred and have been recorded by the unit.

The events appear in a table that lists events, the number of events logged, the start and stop time of the event, and the duration of the event.

Graph

This function allows incoming errors and alarms to be graphed. The graphs can be saved, recalled, and printed from a history file.

For more information about graphs, select *Use Graphs* in the Common Tasks section of the online help.

Large LEDs

This function displays the SDH LEDs in a large, easy-to-read format that covers the entire touch screen area. This is useful for viewing any errors or alarms from a long distance, such as across the room from a test bay.

This function also allows:

- On/Off control of the unit's laser
- Single error insertion into the transmit SDH signal

Related Topics:

[LED Definitions](#)

PTR

This function monitors and reports received Pointer statistics. A count of the following Pointer statistics appear:

- **Pointer Justification:** Indicates the Positive Pointer Justification count.
- **Negative Justification:** Indicates the Negative Pointer Justification count.
- **Positive Justification Seconds:** Indicates the duration of a Pointer adjustment.
- **NDF Count:** Indicates the New Data Flag count.
- **Receive Pointer Value (in decimal):** Valid Pointers range from 0 to 782.

Scan

This function displays a list of received errors and alarms. For **alarms**, the duration is reported as a count in seconds. For **errors**, an error count is reported.

The message **No Errors or Alarms** appears if no events are received by the system.

This function provides a quick summary of incoming errors and alarms. It is effective in identifying a general area to investigate when error or alarm activity is detected.

STM-64 Test

The Test screen configures test parameters associated with a protocol processor.

The Test screen contains the following functions:

- SET 1
- APS
- RTD

Action After Duration

This function defines what activities occur at the conclusion of a timed test. To determine how long a test will run, refer to the Duration function section. The following options are available.

Options	Description
None	No action occurs at the end of the test duration.

Screen and Function Descriptions

Print Current Statistics	Test results are printed to the attached printer at the end of a timed test. The timed test is not repeated.
Record Current Statistics	Test results are printed to a file at the end of a timed test. Test results appear in a columned report format.
Record Current Statistics Using a Delimiter	Test results are printed to a file at the end of a timed test. Test results appear in a quote/comma-report format, meaning that error and/or alarm values are enclosed in quotes ("") and separated by commas (,).
Print Statistics and Repeat Test	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, test statistics (which are results for the Scan, Errors, Alarms, and PTR functions) are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function.</p>
Record Statistics and Repeat Test	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmss.stat where,</p> <p>xx indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4).</p> <p>hmmss indicates the current time in hours, minutes, and seconds.</p> <p>stat indicates the Statistics file extension.</p>

<p>Print Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, test events (which are a detailed summary of alarms, errors, and Pointer activity) are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function</p>
<p>Record Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmss.stat.</p>
<p>Print Statistics/Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function</p>
<p>Record Statistics/Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics and events are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmssE.stat (E indicates the file contains both statistics and events).</p>

Screen and Function Descriptions

<p>Print Events and Repeat Test</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
<p>Record Events and Repeat Test</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
<p>Print and Record Events and Repeat Test</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to both the attached printer and a report file. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
<p>Print Events</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
<p>Record Events</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>

Print and Record Events	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to both the attached printer and a report file.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
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Duration

This function configures how long a timed test runs. The following options are available:

Options	Description
Continuous	Test is untimed, and unit is always collecting data.
5 Minutes	Test runs for 5 minutes.
15 Minutes	Test runs for 15 minutes.
1 Hour	Test runs for 1 hour.
2 Hours	Test runs for 2 hours.
24 Hours	Test runs for 24 hours.
72 Hours	Test runs for 72 hours.
1 Week	Test runs for 1 week.
2 Weeks	Test runs for 2 weeks.
User Defined	Allows a specific test duration to be entered using a touch screen keypad. The minimum duration is 1 minute. The maximum duration is 99 days, 23 hours, and 59 minutes.

Protection Switch Criteria

This is an **APS (RX)** function that is used to measure APS activity.

The **Protection Switch Criteria** function determines the type of alarm, error, or pattern event that is used as a trigger to generate APS activity in your network. The unit monitors the incoming signal for the specified event. If it occurs, its duration in both seconds and frames is measured and logged. The APS measurement has an accuracy of 0.5 milliseconds.

The following options are available:

Options	Description
B1	An APS is generated if a B1 error is received. The duration in seconds and frames is measured and logged.
OOF	An APS is generated if an Out of Frame alarm is received. The duration in seconds and frames is measured and logged.
MS-AIS	An APS is generated if a Multiplex Section AIS alarm is received. The duration in seconds and frames is measured and logged.
AU-AIS	An APS is generated if an Administrative Unit AIS alarm is received. The duration in seconds and frames is measured and logged.
PRBS	An APS is generated if a PRBS pattern is received with errors. The duration in seconds and frames is measured and logged.

For information about measuring APS activity, select *Measure SDH and SONET APS Activity* in the Common Tasks section of the online help.

APS (Automatic Protection Switch)

The unit can measure APS switching intervals in your network. The unit can be configured to monitor for a specific event that will cause an APS switch. When this event occurs, the duration in both seconds and frames is logged. These statistics can be used to determine how long it takes for your network equipment to react to an APS event and switch to a backup path.

Using the Test APS functionality, you can set a specific event as a trigger for APS activity. The APS measurement has an accuracy of 0.5 milliseconds.

Test APS functions include:

- **Protection Switch Criteria**
- **State:** Starts and stops Automatic Protection Switching mode. The unit will begin monitoring the incoming signal for a single or continuous APS event. If an APS event occurs, the protection switch time will appear in both seconds and frames present. The results will not include the number of good frames, but the number of frames that elapsed before the first good frame, meeting the entered criteria, occurred.

Single APS - Monitors for a single APS event. Seconds and frames are reported and the State returns to Inactive.

Continuous APS - Constantly monitors for APS events, and updates the seconds and frames reported.

Stop APS - Stops APS monitoring. The State returns to Inactive.

- **Protection Switch Time (Frames):** Indicates the number of frames received during the APS switching event.
- **Protection Switch Time (Seconds):** Indicates the duration in seconds that it took for the APS switch event to occur.
- **Consecutive Good Time Required:** This function allows you to enter the duration (in milliseconds) of valid frames to occur before Protection Switching is confirmed to be activated. The range is 0.125 to 2047.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of valid frames to occur before Protection Switching is confirmed to be activated. The range is 1 to 16383 frames and is entered using a keypad.

For more information about monitoring APS activity, select *Measuring SDH and SONET APS Activity* in the Common Tasks section of the online help.

RTD (Round-Trip Delay)

The round-trip delay function allows you to transmit a known frame into your network and measure how long it takes for the frame to return to the unit.

Test RTD functions include:

- **State:** Starts and stops round-trip delay mode.

Single Round-Trip Delay - If selected, an AIS alarm is inserted into a frame and transmitted once through your network. The frame's transmission through the network is measured in frame counts and milliseconds. Frame counts indicates the number of frames received before the AIS frame is received by the unit. Milliseconds indicates how long it took for the AIS frame to travel out and return to the unit.

Continuous Round-Trip Delay - If selected, an AIS alarm is inserted into a frame and continuously transmitted through your network. The current frame count and duration appear in the **Current** column. The fastest round trip appears in the **Minimum** column and the slowest round trip appears in the **Maximum** column.

Stop Round-Trip Delay - Stops round-trip delay activity. The State returns to Inactive.

- **Round-trip Delay Time (Frames):** Indicates the number of frames received during the measurement.
- **Round-trip Delay Time (Seconds):** Indicates the duration in seconds that it took for the known frame to return to the unit.
- **Consecutive Good Time Required:** This function allows you to enter the duration (in milliseconds) of valid frames to occur before the round-trip delay function is confirmed to be activated. It is used to fine-tune the measurement. The range is 0.125 to 2047.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of valid frames to occur before the round-trip delay function is confirmed to be activated. It is used to fine-tune the measurement. The range is 1 to 16383 frames and is entered using a keypad.

For more information about round-trip delay, select *Round-Trip Delay* in the Common Tasks section of the online help.

SET 1

The SET 1 functions determine how long a protocol processor's test runs and what activities occur at the end of the test.

The following appears on the SET 1 screen.

- **Duration**
- **Action After Duration**
- **Pause Test/Resume Test:** This button switches between pausing an active test and continuing an active test. The button's label indicates the action that will happen when it is selected.

For more information about tests, select *Start a Test* in the Common Tasks section of the online help.

STM-64 Performance Monitoring

Performance Monitoring provides greater detail about incoming Regenerator Section, Multiplex Section, and Higher-Order Path errors.

- RS
- MS
- HP
- BIT

Performance Monitoring BIT

This provides a detailed breakdown for BIT errors detected and logged by the STM-64 protocol processor.

This section is broken down into the following areas:

G.821 BIT Errors

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.821 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

G.826 BIT Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

M.2101.1 BIT Errors

Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.

M.2101.1 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

Performance Monitoring HP

This provides a detailed breakdown for Higher-Order Path errors detected and logged by the STM-64 protocol processor.

This section is broken down into the following areas:

G.826 Near B3 Errors and Far HP REI Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

M.2101.1 Near B3 Errors and Far HP REI Errors

Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.

M.2101.1 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

Performance Monitoring LP

This provides a detailed breakdown for Lower-Order Path errors detected and logged by the STM-64 protocol processor.

This section is broken down into the following areas:

G.826 Near LP BIP Errors and Far LP REI Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

M.2101.1 Near LP BIP Errors and Far LP REI Errors

Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.

M.2101.1 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

Performance Monitoring MS

This provides a detailed breakdown for Multiplexor section errors detected and logged by the STM-64 protocol processor.

This section is broken down into the following areas:

G.826 Near B2 Errors and Far MS REI Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass or failure

M.2101.1 Near B2 Errors and Far MS REI Errors

Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.

M.2101.1 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass or failure

Performance Monitoring RS

This provides a detailed breakdown for Regenerator Section errors detected and logged by the STM-64 protocol processor.

G.826 Near B1 Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

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STM-16 Overview

This section of the online help includes the following:

- STM-16 Specific Tasks
- STM-16 Screen and Function Descriptions

You may also navigate through the topics by using the **Contents** tab and window that appear on the left side of the screen.

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STM-16 Specific Tasks

STM-16 Specific Tasks

This section contains STM-16-specific tasks. General tasks are listed in Common Tasks located in the Getting Started section

STM-16 Specific Tasks

This section contains STM-16-specific tasks. General tasks are listed in Common Tasks located in the Getting Started section

Calibrate STM-16 Optical Power

The following procedures describe the unit's optical power calibration. While performing this task, you will measure, record, and enter the Zero optical power input and the optical power readings for -20 dBm and -10 dBm.

Before You Begin

Read these procedures before trying to calibrate the unit.

WARNING: Power the unit off before removing the optical connector dust caps to clean the unit's fiber optic ports.

Before performing optical power calibration, use a fiber-optics cleaning kit to clean the fiber-optic ports on the unit, the optical power meter, the optical attenuator, and the fiber cables. Dirty optical fibers will affect optical measurements.

The following equipment is required for unit optical calibration:

- Two three-foot singlemode, fiber-optic cables
- Variable optical attenuator
- Optical power meter
- Fiber-optics cleaning kit
- Pencil and paper to record optical power measurements

Restoring Raw Power Readings

The following restores the unit's raw (unconverted) power readings.

1. Make sure that the dust caps are on the unit's TX and RX optical ports.
2. Turn the unit on.
3. From the STM-16 tab, select **Receive**.
4. Select **Signal Status**.
5. Select **Update Signal Calibration**.
6. Select **Zero power reading**. A touch screen keypad appears.
7. Enter **0** and select **OK**.
8. Select **Save** to restore the raw (unconverted) power reading.

Obtaining Zero Optical Power Input

1. Make sure that the dust caps are on the unit's TX and RX optical ports, and that the unit is turned on.
2. Make sure that the unit's laser is off.
3. From the STM-16 tab, select **Receive**.
4. Select **Signal Status**. Record the optical power reading. This value is the Zero power reading.

Obtaining -20 dBm Power Reading

1. With the unit turned on, connect a fiber-optic cable from the unit's 2.5 Gbps TX optical port to the optical attenuator's input connector.
2. Attach a fiber-optic cable from the attenuator's output port to the optical power meter.
3. Turn the unit's laser on.
4. Adjust the attenuator so that the optical power meter reads -20 dBm.
5. Disconnect the fiber-optic cable from the optical power meter, and attach it to the unit's 2.5 Gbps RX optical port.
6. From the STM-16 tab on the unit, select **Receive**.
7. Select **Signal Status**. Record the optical power reading. This value is the -20 dBm power reading.

Obtaining -10 dBm Power Reading

1. Disconnect the fiber-optic cable from the unit's 2.5 Gbps RX optical port and attach it to the optical power meter. (You have a direct fiber-optic cable connection from the optical attenuator to the optical power meter.)
2. Adjust the attenuator so that the power meter reads -10 dBm.
3. Disconnect the fiber-optic cable from the optical power meter, and attach it to the unit's 2.5 Gbps RX optical port.
4. From the STM-16 tab on the unit, select **Receive**.
5. Select **Signal Status**. Record the optical power reading. This value is the -10 dBm power reading.

Entering Optical Power Readings

1. From the STM-16 tab on the unit, select **Receive**.

2. Select **Signal Status**.
3. Select **Update Signal Calibration**.
4. Select **Zero power reading**. A touch screen keypad appears.
5. Enter the value recorded earlier for the zero power reading and select **OK**.
6. Select **-20 dBm power reading**. A touch screen keypad appears.
7. Enter the value recorded earlier for the -20 dBm power reading and select **OK**.
8. Select **-10 dBm power reading**. A touch screen keypad appears.
9. Enter the value recorded earlier for the -10 dBm power reading and select **OK**.
10. Select **Save** to save the new calibration values. This completes the unit's optical calibration procedure.

STM-16 Screen and Function Descriptions

Screen and Function Descriptions

- STM-16 LEDs
- STM-16 Transmit
- STM-16 Receive
- STM-16 Results
- STM-16 Test
- STM-16 Performance Monitoring

You may also navigate through these topics by using the table of contents in the left pane.

STM-16 LEDs

This section defines the SDH LEDs that appear on the touch screen's LED area and when the Large LEDs tab is selected.

LED	Definition
APS	Automated Protection Switching. Indicates that the K1 and K2 bytes on the incoming STM signal have changed. This is an alarm LED.
AU-AIS	Administrative Unit - Alarm Indication Signal. Indicates an all-ones characteristic or adapted information signal was detected on the AU. It is generated to replace the normal traffic signal when it contains a defect condition in order to prevent consequential downstream failures being declared or alarms being raised. This is an alarm LED.
AU-LOP	Administrative Unit - Loss of Pointer. Indicates that a consecutive number of invalid pointers or NDFs were received on the AU. This is an alarm LED.
B1 ERR	Regenerator Section BIP-8 Code Violation. Indicates parity errors occurred on one of the eight parity checks when evaluated by byte 1 of the SDH frame. This is an error LED.
B2 ERR	Multiplex Section BIP-8 Code Violation.

	Indicates that parity errors occurred on any of the parity checks when evaluated by the B2 byte of the SDH frame. This is an error LED.
B3 ERR	Higher-Order Path BIP-8 Code Violation. This is a parity code (even) used to determine if a transmission error has occurred over a path. Its value is calculated over all the bits of the previous virtual container before scrambling and placed in the B3 byte of the current frame. This is an error LED.
BIT ERR	BIT Error. Indicates a bit error was detected in the payload. This is an error LED.
CLK	Clock. Displays the type of transmit clock specified in the setting. Clock settings include: SETS, Bits, Internal, or RCVD. This is an alarm LED.
HP OK	Higher-Order Path OK. This is a status LED.
HP-RDI	Higher-Order Path - Remote Defect Indicator. Indicates a signal was returned to the transmitting HP Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect. This is an alarm LED.
HP-REI	Higher-Order Path - Remote Error Indication. Indicates to the transmitting node that an errored block has been detected at the HP receiving node. This is an error LED.
HP-UNEQ	Higher-Order Path - Unequipped. Indicates that an all-zeros patterns was detected in the C2 byte. This byte is received from the HP terminating equipment. This is an alarm LED.
LOF	Loss of Frame. Indicates that a frame alignment problem with the incoming signal has been detected. An LOF is reported if an Out of Frame (OOF) defect continues for three milliseconds or longer. This is an alarm LED.

STM-16 Screen and Function Descriptions

LOS	Loss of Signal. Indicates that a valid STM-4 signal is not being received. If an all-zeros pattern exists for 100 milliseconds or longer on the incoming STM signal, then an LOS is reported. This is an alarm LED.
MS-AIS	Multiplex Section - Alarm Indication Signal. Indicates an all-ones characteristic or adapted information signal was detected on the MS. It is generated to replace the normal traffic signal when it contains a defect condition in order to prevent consequential downstream failures being declared or alarms being raised. This is an alarm LED.
MS OK	Multiplex Section Overhead OK. This is a status LED.
MS-RDI	Multiplex Section - Remote Defect Indicator. Indicates a signal returned to the transmitting MS Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect. This is an alarm LED.
MS-REI	Multiplex Section - Remote Error Indication. An indication returned to a transmitting node that an errored block has been detected at the MS receiving node. This is an error LED.
OOF	Out of Frame. Indicates that four consecutive frames have been received with invalid or errored framing patterns. This is an alarm LED.
PAT SYNC	Indicates a loss of pattern synchronization. This is an alarm LED.
PTR-ADJ	Administrative Unit - Pointer Adjustment. Indicates that there was pointer movement occurring on the AU. This LED flashes red during a Pointer Adjustment event. This is an event LED.
RS OK	Regenerator Section Overhead OK. This is a status LED.

RX	Displays the received optical power in dBm. This is a status LED.
TC-AIS	Tandem Connection-Alarm Indication Signal. Indicates if IEC bits 1110 are being received from upstream TCM equipment. (Bits 1-4 of the N1 byte are the IEC bits.) This is an alarm LED.
TC-IEC	Tandem Connection-Incoming Error Count. Indicates a B3 error count is being received from downstream TCM equipment. Bits 1-4 of the N1 byte are used for this indicator. This is an error LED.
TC-LOF	Tandem Connection-Loss of Frame. Indicates the loss of a valid multiframe pattern from upstream TCM equipment. This is an alarm LED.
TC-ODI	Tandem Connection-Outgoing Defect Indicator. Indicates that the unit is sending an ODI alarm to upstream TCM equipment. Bit 7 in multiframe 74 of the N1 byte is used for this indicator. This is an alarm LED.
TC-OEI	Tandem Connection-Outgoing Error Indication. Indicates that the unit is sending an OEI error to upstream TCM equipment. Bit 6 of the N1 byte is used for this indicator. This is an error LED.
TC-RDI	Tandem Connection-Remote Defect Indication. Indicates that a defect has occurred at the downstream TCM equipment. The unit is receiving an alarm. Bit 8 in multiframe 73 of the N1 byte is used for this indicator. This is an alarm LED.
TC-REI	Tandem Connection-Remote Error Indication. Indicates that an error has occurred at the downstream TCM equipment. The unit is receiving an error. Bit 5 of the N1 byte is used for this indicator. This is an error LED.
TC SUMMARY	Tandem Connection Summary. Indicates if a TCM error or alarm has

	been detected. If this LED is red, click on the LED text (TC Summary) to display the TC LEDs.
TC-UNEQ	Tandem Connection-Unequipped. Indicates that a 00h pattern has been detected in the N1 byte of a Tandem Connection. This is an alarm LED.

STM-16 Transmit

The STM-16 Transmit screen contains the following functions:

- Transmit Settings 1
- Transmit Settings 2
- Transmit Overhead
- Transmit Pointer Generation
- Transmit APS
- Transmit Error Alarm

Transmit Error Alarm

This function determines the type of error transmitted by the unit. The purpose of generating an error with unit is to stress the network element that is receiving the error by testing if it can detect the incoming error and then report error statistics such as error counts and rates. The following options are available:

Error to Insert

Select an error to insert. Choose one of the following options.

Option	Description
None	No errors are generated. Turns errors off.
B1 Error	Generates a BIP-8 (Bit Interleaved Parity, 8-bit) error over the Regenerator Section layer. Bits in the B1 byte are toggled to create an error. This type of simulation allows an NE (in this case, the downstream equipment) to be tested to verify if (1) it can detect incoming errors, and (2) then conduct performance monitoring such as error counts and rates.
B2 Error	Generates a BIP-8 error over the

	<p>Multiplex Section layer. Bits in the B2 byte are toggled to create an error. This type of simulation allows an NE (in this case, the downstream equipment) to be tested to verify if (1) it can detect incoming errors, and (2) then conduct performance monitoring such as error counts and rates.</p>
B3 Error	<p>Generates a BIP-8 error over the Higher-Order Path layer. Bits in the B3 byte are toggled to create an error. This type of simulation allows an NE (in this case, the downstream equipment) to be tested to verify if (1) it can detect incoming errors, and (2) then conduct performance monitoring such as error counts and rates.</p>
MS-REI	<p>Generates a Remote Error Indicator over the Multiplex Section layer. An MS-REI is a count of B2 errors received at the far end. When the unit transmits this error, it simulates a downstream NE sending an error count back to the source of its incoming SDH signal. The unit uses the M1 byte of the MSOH to transmit the error count. This type of simulation allows an NE (in this case, the upstream equipment) to be tested to verify if (1) it can detect incoming remote errors, and (2) then conduct performance monitoring such as error counts and rates. (This type of error was formerly called a Line Far End Block Error - FEBE-L.)</p>
HP-REI Error (Path FEBE)	<p>Generates a Remote Error Indicator over the Higher-Order Path layer. An HP-REI is a count of B3 errors received at the far end. When the unit transmits this error, it simulates an NE sending an error count back to the source of its incoming SDH signal. The unit uses the G1 byte of the HPOH to transmit the error count. This type of simulation allows an NE (in this case, the upstream</p>

	equipment) to be tested to verify if (1) it can detect incoming remote errors, and (2) then conduct performance monitoring such as error counts and error rates.
BIT Error	Generates bit errors. This type of simulation allows an NE (in this case, the downstream equipment) to be tested to verify if (1) it can detect incoming errors, and (2) then conduct performance monitoring such as error counts and error rates.
TC-IEC	Generates a Tandem Connection Incoming Error Count over the Path layer. A TC-IEC is a count of B3 errors received by TCM equipment at the far end. Bits 1-4 of the N1 byte are the IEC bits.
TC-REI	Generates a Tandem Connection Remote Error Indicator over the Path layer between TCM equipment. Bit 5 of the N1 byte is used for this error.
TC-OEI	Generates a Tandem Connection Outgoing Error Indicator over the Path layer between TCM equipment. Bit 6 of the N1 byte is used for this error.

Error Insert Rate

The Error to Insert function determines the type of error transmitted. The Error Insert Rate function sets the error rate for the selected error. The unit starts transmitting errors after the insertion rate is selected.

The following options are available:

Option	Descriptions
Off	Turns error transmission off.
1e-X	X is a value from 3 to 10; for example, 1e-3 through 1e-10. X will vary based on the type of error selected.
Maximum	Generates errors at the maximum rate listed below.

If this error is inserted...	Then this range of rates is available...
B1	1e-6 to 1e-10; maximum rate is 6.43e-6
B2	1e-3 to 1e-10; maximum rate is 1.25e-3
B3	1e-6 to 1e-10; maximum rate is 6.65e-6
MS-REI (MS-FEBE)	1e-4 to 1e-10; maximum rate is 2.07e-4
HP-REI (HP-FEBE)	1e-6 to 1e-10; maximum rate is 6.65e-6
Bit	1e-3 to 1e-10; maximum rate selection is not available
TC-IEC error	1e-6 to 1e-10; maximum rate is 6.65e-6
TC-REI error	1e-3 to 1e-10; maximum rate selection is not available
TC-OEI error	1e-3 to 1e-10; maximum rate selection is not available

Alarm Generated (SDH)

This function configures the unit to generate an alarm in the transmit SDH signal. Alarm generation by the unit is one way to test if downstream SDH equipment reacts properly to the alarm it receives in the incoming SDH signal.

The following alarms are available:

Option	Description
None	No alarms are generated. Turns alarms off.
LOS	Loss of Signal. An all-zeros pattern is transmitted to simulate a loss of signal or loss of optical power. This forces the downstream SDH equipment to (1) generate an AIS alarm to its downstream network elements (NE), and (2) generate an RDI alarm to its upstream NEs.
LOF	Loss of Frame. An all-zeros pattern is inserted into the A1 and A2 framing bytes of the Section OH. This

STM-16 Screen and Function Descriptions

	<p>simulates the absence of a valid framing pattern. This forces the downstream SONET equipment to generate an AIS alarm to its downstream network elements (NE), and generate an RDI alarm to its upstream NEs.</p>
AU-LOP	<p>Administrative Unit Loss of Pointer. This simulates a loss of a valid STS Pointer. When the downstream NE receives an AU-LOP, it generates a DS_n AIS alarm to its downstream equipment and an HP-RDI alarm to its upstream equipment.</p>
MS-AIS	<p>Multiplex Section Alarm Indication Signal. The transmission of an MS-AIS to a downstream NE forces that NE to send an AU-AIS alarm to the next downstream NE. The NE will also send an MS-RDI alarm to its upstream equipment. An MS-AIS simulates an alarm generated by Line terminating equipment (LTE).</p>
MS-RDI	<p>Multiplex Section Remote Defect Indicator. This generates an MS-RDI condition using the K2 byte of the Line OH. This simulates a downstream NE (in this case the system unit) at the Line layer, reporting a failure to an upstream NE. The downstream NE (unit) has encountered a downstream failure and is alerting upstream SDH equipment.</p> <p>To do this, the unit changes the pattern of the K2 byte. The NE receiving the MS-RDI alarm should detect a change to the K2 byte on the incoming SDH signal. This forces the NE to generate a Remote Alarm Indicator (RAI) to its upstream NEs.</p>
AU-AIS	<p>Administrative Unit Alarm Indication Signal. The transmission of an AU-AIS to a downstream NE forces that NE to send an AIS alarm to the next</p>

	<p>downstream NE. The NE will also send an RDI alarm to its upstream equipment. An AU-AIS simulates an alarm generated by Path terminating equipment (PTE).</p>
HP-RDI	<p>Higher-Order Path Remote Defect Indicator. This generates an HP-RDI condition using the G1 byte of the Higher-Order Path OH. This simulates a downstream NE (in this case, the unit), at the Path layer, reporting a failure to an upstream NE.</p> <p>To do this, the unit changes the pattern of the G1 byte in the Path OH. The NE receiving the HP-RDI alarm should detect a change to the G1 byte on the incoming SDH signal.</p>
HP-UNEQ	<p>Higher-Order Path Unequipped Alarm. An all-zeros pattern is inserted into the C2 byte of the HPOH. The C2 byte is the HP Signal Label. (This type of error is used between Higher-Order Path terminating equipment-PTE). When a PTE receives this alarm, it will generate an AIS to downstream NEs.</p>
TC-RDI	<p>Tandem Connection-Remote Defect Indicator. Generates an alarm to upstream equipment indicating that defects have been detected within the Tandem Connection. The TCM equipment receiving this alarm should detect a change to Bit 8 in multiframe 73 of the N1 byte.</p>
TC-ODI	<p>Tandem Connection-Outgoing Defect Indicator. Generates an alarm to upstream TCM equipment indicating that defects have been detected within the Tandem Connection. The TCM equipment receiving this alarm should detect a change to Bit 7 in multiframe 74 of the N1 byte.</p>
TC-AIS	<p>Tandem Connection-Alarm Indication Signal. Generates an AIS alarm to</p>

STM-16 Screen and Function Descriptions

	downstream TCM equipment by setting Bits 1-4 of the N1 byte to 1110.
TC-UNEQ	Tandem Connection-Unequipped. Generates an all-zeros pattern is inserted into the N1 byte of the Path OH.
TC-LOF	Tandem Connection-Loss of Frame. Generates a loss of a valid multiframe pattern to downstream equipment.

After selecting an alarm, the alarm continues until one of the following occurs:

- The alarm is turned off using the **None** option.
- A mapping change occurs.

For more information about inserting alarms, select *Insert Alarms* in the Common Tasks section of the online help.

STM-16 Transmit Overhead

The STM-16 Transmit Overhead screen contains the following options.

Option	Description
SOH Slot	Select an Overhead slot from one to 48. This function selects a specific SOH slot within the STM-16 signal. The overhead bytes that appear on the OH screen are associated with this slot. There are 48 SOH slots available in an STM-16 signal.
AU-4-4 Added	Select 1 to 4, All, or None.
RSOH	Select the Regenerator Section Overhead to include: A1, A2, Z0, B1, E1, F1, D1, D2, and D3.
MSOH	Select the Multiplex Section Overhead to include: H1, H2, H3, B2, K1, K2, D4-12, Z1, Z2, and E2.
HPOH	Select the Higher-Order Path Overhead to include: B3, J1, C2, G1, F2, H4, Z3, Z4, and Z5. Note: This option will be disabled if Passthru mode is enabled, or if AU-4

	is set to None.
Intrusive Overhead	Select an intrusive overhead button. Note: This option is only enabled if Pass Thru is enabled.
J0 Trace	<p>Selects a default or customized pattern to be used as the J0 trace. Select one of the following patterns:</p> <ul style="list-style-type: none"> • Default (64 byte): Selects the Digital Lightwave ASCII message as the J0 trace pattern. The message consists of 62 characters appended with a CR and LF. • User Defined (64 byte): Selects a user-defined ASCII message as the J0 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 64 characters in length (62 characters plus CR and LF). • All Ones: Selects an All Ones pattern as the J0 trace pattern. • All Zeros: Selects an All Zeros pattern as the J0 trace pattern. • Default (16 byte): Selects the Digital Lightwave ASCII message as the J0 trace pattern. The message consists of 16 characters. • User Defined (16 byte): Selects a user-defined ASCII message as the J0 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 16 characters in length.
J1 Trace	Selects a default or customized pattern to be used as the J1 trace. Select one of the following patterns:

	<ul style="list-style-type: none"> • Default (64 byte): Selects the Digital Lightwave ASCII message as the J1 trace pattern. The message consists of 62 characters appended with a CR and LF. • User Defined (64 byte): Selects a user-defined ASCII message as the J1 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 64 characters in length (62 characters plus CR and LF). • All Ones: Selects an All Ones pattern as the J1 trace pattern. • All Zeros: Selects an All Zeros pattern as the J1 trace pattern. • Default (16 byte): Selects the Digital Lightwave ASCII message as the J1 trace pattern. The message consists of 16 characters. • User Defined (16 byte): Selects a user-defined ASCII message as the J1 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 16 characters in length.
<p>TC Trace</p>	<p>The TC Trace is a 16-byte pattern that can be created for repeated transmission between TCM equipment. The pattern is a string of ASCII characters and can be configured to send the unit's default pattern or a customized pattern.</p> <p>Note: Enable TCM mode (using TC Overhead Processing) before sending the TC Trace.</p>

	<p>Select one of the following patterns:</p> <ul style="list-style-type: none"> • Default: Selects the 16-byte Digital Lightwave ASCII message as the TC trace pattern. • User Defined: Selects a 16-byte user-defined ASCII message as the TC trace pattern. The message is entered and saved using a touch screen keyboard.
--	---

STM-16 Transmit Pointer Generation

The STM-16 Transmit Pointer Generation screen contains the following options.

Option	Description
Pointer Action	<p>Determines the type of Pointer activity that occurs when the Inc Pointer and Dec Pointer buttons are selected.</p> <ul style="list-style-type: none"> • Single: Inserts a single Pointer movement with each selection of the Inc Pointer or Dec Pointer button. The Pointer value changes by one. • Increment/Decrement: Determines the type of Pointer activity that occurs when the Inc Pointer and Dec Pointer buttons are selected.

STM-16 Screen and Function Descriptions

NDF on New Pointer	<p>The NDF on New Pointer allows you to specify whether the NDF bits are set when a new Pointer is present in the generated signal. The following options are available:</p> <ul style="list-style-type: none"> • Yes (On): Generates an NDF when a new Pointer is transmitted. • No (Off): Disables NDF functionality.
Pointer Value	<p>The Pointer Value indicates the offset between the H1/H2 bytes and the first byte of the Virtual Container. The actual Pointer Value consists of the last 10 bits (bits 7 through 16) that span the H1 and H2 bytes. Pointer Values are entered using a keypad. A valid Pointer Value is a binary number ranging from 0 to 782. After entering the new Pointer Value, the Pointer automatically moves to the new position.</p>
Burst Count	<p>This function allows you to determine the number of Pointer location movements to occur when the Inc Pointer or Dec Pointer buttons are pressed. The Pointer burst count ranges from 1 to 8.</p>
AU Frequency Type	<p>Adjusts the rate at which AU Pointer adjustments are needed in the Administrative Unit (AU). Enter a frequency type ranging from -100.0 ppm to +100.0 ppm. This function is disabled by entering 0.</p>
Increment/Decrement Pointer	<p>Alternates the Pointer insertion from increment to decrement with a 200-msec delay in between.</p>

STM-16 Transmit Settings 1

The STM-16 Transmit Settings 1 screen contains the following options.

Option	Description
Settings Control	If Coupled is selected, settings changed on the Transmit screen will automatically change on the Receive screen as well. If Independent is selected, settings established on the Transmit screen will only affect Transmit mode.
Passthru Mode	Activates or deactivates pass-thru mode, allowing an incoming STM signal to pass through the unit without altering the data in the signal. The following options are available: On and Off .
Mapping	Sets mapping to AU-4-4c or AU-4-16c. Note: This function is not available in systems that do not contain circuit packs (cards) lower than 2.5G (STM-16/OC-48).
AU-4 Added	Select 1 to 4, All, or None as the foreground channel. Note: This function is not available in systems that do not contain circuit packs lower than 2.5G.
Background AU Pattern	Enter any 32 bit value as the background channel. Note: This function is not available in systems that do not contain circuit packs lower than 2.5G.
Payload Pattern	Select User-defined (32 bit value), PRBS 15, PRBS 15 INV, PRBS 23, PRBS 23 INV, PRBS 31, or PRBS 31 INV.
Clock Reference	Select Internal, Recovered, or Bits/Sets.
Laser Type	Select 1310 nm or 1550 nm laser type on the 2.5G circuit pack.
Initial Laser Setting	Controls whether the laser is on or off when the unit is turned on. <ul style="list-style-type: none"> • Off. The unit's laser will be off when the unit is turned on. • On. The unit's laser will be on

	<p>when the unit is turned on.</p> <ul style="list-style-type: none"> • Restore Previous State. When the unit is turned on, the laser will be on or off based on its previous setting before the unit was turned off.
<p>TC Overhead Processing</p>	<p>Enables Tandem Connection Monitoring (TCM) transmit mode.</p> <ul style="list-style-type: none"> • Enable: For SDH, the unit uses its TCM circuitry and the N1 byte to generate errors and alarms between TCM equipment. For SONET, the unit uses the Z5 byte. • Disable: TCM mode is disabled, and the N1 and Z5 bytes follow normal operation.

Transmit Settings 2

The STM-16 Transmit Settings 2 screen contains the following options.

Option	Description
<p>Line Frequency Offset</p>	<p>Adjusts the offset of the signal frequency of the transmitted SDH signal. The frequency can be adjusted in parts per million (PPM). The following options are available:</p> <ul style="list-style-type: none"> • Off=0: The frequency cannot be adjusted. • Edit: Adjusts the signal frequency in PPM. Use the + and - arrow keys to adjust the 00.0 decimal place. The frequency offset ranges from -100.0 to 100.0 in increments of 0.1. The default value is 00.0. After an offset value is

	<p>entered, the Confirm button on the touch screen keypad must be selected for the new offset value to be accepted.</p>
<p>SS Bits in H1 Label</p>	<p>Set to SONET (00) or SDH (10).</p>
<p>HP Signal Level</p>	<p>Set the C2 byte to:</p> <ul style="list-style-type: none"> • Unequipped (00) • Equipped (01) • TUG Structured (02) • Lock TU Mode (03) • Asyn Mapping for 34368 KB (04) • Asyn Mapping for 139264 KB (12) • Map for ATM (13) • Map for DQDB (14) • Map for FDDI (15) • O.181 Test Signal Mapping (FE) • VC-AIS (FF) • User Defined (any eight bit pattern 0 to FF). <p>Note: This option is coupled with the C2 byte option in the Transmit Overhead screen. If it is changed in this screen, it will change in the Overhead screen as well.</p>
<p>Synchronization Status (S1)</p>	<p>Sets the S1 byte to:</p> <ul style="list-style-type: none"> • Quality Unknown: Sets byte value to 00000000. • Rec. G.811: Sets byte value to 00000010. • Rec. G.812 Transmit: Sets byte value to 00000100. • Rec. G.812 Local: Sets byte value to 00001000. • Sync Equip Timing Src: Sets byte value to 00001011. • User Defined (any eight bit pattern 0 to FF).

<p>Trigger In</p>	<p>Determines how the protocol processor responds when an external pulse is received using the Trigger In connector. Select one of the following:</p> <ul style="list-style-type: none"> • Restart: The protocol processor restarts when an external pulse is received. • Error Insert: The protocol processor inserts an error (as defined by Trigger Out) when an external pulse is received. • None: The protocol processor does not respond to an external pulse.
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STM-16 Receive

The STM-16 Receive screen contains the following functions:

- Receive Settings 1
- Receive Settings 2
- Receive Overhead
- Receive Signal Status

Receive APS

The unit can measure APS switching intervals in your network. The unit can be configured to monitor for a specific event that will cause an APS switch. When this event occurs, the duration in both seconds and frames is logged. These statistics can be used to determine how long it takes for your network equipment to react to an APS event and switch to a backup path.

Using the Receive APS functionality, you can set a specific event as a trigger for APS activity. The APS measurement has an accuracy of 0.5 milliseconds.

Receive APS functions include:

- **Protection Switch Criteria:** Determines the type of alarm, error, or pattern event that is used as a trigger to generate APS activity in your network. The unit monitors the incoming signal for the specified event. If it occurs, its duration in both seconds and frames is measured and logged.

The APS measurement has an accuracy of 0.5 milliseconds. Options include: None, B1, OOF, MS-AIS, AU-AIS, or PRBS.

- **State:** Indicates the current condition when monitoring and measuring received APS activity.
- **Protection Switch Time (Seconds):** Indicates the duration in seconds that it took for the APS switch event to occur.
- **Protection Switch Time (Frames):** Indicates the number of frames received during the APS switching event.
- **Consecutive Good Time Required:** Indicates the duration (in milliseconds) of valid frames to occur before Protection Switching is confirmed to be activated. The range is 0.125 to 2047.875 milliseconds.
- **Consecutive Good Frames Required:** Indicates the number of valid frames to occur before Protection Switching is confirmed to be activated. The range is 1 to 16383 frames.
- **Start:** Starts the Automatic Protection Switching mode. The unit will begin monitoring the incoming signal for this event. If it occurs, the protection switch state and time will appear in both seconds and frames present. The results will not include the number of good frames, but the number of frames that elapsed before the first good frame, meeting the entered criteria, occurred.

STM-16 Receive Overhead

The STM-16 Receive Overhead Received screen contains the following options.

Option	Description
SOH Slot	Selects a specific SOH slot to monitor on the incoming STM-16 signal. For an STM-16 signal, slots 1-48 can be viewed. The following bytes appear for the selected SOH slot: Regenerator Section Overhead bytes (A1, A2, Z0, B1, E1, F1, D1, D2, and D3), Multiplex Section Overhead bytes (B2, K1, K2, D4-D12, Z1, Z2, and E2), Pointer bytes (H1, H2, and H3), Higher-Order Path Overhead bytes (B3, C2, G1, F2, H4, Z3, Z4, and Z5), J0 Trace byte, and J1 Trace byte.

STM-16 Screen and Function Descriptions

AU-4 Dropped	<p>Selects a specific STM-4 signal to monitor in the STM-16 signal. The system receives an STM-16 signal that is demuxed into four STM-4 signals and then processed by the system. The following options are available:</p> <ul style="list-style-type: none"> • 1: Selects STM-4 #1 as the dropped and monitored channel. • 2: Selects STM-4 #2 as the dropped and monitored channel. • 3: Selects STM-4 #3 as the dropped and monitored channel. • 4: Selects STM-4 #4 as the dropped and monitored channel.
RSOH	<p>Displays the Overhead bytes for a specific Regenerator Section OH slot on the incoming SDH STM-16 signal. This is a read-only function.</p>
MSOH	<p>Displays the Overhead bytes for a specific Multiplex Section OH slot on the incoming SDH STM-16 signal. This is a read-only function.</p>
HPOH	<p>Displays the Overhead bytes for a specific Higher-Order Path OH slot on the incoming SDH STM-16 signal. This is a read-only function.</p>
J0 Trace	<p>Displays the J0 trace received on the incoming SDH signal. This is a read-only function.</p>
J1 Trace	<p>Displays the J1 trace received on the incoming SDH signal. This is a read-only function.</p>
TC Trace	<p>Displays the TC trace received on the incoming SDH signal. This is a read-only function.</p>

STM-16 Receive Settings 1

This function configures the STM-16 Receive mapping, which maps a pattern into the STM-16 interface.



Options marked with an asterisk (*) indicate that the function is coupled with the Transmit settings if Setting Control is set to "Coupled."

The STM-16 Receive Settings 1 screen contains the following options.

Option	Description
*Settings Control	<p>If Coupled is selected, settings changed on the Receive screen will automatically change on the Transmit screen as well.</p> <p>If Independent is selected, settings established on the Receive screen will only affect Receive mode.</p>
*Mapping	<p>Configures the SDH transmit and receive mapping. This maps an AU-4-4c pattern or AU-4-16c pattern into an STM-16 interface.</p> <p>Note: This function is not available in systems that do not contain circuit packs (cards) lower than 2.5G (STM-16/OC-48).</p>
AU-4-4c Dropped	<p>Selects a specific STM-4 signal as the foreground (or source) channel in the STM-16 signal. The source channel can be used to transmit alarms, errors, or patterns. The four STM-4 signals are multiplexed into a single STM-16 signal. The following options are available:</p> <ul style="list-style-type: none"> • 1: Selects STM-4 #1 to transmit as the source channel. • 2: Selects STM-4 #2 to transmit as the source channel. • 3: Selects STM-4 #3 to transmit as the source channel.

STM-16 Screen and Function Descriptions

	<ul style="list-style-type: none"> • 4: Selects STM-4 #4 to transmit as the source channel. <p>Note: This function is not available in systems that do not contain circuit packs (cards) lower than 2.5G (STM-16/OC-48).</p>
Payload Pattern	<p>Selects the type of pattern that the unit expects to receive on the incoming SDH signal.</p> <p>Note: This function is automatically coupled to its equivalent Transmit function.</p> <p>The following options are available: Live (user data is received; no pattern is used), User Defined (range from 1 bit to 32 bits and is entered using a touch screen keypad), PRBS 2¹⁵-1, PRBS 2¹⁵-1 Inverted, PRBS 2²³-1, PRBS 2²³-1 Inverted, PRBS 2³¹-1, and PRBS 2³¹-1 Inverted.</p>
Trigger Out	<p>Allows the protocol processor to respond to an external "pulse" received.</p> <p>Select from one of the following events: None, LOF, OOF, B1, B2, B3, Frame, MS-REI, MS-RDI, HP-REI, HP-RDI, Bit, New Pointer with NDF, New Pointer without NDF, Pointer Increment /Decrement, and AU-LOP.</p>

STM-16 Receive Signal Status

This function displays the following measurements of the incoming SDH signal:

- Frequency in MHz.
- Optical Power
- Line Frequency offset received in Hz and ppm
- Update Signal Calibration allows you to update the following calibrations:
 - Zero power reading

- -20 dBm power reading
- -10 dBm power reading

Click on the **Save** button to update the signal calibration.

Related Topics:

- Calibrate Optical Power

STM-16 Receive Settings 2

This function configures the unit's STM-16 receive parameters. The SET 2 screen contains the following options.

Options	Description
PLM Alarm Reporting	<p>This function enables Higher-Order Path Payload Label Mismatch (HP-PLM) alarm reporting. An HP-PLM alarm occurs when the incoming Higher-Order Path Signal Label (C2 byte) does not match the expected Higher-Order Path Signal Label (C2 byte). The following options are available:</p> <ul style="list-style-type: none"> • Enabled: HP-PLM alarms are recognized and reported. • Disabled: HP-PLM alarms are ignored.
Expected HP Label	<p>Configure to receive a specific value for the C2 byte. The following options are available:</p> <ul style="list-style-type: none"> • Unequipped (00): The expected C2 byte is 00000000. • Equipped (01): The expected C2 byte is 00000001. • TUG Structured (02): The expected C2 byte is 00000010. • Lock TU Mode (03): The expected C2 byte is 00000011.

	<ul style="list-style-type: none"> • Asyn Mapping for 34368 KB (04): The expected C2 byte is 00000100. • Asyn Mapping for 139264 KB (12): The expected C2 byte is 00010010. • Mapping for ATM (13): The expected C2 byte is 00010011. • Mapping for DQDB (14): The expected C2 byte is 00010100. • Asyn Mapping for FDDI (15): The expected C2 byte is 00010110. • O.181 Test Signal Mapping (FE): The expected C2 byte is 11111110. • VC-AIS (FF): The expected C2 byte is 11111111. • User Defined: Allows an 8-bit Path Signal Label, from 00h to FFh, to be entered for the C2 byte value.
<p>TIM Alarm Reporting</p>	<p>An HP Path Trace Identifier Mismatch (HP-TIM) alarm occurs when the incoming J1 trace does not match the expected J1 trace. A Regenerator Section Trace Identifier Mismatch (RS-TIM) alarm occurs when the incoming J0 trace does not match the expected J0 trace. The following options are available:</p> <ul style="list-style-type: none"> • Enabled: TIM alarms are recognized and reported. • Disabled: TIM alarms are ignored.
<p>Expected J0</p>	<p>Defines the expected J0 trace received on the incoming SDH signal. A RS-TIM alarm occurs if the incoming J0 trace does not match the expected J0 trace. The J0 byte is part of the Regenerator Section OH and is</p>

	<p>known as the Section trace, or J0 trace. The J0 trace is a pattern that can be created for repeated transmission. The pattern is a string of ASCII characters.</p> <ul style="list-style-type: none"> • Default (64 byte): Selects the Digital Lightwave ASCII message as the expected J0 trace pattern. The message consists of 62 characters appended with a CR and LF. • User Defined (64 byte): Selects a user-defined ASCII message as the expected J0 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 64 characters in length (62 characters plus CR and LF). • All Ones: Selects an All Ones pattern as the J0 trace pattern. • All Zeros: Selects an All Zeros pattern as the J0 trace pattern. • Default (16 byte): Selects the Digital Lightwave ASCII message as the expected J0 trace pattern. The message consists of 16 characters. • User Defined (16 byte): Selects a user-defined ASCII message as the expected J0 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 16 characters in length.
<p>Expected J1</p>	<p>Defines the expected J1 trace received on the incoming SDH signal. A HP-TIM alarm occurs if the incoming J1 trace does not match the expected J1 trace. The J1 byte is part of the Higher-order Path OH and is</p>

	<p>known as the Path trace, or J1 trace. The J1 trace is a pattern that can be created for repeated transmission. The pattern is a string of ASCII characters. The following options are available:</p> <ul style="list-style-type: none"> • Default (64 byte): Selects the Digital Lightwave ASCII message as the expected J1 trace pattern. The message consists of 62 characters appended with a CR and LF. • User Defined (64 byte): Selects a user-defined ASCII message as the expected J1 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 64 characters in length (62 characters plus CR and LF). • All Ones: Selects an All Ones pattern as the J1 trace pattern. • All Zeros: Selects an All Zeros pattern as the J1 trace pattern. • Default (16 byte): Selects the Digital Lightwave ASCII message as the expected J1 trace pattern. The message consists of 16 characters. • User Defined (16 byte): Selects a user-defined ASCII message as the expected J1 trace pattern. The message is entered and saved using a touch screen keyboard. The message can be up to 16 characters in length.
<p>SS Bits Alarm Reporting</p>	<p>Disables or enables SS bits reporting. This function is used in conjunction with the Expected SS Bits function. If enabled, and an SS Bits mismatch is detected on the received signal, the</p>

	duration in seconds will appear under the Results Scan function.
Expected SS Bits	<p>Selects one of the following as the expected SS Bits value:</p> <ul style="list-style-type: none"> • 00 (SONET) • 01 (Undefined) • 10 (SDH) • 11 (Undefined)
TC Error/Alarm Processing	<p>Enables or disables Tandem Connection Monitoring (TCM) mode. This function is used in conjunction with the Expected TC Trace function.</p> <p>The TC Summary LED turns red if a TCM error or alarm is reported. Select the TC Summary text for more details.</p> <ul style="list-style-type: none"> • Enable: Turns on TCM error and alarm reporting mode. • Disable: Turns off TCM error and alarm reporting mode. (Note: Disable this option if you are not performing TCM testing. This will prevent false error and alarm reporting.)
Expected TC Trace	<p>Defines the expected TC trace received on the incoming signal. For SONET, this is in the Z5 byte. For SDH, this is in the N1 byte. The following options are available:</p> <ul style="list-style-type: none"> • Default: Selects the 16-byte Digital Lightwave ASCII message at the expected TC trace pattern. • User Defined: Selects a 16-byte user-defined ASCII message as the expected TC trace pattern. The message is entered and saved using a

	screen keypad.
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STM-16 Results

The STM-16 Results screen contains the following functions:

- Scan
- Error
- Alarms
- PTR
- Event
- APS
- Graph
- Large LEDs

Results APS

The APS Results monitor incoming APS activity. It logs and displays the K1 and K2 byte sequences received by the unit. A maximum of 16 byte sequences can appear on the touch screen.

The following information appears in the APS report for the last 16 K1 and K2 byte sequences received:

- The HEX value of the K1 byte.
- The HEX value of the K2 byte.
- The number of frames received that contain the K1 and K2 bytes.
- The elapsed time of the frames that contain the K1 and K2 bytes.



Per GR-253-CORE, only the upper 12 bits of the K1/K2 bytes (K1 bits 1-8 and the K2 bits 1-4) are used for APS operation. K2 bit 5 sets the APS mode type (1+1, 1:1) and cannot be changed during operation. K2 bits 6-8 are for alarms. Any changes to the lower four bits of the K2 byte do not affect APS operation. The Results APS table only starts and displays a new entry item if the upper 12 K1/K2 bits stabilize on a new value for a minimum of three consecutive frames.

Results Alarms

The unit can monitor and report alarms and their duration on the incoming SDH signal. The Alarms function lists the duration of the alarm in seconds.

The following alarms can be monitored:

- Clock Sync
- LOS (Loss of Signal)
- LOF (Loss of Frame)
- OOF (Out of Frame)
- RS-TIM (Regenerator Section Trace Identifier Mismatch for the J0 byte)
- MS-AIS (Multiplex Section Alarm Indication Signal)
- MS-RDI (Multiplex Section Remote Defect Indicator)
- APS (Automatic Protection Switching)
- AU-AIS (Administrative Unit Alarm Indication Signal)
- AU-LOP (Administrative Unit Loss of Pointer)
- HP-UNEQ (Higher-Order Path Unequipped Payload)
- HP-RDI (Higher-Order Path Remote Defect Indicator)
- HP-TIM (Higher-Order Path Trace Identifier Mismatch for the J1 byte)
- HP-PLM (Higher-Order Path Payload Label Mismatch)
- Pattern Sync
- TC-RDI (Tandem Connection-Remote Defect Indicator)
- TC-ODI (Tandem Connection-Outgoing Defect Indicator)
- TC-AIS (Tandem Connection-Alarm Indication Signal)
- TC-UNEQ (Tandem Connection-Unequipped)
- TC-TIM (Tandem Connection-Trace Identifier Mismatch)
- TC-LOF (Tandem Connection-Loss of Frame)

Results Errors

The unit can monitor and report errors on the incoming SDH signal. The Errors function provides a detailed analysis of the incoming error as described below.

The errors reported are a result of:

- Incoming errors that are generated by the SDH network, or
- Errors being intentionally generated by the system when it is used in a loopback environment

The following errors can be monitored:

- B1 (Regenerator Section BIP-8)
- B2 (Multiplex Section BIP-8)
- B3 (Higher-Order Path BIP-8)
- MS-REI (Multiplex Section Remote Error Indicator)
- HP-REI (Higher-Order Path Remote Error Indicator)
- BIT (BIT errors reported in the payload)

- NDF-P (errors occurring as a result of the Receive Pointer being recorded without receiving a New Data Flag)
- TC-IEC (Tandem Connection-Incoming Error Count)
- TC-REI (Tandem Connection-Remote Error Indicator)
- TC-OEI (Tandem Connection-Outgoing Error Indicator)

The following parameters are measured for these incoming errors:

- Error count using an 11-digit format
- Average error rate using an N.NNe-N format
- Current error rate using an N.NNe-N format

Results Event

The Results Event function provides a detailed summary of alarm, error, Pointer events, and APS activity that have occurred and have been recorded by the unit.

The events appear in a table that lists events, the number of events logged, the start and stop time of the event, and the duration of the event.

Select the **Descending/Ascending** button to toggle between the order you wish to view the results. Select **Pause** to temporarily halt the display of results.

Results Graphs

Use the Graphs button to view error and alarm results for the STM-16 protocol processor. These graphs show the test history for either the current test or the previous test. You can configure the graph function to display any combination of STM-16 alarms and errors.

To use the Results Graph functions, see the Using Graphs section.

Results Large LEDs

This function displays the STM-16 LEDs in a large, easy-to-read format that covers the entire touch screen area. This is useful for viewing any errors or alarms from a long distance, such as across the room from a test bay. This function also allows single error insertion into the transmit SDH signal.

For a list of available LEDs in the STM-16 protocol processor, see STM-16 LEDs.

Results PTR

This function monitors and reports received STS Pointer statistics. A count of the following Pointer statistics appear:

- Positive Justification: Indicates the Positive Pointer Justification count.
- Negative Justification: Indicates the Negative Pointer Justification count.
- Pointer Justification Seconds: Indicates the duration of a Pointer adjustment.
- NDF Count: Indicates the New Data Flag count.
- Receive Pointer Value (in decimal): Valid Pointers range from 0 to 782.

Results SCAN

This function provides a quick summary of incoming errors and alarms. It is effective in identifying a general area to investigate when error or alarm activity is detected. This function displays a list of received errors and alarms. For **alarms**, the duration is reported as a count in seconds. For **errors**, an error count is reported.

When no activity is occurring, the screen displays, "No errors or alarms."

STM-16 Test

The Test screen configures test parameters associated with a protocol processor.

The Test screen contains the following functions:

- SET 1
- APS
- RTD

Action After Duration

This function defines what activities occur at the conclusion of a timed test. To determine how long a test will run, refer to the Duration function section. The following options are available.

Options	Description
None	No action occurs at the end of the test duration.
Print Current Statistics	Test results are printed to the attached printer at the end of a timed test. The timed test is not repeated.

STM-16 Screen and Function Descriptions

Record Current Statistics	Test results are printed to a file at the end of a timed test. Test results appear in a columned report format.
Record Current Statistics Using a Delimiter	Test results are printed to a file at the end of a timed test. Test results appear in a quote/comma-report format, meaning that error and/or alarm values are enclosed in quotes ("") and separated by commas (,).
Print Statistics and Repeat Test	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, test statistics (which are results for the Scan, Errors, Alarms, and PTR functions) are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function.</p>
Record Statistics and Repeat Test	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmss.stat where,</p> <p>xx indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4).</p> <p>hmmss indicates the current time in hours, minutes, and seconds.</p> <p>stat indicates the Statistics file extension.</p>
Print Events and Repeat Test	Note: This option appears when

	<p>Repeat Actions is selected.</p> <p>At the conclusion of a timed test, test events (which are a detailed summary of alarms, errors, and Pointer activity) are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function</p>
<p>Record Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmss.stat.</p>
<p>Print Statistics/Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function</p>
<p>Record Statistics/Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics and events are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmssE.stat (E indicates the file contains both statistics and events).</p>
<p>Print Events and Repeat Test</p>	<p>Enables real-time reporting. Any</p>

STM-16 Screen and Function Descriptions

	<p>event that occurs during a real-time test is automatically sent to the attached printer. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Record Events and Repeat Test	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Print and Record Events and Repeat Test	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to both the attached printer and a report file. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Print Events	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
Record Events	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>

<p>Print and Record Events</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to both the attached printer and a report file.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
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Duration

This function configures how long a timed test runs. The following options are available:

Options	Description
Continuous	Test is untimed, and unit is always collecting data.
5 Minutes	Test runs for 5 minutes.
15 Minutes	Test runs for 15 minutes.
1 Hour	Test runs for 1 hour.
2 Hours	Test runs for 2 hours.
24 Hours	Test runs for 24 hours.
72 Hours	Test runs for 72 hours.
1 Week	Test runs for 1 week.
2 Weeks	Test runs for 2 weeks.
User Defined	Allows a specific test duration to be entered using a touch screen keypad. The minimum duration is 1 minute. The maximum duration is 99 days, 23 hours, and 59 minutes.

APS (Automatic Protection Switch)

The unit can measure APS switching intervals in your network. The unit can be configured to monitor for a specific event that will cause an APS switch. When this event occurs, the duration in both seconds and frames is logged. These statistics can be used to determine how long it takes for your network equipment to react to an APS event and switch to a backup path.

Using the Test APS functionality, you can set a specific event as a trigger for APS activity. The APS measurement has an accuracy of 0.5 milliseconds.

Test APS functions include:

- **Protection Switch Criteria:** Determines the type of alarm, error, or pattern event that is used as a trigger to generate APS activity in your network. The unit monitors the incoming signal for the specified event. If it occurs, its duration in both seconds and frames is measured and logged. The APS measurement has an accuracy of 0.5 milliseconds. Options include: None, B1, OOF, MS-AIS, AU-AIS, or PRBS.
- **State:** Starts and stops Automatic Protection Switching mode. The unit will begin monitoring the incoming signal for a single or continuous APS event. If an APS event occurs, the protection switch time will appear in both seconds and frames present. The results will not include the number of good frames, but the number of frames that elapsed before the first good frame, meeting the entered criteria, occurred.

Single APS - Monitors for a single APS event. Seconds and frames are reported and the State returns to Inactive.

Continuous APS - Constantly monitors for APS events, and updates the seconds and frames reported.

Stop APS - Stops APS monitoring. The State returns to Inactive.

- **Protection Switch Time (Frames):** Indicates the number of frames received during the APS switching event.
- **Protection Switch Time (Seconds):** Indicates the duration in seconds that it took for the APS switch event to occur.
- **Consecutive Good Time Required:** This function allows you to enter the duration (in milliseconds) of valid frames to occur before Protection Switching is confirmed to be activated. The range is 0.125 to 2047.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of valid frames to occur before Protection Switching is confirmed to be activated. The range is 1 to 16383 frames and is entered using a keypad.

For more information about monitoring APS activity, select *Measuring SDH and SONET APS Activity* in the Common Tasks section of the online help.

RTD (Round-Trip Delay)

The round-trip delay function allows you to transmit a known frame into your network and measure how long it takes for the frame to return to the unit.

Test RTD functions include:

- **State:** Starts and stops round-trip delay mode.

Single Round-Trip Delay - If selected, an AIS alarm is inserted into a frame and transmitted once through your network. The frame's transmission through the network is measured in frame counts and milliseconds. Frame counts indicates the number of frames received before the AIS frame is received by the unit. Milliseconds indicates how long it took for the AIS frame to travel out and return to the unit.

Continuous Round-Trip Delay - If selected, an AIS alarm is inserted into a frame and continuously transmitted through your network. The current frame count and duration appear in the **Current** column. The fastest round trip appears in the **Minimum** column and the slowest round trip appears in the **Maximum** column.

Stop Round-Trip Delay - Stops round-trip delay activity. The State returns to Inactive.

- **Round-trip Delay Time (Frames):** Indicates the number of frames received during the measurement.
- **Round-trip Delay Time (Seconds):** Indicates the duration in seconds that it took for the known frame to return to the unit.
- **Consecutive Good Time Required:** This function allows you to enter the duration (in milliseconds) of valid frames to occur before the round-trip delay function is confirmed to be activated. It is used to fine-tune the measurement. The range is 0.125 to 2047.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of valid frames to occur before the round-trip delay function is confirmed to be activated. It is used to fine-tune the measurement. The range is 1 to 16383 frames and is entered using a keypad.

For more information about round-trip delay, select *Round-Trip Delay* in the Common Tasks section of the online help.

SET 1

The SET 1 functions determine how long a protocol processor's test runs and what activities occur at the end of the test.

The following appears on the SET 1 screen.

- **Duration**
- **Action After Duration**
- **Pause Test/Resume Test:** This button switches between pausing an active test and continuing an active test. The button's label indicates the action that will happen when it is selected.

For more information about tests, select *Start a Test* in the Common Tasks section of the online help.

Performance Monitoring

Performance Monitoring provides greater detail about incoming Regenerator Section, Multiplex Section, Higher-Order Path, and Bit errors.

The following options are available:

- RS
- MS
- HP
- Bit

Performance Monitoring Bit

This provides a detailed breakdown for BIT errors detected and logged by the STM-16 protocol processor.

This section is broken down into the following areas:

G.821 BIT Errors

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.821 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass or failure

G.826 BIT Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass or failure

M.2101.1 BIT Errors

Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.

M.2101.1 Allocation: Select an allocation percentage from 0 to 100.

Duration: Set to 2 hours, 1 day, or 7 days.

Status: Pass, Uncertain, or failure

Perf Monitoring HP

This provides a detailed breakdown for Higher-Order Path errors detected and logged by the STM-16 protocol processor.

This section is broken down into the following areas:

G. 826 Near B3 Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

G. 826 Far High Path REI Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure.

M.2101.1 Near - B3 Errors

Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.

M.2101.1 Allocation: Select an allocation percentage from 0 to 100.

Duration: Set to 2 hours, 1 day, or 7 days.

Status: Pass, Uncertain, or failure.

M.2101.1 Far High Path REI Errors

Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.

M.2101.1 Allocation: Select an allocation percentage from 0 to 100.

Duration: Set to 2 hours, 1 day, or 7 days.

Status: Pass, Uncertain, or failure.

Perf Monitoring LP

This provides a detailed breakdown for Lower-Order Path errors detected and logged by the STM-16 protocol processor.

This section is broken down into the following areas:

G.826 Near LP BIP Errors and Far LP REI Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

M.2101.1 Near LP BIP Errors and Far LP REI Errors

Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.

M.2101.1 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

Perf Monitoring MS

This provides a detailed breakdown for Multiplex Section errors detected and logged by the STM-16 protocol processor.

G. 826 Near - B2 Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

G. 826 Far Multiplex Section REI Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

M.2101.1 Near B2 Errors

Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.

M.2101.1 Allocation: Select an allocation percentage from 0 to 100.

Duration: Set to 2 hours, 1 day, or 7 days.

Status: Pass, Uncertain, failure

M.2101.1 Far Multiplex Section REI Errors

Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.

M.2101.1 Allocation: Select an allocation percentage from 0 to 100.

Duration: Set to 2 hours, 1 day, or 7 days.

Status: Pass, Uncertain, failure

Perf Monitoring RS

This provides a detailed breakdown for Regenerator Section errors detected and logged by the STM-16 protocol processor.

Regenerator Section B1 Errors

Errored Block (EB) count

Background Block Error (BBE) by count, rate percentage, and objective percentage.

Errored Seconds (ES) by count, rate percentage, and objective percentage.

Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.

G.826 Allocation: Select an allocation percentage from 0 to 100.

Status: Pass, Uncertain, or failure

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OSA Overview

This section of the online help system has topics that discuss:

- OSA Specific Tasks
- OSA Screen and Function Descriptions
- OSA Frequency and Wavelength Tables
- OSA Connector Panels
- OSA Technical Specifications

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OSA Specific Tasks

OSA Specific Tasks

This section includes tasks that are specific to the OSA protocol processor. For general tasks, refer to the Common Tasks section.

Please use the **Contents** tab and window (left side of the screen) to select, open, and view Specific Tasks for this protocol processor.

Autoscan

Autoscan performs a spectrum sweep and detects the active channels. By automatically scanning channels, this function reduces the time needed to manually enter a channel range using the User Defined span function.

To use Autoscan:

1. Select **Spectrum**.
2. Select **SET**.
3. Select **Autoscan**.
4. The range of active channels appear in the graph. In addition, the beginning and ending channels appear for the **Start** and **Stop** functions.
5. If necessary, configure the X- and Y-axis parameters using the **Wavelength Settings** and **Power Settings** functions.

Comparing Graphs

Two spectrum graphs (snapshots) can be selected and displayed simultaneously to view differences between power levels.

To compare graphs:

1. Select **Spectrum**.
2. Select **Compare**.
3. Select **Graph Selection** to select the first graph used in the comparison. Select **Color Choice** to assign a color to the first graph.
4. Select **Graph Selection 2** to select the second graph to compare. Select **Color Choice** to assign a color to the second graph.
5. Select **Operation** to determine the action that the comparison graph displays. The following operations are available:
 - Add: The comparison graph displays the sum of the two graphs.
 - Subtract: The comparison graph displays the difference of the two graphs.

- **Overlay:** The comparison graph is superimposed on a previous graph. This is helpful when monitoring power differences over a period of time.
6. Select **Color Choice** to assign a color to the comparison graph.
 7. The graphs appear on the screen.

Configuring an OSA Alarm

You can configure specific thresholds for each channel. When a threshold is exceeded, an alarm is generated and logged. The functions appearing on the Alarm screen allow you to add and remove channels to monitor. Alarm results can be viewed using the Channel Results screen.

To configure an OSA alarm:

1. Select **Channel**.
2. Select **Alarm**.
3. Select one or all channels using **Channel Number**.
4. Set the SNR, drift, low power, and high power threshold values.
5. Select **Add**. The channels appear in the table.

To remove a channel from the alarm list:

1. Select a channel number (**Channel #** column) from the table.
2. Select **Remove**.

To remove all channels from the alarm list:

- Select **Remove All**.

Configuring Spectrum Settings


The Spectrum Settings screen determines how spectrum information is represented and displayed on your screen. After customizing a view, it can be saved using the Snapshot function. The newly created view is entirely local and does not change data on the unit.

Use the Spectrum Settings to:

- Select a wavelength channel-band to monitor
- Perform an autoscan to quickly determine the available channels
- Define units of measure for the X- and Y-axis
- Narrow the range of interest by specifying the starting and ending channel range


To configure Spectrum graph settings:

1. Select **Spectrum**.
2. Select **SET**.
3. Use the **Wavelength Settings** to configure the graph's X-axis and channel range.
 - Select **Span** to display C-band or L-band channel ranges.

 If you switch between channel bands when only one light source is present, you must reboot the unit.

For example, if you have a C-band light source attached to the unit, switch to L-band, which is not present, and then switch back to C-band, a reboot is required.

If a light source is available for both C- and L-band, the reboot is not necessary.

 If an Autoscan is performed, User Defined appears as the Span value. Use **Start** and **Stop** to set the beginning and ending channels that appear on the graph.

- Select **X Unit of Measure** to set the unit of measure to nanometers or terahertz.
 - Select **Center** to center the graph on a specific channel.
4. User **Power Settings** to configure the graph's Y-axis and displayed power level range.
 - Select **Reference Level** to set the uppermost limit for the Y-axis.
 - Select **dB/Division** to set the vertical scale (divisions) of the Y-axis.
 5. After configuring the Wavelength Settings and Power Settings, the new parameters appear for the graph.
 6. Select **Scan Rate (sec)** to set the graph's refresh rate.
 7. Select **Snapshot** to save the new graph parameters.
 8. If you changed channel bands using the Span function when only one light source is available, perform the following to reboot the unit:
 - Turn the unit off.
 - Wait approximately 10 seconds, and turn the unit on.
 - While the unit boots, it performs an internal diagnostic test. When complete, the user interface appears on the screen.

Configuring Channel Settings

The Channel Settings screen determines how channel functions appear in C-band and L-band tables by narrowing the range of channels available.

The unit has a default channel table consisting of:

- 80 channels
- A channel spacing of 50 GHz (0.05 THz)
- A C-band channel range from 1525 nm to 1561 nm
- An L-band channel range from 1570 nm to 1603 nm

To change the parameters of the channels displayed in tables:

1. Select **Channel**.
2. Select **Set**.
3. Select **First Channel** to set the starting channel. Channels range from 1 to 80.
4. Select **Channel Count** to set the number of channels. The channel count ranges from 1 to 80. However, the maximum channel count that can be entered varies based on the First Channel value.
5. Select **Channel Spacing** to change the channel spacing to one of three Gigahertz values. The default is 50 GHz.

Fine-Tuning Channels

Using the **OSA Graph screen**, you can select a single channel, which will be your reference channel, and then compare and fine-tune the remaining channels based on the reference channel's values.

1. Select **Reference Channel** and enter a channel that appears in the table above the graph.
2. Select **Deviation** and to set the type of deviation (power, SNR, or wavelength/frequency deviation) to monitor.
3. A bar chart appears showing the other channels' deviations compared to the reference channel.

Overlapping Graphs

Graphs can be displayed over a period of time using the Spectrum Overlap functions.

To overlap graphs:

1. Select **Spectrum**.
2. Select **Overlap**.
3. Select **Graph Type** and set the graph format.
4. Select **High Color Choice** (Max.) and **Low Color Choice** (Min.) to assign colors to each graph type.
5. As the unit completes a spectrum sweep, power levels, based on the Graph Type setting, appear in the graph. Subsequent spectrum sweeps will appear on the graph and be superimposed on the previous graph. This provides a visual comparison of the spectrum sweep.

Snapshot and View

The Snapshot and View functions allow you to save or restore graph parameters for the Spectrum Settings graph and the Channel Settings graph.

To select a snapshot:

1. Select **View** from the Spectrum Settings screen or Channel Settings screen. The Select View window appears.
2. Select a snapshot. The snapshot's parameters appear in the graph.

To save a snapshot:

1. Select **Snapshot**. The Snapshot Configuration window appears.
2. Select **Snapshot Name**. A keypad appears allowing you to enter a unique 24-character name for the snapshot.
3. Select **Enter** (on the keypad) to save the snapshot name.
4. Select **Add** to add the new snapshot to the Snapshot Configuration list.
5. Select **OK** to save the new snapshot.

To delete a snapshot

1. Select **Snapshot**. The Snapshot Configuration window appears.
2. Select a snapshot from the Snapshot Configuration list.
(Select the snapshot number that appears in the View column.)
3. Select **Remove**. The snapshot is deleted and appears as **<Empty>** in the list.
4. Select **OK** to close the window.

Using Zoom

You can increase or decrease an OSA graph's view magnification using the Zoom In and Zoom Out functions. You can observe greater detail, regarding a particular point on the graph, by zooming-in. Zooming-out restores the graph to its initial settings.

Zoom In

To zoom in on a specific area of the graph using a touch screen:

- Drag your finger diagonally across the screen to select and magnify an area of the graph.

To zoom in on a specific area of the graph using the Remote Control Application:

1. Right-click and drag your mouse pointer across an area of the graph.
2. Release the mouse button.

Zoom Out

To zoom out and restore the graph's initial view magnification using a touch screen:

- Press your finger twice (double click) on the graph.

To zoom out and restore the graph's initial view magnification using the Remote Control Application:

- Select **Zoom Out**.

Viewing Broadband Power

To view the power levels across the entire bandwidth:

1. Select **Spectrum**.
2. Select **SET**.
3. Select **Span**.
4. Select **C-Band** or **L-Band**.
5. The aggregate broadband power value appears in the upper left corner of the screen.

Related Topic:

Viewing Channel Power

Viewing Channel Power

1. Select **Channel**.
2. Select **Set**.

3. The Channel Power screen appears and contains a channel list table (based on the Channel Set configuration) and channel power graph.

The power level for each channel appears in the **Ch Pwr** column. The graph provides a visual display of the peak power for all channels in the list.

4. Select **View** to view a full-screen Channel Power table.

Related Topic:

Viewing Broadband Power

Viewing Alarms (Channel Results)

The Channel Results table displays a list of all channels reporting alarms. The alarm thresholds are based on settings configured using the Channel Alarm screen.

To view results:

1. Select **Channel**.
2. Select **Results**
3. The Channel Results table appears. If an alarm condition exists, the following is reported:
 - Channel number, which indicates the C-band or L-band channel reporting the alarm
 - Alarm type, which indicates the type of alarm reported (for example, Drift, SNR, Power High, and Power Low)
 - Current alarm value:
 - For Drift alarms, the channel's current drift value appears in picometers (pm).
 - For Power High or Power Low alarms, the channel's current power level (dBm) appears.
 - For SNR alarms, the channel's current signal-to-noise ratio (dB) appears.



These statistics are cleared when the unit is restarted.

Viewing Signal-to-Noise Ratio

1. Select **Channel**.
2. Select **Set**.

3. The Channel Power screen appears and contains a channel list table (based on the Channel Set configuration) and channel power graph.

The SNR for each channel appears in the **S/N** column. The graph provides a visual display of the peak power for all channels in the list.

Screen and Functions Descriptions

OSA Screen and Functions Overview

OSA consists of the following components:

- OSA Spectrum
- OSA Channel
- OSA Test

OSA Screen and Functions Overview

OSA consists of the following components:

- OSA Spectrum
- OSA Channel
- OSA Test

OSA Spectrum

The Spectrum screen contains the following:

- View
- Set
- Compare
- Overlap

Spectrum Compare

The Spectrum Compare screen allows you to examine live and/or stored graphs together, and then perform comparison operations on the two graphs.

The following functions appear on the screen.

Function	Description
Graph Selection	Selects the first graph used for comparison. The default is Live, which displays the current spectrum data.
Color Choice	Selects the line color used for the first graph.
Graph 2 Selection	Selects the second graph used for comparison.
Color Choice	Selects the line color used for the second graph.

<p>Operation</p>	<p>Selects graph formatting and determines how the information is displayed.</p> <ul style="list-style-type: none"> • Add: Displays the sum of the two graphs. • Subtract: Displays the difference of the two graphs. • Overlay: The previous graphs remains on the screen and the current graph is placed on top of the earlier graph. This is helpful when monitoring power differences over a period of time.
<p>Color Choice</p>	<p>Selects the line color used for the operation graph.</p>
<p>Zoom Out</p>	<p>Adjusts the graph's view by allowing you to decrease the view magnification. This restores the graph's original view.</p> <p>Note: If using a remote GUI, a double-click will zoom out. If using a touch screen, double-press using your finger to zoom out.</p>
<p>Zoom In (using cursor tracing)</p>	<p>Increases view magnification allowing you to zoom in on a specific area of the graph.</p> <p>Note: If using a remote GUI, define an area of the graph using your mouse pointer to select an area to magnify. If using a touch screen, drag your finger diagonally across the screen to zoom-in on a specific area.</p>

Spectrum Overlap


The Spectrum Overlap screen displays graphs over a period of time. This allows you to place a new spectrum graph over a previous spectrum graph, and provides a visual comparison of the spectrum sweep.

The following appears on this screen.

Function	Description
Graph Type	Selects one of the following graph formats: <ul style="list-style-type: none"> • Min: Displays only the spectrum's low power limits. • Max: Displays only the spectrum's high power limits. • Min/Max: Displays both the spectrum's high and low power limits.
High Color Choice	Selects the graph's line color for the Max power limits.
Low Color Choice	Selects the graph's line color for the Min power limits.
Zoom Out	Adjusts the graph's view by allowing you to decrease the view magnification. <p>Note: If using a remote GUI, a double-click will zoom out. If using a touch screen, double-press using your finger to zoom out.</p>
Zoom In (using cursor tracing)	Increases view magnification allowing you to zoom in on a specific area of the graph. <p>Note: If using a remote GUI, define an area of the graph using your mouse pointer to select an area to magnify. If using a touch screen, drag your finger diagonally across the screen to zoom-in on a specific area.</p>

Spectrum Set

The Spectrum Settings screen configures the Spectrum graph's parameters for the X- and Y-axis.

 The data view that appears on your screen is local and relative to your configuration. Changes you make using the Spectrum Settings do not changing data on the unit.

The following functions appear on the spectrum Set screen:

Function	Description
X Unit of Measure	Determines the unit of measure for the X-axis. Wavelength values (in nanometers) or ITU frequency values (in terahertz) can appear across the bottom of the spectrum graph.
Center	Centers the graph on a specific point on the X-axis. This can be used to contract the graph view and narrow the range of channels displayed. When the graph is centered on a point, the starting and ending wavelengths across the X-axis are contracted and automatically adjust to the new view.
Span	<p>Indicates the type of wavelength channel band currently selected.</p> <ul style="list-style-type: none"> • C-Band. • L-Band. • User Defined. Sets a beginning and ending wavelength using Start and Stop to select a specific range. <p>Important: If you switch between channel bands when only one light source is present, you must reboot the unit. For example, if you have a C-band light source attached to the unit, switch to L-band, which is not present, and then switch back to C-</p>

Screen and Functions Descriptions

	band, a reboot is required. If a light source is available for both C- and L-band, the reboot is not necessary.
Start	Sets the beginning wavelength or frequency to display on the graph's X-axis.
Stop	Sets the ending wavelength or frequency to display on the graph's X-axis.
Reference Level	Sets the uppermost limit for the Y-axis. The graph's Y-axis indicates power in dBm.
dB/Division	Sets the vertical scale, or divisions, of the graph's Y-axis.
Scan Rate (sec)	Sets the graph's refresh rate. The default scan rate is 0.25 seconds.
View	<p>Displays a list of the current (Live) or saved graphs (snapshots). When a snapshot is selected, the data points associated with that graph appear in the graph display.</p> <p>Note:The View button can be selected after a snapshot has been saved.</p>
Snapshot	Assigns a unique 24-character label to a specific data point on the graph. A maximum of 16 snapshots can be saved.
Zoom Out	<p>Adjusts the graph's view by allowing you to decrease the view magnification. This restores the graph's view as defined by the X Unit of Measure, Center, and Span functions.</p> <p>Note: If using a remote GUI, a double-click will zoom out. If using a touch screen, double-press using your finger to zoom out.</p>
Zoom In (using cursor tracing)	Increases view magnification allowing you to zoom in on a specific area of the graph.

	<p>Note: If using a remote GUI, define an area of the graph using your mouse pointer to select an area to magnify. If using a touch screen, drag your finger diagonally across the screen to zoom-in on a specific area.</p>
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Spectrum View

The View screen displays the channel graph in a large, easy-to-read format. The graph's parameters are configured using the Spectrum Settings screen.

OSA Channel

The Channel screen contains the following functions:

- View
- Set
- Alarm
- Graph
- Result

Channel Alarm

Use the Alarm functions to set the criteria, or thresholds, that will trigger alarms. All active alarms appear in the table.

The following functions appear on this screen.

Function	Description
Channel Number	Selects a channel to monitor. If All is selected, then all 80 channels (C- or L-bands) are added to the Alarm table.
SNR Threshold	Sets a limit on the channel's signal-to-noise ratio. An alarm is generated if the SNR exceeds this value. The maximum value is 30.0 dB. The minimum value is 0.0 dB.
Drift Threshold	Determines how far the channel's signal can drift before an alarm is generated. The maximum value is 216.0 nm. The minimum value is 0.0

	nm.
Power Low Threshold	Determines the lower power limit. An alarm is generated if the signal exceeds this value. The maximum value is -1.0 dBm. The minimum value is -60.0 dBm.
Power High Threshold	Determines the upper power limit. An alarm is generated if the signal exceeds this value. The maximum value is 0.0 dBm. The minimum value is -60.0 dBm.
Add	Adds one or more channels to the alarm table. Only the channels listed in the table are monitored.
Remove	Removes a channel from the alarm table.
Remove All	Removes all channels from the alarm table.
Channel Alarm Table	<p>Displays all channels selected that are selected for alarm monitoring. The table displays:</p> <ul style="list-style-type: none"> • Channel number • Signal-to-Noise ratio • Drift • Low Power • High Power

Channel Graph

The Graph screen allows you to select a single channels, which will be your reference channel, and then compare and fine-tune the remaining channels based on the reference channel's values.

To use the Graph screen:

1. Select **Reference Channel** and enter a channel that appears in the table above the graph.
2. Select **Deviation** and to set the type of deviation (power, SNR, or wavelength/frequency deviation) to monitor.
3. A bar chart appears showing the other channels' deviations compared to the reference channel.

The following appears on the Graph screen:

Function	Description
Channel Graph Table	<p>Displays a subset of channels that appear in the Channel Set graph. The following channel information appears in the table:</p> <ul style="list-style-type: none"> • Channel Number (#) • Grid: Indicates the channel value based on the frequency/wavelength table. • Frequency or Wavelength: Indicates the actual channel value in THz or nm. • Deviation: Indicates the difference between the Grid value and the frequency or wavelength value. • Channel Power • Signal-to-Noise Ratio
Reference Channel	Sets the reference channel.
Deviations	Selects a deviation based on power (dBm), SNR (dB), or wavelength/frequency deviation. The wavelength/frequency deviation is the difference between the expected channel value (Grid) and the actual channel value.
Zoom In (using cursor tracing)	<p>Increases view magnification allowing you to zoom in on a specific area of the graph.</p> <p>Note: If using a remote GUI, define an area of the graph using your mouse pointer to select an area to magnify. If using a touch screen, drag your finger diagonally across the screen to zoom-in on a specific area.</p>
Zoom Out	Adjusts the graph's view by allowing you to decrease the view magnification. If using a remote GUI, a double-click will zoom out.

	<p>Note: If using a remote GUI, a double-click will zoom out. If using a touch screen, double-press using your finger to zoom out.</p>
--	---

Channel Result

The Channel Result screen displays a list of channels currently reporting alarms. When the unit is restarted, the Result table is cleared.

The following information is reported:

- C-band or L-band channel number
- Alarm type
- Alarm value

Channel Set

The Channel Settings screen allows you to select either a live graph or a snapshot and compare the channel information between the chart and the graph. The graph will handle zooming and the table will only display the subset of information displayed in the graph.

Function	Description
Channel Set Table	<p>Displays a subset of channels that appear in the Channel Set graph (located along the bottom of the screen). The following channel information appears in the table:</p> <ul style="list-style-type: none"> • Channel Number (#) and Type (C-band or L-band) • Grid: Indicates the channel value based on the frequency/wavelength table. • Frequency or Wavelength: Indicates the actual channel value in THz or nm. • Deviation: Indicates the difference between the Grid value and the frequency or

	<p>wavelength value.</p> <ul style="list-style-type: none"> • Channel Power • Signal-to-Noise Ratio
First Channel	Selects a specific channel as the first channel in the range of channels displayed in the table.
Channel Count	Selects a range of channels.
Channel Spacing	<p>Sets the channel spacing for the table and graph. The following options are available:</p> <ul style="list-style-type: none"> • 50 (GHz) • 100 (GHz) • 200 (GHz)
View	Displays a list of the current (Live) or saved graphs. When selected, the data points associated with the graph appear in the graph display.
Snapshot	Saves a scan and assigns a unique 24-character label to a specific data point on the graph. A maximum of 16 snapshots can be saved.
Zoom Out	<p>Adjusts the graph's view by allowing you to decrease the view magnification. This restores the graph's view as defined by the Spectrum Set's X Unit of Measure, Center, and Span functions.</p> <p>Note: If using a remote GUI, a double-click will zoom out. If using a touch screen, double-press using your finger to zoom out.</p>
Zoom In (using cursor tracing)	<p>Increases view magnification allowing you to zoom in on a specific area of the graph.</p> <p>Note: If using a remote GUI, define an area of the graph using your mouse pointer to select an area to magnify. If using a touch screen, drag your finger diagonally across the screen to zoom-in on a specific area.</p>

Channel View

The View screen displays the following channel statistics in a large, easy-to-read format.

- Channel Number (#)
- Grid: Indicates the channel value based on the frequency/wavelength table.
- Frequency or Wavelength: Indicates the actual channel value in THz or nm.
- Deviation: Indicates the difference between the Grid value and the frequency or wavelength value.
- Channel Power
- Signal-to-Noise Ratio

OSA Test

The Test screen configures test parameters associated with a protocol processor.

The Test screen contains the following functions:

- SET 1

Action After Duration

This function defines what activities occur at the conclusion of a timed test. To determine how long a test will run, refer to the Duration function section. The following options are available.

Options	Description
None	No action occurs at the end of the test duration.
Print Current Statistics	Test results are printed to the attached printer at the end of a timed test. The timed test is not repeated.
Record Current Statistics	Test results are printed to a file at the end of a timed test. Test results appear in a columned report format.
Record Current Statistics Using a Delimiter	Test results are printed to a file at the end of a timed test. Test results appear in a quote/comma-report format, meaning that error and/or

	<p>alarm values are enclosed in quotes (") and separated by commas (,).</p>
<p>Print Statistics and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, test statistics (which are results for the Scan, Errors, Alarms, and PTR functions) are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function.</p>
<p>Record Statistics and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhhmmss.stat where,</p> <p>xx indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4).</p> <p>hhmmss indicates the current time in hours, minutes, and seconds.</p> <p>stat indicates the Statistics file extension.</p>
<p>Print Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, test events (which are a detailed summary of alarms, errors, and Pointer activity) are automatically printed to a printer, and the timed test is restarted.</p>

	<p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function</p>
<p>Record Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmss.stat.</p>
<p>Print Statistics/Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted.</p> <p>This cycle continues until the timed test is stopped by selecting Stop from the Common Function Buttons row or by changing the value of the Action After Duration function</p>
<p>Record Statistics/Events and Repeat Test</p>	<p>Note: This option appears when Repeat Actions is selected.</p> <p>Test statistics and events are printed to a file at the end of a timed test. Test results appear in a columned report format. The file name convention used is: xxhmmssE.stat (E indicates the file contains both statistics and events).</p>
<p>Print Events and Repeat Test</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>

<p>Record Events and Repeat Test</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
<p>Print and Record Events and Repeat Test</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to both the attached printer and a report file. When the test duration expires, the test restarts.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
<p>Print Events</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
<p>Record Events</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>
<p>Print and Record Events</p>	<p>Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to both the attached printer and a report file.</p> <p>Note: This option only appears on the touch screen of portable units when Realtime Actions is selected.</p>

Duration

This function configures how long a timed test runs. The following options are available:

Options	Description
Continuous	Test is untimed, and unit is always collecting data.
5 Minutes	Test runs for 5 minutes.
15 Minutes	Test runs for 15 minutes.
1 Hour	Test runs for 1 hour.
2 Hours	Test runs for 2 hours.
24 Hours	Test runs for 24 hours.
72 Hours	Test runs for 72 hours.
1 Week	Test runs for 1 week.
2 Weeks	Test runs for 2 weeks.
User Defined	Allows a specific test duration to be entered using a touch screen keypad. The minimum duration is 1 minute. The maximum duration is 99 days, 23 hours, and 59 minutes.

SET 1

The SET 1 functions determine how long a protocol processor's test runs and what activities occur at the end of the test.

The following appears on the SET 1 screen.

- **Duration**
- **Action After Duration**
- **Pause Test/Resume Test:** This button switches between pausing an active test and continuing an active test. The button's label indicates the action that will happen when it is selected.

For more information about tests, select *Start a Test* in the Common Tasks section of the online help.

20-Channel C-Band Table with 200 GHz Spacing

Channel Number	Frequency Code (THz)	Wavelength (nm)
1	196.00	1529.55
2	195.80	1531.12
3	195.60	1532.68
4	195.40	1534.25
5	195.20	1535.82
6	195.00	1537.40
7	194.80	1538.98
8	194.60	1540.56
9	194.40	1542.14
10	194.20	1543.73
11	194.00	1545.32
12	193.80	1546.92
13	193.60	1548.51
14	193.40	1550.12
15	193.20	1551.72
16	193.00	1553.33
17	192.80	1554.94
18	192.60	1556.55
19	192.40	1558.17
20	192.20	1559.79

20-Channel L-Band Table with 200 GHz Spacing

Channel Number	Frequency Code (THz)	Wavelength (nm)
1	190.90	1570.42
2	190.70	1572.06
3	190.50	1573.71
4	190.30	1575.37
5	190.10	1577.03
6	189.90	1578.69
7	189.70	1580.35

8	189.50	1582.02
9	189.30	1583.69
10	189.10	1585.36
11	188.90	1587.04
12	188.70	1588.73
13	188.50	1590.41
14	188.30	1592.10
15	188.10	1593.79
16	187.90	1595.49
17	187.70	1597.19
18	187.50	1598.89
19	187.30	1600.60
20	187.10	1602.31

40-Channel C-Band Table with 100 GHz Spacing

Channel Number	Frequency Code (THz)	Wavelength (nm)
1	196.00	1529.55
2	195.90	1530.33
3	195.80	1531.12
4	195.70	1531.90
5	195.60	1532.68
6	195.50	1533.47
7	195.40	1534.25
8	195.30	1535.04
9	195.20	1535.82
10	195.10	1536.61
11	195.00	1537.40
12	194.90	1538.19
13	194.80	1538.98
14	194.70	1539.77
15	194.60	1540.56
16	194.50	1541.35
17	194.40	1542.14
18	194.30	1542.94
19	194.20	1543.73

20	194.10	1544.53
21	194.00	1545.32
22	193.90	1546.12
23	193.80	1546.92
24	193.70	1547.72
25	193.60	1548.51
26	193.50	1549.32
27	193.40	1550.12
28	193.30	1550.92
29	193.20	1551.72
30	193.10	1552.52
31	193.00	1553.33
32	192.90	1554.13
33	192.80	1554.94
34	192.70	1555.75
35	192.60	1556.55
36	192.50	1557.36
37	192.40	1558.17
38	192.30	1558.98
39	192.20	1559.79
40	192.10	1560.61

40-Channel L-Band Table with 100 GHz Spacing

Channel Number	Frequency Code (THz)	Wavelength (nm)
1	190.90	1570.42
2	190.80	1571.24
3	190.70	1572.06
4	190.60	1572.89
5	190.50	1573.71
6	190.40	1574.54
7	190.30	1575.37
8	190.20	1576.20
9	190.10	1577.03
10	190.00	1577.86
11	189.90	1578.69

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12	189.80	1579.52
13	189.70	1580.35
14	189.60	1581.18
15	189.50	1582.02
16	189.40	1582.85
17	189.30	1583.69
18	189.20	1584.53
19	189.10	1585.36
20	189.00	1586.20
21	188.90	1587.04
22	188.80	1587.88
23	188.70	1588.73
24	188.60	1589.57
25	188.50	1590.41
26	188.40	1591.26
27	188.30	1592.10
28	188.20	1592.95
29	188.10	1593.79
30	188.00	1594.64
31	187.90	1595.49
32	187.80	1596.34
33	187.70	1597.19
34	187.60	1598.04
35	187.50	1598.89
36	187.40	1599.75
37	187.30	1600.60
38	187.20	1601.46
39	187.10	1602.31
40	187.00	1603.17

80-Channel C-Band Table with 50 GHz Spacing

Channel Number	Frequency Code (THz)	Wavelength (nm)
1	196.00	1529.55
2	195.95	1529.94
3	195.90	1530.33

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4	195.85	1530.72
5	195.80	1531.12
6	195.75	1531.31
7	195.70	1531.90
8	195.65	1532.29
9	195.60	1532.68
10	195.55	1533.07
11	195.50	1533.47
12	195.45	1533.86
13	195.40	1534.25
14	195.35	1534.64
15	195.30	1535.04
16	195.25	1535.43
17	195.20	1535.82
18	195.15	1536.22
19	195.10	1536.61
20	195.05	1537.00
21	195.00	1537.40
22	194.95	1537.79
23	194.90	1538.19
24	194.85	1538.58
25	194.80	1538.98
26	194.75	1539.37
27	194.70	1539.77
28	194.65	1540.16
29	194.60	1540.56
30	194.55	1540.95
31	194.50	1541.35
32	194.45	1541.75
33	194.40	1542.14
34	194.35	1542.54
35	194.30	1542.94
36	194.25	1543.33
37	194.20	1543.73
38	194.15	1544.13
39	194.10	1544.53

Screen and Functions Descriptions

40	194.05	1544.92
41	194.00	1545.32
42	193.95	1545.72
43	193.90	1546.12
44	193.85	1546.52
45	193.80	1546.92
46	193.75	1547.32
47	193.70	1547.72
48	193.65	1548.11
49	193.60	1548.51
50	193.55	1548.91
51	193.50	1549.32
52	193.45	1549.72
53	193.40	1550.12
54	193.35	1550.52
55	193.30	1550.92
56	193.25	1551.32
57	193.20	1551.72
58	193.15	1552.12
59	193.10	1552.52
60	193.05	1552.93
61	193.00	1553.33
62	192.95	1553.73
63	192.90	1554.13
64	192.85	1554.54
65	192.80	1554.94
66	192.75	1555.34
67	192.70	1555.75
68	192.65	1556.15
69	192.60	1556.55
70	192.55	1556.96
71	192.50	1557.36
72	192.45	1557.77
73	192.40	1558.17
74	192.35	1558.58
75	192.30	1558.98

76	192.25	1559.39
77	192.20	1559.79
78	192.15	1560.20
79	192.10	1560.61
80	192.05	1561.01

80-Channel L-Band Table with 50 GHz Spacing

Channel Number	Frequency Code (THz)	Wavelength (nm)
1	190.90	1570.42
2	190.85	1570.83
3	190.80	1571.24
4	190.75	1571.65
5	190.70	1572.06
6	190.65	1572.48
7	190.60	1572.89
8	190.55	1573.30
9	190.50	1573.71
10	190.45	1574.13
11	190.40	1574.54
12	190.35	1574.95
13	190.30	1575.37
14	190.25	1575.78
15	190.20	1576.20
16	190.15	1576.61
17	190.10	1577.03
18	190.05	1577.44
19	190.00	1577.86
20	185.95	1578.27
21	189.90	1578.69
22	189.85	1579.10
23	189.80	1579.52
24	189.75	1579.93
25	189.70	1580.35
26	189.65	1580.77

Screen and Functions Descriptions

27	189.60	1581.18
28	189.55	1581.60
29	189.50	1582.02
30	189.45	1582.44
31	189.40	1582.85
32	189.35	1583.27
33	189.30	1583.69
34	189.25	1584.11
35	189.20	1584.53
36	189.15	1584.95
37	189.10	1585.36
38	189.05	1585.78
39	189.00	1586.20
40	188.95	1586.62
41	188.90	1587.04
42	188.85	1587.46
43	188.80	1587.88
44	188.75	1588.30
45	188.70	1588.73
46	188.65	1589.15
47	188.60	1589.57
48	188.55	1589.99
49	188.50	1590.41
50	188.45	1590.83
51	188.40	1591.26
52	188.35	1591.68
53	188.30	1592.10
54	188.25	1592.52
55	188.20	1592.95
56	188.15	1593.37
57	188.10	1593.79
58	188.05	1594.22
59	188.00	1594.64
60	187.95	1595.06
61	187.90	1595.49
62	187.85	1595.91

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63	187.80	1596.34
64	187.75	1596.76
65	187.70	1597.19
66	187.65	1597.62
67	187.60	1598.04
68	187.55	1598.47
69	187.50	1598.89
70	187.45	1599.32
71	187.40	1599.75
72	187.35	1600.17
73	187.30	1600.60
74	187.25	1601.03
75	187.20	1601.46
76	187.15	1601.88
77	187.10	1602.31
78	187.05	1602.74
79	187.00	1603.17
80	186.95	1603.60

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POS Overview

This section of the online help system has topics that discuss:

- Configuring the Unit for POS Mode
- POS Specific Tasks
- POS Screen and Function Descriptions
- Troubleshooting a POS Connection

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POS Specific Tasks

Configuring for POS Mode

To configure the unit for POS operation:

1. Select a protocol processor.
2. Select **Transmit**.
3. Select **Set 1**.
4. Select **Mapping**.
5. Select **POS**.

The unit is now configured for POS operation. Select the POS tab to access POS functions.

Starting Link Negotiation


In a point-to-point network, you must first negotiate the connection before data can travel across the link.

Before negotiating a link:

- Make sure the unit is configured for POS operation.

To start link negotiation:

1. Select a protocol processor.
2. Select **POS**.
3. Select **Transmit**.
4. Select **PPP**.
5. Use the **SPE Scrambling** function to determine if bytes will be scrambled.
6. Use the **FCS Generation** function to configure error correction.
7. Select the **LCP/IPCP Connect** button to start point-to-point link negotiation. The LCP/IPCP LED is green when the link is established.

 An LCP/IPCP connection cannot be established when transmitting at the maximum bandwidth. If the connection fails to establish (the LCP/IPCP LED is red), reduce the data rate by 1 percent, and try to make the connection again. Bandwidth percentage can be changed using the **Data Rate** function located under **Gen Main**.

Maximum bandwidth (data rate) is dependent on the packet size. As a result, 100 percent bandwidth may not be available due to the packet size.

Sending POS Traffic

Once in POS mode, you can create and send POS traffic on your network.

Before generating POS traffic:

- Make sure the unit is configured for POS operation.
- Make sure a point-to-point link is established.

To generate POS traffic:

1. Select the **POS** tab.
2. Select **Transmit**.
3. Select **Gen Main**. The main generator screen appears.
4. Enter your:
 - Source IP address
 - Destination IP address
 - Source port
 - Destination port
5. Edit the POS traffic:
 - Select an IP transmit protocol.
 - Enter a packet size.
 - Select a data pattern to transmit.
 - Enter the percentage of bandwidth (**Data Rate**) that will be dedicated to POS transmission.
6. After entering a data rate, the POS traffic is transmitted from the unit.

To inject errors, refer to Inserting POS Errors.

Inserting POS Errors

Single errors can be inserted into the POS traffic. Before inserting errors, make sure:

- The unit is configured for POS operation.
- The PPP link is established.
- The POS traffic generation has been configured.

To insert errors into POS traffic:

1. Select **Transmit**.
2. Select **Error Alarm**.
3. Select **Error Type**. The **Select Error Type** window appears.
4. Select an error.
5. Select **Error Insert**. The system transmits a single error.

Receiving POS Traffic

The Receive POS functions configure the unit for the expected POS traffic. If the received signal's criteria does not match the configured receive criteria, an error is logged under the Results functions.

The following Receive functions can be monitored:

- Receiving PPP Traffic
- Filtering and Monitoring a Substream

Troubleshooting a POS Connection

Symptom: The LCP/IPCP LED is red, and an LCP/IPCP connection cannot be established.

Solution: An LCP/IPCP connection cannot be established when transmitting at maximum bandwidth. If the connection fails to establish, reduce the data rate by 1 percent, and try to make the connection again. Bandwidth percentage can be changed using the **Data Rate** function located under **Gen Main**.

Maximum bandwidth (data rate) is dependent on the packet size. As a result, 100 percent bandwidth may not be available due to the packet size.

Screen and Functions Description

POS Screen and Functions Overview

POS consists of the following components:

- POS LEDs
- POS Transmit
- POS Receive
- POS Results

POS LEDs and Quick Status Indicators

When the POS tab is selected, the following appears in the LEDs/Quick Status Area:

LED/Quick Status	Description
E/A:	Indicates error inserted and alarm generated.
LCP/IPCP (Link Control Protocol/PPP Internet Protocol Control Protocol)	Indicates current link status. <ul style="list-style-type: none">• Green: Link is up.• Red: Link is down.
FCS (Frame Check Sequence)	Flashes red when an FCS error occurs.
IPHC (Internet Protocol Header Checksum)	Flashes red when an IPH checksum error occurs.
UDPC (User Datagram Protocol Checksum)	Flashes red when a UDP checksum error occurs.
BIT	Indicates that a BIT error was detected.

POS Transmit

The POS Transmit screen contains the following functions:

- POS Transmit PPP
- POS Transmit Gen Main
- POS Transmit Error Alarm

Error Alarm

This function allows you to transmit POS errors and alarms.

The following options are available on the POS Errors and Alarms screen.

Option	Description
Error Type	Inserts an error that is transmitted by POS. The options available are BIT errors, FCS errors, and Invalid UDPs.

Gen Main

Use the Generator Main functions to configure the primary POS transmit traffic generator. These functions determine the type of traffic generated along with the source and destination link addresses.

The following appears on the Generator Main screen.

Function	Description
Source IP Address	Sets the source IP address.
Destination IP Address	Sets the destination IP address.
Source Port	Sets the source port value.
Destination Port	Sets the destination port value.
Transmit Protocol	Selects UDP protocol to use for the transmitted packets.
Packet Size	Sets the number of bytes transmitted in the packet. Values can range from 68 bytes to 1500 bytes.
Data Rate	<p>Determines the percentage of bandwidth used to transmit the traffic. Values can range from 0 percent to 100 percent of bandwidth entered in 1 percent increments.</p> <p>Note: An LCP/IPCP connection cannot be established when transmitting at maximum bandwidth. If the connection fails to establish, reduce the data rate by 1 percent, and try to make the LCP/IPCP connection again.</p> <p>Maximum bandwidth (data rate) is</p>

	dependent on the packet size. As a result, 100 percent bandwidth may not be available due to the packet size.
Pattern	<p>Selects and inserts a data pattern into the packet as data. The following options are available:</p> <ul style="list-style-type: none"> • PRBS. • User Defined. Allows a user defined pattern to be used as data.

PPP

Use the Point-to-Point Protocol (PPP) functions to set the criteria used when first negotiating a point-to-point link.

In a point-to-point link, each end of the link sends LCP packets to configure and test the data link. Refer to Starting Link Negotiation for link negotiation procedures.

The following functions appear.

Function	Description
SPE Scrambling	<p>Allows bytes to be scrambled during transmission. The SPE consists of the Path overhead bytes and the payload.</p> <ul style="list-style-type: none"> • On. Enables scrambling. • Off. Bytes are not scrambled and are transmitted normally.
FCS Generation	<p>Allows error correction using a 32-bit frame check sequence. Off disables FCS generation.</p>
LCP/IPCP Connect	<p>Starts the negotiation required to establish a connection in a point-to-point link. When selected, LCP packets are transmitted to configure</p>

	<p>and test the data link.</p> <p>Note: An LCP/IPCP connection cannot be established when transmitting at maximum bandwidth. If the connection fails to establish, reduce the data rate by 1 percent, and try to make the LCP/IPCP connection again.</p> <p>Maximum bandwidth (data rate) is dependent on the packet size. As a result, 100 percent bandwidth may not be available due to the packet size.</p>
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POS Receive

The POS Receive screen contains the following function:

- POS Receive Set 1

SET 1

Use the Set 1 functions to configure the expected parameters for the incoming POS signal. This is the criteria that will be used to check the incoming payload data.

PPP Functions	Description
SPE Descrambling	<p>Determines if the unit will descramble the received payload. For example, if the received payload is scrambled, set this function to Enable to unscramble the payload.</p> <p>The following options are available: Disable: The received payload is not descrambled. Enable: The received payload is descrambled.</p>
FCS Implementation	Determines if the unit will perform a

Screen and Functions Description

	<p>Frame Check Sequence (FCS) on the received payload and report errors.</p> <p>The following options are available: None: No error checking is performed.</p> <p>CRC-32: A 32-bit (four byte) FCS is calculated. Packets with FCS errors are reported under the Result functions if FCS errors occur.</p>
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Substream Functions	Description
Pattern	<p>Sets the expected pattern to be received in the payload data. BIT errors are reported if the received pattern is not the same as the expected pattern.</p> <p>The following patterns are available: Live: User data is received; no pattern is used.</p> <p>PRBS 2³¹-1: Configured to receive a proprietary PRBS 2³¹-1 pattern.</p> <p>User Defined: Allows the creation of a unique pattern as the expected receive pattern. The pattern can range from 1 bit to 32 bits.</p>
Destination IP Address	<p>Sets the IP address of the destination host using dotted decimal notation.</p>
Protocol	<p>Sets an expected protocol for the incoming payload. An error occurs if the incoming protocol is different from what is selected.</p> <p>UDP is the only protocol available.</p>

POS Results

All monitored activity that the system receives is reported to the Results screen. This screen provides several layers of granularity for analyzing the incoming signal, pattern, errors, and alarms.

The Result functions are:

- Scan
- Errors
- Count
- Event Log
- Large LED
- Graphs

Alarms

The system can monitor and report alarms and their duration on the incoming POS signal. The **Alarms** function lists the duration of the alarm in seconds.

The following alarms can be monitored:

- FCS
- PHC
- UDP-C
- TCP-C
- UDP
- TCP

Count

The Count screen displays the following statistics:

Count	Description
Send Frames	Reports the total number of frames sent and the duration in seconds.
Receive Frames	Reports the total number of frames received and the duration in seconds.
Receive Bytes	Reports the total number of bytes received and the duration in seconds.
PPP	Reports the following for PPP packets: <ul style="list-style-type: none">• Total number of PPP packets received and the duration in

	<p>seconds.</p> <ul style="list-style-type: none"> • Number of valid PPP packets received and the duration in seconds.
IP	<p>Reports the following for IP packets:</p> <ul style="list-style-type: none"> • Total number of IP packets received and the duration in seconds. • Number of valid IP packets received and the duration in seconds.
UDP	<p>Reports the following for UDP packets:</p> <ul style="list-style-type: none"> • Total number of UDP packets received and the duration in seconds. • Number of valid UDP packets received and the duration in seconds.

Errors

The system can monitor and report errors on the incoming POS signal. The **Errors** function provides a detailed analysis of the incoming error as described below.

The errors reported are a result of:

- Incoming errors that are generated by the POS network, or
- Errors being intentionally generated by the system when it is used in a loopback environment

The following errors can be monitored:

- **Invalid FCS (Frame Check Sequence).** An invalid FCS can be caused by a BIT error anywhere in the packet.
- **Invalid IPCP (Internet Protocol Control Protocol).** An invalid IPCP can be caused by a BIT error in the IP header.

- **Invalid UDPC (User Datagram Protocol Checksum).** An invalid UDPC can be caused by a BIT error anywhere in the UDP.
- **BIT**

The following parameters are measured for these incoming errors:

- Error count using an 11-digit format
- Average error rate using an N.NNe-N format
- Current error rate using an N.NNe-N format

Note: Error rates are calculated over the entire OC-192/STM-64 signal's bandwidth.

Event

The Event Log provides a detailed summary of POS activity that has occurred and been recorded by the unit.

The events appear in a table that lists:

- The events
- The number of events logged (count)
- The start and stop time of the event
- The duration of the event.

Events can be displayed in ascending or descending order. For more information about the Event Log, select *Using the Event Log* in the Common Tasks section of the online help.

Graphs

This function allows incoming counts and alarms to be graphed. The graphs can be saved, recalled, and printed from a history file.

For more information about graphs, select *Using Graphs* in the Common Tasks section of the online help.

Large LED

This screen displays the **POS LEDs** in a large, easy-to-read format that covers the entire touch screen area. This is useful for viewing any errors or alarms from a long distance, such as across the room from a test bay.

Scan

This function provides a quick summary of incoming errors and alarms. It is effective in identifying a general area to investigate when error or alarm activity is detected.

- For **alarms**, the duration is reported as a count in seconds.
- For **errors**, an error count is reported.
- The message **No Errors or Alarms** appears if no events are received by the unit.

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