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Test & Measurement

- sales
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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 all us for FREE!

TMG Corporate Website

TMG Products Website

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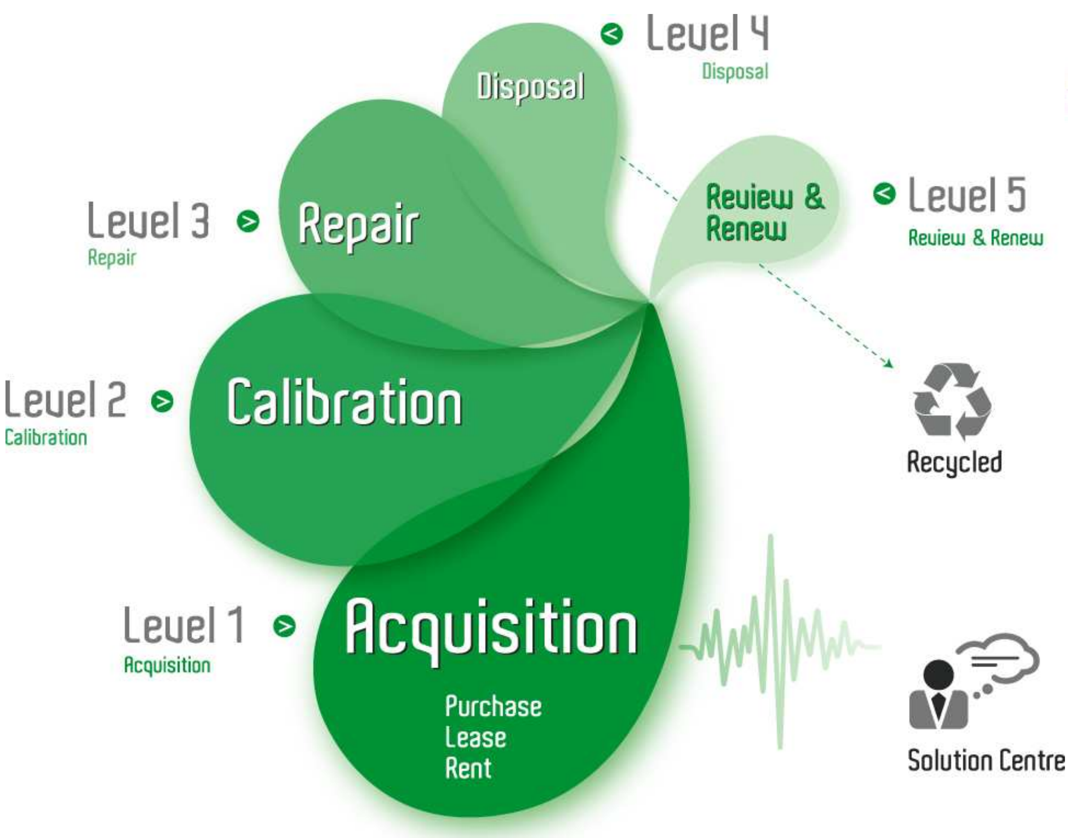

Product Lifecycle Management System

Form 080/01

NIC PLUS Online Help User's Guide

July 2003
Document No. CO 004678F – 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.

15550 Lightwave Drive – Clearwater, Florida 33760 – United States
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Table Of Contents

Introduction 1
Version Information 1
Product Overview 1
Features 2
Technical Specifications 2
Physical Characteristics 2
Auxiliary Interfaces 2
Connector Panel 3

Introduction

Welcome!

Digital Lightwave, Inc. is pleased to present the Network Information Computer (NIC) Plus 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 Plus unit? Contact our Technical Support personnel.

July 2003

Version Information

NIC Plus Online Help Document Number: CO 004678F - Version 3.2

Last updated: July 2003

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

In addition, this information is also available on the unit's rear label.

Product Overview

The NIC Plus provides a flexible solution for verifying and qualifying the performance of today's global communications networks. The unit's flexible software/firmware-based architecture combines several traditional hardware based test sets into a single platform.

The NIC Plus can be configured to offer diagnostics ranging from DS0/64K through OC-192/STM-64, including ATM and POS.

Features

The NIC Plus offers the following features and enhancements:

- Simultaneous and independent testing of SONET/SDH, T-Carrier, PDH, and ATM. Separate protocol processors for OC-3/STM-1 through OC-192/STM-64, ATM, DS1, DS3, E1, E3, and E4.
- DS1/DS3 and E1/E3 drop and insert from SONET/SDH, built in M13/E13
- OC-192.STM-64 throughmode with overhead manipulation
- OC-192/SDH-64 1310/1550 nm wavelength laser
- OC-48/SDH-16 1310/1550 nm dual wavelength laser option
- Optical spectrum analyzer (OSA) to monitor C- and L-band optical channels
- Packet over SONET/SDH (POS) for 10G and 2.5G rates
- Support for AAL0, AAL1, AAL5, traffic shaping, OAM, QoS measurements, and HEC generation
- Auto configuration to pattern level
- Dual slot PCMCIA interface for modem, GPIB, or memory storage

Technical Specifications

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

Physical Characteristics

Operating Temperature: 0° to 40° C @ 85% Relative Humidity

Storage Temperature: -20° to 60° C @ 95% Relative Humidity

Power Requirements: 100–120, 200–240 VAC, 50–60 Hz

Dimensions: 13.7" H x 13.0" W x 7.9" D (348 mm x 330 mm x 201 mm)

Weight: Approximately 20 to 25 pounds, depending on configuration.

Auxiliary Interfaces

RS-232: DB-9 male

Parallel Port: DB-25 female

USB: Universal Serial Bus. Type A female

Input/Output Trigger: SMA

10G and 2.5G Clock Out: SMA

BITS/SETS Clock: Bantam

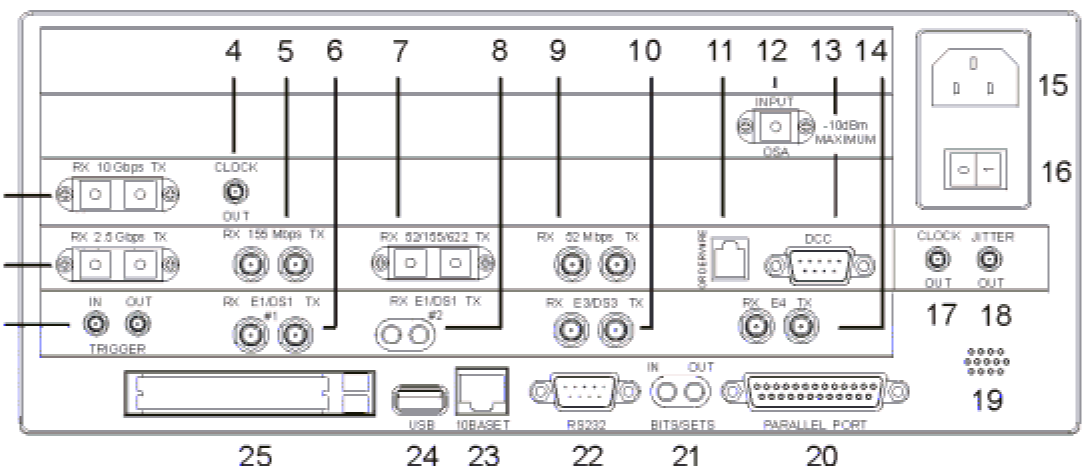
PC Card (PCMCIA): Dual-slot PC card slot that accepts two Type II cards. Approved cards are:

- Modem: None
- Flash: SanDisk 48 Mbyte Flash
- GPIB: National Instruments model number PCMCIA-GPIB.NI-488.2 for Windows NT

10BaseT: RJ45

Connector Panel

The NIC Plus 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 unit 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 unit 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	155 Mbps RX and TX	BNC connectors SONET/SDH electrical rates.
6	E1/DS1 RX and TX	BNC connectors for E1 and DS1 electrical rates.
7	52/155/622 Mbps RX and TX	Optical output and input connectors for OC-1, OC-3, OC-12, STM-0, STM-1, and STM-4 optical rates. The unit supports the following optical connectors: SC, ST, and FC.
8	E1/DS1 RX and TX	Bantam connectors for DS1 and E1 electrical rates.
9	52 Mbps RX and TX	BNC connectors for STS-1 and STM-0e signals.
10	E3/DS3 RX and TX	BNC connectors for E3 and DS3 rates.
11	Orderwire	4-pin modular handset jack (A-law and Mu-law). Not intended for direct connection to telecommunications circuits.
12	OSA Input	SC optical input connector for Optical Spectrum Analyzer operation. **Note:** To avoid damaging the unit, do not exceed the maximum input power of -10 dBm.
13	DCC	DataCom Channel. RS-449, DB-15
14	E4 RX and TX	75 ohm unbalanced BNC connectors for E4 rates.
15	Power Cord Connector	AC input connector. Accepts a 3-prong, grounded Type 13 connector.
16	Power Switch	Turns unit on or off (0=off, 1=on).

17	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.
18	Jitter Out	SMA connector for Jitter frequency measurement.
19	Speaker	Speaker for audible touch screen beeps, VF tones, and DS0 drop.
20	Parallel Port	25-pin female connector for parallel printer.
21	BITS/SETS In and Out	Bantam jacks for external timing equipment. BITS clocking supports 1.544 Mhz. SETS clocking supports 2.048 Mhz.
22	RS232	9-pin male connector for SCPI RS232 Direct and SCPI RS232 modem.
23	10BaseT	8-pin modular jack for Ethernet connection.
24	USB	Universal Serial Bus for USB product support.
25	PCMCIA (PC Card)	Dual-slot PC card slot that accepts two Type II cards. Approved cards are: • Modem: None • Flash: SanDisk 48 Mbyte Flash • GPIB: National Instruments model number PCMCIA-GPIB.NI-488.2 for Windows NT

Common Tasks and Functions Online Help

Table Of Contents

Overview 1

Getting Started 3

Screen Components 3

Technical Support 4

Standard Service Hours 4

Extended Service Hours 4

Email 4

Agency Approvals 5

Safety Guidelines for Portable Products 6

CDRH Accession Numbers 7

Safety Guidelines for Rackmount Products 8

Fiber-Optic Cleaning Procedure 9

Inspect the Ferrule End Face of a Patch Cord Connector 9

To Clean a Patch Cord Connector Using Lint-Free Tissue and Alcohol 10

Return Shipping Instructions 11

Shipping with the Original Container 11

Shipping Without the Original Container 12

Warranty and Repair 12

Limited Warranty for Equipment 12

Limited Warranty for Software and Firmware 13

Limitations of all Warranties 13

Return Policies 14

Screen Components....14
Lock Icon....15
Overview....16
Using the Lock Icon....16
Configuring the Lock on Startup....17
System Tab....17
Turning a Portable Unit On and Off....18
Common Tasks....19
Common Tasks Overview....19
Common Tasks Overview....19
Add a New User....19
Add/Drop SDH and PDH Signals....20
Specify Frames and Patterns for the Added Signal....20
Adjust Touch Screen Brightness....21
Using Alarm Beeper Status....21
Auto Config....22
Automating the Remote Control Application Icon....24
Calibration....25
Touch Screen Calibration....25
Change SONET and SDH Overhead Bytes....27
Change SDH and SONET Overhead Bytes in Passthru Mode....27
Change Tab Name....29
Chat....29

Clear History and Results....30
Communications Port Assignment....30
Configure and Assign the Ethernet Port....30
Configure and Assign the GPIB Port....32
Configure a RAS Port....32
Configure and Assign the Serial Port....33
Configure the Wireless Port....33
Configure a Protocol Mode....34
Configure and Transmit APS Commands for OC-1/3/12 or STM-0/1/4....35
Configure SONET and SDH APS Commands....36
Create a New Directory....37
Delete a User....38
Display All Test Status....38
Display History....39
Display Large LEDs....40
Display Serial Numbers and Software Revision....40
Display SDH and SONET Overhead Bytes....40
Dropping and Inserting an STM-64/16/4....41
Edit the S1 Byte....42
Enable/Disable Beep on Touch....43
Enable/Disable Security System Lock....43
Enter a License Key....43
Establish a Default Login....44

Establish a Required User Login 44
Use the Event Log 45
Delete a File 45
Download a File 46
Rename a File 46
Upload a File 47
View a File 47
    View File Details 48
FTP 48
Use Graphs 48
Increase or Decrease Speaker Volume 48
Insert Payload Patterns 49
Insert Alarms 49
Insert Errors 50
Insert Single Errors 50
Using LEDs 51
    Quick Status LEDs Color Description 51
    Large LED Tab Color Description 51
Locking/Unlocking the Screen 52
Make Pointer Adjustments 52
Frequency Calibration 53
Measure APS Activity 54
View the Incoming J0, J1, or J2 Trace 55

Monitor Incoming Errors, Alarms, or Pointer Activity 55

Monitor Signal Status 56

Monitor 57

Monitor SONET and SDH APS Commands 57

Pause/Resume a Test..58

Print a File 58

Print Report (Graph)...59

Print a Real-Time Test 59

Print Report 61

Printer Port Configuration...62

For Parallel Printing: 62

For Serial Printing: 62

Quad Port Selection 63

Re-Boot Unit...64

Replay Graphs/Stop Replay 64

Remote Control Application..64

Reset System 65

Restart an Error, Alarm, or Event 66

Restore Default Tab Names..66

Restore a Settings Configuration or Factory Defaults 67

Round-Trip Delay 67

Save a Customized Settings Configuration 68

Save Graphs 68

Screen Capture 69
SDH/SONET Signal Notification 69
Security 69
User Security Information 70
System Services and FTP Administrator 70
Set Oscillator Value 71
Set the External Clock 71
Set Time and Date 71
Start a Test 72
Start the Screen Saver 72
Stop a Test 73
Using the Switch Matrix 73
To configure the unit using the Presets button: 74
TCM 74
Turn Laser On or Off 74
Laser Safety 75
Transmit SONET and SDH APS Commands 75
Update a User Profile 76
Upgrade Software 76
View Activity of Add/Dropped Signals 77
Troubleshooting 79
Troubleshooting 79
Troubleshooting 82

Index 89

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.

1 November 02
V3.2

Getting Started

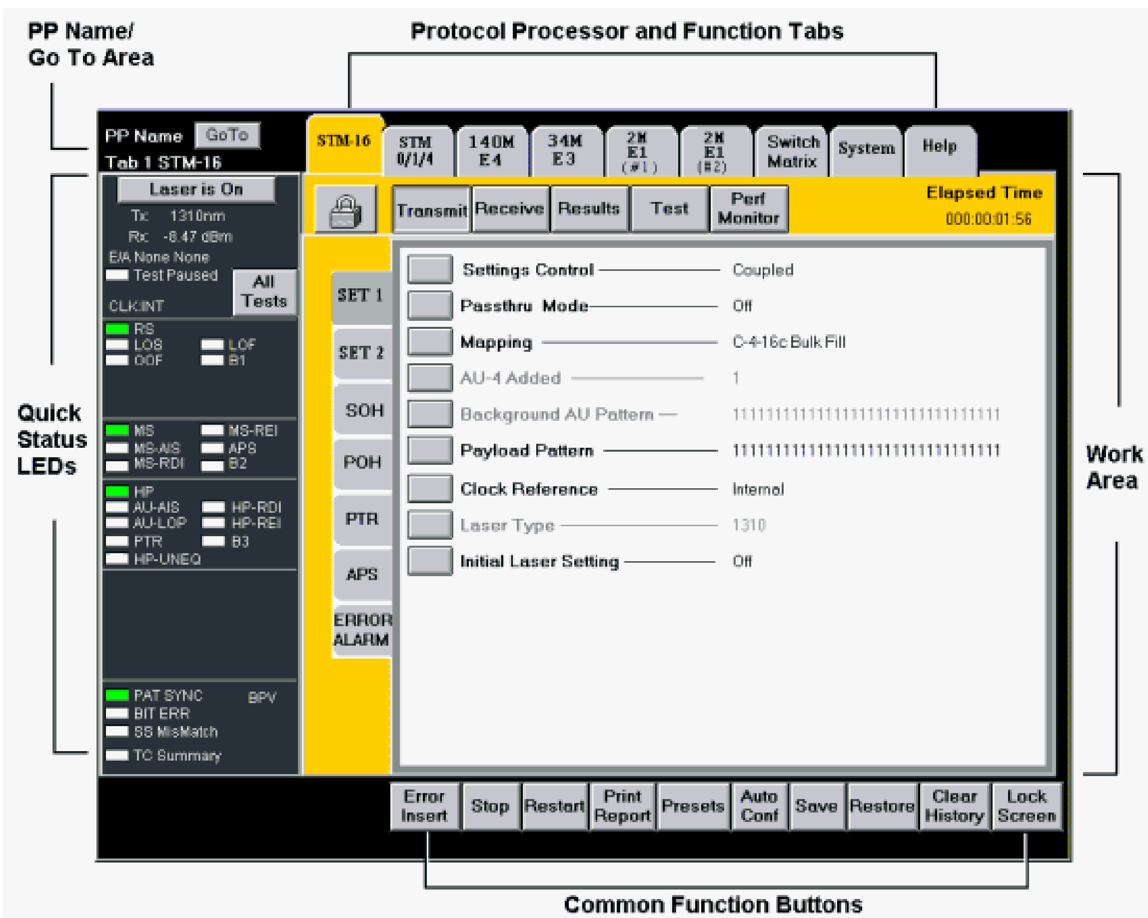
Screen Components

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 you 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

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.

<u>For NIC 2.5G and NIC 10G:</u>

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

<u>For NIC Plus:</u>

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

<u>For NAA IV:</u>

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

<u>For DCA 425:</u>

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.

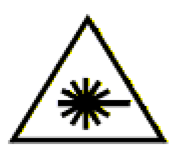
  For use outside of North America, use an HO5VV-F power cord with a 1-mm^2, two conductor plus ground, IEC 320 connector on one end, and a wall-socket plug on the other end that is certified for use in the country of installation.

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

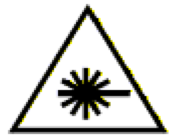
DCA 425: 9922616

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

ATTENTION

Reliable, error-free operation requires clean fiber-optic surfaces.
Inspect and clean optical fiber frequently to ensure cleanliness.

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):

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 the 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.

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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.

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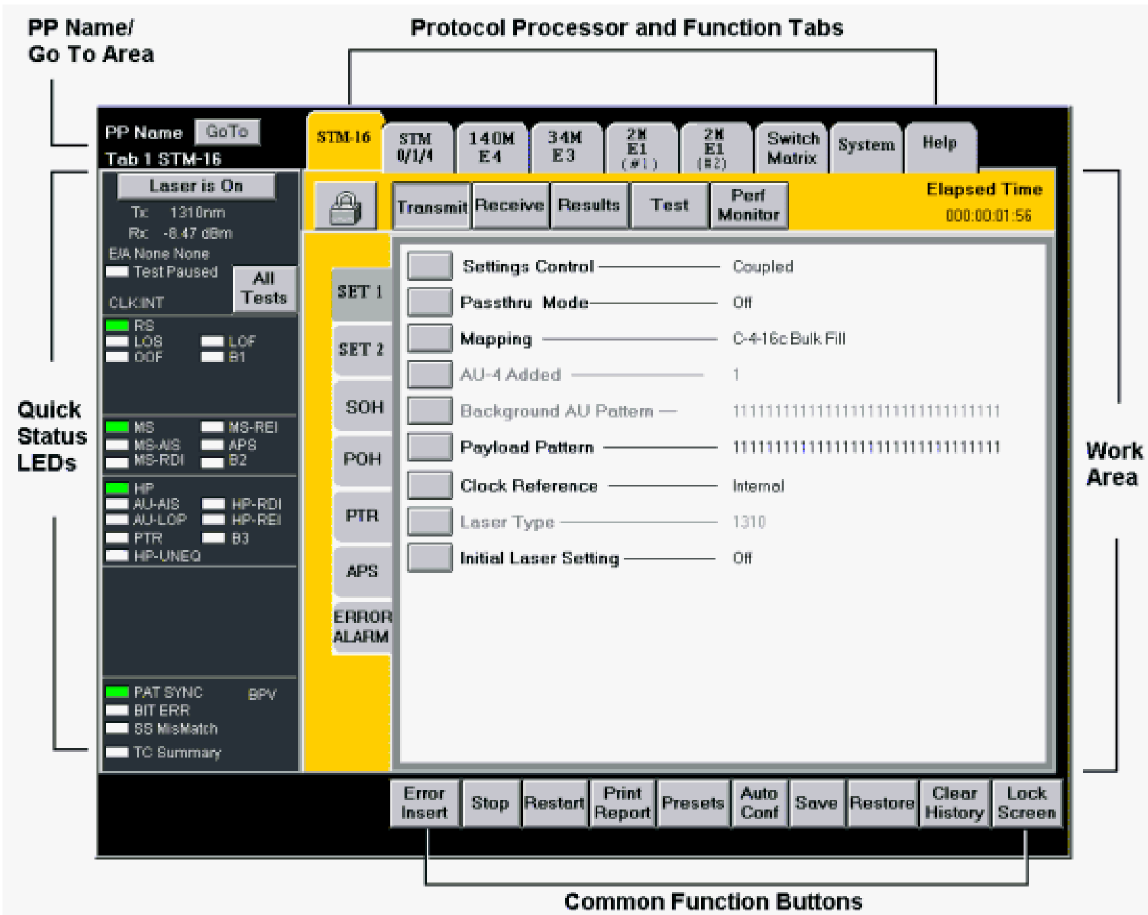
Screen Components

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 you 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

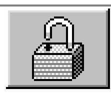
Overview

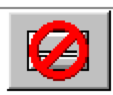
The unit's multi-user functionality allows up to four simultaneous users to be connected to a portable unit. This includes one local user, via the unit's touch screen, and three remote users using the Remote Control Application (remote GUI), SCPI commands, or TL1 commands.

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, "*User X* currently has it locked. Do you wish to force an Unlock and then Lock? Yes. No." (*User X* is the name of the current

	owner.) By selecting Yes,  now appears on my GUI. 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." (*User Y* is my user name.) Other users will see  on their GUI. **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."
	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.

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

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** (dimmest 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:

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	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. **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.
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:

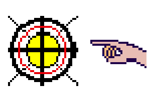
> Although touch screen calibration can be performed using your finger, a pointing device, such as a stylus, is recommended for greater accuracy.

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.

9. 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:

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.
4. In *SDH* mode, select a slot using the **SOH Slot** function.

   In *SONET* mode, select a slot using the **STS-1 Slot** function.
5. 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.

6. 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 Input 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 Illega**l 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

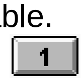
The following only applies to SDH and SONET protocol processors.

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

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

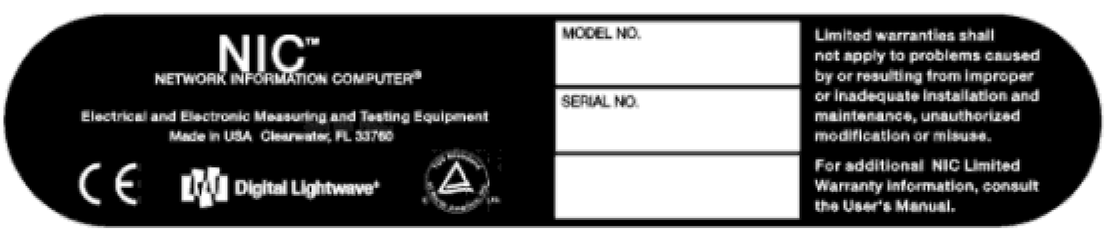
This function displays the following information:

- 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 Eqip 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 a 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.

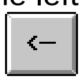
> If you do not have authorization to delete files, the **Access Denied** message appears.

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.

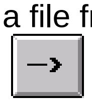
The extensions above are default file extensions. You are able change these to .txt (text) files using the **Rename** function.

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:

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:
   - Error count using an 11-digit format
   - Average error rate over the total error duration using an N.NNe-N format
   - Current error rate using an N.NNe-N format
   - Errored seconds using an 8-digit format
   - The percentage of seconds in which the error was present
   - The total number of error-free seconds using an 8-digit format
   - 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.

- 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**.

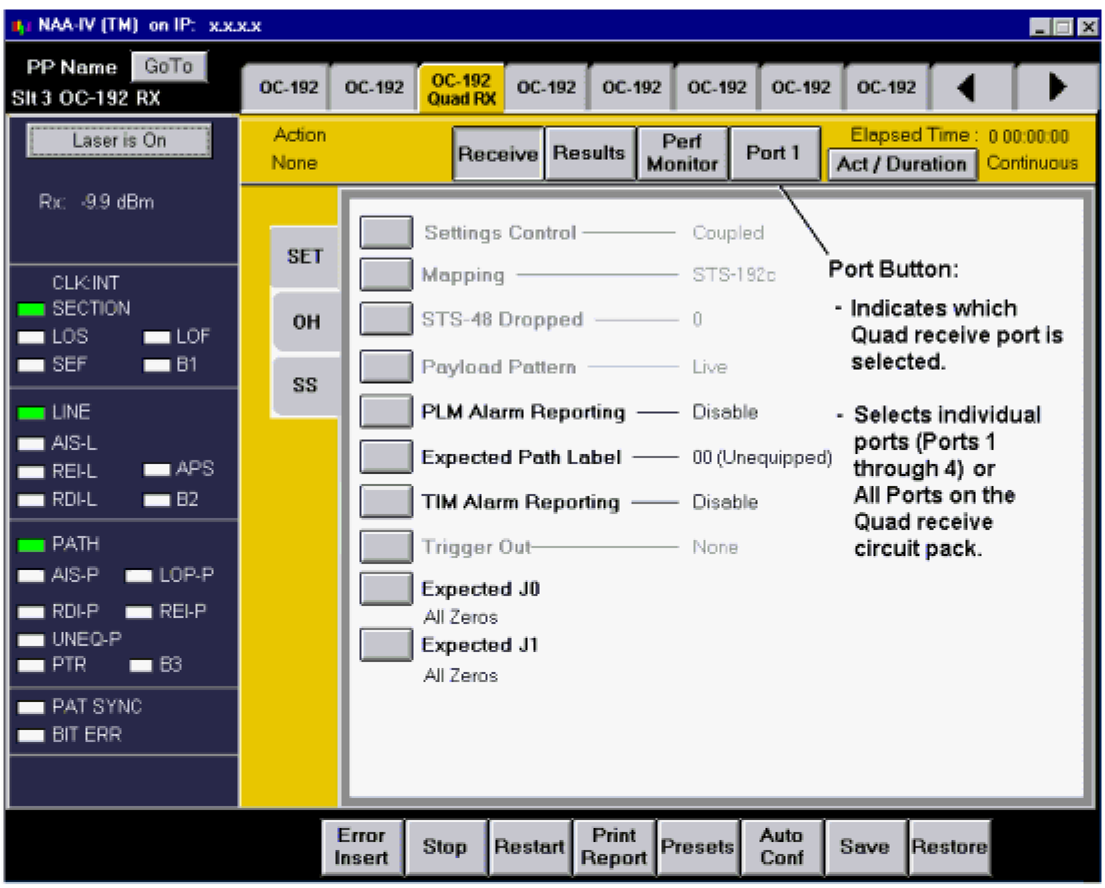
If it is necessary to change the serial port parameters:

- 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

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 activitiy 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**.

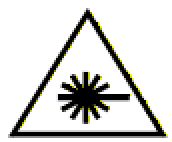
Turn Laser On or Off

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.

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.

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)	• 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

Optical	SONET B1, B2 errors appearing when locally looped.	• 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. **Note:** Attenuation is required for local loopback of OC-48/STM-16.
Optical	Loss of signal or power level low	Check for optical connector tightness and eliminate any fiber kinks or knots.
Ethernet	Device not communicating	• Ensure cable is the correct type (*Direct* if connected to a LAN, and *Crossover* 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	• 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	• 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	• 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	• 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	• 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.

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)	• 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
Optical	SONET B1, B2 errors appearing when locally looped.	• 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. **Note:** Attenuation is required for local loopback of OC-48/STM-16.
Optical	Loss of signal or power level low	Check for optical connector tightness and eliminate any fiber kinks or knots.

Ethernet	Device not communicating	• Ensure cable is the correct type (*Direct* if connected to a LAN, and *Crossover* 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	• 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	• 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	• 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	• 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	• 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.

Index

A

AC 18

Account Information 76

Act/Duration button 46, 58, 59, 72

Action After Duration 59, 72

Action menu 72

Active User 69

Add

New User 19

Add 19

Adjust Touch Screen Brightness 21

Agency Approvals 5

Alarm Beeper Status 21

Alarm button 39

Alarm Sounds 21

Alarms 39, 55, 61, 66

All Test Status 38

APS 46, 61

Auto Config 22

B

B2 .... 79, 83

C

Calibration 19, 25, 38, 43, 69, 76

CDRH Accession No 6, 74

CD-ROM 76

Chat 29

Circuit Pack Information 40

Clear History 30

Clock

Bits 71

Clock 71

Common Function Buttons 68

Common Tasks 1

Communication Ports 30

Configuring and Assigning the Ethernet Port 30

Configuring and Assigning the GPIB Port 32

Configuring and Assigning the Serial Port 33

Customer Service 79, 83

Customized Settings Configuration

Save 68

Customized Settings Configuration 68

D

D1-D3 27

D4-D12 27

Date 71

DBdsx 56

DBm 56

DEC Pointer 36, 52

Decrease Speaker Volume 48

Default button 44

Default Login

Establish 44

Default Login................................ 44

Default User 44

Delete

File 45

User 38

Delete 38

Delete 45

Digital Lightwave 6, 11, 12

Display All Test Status 38

Display History 39

Display Serial Numbers 40

Download

File 46

Download 46

DS1/DS3 34

Duration 59, 72

E

E1 .... 39, 49, 50, 55

E3 .... 39, 49, 50, 55

E4 49

Elapsed Time 72

EMC Standards 5

Error Insert button 50

Errors

Insert 50

Restart 66

select 39

Errors 39

Errors 50

Errors 55

Errors 61

Errors 66

Errors button 39

Ethernet 30, 79, 83

Ethernet Communication 30

Event Log

Use 45

Event Log.................................. 45

Events Report 61

External Clock

Set.. 71

External Clock............................ 71

F

F1 Intrude 27

Factory Defaults......................... 67

Fiber-Optic Cleaning Procedure 9

File

Delete.................................. 45

Download 46

Graphs 59

Print..................................... 58

Rename................................ 46

Upload................................. 47

View 47

File Browser......................... 59, 61

File List 37, 45, 46, 47, 58, 67

File Services ... 37, 45, 46, 47, 58, 69

FTP 46, 47

FTP Site Information 47

Functions..............................48, 71

G

GPIB...............................32, 79, 83

Graphs 39, 46, 48, 59

Graphs button 39, 48

GRP 46, 59, 64

GUI 24

H

Hardware configuration 34

Help...18

I

Intrusive Overhead button 27

IP Address............................46, 47

K

K1..61

K2..61

Kit Number 40

L

Label Preferences 29, 66

Large LEDs 30, 51

Laser button 74

Laser Safety 6, 74

LED/Quick Status.......................... 71
LEDs.......................... 30, 39, 51, 66
Lock Icon 16
Lock Screen................................. 52
Login.. 44
Loopback
  OC-48/STM-16.................... 79, 83
Loopback 79
Loopback 83

M

Make Pointer Adjustments............ 52
Map... 49
Master Configuration..................... 22
Master Electrical 22
MHZ...................................... 79, 83
Misc 79, 83
Monitor Incoming Errors................ 55
Monitor Signal Status.................... 56
Monitor Tab.................................. 57

N

N.NNe-N 39, 55
NDF 55
NDF Count................................... 39
Negative Justification 39
Negative Pulse 56
New Data Flags.......................39, 55
New Directory...............................37

O

Overhead 27

P

Parallel Port..................................62
Passthru Mode 27
Password 19, 46, 47, 76
Pause 58
PC 46, 47
PC Card 46, 47
PCMCIA 46, 47, 79, 83
PCMCIA Modem 64
PDH.......................................34, 56
Performance Monitoring................73
Periodic Maintenance......................9
Permissions...........................19, 76
Pointer
  adjusting 52
  incoming 55
Pointer...................................39, 45

Pointer 55
Pointer 61
Pointer Activity 55
Pointer Adjustments...................... 52
Pointer Justification Seconds........ 39
Port Selection 30, 32, 33, 63
Positive Justification...................... 39
Print 58, 59
Print a Real-Time Test 59
Print Report....................... 59, 61, 64
Print Screen 69
Printer Port Configuration 62
Product Serial Number.................. 40
Protocol Mode............................... 34
Protocol Processor........ 3, 14, 48, 71
PTR.. 39, 61

Q

Quad RX 63
Quick Status LEDs............ 30, 51, 74
Quick Status LEDs Color Description
.... 51

R

Real-Time Test 59
Reboot 64
Receive Settings 68
Refresh button...............................45
Remote Access 64
Remote Control 24, 61, 64
Remote GUI 24, 61, 64
Rename
File..46
Rename...46
Replay Graphs/Stop Replay..........64
Required User Login
Establish 44
Required User Login 44
Reset System 65
Restart
Error..66
Restart...51
Restart...66
Restart button....................30, 66, 73
Restore
Settings Configuration 67
Restore..67
Results
Scan 61

Results 30, 59
Results 61
Results 73
Results button 39, 45
Resume 58
Return Policies 12
Return Shipping Instructions 11
RMA 11, 12
Round-Trip Delay 67

S

S1 Byte 42
Safety Guidelines 6
Safety Standards 5
Save
  Customized Settings Configuration 68
Save 68
Save Graphs 68
Scan
  results 61
Scan 61
SCPI 30
SCPI Version 40
Screen Capture 46, 69
Screen Lock 52
Screen Print 69
Screen Saver
  Start 72
Screen Saver 72
SDH 30, 49, 56
Security 19, 38, 69, 76
Security System Lock
  enable 43
  select 43
Security System Lock 43
Security System Lock 69
Selecting a Port 63
Serial Configuration 33
Serial Port 62
Serial Printer 62
Set Date 71
Set Oscillator Value 71
Set Time 71
SETS 71, 79, 83
Settings 46, 61, 79, 83
Settings Configuration
  Restore 67

Settings Configuration 67
Shipping 11
Signal Detection 22, 69
SNMP 30
Software Upgrade System 76
SONET 30
Sounds 21
SS Bits 69
SS Mismatch LED 69
Start Screen Saver 72
Status 38
STM-16 3, 14, 39, 50, 55
STM-4 39, 50, 55
Stop 73
Switch Matrix 73
System 17, 37, 46, 47, 48, 58, 71, 79, 83
System Lock 19, 38, 76
System Services 43
System Tab 17

T

Tab 29, 66
TCM 74
Technical Support 4
Test 58, 72, 73
Time 71
TL1 30
Touch Screen 25, 79, 83
Touch Screen Components 3, 14
Transmit button 72
Transmit Clock 79, 83
TUV File No 5

U

Unavailable errored 39
Unit Serial Number 11
Unlock Touch Screen 59
Update
  User Profile 76
Update 76
Upgrade Software 76
Upload
  File 47
Upload 47
User
  Delete 38
User 38
User File 67

User ID........................ 19, 46, 47, 76

User List...................... 19, 38, 44, 76

User Login Required..................... 44

User Name.................................... 69

User Profile

  Update....................................... 76

User Profile 76

V

VAC....................................6, 79, 83

View File Details............................47

W

Warranty..12

Wireless 33

Work Area 72

OTN Online Help

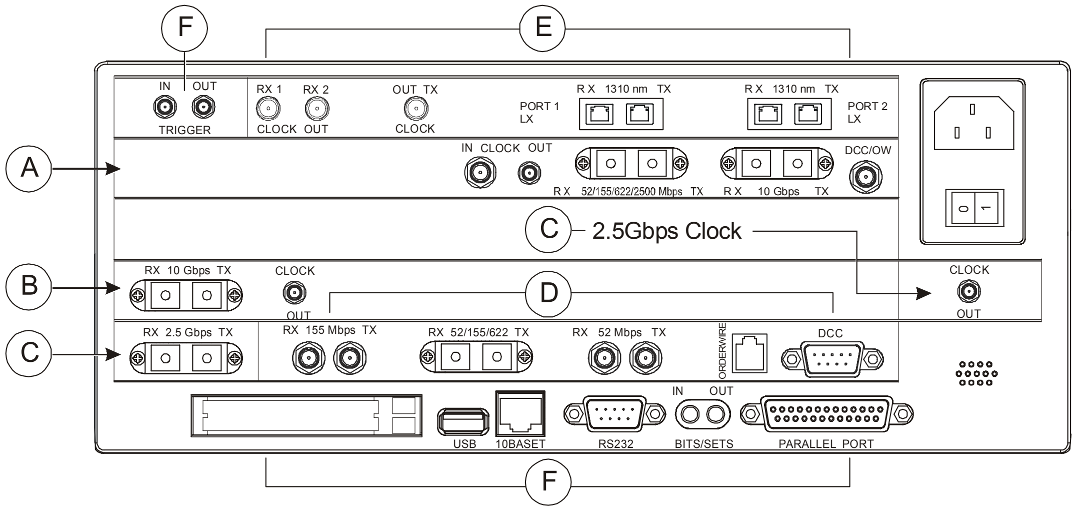
Optical Transport Network (OTN) G.709 Overview

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

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

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 **OTN**.
2. Select **TRANSMIT**.
3. Select **SET 1**.
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 **TRANSMIT**.
2. Select **SET 1**.
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).

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 OTN.
2. Select TRANSMIT.
3. Select ERRORS ALARMS.
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 OTN.
2. Select TRANSMIT.
3. Select ERRORS ALARMS.
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.

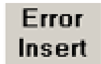
To insert errors:

1. Select OTN.
2. Select TRANSMIT.
3. Select ERRORS ALARMS.
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 TRANSMIT.
3. Select ERRORS ALARMS.
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

<u>Note</u>: **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 OTN.
2. Select RECEIVE.
3. Select OTN OH.
4. Select one of the following OTN structures: OTU, ODU-1, or TCM.
5. The incoming SAPI, DAPI, and Operator Specific traces appear at the bottom of the

screen.

> <u>NOTE</u>:
> 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 OTN.
2. Select RECEIVE.
3. Select SIG.

   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.

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.

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. *If this LED is red, select the LED text (TCM Summary) to display the LEDs for TCM1 to TCM6.*
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

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, 12^{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

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.

GigE Online Help

Table Of Contents

Gigabit Ethernet (GigE) Overview....................1

GigE Connector Panel....................3

GigE Specific Tasks....................5

Adding a Stream....................5

GigE Specific Tasks....................5

Adding a Stream....................5

Using BERT Test Mode....................5

Configuring Gigabit Ethernet for Framed Mode....................7

Deleting a Stream....................7

Frame Loss Testing....................7

Insert Stream Errors....................8

Measuring APS Activity....................9

Port Selection....................10

Rearrange Stream Control Columns....................10

Throughput Testing....................11

Throughput Test Overview....................11

Throughput Test Procedures....................11

Transmitting a Stream....................13

Screen and Function Description....................15

Gigabit Ethernet Screen and Functions Overview....................15

Gigabit Ethernet Screen and Functions Overview....................15

GigE LEDs....................15

Negotiation Button....16
GigE BERT....16
Event Log....17
Performance Monitoring Bit....17
Performance Monitoring FCS....18
BERT Test Mode....18
GigE APS....21
APS (Automatic Protection Switch) for Gigabit Ethernet....21
APS Consecutive Bad Time and Consecutive Good Time....22
GigE RFC 2544....22
Frame Loss....22
Graph....23
RFC 2544 Thru Put....24
GigE Packet....25
Add Stream and Edit Stream Functions....25
Alarms....28
Count....29
Error Alarm....31
Error Type....31
Error Rate....32
Errors....32
Strm Ctrl....33
Strm Rslt....34

GigE Test 35

Test Duration.. 36

SET 1 36

GigE Port.. 37

Index... 39

Gigabit Ethernet (GigE) Overview

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

- GigE Specific Tasks
- GigE Screen and Function Descriptions
- GigE Negotiation Button

- GigE Connector Panel

1 December 02

GigE Connector Panel

The GigE circuit packet is a dual-port card that can be configured with the following LC-type port configurations:

- Two 1000Base LX (Long-haul) ports with 1310 nm lasers

- Two 1000Base SX (Short-haul) ports with 850 nm lasers

- One 1000Base LX port and one 1000Base SX port

GigE Specific Tasks

Adding a Stream

A total of four Ethernet streams can be created and added to the Stream Control table.

To add a stream:

1. Select a port. The current port is indicated by the **Port** button.
2. Select **Packet**. The Stream Control screen appears.
3. Select **Add Stream** from the Maintenance Functions section.
4. The Traffic Stream Profile window appears. Enter parameters for the Ethernet stream.
5. Select **Save**.
6. The Ethernet stream appears in the Stream Control table.

GigE Specific Tasks

This section includes tasks that are specific to the Gigabit Ethernet 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.

Adding a Stream

A total of four Ethernet streams can be created and added to the Stream Control table.

To add a stream:

1. Select a port. The current port is indicated by the **Port** button.
2. Select **Packet**. The Stream Control screen appears.
3. Select **Add Stream** from the Maintenance Functions section.
4. The Traffic Stream Profile window appears. Enter parameters for the Ethernet stream.
5. Select **Save**.
6. The Ethernet stream appears in the Stream Control table.

Using BERT Test Mode

To generate bit errors:

1. Select **BERT**.
2. Select **Test**.

3. Select **Activate** to start BERT mode. The message **BERT Mode is Active** appears and the Activate button toggles and becomes a Deactivate button.
4. Select **Framing** and select Framed or Unframed.
5. Select **Test Pattern** and select a pattern to generate.
6. Select **Payload Size (Bytes)** and enter a byte value ranging from 18 to 9220 bytes.
7. Select **Error Type** and select an error to generate.
8. Select **Error Rate** and select an error insertion rate. The unit starts transmitting bit errors.

When BERT mode is active, Ethernet stream transmission is disabled.

To stop bit error transmission:

- Select **Error Rate** and select **Off**.

To generate a single bit error:

1. Select **BERT**.
2. Select **Test**.
3. Select **Activate** to start BERT mode. The message **BERT Mode is Active** appears and the Activate button toggles and becomes a Deactivate button.
4. Select **Framing** and select Framed or Unframed.
5. Select **Test Pattern** and select a pattern to generate.
6. Select **Payload Size (Bytes)** and enter a byte value ranging from 18 to 9220 bytes.
7. Select **Error Type** and select an error to generate.
8. Select **Error Insert**, which appears at the bottom of the screen, to transmit one bit error.

To save and print results:

1. Select **Print**. The File Browser window appears, which allows you to name and save results to a file using the .REP extension. (The file can be saved locally on the unit, or remotely on a PC if using the Remote Control Application software.)
2. After naming the file, it can be printed directly to an attached printer or printed later using the File Service's Print function located under the System tab.

Related Topic

BERT Test

Configuring Gigabit Ethernet for Framed Mode

Framed mode is required for various Gigabit Ethernet activity.

To select Framed mode:

1. Select the **BERT** button.
2. Select the **Test** tab.
3. Select **Framing**. The Framing options appear.
4. Select **Framed**.

Deleting a Stream

To delete a stream from the Stream Control table:

1. Select a port. The current port is indicated by the **Port** button.
2. Select **Packet**. The Stream Control screen appears.
3. Select an Ethernet stream using the Stream ID selection numbers.
4. Select **Delete Stream**.
   A delete confirmation message appears.
5. Select **Yes**.
   The stream is removed from the table.

Frame Loss Testing

This is an RFC 2544 benchmark test. Its purpose is to determine the number of frames lost by looping a stream through the network at varying transmit frame rates. The Frame Loss screen allows you to select a specific frame size to use in the Ethernet stream.

> A Throughput test cannot be performed if a Frame Loss test is running.

To configure the Frame Loss test:

1. Select a port. The current port is indicated by the **Port** button.
2. Select **RFC 2544**.
3. Select **Frame Loss**.
4. Select **Trial Duration** and determine how long the test runs.
5. Select **Stream ID** and select an Ethernet stream for the test.

> If an Ethernet stream has not been defined, the Stream ID function is disabled. (**No Streams Defined** appears for the Stream ID value, and the Activate button is disabled.) Select Adding a Stream to create an Ethernet stream.

To start the Frame Loss test:

1. Select **Activate**. Once the test begins, the button toggles to Deactivate.
2. The unit transmits a stream (using a 64-byte frame size) at 10% of the maximum byte-size rate.

   A status message appears at the bottom of the screen indicating the current frame size and stream rate that is being transmitted, for example, **Processing size 64 Rate 10**. When this completes, the number of frames transmitted and the number of frames received appears in the Frame Loss table.
3. The unit transmits a stream at 20% of the maximum byte-size rate and displays results in the Frame Loss table when completed.
4. This process continues for stream rates of 30% through 100% at 10% increments.
5. After transmitting at 100 %, the entire test is repeated using a larger frame size, for example, 128, 256, 512, 10-24, 1280, and 1518 bytes.

Do **not** turn off an Ethernet stream while an RFC 2544 test is active. Turning off a stream, while the test is in progress, will disrupt test results.

To view results for a specific frame size after starting a test: :

1. Select a frame size (64, 128, 256, 512, 1024, 1280, or 1518 bytes) from the **Select Report Size** section of the screen.
2. The Frame Loss table now displays the transmit and receive statistics for the selected frame size.

The status message that appears at the bottom of the screen always indicates which frame size and stream rate is currently being transmitted and not the report statistics selected.

To save and print results:

1. Select **Print**. The File Browser window appears, which allows you to name and save results to a file using the .REP extension. (The file can be saved locally on the unit, or remotely on a PC if using the Remote Control Application software.)
2. After naming the file, it can be printed directly to an attached printer or printed later using the File Service's Print function located under the System tab.

Insert Stream Errors

FCS errors can be selected and inserted into an Ethernet stream. One reason for transmitting errors is to determine if the receiving equipment can detect an error in the incoming signal.

To insert multiple errors:

1. Select a port. The current port is indicated by the **Port** button.
2. Select **Packet**. The Stream Control screen appears.
3. Select a stream to transmit, and turn its transmission on.
4. Select **Error Alarm**. The Generate functions appear.
5. Select **Error Type**. The **Select Error Type** window appears.
6. Select an error.
7. Select **Error Rate**. The **Select Error Rate** window appears.
8. Select an error rate. The unit starts transmitting errors.

To stop error transmission:

1. Select **Packet**.
2. Select **Error Alarm**.
3. Select **Error Rate**.
4. Select **None**. Error transmission stops.

To insert a single error:

1. Select a port. The current port is indicated by the **Port** button.
2. Select **Packet**. The Stream Control screen appears.
3. Select a stream to transmit, and turn its transmission on.
4. Select **Error Alarm**.
5. Select **Error Type**. The **Select Error Type** window appears.
6. Select an error.
7. Select the **Error Insert** button at the bottom of the screen to inject the error.

Measuring APS Activity

The system can measure APS switching intervals in your network by monitoring CRC errors.

To measure GigE APS activity:

1. Verify the port that you want to use. The current port is indicated by the **Port** button.
2. Select **APS**. The APS measurement screen appears.

3. Select **Consecutive Bad Time Required** and enter a time interval ranging from 0.1 milliseconds to 409.0 milliseconds. (The APS timer starts if the unit receives an error for a minimum of this duration. This is known as a bad-time event.)
4. Select **Consecutive Good Time Required** and enter a time interval ranging from 0.1 milliseconds to 409.0 milliseconds. (The APS timer stops if the unit receives an error-free duration immediately following a valid bad-time event.)
5. Select **State.** The APS options appear.
6. 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.

To stop monitoring APS measurement activity:

1. Select **State**.
2. Select **Stop APS**.

Port Selection

The Gigabit Ethernet circuit pack has two ports that operate independently.

To select a GigE port to configure or monitor:

1. Select the **Port** button.
2. The port options appear.
    - **Port 1** selects Port 1. Any subsequent changes made to the GigE unit apply to Port 1.
    - **Port 2** selects Port 2. Any subsequent changes made to the GigE unit apply to Port 2.

Rearrange Stream Control Columns

The Stream Control table can be customize so that the parameters that are most important to you can appear first in the table. This reduces the need to scroll left and right through the table to view different statistics.

To rearrange the columns that appear in the Stream Control table:

1. Select **Packet**. The Stream Control screen appears.
2. Select **Rearrange Columns**. The Rearrange Columns window appears.
3. Select **Columns**. The Select Next Column window appears.
4. Select the column that you want to appear first in the Stream Control table. It is added to the Column list.
5. Repeat Step 4 to continue adding subsequent columns to the list. Otherwise continue to the next step.

6. Select **Apply** or **Save**.

   Apply will save the column settings for the current session. If the unit is rebooted, or if factory default settings are restored, the columns will return to the default column positions.

   Save will apply and permanently save the new column settings. When a software upgrade is performed, the columns will return to the original default positions.
7. The Stream Control table columns now appear in the selected order.

Throughput Testing

This is an RFC 2544 benchmark test that calculates your network's throughput rate. The fastest throughput speed is indicated by the rate at which the transmission and reception of the Ethernet test stream is accomplished without packet loss.

The following provides a test overview and test procedures.

Throughput Test Overview

In summary, the test starts by transmitting a stream at 100 % using a frame size of 64 bytes. If it fails (i.e., an unacceptable number of frames are lost), the stream transmission rate falls back a certain percentage and is transmitted again. This process continues until the test passes without losing frames. The test then tries to zero in on the best throughput rate based on the Resolution Rate. The final rate appears as the Passing Rate.

Once this is completed, the frame size is increased to 128 bytes, and the test is repeated until a passing rate is achieved. Subsequent tests are performed using frame sizes of 256, 512, 1024, 1280, and 1518 bytes.

When performing a throughput test, you can adjust the following parameters to fine-tune your test results:

- **Trial Duration –** which determines how long the test runs for each test attempt.
- **Acceptable frame loss rate –** which defines the percentage of frames that can be lost without being considered a failure.
- **Resolution rate –** which sets the level of precision for the test. The finer the resolution, the longer it takes to complete the test.

Throughput Test Procedures

A Throughput test cannot be performed if a Frame Loss test is running.

To configure the Throughput test:

1. Verify the port that you want to use. The current port is indicated by the **Port** button.
2. Select **RFC 2544**.
3. Select **Thru Put**.
4. Select **Trial Duration** and determine how long the test runs.
5. Select **Stream ID** and select an Ethernet stream for the test.

If an Ethernet stream has not been defined, the Stream ID function is disabled. (**No Streams Defined** appears for the Stream ID value, and the Activate button is disabled.) Select Adding a Stream to create an Ethernet stream.

6. Select **Accept Loss Rate** and enter an acceptable packet loss rate ranging from 1 % to 100 %. This value serves as a threshold. The default rate is 0 %, which means that even one lost packet is a failure. The minimum rate is 1 %, the maximum rate is 100 %.
7. Select **Resolution Rate**, and enter a value ranging from 1 % to 100 %. The lower the rate, the more precise the measurement. The default rate is 1 %.

To start the Throughput test:

- Select **Activate**. Once the test begins, this button toggles to Deactivate.

  The unit first transmits a test stream (containing packets with 64-byte frames) using the configured parameters. These packets are looped through the network and returned to the unit. If no packet loss is reported, results are posted for the 64-byte frame size, and the unit transmits a stream containing packets with 128-byte frames. However, if frame loss is detected in the 64-byte transmission, the stream is retransmitted at a reduced rate. This process continues until results are within the Resolution Rate percentage.

Do **not** turn off an Ethernet stream while an RFC 2544 test is active. Turning off a stream, while the test is in progress, will disrupt test results.

To view Throughput test results:

- Throughput test results can be viewed using the results table on the **Thru Put** screen.

To stop the Throughput test:

- Select **Deactivate**.

To save and print results:

1. Select **Print**. The File Browser window appears, which allows you to name and save results to a file using the .REP extension. (The file can be saved locally on the unit, or remotely on a PC if using the Remote Control Application software.)
2. After naming the file, it can be printed directly to an attached printer or printed later using the File Service's Print function located under the System tab.

Transmitting a Stream

To start transmission of an Ethernet stream:

1. Select a port. The current port is indicated by the **Port** button.
2. Select **Packet**. The Stream Control screen appears.
3. Select an Ethernet stream using the Stream ID selection numbers.
4. Select **TX On/Off**.
5. **On** appears in the TX State column.

> When Ethernet stream transmission is enabled, BERT mode is disabled.

To stop transmission of an Ethernet stream:

- Select **TX On/Off**.
  Off appears in the TX State column.

> Do **not** turn off an Ethernet stream while an RFC 2455 test is active. Turning off a stream, while the test is in progress, will disrupt test results.

Screen and Function Description

Gigabit Ethernet Screen and Functions Overview

Gigabit Ethernet consists of the following components:

- GigE LEDs
- GigE Negotiation Button
- GigE BERT
- GigE APS
- GigE RFC 2544
- GigE Packet
- GigE Test
- GigE Port

Gigabit Ethernet Screen and Functions Overview

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- GigE LEDs
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- GigE BERT
- GigE APS
- GigE RFC 2544
- GigE Packet
- GigE Test
- GigE Port

GigE LEDs

When the GigE tab is selected, the following appears in the LEDs/Quick Status Area. (Select Negotiation Button for information about Auto-Negotiation.)

LED/Quick Status	Description
E/A:	Error/Alarm Indicator. Indicates the type of error inserted and/or alarm generated.
FCS	Frame Check Sequence. Flashes red when an FCS error occurs.
LOS	Loss of Signal. When red, indicates that a valid signal is not being received. If an all zeros pattern exists for 100 milliseconds or longer on the

	incoming signal, then an LOS is reported. This is an alarm LED.
Link State	Indicates the port's connection status. If green, the port is receiving a valid signal.
Code Err	Indicates an error (an invalid 10B code) was detected on the incoming Ethernet stream.
Pat Sync	Indicates a loss of pattern synchronization. This is an alarm LED.
BIT Err	Indicates that BERT mode detected a BIT error.

Negotiation Button

This is a toggle button (that switches between **Negotiation is Enabled** and **Negotiation is Disabled**), which turns on and off Auto-Negotiation mode.

Auto-Negotiation is an Ethernet handshaking mechanism that looks at the incoming signal and determines the link speed and the duplex mode (full-duplex or half-duplex).

When Auto-Negotiation is first enabled on the unit, it attempts to auto-negotiate the link with a remote device. After successful negotiation, Auto-Negotiation will not be performed again unless the remote device initiates an auto-negotiation sequence.

By disabling Auto-Negotiation, the unit can simulate older Ethernet equipment that does not support auto-negotiation logic.

To turn Auto-Negotiation on:

- Select the Negotiation button. The button indicates **Negotiation is Enabled**.

To turn Auto-Negotiation off:

- Select the Negotiation button. The button indicates **Negotiation is Disabled**.

GigE BERT

The BERT screen contains the following functions:

- Test
- Perf Monitoring Bit
- Perf Monitoring FCS
- Event

Event Log

The Event Log provides a detailed summary of Gigabit Ethernet alarm and error events that have occurred and have been recorded by the unit.

The events appear in a table that lists:

- The type of event.
- The number of times the event was logged.
- The start and stop time of the event.
- The duration of the event.

Performance Monitoring Bit

The Performance Monitoring Bit screen provides a detailed breakdown for BIT errors detected and logged by the GigE protocol processor.

A table reporting the following bit error measurements appears on this screen.

EB (Errored Block count)	Reports the number of blocks which have one or more bit errors. An EB is counted when errored seconds, SES, or UAS seconds occur.
BBE (Background Block Error count)	Reports the number of BIT errors reported per second. A BBE is counted when an errored second occurs. (SES seconds are not included.)
ES (Errored Seconds count)	Reports the number of errored seconds by count and percentage rate. (UAS seconds are not included.)
EFS (Error-free Seconds count)	Reports the number of error-free seconds by count and percentage rate.
SES (Severely Errored Seconds count)	Reports the number of severely errored seconds by count and percentage rate. An SES is counted for bit errors > 1e-5, or when an LOS or Link State alarm occurs.
UAS	Reports the number of unavailable

(Unavailable Seconds)	seconds by count and percentage rate. UAS seconds are counted when 10 consecutive SES seconds occur. The UAS count stops when 10 consecutive non-SES seconds occur.

Performance Monitoring FCS

The Performance Monitoring FCS (frame check sequence) screen provides a detailed breakdown for FCS errors detected and logged by the GigE protocol processor.

A table reporting the following FCS error measurements appears on this screen.

EB (Errored Block count)	Reports the number of blocks which have one or more FCS errors.
BBE (Background Block Error count)	Currently not supported.
ES (Errored Seconds count)	Reports the number of errored seconds by count and percentage rate.
EFS (Error-free Seconds count)	Reports the number of error-free seconds by count and percentage rate.
SES (Severely Errored Seconds count)	Reports the number of severely errored seconds by count and percentage rate. An SES is counted when an LOS or Link State alarm occurs.
UAS (Unavailable Seconds)	Reports the number of unavailable seconds by count and percentage rate. UAS seconds are counted when 10 consecutive SES seconds occur. The UAS count stops when 10 consecutive non-SES seconds occur.

BERT Test Mode

By design, bit errors that occur in an Ethernet frame are automatically discarded because of CRC detection. However, the unit's **BERT Test** provides a bit-error-rate tester that generates bit errors using PRBS or user-defined patterns within a frame. The unit can insert and monitor bit errors by looping this pattern through the network and back to the unit.

BERT mode can be configured to operate independently on each port.

Select Using BERT Test Mode for procedures to transmit and monitor a Bit error test.

The following appears on the BERT screen.

Function	Description
Framing	Configures the bit stream to be unframed or encapsulated in an Ethernet frame of a fixed length. Select either **Unframed** or **Framed**.
Test Pattern	Selects and transmits a pattern. • PRBS • PRBS Inverted • User Defined. Allows a fixed, 32-bit user defined pattern to be created and transmitted. • Live. Live user data is transmitted and received instead of a pattern.
Payload Size (Bytes)	Sets the size of the packet, which can range from 18 bytes to 9220 bytes.
Error Type	Enables and disables bit error generation. If **None** is selected, no errors are generated and bit error transmission is turned off. If **BIT** is selected, bit errors are generated at a rate determined by the Error Rate function. If **FCS** is selected, frame check sequence errors are generated at a rate determined by the Error Rate function.
Error Rate	Sets a bit error insertion rate that

	ranges from **1e-3** to **1e-9**. **Off.** Turns error transmission off.
MAC Source	Allows you to configure the source MAC address of the BERT traffic. This is only available for Framed mode. **Note:** This function is independent of the Packet stream source MAC address function.
MAC Destination	Allows you to configure the destination MAC address of the BERT traffic. This is only available for Framed mode. **Note:** This function is independent of the Packet stream destination MAC address function.
Sent and Received Statistics Table	This table reports the number of bits and frames sent and received. Statistics in this table are cleared when the Restart button (located at the bottom of the screen) is selected.
Error Statistics Table	Reports the following received error statistics: • Error count using an 11-digit format • Errored seconds using an 8-digit format • Average error rate using an N.NNe-N format • Current error rate using an N.NNe-N format
Activate/Deactivate Button	Starts and stops BERT mode operation.
Print	Saves BERT test results to a file using the .REP extension, and prints the file to an attached printer. **Note:** The file can be saved locally on the unit, or remotely on a PC if using the Remote Control Application software. If a printer is not attached, the file can be printed later using the

	File Services' Print function located under the System tab.

GigE APS

The APS screen contains the following:

- Test

APS (Automatic Protection Switch) for Gigabit Ethernet

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 is logged in milliseconds. 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. The APS measurement has an accuracy of 0.1 milliseconds. For APS test procedures, select Measuring GigE APS Activity.

APS Test screen functions include:

- **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 milliseconds. The results will not include the number of good milliseconds, but the time that elapsed before the first good period, meeting the event criteria, occurred.

  Single APS - Monitors for a single APS event. If the event occurs, the duration is reported and the State returns to Inactive.

  Continuous APS - Constantly monitors for APS events, and updates the Protection Switch Time durations.

  Stop APS - Stops APS monitoring. The State returns to Inactive.
- **Protection Switch Time (Seconds):** Indicates the duration in seconds that it took for the APS switch event to occur. The last, shortest, longest, and average durations are reported.
- **Consecutive Good Time Required:** Values for this function range from 0.1 milliseconds to 409.0 milliseconds.

  This is a user-defined error-free duration that immediately follows a bad-time event. When the criteria is met for both the Consecutive Bad Time

Required and Consecutive Good Time Required functions, the unit's APS timer stops.

- **Consecutive Bad Time Required:** Values for this function range from 0.1 milliseconds to 409.0 milliseconds.

  This is a time period that defines the start of the APS timer. If the unit receives an error (for example, an FCS checksum error) that lasts for at least this duration, the unit's APS timer starts.

APS Consecutive Bad Time and Consecutive Good Time

Consecutive Bad Time Required is the unit's minimum duration required for an error to be considered a valid APS event.

For example, if bad-time is configured for 200 ms, and the unit receives FCS checksum errors for at least this interval, the APS timer starts.

Consecutive Good Time Required is the error-free period that immediately occurs after a bad-time event.

For example, if good-time is configured for 30 ms, and the unit receives error-free FCS checksums for this duration, after a valid bad-time period (i.e., 200 ms), the APS timer stops. The event that caused the APS switch to occur is considered closed.

The criteria for both bad time and good time must be met for the APS timer to stop.

GigE RFC 2544

The RFC 2544 screen contains the following functions:

- Thru Put
- Frame Loss
- B2B
- Graph

Frame Loss

This is an RFC 2544 benchmark test. Its purpose is to determine the number of frames lost by looping a stream (with a specified frame size) through the network at varying transmit frame rates. Select Frame Loss Testing for test procedures.

The following appears on the RFC 2544 Frame Loss screen:

Screen Functions	**Description**
Trial Duration	Determines how long the test runs for each frame size. This duration is used each time the test fails. The default value is 240 seconds.
Stream ID	Selects an Ethernet stream to use for the test. Ethernet streams are created using the Add Stream function.
Dest Mac Address (Read only)	Displays the MAC destination address of the selected Ethernet stream. The address appears as a 6-byte HEX value.
Select Report Size	Determines which frame-size results appear in the Frame Loss table. Available frame sizes are 64, 128, 256, 512, 1024, 1280, or 1518 bytes.
Rate % Column	Indicates the percentage of bandwidth transmitted.
Transmit Frames Column	Reports the total number of frames transmitted.
Receive Frames Column	Reports the total number of frames received.
Activate/Deactivate Button	This button starts and stops the test. It toggles between Activate (when a test is not running) and Deactivate (when a test is running).
Print	Saves Frame Loss test results to a file using the .REP extension, and prints the file to an attached printer. **Note:** The file can be saved locally on the unit, or remotely on a PC if using the Remote Control Application software. If a printer is not attached, the file can be printed later using the File Services' Print function located under the System tab.

Graph

The Graph screen plots the results of the RFC 2544 screen tests as a graph. A maximum of three different graphs can appear on the screen.

RFC 2544 Thru Put

Select **Throughput Testing** for additional information describing how to use the unit's RFC 2544 functions.

The RFC 2544 Throughput and Latency benchmark tests can be performed using the functions that appear on the RFC 2544 Thru Put screen. For test procedures, select Throughput Testing.

The following describes the functions that appear on the RFC 2544 Thru Put screen:

Screen Functions	Description
Trial Duration	Determines how long the test runs for each frame size. This duration is used each time the test fails. The default is 240 seconds.
Stream ID	Selects an Ethernet stream to use for the test. Ethernet streams are created using the Add Stream function.
Dest Mac Address (Read only)	Displays the MAC destination address of the selected Ethernet stream. The address appears as a 6-byte HEX value.
Acceptable Loss Rate (Select Throughput Test Overview for more information about acceptable loss rates.)	Sets a packet loss rate threshold. The test fails if packet loss exceeds this value. The default is 0 %, which means that even one lost packet is a failure. The minimum rate is 1 %, the maximum rate is 100 %.
Resolution Rate (Select Throughput Test Overview for more information about resolution rates.)	Sets a level of precision for the test. The default resolution is 1 %. The finer the resolution (for example, 1 %), the longer it takes to complete the test. Likewise, the less precise the test (for example, 10 %), the faster, yet less accurate, the test completes.
Size Column	Indicates the transmitted test frame

	size.
Passing Rate Column	Reports the passing rate (percentage) for the specific packet size.
Transmit Packets	Reports the number of packets transmitted in the stream for the specific frame size.
Received Packets	Reports the number of packets received by the unit.
Latency Columns (Minimum, Maximum, and Average in milliseconds)	Reports how long it takes for the test frames to traverse the network and return to the unit. The values that appear are in milliseconds. **Note:** If the unit is looped on itself, the latency may appear as 0 ms.
Activate/Deactivate Button	This button starts and stops the test. It toggles between Activate (when a test is not running) and Deactivate (when a test is running).
Print	Saves Throughput test results to a file using the .REP extension, and prints the file to an attached printer. **Note:** The file can be saved locally on the unit, or remotely on a PC if using the Remote Control Application software. If a printer is not attached, the file can be printed later using the File Services' Print function located under the System tab.

GigE Packet

The Packet screen contains the following:

- Strm Ctrl
- Error Alarm
- Count
- Strm Rslt
- Capture

Add Stream and Edit Stream Functions

The **Add Stream** function creates a new stream for the port.
The **Edit Stream** function modifies an existing stream's profile parameters.

A stream profile defines the following frame parameters:

- Type
- Size
- Content
- Destination and source addresses

The following **Traffic Stream Profile** parameters can be configured for an Ethernet stream.

The stream protocol is set to UDP/IP by default.

Parameter	Description
Payload	Sets the type of data used for the stream's payload. The payload can be set to: • All Ones pattern • All Zeros pattern • User Defined
MAC Source Address	Sets a hardware MAC source (origination) address for generated traffic. The address is a 6-byte HEX value that is entered using a keypad.
MAC Destination Address	Sets a hardware MAC destination address. The address is a 6-byte HEX value that is entered using a keypad.
IP Source Address	Sets the IP address of the frame's original sender. The address is entered in dotted-decimal notation using a keypad.
IP Destination Address	Sets the IP address of the frame's final destination. The address is entered in dotted-decimal notation using a keypad.
UDP Source Port	Selects a UDP source port. It can be set to one of the following port

	numbers: • RJE (5) - Remote Job Entry • FTP (21) - File Transfer Protocol • Telnet (25) • SMTP (25) - Simple Mail Transfer Protocol • DSP (33) - Display Support Protocol • RLP (39) - Resource Location Protocol • DCP (93) - Device Control Protocol • X400 (103) • POP1 (109) - Post Office Protocol • POP3 (110) - Post Office Protocol • SFTP (115) - Simple File Transfer Protocol • SNMP (161) - Simple Network Management Protocol • MailQ (174) • User Defined - Dialog appears allowing you to enter a port number and description. Once added, the user defined port appears in the port number list.
UDP Destination Port	Selects a UDP destination port. It can be set to one of the following port numbers: • RJE (5) - Remote Job Entry • FTP (21) - File Transfer Protocol • Telnet (25) • SMTP (25) - Simple Mail Transfer Protocol • DSP (33) - Display Support Protocol • RLP (39) - Resource Location Protocol • DCP (93) - Device Control

	Protocol • X400 (103) • POP1 (109) - Post Office Protocol • POP3 (110) - Post Office Protocol • SFTP (115) - Simple File Transfer Protocol • SNMP (161) - Simple Network Management Protocol • MailQ (174) • User Defined - Dialog appears allowing you to enter a port number and description. Once added, the user defined port appears in the port number list.
Frame Length	Sets the frame size (bytes). The frame size is entered as a decimal value, entered using a keypad, ranging from 60 to 9220. The default value is 64 bytes.
% BW	Sets the bandwidth percentage used. This value ranges from 3 % (minimum) to 100 % (maximum). The default value is 100 %.
VLAN Tag	Enables VLAN tagging for the frame. The VLAN tag is a 4-byte tag that is inserted into the frame. When enabled, the VLAN ID and VLAN QOS parameters are available.
VLAN ID	Assigns a VLAN ID to the frame. This identifies to which VLAN the frame belongs. IDs are entered as a decimal value from 0 to 4095. (VLAN tagging must be enabled to use this parameter.)
VLAN QOS	Sets the user priority level. Levels range from 0 to 7.
Save	Saves the current stream profile.
Exit	Closes the stream profile window.

Alarms

The unit can monitor and report alarms and durations on the incoming signal. An alarm's duration appears in seconds.

The following alarms can be monitored:

- LOS (Loss of Signal)
- Line Sync

Count

The Count screen displays the following Packet statistics and VLAN statistics:

Packets Count	**Description**
Transmitted Packets	Reports the total number of frames sent. The duration appears in seconds.
Transmitted Bytes	Reports the total number of bytes sent. The duration appears in seconds.
Received Packets	Reports the total number of frames received. The duration appears in seconds.
Received Bytes	Reports the total number of bytes received. The duration appears in seconds.
Pause Packets Received	Reports the total number of Pause frames received. A pause occurs when the Pause frame's time parameter is a non-zero value.
Pause Quantas Taken	Reports the total number of quantas received. A quanta is a 512-bit timing increment used by a Pause frame. The number of quanta (N x 512-bits) indicate the duration of the pause.
Pause End Packets	Reports the number of times that a Pause condition ended allowing data transmission to resume. The pause condition ends when the Pause frame's time parameter is set to 0.
Pause Packets Overwrites	Reports the total number of Pause

	frame overwrites received. A Pause frame overwrite is counted if a newly received Pause frame overwrites the state of the current Pause frame.
IP Packets	Reports the following for IP packets: • Total number of IP packets received. • Number of valid IP packets received. • Total number of bytes received.
ICMP Packets	Reports the following for ICMP packets: • Total number of ICMP packets received. • Number of valid ICMP packets received. • Total number of bytes received.
TCP Packets	Reports the following for TCP packets: • Total number of TCP packets received. • Number of valid TCP packets received. • Total number of bytes received.
UDP Packets	Reports the following for UDP packets: • Total number of UDP packets received. • Number of valid UDP packets received. • Total number of bytes received.

IGMP Packets	Reports the total number of IGMP packets received.
BGP Packets	Reports the total number of BGP packets received.
OSPF Packets	Reports the total number of OSPF packets received.

VLAN Count	**Description**
VLAN Tagged Frames	Reports the total number of frames received that are identified as VLAN frames. The 4-byte VLAN tag is inserted in the Ethernet frame between the Source MAC Address field and the Length/Type field.
Quality of Service Entry # 0 – 7	Reports the number of frames received for each user priority level value. A total of 8 different counters appear in the table.

Error Alarm

This function allows you to transmit GigE errors to simulate various defects and anomalies. One reason for transmitting these defects is to determine if the receiving equipment can detect an error in the incoming signal.

The following items appear on the GigE Errors and Alarms screen.

- Error Type
- Error Rate
- Errors Button
- Alarms Button

Error Type

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 is available:

Error Type	**Description**
FCS Error	Generates a Frame Check Sequence error. The unit sends an invalid FCS to an end system. This can be used to verify that an end system can detect such an error.

Error Rate

This function sets the error rate for the selected error. (The **Error Type** function determines the type of error transmitted.) The system starts transmitting errors after the insertion rate is selected.

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

Options	**Descriptions**
Off	Turns error transmission off.
1e-*X*,	X is a value from 3 to 5; for example, 1e-3 through 1e-5. X will vary based on the type of error selected.

Errors

The unit can monitor and report a detailed analysis of errors on the incoming signal. The errors reported are a result of:

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

The following errors can be monitored:

- **Invalid CRC.**
- **Invalid IP Checksum.** An invalid IP can be caused by an error introduced in the packet by a network router or bridge.
- **Fragment Frames.** Indicates that the unit has received an undersized frame with a bad CRC checksum.

- **Undersized Frames.** Indicates that the unit has received a frame that is smaller than 64 bytes (an undersized frame) with a good CRC checksum.
- **Oversized Frames.** Indicates that the unit has received an extended (jumbo) frame that is larger than 1518 bytes.

The following parameters (statistics) 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

Strm Ctrl

The Stream Control screen defines the Ethernet frame parameters that you create to generate a traffic flow, or stream, into the network. Use the Strm Ctrl screen to view, add, delete, edit, or transmit an Ethernet stream

The following functions appear on this screen.

Function	Description
Stream Control Table	Displays the traffic profiles for the current streams configured for the port. A total of four streams can be saved for each port.
Rearrange Columns	Adjusts the order in which traffic profile values appear in the Stream Control table. This allows you to customize the table so that the parameters that are most important to you can appear first in the table. This reduces the need to scroll left and right through the table to view different statistics. Select Rearrange Columns for setup procedures.
Maintenance Functions	These buttons allow you to create, modify, and delete, stream profiles, In addition, you can transmit a single stream. **Add Stream:** Configures and saves a traffic stream. When selected, the

	stream parameters appear. **Edit Stream:** Displays stream parameters, which can be edited and saved. **Delete Stream:** Deletes the selected stream from the Stream Control table. **TX On/Off:** Starts and stops the transmission of the selected Ethernet stream from the Stream Control table.
Error Statistics Table	Reports the following received Ethernet stream error statistics: • Error count using an 11-digit format • Errored seconds using an 8-digit format • Average error rate using an N.NNe-N format • Current error rate using an N.NNe-N format
Count Statistics Table	Reports the total number of frames and bytes transmitted and received by the selected Ethernet stream.

Strm Rslt

The Stream Results screen displays statistics for a selected incoming Ethernet stream.

To select a stream:

1. Use the scroll buttons (**First**, **Prev**, **Next**, and **Last**) at the bottom of the screen to select a specific incoming stream.
2. The selected stream appears in the **Selected Stream Entry** that appears at the top of the screen.
3. The transmit and receive statistics appear below the Selected Stream Entry.

Stream Results	Description

Packets Transmitted	Indicates the number of packets transmitted by the selected stream.
Bytes Transmitted	Indicates the number of bytes transmitted and the bandwidth percentage used by the selected stream.
Packets Received	Indicates the total number of packets received by the selected stream.
Bytes Received	Indicates the total number of bytes received and the bandwidth percentage used by the selected stream.
VLAN Tagged Frames	Indicates the total number of VLAN tagged frames received in the selected stream.
Out of Sequence Packets	Indicates the number of out-of-sequence packets received. Each sent packet is marked with a sequence number. One is added to this count when a packet arrives that has a sequence number different than one plus the sequence number of the previous packet.
CRC Errors	Indicates the total number of CRC checksum errors received in the selected stream.
Lost Frames	Indicates the total number of frames lost by the selected stream.
UDP/TCP Checksum Errors	Indicates the total number of UDP or TCP checksum errors received in the selected stream.

GigE Test

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

The Test screen contains the following functions:

- Set 1

Test Duration

This function configures how long the test runs. The following options are available:

Options	Description
Continuous	Test is untimed, and the 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 Duration function appears on the SET 1 screen. It configures how long the test runs. The following options are available:

Options	Description
Continuous	Test is continuous, and the 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.

For more information about tests, select *Start a Test* in the Common Tasks section of the online help.

GigE Port

The unit supports dual Gigabit Ethernet transmit and receive ports. Use the Port button to select Port 1 or Port 2.

The following options appear:

- **Port 1.** Indicates that Port 1 is selected. Functions that appear on the screen control and configure Port 1 operations.
- **Port 2.** Indicates that Port 2 is selected. Functions that appear on the screen control and configure Port 2 operations.

Index

A

Add Stream 25

Adding a Stream 5

B

BERT Test 5

C

Configuring a Stream 5

F

Frame Loss Testing 7

G

GigE BERT 16

GigE LEDs 15

GigE Packet 25

L

LEDs 15

M

Measure GigE APS Activity 9

N

Negotiation Button 16

S

Strm Ctrl 5, 32

Strm Rslt 34

T

Thru Put 23

V

VLAN 25

OSA Online Help

Table Of Contents

OSA Overview 1

OSA Specific Tasks 3

OSA Specific Tasks...3

Autoscan 3

Comparing Graphs 3

Configuring an OSA Alarm 4

Configuring Spectrum Settings...4

Configuring Channel Settings...5

Fine-Tuning Channels 6

Overlapping Graphs 6

Snapshot and View 7

Using Zoom...7

Zoom In 8

Zoom Out..8

Viewing Broadband Power 8

Viewing Channel Power 8

Viewing Alarms (Channel Results) 9

Viewing Signal-to-Noise Ratio...9

Screen and Functions Descriptions 11

OSA Screen and Functions Overview..11

OSA Screen and Functions Overview..11

OSA Spectrum 11

Spectrum Compare 11
Spectrum Overlap 12
Spectrum Set..14
Spectrum View 16
OSA Channel 16
Channel Alarm..16
Channel Graph 17
Channel Result..19
Channel Set 19
Channel View 21
OSA Test..21
Action After Duration 21
Duration..25
SET 1 25
20-Channel C-Band Table with 200 GHz Spacing 26
20-Channel L-Band Table with 200 GHz Spacing..26
40-Channel C-Band Table with 100 GHz Spacing 27
40-Channel L-Band Table with 100 GHz Spacing..28
80-Channel C-Band Table with 50 GHz Spacing 29
80-Channel L-Band Table with 50 GHz Spacing...32
Index 35

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

2 December 02

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.

Operation	Selects graph formatting and determines how the information is displayed. • **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.
Color Choice	Selects the line color used for the operation graph.
Zoom Out	Adjusts the graph's view by allowing you to decrease the view magnification. This restores the graph's original view. **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.
Zoom In (using cursor tracing)	Increases view magnification allowing you to zoom in on a specific area of the graph. **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.

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: • **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. **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.
Zoom In (using cursor tracing)	Increases view magnification allowing you to zoom in on a specific area of the graph. **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.

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	Indicates the type of wavelength channel band currently selected. • C-Band. • L-Band. • User Defined. Sets a beginning and ending wavelength using **Start** and **Stop** to select a specific range. **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-

	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	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. **Note:**The View button can be selected after a snapshot has been saved.
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	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. **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.
Zoom In (using cursor tracing)	Increases view magnification allowing you to zoom in on a specific area of the graph.

	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.

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	Displays all channels selected that are selected for alarm monitoring. The table displays: • 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	Displays a subset of channels that appear in the Channel Set graph. The following channel information appears in the table: • 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)	Increases view magnification allowing you to zoom in on a specific area of the graph. **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.
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.

	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.

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	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: • 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

	wavelength value. • 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	Sets the channel spacing for the table and graph. The following options are available: • 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	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. **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.
Zoom In (using cursor tracing)	Increases view magnification allowing you to zoom in on a specific area of the graph. **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.

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

	alarm values are enclosed in quotes (") and separated by commas (,).
Print Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.
Print Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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.

	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
Record Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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**.
Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).
Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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

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

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

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

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

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

Index

A

Alarm Results 9

Alarm Thresholds 4, 16

Autoscan 3

C

C-Band 4, 13

Ch Pwr 8

D

Deviation 17

Drift 16

F

Fine-Tuning Channels 17

L

L-Band 4, 13

O

OSA Overview 1

P

Power Settings 4

R

Reference Channel 8

S

Snapshot 7, 13, 19

SNR 16

T

Threshold Values 16

V

View 7

W

Wavelength Settings 4

STM-64 Online Help

Table Of Contents

STM-64 Overview 1

STM-64 Specific Tasks 3

STM-64 Specific Tasks 3

Calibrate Optical Power (SDH) 3

Screen and Function Descriptions 7

STM-64 Screen and Function Descriptions Overview 7

STM-64 LEDs 7

STM-64 Transmit 10

STM-64 Transmit APS 10

STM-64 Transmit Error Alarm 11

STM-64 Transmit Overhead 11

STM-64 Transmit Pointer Generation 12

STM-64 Transmit Settings 1 13

STM-64 Transmit Settings 2 17

STM-64 Receive 19

STM-64 Receive APS 20

STM-64 Receive Overhead 20

STM-64 Receive Settings 1 21

STM-64 Receive Settings 2 25

STM-64 Receive Signal Status 28

STM-64 Results 29

APS Results 29

Alarms 29
Errors 30
Event Log 31
Graph 31
Large LEDs 31
PTR 32
Scan 32
STM-64 Test...32
Action After Duration 32
Duration..36
Protection Switch Criteria 36
APS (Automatic Protection Switch) 37
RTD (Round-Trip Delay) 38
SET 1 39
STM-64 Performance Monitoring 39
Performance Monitoring BIT 39
G.821 BIT Errors...40
G.826 BIT Errors...40
M.2101.1 BIT Errors 40
Performance Monitoring HP 41
G.826 Near B3 Errors and Far HP REI Errors 41
M.2101.1 Near B3 Errors and Far HP REI Errors 41
Performance Monitoring LP..41

G.826 Near LP BIP Errors and Far LP REI Errors....................................41
M.2101.1 Near LP BIP Errors and Far LP REI Errors................................42
Performance Monitoring MS...42
G.826 Near B2 Errors and Far MS REI Errors..42
M.2101.1 Near B2 Errors and Far MS REI Errors....................................43
Performance Monitoring RS...43
G.826 Near B1 Errors..43
Index..45

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.

2 December 02

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.

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.

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**.

	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**. • **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

	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.
AU-4-16 Added **Note:** AU-4-16 Added only appears when Mapping is set to C-4-16c Bulk.	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. • **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.
AU-4-4 Added **Note:** AU-4-4Added only appears when Mapping is set to C-4-4c Bulk.	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. • **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.

	• **None.** No foreground channel is selected.
AU-4 Added **Note:** AU-4 Added only appears when Mapping is set to C-4 Bulk.	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. • **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.
AU-3 Added **Note:** AU-3 Added only appears when Mapping is set to C-3 Bulk.	Selects one of 192 AU-3 signals as the foreground channel in the STM-64 signal. • **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.
Background AU-4-16 Pattern **Note:** Only appears when Mapping is set to C-4-16c Bulk.	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.
Background AU-4-4 Pattern **Note:** Only appears when Mapping is set to C-4-4c Bulk.	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

	bit to 32 bits and is entered using screen keypad. It can be entered in Hex, decimal, or binary format.
Background AU-4 Pattern **Note:** Only appears when Mapping is set to AU-4.	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.
Background AU-3 Pattern **Note:** Only appears when Mapping is set to AU-3	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	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.

STM-64 Transmit Settings 2

The STM-64 Transmit Settings 2 screen contains the following functions.

Functions	**Description**
Line Frequency Offset	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: **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 entered, the Confirm button on the touch screen keypad must be selected for the new offset value to be accepted.
SS Bits in H1 Label	Set to SONET (00) or SDH (10).
* HP Signal Label	Set the C2 byte to: • 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. **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.
Synchronization Status (S1)	Sets the S1 byte to: • 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 Eqip 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	Enables Tandem Connection Monitoring (TCM) transmit mode. • **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.

	If **Independent** is selected, settings established on the Receive screen will only affect Receive mode.
*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**. 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**. • **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 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. Configures the SDH transmit and receive mapping. This maps an **AU-4-64c** pattern or **AU-4-16** pattern into an STM-64 interface.
AU-4-16 Dropped **Note:** AU-4-16 Dropped only appears when Mapping is set to C-4-16c Bulk.	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. • **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.

AU-4-4 Dropped **Note:** AU-4-4 Dropped only appears when Mapping is set to C-4-4c Bulk.	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. • **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.
AU-4 Dropped **Note:** AU-4 Dropped only appears when Mapping is set to C-4 Bulk.	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. • **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.
AU-3 Dropped **Note:** AU-3 Dropped only appears when Mapping is set to C-3 Bulk.	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. • **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.
Payload Pattern	Selects the type of pattern that the unit expects to receive on the incoming SDH 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, 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	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: • **Enabled:** HP-PLM alarms are recognized and reported. • **Disabled:** HP-PLM alarms are ignored.
Expected HP Signal (C2) Label	Configure to receive a specific value for the C2 byte. The following options are available: • **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. • **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.
TIM Alarm Reporting	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: • **Enabled:** TIM alarms are recognized and reported.

	• **Disabled:** TIM alarms are ignored.
Expected J0	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).
Expected J1	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).
SS Bits Alarm Reporting	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.
Expected SS Bits	Selects one of the following as the expected SS Bits value: • 00 (SONET) • 01 (Undefined) • 10 (SDH) • 11 (Undefined)
TC Error/Alarm Processing	Enables or disables Tandem Connection Monitoring (TCM) mode. This function is used in conjunction with the **Expected TC Trace** and **TIM Alarm Reporting** functions. The TC Summary LED turns red if a TCM error or alarm is reported. Select the TC Summary text for more details. • **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	Defines the expected TC trace received on the inco9ming signal. For SONET, this is in the Z5 byte. For SDH, this is in the N1 byte. The following options are available: • **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.

<u>**Related Topics:**</u>

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 (Adminitrative 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.

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	**Note:** This option appears when **Repeat Actions** is selected. 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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.

Print Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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
Record Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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**.
Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).

Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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

Index

A

Add Drop Mapping 13, 21

C

Calibration....................................... 3

M

Mapping - 10 Gbps..................13, 21

S

STM-64 Overview............................1

STM-16 Online Help

Table Of Contents

STM-16 Overview 1

STM-16 Specific Tasks 3

STM-16 Specific Tasks 3

STM-16 Specific Tasks 3

Calibrate STM-16 Optical Power 3

Before You Begin...3

STM-16 Screen and Function Descriptions 7

Screen and Function Descriptions..7

STM-16 LEDs...7

STM-16 Transmit...11

Transmit Error Alarm 11

Error to Insert...11

Error Insert Rate 13

Alarm Generated (SDH) 14

STM-16 Transmit Overhead...17

STM-16 Transmit Pointer Generation...20

STM-16 Transmit Settings 1...21

Transmit Settings 2 23

STM-16 Receive...25

Receive APS 25

STM-16 Receive Overhead...26

STM-16 Receive Settings 1..28

STM-16 Receive Signal Status....29
STM-16 Receive Settings 2....30
STM-16 Results....35
Results APS....35
Results Alarms....35
Results Errors....36
Results Event....37
Results Graphs....37
Results Large LEDs....37
Results PTR....37
Results SCAN....38
STM-16 Test....38
Action After Duration....38
Duration....42
APS (Automatic Protection Switch)....42
RTD (Round-Trip Delay)....43
SET 1....44
Performance Monitoring....45
Performance Monitoring Bit....45
G.821 BIT Errors....45
G.826 BIT Errors....45
M.2101.1 BIT Errors....46
Perf Monitoring HP....46

G. 826 Near B3 Errors 46

G. 826 Far High Path REI Errors 47

M.2101.1 Near - B3 Errors 47

M.2101.1 Far High Path REI Errors 47

Perf Monitoring LP 48

G.826 Near LP BIP Errors and Far LP REI Errors 48

M.2101.1 Near LP BIP Errors and Far LP REI Errors 48

Perf Monitoring MS 48

G. 826 Near - B2 Errors 48

G. 826 Far Multiplex Section REI Errors 49

M.2101.1 Near B2 Errors 49

M.2101.1 Far Multiplex Section REI Errors 50

Perf Monitoring RS 50

Regenerator Section B1 Errors 50

Index 51

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.

2 December 02

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.

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

	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.
B3 Error	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.
MS-REI	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.)
HP-REI Error (Path FEBE)	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

	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

	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.
AU-LOP	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 DSn AIS alarm to its downstream equipment and an HP-RDI alarm to its upstream equipment.
MS-AIS	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).
MS-RDI	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. 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.
AU-AIS	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

	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).
HP-RDI	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. 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.
HP-UNEQ	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.
TC-RDI	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.
TC-ODI	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.
TC-AIS	Tandem Connection-Alarm Indication 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. 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	Selects a default or customized pattern to be used as the J0 trace. Select one of the following patterns: • **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:

	• **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.
TC Trace	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. **Note:** Enable TCM mode (using **TC Overhead Processing**) before sending the TC Trace.

	Select one of the following patterns: • **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	Determines the type of Pointer activity that occurs when the Inc Pointer and Dec Pointer buttons are selected. • **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.

NDF on New Pointer	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: • **Yes (On):** Generates an NDF when a new Pointer is transmitted. • **No (Off):** Disables NDF functionality.
Pointer Value	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.
Burst Count	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.
AU Frequency Type	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.
Increment/Decrement Pointer	Alternates the Pointer insertion from increment to decrement with a 200-msec delay in between.

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. • **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	Enables Tandem Connection Monitoring (TCM) transmit mode. • **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
Line Frequency Offset	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: • **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

	entered, the Confirm button on the touch screen keypad must be selected for the new offset value to be accepted.
SS Bits in H1 Label	Set to SONET (00) or SDH (10).
HP Signal Level	Set the C2 byte to: • 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. **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.
Synchronization Status (S1)	Sets the S1 byte to: • 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 Eqip 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 using the Trigger In connector. Select one of the following: • **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.

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.

AU-4 Dropped	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: • **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	Displays the Overhead bytes for a specific Regenerator Section OH slot on the incoming SDH STM-16 signal. This is a read-only function.
MSOH	Displays the Overhead bytes for a specific Multiplex Section OH slot on the incoming SDH STM-16 signal. This is a read-only function.
HPOH	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.
J0 Trace	Displays the J0 trace received on the incoming SDH signal. This is a read-only function.
J1 Trace	Displays the J1 trace received on the incoming SDH signal. This is a read-only function.
TC Trace	Displays the TC trace received on the incoming SDH signal. This is a read-only function.

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	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 SDH transmit and receive mapping. This maps an AU-4-4c pattern or AU-4-16c pattern into an STM-16 interface. **Note:** This function is not available in systems that do not contain circuit packs (cards) lower than 2.5G (STM-16/OC-48).
AU-4-4c Dropped	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: • **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.

	• **4:** Selects STM-4 #4 to transmit as the source channel. **Note:** This function is not available in systems that do not contain circuit packs (cards) lower than 2.5G (STM-16/OC-48).
Payload Pattern	Selects the type of pattern that the unit expects to receive on the incoming SDH signal. **Note:** This function is automatically coupled to its equivalent Transmit function. 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. 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.

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	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: • **Enabled:** HP-PLM alarms are recognized and reported. • **Disabled:** HP-PLM alarms are ignored.
Expected HP Label	Configure to receive a specific value for the C2 byte. The following options are available: • **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.

	• **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.
TIM Alarm Reporting	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: • **Enabled:** TIM alarms are recognized and reported. • **Disabled:** TIM alarms are ignored.
Expected J0	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

	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. • **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.
Expected J1	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

	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: • **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.
SS Bits Alarm Reporting	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.
Expected SS Bits	Selects one of the following as the expected SS Bits value: • 00 (SONET) • 01 (Undefined) • 10 (SDH) • 11 (Undefined)
TC Error/Alarm Processing	Enables or disables Tandem Connection Monitoring (TCM) mode. This function is used in conjunction with the Expected TC Trace function. The **TC Summary LED** turns red if a TCM error or alarm is reported. Select the TC Summary text for more details. • **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	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: • **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.

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.

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	**Note:** This option appears when **Repeat Actions** is selected. 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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.
Print Events and Repeat Test	**Note:** This option appears when

	Repeat Actions is selected. 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. 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
Record Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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**.
Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).
Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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

Index

A

A1 26

A2 26

AIS-L 25

AIS-P 25

APS.................................. 25, 34, 36

APS Results.................................. 34

AU Frequency Type 20

AU-4 Added 21

AU-4 Dropped 26

AU-4-16C............................... 21, 27

AU-4-4C................................. 21, 27

AU-4-4c Dropped 27

Automatic Protection Switching 25

B

B1 .... 21, 26

B2 .... 21, 26

B3 .... 21, 26

Background AU Pattern 21

Background Block Error ... 44, 45, 46, 47

BBE............................ 44, 45, 46, 47

Bit.................................... 21, 43, 44

Bits/Sets 21

Burst Count 20

C

C2.................................... 21, 26, 27

Calibrate Optical Power...................3

Calibration 3

Clock Reference............................21

CR 27

D

D1..26

D2..26

D3..26

D4-D12 26

Dec Pointer button.........................20

E

E1..26

E2..26

EB 44, 45, 46, 47

Errored Block 44, 45, 46, 47

Errored Seconds 44, 45, 46, 47

ES 44, 45, 46, 47

Expected J1 27

Expected JO 27

F

F1.. 26

F2.. 26

Far LP REI Errors 46

FF 21

Frame 21

G

G.821 Allocation............................ 44

G.821 BIT Errors........................... 44

G.826 Allocation.......... 44, 45, 46, 47

G.826 BIT Errors........................... 44

G.826 Near B1 Errors 47

G.826 Near B3 Errors 45

G.826 Near LP BIP Errors 46

Graphs button 36

H

H1 .... 20, 26

H1/H2... 20

H2 .... 20, 26

H3 26

H4 26

Higher-Order Path................... 43, 45

Higher-Order Path OH............26, 27

Higher-Order Path Overhead 26

Higher-Order Path Signal Label 27

HP Signal Level............................21

HPOH...26

I

Inc Pointer 20

Increment/Decrement....................20

Increment/Decrement Pointer 20

Intrusive Add/Drop.........................21

J

J0 ....26, 27

J0 Trace 26

J1 ....26, 27

J1 Trace 26

K

K1..26, 34

K2..26, 34

L

Laser Type 21

LEDs 36

LF...27

Line Frequency 29

Line Frequency Offset.................. 21
LOP.. 21
Lower-Order Path 46

M

Mapping 21
MSOH 26
Multiplex Section.......................... 43
Multiplex Section OH 26
Multiplex Section Overhead 26

N

NDF Count................................... 37
NDF on New Pointer 20
Negative Justification.................... 37
New Data Flag 37
New Pointer 21
NIC 2.5G..................................... 26

O

Optical Power 29
Overhead 21, 26

P

Pass-thru 21
Path 27
Payload Pattern 21, 27
Perf Monitoring HP 45
Perf Monitoring LP 46
Perf Monitoring RS 47
Performance Monitoring 43
Performance Monitoring Bit...........44
PLM Alarm Reporting 27
PLM-P 27
Pointer 20, 36, 37
Pointer Increment..........................21
Pointer Justification Seconds 37
Pointer Value................................20
Positive Justification 37
Positive Pointer Justification..........37
PPM SPE 20
PRBS 25
PRBS 15 21
PRBS 15 INV 21
PRBS 2^15-1................................27
PRBS 2^15-1 Inverted...................27
PRBS 2^23-1................................27
PRBS 2^23-1 Inverted...................27
PRBS 2^31-1................................27
PRBS 2^31-1 Inverted...................27

PRBS 21 INV 21

PRBS 23 21

Protection Switch Criteria.............. 25

Protection Switch Time 25

R

RDI-L 21

RDI-P 21

Regenerator Section 43, 47

Regenerator Section OH......... 26, 27

Regenerator Section Overhead 26

REI-L.. 21

REI-P 21

Restart, Error Insert 27

Result... 36

Results APS................................. 34

Results Event............................... 36

Results Graphs 36

Results PTR................................. 37

Results SCAN 37

RSOH 26

S

Save button.................................. 29

SDH 21, 26, 27, 29, 36

Section 27

Section Trace Identifier Mismatch .27

SEF 21, 25

SES 44, 45, 46, 47

Setting Control 21, 27

Severely Errored Seconds44, 45, 46, 47

SOH 26

SONET...21

STM...21

STM-16 .. 1, 3, 20, 26, 27, 36, 44, 45, 46, 47

STS Pointer..................................37

T

TIM 27

TIM Alarm Reporting 27

TIM-P 27

TIM-S 27

Transmit Overhead........................21

Trigger..25

Trigger In......................................21

Trigger Out 27

U

UAS............................44, 45, 46, 47

Unavailable Seconds .. 44, 45, 46, 47
Unequipped 21
Update Signal Calibration 29

V

Valid Pointers................................ 37
Value.. 27
Virtual Container 20

Z

Z0 26
Z1 26
Z2 26
Z3 26
Z4 26
Z5 26

STM-4 Online Help

Table Of Contents

STM-0/1/4 1

SDH Technical Specifications 3

STM-0/1/4 Specific Tasks 7

STM-0/1/4 Specific Tasks 7

Add a DCC Channel 7

Calibrate STM-0/1/4 or OC-1/3/12 Optical Power 7

Before You Begin 7

Procedures 8

Change STM-0/1/4 Section Overhead 8

Change STM-0/1/4 Path Overhead 9

Monitor STM-0/1/4 Path Overhead 10

Monitor STM-0/1/4 Section Overhead 10

Start/Stop an STM-0/1/4 TU Scan 10

STM-0/1/4 Screen and Function Descriptions 13

STM-0/1/4 Screen and Function Descriptions 13

STM-0/1/4 Screen and Function Descriptions 13

STM-0/1/4 LEDs 13

STM-0/1/4 Transmit Screen 18

STM-0/1/4 Transmit APS 18

Transmit User Button 19

Transmit Default Button 19

Transmit Illegal Button 19

STM-0/1/4 Transmit Errors and Alarms 20
STM-0/1/4 Transmit POH 20
STM-0/1/4 Transmit PTR 22
What is a Pointer? 22
STM-0/1/4 Transmit SOH 24
STM-0/1/4 Transmit Settings 1 25
STM-0/1/4 Transmit Settings 2 (SET 2) 28
Transmit APS Linear 31
Transmit APS Ring 31
STM-0/1/4 Receive 31
STM-0/1/4 Receive Path Overhead 31
STM-0/1/4 Receive Section Overhead 32
STM-0/1/4 Receive Settings 1 33
STM-0/1/4 Receive Settings 2 36
STM-0/1/4 Receive Signal Status 38
Channel 1 38
Channel 2 38
STM-0/1/4 Results 38
Receive DCC Mon 39
STM-0/1/4 Results Alarms 40
STM-0/1/4 Results Errors 41
STM-0/1/4 Results Event Log 41
STM-4 Results Graphs 42

STM-0/1/4 Results PTR 42

STM-0/1/4 Results Scan 42

STM-0/1/4 Test..43

Action After Duration 43

Duration..46

Protection Switch Criteria 47

STM-0/1/4 Receive TU Scan...48

APS (Automatic Protection Switch) 48

RTD (Round-Trip Delay) 49

SET 1 50

STM-0/1/4 Performance Monitoring 50

Performance Monitoring Bit...51

G.821 BIT Errors...51

G.826 BIT Errors...51

M.2101.1 BIT Errors 51

Perf Monitoring HP 52

G.826 Near B3 Errors and Far HP REI Errors 52

M.2101.1 Near B3 Errors and Far HP REI Errors.................................52

Perf Monitoring LP...52

G.826 Near LP BIP Errors and Far LP REI Errors...............................53

M.2101.1 Near LP BIP Errors and Far LP REI Errors..........................53

Perf Monitoring MS..53

G.826 Near B2 Errors and Far MS REI Errors.....................................53

M.2101.1 Near B2 Errors and Far MS REI Errors..54
Perf Monitoring RS..54
G.826 Near B1 Errors..54
Index...57

STM-0/1/4

This STM-0/1/4 section includes:

- STM-0/1/4 Specific Tasks
- STM-0/1/4 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

SDH Technical Specifications

Tech Spec	Description
SDH	STM-0, STM-1, STM-4, STM-16, STM-0e, STM-1e
Line code	**STM-0/16:** NRZ, scrambled **STM-0e:** B3ZS **STM-1e:** CMI
Mapping	**STM-16:** AU-4-16c , AU-4-4c **STM-4/1/0:** AU-4-4c, AU-4/C-4, AU-4/C-3, AU-4/C-2, AU-4/C-12, AU-4/C-11, AU-3/C-3, AU-3/C-2, AU-3/C-12, AU-3/C-11
Line Rate	**TX:** N x 51.84 MHz Stratum III-compliant, Offset capability ± 100 ppm **RX:** N x 51.84 MHz ± 50 ppm (STM-16), ± 100 ppm (up to STM-4)
Input Signal Measurement	**Optical:** Optical power meter is 0 to -26 dBm, ± 1.5dBm. **Electrical:** Peak voltage range is ± 0.31 to ± 1.2vp. **Frequency measurement range:** N x 51.84 MHz ± 50 ppm (STM-16), N x 51.84 MHz ± 100 ppm (up to STM-4)
Synchronization	Internal, received SDH signal, SETS (2.048 Mbps), BITS (1.544 Mbps)
Impedance	Electrical: 75 ohm +5% unbalanced
Level (TX) Optical	**1310:** • STM-0/1/4: -5 dBm typical, singlemode, Intermediate Reach, 1260-1360 nm, 1308 nm typical • STM-16 (optional): Long Reach-compliant

	1550: • STM-0/1/4: 0 dBm typical, singlemode, Long Reach,1480-1580 nm, 1554 nm typical • STM-16: Long Reach-compliant **Dual 1310/1550:** • Comprised of 1310 nm and 1550 nm laser options listed above and additional 1dB power reduction • Level (Rx) STM-0/1/4: -7 to -26 dBm, -30 dBm typical min @ 10-10 BER @ 2^{23} -1 PRBS; • STM-16: -2 dBm to -26 dBm typical, Long Reach-compliant
Level (TX) Electrical	STM-0e/1e: 1.03 Vp +10%
Level (Rx) Optical	-7 to -26 dBm, -30 dBm typical minimum at 10^{-10} BER with 2^{23}-1 PRBS for STM-16
Connectors	**Optical:** FC-PC, SC, ST **Electrical:** STM-0e/STM1e: BNC 75 ohm
Error Measurement	B1, B2, B3, LP-BIP, MS-REI, HP-REI, LP-REI, BPV, BIT, AU-NDF, TU-NDF.
Datacom Channel (DCC)	TX and RX: Any 8-bit value in any byte D1 to D12 PRBS* 2^7-1 normal or inverted on D1-D3 or D4-D12; DCC connector on D1-D3 or D4-D12 *PRBS per ITU-T 0.151/0.152
Alarm Detection	Clock sync, pattern sync, LOF, LOS, OOF, MS-AIS, LOP, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-UNEQ, RS-TIM, HP-TIM, HP-PLM, TU-AIS, TU-LOP, LP-RDI, LP-PLM, LP-UNEQ, LP-TIM
Alarm Generation	LOF, LOS, MS-AIS, LOP, MS-RDI, AU-AIS, AU-LOP, HP-RDI, HP-UNEQ, TU-AIS, TU-LOP, LP-RDI, LP-PLM, LP-

	UNEQ, LP-TIM
Patterns	**C4-16c, AU-4-4c, C-4, PRBS* (normal & inverted):** 2^{31}-1, 2^{23}-1, 2^{20}-1, 2^{15}-1, any 32-bit user pattern **C-3, C-2, C-12, C-11: PRBS (normal & inverted):** 2^{23}-1, 2^{20}-1, 2^{15}-1, 2^{9}-1, any 32-bit user pattern *PRBS per ITU-T 0.151/0.152.
APS Commands	Support of linear- and ring-mode commands for K1/K2 bytes (G.841)
Pointer Control	**AU:** New value, single adjustments (increment or decrement), burst 2-8 adjustments, increment-decrement, decrement-increment, NDF control, AU frequency, Offset: ± 100 ppm **TU:** New value, single adjustments (increment or decrement), NDF control, TU frequency offset is ± 100 ppm.
Control and Monitoring	**Overhead:** • Transmit and receive any 8-bit pattern in all slots for any overhead byte specified. • J0, J1, J2 Trace: Transmit and Receive **Section OH:** A1, A2, C1, D1-D12, E1, E2, F1, K1, K2, S1, M1 Z1, Z2 **HP OH:** C2, F2, G1, J1 (Trace), F3, K3, N1 **Receive monitor:** o Section OH: all bytes o LP OH: V5, J2 (Trace), N2, K4 **Drop & Insert (for terminated element):** E1, E3 • **Pass Through with**

	Drop/Insert: SDH E3 passthru: Drop/insert of a single E3 to/from the PDH circuit pack or E3 line interface while passing thru the other TU-3s in the signal • **SDH E1 passthru:** Drop/Insert of a single E1 for analysis while passing thru the other TU-12's in the signal • **SDH E3/E1 passthru:** Drop/insert of a single E3 for analysis while passing thru the other TU-3s in the signal
Error Injection	B1, B2, B3, LP-BIP, MS-REI, HP-REI, LP-REI, BPV, BIT
Error Injection Rate	BPV and BIT: Single, 10^{-9} to 10^{-3}, user-programmable Other errors: Single, 10^{-9} to maximum, user-programmable
Switch to Protect Measurement	Up to 125 milliseconds , 92 microseconds, resolution (STM-16 only).

STM-0/1/4 Specific Tasks

STM-0/1/4 Specific Tasks

This section includes tasks that are specific to the STM-0/1/4 protocol processor. For a list of general tasks, see Common Tasks located in the Getting Started section.

Add a DCC Channel

The system supports the addition of DCC Channels into the STM payload. Adding a DCC channel defines specific bytes in the MS and RS Section and HP and LP Path overhead that are used to send operation and maintenance information between the Section and Path equipment.

To add a DataCom Channel:

1. Select **STM-0/1/4**.
2. Select **Transmit**.
3. Select **SET**.
4. Select **DataCom Channel Added**. A window with pattern options appears.
5. Select a pattern. Options include:
    - RS PRBS 2^7-1 and RS PRBS 2^7-1 (Inv)
    - MS PRBS 2^7-1 and MS PRBS 2^7-1 (Inv)
    - RS DCC Port
    - MS DCC Port
    - None

The system will add a DataCom channel into the STM payload.

Calibrate STM-0/1/4 or OC-1/3/12 Optical Power

The following procedures describe the unit's optical power calibration. While performing this task, you will measure, record, and enter power reading input for:

- Channel 1 calibration, which includes the Zero power reading input and the optical power readings for -10 dBm and -5 dBm.
- Channel 2 calibration, which includes the Zero power reading input and the optical power readings for -30 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

Procedures

How to Calibrate Optical Power for Channel 1

How to Calibrate Optical Power for Channel 2

Change STM-0/1/4 Section Overhead

The Section Overhead (OH) function allows you to stress an STM network by directly editing the Multiplex Section (MS) and Regenerator Section OH bytes to simulate errors, alarms, and other stress conditions.

A specific slot can be selected, and its RS and MS Overhead bytes can be changed for transmission out of the system. By altering the OH bytes, this allows other STM-4 equipment to detect, and if necessary, react to these changes.

To change Section Overhead bytes:

1. Select **STM-0/1/4**.
2. Select **Transmit**.
3. Select **SOH**.
4. Select **SOH Slot** to select a slot.
5. Select an RS or MS 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. Select the **HEX** or **DEC** button on the keypad.

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

6. 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 STM-0/1/4 Path Overhead

The Path Overhead (OH) function allows you to stress an STM network by directly editing the Higher-Order and Lower-Order Path OH bytes to simulate errors, alarms, and other stress conditions.

A specific slot can be selected, and its Higher-Order and Lower-Order Overhead bytes can be changed for transmission out of the system. By altering the OH bytes, this allows other STM-4 equipment to detect, and if necessary, react to these changes.

To change Path Overhead bytes:

1. Select **STM-0/1/4**.
2. Select **Transmit**.
3. Select **POH**.
4. Select an **HP** or **LP** 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. Select the **HEX** or **DEC** button on the keypad.

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

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

Monitor STM-0/1/4 Path Overhead

The system can monitor and display the Path Overhead bytes (HP and LP OH) and the J0 and J1 Trace bytes.

The Path Overhead consists of the Higher-Order and Lower-Order Overhead bytes. You can monitor the incoming signal and view individual bytes for any of the 12 slots in the STM signal.

To view incoming path overhead bytes:

1. Select **STM-0/1/4**.
2. Select **Receive**.
3. Select **POH**. The Path Overhead bytes appear.

Monitor STM-0/1/4 Section Overhead

The system can monitor and display the Section Overhead bytes (MS and RS OH) and AU pointer.

The Section Overhead consists of the Multiplex Section and Regenerator Section bytes. You can monitor the incoming signal and view individual bytes for any of the 12 slots in the STM signal.

To view incoming path overhead bytes:

1. Select **STM-0/1/4**.
2. Select **Receive**.
3. Select **SOH**. The Section Overhead bytes appear.

Start/Stop an STM-0/1/4 TU Scan

The TU Scan function inspects and then reports the contents of the 28 foreground TUG drops that are obtained within a multiplexed STM signal.

The information reported consists of items such as the framing and pattern activity detected on each STM channel.

The protocol processor must be receiving a valid signal, otherwise, the scan aborts. While a scan is in progress, you cannot access other functions.

To start a TU scan:

1. Select the **STM-0/1/4** protocol processor tab.

2. Select **Receive**.
3. Select **TU Scan**.
4. Select **Start Scan**. Framing and pattern activity for each TU drop is displayed on the screen.

To stop the TU scan:

- Select the **Stop Scan** button.

STM-0/1/4 Screen and Function Descriptions

STM-0/1/4 Screen and Function Descriptions

The following is a list of all STM-0/1/4 function screens:

- STM-0/1/4 LEDs
- STM-0/1/4 Transmit
- STM-0/1/4 Receive
- STM-0/1/4 Results
- STM-0/1/4 Test
- STM-0/1/4 Performance Monitoring

You may also navigate through these topics using the Table of Contents located in the left pane.

STM-0/1/4 Screen and Function Descriptions

The following is a list of all STM-0/1/4 function screens:

- STM-0/1/4 LEDs
- STM-0/1/4 Transmit
- STM-0/1/4 Receive
- STM-0/1/4 Results
- STM-0/1/4 Test
- STM-0/1/4 Performance Monitoring

You may also navigate through these topics using the Table of Contents located in the left pane.

STM-0/1/4 LEDs

When the STM-0/1/4 protocol processor is selected, the following LEDs are displayed in the LEDs Quick Status Area of the touch screen.

LED	Description
Laser On/Off	Enables or disables the laser.
TX	Displays the transmit interface and laser frequency.
RX	Displays the receive interface and laser frequency.
E/A	Displays the error and/or alarm generated. "None" displays if no errors are alarms are generated.

Test Paused	Indicates if a timed test has been paused using the Action/Duration button.
RS	Regenerator Section Overhead OK. This is a status LED.
LOS	Loss of Signal. An alarm LED indicating a valid STM 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.
LOF	Loss of Frame. An alarm LED indicating that a frame alignment problem with the incoming STM-4 signal has been detected. An LOF is reported if a severely errored framing (SEF) defect continues for three milliseconds or longer.
OOF	Out of Frame. An alarm LED indicating that four consecutive frames have been received with invalid or errored framing patterns.
B1	Section Bit Interleaved Parity 8 Code Violation. An error LED indicating parity errors occurred on one of the eight parity checks when evaluated by byte 1 of the STM signal.
MS	Multiplex Section Overhead OK. This is a status LED.
MS-AIS	Multiplex Section - Alarm Indication Signal. An alarm LED Indicating 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.
MS-RDI	Multiplex Section - Remote Defect Indicator. An alarm LED indicating a signal returned to the transmitting MS Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS

	defect.
MS-REI	Multiplex Section - Remote Error Indication. An error LED indication returned to a transmitting node that an errored block has been detected at the MS receiving node.
MS-APS	Multiplex Section - Automated Protection Switching. An alarm LED indicating the K1 and K2 bytes on the incoming STM signal have changed.
B2	Multiplex Section Bit Interleaved Parity Code byte. An error LED indicating parity errors occurred on any of the 24 parity checks when evaluated by the byte B2 of the STM-4.
HP	Higher-Order Path OK. This is a status LED.
AU-AIS	Administrative Unit - Alarm Indication Signal. An alarm LED indicating 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.
AU-LOP	Administrative Unit - Loss of Pointer. An alarm LED indicating a consecutive number of invalid pointers of NDFs were received on the AU.
AU-PTR	Administrative Unit - Pointer Adjustment. An event LED indicating there was pointer movement occurring on the AU. This LED flashes red during a Pointer Adjustment event.
HP-UNEQ	Higher-Order Path - Unequipped. An alarm LED indicating an all-zeros patterns was detected in the C2 byte. This byte is received from the HP terminating equipment.
HP-RDI	Higher-Order Path - Remote Defect Indicator. An alarm LED indicating a signal was returned to the transmitting

	HP Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect.
HP-REI	Higher-Order Path - Remote Error Indication. An error LED indicating to the transmitting node that an errored block has been detected at the HP receiving node.
B3	Path Bit Interleaved Parity Code (Path BIP-8) byte. An error LED indicating that a parity code (even) was used to determine if a transmission error has occurred over a path. Its value was calculated over all the bits of the previous virtual container before scrambling and placed in the B3 byte of the current frame.
LP	Lower-Order Path OK. This is a status LED.
TU-AIS	Tributary Unit - Alarm Indication Signal. An alarm LED indicating an all-ones characteristic or adapted information signal was detected on the TU. 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. **Note:** This LED is only displayed if C-11, C-12, C-2, or AU-4 with C-3 is selected.
TU-LOP	Tributary Unit - Loss of Pointer. An alarm LED indicating a consecutive number of invalid pointers or NDFs were received on the TU. **Note:** This LED is only displayed if C-11, C-12, C-2, or AU-4 with C-3 is selected.
TU-PTR	Tributary Unit - Pointer Adjustment. An event LED indicating pointer movement is occurring on the TU. This LED flashes red during a Pointer Adjustment event. **Note:** This LED is only displayed if C-11, C-12, C-2, or AU-4 with C-3 is selected.

TU-LOM	Tributary Unit - Loss of Multiframe. An alarm LED declared when two consecutive multiframe alignment signals have been received with an error on the TU.
LP-BIP	Lower-Order Path - Bit Interleaved Parity. Indicates that an error on the LP occurred during a parity check, which involves grouping all the bits in a block into units and then performing a parity check of each bit position in the group. This is an error LED. **Note:** This LED is only displayed if C-11, C-12, C-2, or AU-4 with C-3 is selected.
LP-RDI	Lower-Order Path - Remote Defect Indicator. Indicates a signal was returned to the transmitting LP Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect. This is an alarm LED. **Note:** This LED is only displayed if C-11, C-12, C-2, or AU-4 with C-3 is selected.
LP-RFI	Lower-Order Path - Remote Failure Indicator. Indicates a defect on the LP that persisted beyond the maximum time allocated to the transmission system protection mechanisms. When this occurs, the RFI is sent to the far end and initiates a path protection switch. This is an alarm LED. **Note:** This LED is only displayed if C-11, C-12, C-2, or AU-4 with C-3 is selected.
LP-REI	Lower-Order Path - Remote Error Indication. Indicates to the transmitting node that an errored block has been detected at the LP receiving node. This is an error LED. **Note:** This LED is only displayed if C-11, C-12, C-2, or AU-4 with C-3 is selected.
LP-UNEQ	Lower-Order Path - Unequipped. Indicates that an all-zeros patterns has been detected in the C2 byte. This byte is being received from LP terminating equipment. This is an alarm LED.

	Note: This LED is only displayed if C-11, C-12, C-2, or AU-4 with C-3 is selected.
PAT SYNC	Indicates a loss of pattern synchronization. This is an alarm LED. **Note:** This LED is enabled only if the container contents selected are Bulk Filled.
Bit Err	An error LED indicating a bit error was detected in the payload. **Note:** This LED is enabled only if the container contents selected are Bulk Filled.
BPV	Bipolar Violation - An error LED indicating the presence of a Bipolar Violation error.

STM-0/1/4 Transmit Screen

This screen allows you to configure the transmit signal parameters for the STM line interface and the STM protocol processor to match the STM signal used in your test environment.

The STM-0/1/4 Transmit screen contains the following functions:

- SET 1
- SET 2
- SOH
- POH
- PTR
- APS
- Error Alarm

STM-0/1/4 Transmit APS

The Transmit APS function configures 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:

- Linear

- Ring

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 press either the Transmit User button, the Transmit Default button, or the Transmit Illegal button. The **Receive Column** displays the bit values received for the K1 and K2 bytes.

Transmit User Button

This button transmits 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 Transport Overhead function menu.

Transmit Default Button

This button transmits the default bit values (10101010) for the K1 and K2 bytes. When pressed, the default bit values appear in the Transmit column:

Command	Linear Mode Bit Value	Ring Mode Bit Value
K1 Full Byte	10101010	10101010
K1 Bits 1-4	SD-LP	SD-P
K1 Bits 5-8	#10	#10
K2 Full Byte	10101010	10101010
K2 Bits 1-4	#10	#10
K2 Bit 5 (provisioned)	1:n	LNG/OTN
K2 Bits 6-8	(010)	Br & Sw

Transmit Illegal Button

This button transmits the illegal bit values (11111111) for the K1 and K2 bytes. When pressed, the illegal bit values appear in the Transmit column:

Command	Linear Mode Bit Value	Ring Mode Bit Value
K1 Full Byte	11111111	11111111
K1 bits 1-4	LP	LP-S
K1 Bits 5-8	EXTRA	#15
K2 Full Byte	11111111	11111111
K2 Bits 1-4	EXTRA	#15
K2 Bit 5 (provisioned)	1:n	LNG/OTN
K2 Bits 6-8	AIS-L	AIS-L

STM-0/1/4 Transmit Errors and Alarms

This function allows you to enter errors and alarms.

The following options are available on the STM-0/1/4 Errors and Alarms screen.

Option	Description
Error to Insert	Inserts an error that is transmitted by the STM-0/1/4 protocol processor. The options available include: B1, B2, B3, MS-REI, HP-REI, LP-BIP, and LP-REI.
Error Insert Rate	Sets the insertion rate of the STM-0/1/4 Transmit error from 1e-3 through 1e-9. A user-defined rate is also available.
Alarm Generated	Generates a specific alarm on the transmit side of the STM-0/1/4 protocol process. The following options are available: LOS, LOF, MS-AIS, AU-LOP, RS-RDI, AU-AIS, HP-RDI, HP-UNEQ, TU-AIS, TU-LOP, TU-UNEQ, LP-RDI, LP-RFI, and None.

STM-0/1/4 Transmit POH

The STM Transmit Path Overhead consists of eight bytes that are responsible for monitoring performance and transporting the STM payload.

The system allows direct access and editing of the Higher-Order and Lower-Path Overhead bytes to simulate errors, alarms, and other stress conditions. This method of stressing the network is an alternative to using the error and alarm functions.

The following STM Path Overhead bytes can be edited.

Option	Description
B3	STS Path BIP-8. This can be an HP or LP OH byte used to generate B3 errors.
C2	STS Path Signal Label. This can be an HP or LP OH byte.
G1	Path Status. This can be an HP or LP OH byte used to generate REI-P errors.

F2	Path User Channel. This can be an HP or LP OH byte.
H4	Indicator. This can be an HP or LP OH byte.
F3	Path user channel byte. This byte is allocated for communication purposes between path elements and is payload dependent. This can be an HP or LP OH byte.
K3	Allocated for APS signalling for protection at the VC-4/3 path levels. This can be an HP or LP OH byte.
N1	Allocated to provide a Tandem Connection Monitoring function. This can be an HP or LP OH byte.
B3	Path bit interleaved parity code (Path BIP-8) byte. 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 can be an HP or LP OH byte.
Z3	Path Growth. This can be an HP or LP OH byte.
Z4	Path Growth. This can be an HP or LP OH byte.
Z5	Tandem Connection. This can be an HP or LP OH byte.
V5	Virtual Tributary Path Overhead byte. This is a LP OH byte.
N2	A LP OH byte allocated for Tandem Connection Monitoring for the VC2, VC-12, and VC-11 level.
K4	LP OH byte. Bits 1-4 are allocated for APS signalling for protection at the Lower-Order path level. Bits 5-7 are reserved for optional use. Bit 8 is reserved for future use and has no defined value.

HP Trace	Higher-Order VC-N path trace byte. This user-programmable byte repetitively transmits a 16-byte, E.64 format string plus 1 byte CRC-7. A 64 byte free format string is also permitted for this Access Point Identifier. This allows the receiving terminal in a path to verify its continued connection to the intended transmitting terminal.
LP Trace	Used to repetitively transmit a Lower-Order Access Path Identifier so that a path receiving terminal can verify its continued connection to the intended transmitter. A 16-byte frame is defined for the transmission of Path Access Point Identifiers. This 16-byte frame is identical to the 16-byte frame of the J1 and J0 bytes.

STM-0/1/4 Transmit PTR

The beginning of an STM payload is identified by a Pointer, located in the H1 and H2 Pointer bytes. A STM network can be stressed by adjusting Pointer parameters that appear on the PTR screen.

The functions associated with this screen provide a number of ways to stress the network by manipulating the SDH Pointer and payload.

What is a Pointer?

The beginning of a STM payload is identified by a Pointer. An AU Pointer is a reference marker indicating the beginning of the Virtual Container-4 (VC-4) or VC-3 virtual container in an AU-4 or AU-3. A TU Pointer provides a method of allowing flexible and dynamic alighment of VC-3 withing the TU-3 frame, independent of the actual content of the VC-3.

The components of the H1 and H2 bytes are:

- The New Data Flag (NDF), which is the first four bits of the H1 byte. These bits are used to indicate if a new Pointer is present. If a new Pointer value is present, then the NDF bits are toggled.
- The SS bits (bits 5 and 6)
- The Pointer Value, which is the last 10 bits (bits 7 through 16) that span the H1 and H2 bytes.

The following AU and TU Pointer options are available on the PTR screen.

Option	Description
NDF Flag	**Yes (On):** Generates an NDF when a new Pointer is transmitted. **No (Off):** Disables NDF functionality.
New TX Pointer Value	The New Transmit Pointer Value function provides another method for stressing an SDH network to verify if the receiving SDH equipment can detect Pointer Value changes. The AU Pointer Value indicates the offset between the H1/H2 bytes and the first byte of the Virtual Container (VC). The actual Pointer Value consists of the last 10 bits (bits 7 through 16) that span the H1 and H2 bytes. AU Pointer Values are entered using a keypad. A valid Pointer Value is a binary number ranging from 0 to 782. After entering the new value, the Pointer automatically moves to the new position.
Burst Count	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.
Frequency Offset	Frequency Offset function adjusts the rate at which AU Pointer adjustments are needed in the Administrative Unit (AU). By slowing the rate, the SDH network is forced to increment the H1 and H2 Pointer bytes. This is known as positive frequency justification. By increasing the rate, the SDH network is forced to decrement the H1 and H2 Pointer bytes. This is known as negative frequency justification.

	This type of adjustment simulates network clocks that either run fast or slow. By adjusting the rate, this forces the SDH equipment to compensate by decrementing or incrementing the H1 and H2 Pointer bytes. The AU Frequency Offset function uses a keypad to enter a frequency offset ranging from -100.0 ppm to +100.0 ppm. For STM-64, this allows a line frequency range from 9,954,275,328 Hz to 9,952,284,672 Hz. For STM-16, this allows a line frequency range from 2,488,568,832 Hz to 2,488,071,168 Hz. This function is disabled by entering 0 for the frequency offset.

The **Increment** Pointer button starts a positive Pointer adjustment movement.

The **Decrement** Pointer button starts a negative Pointer adjustment movement.

The number of adjustments generated depends on the setting of the Burst Count function, which ranges from two to eight Pointer positions.

STM-0/1/4 Transmit SOH

This function displays the Regenerator Section, Multiplex Section, Administrative Unit pointer overhead bytes, and J0 bytes that are transmitted for a selected STM. These bytes can be edited to determine if the equipment can detect problems due to any of these types of overhead errors.

The following options are available:

Option	Description
SOH Slot	Select a Section Overhead slot. If you are mapped to: • STM-1: Select 1 through 3. • STM-4: Select 1 through 12. • STM-16: Select 1 through 48.
RS	Select a Regenerator Section overhead byte. RS bytes consists of the first nine

	bytes of the SOH. RS options are: • A1, A2 • Z0 • E1 • F1 • D1, D2, D3
MS and AU Pointer	Select Multiplex Section and Administrative Unit Pointer overhead bytes. These include: H1, H2, H3, K1, K2, D4 through D12, Z1, Z2, or E2.
J0 Trace	Select Default (16 byte), All Ones, All Zeros, or User Defined.

STM-0/1/4 Transmit Settings 1

The STM-0/1/4 Transmit Settings 1 screen contains the following options:

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

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: • Off • Intrusive • Intrusive Add/Drop
*Interface	Selects the optical or electrical interface. The following options are

	available: **STM-0**, **STM-0e**, **STM-1**, **STM-1e**, and **STM-4**. If the unit is licensed for Jitter operation, the following options are also available: **STM-0 Jitter.** Sets the optical transmit interface to 51.84 Mbps. This is comparable to SONET's OC-1. **STM-1 Jitter.** Sets the optical transmit interface to 155.52 Mbps. This is comparable to SONET's OC-3. **STM-4 Jitter.** Sets the optical transmit interface to 622.08 Mbps. (Default setting for the SDH circuit pack.) This is comparable to SONET's OC-12.
Clock Reference	Determines the timing source for the STM transmit signal. The following options are available: • **Internal.** Derives the transmit data's timing source from the unit's internal clock. • **Recovered (RX Clock).** Derives the transmit timing source from the clock signal on the receive interface. If this option is selected, but a signal is not available, then this function defaults to Internal. • **BITS/SETS.** ◦ BITS: Synchronizes the transmitted signal to the BITS (Building Integrated Timing Supply) clock input, which is 1.544 MHz. If this option is selected, but BITS clocking is not available, then this function defaults to Internal.

	- SETS: Synchronizes the transmitted signal to the SETS (Synchronous Equipment Timing Source) clock input, which is 2.048 MHz. If this option is selected, but SETS clocking is not available, then this function defaults to Internal. **10.0 Mhz External.** Derives timing from an external timing source attached to the 10 MHz In Ref Clock connector. **Note:** This option only appears if the unit is configured for Jitter operation. **2.048 Mhz External.** Derives timing from an external timing source attached to the 2.048 MHz In Ref Clock connector. Note: This option only appears if the unit is configured for Jitter operation.
Line Freq Offset	Line Frequency Offset can be deactivated by setting it to "Off" or a customized amount between 100 and -100 can be entered.
DataCom Channel Added	Adds a DCC Channel into the STM payload. Select one of the following: - None - RS PRBS 2^7-1 - RS PRBS 2^7-Inv - RS DCC Port - MS PRBS 2^7-1 - MS PRBS 2^7-1 Inv

	• MS DCC Port
*Order Wire Add	Allows you to add or drop an orderwire circuit. The following options are available: • None • E1 • E2
Laser Type	Configures the type of laser used by the unit. This function is only available for units containing dual lasers. The following options are available: • 1310 nm laser • 1550 nm laser
Initial Laser Setting	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.

STM-0/1/4 Transmit Settings 2 (SET 2)

This function selects the type of STM Transmit mapping and patterns used by the STM protocol processor. Mappings include E1, E3, C-11, C-12, C-2, C-3, C-4, and C-4c Bulk.

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

The following options are available:

Option	**Description**
*Mapping	E1, E3, C-11, C-12, C-2, C-3, C-4, and C-4c Bulk. **Note:** E1 and E3 mappings may be disabled depending on selections made in the Options, Protocol, and System settings.
*AU-Type	Select AU-3, AU-4, or AU-4-4c.
*Foreground AU Inserted	Select 1 to 48 Foreground AUs or All. **Note:** Default is **1** unless set to STM-1 or higher when AU-3, or set to STM-4 or higher when AU-4 is selected.
Background AU Pattern	Select 0 to 8 bits.
HP Signal (C2) Label Inserted	Set the C2 byte to: • 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. **Note:** This option is coupled with the C2 byte option in the Path Overhead (POH) screen. If it is changed in this screen, it will change in the Overhead screen as well.
Synchronization Status (S1)	Sets the S1 byte to: • 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 Eqip Timing Src: Sets byte value to 00001011. • User Defined (any eight bit pattern 0 to FF.
*Foreground TUG-3 Inserted	Select 1 to 3 TUGs. Default is None.
*Foreground TU # Inserted	Select 1 to 48 Foreground TUs or All. **Note:** Default is **None** if C-4, C-4c or AU-3 and C3 is selected.
Background TU Pattern	Select 0 to 8 bits. **Note:** Default is **None** if C-4, C-4c or AU-3 and C3 is selected.
LP Signal Label Inserted	Set the V5 byte to: • Unequipped (00) - 00000000 • Equipped (01) - 00000001 • Asynchronous (02) - 00000010 • Bit Synchronous (03) - 00000011 • Byte Synchronous (04) - 00000100 • O.181 Test Signal Mapping (06) - 00000110 • VC-AIS (07) - 00000111 • User Defined - Any eight-bit pattern 00 to FF This option is disabled if mapping is set to C-4 Bulk, AU-4; or if mapping is set to E4.
*Foreground Pattern	Select User Defined, PRBS 9, PRBS 9 Inverted (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. **Note:** This

	option is not available if Container Contents is not set to *Bulk*.

Transmit APS Linear

This function configures the system to transmit APS functions for a Linear (span) network. The following K1 and K2 bytes are available:

- 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)

Transmit APS Ring

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)

STM-0/1/4 Receive

The Receive function contains several functions and options that configure the receive signal parameters. If the incoming signal does not match the expected parameters, errors, and alarms can be logged by the system.

The STM-0/1/4 Receive screen contains the following functions:

- Receive Settings 1 (SET 1)
- Receive Settings 2 (SET 2)
- Receive Section Overhead (SOH)
- Receive Path Overhead (POH)
- Receive Signal Status (SIG)
- Receive TU Scan

STM-0/1/4 Receive Path Overhead

This function displays the incoming Higher-Order Path and Lower-Order Overhead bytes. It also displays the J1 and J2 Trace messages. This is a read-only function.

The following options are available in the STM-0/1/4 Receive Path Overhead screen.

Options	**Description**
HP	Displays the Higher-Order Path bytes to include: F3, K3, N1, B3, C2, G1, F2, H4, Z3, Z4, Z5.
LP	Displays the Lower-Order Path bytes to include: • **For C-3 and AU-4 settings:** B3, C2, G1, F2, F3, H4, Z3, Z4, Z5 • **For C-11, C-12, and C2 settings:** V5, F3, N2, K4
HP Trace	The HP Trace byte is part of the Path OH and is known as the Higher-Order Path trace or J1 trace. The HP trace is a 64-byte pattern that can be created for repeated transmission. The pattern is a string of ASCII characters. The J1 trace can be configured to send the unit's default pattern or a customized pattern.
LP Trace	Displays the Lower-Order Path Trace.

STM-0/1/4 Receive Section Overhead

This function displays the Section Overhead bytes for a specific SOH slot on the incoming STM signal. This is a read-only function.

The following options are available in the STM-0/1/4 Receive Section Overhead screen.

Options	**Description**
SOH Slot	Displays the Section Overhead slot being monitored on the incoming side STM signal.

RS	Displays the Regenerator Section Overhead bytes (A1, A2, Z0, B1, E1, F1, D1, D2, and D3)
MS and AU Pointer	Displays the Multiplex Section Overhead bytes (B2, K1, K2, D4-D12, Z1, Z2, and E2) and AU pointer bytes (H1, H2, and H3)
RS Trace	Displays the Regenerator Section trace.

STM-0/1/4 Receive Settings 1

This function configures the unit's Receive parameters for your STM test environment.

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

The STM-0/1/4 Receive Settings 1 screen contains the following options:

Option	**Description**
Settings Control	Select **Coupled** or **Independent**. When *Coupled* is selected, changes in the Receive settings will automatically be changed for the Transmit settings. When *Independent* is selected, changes made to the Receive settings will not affect Transmit settings.

*Interface	Selects the optical or electrical interface. The following options are available: • STM-0 • STM-0e • STM-1 • STM-1e • STM- 4
*Mapping	Maps the STM-4 interface to one of the following: E1, E3, DS1, DS3, C-11 Bulk, C-12 Bulk, C-2 Bulk, C-3 Bulk, C-4 Bulk, C4-4c Bulk, C-11 ATM, C-12 ATM, C-2 ATM, C-3 ATM, C-4 ATM, or C4-4c ATM. **Note:** Some options may not appear depending on your current configuration and hardware.
*AU Type	Selects an Administrative Unit type to include AU-3, AU-4, or AU-4-4c.
*Foreground AU Dropped	Select the foreground Administrative Unit to be dropped. Values are from 1 to 48. **Note:** The options that appear will depend on your current configuration.
*Orderwire Drop	Allows you to drop an orderwire circuit for a protocol processor. The following options are available: • None • E1 • E2

DataCom Channel Drop	Defines specific bytes in the Section and Line overhead that is used to send operation and maintenance information between the Section and Line equipment. The following options are available: • None • RS PRBS 2^7-1 • RS 2^7-1 (Inverted) • RS DCC Port • MS PRBS 2^7-1 • MS PRBS 2^7-1 (Inverted) • MS DCC Port
*Foreground AU Dropped	Select the foreground Administrative Unit to be dropped. Values are from 1 to 48. **Note:** The options that appear will depend on your current configuration.
*Foreground TUG-3 Dropped	Select 1 through 3 as the foreground Tributary Unit-3 to be dropped. **Note:** *None* will display unless AU-4 is set as the AU type.
*Foreground TU # Dropped	Select 1 through 28 for the number of foreground Tributary Units to be dropped. **Note:** *None* will display if mapping is set to C4-4c, C-4, C-3, or AU type is set to AU-3.
*Foreground Pattern Expected	Select from the following foreground patterns: Live, User-Defined (up to 32 bits). 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, or PRBS 31

	INV **Note:** If Container Contents is not set to *Bulk*, this option will not be available.

STM-0/1/4 Receive Settings 2

This function configures the STM Receive mapping, which maps an STM pattern into the STM 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-0/1/4 Receive Settings 2 screen.

Option	Description
PLM Alarm Reporting	Disable or enable Payload Label Mismatch reporting.
Expected HP Signal Label	Enter any eight bits for the Higher-Order Path Signal Label for byte C2 expected. Configure to receive a specific value for the C2 byte. The following options are available: • **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. • **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.
Expected LP Signal Label	Select one of the following values for the expected Lower Order Path Signal: • Unequipped - (00000000) • Equipped - (00000001) • Asynchronous - 00000010 • Bit Synchronous - 00000011 • Byte Synchronous - 00000100 • O.181 Test Signal Mapping - 00000110 • VC-AIS - 00000111 • User Defined - An eight-bit pattern from 00h to FFh.
TIM Alarm Reporting	Disables or enables Trace Identifier Mismatch reporting. This function enables TIM alarm reporting. A Trace Identifier Mismatch (TIM) alarm occurs when the incoming J1 or J0 trace does not match the expected J1 or JO trace.
SS Bits Alarm Reporting	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.
Expected SS Bits	Selects one of the following as the expected SS Bits value:

	• 00 (SONET) • 01 (Undefined) • 10 (SDH) • 11 (Undefined)
Expected J0 Trace	Allows you to enter the expected J0 Trace. Options include Default, All Ones, or User. User-defined allows you to enter any eight bits.
Expected J1 Trace	Allows you to enter the expected J1 Trace. Options include Default, All Ones, or User. User-defined allows you to enter any eight bits.
Expected J2 Trace	Allows you to enter the expected J2 Trace. Options include Default, All Ones, or User. User-defined allows you to enter any eight bits.

STM-0/1/4 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:

Channel 1

- Zero power reading
- -10 dBm power reading
- -5 dBm power reading

Channel 2

- Zero power reading
- -30 dBm power reading
- -10 dBm power reading

Click on the **Save** button to update the signal calibration.

STM-0/1/4 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 main functions under Results are:

- Scan
- Err
- Alarm
- PTR
- Large LED
- Event Log
- Graph
- DCC Mon

Receive DCC Mon

The DCC Monitor button lets you edit the Datacom channel RS and MS overhead data for testing.

The following DCC Channel options are available for this command.

DCC Channel Option	**Description**
Section Drop/Insert	Allows you to drop and insert the RS DCC and edit the MS DCC bytes.
Section PRBS Test	Allows you to edit the Line DCC bytes and transmit an inserted PRBS pattern in the D1–D3 Section DCC bytes. The received pattern and Bit are monitored for both the DCC drop from SONET and the DCC Input from Connector. If either fails, then the PAT SYNC or BIT indicators turn red. The BIT Error count, Ratio and Seconds appear below the indicators in a table format.
Internal Byte	Allows you to edit the DCC bytes for Section (D1–D3) and Line (D4–D12) of the Transport Overhead. You must initialize the Transmit function and access the Transport Overhead selector to edit these DCC bytes.
Line Drop/Insert	Allows you to drop and insert the Line

	DCC and edit the Section DCC bytes.
Line PRBS Test	Allows you to edit the Section DCC bytes and transmit an inserted PRBS pattern in the D4–D12 Line DCC bytes. The pattern and BIT monitoring are the same as described in the Section PRBS Test option.

Monitor DCC results by viewing:

- DCC Drop from SONET
- DCC Drop from Connector
- Bit Error
  - Count
  - Rate
  - Seconds

STM-0/1/4 Results Alarms

This function monitors and reports alarms and their duration on the incoming STM signal. The Alarms function lists the duration of the alarm in seconds.

The following alarms can be monitored:

- Clock
- 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)
- TU-LOP (Tributary Unit Loss of Pointer)
- TU-AIS (Tributary Unit - Alarm Indication Signal)

- LP-RDI (Lower-Order Path - Remote Defect Indicator)
- LP-RFI (Lower-Order Path - Remote Fault Indicator)
- LP-UNEQP (Lower-Order Path - Unequipped Payload)
- LP-TIM (Lower-Order Path - Trace Identifier Mismatch)
- LP-PLM (Lower-Order Path - Payload Label Mismatch)
- Pattern Sync

STM-0/1/4 Results Errors

The system can monitor and report errors on the incoming STM signal. The Errors function provides a detailed analysis of the incoming errors.

The errors reported are a result of:

- Incoming errors that are generated by the STM 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)
- MS-REI (Multiplex Section - Remote Error Indicator)
- B2 (Multiplex Section BIP-8)
- HP-REI (Higher-Order Path - Remote Error Indicator)
- AU-NDF (Administrative Unit - New Data Flag)
- B3 (Higher-Order Path BIP-8)
- LP-REI (Lower-Order Path - Remote Error Indication)
- LP-BIP (Lower-Order Path - Bit Interleaved Parity)
- BIT ERR (BIT errors reported in the payload)

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 for current seconds only

STM-0/1/4 Results 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.

Select the **Descending** and **Ascending** buttons to determine the viewing order.

Select the **Refresh** button to obtain current event log activity.

STM-4 Results Graphs

Use the Graphs button to view error and alarm results for the STM-4 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-4 alarms and errors.

To use the Results Graph functions, see the Using Graphs section.

STM-0/1/4 Results PTR

This function monitors and reports received STM AU and TU 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 HEX and decimal format): Valid Pointers range from 0 to 782.

STM-0/1/4 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-0/1/4 Test

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

The Test screen contains the following functions:

- SET 1
- APS
- RTD
- TU Scan

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	**Note:** This option appears when **Repeat Actions** is selected. 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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.
Print Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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
Record Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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**.

Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).
Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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.

STM-0/1/4 Receive TU Scan

The TU Scan function inspects and then reports the contents of the 28 foreground TUG drops that are obtained within a multiplexed STM-0/1/4 signal.

The information reported consists of items such as the framing and pattern activity detected on each TU drop.

The protocol processor must be receiving a valid signal, otherwise, the scan aborts. While a scan is in progress, you cannot access other functions.

The following option is available on the Receive TU Scan screen:

- Foreground TUG: Select a value from 1 to 3.

After a foreground TUG is selected, select **Start Scan**. The screen displays the framing and pattern activity on each of the 28 TU drops.

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-0/1/4 Performance Monitoring

Performance Monitoring provides greater detail about incoming MS, RS, HP, LP, and bit errors.

The following functions are available on the STM-0/1/4 Performance Monitoring screen:

- RS
- MS
- HP

- LP
- Bit

Performance Monitoring Bit

This provides a detailed breakdown for BIT errors detected and logged by the STM-0/1/4 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

Perf Monitoring HP

This provides a detailed breakdown for Higher-Order Path errors detected and logged by the STM-0/1/4 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

Perf Monitoring LP

This provides a detailed breakdown for Lower-Order Path errors detected and logged by the STM-0/1/4 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 Multiplexor section errors detected and logged by the STM-0/1/4 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, Uncertain, failure

Perf Monitoring RS

This provides a detailed breakdown for Regenerator Section errors detected and logged by the STM-0/1/4 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

Index

A

Action After Duration 18

Administrative Unit 13

AIS 13

Alarm Generated........................... 18

Alarm Indication Signal 13

APS... 13

ATM 13

AU... 13

AU-AIS.................................. 13, 18

AU-LOP 13, 18

AU-PTR 13

Automated Protection Switching ... 13

B

B1 .... 13, 18

B2 .... 13, 18

B3 .... 13, 18

Bit Interleaved Parity.................... 13

Bits... 13

C

C2 13

Calibration...................................... 7

CLK 13

Clock Reference............................18

Code Violation...............................13

D

DataCom Channel Added 18

DCC Channels 7

E

E1...13, 18

E2..18

E3..13

Error Insert Rate............................18

F

Frame

Loss 13

Frame..13

H

Higher-Order Path.........................13

HP 13, 18

HP Terminating Equipment 13

HP-OK...13

HP-RDI..................................13, 18

HP-REI..................................13, 18

HP-UNEQ 18

HP-UNQ....................................... 13

I

Incoming

STM.. 13

STM-4 13

Incoming 13

K

K1 13

K2 13

L

LEDs 13

LEDs Quick Status Area 13

Line Frequency Offset.................. 18

LOF...................................... 13, 18

LOS...................................... 13, 18

Loss

Frame...................................... 13

Pointer..................................... 13

Loss 13

Lower-Order Path 13

LP 13

LP OK 13

LP Path 18

LP Terminating Equipment............13

LP-BIP...................................13, 18

LP-RDI 13, 18

LP-REI...................................13, 18

LP-RFI...................................13, 18

LP-UNQ..13

M

MS OK..13

MS Terminating Equipment...........13

MS-AIS..................................13, 18

MS-RDI 13

MS-REI..................................13, 18

Multiplex Section 13, 18

Multiplex Section Bit Interleaved Parity Code 13

Multiplex Section Overhead OK 13

N

NDFs 13

O

OOF 13

Orderwire 18

P

Path..18

Path BIP-8 13

Path Bit Interleaved Parity Code ... 13

PATLOSS 13

Pointer

Loss... 13

Pointer 13

Pointer Adjustments...................... 13

PRBS 2^7-1 18

R

Regenerater Section 18

Regenerator Section Overhead OK 13

Remote Defect Indicator 13

Remote Error Indication 13

Remote Failure Indicator............... 13

RS.. 18

RS DCC Port 18

RS OK.. 13

RS PRBS 2^7-1 18

RS Section 18

RS-RDI 18

RX Power..................................... 13

S

SDH 13

Section Bit Interleaved Parity 13

SEF 13

SETS.....................................13, 18

Settings Control.............................18

STM-0 18

STM-0e 18

STM-1e 18

STM-4 ....13, 18

STM-4 LEDs.................................13

STM-4 Performance Monitoring 50

STM-4 Receive 31

STM-4 Results 38

STM-4 Transmit 18

STM-4 Transmit Settings...............18

Synchronous Equipment Timing Source 18

T

Transmit 13, 18

Transmit Patterns............................7

Tributary Unit.................................13

TU 13

TU-AIS 13, 18

TU-LOP 13, 18

TU-PTR 13

TU-UNEQ 18

U

Unequipped.................................. 13

OC-192 Online Help

Table Of Contents

OC-192 Overview 1

OC-192 Specific Tasks 3

OC-192 Specific Tasks..3

Calibrate Optical Power..3

Screen and Function Descriptions 5

OC-192 Screen and Function Descriptions Overview 5

OC-192 LED Definitions 5

OC-192 Transmit...9

OC-192 Transmit APS...9

APS Mode 11

APS Overview 11

Duration in Frames..12

OC-192 Transmit Error Alarm...12

Alarm Generated 12

Error Insert Rate (SONET) 15

Error to Insert (SONET)..16

OC-192 Transmit Overhead 18

OC-192 Transmit Pointer Generation...19

OC-192 Transmit Settings 1 20

OC-192 Transmit Settings 2 24

OC-192 Receive..26

OC-192 Receive Overhead 26

OC-192 Receive Settings 1 27
OC-192 Receive Settings 2 (SET 2) 31
OC-192 Receive Signal Status 36
OC-192 Results 36
APS Results 37
Alarms 37
Errors 38
Event Log 39
Graphs 39
Large LEDs Overview 39
PTR (SONET) 39
Scan 40
OC-192 Test 40
Action After Duration 40
Duration 44
Protection Switch Criteria 44
APS (Automatic Protection Switch) 45
RTD (Round-Trip Delay) 46
SET 1 47
OC-192 Performance Monitoring 48
Line Analysis 48
Path Analysis 49
Section Analysis 51

Index 53

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

	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

	equipment to generate an AIS alarm to its downstream network elements (NE), and generate an RDI alarm to its upstream NEs.
LOP-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 DSn AIS alarm to its downstream equipment and an RDI-P alarm to its upstream equipment.
AIS-L	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. An AIS-L simulates an alarm generated by Line terminating equipment (LTE).
RDI-L	Line Remote Defect Indicator. This generates an RDI-L condition using the K2 byte of the Line OH. 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. 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.
AIS-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

	alarm to its upstream equipment. An AIS-P simulates an alarm generated by Path terminating equipment (PTE).
RDI-P	Path Remote Defect Indicator. This generates an RDI-P condition using the G1 byte of the Path OH. This simulates a downstream NE (in this case, the NIC), at the Path layer, reporting a failure to an upstream NE. 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.
UNEQ-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) When a PTE receives this alarm, it will generate an AIS to downstream NEs.
TC-RDI	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.
TC-ODI	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.
TC-AIS	Tandem Connection-Alarm Indication

	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	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. 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 Line 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.
B3 Error	Generates a BIP-8 error over the STS 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.
REI-L Error	Generates a Remote Error Indicator over the Line layer. An REI-L is a count of B2 errors received at the far end. 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. (This type of error was formerly called a Line Far End Block Error - FEBE-L.)
REI-P Error	Generates a Remote Error Indicator over the Path layer. An REI-P is a count of B3 errors received at the far end. 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.

	(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.

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**.

	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**. • **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

	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.
STS-48 Added **Note:** STS-48 Added only appears when Mapping is set to STS-48c Bulk.	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. • **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.
STS-12 Added **Note:** STS-12 Added only appears when Mapping is set to STS-12c Bulk.	Selects one of 16 STS-12 signals as the foreground channel in the STS-192 signal. • **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.

STS-3 Added **Note:** STS-3 Added only appears when Mapping is set to STS-3c Bulk.	Selects one of 64 STS-3 signals as the foreground channel in the STS-192 signal. • **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.
STS-1 Added **Note:** STS-1 Added only appears when Mapping is set to STS-1 Bulk.	Selects one of 192 STS-1 signals as the foreground channel in the STS-192 signal. • **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.
Background STS-48 Pattern **Note:** Only appears when Mapping is set to STS-48c Bulk.	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.
Background STS-12 Pattern **Note:** Only appears when Mapping is set to STS-12c Bulk.	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.
Background STS-3 Pattern	Determines the type of pattern inserted into the 63 remaining STS-3

Note: Only appears when Mapping is set to STS-3c Bulk.	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.
Background STS-1 Pattern **Note:** Only appears when Mapping is set to STS-1 Bulk.	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.
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	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.

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

	frequency of the transmitted SONET signal. The frequency can be adjusted in parts per million (PPM). The following options are available: **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 entered, the Confirm button on the touch screen keypad must be selected for the new offset value to be accepted.
SS Bits in H1 Label	Set to SONET (00) or SDH (10).
Path Signal Label	Set the C2 byte to: • 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. **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.
Synchronization Status (S1)	Sets the S1 byte to: • 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 Eqip 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	Enables Tandem Connection Monitoring (TCM) transmit mode. • **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

	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	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**. 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**. • **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 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.
STS-48 Dropped **Note:** STS-48 Dropped only appears when Mapping is set to STS-48c Bulk.	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. • **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.

STS-12 Dropped **Note:** STS-12 Dropped only appears when Mapping is set to STS-12c Bulk.	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. • **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.
STS-3 Dropped **Note:** STS-3 Dropped only appears when Mapping is set to STS-3c Bulk.	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. • **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.
STS-1 Dropped **Note:** STS-1 Dropped only appears when Mapping is set to STS-1 Bulk.	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. • **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.
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-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	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: • **Enabled:** PLM-P alarms are recognized and reported. • **Disabled:** PLM-P alarms are ignored.
Expected Path Signal Label	Configure to receive a specific value for the C2 byte. The following options are available: • **Unequipped (00):** The

	expected C2 byte is 00000000. • **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.
TIM Alarm Reporting	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

	available: • **Enabled:** TIM alarms are recognized and reported. • **Disabled:** TIM alarms are ignored.
Expected J0	Defines the expected J0 trace received on the incoming SONET signal. The following options are available: • **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	Defines the expected J1 trace received on the incoming SONET signal. The following options are available: • **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	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.
Expected SS Bits	Selects one of the following as the expected SS Bits value: • 00 (SONET) • 01 (Undefined) • 10 (SDH) • 11 (Undefined)
TC Error/Alarm Processing	Enables or disables Tandem Connection Monitoring (TCM) mode. This function is used in conjunction with the **Expected TC Trace** and **TIM Alarm Reporting** functions. The **TC Summary LED** turns red if a TCM error or alarm is reported. Select the TC Summary text for more details. • **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	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: • **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

	16-byte All Zeros pattern as 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-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.

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	**Note:** This option appears when **Repeat Actions** is selected. 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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.
Print Events and Repeat Test	**Note:** This option appears when

	Repeat Actions is selected. 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. 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
Record Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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**.
Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).
Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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

	statistic also reports the percentage of errored seconds compared to the duration of error-free seconds.
Near End Severely Errored Seconds (SES-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.
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 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.)
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.

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?

Index

A

Add Drop Mapping 20, 27

APS.. 44

C

Calibration....................................... 3

M

Mapping - 10 Gbps..................20, 27

O

OC-192 Overview............................1

R

RTD...45

OC-48 Online Help

Table Of Contents

OC-48 Overview 1

OC-48 Specific Tasks 3

OC-48 Specfic Tasks 3

Calibrate Optical Power 3

Screen and Function Descriptions 5

OC-48 Screen and Function Descriptions Overview 5

OC-48 Transmit 5

OC-48 Transmit APS 5

Duration in Frames (SONET) 6

Protection Switch Criteria (SONET) 6

OC-48 Transmit Error Alarm 7

OC-48 Transmit Overhead 8

OC-48 Transmit Pointer Generation 8

OC-48 Transmit Settings 1 9

OC-48 Transmit Settings 2 11

OC-48 Receive 12

OC-48 Receive APS 13

Consecutive Good Frames Required 13

Consecutive Good Time Required 13

Protection Switch Time (Frames) 14

Protection Switch Time (Seconds) 14

State 14

OC-48 Receive Overhead 14
OC-48 Receive Settings 1 15
OC-48 Receive Settings 2 16
OC-48 Receive Signal Status 20
OC-48 Results 21
APS Results 21
Alarms 22
Errors 22
Event Log 23
Graphs 23
Large LEDs Overview 24
PTR 24
Scan 24
OC-48 Test 24
Action After Duration 25
Duration 28
Protection Switch Criteria 29
APS (Automatic Protection Switch) 30
RTD (Round-Trip Delay) 31
SET 1 31
OC-48 Performance Monitoring 32
Line Analysis 32
Path Analysis 33

Section Analysis 34

Index 37

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.

2 December 02

OC-48 Specific Tasks

OC-48 Specfic 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

	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 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 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 STS-12 Pattern	Enter any 32 bit value for 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 (OC-48/STM-16).
Initial Laser Setting	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.
TC Overhead Processing	Enables Tandem Connection Monitoring (TCM) transmit mode.

	• **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-48 Transmit Settings 2

The OC-48 Transmit Settings 2 screen contains the following functions.

Function	Description
Line Frequency Offset	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: **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 entered, the Confirm button on the touch screen keypad must be selected for the new offset value to be accepted.
SS Bits in H1 Label	Set to SONET (00) or SDH (10).
Path Signal Label	Set the C2 byte to: • 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. **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.
Synchronization Status (S1)	Sets the S1 byte to: • 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 Eqip 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.

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.

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	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: • **Enabled:** PLM-P alarms are recognized and reported. • **Disabled:** PLM-P alarms are ignored.
Expected Path Signal (C2) Label	Configure to receive a specific value for the C2 byte. The following options are available: • **Unequipped (00):** The expected C2 byte is 00000000. • **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.
TIM Alarm Reporting	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: • **Enabled:** TIM alarms are recognized and reported. • **Disabled:** TIM alarms are ignored.
Expected J0	Defines the expected J0 trace

	received on the incoming SONET signal. The following options are available: • **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	Defines the expected J1 trace received on the incoming SONET signal. The following options are available: Defines the expected J1 trace received on the incoming SONET

	signal. The following options are available: • **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	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.
Expected SS Bits	Selects one of the following as the

	expected SS Bits value: • 00 (SONET) • 01 (Undefined) • 10 (SDH) • 11 (Undefined)
TC Error/Alarm Processing	Enables or disables Tandem Connection Monitoring (TCM) mode. This function is used in conjunction with the Expected TC Trace function. The TC Summary LED turns red if a TCM error or alarm is reported. • **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	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: • **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	**Note:** This option appears when **Repeat Actions** is selected. 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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected.

	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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.
Print Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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
Record Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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**.
Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and

	the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).
Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units

	when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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.

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.

Index

C

Calibration..3

O

OC-48 Overview..............................1

POS Online Help

Table Of Contents

POS Overview 1

POS Specific Tasks 3

Configuring for POS Mode 3

Starting Link Negotiation 3

Sending POS Traffic 4

Inserting POS Errors 4

Receiving POS Traffic 5

Troubleshooting a POS Connection 5

Screen and Functions Description 7

POS Screen and Functions Overview 7

POS LEDs and Quick Status Indicators 7

POS Transmit 7

Error Alarm 7

Gen Main 8

PPP 9

POS Receive 10

SET 1 10

POS Results 12

Alarms 12

Count 12

Errors 13

Event 14

Graphs 14
Large LED 14
Scan 15
Index 17

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

22 March 02

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. • **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	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. **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. 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.
Pattern	Selects and inserts a data pattern into the packet as data. The following options are available: • 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	Allows bytes to be scrambled during transmission. The SPE consists of the Path overhead bytes and the payload. • **On**. Enables scrambling. • **Off**. Bytes are not scrambled and are transmitted normally.
FCS Generation	Allows error correction using a **32**-bit frame check sequence. **Off** disables FCS generation.
LCP/IPCP Connect	Starts the negotiation required to establish a connection in a point-to-point link. When selected, LCP packets are transmitted to configure

	and test the data link. **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. 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.

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	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. The following options are available: **Disable:** The received payload is not descrambled. **Enable:** The received payload is descrambled.
FCS Implementation	Determines if the unit will perform a

	Frame Check Sequence (FCS) on the received payload and report errors. The following options are available: **None:** No error checking is performed. **CRC-32:** A 32-bit (four byte) FCS is calculated. Packets with FCS errors are reported under the Result functions if FCS errors occur.

Substream Functions	Description
Pattern	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. The following patterns are available: **Live:** User data is received; no pattern is used. **PRBS 2^31-1:** Configured to receive a proprietary PRBS 2^31-1 pattern. **User Defined:** Allows the creation of a unique pattern as the expected receive pattern. The pattern can range from 1 bit to 32 bits.
Destination IP Address	Sets the IP address of the destination host using dotted decimal notation.
Protocol	Sets an expected protocol for the incoming payload. An error occurs if the incoming protocol is different from what is selected. **UDP** is the only protocol available.

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: • Total number of PPP packets received and the duration in

	seconds. • Number of valid PPP packets received and the duration in seconds.
IP	Reports the following for IP packets: • Total number of IP packets received and the duration in seconds. • Number of valid IP packets received and the duration in seconds.
UDP	Reports the following for UDP packets: • 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.

Index

F

FCS Generation 3

L

LCP/IPCP Connect button 3

LCP/IPCP LED........................ 3, 5, 7

Link Negotiation 3

P

POS Configuration 3

POS Overview................................1

S

SPE Scrambling 3

Starting POS Mode 3

U

Using

FCS Generation...........................3

SPE Scrambling...........................3

DS3 Online Help

Table Of Contents

DS3 1

DS3-Specific Tasks 3

DS3-Specific Tasks 3

Drop an E1 out of a DS3 Signal 3

Specifying Frames and Patterns for the Dropped/Inserted Signal 3

View the Event Activity of the Dropped and Inserted Signals 3

DS3 or E3 Electrical Power Calibration 4

Required Equipment 4

Hardware Setup 4

Restoring Raw Power Readings for E3 or DS3 4

Calibrating E3 or DS3 Signal Calibration 5

Enabling FEAC Codes 6

Start/Stop Channel Scan 7

DS3 Screen and Field Descriptions 9

DS3 Screen and Function Descriptions 9

DS3 LEDs 9

DS3 Transmit 10

DS3 Transmit Errors and Alarms 11

DS3 Transmit FEAC Codes 12

DS3 Transmit Settings 1 14

DS3 Transmit Settings 2 16

DS3 Receive 17

DS3 Receive Channel Scan 17
DS3 Receive Settings 1 17
DS3 Receive Signal Status 20
DS3 Results 20
DS3 Results Alarms 20
DS3 Results Errors 21
DS3 Results Graphs 21
DS3 Results Large LEDs 21
DS3 Results Scan 22
Results Event 23
DS3 Test 23
Action After Duration 23
Duration 27
SET 1 27
DS3 Performance Monitoring 28
DS3 Performance Monitoring Bit 28
DS3 Performance Monitoring Line 28
DS3 Performance Monitoring Path 29
Index 31

DS3

This section includes:

- DS3-Specific Tasks
- 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

DS3-Specific Tasks

DS3-Specific Tasks

This section includes a list of tasks that are specific to the DS3 protocol processor. For a list of general tasks, see Common Tasks located in the Getting Started section.

Drop an E1 out of a DS3 Signal

You are able to drop an E1 signal into an DS3 signal to monitor for error and alarm conditions. Additionally, you are able to specify which channel (1-21) to drop the signal into.

1. Select **Presets** from the Common Function Buttons.
2. Select one of the following presets:

    - DS3/E1 #1 D/I
    - DS3/E1 #2 D/I
    - DS3/E1 #1 Payload
    - DS3/E1 #2 Payload

    The unit is configured to drop an E1 out of the DS3 signal. Additionally, you can specify different frames and patterns for the dropped/inserted signal (see the section below).

Specifying Frames and Patterns for the Dropped / Inserted Signal

1. Select **DS3**.
2. Select **Transmit**.
3. Select **MAP**.
4. If you wish to enable Pass Thru mode, select **Pass Thru Mode** and select **On**. Otherwise, keep this option turned off.
5. Select **E1 #1 or #2 Channel Inserted**(the option that displays is dependent on whether you selected E1 #1 or #2) and select the channel (1 -21, All, or None) in which you wish to drop the E1 signal.
6. Select **E1 #1 or #2 Channel Inserted**(the option that displays is dependent on whether you selected E1 #1 or #2) and select the channel (1-21, All, or None) in which you wish to drop the E1 signal.
7. Select **E1 Background Frame** and select the background frame (All Zeros or All Ones) for the specified channel.
8. Select **E1 Background Pattern** and select up to a 32-bit background pattern for the specified channel.

View the Event Activity of the Dropped and Inserted Signals

1. Select **Results**.
2. Select **Scan** to view a summary of the error and alarm counts that have occurred.
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 **Event** to view a list of event activity, number of events, the time they occurred, and how long they occurred.
6. Select **Large LED** to view errors and alarms in the form of LEDs.

DS3 or E3 Electrical Power Calibration

The following procedures describe the unit's negative and positive power calibration. While performing this task, you will measure, record, and enter power reading input for zero power reading and 0.2 and 0.8 volt reading for E3 or DS3.

Required Equipment

The following equipment is required to perform E3 or DS3 calibration:

- Digital oscilloscope (use highest bandwidth available) or equivalent measuring equipment
- Variable attenuator
- Electrical power meter or a calibrated NIC that can provide 0.2 and 2.0 volts power
- BNC T-connector
- Two 2-ft., 75 ohm coaxial cables with male BNC connectors
- Pencil and paper to record power measurements

Hardware Setup

The following describes how to attach cables to the measuring devices (an oscilloscope will be used in this example) and how to configure these devices for E3/DS3 calibration.

To attach cables between the unit and the oscilloscope:

1. Make sure that the unit and oscilloscope are turned on.
2. Connect the BNC T-connector to the oscilloscope's BNC input connector.
3. Connect one end of a BNC cable to the unit’s **E3/DS3 TX** BNC connector and connect the other end of the cable to the BNC T-connector attached to the oscilloscope.
4. Connect one end of a BNC cable to the unit’s **E3/DS3 RX** BNC connector and connect the other end of the cable to the BNC connector attached to the oscilloscope.

Restoring Raw Power Readings for E3 or DS3

The following restores the unit's raw (unconverted) power readings.

1. From the **E3** or **DS3** tab on the unit, select **Receive**.
2. Select **SIG**.
3. Select **Update Signal Calibration**.
4. Select **Negative**.
5. Select **Zero power reading**. A keypad appears.
6. Enter 0 and select **OK**.
7. Select the **Save** button to restore the raw power reading.
8. Select **Positive**.
9. Select **Zero power reading**. A keypad appears.
10. Enter 0 and select **OK**.
11. Select **0.2 Volts Reading**. A keypad appears.
12. Enter 0 and select **OK**.
13. Select **0.8 Volts Reading**. A keypad appears.
14. Enter 0 and select **OK**.
15. Select the **Save** button to restore the raw power reading.

Calibrating E3 or DS3 Signal Calibration

The following procedures describe how to perform E3 or DS3 calibration using a NIC and oscilloscope.

Obtain Zero Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. For zero volt value, do not connect the cable to the Receive connector on the unit.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Positive Signal Calibration.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Negative Signal Calibration.

Obtain 0.2 Volts Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values. *(Reconnect the cable to the Receive connector on the unit.)*
2. Attenuate the signal until the oscilloscope reads 0.2 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 0.2 volts power reading.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 0.2 volts power reading.

Obtain 0.8 Volts Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. Attenuate the signal until the oscilloscope reads 0.8 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 0.8 volts power reading.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 0.8 volts power reading.

Enter Negative Signal Power Readings

1. Make sure that the Negative Signal Calibration functions appear on the SIG screen. If necessary, select the Negative button.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.2 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.2 volts power reading and select **OK**.
6. Select **0.8 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 0.8 volts power reading and select **OK**.
8. Select **Save** to save the new Negative Signal Calibration values.

Enter Positive Signal Power Readings

1. Select the Positive button. The Positive Signal Calibration functions appear on the SIG screen.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.2 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.2 volts power reading and select **OK**.
6. Select **0.8 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 0.8 volts power reading and select **OK**.
8. Select **Save** to save the new Positive Signal Calibration values. This completes the unit's E3 or DS3 signal calibration.

Enabling FEAC Codes

FEAC Codes are only available when the DS3 protocol processor is configured for C-BIT framing.

To enable FEAC Code functionality:

1. From the **DS3** tab, select **Transmit**.

2. Select **SET1**.
3. Select **Framing**.
4. Select **C-BIT**.
5. The FEAC Codes button appears on the screen. Select **FEAC Codes** to display this functionality.

Start/Stop Channel Scan

The Chan Scan function inspects and then reports the contents of the 21 E1 channels or 28 DS1 channels that are obtained within a multiplexed DS3 signal. The information reported consists of items such as the framing and pattern activity detected on each E1 or DS1 channel.

The DS3 protocol processor must be receiving a valid signal, otherwise, the DS3 scan aborts. While a scan is in progress, you cannot access other functions.

To start an DS3 channel scan:

1. Select **DS3**.
2. Select **Receive**.
3. Select **Chan Scan**. The Channel Scan screen appears.
4. Select **Start Scan**. Framing and pattern activity for each channel is displayed on the screen.

To stop the DS3 scan:

Select the **Stop Scan** button.

DS3 Screen and Field Descriptions

DS3 Screen and Function Descriptions

The following function screens are available through the DS3 protocol processor tab.

- DS3 LEDs
- DS3 Transmit
- DS3 Receive
- DS3 Results
- DS3 Test
- DS3 Performance Monitoring

DS3 LEDs

When the DS3 protocol processor is selected, the following LEDs are displayed in the LEDs Quick Status Area of the touch screen.

LED	Description
TX:	Displays the DS3 transmit signal level and transmit framing value.
RX:	Displays the DS3 receive input termination value and the expected receive framing value.
E/A	Displays the error and/or alarm currently generated by the unit.
CLK:	Indicates the timing source for the transmit signal. This value is specified by the Clock Reference function. Clock settings include: INT, BITS, SETS, or RCVD.
Line	Indicates received line code. Values that appear are: B3ZS or "blank" if an LOS exists.
LOS	Loss of Signal. Indicates a Loss of Signal status was detected. This is an alarm LED.
BPV	Bipolar Violation. Indicates two consecutive pulses of the same polarity occurred in the same digital bit stream.
OOF	Out of Frame. Indicates that four consecutive frames have been

	received with invalid or errored framing patterns. This is an alarm LED.
Frame	Indicates if the DS3 protocol processor has received framing errors. This is an error LED.
AIS	Alarm Indication Signal. Indicates an Alarm Indication Signal occurred on the Line layer. This is an alarm LED.
Yellow	Indicates that a yellow alarm was received on the DS3 signal. This is an alarm LED.
P-Parity	Indicates an error in the P-bit channel (P1 and P2) that provides parity information for the preceding M-frame on the DS3 signal. This is an error LED.
C-Parity	Indicates an error in the C-bit channel of the DS3 channel, which is used to denote the presence or absence of stuffed bits. This is an error LED.
FEBE	Far End Block Error. Indicates a Bit error occurred on the far end of the DS3 signal. This is an error LED.
Idle	Indicates an idle alarm was received. This is an alarm LED.
Pat Sync	Pattern Synchronization. Indicates a loss of pattern synchronization. This is an alarm LED.
Bit Err	Bit Error. Indicates a bit error was detected in the payload. This is an error LED.

DS3 Transmit

This function allows you to define the parameters used in DS3 Transmit operations.

The following functions are available through the DS3 Transmit screen.

- DS3 Transmit Settings 1 (SET 1)
- DS3 Transmit Settings 2 (SET 2)

- DS3 Transmit Errors and Alarms
- DS3 Transmit FEAC Codes

DS3 Transmit Errors and Alarms

This function allow you to enter errors or alarms.

The following options are available for the DS3 Errors and Alarms screen:

Option	Description
Error to Insert	Inserts an error that is transmitted by the DS3 protocol processor. The options available include: • **None:** Turns off DS3 error insertion • **BPV Error:** Transmits Bipolar Violation errors which result in a line code violation event for an AMI-Coded signal, the occurrence of received excessive zeros, or a bipolar violation. • **Bit:** Transmits a bit error which results in a frame synchronization bit error event. This also inserts a frame bit error in the received frame bit pattern. • **Frame:** Results in a severely errored framing event, which occurs when two or more framing bit pattern errors occur within a 3-ms period. **Note:** This type of error is not available if the DS3 protocol processor is configured for Unframed framing format. • **P-Parity error:** Results in an error in the P-bit channel (P1 and P2) that provides parity information for the preceding M-frame. **Note:** This option is not available if the DS3 protocol processor is configured for Unframed

	framing format. • **C-Parity error:** Results in an error in the C-bit channel which is used to denote the presence or absence of stuffed bits. **Note:** This option is only available if the DS3 protocol processor is configured for C-Bit framing format. • **FEBE error:** Results in a error in one of the three C-Bits in the M-subframe designated as the Far End Block Error (FEBE) bit. **Note:** This option is only available if the DS3 protocol processor is configured for C-Bit framing format.
Error Insert Rate	Sets the insertion rate for DS3 transmit errors. This function is not available if Error to Insert is set to None. The following options are available for this command: • **Off:** No errors are inserted for transmission. • **1e-X**, where X is a value from 3 to 9
Alarm Generated	Generates a specific alarm on the transmit side of the DS3 protocol processor. The following options are available: LOS, OOF, AIS, Yellow, or Idle. **Note:** OOF, Idle, and Yellow alarms are not available if DS3 Framing is set to unframed.

DS3 Transmit FEAC Codes

FEAC Code functionality only appears on the screen when the DS3 protocol processor is configured for C-BIT framing.

The Far-End Alarm and Control (FEAC) channel allows alarm and status information to be sent from the equipment at the far-end of the signal to the equipment at the far-end of the signal. It also allows the near-end equipment to initiate loopback tests from the far-end equipment.

This function configures the type of alarm or loopback test that is sent from the far end of the DS3 connection. In addition, it allows you to use the unit locally to send a command to the far-end equipment that will then initiate an alarm or loopback to the unit.

The following options are available:

Option	**Description**
TX Burst Cycle	Selects a burst cycle from 1 to 16.
TX FEAC Type	Determines if the far-end equipment sends an alarm/status code (**Alarm/Status**), or if the far-end equipment starts a loopback test to the unit (**Loopback Activate**) or stops a loopback test to the unit (**Loopback Deactivate**).
TX Alarm/Status Code	Selects the type of alarm code or status code that the far-end equipment sends to the unit**.** **Note:** This option is only available if TX FEAC Type is set to Alarm/Status.
TX Loopback Line	Selects an individual DS1 signal or the entire DS3 signal to activate and deactivate loopback tests. **Note:** This option is only available if TX FEAC Type is set to Loopback Activate.
Last RX Alarm/Status Code	Displays the last alarm or status detected by the unit and how long ago (in seconds) it was detected.
Last RX Loopback Activate	Displays the last loopback started by the far-end equipment and detected by the unit. It also displays how long ago (in seconds) it was activated**.** **Note:** This information only appears if the TX FEAC Type option is set to Loopback Activate.
Last RX Loopback Deactivate	Displays the last loopback stopped by the far-end equipment and detected

	by the unit. It also displays how long ago (in seconds) it was deactivated**.** **Note:** This information only appears if the TX FEAC Type option is set to Loopback Deactivate.

DS3 Transmit Settings 1

This screen allows you to configure the transmit signal parameters for the DS3 line interface and the DS3 protocol processor to match the DS3 signal used in your test environment.

The DS3 Transmit Settings 1 screen contains the following parameters:

Parameter	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.
Signal Level	Sets the signal strength of the DS3 transmit signal. The signal level values simulate high and low impedance experienced by a DS3 signal. The following options are available: • **DSX-3:** Sets the DS3 signal level to 0.48 Vp. This level is equal to a high signal sent through 450 feet of coaxial cable and is the standard cross-connect level. • **DS3 High:** Sends the DS3 signal at a higher voltage to simulate a "hot" signal sent over a short cable distance. The DS3 signal level is set to 0.95 Vp. Use this setting when testing from the network element location rather than at

	the DSX. This signal, sent through 450 feet of coaxial cable, is equal to DSX-3 level. • **DS3 Low:** Sends the DS3 signal at a lower voltage to simulate transmission over a long cable distance. The DSX-3 signal level is set to 0.35 Vp. This level simulates a standard DSX level sent through 450 feet of coaxial cable.
Line Freq Offset	Select Off (0, which means the frequency cannot be adjusted) or -100.0 to 100.0 in 0.1 increments.
Clock	Determines the timing source for the DS3 transmit signal. The following options are available: • **Internal:** Derives the transmit data's timing source from the system's internal clock. • **Recovered:** Derives the transmit data's timing source from the system's recover clock. • **BITS:** Derives the transmit's data timing source from the BITS (Building Integrated Timing Supply) clock input, which is 1.544 MHz. If this option is selected, but BITS clocking is not available, then this function defaults to Internal. CLK:BITS displays when configured for BITS clocking • **SETS:** Derives the transmit's data timing source from the SETS (Synchronous Equipment Timing Source) clock input, which is 2.048 MHz. If this option is selected, but SETS clocking is not available, then this function defaults to Internal. CLK:SETS

	displays when configured for SETS clocking.
Framing	Configures the framing format used for the DS3 transmit signal. The following options are available: • **Framed:** Configures the system to transmit a DS3 signal using a framed format. • **Unframed:** Configures the system to transmit a DS3 signal using an unframed format. • **M13:** Configures the DS3 protocol processor to transmit a signal in a an M13 framing format. • **C-Bit:** Configures the DS3 protocol processor to transmit a signal in a C-bit framing format. This type of formatting allows for the use of FEAC codes.

DS3 Transmit Settings 2

This function selects the type of DS3 Transmit mapping and patterns used by the E1 protocol processor.

The following options are available:

Option	Description
Mapping	Select DS1, ATM Direct, ATM PLCP, or Bulk Filled. **Note:** The ATM options will only appear if the ATM hardware is available.
Pass Thru Mode	Select **On** to enable Passthru mode. Select **Off** to disable Passthru mode. **Note:** This option is unavailable if Mapping is not set to DS1.
Payload Pattern	Select User Defined (32-bit entry),

	PRBS 15, PRBS 15 INV, PRBS 20, PRBS 20 INV, PRBS 23, PRBS 23 INV, All Ones, or All Zeroes. **Note:** This option is unavailable if Mapping is not set to Bulk Filled.
DS1 #1 Channel Inserted	Selects from Channels 1 through 28. **Note:** This option is unavailable if Mapping is not set to DS1.
DS1 #2 Channel Inserted	Selects from Channels 1 through 28. **Note:** This option is unavailable if Mapping is not set to DS1.
DS1 Background Frame	Select from Unframed, D4/SF, and ESF.
DS1 Background Pattern	Enter any 32-bit pattern.

DS3 Receive

This function allows you to configure settings for the parameters used in the DS3 Receive operations.

The following functions are available through the DS3 Receive screen.

- DS3 Receive Settings 1 (SET 1)
- DS3 Receive Signal Status
- DS3 Receive Channel Scan

DS3 Receive Channel Scan

This function inspects and then reports the contents of the 28 DS1 channels that are contained within a multiplexed DS3 signal. The information reported consists of Mapping and Pattern values for each DS1 channel.

> To use this function, Mapping must be set to DS1, and the system must receive a valid signal.

For more information, see Start/Stop Channel Scan.

DS3 Receive Settings 1

This screen allows you to configure your unit's Receive parameters for your DS3 test environment. The values selected for the parameters are expected values.

This means that an error can occur if the unit does not receive the expected parameter value.

The DS3 Receive Settings 1 screen contains the following parameters:

Parameter	**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.
Signal Source	Allows you to select the DS3 Line Interface as the signal source.
Input Termination	Configures the DS3 line input termination. Select one of the following options: • **Terminated:** Sets the Receive Sensitivity of the DS3 Line Interface. Use this setting if the DS3 line terminates at the system's Line Interface. • **Monitor:** Sets the Receive Sensitivity of the DS3 Line Interface. Use this setting if the DS3 line connects to a monitor jack.

Framing	Configures the framing format used for the DS3 Receive signal. An error occurs if the DS3 signal is not in the selected framing format. The following options are available: • **Unframed:** Configures the system to receive a signal in an unframed format. • **M13:** Configures the system to receive a signal in an M13 framing format. • **C-Bit:** Configures the system to receive a signal in a C-Bit framing format. This type of formatting allows the use of FEAC codes.
Mapping	Select ATM Direct, ATM PLCP, or Bulk Filled. **Note:** The ATM options only appear if the ATM hardware is available.
Payload Pattern	Selects the type of DS3 signal pattern that the system *expects* to receive. The following patterns are available: Live (uses live data traffic; no pattern; used primarily for monitoring errors and alarms within a data stream), User Defined (32-bit entry), PRBS 15, PRBS 15 INV, PRBS 20, PRBS INV 20, PRBS 23, PRBS 23 INV, All Ones, or All Zeroes. **Note:** This option is unavailable if Mapping is not set to Bulk Filled.
DS1 #1/E1 #1 Channel Drop	Selects from Channels 1 through 21 (for E1) and 28 (for DS1). **Note:** This option is unavailable if Mapping is not set to E1/DS1.

DS1 #2/E1 #2 Channel Drop	Selects from Channels 1 through 21 (for E1) and 28 (for DS1). **Note:** This option is unavailable if Mapping is not set to E1/DS1.

DS3 Receive Signal Status

This function displays the electrical power, line frequency, and line frequency offset of the incoming DS3 signal. It also contains the Calibration function, which allows you to

The following information is displayed on the DS3 Receive Signal Status screen:

- Peak Positive Pulse Voltage (in volts)
- Peak Negative Pulse Voltage (in volts)
- Power in dBm
- Power in dBdsx
- Line Frequency in MHz
- Line Frequency Offset Received in Hz and ppm
- Calibration: This function controls the unit's Negative and Positive signal calibration. The following calibration functions are available:
    - Select **Negative** or **Positive** signal calibration.
        - Configure Zero Power Reading
        - Configure 0.2 Volts Reading
        - Configure 0.8 Volts Reading
    - Select **Save** to set the configuration.

DS3 Results

This function allows you to view DS3 error and alarm analysis and create a history of these events by graphing the information.

The following functions are available through the DS3 Results screen

- Scan
- Errors
- Alarm
- Event
- Large LED
- Graph

DS3 Results Alarms

This function displays how long E3 alarms were detected by the system. Results for the following alarms display.

- Clock
- Out of Frame (OOF)
- Pat Sync
- LOS
- AIS
- Idle
- Yellow

DS3 Results Errors

This function reports statistical information on errors including the error count (11 digits), average error rate (in N.NNe-N format), and current error rate (in N.NNe-N format for the current second only).

The following errors are reported:

- Bit
- BPV
- Frame
- P-Parity
- C-Parity
- FEBE

DS3 Results Graphs

Use the Graphs button to view error and alarm results for the DS3 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 DS3 alarms and errors.

To use the Results Graph functions, see Using Graphs.

DS3 Results Large LEDs

This button displays the DS3 LED Error and Alarm Indicators in a large, easy to read format that covers the entire screen area. This is especially useful for viewing any errors or alarms from a long distance, such as across the room from a test bay.

The following describes the LED colors:

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.

DS3 Results Scan

This function provides a quick report of detected errors and alarms and lists the duration of these events.

If there is currently no activity, "No Errors or Alarms" is displayed on the screen.

The following options are available in the DS3 Results Scan screen.

Option	**Description**
Clock	Type of clock: internal, SETS, or Bits.
LOS Seconds	The number of seconds a Loss of Signal occurred.
BPV Error Count	The number of Bipolar Violations errors that occurred.
LOF Seconds	The number of seconds a Loss of Frame occurred.
AIS Seconds	The number of seconds a Alarm Indication Signal occurred.
FAS Error Count	The number of Frame Alignment Signal errors that occurred.
RDI Seconds	The number of seconds that a Remote Defect Indicator error occurred.
Pattern Loss Seconds	The number of seconds that a Loss of Pattern occurred.

Bit Errors Count	The number of Bit Errors that occurred.

Results Event

The Results Event function provides a detailed summary of alarm and error event and 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.

Select **Resume** to list event activity.

DS3 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

	alarm values are enclosed in quotes (") and separated by commas (,).
Print Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.
Print Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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.

	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
Record Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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**.
Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).
Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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.

DS3 Performance Monitoring

The DS3 Performance Monitoring screen includes the following functions:

- Line
- Path
- Bit

DS3 Performance Monitoring Bit

Performance Monitoring provides greater detail about incoming Bit errors.

The following statistics are reported:

DS3 Bit Statistics	**Description**
CV	Code Violation - Bit. This is an error count of incoming B2 errors.
ES	Errored Seconds. The number of seconds and percentage in which errors were detected in the monitored signal.
EFS	Error Free Seconds. The time, in seconds and percentage, in which there were no errors detected in the signal being monitored.
SES	Severely Errored Seconds. The number of seconds and percentage in which the signal has an extremely high error rate.
UAS	Unavailable Seconds. The time in seconds and percentage, in which the monitored signal was unavailable.

DS3 Performance Monitoring Line

Performance Monitoring provides greater detail about incoming Line errors.

The following statistics are reported:

DS3 Line Statistics	Description
CV	Line Code Violation. This is an error count of incoming B2 errors.
ES	Errored Seconds. The number of seconds and percentage in which errors were detected in the monitored signal.
EFS	Error Free Seconds. The time, in seconds and percentage, in which there were no errors detected in the signal being monitored.
SES	Severely Errored Seconds. The number of seconds and percentage in which the signal has an extremely high error rate.
UAS	Unavailable Seconds. The time in seconds and percentage, in which the monitored signal was unavailable.

DS3 Performance Monitoring Path

Performance Monitoring provides greater detail about incoming Path errors.

The following statistics are reported:

DS3 Path Statistics	Description
CV	Code Violation. This is an error count of incoming B2 errors.
ES	Errored Seconds. The number of seconds and percentage in which errors were detected in the monitored signal.
EFS	Error Free Seconds. The time, in seconds and percentage, in which there were no errors detected in the signal being monitored.
SES	Severely Errored Seconds. The number of seconds and percentage in which the signal has an extremely high error rate.
UAS	Unavailable Seconds. The time in

	seconds and percentage, in which the monitored signal was unavailable.

Index

C

Calibration..4

F

FEAC Codes 6, 12

DS1 Online Help

Table Of Contents

DS1 Overview 1

DS1-Specific Tasks 3

DS1-Specific Tasks Overview 3

DS1 or E1 Electrical Power Calibration 3

Required Equipment 3

Hardware Setup 3

Restoring Raw Power Readings for E1 or DS1 4

Calibrating the E1 or DS1 Signal 5

Calibrating the E1 #2 Bridged or DS1 #2 Bridged Signal 7

DS1 Screen Functions and Descriptions 11

DS1 Screen and Function Descriptions Overview 11

DS1 LEDs 11

DS1 Transmit Overview 12

Transmit Error Alarm 12

Transmit Loop Code 15

Transmit Settings 1 19

Receive Overview 24

Circuit Signal 24

Receive DS0 27

Receive SS 29

Receive Settings 1 30

Results Overview 33

Result Error 33

Result Graph 33

Result Large LED 34

Result Scan 34

Result Alarm 34

Results Event 34

DS1 Test 35

Action After Duration 35

Duration 38

SET 1 39

Performance Monitoring Overview 40

DS1 Performance Monitoring CRC 40

G.821 40

G.826 40

M.2100 41

Performance Monitoring Bit 41

Performance Monitoring Frame 42

Index 45

DS1 Overview

This section includes:

- DS1-Specific Tasks Overview
- DS1 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

DS1-Specific Tasks

DS1-Specific Tasks Overview

This section covers procedures that are specific to the operation of the DS1 protocol processor. For a list of general tasks, which apply to all protocol processors, see Common Tasks located in the Getting Started section.

DS1 or E1 Electrical Power Calibration

The following procedures describe the unit's negative, positive, negative bridged, and positive bridged power calibration. While performing this task, you will measure, record, and enter power reading input for zero power reading and 0.5 and 2.0 volt reading for E1 and DS1.

Required Equipment

The following equipment is required to perform E1 or DS1 calibration:

- Digital oscilloscope (use highest bandwidth available) or equivalent measuring equipment
- Variable attenuator
- Electrical power meter or a calibrated NIC that can provide 0.5 and 2.0 volts power
- BNC T-connector
- Bantam Connector
- Two 2-ft., 75 ohm coaxial cables with male BNC connectors
- Two 2-foot, 120 ohm UTP cables with male Bantam connectors (for E1 only)
- Pencil and paper to record power measurements

Hardware Setup

The following describes how to attach cables to the measuring devices (an oscilloscope will be used in this example) and how to configure these devices for E1 or DS1 calibration.

To attach cables between the unit and the oscilloscope:

1. Make sure that the unit and oscilloscope are turned on.
2. Connect the BNC T-connector to the oscilloscope's BNC input connector.
3. Connect one end of a BNC cable to the unit’s **E1/DS1 #1 TX** BNC connector and connect the other end of the cable to the BNC T-connector attached to the oscilloscope.

4. Connect one end of a BNC cable to the unit’s **E1/DS1 #1 RX** BNC connector and connect the other end of the cable to the BNC connector attached to the oscilloscope.
5. Connect the Bantam cable to the oscilloscope's Bantam input connector.
6. Connect one end of a Bantam cable to the unit’s **E1/DS1 #2 TX** Bantam connector and connect the other end of the cable to the Bantam connector attached to the oscilloscope.
7. Connect one end of a Bantam cable to the unit’s **E1/DS1 #2 RX** Bantam connector and connect the other end of the cable to the Bantam connector attached to the oscilloscope.

Restoring Raw Power Readings for E1 or DS1

The following restores the unit's raw (unconverted) power readings for E1 #1, E1 #2, DS1 #1, or DS1 #2.

Raw Negative Power Readings for E1 #1, DS1 #1, E1 #2, or DS1 #2

The following procedures apply to the Negative button that appears for the E1 #1, DS1 #1, E1 #2, or DS1 #2 tabs.

1. From the **E1** or **DS1** tab on the unit, select **Receive**.
2. Select **SIG**.
3. Select **Update Signal Calibration**.
4. Select the **Negative** button. The Negative Signal Calibration functions appear.
5. Select **Zero power reading**. A keypad appears.
6. Enter 0 and select **OK**.
7. Select **0.5 Volts Reading**. A keypad appears.
8. Enter 0 and select **OK**.
9. Select **2.0 Volts Reading**. A keypad appears.
10. Enter 0 and select **OK**.
11. Select **Save**.

Raw Positive Power Readings for E1 #1, DS1 #1, E1 #2, or DS1 #2

The following procedures apply to the Positive button that appears for the E1 #1, DS1 #1, E1 #2, or DS1 #2 tabs.

1. Select the **Positive** button. The Positive Signal Calibration functions appear.
2. Select **Zero power reading**. A keypad appears.
3. Enter 0 and select **OK**.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter 0 and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter 0 and select **OK**.

8. Select **Save**.

Raw Negative Bridged Power Readings for E1 #2 or DS1 #2

The following procedures only apply to the Negative Bridged button that appears for the E1 #2 or DS1 #2 tabs.

1. Select **Negative Bridged**. The Negative Bridged Signal Calibration functions appear.
2. Select **Zero power reading**. A keypad appears.
3. Enter 0 and select **OK** to accept the new value.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter 0 and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter 0 and select **OK**.
8. Select **Save**.

Raw Positive Bridged Power Readings for E1 #2 or DS1 #2

The following procedures only apply to the Positive Bridged button that appears for the E1 #2 or DS1 #2 tabs.

1. Select **Positive Bridged**. The Positive Bridged Signal Calibration functions appear.
2. Select **Zero power reading**. A keypad appears.
3. Enter 0 and select **OK** to accept the new value.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter 0 and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter 0 and select **OK**.
8. Select **Save**.

Calibrating the E1 or DS1 Signal

The following procedures describe how to perform E1 and DS1 calibration using the unit and an oscilloscope. These procedures apply to both the Negative and Positive buttons that appear under the **E1 #1**, **DS1 #1**, **E1 #2**, or **DS1 #2** tabs.

Obtain Zero Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. For zero volt value, do not connect the cable to the Receive connector on the unit.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Positive Signal Calibration.

4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Negative Signal Calibration.

Obtain 0.5 Volts Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values. *(Reconnect the cable to the Receive connector on the unit.)*
2. Attenuate the signal until the oscilloscope reads 0.5 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 0.5 volts power reading.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 0.5 volts power reading.

Obtain 2.0 Volts Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. Attenuate the signal until the oscilloscope reads 2.0 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 2.0 volts power reading.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 2.0 volts power reading.

Enter Negative Signal Power Readings

1. Make sure that the Negative Signal Calibration functions appear on the SIG screen. If necessary, select the **Negative** button.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**.
8. Select **Save** to save the new Negative Signal Calibration values.

Enter Positive Signal Power Readings

1. Select the **Positive** button. The Positive Signal Calibration functions appear on the SIG screen.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.5 Volts Reading**. A keypad appears.

5. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**

   This concludes signal calibration for the E1 #1 or DS1 #1 tabs.

   if you are performing calibration using the E1 #2 or DS1 #2 tabs, continue to the next section to perform Negative Bridged and Positive Bridged signal calibration.

Calibrating the E1 #2 Bridged or DS1 #2 Bridged Signal

The following procedures only apply to the Negative Bridged and Positive Bridged buttons that appear under the **E1 #2** and **DS1 #2** tabs.

Configure the Unit for Bridged Termination

The following procedures only apply to the E1 #2 and DS1 #2 tabs.

1. Select **SET 1** to display the E1 #2 or DS1 #2 receive settings functions.
2. Select the **Termination Type** function, and select **Bridged**.
3. Select **SIG**.
4. Select **Update Signal Calibration**. The negative and positive calibration functions appear.

Obtain Zero Power Reading for Bridged Termination

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. For zero volt value, do not connect the cable to the Receive connector on the unit.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Positive Bridged Signal Calibration.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Negative Bridged Signal Calibration.

Obtain 0.5 Volts Power Reading for Bridged Termination

1. Using the oscilloscope, measure and record the average positive and negative peak values. *(Reconnect the cable to the Receive connector on the unit.)*
2. Attenuate the signal until the oscilloscope reads 0.5 volts.

3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 0.5 volts power reading for Positive Bridged Signal Calibration.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 0.5 volts power reading for Negative Bridged Signal Calibration.

Obtain 2.0 Volts Power Reading for Bridged Termination

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. Attenuate the signal until the oscilloscope reads 2.0 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 2.0 volts power reading for Positive Bridged Signal Calibration.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 2.0 volts power reading for Negative Bridged Signal Calibration.

Enter Negative Bridged Signal Power Readings

1. Select the **Negative Bridged** button. The Negative Bridged Signal Calibration functions appear on the SIG screen.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**.
8. Select **Save** to save the new Negative Bridged Signal Calibration values.

Enter Positive Bridged Signal Power Readings

1. Select the **Positive Bridged** button. The Positive Bridged Signal Calibration functions appear on the SIG screen.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**.
8. Select **Save** to save the new Positive Bridged Signal Calibration values. This completes the unit's E1 or DS1 signal calibration.

DS1 Screen Functions and Descriptions

DS1 Screen and Function Descriptions Overview

The following function screens are available through the DS1 protocol processor tab.

- DS1 LEDs
- DS1 Transmit
- DS1 Receive
- DS1 Results
- DS1 Test
- DS1 Performance Monitoring

DS1 LEDs

The DS1 Processor LED and Status Indicators area serves the following purposes:

- To provide access to the DS1 protocol processor functions, which is achieved by selecting the blue DS1 title bar on the screen.
- To provide a visual status of DS1 activity such as the line interface transmit and receive settings and DS1 alarm and error conditions.

The following describes the DS1 Processor Alarm and Status Indicators area.

LED	Description
TX/RX	TX indicates the current transmit DS1 Line Interface Signal Level. RX indicates the current value of the DS1 Line Interface Input Termination.
LOS	Loss of Signal: Indicates a Loss of Signal status was detected.
BPV	Bipolar Violation Error: Indicates the presence of a Bipolar Violation error. This happens when two consecutive pulses of the same polarity occur in the same digital bit stream.
OOF	Out of Frame. Indicates that four consecutive frames have been received with invalid or errored framing patterns.
Frame	Framing: Indicates the type of DS1 framing selected

FBIT	Frame Bit Error: Indicates a frame bit error in the received frame bit pattern. This applies to both SF and ESF framing.
Idle	Indicates a DS1 Idle alarm was received.
EXZ	Excess Zeros: Indicates that more than the permitted number of consecutive zeros were received. For AMI Line Coding, 16 or more zeros are excessive; for B8ZS Line Coding, 8 or more zeros are excessive.
AIS	Alarm Indication Signal: Indicates, to downstream equipment, that an upstream failure has occurred on the DS1 signal.
Yellow	Yellow Alarm: Also known as a Remote Alarm Indication (RAI) signal. Indicates to the far end that a failure was detected.
CRC	Cyclic Redundancy Check: Indicates that a CRC error has occurred. This applies to ESF framing only.
Pat Sync	Pattern Synchronization: Indicates cell synchronization condition
Bit Err	Indicates that a Bit error was received.

DS1 Transmit Overview

The Transmit functions provide a means for defining the signal parameters used in DS1 transmit operations.

The following functions are available through the DS1 Transmit screen.

- DS1 Transmit Settings 1 (SET 1)
- DS1 Transmit Loop Code
- DS1 Transmit Error Alarm

Transmit Error Alarm

The Transmit Error Alarm function allows you to select the type of errors and alarms transmitted by the DS1 protocol processor.

Determines the type of error that is transmitted by the DS1 protocol processor. Often, these errors are used by the receiving equipment to determine if a transmission error has occurred.

Use the Error Insert button to inject single errors into the DS1 transmit signal. When this occurs, the appropriate error LED flashes red, and the error is recorded by various functions in the Results function.

The following options are available:

Option	Description
Error to Insert	Select the error to insert. The following options are available: • **None:** Turns off DS1 error insertion. • **BPV:** Transmits Bipoloar Violation errors, which result in a line code violation event for an AMI-coded signal, the occurrence of received excessive zeros or a bipolar violation that is not part of a zero substitution code. • **Bit Error:** Transmits a bit error which results in a frame-synchronization-bit error event. This also inserts a frame-bit error in the received frame-bit pattern. • **Frame:** Results in a severely errored framing event; the occurrence of two or more framing bit pattern errors within a three-microsecond period. This type of error is not available if the DS1 protocol processor is configured for Unframed framing format. • **CRC:** Results in a CRC error event; the occurrence of a

	received CRC code that is not identical to the corresponding locally calculated code. This option is available only when the DS1 protocol processor is configured for ESF framing.
Error Insert Rate	Sets the insertion rate for DS1 transmit errors. This command is not available if the Type of DS1 Error Added command is set to None. The following options are available: • **Off:** No errors are inserted for transmission. (The value displayed for this command is None.) This command effectively disables the Error Insert Action button. • **1e-3:** Where X is a value from 1 through 3. • **1e-4:** Where X is a value from 2 through 4. • **1e-5:** Where X is a value from 2 through 5. • **User Defined:** Allows you to enter and save a customized error insertion rate. The following range is available: Bit Error: 1e-2 to 1e-7.
Alarm Generated	Generates a specific type of alarm on the transmit side of the DS1 protocol processor. The following options are available: • **None:** No alarms generated. (The value displayed for this command is None.) • **LOS:** Generates a Loss of Signal alarm for the transmit DS2 signal. • **OOF:** Generates an Out of Frame alarm for the transmit DS1 signal.

	• **Yellow:** Generates a Yellow alarm for the transmit DS1 signal. • **AIS:** Generates an AIS (Alarm Indication Signal - also known as a Blue Alarm) signal for the transmit DS1 Signal.

Transmit Loop Code

The Loop Codes function allows you to isolate the connection between the system and the DS1 switch for loopback testing. With this segment isolated, you can configure the system to generate loopbacks in either direction. This allows the system to simulate a DS1 switch so that it can generate or receive loopback codes or place other DS1 facilities into or release from loopback.

The following options are available from Transmit Loop Code screen.

Option	Description
Loopback Type	Determines if the Loop Codes are sent as in-band signal or out-of-band signals. The following options are available: • **In-Band**: Available for all framing formats (Unframed, D4, ESF, and SLC-96). • **Out-of-Band:** Available only for ESF framing. • **DDS-Latching:** Typically used for 64K channels. Send a specific loopback signal for a set number of bytes. This option is available only if the unit is configured for Fractional T1 mode. • **DDS-Non-Latching:** Also known as Alternating Looback. Used for 56K channels only. The Non-Latching loopback sends the selected loopback signal as every other byte in the loopback pattern. This option is available only if the

	unit is configured for Fractional T1 mode.
Loopback Code	Selects the type of loopback code transmitted. The options available vary based on the whether Loopback Type is configured for in-band or out-of-band signaling. The following options are available: • **OCU Loopback:** Test is looped at the Office Channel Unit. This option is only available if the unit is configured for T1 mode. • **CSU Loopback:** Test is looped at the Channel Service Unit. This option is available only if the unit is configured for Fractional T1 mode. • **DSU Loopback:** Test is looped at the Data Service Unit. This option is available only if the unit is configured for Fractional T1 mode. • **4-Bit Smartjack (Facility 1):** A loop-up code "1100", with the framing bits (D4, SF) over writing the pattern, is transmitted indicating to a compatible facility interface to establish a loop back. A loop-down code "1110" is transmitted to terminate the loop back. This option is only available when the Loopback Type command is configured for In-Band. • **5-Bit Smartjack (Facility 2):** A loop-up code "11000", with the framing bits (D4, SF) over writing the pattern, is transmitted indicating to a compatible facility interface to establish a loop back. A loop-down code "11100" is

	transmitted to terminate the loop back. This option is only available when the Loopback Type command is configured for In-Band. • **Line Loopback (CSU):** F or In-Band signaling, the Line Loopback should only be responded to by CSU or CI. A loop-up code "10000", with the framing bits (D4, SF) over writing the pattern, is transmitted indicating to a compatible CSU or CI interface to establish a loop back. A loop-down code "100" is transmitted to terminate the loop back. The pattern should last for at least 5 seconds. The entire signal is looped back at the other end, no change in framing or BPV. For Out-of-Band signaling, the Line Loopback codes are: Loop-up code 0000 1110 1111 1111 and the Loop-down code is 0011 1000 1111 1111. The bits are sent in the order from right to left. These codes are sent in the data link bit in the ESF. The entire signal is looped back at the other end, no change in framing or BPV. • **User Up Code:** Allows you to create an 8-bit loopback pattern for the Loop Up Code. This option is only available for In-Band signaling. • **User Down Code:** Allows you to create an 8-bit loopback pattern for the Loop Down Code. This option is only available for In-Band signaling.

<table>
<tr><td>Auto Response</td><td>Determines how the DS1 protocol processor responds to Loop Up and Loop Down codes. The following options are available:
On: The DS1 protocol processor automatically responds to Loop Up and Loop Down codes. The system responds only to the type of loopback code that is selected by the Loopback Code command.
Off: The DS1 protocol processor does not automatically respond to Loop Up and Loop Down codes.</td></tr>
<tr><td>Tester Line Looped</td><td>Controls whether or not the system loops back the entire loop code signal it receives from a DS1 switch. (The entire loop code signal consists of the payload and framing bits.) The following options are available:
Down: This is the normal operating mode for this command.
Up: This allows a received loop code to be immediately looped at the DS1 Line Interface. The entire loop code signal (payload and framing bits) is looped.
None: The test line is not looped back.</td></tr>
<tr><td>Tester Payload Looped</td><td>Determines whether or not the system loops back just the payload of a loop code received from a DS1 switch. This command allows the loop code signal to enter the system. The signal's framing bits are stripped, new framing bits are added, and then the signal is returned to the DS1 switch. The following options are</td></tr>
</table>

	available: • **Down:** This is normal operating mode for this command. • **Up:** The received loop code is stripped of its original framing bits, but the payload remains intact. The system inserts new framing bits and returns the loop code signal to the DS1 switch. • **None:** The test payload is not looped back.
Loopback	Displays the selected Loopback type.
Loopup Code	Displays the selected Loopup code.
Loopdown Code	Displays the selected Loop down code.
Send Loop Up	Initiates the Loop Up test.
Send Loop DN	Initiated the Loop Down test.

Transmit Settings 1

This function configures the unit's transmit parameters for your DS1 test environment.

The following parameters are available through the DS1 Transmit Settings 1 screen.

Parameter	**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.
Signal Level	Sets the strength of the DS1 transmit signal. The signal level values are relative to a normal DSX1 signal level. The following options are available:

	• **0 dBdsx:** Signal level is at the DSX1 signal level. • **-7.5 dBdsx:** Signal level is -7.5 dB below the normal DSX1 signal level. • **-15 dBdsx:** Signal level is -15 dB below the normal DSX1 signal level.
Line Code	Selects the type of signal coding transmitted by the DS1 protocol processor. The following options are available. • **AMI:** Alternate Mark Inversion coding (Default). • **B8ZS:** Binary 8 Zero Substitution coding.
Line Frequency Offset	Select Off (0, which means the frequency cannot be adjusted) or -100.0 to 100.0 in 0.1 increments.
Clock Reference	Determines the timing source for the DS1 transmit signal. The following options are available: • **Internal:** Derives the transmit data's timing source from the system's internal clock. • **Recovered:** Derives the transmit data's timing source from the system's recover clock. • **BITS:** Derives the transmit's data timing source from the BITS (Building Integrated Timing Supply) clock input, which is 1.544 MHz. If this option is selected, but BITS clocking is not available, then this function defaults to Internal. CLK:BITS displays when configured for BITS clocking • **SETS:** Derives the transmit's data timing source from the

	SETS (Synchronous Equipment Timing Source) clock input, which is 2.048 MHz. If this option is selected, but SETS clocking is not available, then this function defaults to Internal. CLK:SETS displays when configured for SETS clocking.
Loopback	Sets the DS1 test to loopback mode. Select **None** or **Payload**. Payload Loopback codes are: Loop-up code 0001 0100 1111 1111 and Loop-down code 0011 0010 1111 1111. The bits are sent in the order from right to left. These codes are sent in the data link bit in the ESF. The payload of the signal, the 192 information bits are returned to sending side. The framing bits are still generated from the far end. This option is only available for Out-of-Band signaling.
Framing	Configures the framing format used for the DS1 transmit signal. **Note:** Any changes made to this command are replicated to the DS1 receive signal. The following options are available: • **Unframed:** Configures the system to transmit a DS1 signal using an unframed format. • **D4/SF:** Configures the system to transmit a DS1 signal using D4 super frame format. • **ESF:** Configures the system to transmit a DS1 signal using Extended Super Frame format. • **SLC-96:** Configures the system to transmit a DS1 signal using SLC-96 format

	(Subscriber Loop Carrier).
Mapping	Sets mapping to: • **ATM Direct:** Uses HEC-based cell delineation. By using less overhead, the maximum ATM Cell throughput is 1.536 Mbps. • **ATM PLCP:** Physical Layer Convergence Protocol is used. ATM cells are enclosed in a frame defined by PLCP, which adds more overhead. Because of the extra overhead, the maximum ATM Cell throughput is 1.413 Mbps. • Bulk Filled
Payload Pattern	Selects the type of DS1 payload pattern that is transmitted by the system. The following options are available: • QRSS • PRBS 15 • PRBS 20 • PRBS 23 • **All Ones:** Transmits a fixed test pattern of only pulses. This pattern is generally used to stress span repeater current reulator circuits. It can be used as an AIS in unframed circuits, or a keep alive signal, idle code, or red alarm in other circuits. • **3 in 24 (3:21):** Transmits a fixed test pattern of F0100 0100 0000 0000 0000 0100. The pattern is aligned with the F-bits as indicated. 3 in 24 provides the minimum ones density and the maximum excess zeros requirements to stress T1 circuits. When the pattern is framed, it violates

	the minimum ones density requirements. • **1 in 8 (1:7):** Transmits a fixed pattern of F01000000. This pattern stresses the minimum ones density requirement for B8ZS encoded T1 circuits if sent unframed. • **1010 Pattern:** A fixed test pattern of alternating marks (1) and spaces (0). This pattern is generally used to perform a minimum level stress test on clock recovery circuits. • **55DLY:** Transmits a 55 octet Daly pattern. • **T1-2:** Transmits a 96 octet pattern. • **T1-3:** Transmits a 54 octet pattern. • **T1-4:** Transmits a 120 octet pattern. • **T1-5:** Transmits a 53 octet pattern. • **55-OCTET:** Transmits a 55 octet pattern. • **Bridge Tap:** Transmits 21 different patterns to detect bridge taps on a DS1. The following patterns are performed in 30-second increments: All Ones, 1-in2, 1-in-4, 1-in-6, 1-in-7, 1-in-8, 2-in-9, 2-in-10, 2-in-11, 2-in-12, 2-in-13, 2-in-14, 2-in-15, 3-in-18, 3-in-19, 3-in-20, 3-in-21, 3-in-22, 3-in-23, 3-in-24, and QRSS. • **Multi-Pattern:** Transmits five different patterns to stress a DS1. The following patterns are performed in five-minute increments: All Ones, 1-in-8, 2-in-8, 3-in-24, and QRSS. • PRBS 6 • PRBS 6 Inv

	• PRBS 9 • PRBS 9 Inv • PRBS 11 • PRBS 11 Inv • **User Defined:** Allows you to enter up to a 32-bit pattern.
Fractional T1 (1-24)	Configures the system for Fractional T1 testing.
Background DS0 Pattern	Enter any 8-bit pattern.

Receive Overview

The DS1 Receive function provides settings for the signal parameters used in the DS1 protocol processor receive operations. These commands configure the system for the expected receive signal.

The following functions are available from the Receive screen:

- Receive SET 1 (Settings 1)
- Receive DS0
- Receive SS (Signal Status)

Circuit Signal

The DS1 application uses robbed-bit signaling to provide DS0 per-channel circuit signaling data. Eight bits are available for the payload in each channel during 5 out of 6 frames. Every 6th frame, however, the least significant bit (8th) of each time slot is used (robbed) to provide per-channel circuit signaling.

In the D4 format, bits are robbed in the 6th and 12th frame to derive the signaling channel. This bit is called the A bit and the bit from the 12th frame is called the B bit.

In the ESF format, bits are robbed in the 6th, 12th, 18th, and 24th frames to derive the signaling channel. These make up the A, B, C, and D bits respectively.

The contents and meaning of the signaling bits depend on the type of signaling selected using the Circuit Signaling command. The robbed-bit signaling states for six types of D4 and ESF circuit signaling are provided in the following tables.

The following table describes D4 and SLC-96 circuit signaling and bit formats.

Circuit Signalling	Circuit	Signalling States	A	B
Loop Start	Network to CI	LCF	0	1
		Ringing	0	0
	CI to Network	LO (On-hook)	0	1
		LC (Off-hook)	1	1
Ground-Start	Network to CI	LCF	0	1
		LCFO	1	1
		Ringing	0	0
	CI to Network	LO (on-hook)	0	1
		LC)off-hook)	1	1
		RG (service request)	0	0
Loop-Reverse Battery	Network to CI	LO (on-hook)	0	0
		LC (off-hook)	1	1
	CI to Network	LO (on-hook)	0	0
		LC (off-hook)	1	1
Network-Provided Reverse Battery	Network to CI	LCF (on-hook)	0	0
		RLCF (off-hook)	1	1
	CI to Network	LO (on-hook)	0	0
		LC (off-hook)	1	1
E and M Signalling	Network to CI	On-hook	0	0
		Off-hook	1	1
	CI to Network	On-hook	0	0
CI-Provided Loop Start	Network to CI	LO (on-hook)	0	1
		LC (off-hook)	1	1
	CI to Network	LCF	0	1
		Ringing	0	0

Loop Start	Network to CI	LCF	0	1

LCF = Loop Current Feed; RLCF = Reverse Loop Current Feed; LCFO = Loop Current Feed Open; LO = Loop Open LC = Loop Closure; RG = Ring Ground; CI = Customer Installation

The following table describes ESF circuit signaling and bit formats.

Circuit Signalling	**Circuit**	**Signalling States**	**A**	**B**	**C**	**D**
Loop Start	Network to CI	LCF	0	1	0	1
		Ringing	0	0	0	0
	CI to Network	LO (On-hook)	0	1	0	1
		LC (Off-hook)	1	1	1	1
Ground-Start	Network to CI	LCF	0			1
		LCFO	1	1	1	1
		Ringing	0	0	0	0
	CI to Network	LO (on-hook)	0	1	0	1
		LC)off-hook)	1	1	1	1
		RG (service request)	0	0	0	0
Loop-Reverse Battery	Network to CI	LO (on-hook)	0	0	0	0
		LC (off-hook)	1	1	1	1
	CI to Network	LO (on-hook)	0	1	0	1
		LC (off-hook)	1	1	1	1

Network-Provided Reverse Battery	Network to CI	LCF (on-hook) RLCF (off-hook)	0 1	0 1	0 1	0 1
	CI to Network	LO (on-hook) LC (off-hook)	0 1	0 1	0 1	0 1
E and M Signalling	Network to CI	On-hook Off-hook	0 1	0 1	0 1	0 1
	CI to Network	On-hook Off-hook	0 1	0 1	0 1	0 1
CI-Provided Loop Start	Network to CI	LO (on-hook) LC (off-hook)	0 1	1 1	0 1	1 1
	CI to Network	LCF Ringing	0 0	1 0	0 0	1 0

LCF = Loop Current Feed; RLCF = Reverse Loop Current Feed; LCFO = Loop Current Feed Open; LO = Loop Open LC = Loop Closure; RG = Ring Ground; CI = Customer Installation

Receive DS0

The DS0 feature allows you to test and analyze T-Carrier transmission systems at the DS1 and DS0 levels from the DS1 access point. The DS0 function selects individual DS0 channels allowing data bits for D4 and ESF signaling bits (A, B, C, and D) to be monitored. A speaker provides audible VF outputs for the selected DS0 channel. The DS0 function provides analysis of individual circuits using the Chan Drop button or analysis of all 24 DS0 channels using the Chan Scan button.

The following describes the functions associated with each option.

Option	**Description**
Circuit Signal	Selects the specific type of signaling bits that are monitored and displayed within the DS0 Function Menu area. The following options are available: • Unknown • Loop-Start • Ground-Start • Loop-Rev Battery • E and M • CI-Prov Loop Start
Test Site	The network interface and the customer installation use compatible robbed-bit signaling states for each type of circuit signaling (refer to Tables 3-1 and 3-2). The Test Site command allows you to determine whether the Network Interface or the Customer Installation is responsible for generating these signals. The following options are available. • **Customer<--Network:** The network interface generates signaling states to the customer installation. • **Network<--Customer:** The customer installation generates signaling states to the network interface. • **Unknown:** Undefined signaling state. Under normal operation, undefined signaling states should only exist during the transition from one signaling state to another signaling state. The duration of these signaling state transmissions should not exceed 3 milliseconds.
DS0 Channel Dropped	Selects a DS0 channel (Channels 1 through 24) to drop from the DS1

	signal. For ESF channel signaling, the four Channel Signaling Bits, labeled A, B, C, and D, indicate the status of the selected DS0 channel. For D4 or SLC-96, the two Channel Signaling Bits, labeled A and B, indicate the status of the selected DS0 channel.
Single Chan	Allows you to select a single channel to scan for errors.
Prev/Next Chan	The Prev Chan and Next Chan buttons allow you to select a DS0 channel (Channels 1-24) that is dropped from the DS1 signal by scrolling backwards or forwards through the 24-DS0 channels.
All Chans	Scans all DS0 channels within a DS1 signal for framing errors. This allows you to view the D4, SLC-96, or ESF signaling bits for all 24 DS0 channels at once.
DS0 Speaker	Provides audible VF outputs for the selected DS0 channel. You can control the volume of the output using the Volume arrow button options.

Receive SS

The Signal Status function displays the measured voltage, strength, line frequency, and frequency offset of the DS1 Receive signal as it enters the system.

The following information is displayed on the E1 Receive Signal Status screen.

- Peak Positive Pulse Voltage
- Peak Negative Pulse Voltage
- Power in dBm
- Power in dBdSX
- Line Frequency in MHz
- Line Frequency Offset Received in Hz and ppm.
- Update Signal Calibration: This function controls the unit's Negative and Positive signal calibration. The following calibration functions are available:

- Select Negative, Positive, Negative Bridged (for DS1 #2 only), or Positive Bridged (for DS1 #2 only) to calibrate the following readings:
    - Configure Zero Power Reading
    - Configure 0.5 Volts Reading
    - Configure 2.0 Volt Reading
    - Select Save to set the configuration.

Receive Settings 1

The Receive Settings function determines how the DS1 interface and processor parameters are configured.

The following options are available from the Receive Settings 1 screen.

Option	Descriptions
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.
Termination Type	Sets the termination point of the DS1 receive signal. The following options are available: • **Monitor:** Sets the receive sensitivity of the DS1 Line interface. Use this setting if the DS1 line connects to a monitor jack. • **Terminated:** Sets the receive sensitivity of the DS1 Line interface. Use this setting if the DS1 line terminates at the system's Line Interface. • **Bridged:** Allows the DS1 receive signal to be connected to both the DS1 interface and the DS1 protocol processor.

Framing	Configures the framing format used for the DS1 Receive signal. **Note:** Any changes made to this command are replicated to the DS1 Transmit signal. The following options are available: • **Unframed:** Configures the system to transmit a DS1 signal using an unframed format. • **D4/SF:** Configures the system to transmit a DS1 signal using D4 super frame format. • **ESF:** Configures the system to transmit a DS1 signal using Extended Super Frame format. • **SLC-96:** Configures the system to transmit a DS1 signal using SLC-96 format (Subscriber Loop Carrier).
Mapping	Sets Receive mapping to: • **56K Fractional T1:** Configures the system for 56K channel rates. • **64K Fractional T1:** Configures the system for 64K channel rates. • **ATM Direct:** Uses HEC-based cell delineation. By using less overhead, the maximum ATM Cell throughput is 1.536 Mbps. • **ATM PLCP:** Physical Layer Convergence Protocol is used. ATM cells are enclosed in a frame defined by PLCP, which adds more overhead. Because of the extra overhead, the maximum ATM Cell throughput is 1.413 Mbps. • **Bulk Filled:**

Payload Expected	Selects the type of DS1 payload pattern that is received by the system. The following options are available: • QRSS • PRBS 15 • PRBS 20 • PRBS 23 • **All Ones:** A fixed test pattern of only pulses (marks) is received. This pattern is generally used to stress span repeater current regulator circuits. It can be used as an Alarm Indication Signal (AIS) in unframed circuits, or a keep alive signal, idle code, or red alarm in other circuits. • **3 in 24 (3:21):** A fixed test pattern of F0100 0100 0000 0000 0000 0100 is received. The pattern is aligned with the F-bits as indicated. 3 in 24 provides the minimum ones density and the maximum excess zeros requirements to stress T1 circuits. When the pattern is framed, it violates the minimum ones density requirements. • **1 in 8 (1:7):** A fixed pattern of F01000000 is received. This pattern stresses the minimum ones density requirement for B8ZS encoded T1 circuits if sent unframed. • **1010 Pattern:** A fixed test pattern of alternating marks (1) and spaces (0). This pattern is generally used to perform a minimum level stress test on clock recovery circuits. • **55DLY:** A 55 octet Daly pattern is received. • **T1-2:** A 96 octet pattern is received. • **T1-3:** A 54 octet pattern is received. • **T1-4:** A 120 octet pattern is received. • **T1-5:** A 53 octet pattern is

Fractional T1 (1-24)	Configures the system for Fractional T1 testing.
CODEC	Select A-law, MU-law, or True A-law.

Results Overview

The Results function allows you to view DS1 error and alarm analysis and create a history of these events by graphing the information.

The following options are available through the Results screen:

- Scan
- Error
- Alarm
- Event
- Large LED
- Graph

Result Error

This function displays the number of errors detected and the average and current error rate measurement. The errors reported are generated by the DS1 network or intentionally by the system using the Error Insert Action button.

The following DS1 errors are reported.

- BIT
- BPV
- Frame
- CRC
- Excess 0's

Result Graph

Use the Graphs button to view error and alarm results for the DS1 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 DS1 alarms and errors.

To use the Results Graph function, see Using Graphs.

Result Large LED

This button displays the DS1 LED Error and Alarm Indicators in a large, easy to read format that covers the entire screen area. This is especially useful for viewing any errors or alarms from a long distance, such as across the room from a test bay.

The following describes the LED colors:

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.

Result Scan

The Scan function provides a list of received errors and alarms for the DS1 protocol processor. The duration or count of each event also appears. This function is effective in identifying a general area to investigate when an error or alarm is detected.

When no problems are detected, "No Errors or Alarms" is displayed.

Result Alarm

This function displays how long DS1 alarms were detected by the system. Results for the following alarms display.

- AIS Seconds
- Out of Frame Seconds
- Loss of Signal Seconds
- Pat Sync Seconds
- Yellow Seconds
- Excess 0's Seconds
- Clock Seconds
- Idle Seconds
- FBIT

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, and press Resume to start displaying results.

For more information, see the Use the Event Log section.

DS1 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 alarm values are enclosed in quotes (") and separated by commas (,).
Print Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected.

	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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.
Print Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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

Record Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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**.
Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).
Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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.

Performance Monitoring Overview

Performance Monitoring provides greater detail about incoming Frame and Bit errors.

The following options are available:

- Frame
- CRC
- Bit

DS1 Performance Monitoring CRC

This provides a detailed breakdown for CRC errors detected and logged by the DS1 protocol processor.

This section is broken down into the following areas:

G.821

- 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.821 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

G.826

- 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.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.
- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- M.2100 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

Performance Monitoring Bit

This provides a detailed breakdown for BIT errors detected and logged by the E1 protocol processor.

This section is broken down into the following areas:

G.821

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

G.826

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

M.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.
- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- Allocation: Select an allocation percentage from 0 to 100.
- Duration: Set monitoring duration to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

Performance Monitoring Frame

This provides a detailed breakdown for Frame errors detected and logged by the DS1 protocol processor.

This section is broken down into the following areas:

G.821

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass or failure

G.826

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

M.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.
- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- Allocation: Select an allocation percentage from 0 to 100.
- Duration: Set monitoring duration to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

Index

C

Calibration.. 3

E4 Online Help

Table Of Contents

E4 1

E4-Specific Tasks 3

E4 Specific Tasks 3

Add an E3 into an E4 Signal 3

Specifying Frames and Patterns for the Dropped/Inserted Signal 3

View the Event Activity of the Dropped and Inserted Signals 3

Screen and Function Descriptions 5

E4 Screen and Function Descriptions 5

E4 LEDs 5

E4 Transmit 6

E4 Transmit Errors and Alarms 6

E4 Transmit Settings 1 8

E4 Transmit Settings 2 9

E4 Receive 10

E4 Receive Settings 1 10

E4 Receive Signal Status 12

E4 Results 12

E4 Results Alarm 13

E4 Results Errors 13

E4 Results Graph 14

E4 Results Large LEDs 14

E4 Results Scan 14

Results Event 15
E4 Test 15
Action After Duration 16
Duration 19
SET 1 20
E4 Performance Monitoring 20
E4 Performance Monitoring Bit 20
G.821 20
G.826 21
M.2100 21
E4 Performance Monitoring FAS 22
G.821 22
G.826 22
M.2100 22
Index 25

E4

The E4 protocol processor section includes:

- E4-Specific Tasks
- E4 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

E4-Specific Tasks

E4 Specific Tasks

This section includes tasks that are specific to the E4 protocol processor. For a list of general tasks, see Common Tasks located in the Getting Started section.

Add an E3 into an E4 Signal

You are able to drop and insert an electrical E3 PDH signal into an E4 protocol processor signal to monitor for error and alarm conditions.

1. Select **Presets**.
2. Select **E4/E3 D/I Line**.

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

Specifying Frames and Patterns for the Dropped/Inserted Signal

1. Select **Transmit**.
2. Select **SET 2**.
3. Select **E3 Channel Inserted**.
4. Select **E3 Background Frame.**
5. Select **E3 Background Pattern**.

View the Event Activity of the Dropped and Inserted Signals

1. Select **Results**.
2. Select **Scan** to view a summary of the error and alarm counts that have occurred.
3. Select **Error** 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 **Event** to view a list of events, count, time they occurred, and how long they occurred.
6. Select **Large LEDs** to view errors and alarms in the form of LEDs.

Screen and Function Descriptions

E4 Screen and Function Descriptions

The following functions are available through the E4 protocol processor.

- E4 LEDs
- E4 Transmit
- E4 Receive
- E4 Results
- E4 Test
- E4 Performance Monitoring

E4 LEDs

When the E4 protocol processor is selected, the following LEDs are displayed in the LEDs Quick Status Area of the touch screen. They are also located under Results Large LEDs.

LED	Description
TX/RX PWR	Displays the transmitted and received electrical power.
CLK:	Displays the type of transmit clock specified in the setting. Clock settings include: SETS, Internal, or RCVD. This is an alarm LED.
LOS	Loss of Signal. Indicates a Loss of Signal status was detected. This is an alarm LED.
LCV	Line Code Violation. Indicates a Line Code Violation was detected. This is an error LED.

FRAME	Indicates if the E4 protocol processor has received framing synchronization errors. This is an error LED.
AIS	Alarm Indication Signal. Indicates an Alarm Indication Signal occurred on the line layer. This is an alarm LED.
Frame Err	Indicates if the E4 protocol processor has received framing errors. This is an error LED.
RDI	Remote Defect Indicator. Indicates a signal returned to the transmitting Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect. This is an alarm LED.
PAT Sync	Indicates a loss of pattern synchronization. This is an alarm LED.
BIT ERR	Bit Error. Indicates a bit error was detected in the payload. This is an error LED.

E4 Transmit

This function allows you to define the parameters used in E4 Transmit operations.

The following functions are available through the E4 Transmit screen.

- E4 Transmit Settings 1 (SET 1)
- E4 Transmit Settings 2 (SET 2)
- E4 Transmit Errors and Alarms

E4 Transmit Errors and Alarms

This function allows you to enter errors and alarms.

The following options are available on the E4 Errors and Alarms screen.

Option	**Description**
Error to Insert	Inserts an error that is transmitted by the E4 protocol processor. The options available include: • **None:** Turns off E4 error insertion. • **LCV:** Transmits Line Code Violation errors, which result in a line code violation event for an AMI-coded signal. • **Bit:** Transmits a bit error, which results in a frame synchronization bit error event. This also inserts a frame bit error in the received frame bit pattern. • **Frame:** Results in a severely errored framing event, which occurs when two or more framing bit pattern errors within a 3-ms period. This type of error is not available if the E4 protocol processor is configured for Unframed framing format.
Error Insert Rate	Sets the insertion rate for E4 transmit errors. This command is not available if Error to Insert is set to None. The following options are available for this command. • **Off:** No errors are inserted for transmission. This command effectively disables the Error Insert Action button. • **1e-X**, where X is a value from 3 through 10.
Alarm Generated	Generates a specific alarm on the transmit side of the STM-4 protocol process. The following options are available: None, LOS, LOF, AIS, and RDI.

E4 Transmit Settings 1

This screen allows you to configure the transmit signal parameters for the E4 line interface and the E4 protocol processor to match the E4 signal used in your test environment.

The E4 Transmit Settings 1 screen contains the following parameters:

Parameter	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.
Framing	Configures the framing format used for the E4 transmit signal. The following options are available: • **Unframed:** Configures the system to transmit an E4 signal using an unframed format. • **Framed:** Configures the system to transmit an E4 signal using a framed format.
Line Freq Offset	Line Frequency Offset can be deactivated by setting it to "Off" or a customized amount between 100 and -100 can be entered.
Clock	Determines the timing source for the E4 transmit signal. The following options are available: • **Internal:** Derives the transmit data's timing source from the system's internal clock. • **Recovered:** Derives the transmit data's timing source from the system's recover clock. • **BITS:** Derives the transmit's data timing source from the BITS (Building Integrated Timing Supply) clock input, which is

	1.544 MHz. If this option is selected, but BITS clocking is not available, then this function defaults to Internal. CLK:BITS displays when configured for BITS clocking • **SETS:** Derives the transmit's data timing source from the Synchronous Equipment Timing Source.

E4 Transmit Settings 2

This function selects the type of E4 Transmit mapping and patterns used by the E4 protocol processor.

The following options are available:

Option	**Description**
Mapping	Select E3 or Bulk Filled.
Payload Pattern	Select User Defined (32-bit entry), PRBS 9, PRBS 9 Inverted (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. **Note:** This option is not available if Mapping is not set to Bulk Filled.
E3 Channel Inserted	Select from Channels 1 through 4, All, or None. **Note:** This option is unavailable if Mapping is not set to E3.
E3 Background Frame	Select from Framed, Unframed, PCM30, PCM30CRC, PCM31, and PCM31CRC. **Note:** This option is only available if Mapping is set to E3.
E3 Background Pattern	Enter any 32-bit pattern. **Note:** This option is only available if Mapping is set to E3.

E4 Receive

This function allows you to configure settings for the parameters used in the E4 Receive operations.

The following functions are available through the E4 Receive screen.

- E4 Receive Settings 1 (SET 1)

- E4 Receive Signal Status

E4 Receive Settings 1

This screen allows you to configure your unit's Receive parameters for your E4 test environment. The parameter settings to determine how the E4 interface and processor parameters are configured.

The E4 Receive Settings 1 screen contains the following parameters:

Parameter	**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.
Mapping	Mapping options include: E3 or Bulk Filled. **Note:** E3 mapping is only available if the Framing option is set to Framed.
Framing	Configures the framing format used for the E4 Receive signal. The following options are available: • **Unframed:** Configures the system to transmit an E4 signal using an unframed format. • **Framed:** Configures the system to transmit an E4 signal using a framed format.
Payload Expected	Selects the type of E4 signal pattern

	that is transmitted by the system. The following options are available: • **Live:** Uses live data traffic; no pattern. This is used primarily for monitoring errors and alarms within a live data stream. • **PRBS 2^9-1:** Transmits a maximum of 8 consecutive zeros and 9 consecutive ones. • **PRBS 2^9-1 Inverted:** Transmits an inverted 2^9-1 PRBS, inverts it, and transmits a maximum of 9 consecutive zeros and 8 consecutive ones. • **PRBS 2^11-1:** Transmits a maximum of 10 consecutive zeros and 11 consecutive ones. • **PRBS 2^11-1 Inverted:** Transmits an inverted 2^11-1 PRBS, inverts it, and transmits a maximum of 11 consecutive zeros and 10 consecutive ones. • **PRBS 2^15-1:** Transmits a maximum of 14 consecutive zeros and 15 consecutive ones. • **PRBS 2^15-1 Inverted:** Transmits an inverted 2^15-1 PRBS, inverts it, and transmits a maximum of 15 consecutive zeros and 14 consecutive ones. • **PRBS 2^20-1:** Transmits a maximum of 19 consecutive zeros and 20 consecutive ones. • **PRBS 2^20-1 Inverted:** Transmits an inverted 2^20-1 PRBS, inverts it, and transmits a maximum of 20 consecutive zeros and 19 consecutive ones. • **PRBS 2^23-1:** Transmits a maximum of 22 consecutive zeros and 23 consecutive ones. • **PRBS 2^23-1 Inverted:** Transmits an inverted 2^23-1 PRBS, inverts it, and transmits a maximum of 23 consecutive

	zeros and 22 consecutive ones. • **User Defined:** Allows you to enter and save up to a 32-bit, customized pattern.
E3 Channel Dropped	Select a channel to drop, 1-4. **Note:** This function is only available if Mapping is set to E3.

E4 Receive Signal Status

This function displays the electrical power, line frequency, and line frequency offset of the incoming E4 signal.

The following information is displayed on the E4 Receive Signal Status screen.

- Peak Positive Pulse Voltage (in volts)
- Peak Negative Pulse Voltage (in volts)
- Power in dBm
- Power in dBdsx
- Line Frequency in MHz
- Line Frequency Offset Received in Hz and ppm
- Update Signal Calibration: This function controls the unit's negative and positive signal calibration. The following calibration functions are available:
    - Select **Negative** or **Positive** calibration.
        - Configure Zero Power Reading
        - Configure 0.1 Volts Reading
        - Configure 0.4 Volts Reading
    - Click **Save** to set the configuration.

E4 Results

This function allows you to view E4 error and alarm analysis and create a history of these events by graphing the information.

The following functions are available through the E4 Results screen.

- SCAN
- ERR
- Alarm

- Event
- Graph
- Large LED

E4 Results Alarm

This function displays how long E4 alarms were detected by the system. Results for the following alarms display.

- Alarm Indication Signal (AIS)
- Loss of Frame (LOF)
- Loss of Signal (LOS)
- Pattern Loss (PAT LOSS)
- Remote Defect Indication (RDI)

E4 Results Errors

This function reports statistical information on errors including the error count, average error rate, and current error rate.

The following errors are displayed on the E4 Results Errors screen:

- Bit
- LCV
- Frame
- CRC
- FAS
- FEBE

E4 Results Graph

Use the Graphs button to view error and alarm results for the E4 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 E4 alarms and errors.

To use the Results Graph function, see *Using Graphs* in the Common Topics section.

E4 Results Large LEDs

This button displays the E4 LED Error and Alarm Indicators in a large, easy to read format that covers the entire screen area. This is especially useful for viewing any errors or alarms from a long distance, such as across the room from a test bay.

The following describes the LED colors:

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.

E4 Results Scan

This function provides a quick report of detected errors and alarms and lists the duration of these events.

The following options are available in the E4 Results Scan screen.

Option	**Description**
Clock	Type of clock: internal, SETS, or Bits.
LOS Seconds	The number of seconds a Loss of Signal occurred.
LCV Error Count	The number of Line Code Violations errors that occurred.
LOF Seconds	The number of seconds a Loss of

	Frame occurred.
AIS Seconds	The number of seconds a Alarm Indication Signal occurred.
FAS Error Count	The number of Frame Alignment Signal errors that occurred.
CRC Error Count	The number of Cycle Redundancy errors that occurred.
CASMFL Seconds	The number of seconds a Channel-Associated Signalling Multiframe Loss error occurred.
RAI Seconds	The number of seconds a Remote Alarm Indication occurred.
RMFAI Seconds	The number of seconds a Remote Multiframe Alarm Indication occurred.
FEBE Error Count	The number of Far End Block Errors that occurred.
Pattern Loss Seconds	The number of seconds that a Loss of Pattern occurred.
Bit Errors Count	The number of Bit Errors that occurred.

Results Event

The Results Event function provides a detailed summary of alarm and error event and 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.

Select **Resume** to list event activity.

E4 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 alarm values are enclosed in quotes (") and separated by commas (,).
Print Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.
Print Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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
Record Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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**.
Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).
Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time

	test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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.

E4 Performance Monitoring

The E4 Performance Monitoring screen includes the following functions:

- FAS

- BIT

E4 Performance Monitoring Bit

This provides a detailed breakdown for BIT errors detected and logged by the E4 protocol processor.

This section is broken down into the following areas:

G.821

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass or failure

G.826

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass or failure

M.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.
- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- Allocation: Select an allocation percentage from 0 to 100.
- Duration: Select the monitoring duration to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

E4 Performance Monitoring FAS

This provides a detailed breakdown for Frame Alignment Signal errors detected and logged by the E4 protocol processor.

This section is broken down into the following areas:

G.821

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass or failure

G.826

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass or failure

M.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.

- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- Allocation: Select an allocation percentage from 0 to 100.
- Duration: Select the monitoring duration to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

Index

A

Alarm 6, 12

B

Bit.. 20

D

Descriptions 5

E

E3 3

E4 1, 5, 6, 7, 9, 10, 12, 13, 14, 20, 21

E4 LEDs.. 5

E4 Performance 20, 21

E4 Receive 9

E4 Receive Settings...................... 10

E4 Receive Signal Status 12

E4 Results 12

E4 Results Alarm 12

E4 Results Errors.......................... 13

E4 Results Graph.......................... 13

E4 Results Scan 14

E4 Screen 5

E4 Transmit 6

E4 Transmit Errors 6

E4 Transmit Settings 7

Errors 6, 13, 20, 21

F

FAS 21

G

Graph 13

L

LEDs 5

M

Multiframe 12, 14

P

Performance...........................20, 21

R

Receive 9, 10, 12

Results 12, 13, 14

S

Scan 14

Screen..5

Settings 7, 10

Status 12

E3 Online Help

Table Of Contents

E3 1

E3/E4 Technical Specifications 3

E3-Specific Tasks 5

  E3-Specific Tasks 5

  E3 or DS3 Electrical Power Calibration 5

    Required Equipment 5

    Hardware Setup 5

    Restoring Raw Power Readings for E3 or DS3 5

    Calibrating E3 or DS3 Signal Calibration 6

  Start/Stop DS3 and E3 Channel Scan 7

E3 Screen and Field Definitions 9

  E3 Screen and Function Descriptions 9

  E3 LEDs 9

  E3 Transmit 10

  E3 Transmit Errors and Alarms 10

  E3 Transmit Settings 1 11

  E3 Transmit Settings 2 13

  E3 Receive 14

  E3 Receive Channel Scan 14

  E3 Receive Settings 1 15

  E3 Receive Signal Status 17

  E3 Results 17

E3 Results Alarm....17
E3 Results Errors....18
E3 Results Graph....18
E3 Results Large LEDs....18
E3 Results Scan....19
Results Event....19
E3 Test....20
Action After Duration....20
Duration....23
SET 1....24
E3 Performance Monitoring....24
E3 Performance Monitoring Bit....24
G.821....25
G.826....25
M.2100....25
E3 Performance Monitoring FAS....26
G.821....26
G.826....26
M.2100....27
Index....29

E3

This section includes:

- E3-Specific Tasks
- 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

E3/E4 Technical Specifications

E3/E4 Specification	Description
Line code	**E3:** HDB3 **E4:** CMI
Framing	Framed, unframed
Line Rates	**E3:** 34.368 MHz ± 4.6 ppm (TX), -2 ppm/yr 34.368 MHz ± 50 ppm (RX) **E4:** 139.264 MHz +20 ppm (TX), -2 ppm/yr 139.264 MHz +50 ppm (RX)
Impedance	75 ohm unbalanced
Level (TX)	**E3:** 1.00 Vp ± 0.1v **E4:** .5 Vp + .1v
Connectors	BNC: 75 ohm unbalanced
Synchronization	Internal, recovered, SETS
Input Signal Measurement	**E3:** Peak voltage range: ± 0.31 Vp to ± 1.2 Vp Frequency measurement range: 34.368 MHz ± 200 ppm **E4:** Peak voltage range: ± 0.3 Vp to ± .7 Vp Frequency measurement range: 139.264 MHz ± 200 ppm
Input Jitter Tolerance	Per G.823
Frequency Offset Generation	± 100 ppm in units of .1ppm
Error Measurement	**E3:** BPV, BIT, Frame **E4:** Bit, Frame
Alarm Detection	LOS, LOF, pattern sync, AIS, RDI
Alarm Generation	LOS, LOF, AIS, RDI
Error Injection	**E3:** BPV, bit, frame **E4:** Bit, Frame
Error Injection Rate	Single, 10^{-7} to 10^{-3}, user-programmable

Patterns	**E3:** 2^9 -1, 2^9 -1 inverted, 2^{11} -1, 2^{11} -1 inverted, 2^{15} -1, 2^{15} -1 inverted, 2^{20} -1, 2^{20} -1 inverted, 2^{23} -1, 2^{23} -1 inverted, any user-defined pattern up to 32 bits, ATM (mapping) Pass through with Drop & Insert: E3 pass thru with Drop/Insert of a single E1 for test **E4:** 2^{20} -1, 2^{20} -1 inverted, 2^{23} -1, 2^{23} -1 inverted, any user-defined pattern up to 32 bits.
E3 Jitter Measurement	**Jitter Measurement Characteristics:** • Acquisition time: 2 seconds typical, 5 seconds maximum • Jitter resolution: 0.01 UI **Filter Characteristics:** • Wideband measurement: 10 Hz to 400 KHz • Highband measurement: 30 KHz to 400 KHz • Nominal filter attenuation at Fc: 3dB **Jitter Output Characteristics:** • Scale: 0.1 V/UI • Bandwidth: 10 Hz to 40 KHz

E3-Specific Tasks

E3-Specific Tasks

This section includes tasks that are specific to the E3 protocol processor. For a list of general tasks, see Common Tasks located in the Getting Started section.

E3 or DS3 Electrical Power Calibration

The following procedures describe the unit's negative and positive power calibration. While performing this task, you will measure, record, and enter power reading input for zero power reading and 0.2 and 0.8 volt reading for E3 or DS3.

Required Equipment

The following equipment is required to perform E3 or DS3 calibration:

- Digital oscilloscope (use highest bandwidth available) or equivalent measuring equipment
- Variable attenuator
- Electrical power meter or a calibrated NIC that can provide 0.2 and 2.0 volts power
- BNC T-connector
- Two 2-ft., 75 ohm coaxial cables with male BNC connectors
- Pencil and paper to record power measurements

Hardware Setup

The following describes how to attach cables to the measuring devices (an oscilloscope will be used in this example) and how to configure these devices for E3/DS3 calibration.

To attach cables between the unit and the oscilloscope:

1. Make sure that the unit and oscilloscope are turned on.
2. Connect the BNC T-connector to the oscilloscope's BNC input connector.
3. Connect one end of a BNC cable to the unit’s **E3/DS3 TX** BNC connector and connect the other end of the cable to the BNC T-connector attached to the oscilloscope.
4. Connect one end of a BNC cable to the unit’s **E3/DS3 RX** BNC connector and connect the other end of the cable to the BNC connector attached to the oscilloscope.

Restoring Raw Power Readings for E3 or DS3

The following restores the unit's raw (unconverted) power readings.

1. From the **E3** or **DS3** tab on the unit, select **Receive**.
2. Select **SIG**.
3. Select **Update Signal Calibration**.
4. Select **Negative**.
5. Select **Zero power reading**. A keypad appears.
6. Enter 0 and select **OK**.
7. Select the **Save** button to restore the raw power reading.
8. Select **Positive**.
9. Select **Zero power reading**. A keypad appears.
10. Enter 0 and select **OK**.
11. Select **0.2 Volts Reading**. A keypad appears.
12. Enter 0 and select **OK**.
13. Select **0.8 Volts Reading**. A keypad appears.
14. Enter 0 and select **OK**.
15. Select the **Save** button to restore the raw power reading.

Calibrating E3 or DS3 Signal Calibration

The following procedures describe how to perform E3 or DS3 calibration using a NIC and oscilloscope.

Obtain Zero Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. For zero volt value, do not connect the cable to the Receive connector on the unit.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Positive Signal Calibration.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Negative Signal Calibration.

Obtain 0.2 Volts Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values. *(Reconnect the cable to the Receive connector on the unit.)*
2. Attenuate the signal until the oscilloscope reads 0.2 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 0.2 volts power reading.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 0.2 volts power reading.

Obtain 0.8 Volts Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. Attenuate the signal until the oscilloscope reads 0.8 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 0.8 volts power reading.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 0.8 volts power reading.

Enter Negative Signal Power Readings

1. Make sure that the Negative Signal Calibration functions appear on the SIG screen. If necessary, select the Negative button.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.2 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.2 volts power reading and select **OK**.
6. Select **0.8 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 0.8 volts power reading and select **OK**.
8. Select **Save** to save the new Negative Signal Calibration values.

Enter Positive Signal Power Readings

1. Select the Positive button. The Positive Signal Calibration functions appear on the SIG screen.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.2 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.2 volts power reading and select **OK**.
6. Select **0.8 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 0.8 volts power reading and select **OK**.
8. Select **Save** to save the new Positive Signal Calibration values. This completes the unit's E3 or DS3 signal calibration.

Start/Stop DS3 and E3 Channel Scan

The Chan Scan function inspects and then reports the contents of the 21 E1 (for DS3) or 16 E1 (for E3) channels that are obtained within a multiplexed DS3 or E3 signal.

The information reported consists of items such as the framing and pattern activity detected on each E1 channel.

The DS3 or E3 protocol processor must be receiving a valid signal, otherwise, the scan aborts. While a scan is in progress, you cannot access other functions.

To start a channel scan:

1. Select the **DS3** or **E3** protocol processor tab.
2. Select **Receive**.
3. Select **Chan Scan**.
4. Select **Start Scan**. Framing and pattern activity for each channel is displayed on the screen.

To stop the channel scan:

- Select the **Stop Scan** button.

E3 Screen and Field Definitions

E3 Screen and Function Descriptions

The following function screens are available through the E3 protocol processor tab.

- E3 LEDs
- E3 Transmit
- E3 Receive
- E3 Results
- E3 Test
- E3 Performance Monitoring

E3 LEDs

When the E3 protocol processor is selected, the following LEDs are displayed in the LEDs Quick Status Area of the touch screen.

LED	Description
TX/RX PWR	Displays the transmitted and received electrical power.
CLK:	Displays the type of transmit clock specified in the setting. Clock settings include: SETS, Internal, or RCVD. This is an alarm LED.
LOS	Loss of Signal. Indicates a Loss of Signal status was detected. This is an alarm LED.
BPV	Bipolar Violation. Indicates two consecutive pulses of the same polarity occurred in the same digital bit stream. In E3 mode, BPV errors are only generated in the payload. This is an error LED.
LOF	Loss of Frame. Indicates an alarm signal was generated due to a frame alignment problem. This is an alarm LED.
AIS	Alarm Indication Signal. Indicates an Alarm Indication Signal occurred on the line layer. This is an alarm LED.
FRAME	Indicates if the E3 protocol processor has received framing errors. This is

	an error LED.
RDI	Remote Defect Indicator. Indicates a signal returned to the transmitting Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect. This is an alarm LED.
PAT Sync	Pattern Loss. Indicates a loss of pattern synchronization. This is an alarm LED.
BIT ERR	Bit Error. Indicates a bit error was detected in the payload. This is an error LED.

E3 Transmit

This function allows you to define the parameters used in E3 Transmit operations.

The following functions are available through the E3 Transmit screen.

- E3 Transmit Settings 1 (SET 1)
- E3 Transmit Settings 2 (SET 2)
- E3 Transmit Errors and Alarms

E3 Transmit Errors and Alarms

This function allows you to enter errors and alarms.

The following options are available on the E3 Errors and Alarms screen.

Option	Description
Error to Insert	Inserts an error that is transmitted by the E3 protocol processor. The options available include: • **None:** Turns off E3 error insertion. • **BPV Error:** Transmits Bipolar

	Violation errors which result in a line code violation event for an AMI-coded signal, the occurrence of received excessive zeros, or a bipolar violation. • **Bit:** Transmits a bit error which results in a frame synchronization bit error event. This also inserts a frame bit error in the received frame bit pattern. • **Frame:** Results in a severely errored framing event, which occurs when two or more framing bit pattern errors within a 3-ms period. This type of error is not available if the E3 protocol processor is configured for Unframed framing format.
Error Insert Rate	Sets the insertion rate for E3 transmit errors. This command is not available if Error to Insert is set to None. The following options are available for this command: • **Off:** No errors are inserted for transmission. This command effectively disables the Error Insert Action button. • **1e-X**, where X is a value from 3 through 10.
Alarm Generated	Generates a specific alarm on the transmit side of the E3 protocol process. The following options are available: LOS, LOF, AIS, or RDI. **Note:** LOF and RDI alarms are not available if Framing is set to Unframed.

E3 Transmit Settings 1

This screen allows you to configure the transmit signal parameters for the E3 line interface and the E3 protocol processor to match the E3 signal used in your test environment.

The E3 Transmit Settings 1 screen contains the following parameters:

Parameter	**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.
Line Freq Offset	Select Off (0; meaning the frequency cannot be adjusted) or -100.0 to 100.0 in 0.1 increments.
Clock	Determines the timing source for the E3 transmit signal. The following options are available: • **Internal:** Derives the transmit data's timing source from the system's internal clock. **Note: If you wish to drop an E1 from M13 and out the Line, then the clock must be set to Internal.** • **Recovered:** Derives the transmit data's timing source from the system's recover clock. • **Bits:** Derives the transmit's data timing source from the BITS (Building Integrated Timing Supply) clock input, which is 1.544 MHz. If this option is selected, but BITS clocking is not available, then this function defaults to Internal. CLK:BITS displays when configured for BITS clocking. • **SETS:** Derives the transmit's data timing source from the Synchronous Equipment Timing Source.
Framing	Configures the framing format used for the E3 transmit signal. The following

	options are available: • **Framed:** Configures the system to transmit an E3 signal using a framed format. • **Unframed:** Configures the system to transmit an E3 signal using an unframed format.

E3 Transmit Settings 2

This function selects the type of E3 Transmit mapping and patterns used by the E1 protocol processor.

The following options are available:

Option	Description
Mapping	Select E1, ATM Direct, ATM PLCP, or Bulk Filled. **Note:** The ATM options will only appear if the ATM hardware is available.
Payload Pattern	Select User Defined (32-bit entry), PRBS 9, PRBS 9 Inverted (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. **Note:** This option is not available if Mapping is not set to Bulk Filled.
Pass Thru Mode	Select **On** to enable Pass Thru Mode. Select **Off** to disable Pass Thru Mode. **Note**: This option will be unavailable if Mapping is not set to E1.
E1 # 1 Channel Inserted	Select from Channels 1 through 16. **Note:** This option is unavailable if Mapping is not set to E1.
E1 #2 Channel Inserted	Select from Channels 1 through 16. **Note:** This option is unavailable if Mapping is not set to E1.
E1 Background Frame	Select from Unframed, PCM30, PCM30CRC, PCM31, and PCM31CRC. **Note:** This option is

	only available if Mapping is set to E1, and Pass-Thru Mode is turned off.
E1 Background Pattern	Enter any 32-bit pattern. **Note:** This option is only available if Mapping is set to E1, and Pass-Thru Mode is turned off.

E3 Receive

This function allows you to configure settings for the parameters used in the E3 Receive operations.

The following functions are available through the E3 Receive screen.

- E3 Receive Settings 1 (SET 1)
- E3 Receive Signal Status
- E3 Channel Scan

E3 Receive Channel Scan

The Chan Scan function inspects and then reports the contents of the 16 E1 channels that are contained within a multiplexed E3 signal.

The information reported consists of items such as the framing and pattern activity detected on each E1 channel.

The E3 protocol processor must be receiving a valid signal, otherwise, the E3 scan aborts. While a scan is in progress, you cannot access other functions.

To start an E3 channel scan:

1. Select the **E3** protocol processor tab.
2. Select **Receive**.
3. Select **Chan Scan**.
4. Select **Start Scan**. Framing and pattern activity for each channel is displayed on the screen.

To stop the E3 scan:

- Select the **Stop Scan** button.

E3 Receive Settings 1

This screen allows you to configure your unit's Receive parameters for your E3 test environment. The parameter settings to determine how the E3 interface and processor parameters are configured.

The E3 Receive Settings 1 screen contains the following parameters:

Parameter	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.
Framing	Configures the framing format used for the E3 Receive signal. The following options are available: • **Unframed:** Configures the system to transmit an E3 signal using an unframed format. • **Framed:** Configures the system to transmit an E3 signal using a framed format.
Mapping	Mapping options include: E1, Fractional E3, ATM, or Bulk Filled.
Payload Pattern	Selects the type of E3 signal pattern that is transmitted by the system. The following options are available: • **Live:** Uses live data traffic; no pattern. This is used primarily for monitoring errors and alarms within a live data stream. • **PRBS 2^9-1:** Transmits a maximum of 8 consecutive zeros and 9 consecutive ones. • **PRBS 2^9-1 Inverted:** Transmits an inverted 2^9-1 PRBS, inverts it, and transmits a maximum of 9 consecutive zeros and 8 consecutive ones.

	• **PRBS 2^11-1:** Transmits a maximum of 10 consecutive zeros and 11 consecutive ones. • **PRBS 2^11-1 Inverted:** Transmits an inverted 2^11-1 PRBS, inverts it, and transmits a maximum of 11 consecutive zeros and 10 consecutive ones. • **PRBS 2^15-1:** Transmits a maximum of 14 consecutive zeros and 15 consecutive ones. • **PRBS 2^15-1 Inverted:** Transmits an inverted 2^15-1 PRBS, inverts it, and transmits a maximum of 15 consecutive zeros and 14 consecutive ones. • **PRBS 2^20-1:** Transmits a maximum of 19 consecutive zeros and 20 consecutive ones. • **PRBS 2^20-1 Inverted:** Transmits an inverted 2^20-1 PRBS, inverts it, and transmits a maximum of 20 consecutive zeros and 19 consecutive ones. • **PRBS 2^23-1:** Transmits a maximum of 22 consecutive zeros and 23 consecutive ones. • **PRBS 2^23-1 Inverted:** Transmits an inverted 2^23-1 PRBS, inverts it, and transmits a maximum of 23 consecutive zeros and 22 consecutive ones. • **User Defined:** Allows you to enter and save up to a 32-bit, customized pattern.
E1 #1 Channel Drop	Select from Channels 1 through 16. **Note:** This option is unavailable if Mapping is not set to E1.
E1 #2 Channel Drop	Select from Channels 1 through 16. **Note:** This option is unavailable if Mapping is not set to E1.

E3 Receive Signal Status

This function displays the electrical power, line frequency, and line frequency offset of the incoming E3 signal. It also contains the Calibration function, which allows you to

The following information is displayed on the E3 Receive Signal Status screen:

- Peak Positive Pulse Voltage (in volts)
- Peak Negative Pulse Voltage (in volts)
- Power in dBm
- Power in dBdsx
- Line Frequency in MHz
- Line Frequency Offset Received in Hz and ppm
- Calibration: This function controls the unit's Negative and Positive signal calibration. The following calibration functions are available:
    - Select **Negative** or **Positive** signal calibration.
        - Configure Zero Power Reading
        - Configure 0.2 Volts Reading
        - Configure 0.8 Volts Reading
    - Select **Save** to set the configuration.

E3 Results

This function allows you to view E3 error and alarm analysis and create a history of these events by graphing the information.

The following functions are available through the E3 Results screen.

- SCAN
- ERR
- Alarm
- Event
- Large LED
- Graph

E3 Results Alarm

This function displays how long E3 alarms were detected by the system. Results for the following alarms display.

- Alarm Indication Signal (AIS)

- Loss of Frame (LOF)
- Loss of Signal (LOS)
- Pattern Synchronization (PAT SYNC)
- Remote Defect Indicator (RDI)

E3 Results Errors

This function reports statistical information on errors including the error count (11 digits), average error rate (in N.NNe-N format), and current error rate (in N.NNe-N format for the current second only).

The following errors are reported:

- Bit
- BPV
- Frame

E3 Results Graph

Use the Graphs button to view error and alarm results for the E3 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 E3 alarms and errors.

To use the Results Graph functions, see Using Graphs.

E3 Results Large LEDs

This button displays the E3 LED Error and Alarm Indicators in a large, easy to read format that covers the entire screen area. This is especially useful for viewing any errors or alarms from a long distance, such as across the room from a test bay.

The following describes the LED colors:

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.

E3 Results Scan

This function provides a quick report of detected errors and alarms and lists the duration of these events.

The following options are available in the E3 Results Scan screen.

Option	**Description**
Clock	Type of clock: internal, SETS, or Bits.
LOS Seconds	The number of seconds a Loss of Signal occurred.
BPV Error Count	The number of Bipolar Violations errors that occurred.
LOF Seconds	The number of seconds a Loss of Frame occurred.
AIS Seconds	The number of seconds a Alarm Indication Signal occurred.
FAS Error Count	The number of Frame Alignment Signal errors that occurred.
RDI Seconds	The number of seconds that a Remote Defect Indicator error occurred.
Pattern Loss Seconds	The number of seconds that a Loss of Pattern occurred.
Bit Errors Count	The number of Bit Errors that occurred.

Results Event

The Results Event function provides a detailed summary of alarm and error event and 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. Select **Resume** to list event activity. This is a toggable button.

E3 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 alarm values are enclosed in quotes (") and separated by commas (,).
Print Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.
Print Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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
Record Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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**.
Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).
Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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.

E3 Performance Monitoring

The E3 Performance Monitoring screen includes the following functions:

- FAS

- BIT

E3 Performance Monitoring Bit

This provides a detailed breakdown for BIT errors detected and logged by the E3 protocol processor.

This section is broken down into the following areas:

G.821

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass or failure

G.826

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass or failure

M.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.
- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- Allocation: Select an allocation percentage from 0 to 100.
- Duration: Select the monitoring duration to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

E3 Performance Monitoring FAS

This provides a detailed breakdown for Frame Alignment Signal errors detected and logged by the E3 protocol processor.

This section is broken down into the following areas:

G.821

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass or failure

G.826

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass or failure

M.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.
- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- Allocation: Select an allocation percentage from 0 to 100.
- Duration: Select the monitoring duration to be 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

Index

A

AIS 9, 10

AIS Seconds 19

Alarm Indication Signal 9, 19

Alarms 10

ATM 13, 14

B

Background Block Error 24, 26

BBE 24, 26

Bipolar Violation 9, 19

BIT 24

Bit Error 9, 19

Bits/SETS 11

BPV 9

BPV Error 10

BPV Error Count 19

Bulk Filled 13, 14

C

Calibration 5, 16

Channels 13, 14

CLK 9

Coupled 11, 14

E

E1 .... 11, 13, 14

E1 Background Frame 13

E1 Background Pattern 13

E1 Channel Inserted 13

E3 . 1, 5, 9, 10, 11, 14, 16, 17, 18, 24, 26

E3 LEDs 9

E3 Performance Monitoring 24

E3 Performance Monitoring Bit 24

E3 Performance Monitoring FAS 26

E3 Receive 14

EB 24, 26

Error Insert Action button 10

Error Insert Rate 10

Errored Block 24, 26

Errored Seconds 24, 26

Errors

  Insert 10

Errors 10

ES 24, 26

F

FAS Error Count 19

Fractional E3................................ 14

Frame

Loss...................................... 9, 19

Frame 9

Frame 10

Frame 19

Frame Alignment Signal.......... 19, 26

G

G.821 .... 24, 26

G.826 .... 24, 26

Graphs button 18

L

LEDs...................................... 9, 18

LEDs Quick Status Area 9

Line 11

Line Freq Offset 11

Line Frequency 16

Line Frequency Offset Received... 16

LOF.. 9, 10

LOF Seconds............................... 19

LOS.. 9, 10

LOS Seconds............................... 19

M

M.2100 ....24, 26

M.2100 Allocation....................24, 26

M13 11

Mapping 11, 13, 14

O

Off 11

P

Pass-Thru Mode............................13

PAT LOSS......................................9

Pattern...19

Pattern Loss 9

Payload Patterns.....................13, 14

PCM30 13

PCM30CRC 13

PCM31 13

PCM31CRC 13

Peak Negative Pulse Voltage........16

Peak Positive Pulse Voltage 16

PRBS 13, 14

PRBS 11 13

PRBS 11 Inv.................................13

PRBS 15 13

PRBS 15 Inv 13
PRBS 2^11-1 14
PRBS 2^11-1 Inverted 14
PRBS 2^15-1 14
PRBS 2^15-1 Inverted 14
PRBS 2^20-1 14
PRBS 2^20-1 Inverted 14
PRBS 2^23-1 14
PRBS 2^23-1 Inverted 14
PRBS 2^9-1 14
PRBS 2^9-1 Inverted 14
PRBS 20 13
PRBS 20 Inv 13
PRBS 23 13
PRBS 23 Inv 13
PRBS 31 13
PRBS 31 Inv 13

R

Rate 10
RCVD... 9
RDI... 9, 10
RDI Seconds................................ 19
Remote Defect Indicator 9, 19
Restart.. 18
Results
  E3 18
Results 18
Results Graph 18

S

S1... 24, 26
S2... 24, 26
Save 16
SES 24, 26
SETS..................................... 9, 19
Settings Control...................... 11, 14
Severely Errored Seconds 24, 26
Signal 9, 19
Synchronization........................ 9, 10
Synchronous Equipment Timing
  Source 11

T

Terminating Equipment 9
Transmit 9, 11, 14
TX/RX PWR 9

U

UAS 24, 26
Unavailable Seconds............... 24, 26

Unframed 10, 13

User Defined 13, 14

E1 Online Help

Table Of Contents

E1 Overview 1

E1 Technical Specifications 3

E1-Specific Tasks 5

E1-Specific Tasks...5

Change E1 Transmit Overhead...5

Configure Fractional E1 Testing 6

Drop an E1 Signal from an STM-1 Signal 6

E1 or DS1 Electrical Power Calibration 6

Required Equipment 7

Hardware Setup...7

Restoring Raw Power Readings for E1 or DS1 7

Calibrating the E1 or DS1 Signal 9

Calibrating the E1 #2 Bridged or DS1 #2 Bridged Signal.....................10

Modify Overhead Bytes 12

E1 Screen and Function Descriptions...15

E1 Screen and Function Descriptions 15

E1 LEDs...15

E1 Transmit..16

E1 Transmit Errors and Alarms 16

E1 Transmit OH..18

E1 Transmit Settings 1 19

E1 Receive...22

E1 Receive OH....22
E1 Receive Settings 1....22
E1 Receive Signal Status....27
E1 Results....28
E1 Results Alarm....28
E1 Results Errors....28
E1 Results Graph....29
E1 Results Large LEDs....29
E1 Results Scan....29
Results Event....30
E1 Test....31
Action After Duration....31
Duration....34
SET 1....35
E1 Performance Monitoring....35
E1 Performance Monitoring Bit....36
G.821....36
G.826....36
M.2100....37
E1 Performance Monitoring CRC....37
G.821....37
G.826....38
M.2100....38

E1 Performance Monitoring FAS....38
G.821....39
G.826....39
M.2100....40
E1 Performance Monitoring FEBE....40
G.821....40
G.826....40
M.2100....41
Index....43

E1 Overview

This section includes:

- E1-Specific Tasks
- 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

E1 Technical Specifications

E1 Specification	Description
Ports	TX: 2 RX: 2
Line code	AMI, HDB3
Framing	PCM31, PCM31CRC, PCM30, PCM30CRC, unframed
Line Rates	2.048 MHz (TX), 2.048 MHz (RX), offset capability ± 100 ppm
Impedance	100 ohm or 120 ohm ± 5% balanced, 75 ohm unbalanced
Level (RX)	Terminated: 0 -36 dBsx with equalization
Connectors	BNC: 75 ohm unbalanced Bantam: 100 ohm balanced
Synchronization	Internal, Recovered, SETS
Input Signal Measurement	Peak voltage range: ± 0.1 Vp to ± 7 Vp Frequency measurement range: 2.048 MHz ± 200 ppm
Error Measurement	BPV, BIT, frame, CRC, FEBE
Alarm Detection	LOS, AIS, LOF, RAI, RMFAI, CASMFL, pattern sync loss, clock sync loss
Alarm Generation	LOS, AIS, LOF, RAI, RMFAI, CASMFL
Error Insertion	BPV, bit, frame, CRC, FEBE
Error Insertion Rate	Single, 10^{-7} to 10^{-3}, user-programmable
Patterns	**E1:** 2^6 -1, 2^6 -1 inverted, 2^9 -1, 2^9 -1 inverted, 2^{11} -1, 2^{11} -1 inverted, 2^{15} -1, 2^{15} -1 inverted, 2^{20} -1, 2^{20} -1 inverted, 2^{23} -1, 2^{23} -1 inverted, any 32-bit pattern **Fractional E1:** Fill 0 to 31 DS0's with one of the E1 patterns, specified by a 4-byte mask. Specify the 8-bit pattern in background (unselected) DS0's, with a default of 127

64k Bit Audible Connections	64k-bit audible monitoring via speaker
Loopback	Line and payload loopback (manual)
Automatic Configuration	Automatically configures test set to the incoming signal framing, line code, and pattern
E1 Jitter Measurement	**Jitter Measurement Characteristics:** • Acquisition time: 2 seconds typical, 5 seconds maximum • Jitter resolution: 0.01UI **Filter Characteristics:** • Wideband measurement: 10 Hz to 40 KHz • Highband measurement: 8 KHz to 40 KHz • Nominal filter attenuation at Fc: 3 dB **Jitter Output Characteristics:** • Scale: 0.1 V/UI • Bandwidth: 10 Hz to 40 KHz • Format: Single ended, referenced to ground • Impedance: 50 ohm ± 5%

E1-Specific Tasks

E1-Specific Tasks

This section contains tasks that are specific to the E1 protocol processor. For a list of general procedures, see Common Tasks located in the Getting Started section.

Change E1 Transmit Overhead

The Transmit Overhead (OH) function allows you to stress a E1 network by directly editing overhead bits to simulate errors, alarms, and other stress conditions. For the E1 protocol processor, the following overhead bits can be edited:

- **CAS Signaling Bits:** If the framing is set to 30 channels (PCM30 or PCM30CRC), the CAS byte contains ABCD bits for 30 channels, at four bits per channel.
- **Spare Bits:** Contain odd-numbered bits in bits four to eight in the FAS channel (Timeslot 0). Spare bits can be set to a single five-bit value for all bits. Additionally, one of the five bits can be a separate 4,000 bit per second channel with an eight bit sequence specified the channel.
- **E-Bits:** These are Far-End CRC (block) errors. There are two bits per multiframe, and one per super multiframe. If a FEBE is generated, its value will override the value specified for the E-Bit.
- **X-Bits:** These are bits 5, 7, and 8 of the CAS channel (Timeslot 16) in the first frame of the multiframe. X-Bits are only displayed when framing is set for 30 channels (PCM30 or PCM30CRC) and can only be entered on the Transmit side.

A specific slot can be selected, and its bytes can be changed for transmission out of the system. By altering the OH bytes, this allows other receiving equipment to detect and, if necessary, react to these changes.

To change Overhead bytes:

1. Select **E1**.
2. Select **Transmit**.
3. Select **OH**.
4. Select **CAS**, **Spare Bit**, **E Bits**, or **X Bits**.

   A keypad appears allowing the byte's 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. Select the **HEX** or **DEC** button on the keypad.

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

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

Configure Fractional E1 Testing

Configuring the system for fractional E1 testing enables you to bulk fill 0 to 31 DS0's in an E1 Transmit signal with a pattern. Additionally, you can specify an eight-bit pattern in background DS0's.

To configure for fractional E1 testing:

1. Select **E1**.
2. Select **Transmit**.
3. Select **SET**.
4. Select **Mapping** .
5. Select **Fractional E1**.
6. Select **Fractional E1**. A keypad appears.
7. Use the **1** and **0** buttons to specify the pattern you wish to inject. The maximum value is 32 bits. When you are done, select **OK**.
8. Select **Background DS0**. A keypad appears.
9. Use the **1** and **0** buttons to specify the background DS0 pattern you wish to inject. The maximum value is eight bits. When you are done, select **OK**.

Drop an E1 Signal from an STM-1 Signal

1. Select **STM-4**.
2. Select **Transmit**.
3. Select **Settings**.
4. Select **Interface**.
5. Select **STM-1e**.
6. From the Common Function Buttons, select **Presets**.
7. Select **STM-4/E1 #1 or #2 Payload**.
8. Under the STM-4 protocol processor, select **Transmit/Mapping**.
9. Select **Foreground TU # Inserted**.
10. Select the desired E1 to be dropped. The available values are 1 through 28.

E1 or DS1 Electrical Power Calibration

The following procedures describe the unit's negative, positive, negative bridged, and positive bridged power calibration. While performing this task, you will measure, record, and enter power reading input for zero power reading and 0.5 and 2.0 volt reading for E1 and DS1.

Required Equipment

The following equipment is required to perform E1 or DS1 calibration:

- Digital oscilloscope (use highest bandwidth available) or equivalent measuring equipment
- Variable attenuator
- Electrical power meter or a calibrated NIC that can provide 0.5 and 2.0 volts power
- BNC T-connector
- Bantam Connector
- Two 2-ft., 75 ohm coaxial cables with male BNC connectors
- Two 2-foot, 120 ohm UTP cables with male Bantam connectors (for E1 only)
- Pencil and paper to record power measurements

Hardware Setup

The following describes how to attach cables to the measuring devices (an oscilloscope will be used in this example) and how to configure these devices for E1 or DS1 calibration.

To attach cables between the unit and the oscilloscope:

1. Make sure that the unit and oscilloscope are turned on.
2. Connect the BNC T-connector to the oscilloscope's BNC input connector.
3. Connect one end of a BNC cable to the unit’s **E1/DS1 #1 TX** BNC connector and connect the other end of the cable to the BNC T-connector attached to the oscilloscope.
4. Connect one end of a BNC cable to the unit’s **E1/DS1 #1 RX** BNC connector and connect the other end of the cable to the BNC connector attached to the oscilloscope.
5. Connect the Bantam cable to the oscilloscope's Bantam input connector.
6. Connect one end of a Bantam cable to the unit’s **E1/DS1 #2 TX** Bantam connector and connect the other end of the cable to the Bantam connector attached to the oscilloscope.
7. Connect one end of a Bantam cable to the unit’s **E1/DS1 #2 RX** Bantam connector and connect the other end of the cable to the Bantam connector attached to the oscilloscope.

Restoring Raw Power Readings for E1 or DS1

The following restores the unit's raw (unconverted) power readings for E1 #1, E1 #2, DS1 #1, or DS1 #2.

Raw Negative Power Readings for E1 #1, DS1 #1, E1 #2, or DS1 #2

The following procedures apply to the Negative button that appears for the E1 #1, DS1 #1, E1 #2, or DS1 #2 tabs.

1. From the **E1** or **DS1** tab on the unit, select **Receive**.
2. Select **SIG**.
3. Select **Update Signal Calibration**.
4. Select the **Negative** button. The Negative Signal Calibration functions appear.
5. Select **Zero power reading**. A keypad appears.
6. Enter 0 and select **OK**.
7. Select **0.5 Volts Reading**. A keypad appears.
8. Enter 0 and select **OK**.
9. Select **2.0 Volts Reading**. A keypad appears.
10. Enter 0 and select **OK**.
11. Select **Save**.

Raw Positive Power Readings for E1 #1, DS1 #1, E1 #2, or DS1 #2

The following procedures apply to the Positive button that appears for the E1 #1, DS1 #1, E1 #2, or DS1 #2 tabs.

1. Select the **Positive** button. The Positive Signal Calibration functions appear.
2. Select **Zero power reading**. A keypad appears.
3. Enter 0 and select **OK**.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter 0 and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter 0 and select **OK**.
8. Select **Save**.

Raw Negative Bridged Power Readings for E1 #2 or DS1 #2

The following procedures only apply to the Negative Bridged button that appears for the E1 #2 or DS1 #2 tabs.

1. Select **Negative Bridged**. The Negative Bridged Signal Calibration functions appear.
2. Select **Zero power reading**. A keypad appears.
3. Enter 0 and select **OK** to accept the new value.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter 0 and select **OK**.

6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter 0 and select **OK**.
8. Select **Save**.

Raw Positive Bridged Power Readings for E1 #2 or DS1 #2

The following procedures only apply to the Positive Bridged button that appears for the E1 #2 or DS1 #2 tabs.

1. Select **Positive Bridged**. The Positive Bridged Signal Calibration functions appear.
2. Select **Zero power reading**. A keypad appears.
3. Enter 0 and select **OK** to accept the new value.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter 0 and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter 0 and select **OK**.
8. Select **Save**.

Calibrating the E1 or DS1 Signal

The following procedures describe how to perform E1 and DS1 calibration using the unit and an oscilloscope. These procedures apply to both the Negative and Positive buttons that appear under the **E1 #1**, **DS1 #1**, **E1 #2**, or **DS1 #2** tabs.

Obtain Zero Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. For zero volt value, do not connect the cable to the Receive connector on the unit.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Positive Signal Calibration.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Negative Signal Calibration.

Obtain 0.5 Volts Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values. *(Reconnect the cable to the Receive connector on the unit.)*
2. Attenuate the signal until the oscilloscope reads 0.5 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 0.5 volts power reading.

4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 0.5 volts power reading.

Obtain 2.0 Volts Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. Attenuate the signal until the oscilloscope reads 2.0 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 2.0 volts power reading.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 2.0 volts power reading.

Enter Negative Signal Power Readings

1. Make sure that the Negative Signal Calibration functions appear on the SIG screen. If necessary, select the **Negative** button.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**.
8. Select **Save** to save the new Negative Signal Calibration values.

Enter Positive Signal Power Readings

1. Select the **Positive** button. The Positive Signal Calibration functions appear on the SIG screen.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**

   This concludes signal calibration for the E1 #1 or DS1 #1 tabs.

   if you are performing calibration using the E1 #2 or DS1 #2 tabs, continue to the next section to perform Negative Bridged and Positive Bridged signal calibration.

Calibrating the E1 #2 Bridged or DS1 #2 Bridged Signal

The following procedures only apply to the Negative Bridged and Positive Bridged buttons that appear under the **E1 #2** and **DS1 #2** tabs.

Configure the Unit for Bridged Termination

The following procedures only apply to the E1 #2 and DS1 #2 tabs.

1. Select **SET 1** to display the E1 #2 or DS1 #2 receive settings functions.
2. Select the **Termination Type** function, and select **Bridged**.
3. Select **SIG**.
4. Select **Update Signal Calibration**. The negative and positive calibration functions appear.

Obtain Zero Power Reading for Bridged Termination

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. For zero volt value, do not connect the cable to the Receive connector on the unit.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Positive Bridged Signal Calibration.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the zero power reading for Negative Bridged Signal Calibration.

Obtain 0.5 Volts Power Reading for Bridged Termination

1. Using the oscilloscope, measure and record the average positive and negative peak values. *(Reconnect the cable to the Receive connector on the unit.)*
2. Attenuate the signal until the oscilloscope reads 0.5 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 0.5 volts power reading for Positive Bridged Signal Calibration.
4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 0.5 volts power reading for Negative Bridged Signal Calibration.

Obtain 2.0 Volts Power Reading for Bridged Termination

1. Using the oscilloscope, measure and record the average positive and negative peak values.
2. Attenuate the signal until the oscilloscope reads 2.0 volts.
3. Record the value for the **Peak Positive Pulse Voltage** that appears on the SIG screen. This value is the 2.0 volts power reading for Positive Bridged Signal Calibration.

4. Record the value for the **Peak Negative Pulse Voltage** that appears on the SIG screen. This value is the 2.0 volts power reading for Negative Bridged Signal Calibration.

Enter Negative Bridged Signal Power Readings

1. Select the **Negative Bridged** button. The Negative Bridged Signal Calibration functions appear on the SIG screen.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**.
8. Select **Save** to save the new Negative Bridged Signal Calibration values.

Enter Positive Bridged Signal Power Readings

1. Select the **Positive Bridged** button. The Positive Bridged Signal Calibration functions appear on the SIG screen.
2. Select **Zero power reading**. A keypad appears.
3. Enter the value recorded earlier for the zero power reading and select **OK**.
4. Select **0.5 Volts Reading**. A keypad appears.
5. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
6. Select **2.0 Volts Reading**. A keypad appears.
7. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**.
8. Select **Save** to save the new Positive Bridged Signal Calibration values. This completes the unit’s E1 or DS1 signal calibration.

Modify Overhead Bytes

The Modify Overhead (OH) function allows you to stress an E1 network by directly editing CAS signalling bits, spare bits, E-bits, and X-bits to simulate errors, alarms, and other stress conditions.

A specific slot (slots 1 through 30) can be selected, and its bytes can be changed for transmission out of the unit. By altering the bytes, this allows other equipment to detect, and if necessary, react to these changes.

To modify overhead bytes:

1. Select **E1**.
2. Select **Transmit**.
3. Select **OH**.
4. Select an OH byte.

   A keypad appears allowing the byte's 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.

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

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

E1 Screen and Function Descriptions

E1 Screen and Function Descriptions

The following function screens are available through the E1 protocol processor tab.

- E1 LEDs
- E1 Transmit
- E1 Receive
- E1 Results
- E1 Test
- E1 Performance Monitoring

E1 LEDs

When the E1 protocol processor is selected, the following LEDs are displayed in the LEDs Quick Status area of the touch screen.

For information on Large LEDS, see E1 Results Large LEDs.

LED	Description
TX/RX	Displays the Transmit and Receive frequency.
CLK:	An alarm LED that displays the type of transmit clock specified in the setting. Clock settings include: SETS, Internal, or RCVD.
LOS	Loss of Signal. An alarm LED indicating a Loss of Signal status was detected.
BPV	Bipolar Violation. An error LED indicating two consecutive pulses of the same polarity occurred in the same digital bit stream. In E1 mode, BPV errors are only generated in the payload.
LOF	Loss of Frame. An alarm LED indicating an alarm signal was generated due to a frame alignment problem.
AIS	Alarm Indication Signal. An alarm LED indicating an Alarm Indication Signal

	occurred on the line layer.
FRAME	An error LED indicating the E1 protocol processor has received framing errors.
CRC	Cyclic Redundancy Check. An error LED indicating the CRC data at the transmission end did not match the CRC data evaluated at the receiving end.
CASMFL	Channel Associated Signaling Multiframe Loss. Indicates that four zeros at the start of Time Slot 16 in frame 0 cannot be found.
RAI	Remote Alarm Indication. An alarm error indicating to the upstream circuit that a failure condition has been declared downstream.
RMFAI	Remote Multiframe Alarm Indication. This is an alarm LED.
FEBE	Far End Block Error. An error LED indicating a bit error has occurred in the physical layer at the far end of the link.
PAT Sync	An alarm LED indicating a loss of pattern synchronization.
BIT ERR	Bit Error. An error LED indicating a bit error was detected in the payload.

E1 Transmit

This function allows you to define the parameters used in E1 Transmit operations.

The following functions are available through the E1 Transmit screen.

- E1 Transmit Settings 1 (SET 1)
- E1 Transmit Overhead (OH)
- E1 Transmit Errors and Alarms

E1 Transmit Errors and Alarms

This function allows you to enter errors and alarms.

The following options are available on the E1 Errors and Alarms screen.

Option	Description
Error to Insert	Inserts an error that is transmitted by the E1 protocol processor. The options available include: • **None:** Turns off E1 error insertion. • **BPV Error:** Transmits Bipolar Violation errors which result in a line code violation event for an AMI-coded signal, the occurrence of received excessive zeros, or a bipolar violation. • **Bit:** Transmits a bit error which results in a frame synchronization bit error event. This also inserts a frame bit error in the received frame bit pattern. • **Frame:** Results in a severely errored framing event, which occurs when two or more framing bit pattern errors within a 3-ms period. This type of error is not available if the E1 protocol processor is configured for Unframed framing format. • **CRC:** Results in a CRC error event, which occurs when a received CRC code that is not identical to the corresponding locally calculated code. This option is available only when the E1 protocol processor is configured for CRC framing

	format. • **FEBE:** Results in a Far End Block Error, which occurs when a bit error has been detected at the Physical layer of the far end of the link. This option is available only when the E1 protocol processor is configured for CRC framing format.
Error Insert Rate	Sets the insertion rate for E1 transmit errors. This command is not available if Error to Insert is set to None. The following options are available for this command. • **Off:** No errors are inserted for transmission. This command effectively disables the Error Insert Action button. • **1e-X**, where X is a value from 3 through 10.
Alarm Generated	Generates a specific alarm on the transmit side of the E1 protocol process. The following options are available: LOS, LOF, AIS, RAI, RMFAI, and CASMFL.

E1 Transmit OH

This function displays the CAS Signaling Bits, Spare Bits, E Bits, and X Bits that are transmitted for a selected E1. These bytes can be edited to determine if the E1 facility can detect problems due to any of these types of overhead errors.

When a bit button is selected, a key pad appears enabling you to edit the bytes using a Hex, Decimal, or Bin format.

The following table describes the bits available in each Overhead section.

Overhead Bit Type	**Description**

CAS Signaling Bits	Allows you to select: • CH1 through 30 • Global CAS Bits: None or user defined.
Spare Bits	Allows you to select: • **Global Spare Bits:** Allows you to select a specific spare bit (4 through 8) of an eight-bit sequence. Select None to specify no bits. Selecting **None** will change the Global Spare Bits field to all zeros. • **Bit for 8 bit sequence:** None or bit 4 through 8. • **8 bit sequence:** Allows you to select a user pattern for an E1 spare overhead bit.
E Bits	Allows you to select an E Bit up to two bits (00).
X Bits	Allows you to select an X Bit up to three bits (000).

E1 Transmit Settings 1

This screen allows you to configure the transmit signal parameters for the E1 line interface and the E1 protocol processor to match the E1 signal used in your test environment.

The E1 Transmit Settings 1 screen contains the following parameters:

Parameter	**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.
Signal Level	Sets the strength of the E1 transmit signal. The signal level values are relative to a normal E1 signal level. The

	following options are available: • **0 dBdsx:** Signal level is at the E1 signal level. • **-7 dBdsx:** Signal level is -7 dB below the normal E1 signal level. • **-15 dBdsx:** Signal level is -15 dB below the normal E1 signal level.
Line Code	Selects the type of signal coding transmitted by the E1 protocol processor. The following options are available: • **AMI:** Alternate Mark Inversion coding • **HDB3:** High Density Bipolar 3 Zero Substitution coding
Line Frequency Offset	Line Frequency Offset can be deactivated by setting it to "Off" or a customized amount between 100 and -100 can be entered.
Clock Reference	Determines the timing source for the E1 transmit signal. The following options are available: • **Internal:** Derives the transmit data's timing source from the system's internal clock. **Note: If you wish to drop an E1 from M13 and out the Line, then the clock must be set to Internal.** • **Recovered:** Derives the transmit data's timing source from the system's recover clock. • **BITS:** Derives the transmit's data timing source from the BITS (Building Integrated Timing Supply) clock input, which is 1.544 MHz. If this option is selected, but BITS clocking is not available, then this function defaults to Internal. CLK:BITS displays when configured for BITS clocking. • **SETS:** Derives the transmit's

	data timing source from the Synchronous Equipment Timing Source.
Loopback	Selects the type of loopback code transmitted. The options include: • **None:** The loopback function is not active. • **Payload:** Transmits the received payload in a frame formatted by the transmitter using either the internal or recovered clock. • **Line:** Transmits the entire received signal using the recovered clock.
Framing	Configures the framing format used for the E1 transmit signal. The following options are available: • Unframed • PCM30 • PCM30CRC • PCM31 • PCM31CRC
Mapping	Mapping options include: Fractional E1, ATM, or Bulk Filled.
Payload Pattern	Selects the type of E1 signal pattern that is transmitted by the system. The following options are available: • PRBS 2^9-1 • PRBS 2^9-1 Inverted • PRBS 2^11-1 • PRBS 2^11-1 Inverted • PRBS 2^15-1 • PRBS 2^15-1 Inverted • PRBS 2^20-1 • PRBS 2^20-1 Inverted • PRBS 2^23-1 • PRBS 2^23-1 Inverted • User Defined: Allows you to enter and save up to a 32-bit, customized pattern.
Fractional E1	A customized Fractional E1 pattern can be entered in hex, decimal, or bin

	format. 0 to 32 DS0's in an E1 with one of the E1 patterns can be entered.
Background DS0 Pattern	A customized DS0 pattern can be entered in hex, decimal, or bin format.

E1 Receive

This function allows you to configure settings for the parameters used in the E1 Receive operations.

The following functions are available through the E1 Receive screen.

- E1 Receive Settings 1 (SET 1)
- E1 Receive Overhead (OH)
- E1 Receive Signal Status

E1 Receive OH

This function displays the overhead bytes for specific Channel Associated Signalling bytes, spare bits, E-Bits, and X-Bits on the incoming E1 signal. This is a read-only function.

E1 Receive Settings 1

This screen allows you to configure your unit's Receive parameters for your E1 test environment. The parameter settings to determine how the E1 interface and processor parameters are configured.

The E1 Receive Settings 1 screen contains the following parameters:

Parameter	**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.
Terminator Type	Configures the E1 line input termination. Select one of the following options:

	• **Terminated:** Sets the Receive Sensitivity of the E1 Line Interface. Use this setting if the E1 line terminates at the system's Line Interface. • **Monitor:** Sets the Receive Sensitivity of the E1 Line Interface. Use this setting if the E1 line connects to a monitor jack. • **Bridged:** Allows the E1 receive signal to be connected to both the E1 interface and the E1 protocol processor.
Framing	Configures the framing format used for the E1 Receive signal. The following options are available: • **Unframed:** Configures the system to receive an E1 signal using an unframed format. **Note:** For an E1 unframed, all-zeros user pattern, there is an insufficient ones density to detect a signal unless HDB3 encoding is used. Therefore, if E1 is receiving an unframed, all-zeros pattern in AMI encoding from the line interface, an LOS is reported. If E1 is receiving an unframed all-zeros pattern from an E3 or SDH drop, an LOS is suppressed; however, various framing LEDs will not function correctly. In an unframed, all-zeroes pattern, every bit is part of a zero substitution (000V/100V). The corruption of one bit corrupts the entire four-bit substitution. The result is one bit error can cause from two to three errors. Therefore, the insertion of bit errors into an unframed, all-

	zeroes pattern will not result in the correct number of errors detected. • **D4/SF:** Configures the system to transmit an E1 signal using D4 super frame format. • **ESF:** Configures the system to transmit an E1 signal using Extended Super Frame format. • **SLC-96:** Configures the system to transmit an E1 signal using SLC-96 format (Subscriber Loop Carrier). • PCM30 • PCM30CRC • PCM31 • PCM31CRC
Mapping	Mapping options include: Fractional E1, ATM, or Bulk Filled.
Payload Expected	Selects the type of E1 signal pattern that is transmitted by the system. The following options are available: • **Live:** Uses live data traffic; no pattern. This is used primarily for monitoring errors and alarms within a live data stream. • **PRBS 2^15-1:** Transmits a maximum of 14 consecutive zeros and 15 consecutive ones. • **PRBS 2^20-1:** Transmits a maximum of 19 consecutive zeros and 20 consecutive ones. • **PRBS 2^23-1:** Transmits a maximum of 22 consecutive zeros and 23 consecutive ones. • **All Ones:** A fixed test pattern of only pulses (marks) is received. This pattern is generally used to stress span repeater current regulator circuits. It can be used as an Alarm Indication Signal (AIS) in unframed circuits, or a keep alive signal, idle code, or red alarm in other circuits. • **3 in 24 (3:21):** A fixed test

	pattern of F0100 0100 0000 0000 0000 0100 is received. The pattern is aligned with the F-bits as indicated. 3 in 24 provides the minimum ones density and the maximum excess zeros requirements to stress T1 circuits. When the pattern is framed, it violates the minimum ones density requirements. • **1 in 8 (1:7):** A fixed pattern of F01000000 is received. This pattern stresses the minimum ones density requirement for B8ZS encoded T1 circuits if sent unframed. • **1010 Pattern:** A fixed test pattern of alternating marks (1) and spaces (0). This pattern is generally used to perform a minimum level stress test on clock recovery circuits. • **55DLY:** A 55 octet Daly pattern is received. • **T1-2:** A 96 octet pattern is received. • **T1-3:** A 54 octet pattern is received. • **T1-4:** A 120 octet pattern is received. • **T1-5:** A 53 octet pattern is received. • **55-Octet:** A 55 octet pattern is received. • **DDS-1:** An octet of 11111111 (repeated 100 times) followed by an octet of 00000000 (repeated 100 times) received continuously. Note: This pattern is unavailable if the Framing command is set to Unframed or SLC-96. • **DDS-2:** An octet of 01111110 (repeated 100 times) followed by an octet of 00000000 (repeated 100 times) received

	continuously. Note: This pattern is unavailable if the Framing command is set to Unframed or SLC-96. • **DDS-3:** An octet of 01001100 received continuously. Note: This pattern is unavailable if the Framing command is set to Unframed or SLC-96. • **DDS-4:** An octet of 00000010 received continuously. Note: This pattern is unavailable if the Framing command is set to Unframed or SLC-96. • **DDS-5:** DDS-1 pattern (repeated 4 times); DDS-2 (repeated 4 times); DDS-3 (once); DDS-4 (once) received continuously. Note: This pattern is unavailable if the Framing command is set to Unframed or SLC-96. • **DDS-6:** An octet of 11111110 (repeated 7 times) followed by an octet of 11111111 (once) received continuously. Note: This pattern is unavailable if the Framing command is set to Unframed or SLC-96. • **Bridge Tap:** 21 different patterns are received to detect bridge taps on a DS1. The following patterns are performed in 30 second increments: All Ones, 1-in-2, 1-in-4, 1-in-6, 1-in-7, 1-in-8, 2-in-9, 2-in-10, 2-in-11, 2-in-12, 2-in-13, 2-in-14, 2-in-15, 3-in-18, 3-in-19, 3-in-20, 3-in-21, 3-in-22, 3-in-23, 3-in-24, and QRSS. • **Multi-Pattern:** Five different patterns are received to stress a DS1. The following patterns are performed in 5 minute increments: All Ones, 1-in-8, 2-in-8, 3-in-24, and QRSS. • **User Defined:** Allows you to enter and save up to a 32-bit,

	customized pattern.
Fractional E1	A customized Fractional E1 pattern can be entered in hex, decimal, or bin format. 0 to 31 DS0's in an E1 with one of the E1 patterns can be entered. **This feature will be included in a future release.*
CODEC	Select A-law or MU-law.
DS0 Channel Dropped	Select the DS0 channel to be dropped, 1-31.
Speaker On/Off	Toggable button that turns the speaker on and off.
Volume	Controls the speaker volume level. Click **High** to increase volume. Click **Low** to decrease volume.

E1 Receive Signal Status

This function displays the electrical power, line frequency, and line frequency offset of the incoming E1 signal.

The following information is displayed on the E1 Receive Signal Status screen.

- Peak Positive Pulse Voltage
- Peak Negative Pulse Voltage
- Power in dBm
- Power in dBdSX
- Line Frequency in MHz
- Line Frequency Offset Received in Hz and ppm.
- Update Signal Calibration: This function controls the unit's Negative and Positive signal calibration. The following calibration functions are available:
    - Select **Negative**, **Positive**, **Negative Bridged** (for E1 #2 only), or **Positive Bridged** (for E1 #2 only) to calibrate the following readings:
        - Configure Zero Power Reading
        - Configure 0.5 Volts Reading
        - Configure 2.0 Volt Reading
    - Select **Save** to set the configuration.

E1 Results

This function allows you to view E1 error and alarm analysis and create a history of these events by graphing the information.

The following functions are available through the E1 Results screen.

- SCAN
- ERR
- Alarm
- Event
- Graph
- Large LED

E1 Results Alarm

This function displays how long E1 alarms were detected by the system. Results for the following alarms display.

- AIS
- Frame
- LOS
- PAT Sync
- RAI
- RMFAI
- CASMFL

E1 Results Errors

This function reports statistical information on errors including the error count, average error rate, and current error rate.

The following errors are displayed on the E1 Results Errors screen:

- Bit

- BPV
- Frame
- CRC
- FEBE

E1 Results Graph

Use the Graphs button to view error and alarm results for the E1 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 E1 alarms and errors.

To use the Results Graph functions, see the Using Graphs section.

E1 Results Large LEDs

This button displays the E1 LED Error and Alarm Indicators in a large, easy to read format that covers the entire screen area. This is especially useful for viewing any errors or alarms from a long distance, such as across the room from a test bay.

The following describes the LED colors:

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.

For information on the LEDs available for E1, see E1 LEDs.

E1 Results Scan

This function provides a quick report of detected errors and alarms and lists the duration in seconds of these events.

If no activity is currently occurring, "No Error and Alarms" is displayed on the screen.

The following options are available in the E1 Results Scan screen.

Option	Description
Clock	Type of clock: internal, SETS, or Bits.
LOS Seconds	The number of seconds a Loss of Signal occurred.
BPV Error Count	The number of Bipolar Violations errors that occurred.
LOF Seconds	The number of seconds a Loss of Frame occurred.
AIS Seconds	The number of seconds a Alarm Indication Signal occurred.
FAS Error Count	The number of Frame Alignment Signal errors that occurred.
CRC Error Count	The number of Cycle Redundancy errors that occurred.
CASMFL Seconds	The number of seconds a Channel-Associated Signalling Multiframe Loss error occurred.
RAI Seconds	The number of seconds a Remote Alarm Indication occurred.
RMFAI Seconds	The number of seconds a Remote Multiframe Alarm Indication occurred.
FEBE Error Count	The number of Far End Block Errors that occurred.
Pattern Loss Seconds	The number of seconds that a Loss of Pattern occurred.
Bit Errors Count	The number of Bit Errors that occurred.

Results Event

The Results Event function provides a detailed summary of alarm and error event and 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.

Select **Resume** to list event activity.

E1 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 alarm values are enclosed in quotes (") and separated by commas (,).
Print Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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.
Record Statistics and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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, **xx** indicates the current protocol processor (for example, E1=E1, E3=E3, E4=E4, OC=OC-192/48/12, ST=STM-64/16/4). **hhmmss** indicates the current time in hours, minutes, and seconds. **stat** indicates the Statistics file extension.
Print Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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. 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
Record Events and Repeat Test	**Note:** This option appears when

	Repeat Actions is selected. 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**.
Print Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. At the conclusion of a timed test, both test statistics and events are automatically printed to a printer, and the timed test is restarted. 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
Record Statistics/Events and Repeat Test	**Note:** This option appears when **Repeat Actions** is selected. 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: **xxhhmmssE.stat** (E indicates the file contains both statistics and events).
Print Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events and Repeat Test	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.

	Note: This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events and Repeat Test	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically sent to the attached printer. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Record Events	Enables real-time reporting. Any event that occurs during a real-time test is automatically printed to a file. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.
Print and Record Events	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. **Note:** This option only appears on the touch screen of portable units when **Realtime Actions** is selected.

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.

E1 Performance Monitoring

The E1 Performance Monitoring screen includes the following functions:

- FAS
- CRC
- FEBE
- BIT

E1 Performance Monitoring Bit

This provides a detailed breakdown for BIT errors detected and logged by the E1 protocol processor.

This section is broken down into the following areas:

G.821

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

G.826

- 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.
- Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

M.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.
- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- Allocation: Select an allocation percentage from 0 to 100.
- Duration: Set monitoring duration to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

E1 Performance Monitoring CRC

This provides a detailed breakdown for CRC errors detected and logged by the E1 protocol processor.

This section is broken down into the following areas:

G.821

- 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.821 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

G.826

- 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.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.
- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- M.2100 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

E1 Performance Monitoring FAS

This provides a detailed breakdown for Frame Alignment Signal errors detected and logged by the E1 protocol processor.

This section is broken down into the following areas:

G.821

- 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.821 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

G.826

- 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.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.
- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- M.2100 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

E1 Performance Monitoring FEBE

This provides a detailed breakdown for FEBE errors detected and logged by the E1 protocol processor.

This section is broken down into the following areas:

G.821

- 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.821 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

G.826

- 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.2100

- Errored Seconds (ES) by count, percentage and S1 and S2 percentage.
- Severely Errored Seconds (SES) by count, percentage and S1 and S2 percentage.
- M.2100 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

Index

A

Action After Duration............... 19, 22

AIS... 15

Alarm Generated.......................... 19

Alarm Indication Signal 15

AMI 19

ATM 15, 19

B

Bipolar Violation 15

BIT ERR....................................... 15

Bit Error....................................... 15

BPV.. 15

Bulk Filled 19

C

Calibration...................................... 6

CAS 19

CAS Signaling Bits........................ 18

CASMFL 15

Channel Associated Signaling 19

Channel Associated Signaling
Multiframe Loss 15

CLK.. 15

CODEC.. 22

COFA 15

CRC 15, 19

CRC-4 19

Cyclic Redundancy Check 15

D

DB 19

DBdsx...19

DS0 19

DS0 Channel Dropped 22

DS0 Pattern...................................19

E

E1...............................15, 18, 19, 22

E1 LEDs 15

E1 Performance Monitoring...........35

E1 Receive Settings......................22

E1 Results 27

E1 Transmit 19

E1 Transmit OH 18

E1 Transmit Settings.....................19

E13 mux 19

E3..15, 19

Error Insert Rate............................19

F

Far End Block Error 15

FAS... 19

FEBE 15

Fractional E1........................... 19, 22

Frame 15

Frame Alignment

Change..................................... 15

Frame Alignment........................... 15

Frame Alignment Signal................ 19

G

Global CAS Bits 18

Global Spare Bits.......................... 18

H

HDB3 19

High Density Bipolar 19

L

LEDs... 15

LEDs Quick Status Area 15

Line Code 19

Line Freq Offset 19

Line Frequency Offset................... 19

Line Interface 19, 22

LOF 15

LOS 15

M

Multiframe 15

O

Overhead 18

Overhead Bit Type 18

P

PAT LOSS....................................15

Pattern Loss 15

Payload Expected 22

Payload Pattern.............................19

PCM30 19

PCM30CRC 19

PCM31 19

PCM31CRC 19

PRBS 19

PRBS 2^11-1................................19

PRBS 2^11-1 Inverted...................19

PRBS 2^15-1................................19

PRBS 2^15-1 Inverted...................19

PRBS 2^20-1................................19

PRBS 2^20-1 Inverted...................19

PRBS 2^23-1 19

PRBS 2^23-1 Inverted 19

PRBS 2^9-1 19

PRBS 2^9-1 Inverted 19

R

RAI 15

Remote Alarm Indication............... 15

Remote Multiframe Alarm Indication
.... 15

Repeat 19

RMFAI.. 15

RX PWR 15

S

SDH 15, 19

SETS 15, 19

Settings Control 19, 22

Signal... 15

Signal Level...................................19

Signaling Bits 18

Spare Bits......................................18

Synchronization.............................15

Synchronous Equipment Timing
Source 19

T

Time Slot 19

Time Slot 16 15

TS..19

TS 16...19

TS0..19

TS16..19

TU-12 19

X

X Bits...18

ATM Online Help

Table Of Contents

ATM Protocol Processor 1

ATM Technical Specifications 3

ATM-Specific Tasks 7

ATM-Specific Tasks 7

ATM-Specific Tasks 7

Activate or Disable VCC Table Data Transmission and Monitoring 7

Add an SVC 7

Add or Edit a VCC 9

Delete a VCC Entry or Table 9

Enable Signalling 9

Filter Signalling Messages 10

Initiate a Loopback Test 10

Insert ATM Alarms 10

Insert ATM Errors 11

Monitor ATM Activity 12

Perform Load Tests 12

Print a Report 12

Recall a VCC Table 13

Save a VCC Table 13

Start and Stop a VCC Scan 14

Transmit a Burst Count 14

Use Turbo Add to Add Multiple VCCs 15

Table Of Contents

ATM Screen Functions and Descriptions..17

Screen Functions and Definitions..17

Screen Functions and Definitions..17

ATM LEDs...17

Config..19

VCC Table...19

Functions...20

Results 20

Index...21

ATM Protocol Processor

This ATM section is broken into two areas:

- ATM-Specific Tasks
- ATM Screen and Function Descriptions

24 October 02

ATM Technical Specifications

ATM Specifications	Description
Physical Interfaces	STM-0, STM-1, STM-4, E1 (HEC, PLCP), E3 (HEC, PLCP)
Physical Layer	SDH bulk filled; C-3 (into VC-3), C-4 into VC-4, C4-4c Structure into VC-4-4c
Adaptation Layers	AAL0, AAL1, AAL5
Header and Interface Support	Control of all cell header bits, UNI and NNI support, filter on CLP and CI bits
Channel Capacity	**Transmit:** 255 channels (independent AAL, service class, and bandwidth on all VCCs) **Receive:** 256 channels (cell count, bandwidth, AAL5 PDU counts and errors on all channels), stress testing at full STS-12c rate
Traffic Management	Constant Bit Rate (CBR), real time/non-real time Variable Bit Rate (VBR), Unspecified Bit Rate (UBR), Available Bit Rate (ABR)
Quality of Service	Cell transfer delay (min, max, mean), cell delay, variation (1 and 2 point measurement), cell bandwidth analysis, correctable/uncorrectable HEC errors, BERT analysis, real-time channel analysis, CLP monitoring, CI monitoring
Performance Analysis	CER, CLR, CMR, SECBR
Protocol Analysis	**AAL0:** Cell count and bandwidth utilization, Bit error count, Pattern sync errors **AAL1:** AAL1 SAR PDU header SNP errors, Lost cells, misinserted cells for AAL1 VCCs **AAL5:** CPCS analysis, VCC simultaneous analysis, CRC, PDU

	length errors **Network Impairment:** Cell error generation, cell loss, cell misinsertion, CDV, cell reordering, test traffic insertion, VPI/VCI remapping, CLP tagging, CI setting
Error Measurement	HEC correctable and uncorrectable error counts and rates; AAL5 CRC errors, AAL5 length errors; PRBS bit error measurement, loss of PRBS sync; AAL1 SN/SNP error, lost cells, misinserted cell counts and rates; PLCP framing errors, PLCP BIP, PLCP FEBE counts and rates; PCLP B1 CNT, PLCP Framing Error Cnt, cell overflow
Error Injection	HEC-correctable and uncorrectable errors, HEC error rate from continuous to 10^{-9}, HEC error burst from 1 to 10 on consecutive cells; PLCP B1, PLCP, FEBE, PLCP POI, PLCP Frame (A1A2), PLCP (POI)
Alarm Detection	Cell synchronization loss, F4 and F5 AIS OAM flow (end-to-end/segment), F4 and F5 RDI OAM flow (end-to-end/segment); PLCP yellow alarm (RAI)
Cell Payload Patterns	PRBS 2^{15} -1, all 1's, 10101010, user-defined pattern
Alarm Generation	Cell synchronization loss, F4 and F5 AIS OAM flow (end-to-end/segment), F4 and F5 RDI flow (end-to-end/segment), PLCP yellow alarm
SVC Support	Self call SVC, Calling SVC's, Called SVC's
SVC Signaling Support	Call establishment, Cyclic calls, Call bursts, user defined SETUP message, background traffic
SVC Monitoring	All statistics, UNI signalling, ATM layer, AAL-5, Signaling filters, UNI signaling errors, SSCOP errors, port, errors/alarms

ATM Management	Analysis of F4, F5, and loopback OAM cells (ITU I.610), OAM performance monitoring

ATM-Specific Tasks

ATM-Specific Tasks

This section includes tasks that are specific to the ATM protocol processor. For a list of 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.

ATM-Specific Tasks

This section includes tasks that are specific to the ATM protocol processor. For a list of 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.

Activate or Disable VCC Table Data Transmission and Monitoring

1. Select **VCC Table**.
2. Select **VCC CTRL**.
3. Select a VCC.
4. Set the following parameters:

    - Select **All TX Mode** to enable data transmission for up to 255 Transmit connections, starting from the current selection in the VCC Table.
    - Select **All RX Mode** to enable data monitoring for all virtual channels listed in the VCC Table.
    - Select **VCC TX Mode** to enable ATM Cell transmission for individual virtual channels in the VCC Table.
    - Select **VCC RX Mode** to enable ATM Cell monitoring for individual virtual channels in the VCC Table.

5. Select **TX On/Off** to start or stop the transmission of ATM cells on all enabled virtual channels listed in the VCC Table.
6. Select **RX On/Off** to start or stop data traffic reception and monitoring on all enabled virtual channels listed in the VCC Table.

Add an SVC

1. Select **Config**.
2. Select **Set 1**.
3. Select **Signalling** and enable.
4. Select **SVC.** If a change is required, specify the default SVC parameters.

5. Select **VCC Table**.
6. Select **Edit Tbl**.
7. Select **Add VCC** and select **SVC**.
8. To specify the VCC header information in the case of UNI4.0, select **Header**.
9. To change the Default parameters, select **Edit** under the Default Parameter portion of the screen.

   - To specify the VCC's Transmit pattern, select **Transmit Pattern**.
   - To specify the VCC's Receive pattern, select **Receive Pattern**.
   - To specify the traffic capability, select **Traffic Capability.**
   - To specify the forward QoS class, select **Fwd QoS Class**.
   - To specify the backward QoS class, select **Bwd QoS Class**.

10. To change the AAL protocol mode, select **Edit** under the Aal Parameters portion of the screen.
11. Select **AAL** and select AAL0, AAL1, or AAL5.

    - If AAL0 was selected, go to step 12.
    - If AAL1 was selected, select **AAL1 CS1 Octet**.
    - If AAL5 was selected, select **AAL5 CPCS SDU Length** and **AAL5 CPCS UU Octet**.

12. To change the forward traffic descriptors, select **Edit in Fwd Traffic Descriptor** screen.

- Select **Traffic Combination** and select a combination.
- To specify the descriptors:
  - If the combination is 1, select PCR CLP0 and PCR CLP0+1.
  - If the combination is 2, select PCR CLP0, PCR CLP0+1 and Tagging = Tagging Requested.
  - If the combination is 3, select PCR CLP0+1, SCR CLP0 and MBS CLP0.
  - If the combination is 4, select 4 PCR CLP0+1, SCR CLP0, MBS CLP0 and Tagging = Tagging Requested.
  - If the combination is 5, select PCR CLP0+1.
  - If the combination is 6, select PCR CLP0+1, SCR CLP0+1 and MBS CLP0+1.

13. To change the backward traffic descriptors, select **Edit** in the Bwd Traffic Descriptor portion of the screen.

- Select **Traffic Combination** and select a combination.
- To specify the descriptors:
  - If the combination is 1, select PCR CLP0 and PCR CLP0+1.

- If the combination is 2, select PCR CLP0, PCR CLP0+1 and Tagging = Tagging Requested.
- If the combination is 3, select PCR CLP0+1, SCR CLP0 and MBS CLP0.
- If the combination is 4, select 4 PCR CLP0+1, SCR CLP0, MBS CLP0 and Tagging = Tagging Requested.
- If the combination is 5, select PCR CLP0+1.
- If the combination is 6, select PCR CLP0+1, SCR CLP0+1 and MBS CLP0+1.

14. Select **Edit** under the Called Party Address portion of the screen and set the address.
15. If the ATM Interface is UNI4.0, select **Optional** and set the optional parameters.
16. Select **Save**.

Add or Edit a VCC

1. Select **VCC Table**.
2. Select **Edit Tbl**.
3. Select **Add VCC** or **Edit VCC**. The Select VCC Type window appears.
4. Select **PVC** or **SVC**.

   - If PVC is selected, the Add or Edit VCC screen appears. Modify the appropriate PVC parameters.
   - If SVC is selected, the Add SVC screen appears. Modify the appropriate SVC parameters.

5. When the appropriate parameters are modified, select **Save**.

Delete a VCC Entry or Table

1. Select **VCC Table**.
2. Select **Edit Tbl**.
3. *To delete a single entry*, select the VCC that you wish to delete, and select the **Delete** button at the bottom of the table. From the Delete window, select **Single Entry**. The item is deleted.

   To delete an entire table, select the **Delete** *b*utton located at the bottom of the table. From the Delete window, select **Table**. The Confirm Delete window appears, confirming that you wish to delete the current table. Select **Yes**. The entry or table has been removed.

Enable Signalling

1. Select **Config**.

2. Select **ATM Mapping** and set the mapping.
3. To specify the ATM interface, select **ATM Interface** and select **User-UNI3.0**, **User-UNI3.1**, or **User-UNI4.0**.
4. To specify the signalling PCR, select **Signalling PCR** and set the value.
5. To specify the Timer values, select **TMR**.
6. Select **Signalling** and select **Enable**.

Filter Signalling Messages

1. Select **Config**.
2. Enable **Signalling**.
3. Select **SIG FTRS**.
4. Select **Signalling Filter** and select **Enable**.
5. Select **Filter Type** and select a type of filter.

   a. If the filter type selected is Message Filter/ Message and Call Reference Flag/ Message and Call Reference Value, press **Add** and select the message to be filtered.

   b. If the filter type selected is Call Reference Flag/ Message and Call Reference Flag/ Call Reference Value and Flag, select **Call Reference Flag** and set it to **1** or **0**.

   c. If the filter type selected is Call Reference Value/ Message and Call Reference Value/ Call Reference Value and Flag, select **Call Reference Value** and set the value.

6. For selecting multiple messages, repeat step a.

Initiate a Loopback Test

1. Connect to the test unit to which you want to send a loopback.
2. Select **Config**.
3. Select **SET 1**.
4. Select **Loopback**.
5. Select **Enable**.
6. Select **Functions**.
7. Select **Loopback**.
8. Select the table item you wish to send and select **Edit**.
9. Select **Connection Type** and select a parameter.
10. Select **Duration of Insertion** and select a parameter.
11. Select **Single Loopback** and select a parameter.
12. Select **Clear Count** and select a parameter.

Insert ATM Alarms

1. Select **Functions**.
2. Select **Alarm Gen**.
3. Select a VCC in the table.
4. Select the **Edit** button located in the bottom right corner of the table. The Edit Alarm Settings window appears.
5. Select **ATM Alarm Generated** and select an alarm type.
6. Select **Duration of Alarm Generation** and select the duration.
7. If applicable, select **Defect Type**.
8. Select **Save**.

To stop alarm transmission:

1. Select **Functns**.
2. Select **Alarm Gen**.
3. Select an item in the table.
4. Select the **Edit** button located in the bottom right corner of the table. The Edit Alarm Settings window appears.
5. Select **Duration of Alarm Generation.**
6. Select **Off**.

Insert ATM Errors

1. Select **Functns**.
2. Select **Error Gen**.
3. Select a VCC entry from the table.
4. Select the **Edit** button located in the right bottom corner of the table. The Edit Error Settings window appears.
5. Select **Type of Error Added** and select an error type.
6. Select **Error Insertion Rate** and select the rate of the error insert.
7. Select **Error Burst Count** and use the key pad to enter the number of error bursts to occur.
8. Select **Duration of Error Insertion** and select the duration of the error.
9. Select **Save**.

To stop error transmission:

1. Select **Functions**.
2. Select **Error Gen**.
3. Select a VCC entry from the table.
4. Select the **Edit** button located in the right bottom corner of the table. The Edit Error Settings window appears.
5. Select **Error Insertion Rate** or **Duration of Error Insertion**.
6. Select **Off**.

Monitor ATM Activity

You are able to view various ATM test and event activity by viewing the following Result functions:

- Results Scan
- Results ERR
- Results Alarm
- Results Event
- Results Large LED
- Results Graph
- Call RSLTS

Additionally, using the SUM function, you can display a summary report of current cell activity, bandwidth percentage used, virtual channel status, and virtual channel totals for a VCC table.

To access the SUM function:

1. From the ATM protocol processor, select **VCC Table**.
2. Select **SUM**.

Perform Load Tests

1. Select **Config**.
2. Select **Signalling** and select **Enable**.
3. Select **Load Test**.
4. Select **Type of Test** and select one of the types.
5. Select **Calls per Second** and enter a value.

    - If the type of test selected is Call Burst, select **Burst Period** and select a value.
    - If the type of test selected is Call Burst, select **Skip Period** and select a value.

6. Select **Duration** and select a value.

Print a Report

You are able to print the following types of ATM reports:

- **Summary Results Report:** Prints a summarized listing of ATM test results.
- **Summary Counts Report:** Prints a summarized count of idle cells, total monitored cells, discarded cells, valid OAM cells, errored OAM, transmitting VCCs, Receiving VCCs, and total VCCs.

- **VCC Counts Report:** Prints a listing of individual VCC counts or all VCC counts.
- **QOS Counts Report:** Prints a listing of individual QOS counts or all QOS counts.
- **Connection Details:** Prints a listing of individual connections details or all connections details.
- **Current Settings:** Prints the all current configuration settings for the ATM protocol processor.

To print a report:

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.
2. Use the **Destination Printer** functions to print reports to a printer.
3. Use the **Destination File** functions to print reports to a file.
4. Select a report.
5. Select **OK**.

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

Recall a VCC Table

1. Select **VCC Table**.
2. Select **Edit Tbl**.
3. Select **Recall Table** from the bottom of the screen. The File Browser window appears.
4. Select the table that you wish to restore. All table names have a .VCC extension.
5. Select **OK**. A warning message appears confirming that you wish to restore the selected table.
6. Select **Yes**. The table information appears in the Edit Tbl screen.

Save a VCC Table

1. Add the VCCs that you wish to save to a table. For more information, see the Add a VCC section.
2. With the table open, from the Edit Tbl screen, select **Save Table** (located at the bottom of the screen). The File Browser window appears.
3. Select **File Name**. A keypad appears.

4. Enter the name of the table to be saved, and select **Enter**. The table's file name appears next to the Filename field with a .VCC extension.
5. Select **OK**. The table is saved to the directory you specified.

Start and Stop a VCC Scan

The VCC Scan function is a filter that allows you to identify active virtual channels containing specific cell addressing. This feature allows you to filter specific ATM Cell Header addressing parameters and then capture only those ATM cells. This information can then be easily transferred into a VCC Table for additional analysis.

To start a VCC Scan:

1. Select **Functions**.
2. Select **VCC Scan**.
3. Select the **Scan Header** button. The Enter VCC Header keypad appears.
4. Enter the header information and press **Enter** when done.
5. Select the **Start Scan** button to start scanning. The Scan Status (in the top right corner of the table) displays "Active."

Additionally in this screen, you may:

- Use the **Add VCC to VCC Tbl** button to add a scan header to the VCC table.
- Use the **Add All** button to add all scan headers to the VCC table.
- Use the **Clear** button to clear all table entries.

To stop the VCC Scan:

- Select **Stop Scan**. The Scan Status (in the top right corner of the table) displays "Inactive."

Transmit a Burst Count

This function transmits a controlled amount of traffic using either AAL0 cells, AAL1 PDUs, or AAL5 PDUs. This type of traffic is determined by the parameters of the active channel (the virtual channel currently highlighted in the VCC table).

In order to send a Burst Count, TX On/Off must be turned off.

To transmit a single burst:

1. Select **Functns**.
2. Select **VCC Burst**.

3. Select a virtual channel on the VCC Burst table.
4. Select the **Burst Count** button. The Burst Count keypad appears.
5. Enter a value from 1 to 1000, and press **Enter** on the keypad.
6. Select the **Start** button. The burst is transmitted and increments on the Functns screen.

Use Turbo Add to Add Multiple VCCs

1. Select **VCC Table**.
2. Select **Edit Tbl**.
3. Select the **Turbo Add** button. The No. of VCCs to be Added keypad appears.
4. Enter the number of VCCs to be added to the table (1 through 250).
5. Select **OK**. The Turbo Add window appears.
6. Select **PVC** or **SVC**.

    - If PVC is selected, the Add or Edit VCC screen appears. Modify the appropriate PVC parameters.
    - If SVC is selected, the Add SVC screen appears. Modify the appropriate SVC parameters.

> Depending on which parameters are selected for AAL and Traffic Shaping, additional options may appear on the Turbo Add screen.

7. When the appropriate parameters are modified, select **Save**.

ATM Screen Functions and Descriptions

Screen Functions and Definitions

The following function screens are available through the ATM protocol processor tab:

- ATM LEDs
- Config
- VCC Table
- Functions
- Results

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ATM LEDs

The ATM Processor Alarm and Status Indicators area serves the following purposes:

- Provides access to ATM protocol processor functions.
- Provides a visual status of ATM activity such as data traffic transmission and reception on ATM virtual channels.
- Displays ATM alarm and error conditions.

The following describes the ATM Processor Alarm and Status Indicators area.

LED	Description
TX	Displays transmit status of virtual channels. **On** indicates selected virtual channels are active and transmitting. **Off** indicates all virtual channels are not transmitting.
RX	Displays monitor status of virtual channels. **On** indicates selected virtual channels are active and monitoring. **Off**

	indicates all virtual channels are not receiving.
Mapping	Displays the current mapping settings. If none are selected, "None" appears.
LOCS	Loss of Cell Synchronization. Indicates a loss of Cell Sync, which occurs when seven consecutive bad HECs are received. Cell Sync returns when six consecutive good HECs are received.
HEC	Header Error Control. Indicates if a correctable or uncorrectable Header Error Control occurred.
SCNR	Selected Cells Not Received. Monitor or Detail Channels are not receiving cells.
Bit Err	Indicates a Bit error has been received on the active detail channel.
Pat Sync	Loss of Pattern Synchronization. Indicates and displays the status of loss of Pattern Sync on any active details channel.
STA	Status. Indicates that a VCC has received cells with the CLP = 1.
AAL	ATM Adaption Layer. Indicates that an AAL 1 SN or SNP error or lost or misinserted cell occurred, or a PDU length, padding, or CRC error occurred.
AIS	Alarm Indication Signal. Indicates if an AIS is received on an F4 or F5 OAM flow of an active VCC. This is an alarm LED.
RDI	Remote Defect Indicator. Indicates if a Remote Defect Indicator signal is received on an F4 or F5 OAM flow of an active VCC.
O.191 OVFL	Displays O.191 overflow status. **On** indicates that the block size set for the current rate is low and there is an overflow. **Off** indicates that there is no overflow.

SSCOP Link	Displays Service Specific Connection Oriented Protocol (SSCOP) link status. **On** indicates that the SSCOP link is up. **Off** indicates that the SSCOP link is down.
PLCP	Physical Layer Convergence Protocol. Indicates if a PLCP signal is received on the active detail channel.

Config

The Config function provides access to functions that configure the system. The following options are available:

- SET 1

The options below only appear when ATM Interface is not set to NNI and signalling is enabled:

- SVC
- TMR
- SIG FTRS
- LOAD TEST

VCC Table

The VCC Table function provides access to functions that control the creation of VCC tables. This function allows you to view the existing VCCs. Different colours indicate different types of VCCs.

Red indicates PVC.

Blue indicates SVC set up by the analyzer.

Pink indicates SVC set up by the peer.

Through this function, you are able to access the following options:

- VCC Cntrl
- Edit Tbl
- BKGND
- SUM
- VCC Res
- QoS Res
- O.191 RES

- QoS ANAL

Functions

This function allows you to perform the following activities:

- Define the type of errors, alarms, and loopback cells to transmit across the ATM
- Transmit a Burst Count
- Configure ATM cells for network impairment and QOS testing
- Selectively scan for specific ATM cell parameters, gather that information, and then add it to a VCC Table

The following functions are available for the Functions tab.

- VCC Burst
- Err Gen
- ALRM Gen
- Net Imp
- Loop Back
- VCC Scan
- PM OAM
- CAPT

Results

Test activity and event history can be viewed using the various functions of the Results function.

The following buttons make up the Results functions:

- Scan
- ERR
- ALARM
- Event
- Large LED
- Graph
- Call Rslts

Index

A

A1A2 15

AAL 15

AAL0 15

AAL1 15

AAL5 PDU 15

AIS 15

Alarm Indication Signal 15

ATM 15, 18

ATM Adaption Layer 15

ATM Alarms

  Inserting 8

ATM Alarms 8

ATM Cells

  Monitoring 10

ATM Cells 10

ATM Errors

  Inserting 9

ATM Errors 9

ATM LEDs 15

B

BIP 15

BIT

  Indicates 15

BIT..15

Bit Interleaved Parity 15

C

Cell Sync 15

Cell Synchronization......................15

CLP 15

CRC 15

Creating

  Virtual Channel 7

Creating..7

D

Delete

  VCC Table 7

Delete...7

Detail Channels 15

E

E1...15

E3...15

E4...15

F

F4 ... 15

F5 OAM ... 15

Far End Block Error ... 15

FEBE ... 15

Frame ... 15

FRMG ... 15

Functions ... 18

H

Header Error Control ... 15

HECs ... 15

I

Indicates

  Bit ... 15

Indicates ... 15

Indicator

  Mapping ... 15

Indicator ... 15

Inserting

  ATM Alarms ... 8

  ATM Errors ... 9

Inserting ... 8

Inserting ... 9

L

LED ... 15

LOCS ... 15

LOF ... 15

LOPS ... 15

M

Mapping

  Indicator ... 15

Mapping ... 15

Misinserted ... 15

Monitoring

  ATM Cells ... 10

Monitoring ... 10

N

None, STM-4 ... 15

O

OOF ... 15

Other Protocols ... 15

P

Pattern Sync ... 15

Physical Layer Convergence Protocol ... 15

PLCP ... 15

PLCP OOF ... 15

PLCP Yellow Alarm....................... 15
POI... 15
Pointer Synchronization................ 15

R

RDI... 15
Recall
  VCC Table................................ 11
Recall... 11
Remote Defect Indicator 15
Results... 18
RX.. 15

S

Save
  Table 11
Save... 11
SCNR... 15
SDH 15
Selected Cells Not Received 15
SN.. 15
Sngl Burst 17
SNP 15
STA.. 15
STM-16 15
Sum Cnts 17
Synchronization.............................15

T

Table
  Save 11
Table 11
Tbl Functn 17
These LEDs 15
TX..15, 18

V

VCC.......................................15, 17
VCC Cntrl 17
VCC Cnts 17
VCC Table
  Delete 7
  Recall...11
VCC Table......................................7
VCC Table....................................11
VCC Table....................................17
Virtual Channel
  Creating 7
Virtual Channel................................7

Y

YEL 15
Yellow Alarm 15