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Find the *Digital Lightwave NIC 2.5G* at our website: *Click HERE*

NIC 2.5G Online Help User's Guide

March 2005
Document No. CO 003574J – Version 4.2

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.

Digital Lightwave

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NIC 2.5G Online Help

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Table Of Contents

Introduction 1
Version Information 2
Product Overview 2
Major Features 2
Technical Specifications Overview 3
General Specifications 3
Connector Panel 4
Index 7

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Introduction

NIC 2.5G™
NETWORK INFORMATION COMPUTER®
FIRST TRULY PORTABLE COMPUTER FOR
SDH/PDH/ATM NETWORK DIAGNOSTICS

Welcome to the Online Help System

The purpose of this online help system is to assist you with successfully operating your system.

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.


If you have questions regarding your system, please contact our Customer Service representatives.

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23 March 2005

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Version Information

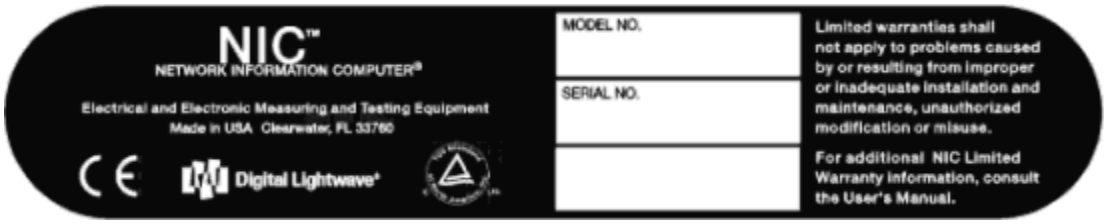
NIC 2.5G™ Online Help Version: 4.2

Last Updated: 23 March 2005

Document Number: CO 003574J

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

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



Product Overview

Digital Lightwave's NIC Network Information Computer (NIC®) is a portable instrument for verifying and qualifying the performance of telecommunications networks and embedded network elements. With a flexible software/firmware-based architecture, the multifunctional NIC replaces a multitude of traditional hardware-based test sets required to install, monitor, and maintain PDH, SDH and ATM networks. Providing a broad range of capabilities in a compact 10.5 to 14-pound package (depending on configuration), the NIC 2.5G can simultaneously and independently test protocols ranging from 64 Kbps through STM-16, including ATM.

The NIC is easy to use, with an intuitive touch-sensitive GUI that allows technicians of any experience level to operate the NIC. Its flexible design lets you configure the NIC to meet your current needs, then upgrade quickly and inexpensively as your network environment changes. The NIC 2.5G is also fully interoperable with the entire NIC product line, providing a broad range of diagnostic capabilities. Combining innovative features, functionality and performance into a single cost-effective product, the NIC is the most advanced testing platform available today.

Major Features

- Simultaneous and independent testing of PDH, ATM, and SDH. Separate protocol processors for E1, E3, E4, ATM, and SDH (includes STM-0/1/4 and STM-16)
- E3 and E1 drop/insert from SDH, built-in E13
- SDH 1310/1550 nm dual wavelength laser option
- SDH STM-16 through-mode with overhead manipulation
- Electrical jitter option for pinpointing jitter problems
- E1, E3, and E4 signal processing
- ATM support for AAL0, AAL1, and AAL5
- ATM traffic shaping and QoS measurement

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- ATM PVC/SVC and OAM support
- ATM HEC error generation and analysis
- ATM 250 channel TX and RX with channel scan
- Alarm/error generation and analysis
- Test set configuration with graphical switch matrix
- Auto configuration to pattern level
- Troublescan
- 10.4-inch active matrix color display with touch screen
- Dual slot PCMCIA interface for modem and memory storage
- Built-in optical power and frequency measurement
- Remote control GUI
- Software/firmware upgradeable via Web

Technical Specifications Overview


Specifications are subject to change without prior notice.

General Specifications

Physical Characteristics:

- Operating Temp: 0° to 50° C @ 85% RH
- Operating Temp with OC-48/STM-16: 0° to 40° C @ 85% RH
- Storage Temp: -20° to 60° C @ 95% RH
- Power Req: 100-120 VAC or 200-240 VAC, 50-60 Hz
- Dimensions: 10.1" H x 12.3" W x 4.7" D (257 mm x 312 mm x 120 mm)
- Weight: 10.5–14 lbs (depending on configuration)

Auxiliary Interfaces:

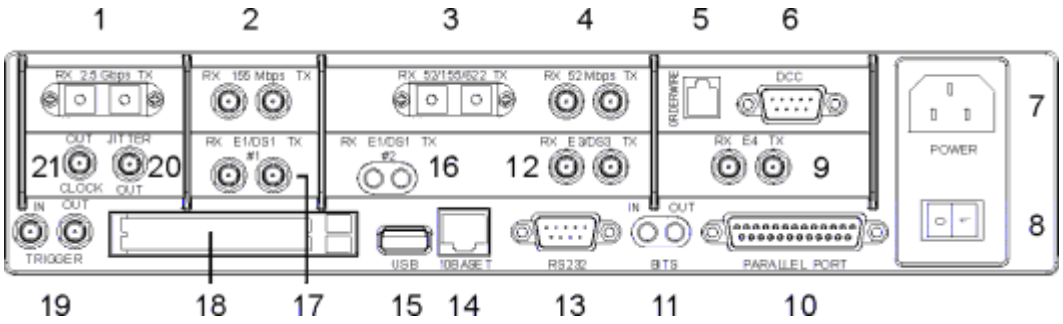
- RS-232: V.24, DB-9
- Parallel Port: DB-25
- DCC: RS-449, DB-15
- Orderwire: Handset jack (A-law)
- BITS/SETS Clock: Bantam
- PCMCIA: Dual-slot PC Card slot that can accept:
  - Modem: None
  - Flash: SanDisk 48 Mbyte Flash
  - GPIB: National Instruments model number PCMCIA-GPIB.NI-488.2 for Windows NT
- 10BaseT: RJ-45

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- Input/Output Trigger: SMA

Connector Panel

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



Connectors may differ depending on your configuration.

No	Connector	Description
1	2.5 Gbps RX/TX	Receive and Transmit input and output connectors for STM-16 optical rates. The following optical connectors are supported upon request: SC, ST, and FC.
2	155 Mbps RX/TX	Receive and Transmit input and output BNC connectors for STM-1e.
3	52/155/622 Mbps RX/TX	Receive and Transmit input and output connectors for STM-0 through STM-4 optical rates. The following optical connectors are supported upon request: SC, ST, and FC.
4	52 Mbps RX/TX	Receive and Transmit input and output BNC connectors for STM-0e.
5	Orderwire	4-pin modular Handset Jack (A-law, Mu-law)
6	DCC	DataCom Channel. RX-449, DB-15
7	Power Cord Connector	AC input connector. Accepts a 3-prong, grounded Type 13 connector.
8	Power Switch	Turns unit on or off (0=off, 1=on).

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9	E4 RX/TX	Receive and Transmit input and output connectors for E4 electrical rates.
10	Parallel Port	25-pin female connector for parallel printer.
11	In Out BITS/SETS	In Out Bantam jacks for external timing equipment. BITS/SETS clocking supports 1.544 Mhz.
12	E3/DS3 RX/TX	BNC Transmit and Receive output and input connectors for E3 and DS3 rates.
13	RS232	9-pin male connector for SCPI RS232 Direct and SCPI RS232 modem.
14	10BaseT	8-pin modular jack for Ethernet connection.
15	USB	Universal Serial Bus for future expansion of USB product support.
16	RX/TX E1/DS1 #2	Receive and Transmit input and output BNC connectors for E1 and DS1.
17	RX/TX E1/DS1 #1	Receive and Transmit input and output Bantam connectors for E1 and DS1.
18	PCMCIA (PC Card)	Dual-slot PC Card slot that accepts two Type II cards. Approved cards are: • 33.6K and 56K Modems: Viking, 3Com, Xircom, US Robotics • Flash: Scan Disk 48 Mbyte Flash • GPIB: INES, National Instruments model number PCMCIA-GPIB.NI-488.2 for Windows NT
19	Jitter Out	BNC connector for use with Jitter.
20	Trigger In and Out	SMA connectors used for trigger operation.
21	Clock Out	SMA connector that allows a trigger output for use of optical eye diagram analysis.

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Index

A

AAL0 2
AAL1 2
AAL5 2
AC 4
Alarm/error 2
A-law, Mu-law 4
ATM 2
Auxiliary Interfaces 3

B

Bantam 4
BITS/SETS 4
BITS/SETS Clock 3
BNC 4
BNC Transmit 4

C

Clock Out 4
Connector Panel 4

D

DataCom Channel 4
Date Last Updated 2
DCC 3, 4
DS1 4
DS3 4
Dual Slot 3

E

E1 ..... 2, 4
E1 drop/insert 2
E3 ..... 2, 4
E4 ..... 2, 4
Ethernet 4

G

General Specifications 3
GUI 2

I

Input/Output Trigger 3

J

Jitter 4
Jitter Out 4

M

Major Features 2

N

NIC 2
NIC 2.5G 2
NIC 2.5G Online Help Version Number 2

O

OAM 2
Online Help System 1
Orderwire 3, 4
Out Bantam 4
Out BITS/SETS 4

P

Parallel Port 3, 4
PC Card 4
PCMCIA 2, 3, 4
PDH 2
Power Switch 4
Product Overview 2

R

RJ-45 3
RS232 4
RS-232 3
RS-449 3
RX 2
RX-449 4

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

S

SC 4
SDH..... 2
SRAM Flash 4
STM-0 4
STM-0/1/4 2
STM-0e 4
STM-16 ..... 2, 4
STM-1e 4
STM-4 4

T

Technical Specifications Overview..... 3
Testing
PDH..... 2
Testing 2
Touch-sensitive GUI 2
Transmit..... 4
Trigger In 4
Troublescan 2
TX 2

U

Universal Serial Bus 4
USB 4

V

V.24 3
VAC 3
Version Information 2

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Common Tasks and Functions Online Help

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Table of Contents

Common Tasks and Functions Overview 1
Getting Started 3
- Screen Components 3
- Technical Support 4
  - Standard Service Hours 4
  - Extended Service Hours 4
  - Email 4
- Agency Approvals 4
- Safety Guidelines for Portable Products 5
  - CDRH Accession Numbers 7
- Safety Guidelines for Rackmount Products 7
- Fiber-Optic Cleaning Procedure 8
  - Inspect the Ferrule End Face of a Patch Cord Connector 8
  - To Clean a Patch Cord Connector Using Lint-Free Tissue and Alcohol 9
- Return Shipping Instructions 10
  - Shipping with the Original Container 10
  - Shipping Without the Original Container 11
- Warranty and Repair 11
  - Limited Warranty for Equipment 11
  - Limited Warranty for Software and Firmware 11
  - Limitations of all Warranties 12
  - Return Policies 12
- Screen Components 14
- Lock Icon 15
  - Using the Lock Icon 15
  - Configuring the Lock on Startup 16
- System Tab 16
- LED Quick Status Area 16
  - Quick Status LEDs Color Description 17
  - Large LED Tab Color Description 17
- Turning the Test Set On and Off 18
  - Turning the Test Set Off 18

Common Tasks Overview 19

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table Of Contents

Adding a New User 19
Adding/Dropping SDH and PDH Signals 19
Specify Frames and Patterns for the Added Signal 20
Adding Notes to a Test Unit 21
Setting the Alarm Beeper Status 22
Displaying All Test Status 23
Auto Conf 23
Enabling Boot Sound 25
Calibrating a Protocol Processor 26
Calibrating Clock Frequency 26
Calibrating the Touch Screen 27
Capturing Screens 28
Chatting 28
Clearing History and Results 29
Communications Port Assignment 29
Configuring the Ethernet Port 29
Configuring GPIB Port 30
Configuring a RAS Port 31
Configuring and Assigning the Serial Port 31
Configuring TCM for Receive Mode 32
Configuring TCM for Transmit Mode 32
Configuring the Wireless Port 33
Configuring a Protocol Mode 34
Configuring and Transmitting OC-1/3/12 and STM-0/1/4 APS Commands 34
Configuring and Transmitting OC-192/STM-64 and OC-48/STM-16 APS Commands 35
Creating a New Directory 37
Establishing a Default Login User 37
Deleting a User 38
Deleting a File 38
Downloading a File 38
Dropping and Inserting an STM-64/16/4 39
Sending Email Alerts 39
Setting the External Clock 41
FTP Processing 41

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Using Graphs 41
Display History 42
Inserting Payload Patterns 43
Inserting Alarms 43
Inserting Multiple Errors 44
Inserting Single Errors 44
Displaying Large LEDs 45
Entering a License Key 45
Locking and Unlocking a Test Set 45
Locking/Unlocking Screen Access 47
Measuring Service Disruption Activity 47
Monitoring the Incoming J0, J1, or J2 Trace 49
Monitoring Incoming Errors, Alarms, or Pointer Activity 49
Monitoring Signal Status 50
Monitoring SCPI or TL1 Commands 50
Monitoring SONET/SDH APS Commands 51
Monitoring the TC Trace 51
Setting Oscillator Value 52
Pausing/Resuming a Test 52
Making Pointer Adjustments 52
Presets Function 53
Printer Port Configuration 53
For Parallel Printing: 53
For Serial Printing: 54
Printing a Graph Report 54
Printing a Real-Time Test 54
Printing a Report 56
Capturing Screens 57
Printing or Viewing Saved Files 58
Quad Port Selection 60
Rebooting the Test Set 61
Replaying Graphs 62
Recording in the Event Log 62
Remote Control Application 62
Automating the Remote Control Application Icon 63

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Remote Control Application Removal 64
Renaming a File 64
Establishing a Required User Login 65
Resetting the System 65
Restarting an Error, Alarm, or Event Test 65
Restoring a Settings Configuration or Factory Defaults 66
Round-Trip Delay Testing 66
Saving a Customized Settings Configuration 67
Saving Graphs for Replay 67
Configuring the Screen Saver 68
Changing SONET or SDH Overhead Bytes 68
Displaying SDH/SONET Overhead Bytes 69
Changing SDH/SONET Overhead Bytes in Passthru Mode 69
SDH/SONET Signal Notification 70
Security Settings 71
User Security Information 71
System Services 72
NT/FTP Administrator 72
Displaying Serial Numbers and Software Revision 72
Increasing or Decreasing Speaker Volume 73
Starting a Test 73
Stopping a Test 74
Using the Switch Matrix 74
Enabling/Disabling Security System Lock 75
Changing a Tab Name 75
Restoring Default Tab Names 76
TC Summary 76
TCM 77
Understanding Test Units 78
Setting Time and Date 78
Adjusting Touch Screen Brightness 79
Turning the Laser On or Off 80
Laser Safety 80
Configuring and Transmitting OC-1/3/12 and STM-0/1/4 APS Commands 80

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Configuring and Transmitting OC-192/STM-64 and OC-48/STM-16 APS Commands 82
Upgrading Test Set Software from CD 83
Uploading a File 84
Updating a User Profile 85
Viewing Added/Dropped Signal Activity 85
Troubleshooting 87
Troubleshooting 87
Index 91

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Common Tasks and Functions 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.

23 March 2005
V4.2

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Getting Started

Screen Components

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

If you are using a portable product that has a touch screen, place 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

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- PP Name/Go To Area
- Work Area
- Common Function Buttons

Technical Support

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

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

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

Standard Service Hours

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

Extended Service Hours

24 hours a day, 7 days a week

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

Email

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

Agency Approvals

TUV Rheinland of North America is the test laboratory used.

For NIC 2.5G and NIC 10G:

TUV Safety File No. E2073411.01/E2073412.01/E2073414.01/.02
EMC Report File (NIC 10G) P2071068.01
EMC Report File (NIC 2.5G) P2071251.01/.02
CU License No. CU2071103.01
CDRH Accession No. 0021615

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For NIC Plus:

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

EMC Report File No. P2171264.01

CE Report File No. E2173659.01

CB Report File No. E2173657.01

CU License No. CU2173522.01

For NAA IV:

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

EMC Report No. P2171118.01

CU License No. CU2173727

GS License No. S2173726

CDRH Accession No. 9922616

For DCA 425:

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

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(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 conductors 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.

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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 wrist strap 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

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Accession Number: 9922616; 21CFR 1040.10 and 1040.11 compliant; EN60825-1:1993+A11+A2.



Class 1 Laser Product



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

Fiber-Optic Cleaning Procedure



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

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

Inspect the Ferrule End Face of a Patch Cord Connector

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

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

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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 microscope 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.

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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.

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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

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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.

Limitations of all Warranties

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

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

For warranty service or repair, this product must be returned in accordance with the Seller's Return Policies to a service facility designated by Seller. The first purchaser shall prepay shipping charges to Digital Lightwave, and if Digital Lightwave discovers a breach of the Limited Warranty, Digital Lightwave shall pay shipping charges to return the product to first purchaser. However, first purchaser shall pay all shipping charges, duties and taxes for products returned by Digital Lightwave to first purchaser outside the United States.

Return Policies

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

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

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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

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- Common Function Buttons

Lock Icon

The unit's multi-user functionality allows up to eight (8) simultaneous users to be connected to a portable unit. This includes one (1) local user, via the unit's touch screen, and seven (7) 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. See Locking and Unlocking a Test Set for more information. For setting the default lock state, see 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 and choosing **Lock** or **Lock and Exit** from the Lock/Unlock dialog box.
	I have the test set locked. I currently control the test set and can configure protocol processors. I can unlock the test set by selecting the icon. 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 privileges –** I can select this icon and force an unlock. **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."

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	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
- Service Disruption
- Monitor
- Chat
- Faults

LED Quick Status Area

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

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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 **red** 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.

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Turning the Test Set On and Off

To turn the test set 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 test set, listen for fan rotation to make sure that the cooling fans are operating properly.
4. As the test set 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.

Turning the Test Set Off

The procedure described below allows the system to write unsaved data to the disk before you shutdown the test set. This task is performed by selecting the Off/Lock common function button on a protocol processor tab or Switch Matrix.

This can only be performed locally from a portable test set's touch screen.

Important: It is important to use the procedure described below when shutting down the test set. Failure to do so may result in lost data and corrupt system files.

To shut down the test set from a protocol processor tab or Switch Matrix:

1. Select the **Off/Lock** common function button. The Unlock Login dialog box appears.

Important: Do not enter the User ID or Password.

2. Select **Shut Down**. The Shutdown? dialog box appears.
3. Select **OK** to continue with the shutdown process, or Cancel to keep the test set on.
4. After all unsaved data is written to the disk, the Shutdown Computer dialog box appears.

Important: The Shutdown Computer dialog box is a standard Windows® message. NIC test sets DO NOT support the Restart option.

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5. Toggle the **power switch** on the top of the test set to the off position.

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.

Adding 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. From the **System** tab, select **Security**.
2. From the **User Name** column, select **NEW USER**.
3. From **Account Information**, select , which is next to the **User Name** field. A keypad appears.
4. Enter the **user name**.
5. Select , which is next to the **Password** field. A keypad appears.
6. Enter a **password**.
7. Select , which is next to the **Permission** field. The Select User Permissions window appears.
8. Select one of the following user permissions:
    - **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 **Update**. The new user profile is added and appears on the User List.

Adding/Dropping SDH and PDH Signals

The NIC allows you to set up single, or multiple test sets, and provides multiplexing and demultiplexing functionality for signal levels. Using the NIC's Preset mode, you can add or drop a signal from optical/electrical SDH and SONET, or electrical PDH into another protocol processor's signal levels in order to monitor for error and alarm conditions. For additional information on test sets see Understanding Test Sets.

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Important: When the NIC/NAA has multiple test units you must first select the desired **test set** protocol tab before selecting the Presets button. The configuration options available through the Preset Selection screen are dependent on the test set that is selected.

1. Select the protocol processor.
2. Select **Presets**. The Apply Presets dialog box appears. Several examples are provided below.
    - **To add an STM-4 signal into an STM-16 signal:**
        a. Select the **Interface** button and choose **STM-16**.
        b. Select the **Configuration** button and choose **STM-4 A/D**.

        Multiple signals can be added to the interface by selecting the Configuration button again and choosing another signal before selecting Apply.

        c. Select **Apply**.
    - **To add an E1 into an E3 signal:**
        a. Select the **Interface** button and choose **E3**.
        b. Select the **Configuration** button and choose **E1 #1 A/D** or **E1 #2 A/D**.

        Multiple signals can be added to the interface by selecting the Configuration button again and choosing another signal before selecting Apply.

        c. Select **Apply**.
    - **To add a E1 #2 A/D LI into an E3 signal:**
        a. Select the **Interface** button and choose **E3**.
        b. Select the **Configuration** button and choose **E1 #2 A/D LI.**

        Multiple signals can be added to the interface by selecting the Configuration button again and choosing another signal before selecting Apply.

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

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.

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**.

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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#1 Channel Inserted** and select from channels 1 through 16 for E1 #1.
5. Select **E1#2 Channel Inserted** 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.

Adding Notes to a Test Unit

When you lock a test unit, you can add notes to the Add/Lock dialog box that are pertinent to the test set. Different test unit can carry their own specific notes.

To add notes to the Lock/Unlock dialog box for a test unit:

1. Choose the desired protocol processor and select the **Lock** icon. The Lock/Unlock dialog box appears.


If the test unit is locked by someone else, select **Force Unlock** and choose **Lock and Exit** or **Lock**.

2. Select **Circuit Info:** and/or **Contact Info:**. The Enter User String keyboard opens.
3. Type notes and select **Enter**. The notes appear in their associated information box.
4. Select **Exit** to close the Lock/Unlock dialog box.

To edit notes on the Lock/Unlock dialog box for a test unit:


To edit the notes, the test unit must be placed in locked mode by the immediate user.

1. Choose the desired protocol processor and select the **Lock** icon. The Lock/Unlock dialog box appears.
2. Select **Circuit Info:** and/or **Contact Info:** and make appropriate changes using the Enter User String keyboard. Select **Enter**.
3. Select **Exit**.

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Setting the 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. From the **System** tab, select **User Preference**.
2. Select **Alarm Beeper Status**.
3. Select **On** or **Maintenance**. The Alarm Beep Definition dialog box appears.
4. Select an alarm type to display the Select All Alarms Sound dialog box.
5. Select a sound. The sound selection uses the WAV file's name. For example, chord.wav appears as CHORD.
6. If desired, select **Test** to hear the sound.
7. Select **Apply**.

To turn off all alarm sounds:

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

To add new WAV files to the Remote NIC on your PC:

1. Make sure that your Remote NIC application is closed.
2. Place a copy of the WAV file into the Compat folder that you are running the Remote NIC from.

   To locate the Compat folder:

   a. Open the Remote NIC (**GalaxyNIC**) directory. For example, the default directory is C:\Program Files\GalaxyNIC.

   b. Locate the **Compat** folder from which the Remote NIC is running. The folder name represents the Feature Set operating on the NIC unit. For example, the Compat folder for Feature Set 4.1.28 appears in the GalaxyNIC directory as Compat400010028.

There can be more than one Compat folder in the GalaxyNIC directory. To determine the correct folder, check the Feature Set version operating on the NIC that you want to add the WAV file to by selecting its **System** tab, choosing **Misc**, and pointing to **About this product**. The **Feature Set** version is located near the top of the **About NIC** dialog box.

3. After the WAV file has been added to the appropriate Compat folder, open the Remote NIC application.

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4. From the **System** tab, select **User Preference**.
5. Select **Alarm Beeper Status**.
6. Select **On** or **Maintenance**. The Alarm Beep Definition dialog box appears.
7. Select an alarm type to display the Select All Alarms Sound dialog box. The new WAV files appear in the dialog box. Only the first 16 sounds will appear in the selection window. The sound files that appear use the WAV file's name.
8. Select the new WAV file and choose **Apply**.

Displaying All Test Status

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

1. From the **System** tab, 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.


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

2. 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.

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

Auto Conf

The Auto Conf 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 Conf** from the Common Function Buttons that appear at the bottom of the touch screen. The Select Type of Auto Configuration dialog box appears.
5. Select the type of auto configuration to perform. See the table below for a description of the options.

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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.  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.

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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.

Enabling Boot Sound

Enabling the Boot Sound option allows a .wav sound file to play, which acknowledges that the NIC unit is fully booted and available.

To enable the boot sound:

1. From the **System** tab, select **Misc**.

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2. From **System Setting**, select the **Boot Sound Enabled** check box.

To disable the Boot Sound, simply clear the Boot Sound Enabled check box.

Calibrating a Protocol Processor

Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode. Once calibration has been enabled, each protocol processor has its own calibration procedure.

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.

The user must have Admin or Calibrate privileges to enable the calibration mode.

The **Update Signal Calibration** button is now available on the protocol processor's **Receive SIG** screen.

Protocol processors have their own calibration procedures. You can find the procedures in **Specific Tasks** section of the protocol's **Online Help**.

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

1. From the **NIC Online Help**, select the **Contents** tab and choose the desired protocol processor.
2. Expand the protocol processor's **Overview** book and select **Specific Tasks**.
3. Select the **Calibrate** topic.

For local touch screen calibration procedures, select Calibrating the Touch Screen.

Calibrating Clock Frequency

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**.

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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.

Calibrating the Touch Screen

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. From the **System** tab, select **Misc**.
2. Select **Recalibrate Touch Screen**. The MtsCal dialog box appears.

   The Recalibrate Touch Screen button does not appear when you are connected to the unit using the Remote Control Application software.
3. Select **5-point Calibration**.

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

   The hand icon indicates which target to select.
4. Place and hold your pointing device as close to the center of the target as possible.
5. The message **Touch Enabled** appears when calibration for that specific point is complete.
6. The hand icon moves to the next target. Repeat step 4 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.

7. When touch screen calibration is complete, a completion message briefly appears on the screen and the MtsCal dialog box reappears. Select **Close**.

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Capturing Screens

This function allows you to print the currently displayed screen and converts it to a bitmap (.bmp) image, which is saved to your test set or PC's hard drive in the GalaxyNIC folder.

Important: You cannot print or view a saved .bmp from the System File Services list box. You must locate the .bmp in the GalaxyNIC directory on your PC. To locate the .bmp:

a. Open the Remote NIC (**GalaxyNIC**) directory. For example, the default directory is C:\Program Files\GalaxyNIC.

b. Locate the **Compat** folder from which the Remote NIC is running. The folder name represents the Feature Set operating on the NIC unit. For example, the Compat folder for Feature Set 4.1.28 appears in the GalaxyNIC directory as Compat400010028.

c. Open the .bmp file and print to a local printer.

To capture a screen:

1. Select the **Print Report** Common Function Button.
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.

Chatting

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

To send a message:

1. From the **System** tab, select **Chat**.
2. Enter your message in the **Input Message** box.
   - Select 

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

Pressing the Enter key on your keyboard will delete the message. To avoid this, select **Multi Lines** before starting to type the message. In addition, if you have a long message, select Multi Lines so that you

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can use the Enter key to keep your message within the Input Message window.

3. You can assign a **High Priority** level to the message, or you can require that the recipient respond to the message (**Reply Required**).

Another user may not see the Chat message unless High Priority or Reply Required is selected.

4. Select **Send**.

Clearing 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** common function button that appears at the bottom of the touch screen.

To clear recorded history (results):

- Select the **Restart** common function button that appears at the bottom of the touch screen. The LEDs' history clears, and the statistics collected under the Results function resets 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
- GPIB port configuration
- Serial port configuration and assignment procedures

Configuring the Ethernet Port

The unit can be controlled using SCPI or TL1 (when licensed) 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 restarted for the changes to take affect.

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To configure the Ethernet port for a static IP address:

1. From the **System** tab, select **I/O Settings**.
2. Select **Ethernet**.
3. Select **Specify an IP address** from the **Ethernet Configuration** functions.
4. 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**.

5. Restart the unit for changes to take affect.

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

1. From the **System** tab, select **I/O Settings**.
2. Select **Ethernet**.
3. From **Ethernet Configuration**, 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. Restart the unit for changes to take affect.

To view the Ethernet port assignment:

The Ethernet port assignment is automatically enabled for SCPI. When licensed for TL1, it also appears on the Port Assignment line.

1. From the **System** tab, select **I/O Settings**.
2. Select **Ethernet**.
3. The **Port Assignment** line displays what has been assigned, by way of default or license. SCPI is automatically listed. If the unit is licensed for TL1, then TL1 is also displayed on the assignment line.

Configuring GPIB Port

The unit can be controlled using SCPI commands through the unit's GPIB port. The Port Assignment line on the GPIB screen automatically displays SCPI as its assignment.

To configure the GPIB port address:

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

1. Select **System**.
2. Select **I/O Settings**.
3. Select **GPIB**.

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4. Select **GPIB Port** and enter the primary address for the GPIB interface. Address values are from 0 to 30. The primary address must match the GPIB host or communications cannot be established.
5. Select **OK**.
6. Restart the unit for changes to take affect.

Configuring 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. From the **System** tab, select **I/O Settings**.
2. Select **RAS**.
3. Select or clear the **Allow remote clients to request a predetermined IP address** check box.

   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 **cleared**, 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.

   a. Select **Start IP Address** and enter the start range value.

   b. Select **End IP Address** and enter the end range value.

Configuring and Assigning 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 the **System** tab.
2. Select **I/O Settings** and choose **Serial**.
3. If necessary, select the **Baud Rate**, **Parity**, **Data Bits**, and **Stop Bits** serial configuration parameters and make the appropriate changes.
4. Select **Port Assignment**. The Select Serial Port Assignment dialog box appears.

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The **Printer** option only displays when configuring from the NIC touch screen. The **TL1** option only displays if the unit is licensed for TL1.

5. Choose the desired port assignment.

Configuring TCM for Receive Mode

When transmitting or monitoring errors and alarms the unit must be configured for TCM operation.

To configure the unit for TCM monitor operation:

1. Select an SDH or SONET protocol processor.
2. Select **Receive** and choose **SET 2**.
3. Select the **TC Error/Alarm Processing** function and select **Enable**.
4. The unit is configured to monitor for incoming TCM errors, alarms, and traces. Select **Monitoring the TC Trace** for more information about incoming trace patterns.

To monitor for TC-TIM alarms:

- Select **Receive**.
- Select **SET 2**.
- Select the **TIM Alarm Reporting** function and select **Enable**.

Related Topics:

Monitoring TCM Results

Monitoring the TC Trace

Configuring TCM for Transmit Mode

When transmitting or monitoring errors and alarms the unit must be configured for TCM operation.

To configure the unit for TCM transmit operation:

1. Select an SDH or SONET protocol processor.
2. Select **Transmit**.
3. Select **SET 2**.
4. Select the **TC Overhead Processing** function and select **Enable**.
5. The unit is configured for transmit TCM mode, which now permits the transmission of TCM errors, alarms, and traces.

Related Topics:

Transmitting TCM errors

Transmitting TCM alarms

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Transmitting a TC trace

Configuring 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:

- 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.

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Configuring 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 the **System** tab and choose **Misc**.
2. Select the **Protocols** button.
3. 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.
4. Select a protocol mode. The screen is updated to reflect the mode selected.

Configuring and Transmitting OC-1/3/12 and STM-0/1/4 APS Commands

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:
   - **K1 Full Byte** - Sets all eight bits of the K1 byte at once.
   - **K1 Bits 1-4** - Sets the first four bits of the K1 byte.

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- **K1 Bits 5-8** - Sets the last four bits of 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:
    - **K2 Full Byte** - Sets all eight bits of the K2 byte at once.
    - **K2 Bits 1-4** - Sets the first four bits of the K2 byte.
    - **K2 Bit 5 (provisioned)** - Sets the fifth bit of the K2 byte.
    - **K2 Bits 6-8** - Sets the last three bits of the K2 byte.
7. Use the following options to transmit bit values:
    - Use 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.
    - Use 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.
    - Use the **Transmit Illegal** button to transmit the illegal bit values (11111111) for the K1 and K2 bytes. When pressed, the illegal bit values appear in the Transmit column.

Configuring and Transmitting OC-192/STM-64 and OC-48/STM-16 APS Commands

 The following only applies to OC-192/STM-64 and OC-48/STM-16 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 OC-192/STM-64 or OC-48/STM-16 protocol processor.
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. To make a new entry:

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- Select **New Item**

To edit an item:

- Select **Item <#>**, for example, Item 12.

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

5. Select **APS Mode**. The APS Mode dialog box appears.
6. Choose **Linear** protection switching mode or **Ring** APS signaling mode.
7. Select a **K1** byte/bit. A value dialog box associated with the K1 selection appears

   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.
8. Select a K2 byte/bit. A value dialog box associated with the K2 selection appears.

   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.
9. Select the desired K1 and/or K2 byte/bit value.
10. From the Apply Maintenance to Entry dialog box, select **Duration in Frames** to set up the number of frames that will be transmitted containing the newly configured K1 and K2 bytes.
11. Select **Update**. The initial APS screen appears on the touch screen.
12. To configure additional K1 and K2 bytes, repeat steps 3-11 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**.

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Creating 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.

Establishing a Default Login User

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.

The default login function is only applicable for the NIC unit. When connecting to a NIC via the Remote NIC application, a user ID and password are required. Establishing a default login user can only be done from the NIC touch screen.

To establish a default login user:

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

The Set as Default button is only available from the NIC touch screen.

To disable a default login:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, clear the **User Login Required** check box. A cleared check box, indicates that User Login Required is disabled.

The User Login Required check box is only available from the NIC touch screen.

3. Reboot the unit for changes to take affect. When the unit restarts, a login box appears.

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

4. 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*.

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Deleting 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. From the **System** tab, select **Security**.
2. From the User List, select the **User Name** to be deleted.
3. With the user name highlighted, select **Delete**. The user is removed from the User List.

Deleting a File

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

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

Downloading 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*,
     a. 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).
     b. If this device is secured with a User ID and Password, then enter this information.
     c. 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 card and PCMCIA drivers are qualified.
3. From the left File List box, select the destination directory.

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4. Select  (download). The file is transferred to the unit.

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

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

   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.

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.

Sending Email Alerts

Before using the email alert feature, check with your Network Administrator to verify that your email account is set up to accept and forward SMTP mail.

Important: After the email alert settings are completed the protocol tab for which the error/alarms have been configured must be selected, or you must be in All Tests mode. Email alert messages will not be generated if these conditions are not met.

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To set up email alerts:

1. From the **System** tab, select **User Preference**.
2. From **Mail Notification**, select the **Mail From**.
3. Using the keypad that appears, enter the sender's email address and press **Enter**.
4. From **Mail Notification**, select the **Mail Server**.
5. Using the keypad that appears, enter the email server address (for example, ms1) and press **Enter**.
6. From **Mail Notification**, select the **Mail To**.
7. Using the keypad that appears, enter the recipient's email address and press **Enter**.
8. From **Mail Notification**, select the **Mail Interval**. The Select Duration of Test dialog box appears.
9. Select the desired test duration period. The test duration determines when the system checks for an error or alarm.

   For example, when you set up a mail interval of 15 minutes on OC-1/3/12 for all error/alarms and then select the OC-1/3/12 tab, the result is, at the first live error/alarm incident an email message is sent to the recipient. After 15 minutes has elapsed the system looks for the next live error/alarm incident and sends another email message. This 15-minute loop continues until you reset the email notification configuration.

This process is not active unless the configured protocol tab or All Tests is selected.

10. From the **Processor / Mail Notify** section, select the protocol processor that you want monitored. The Select Error/Alarm Mail Notification window appears.

You can configure additional protocols for email notification by selecting another protocol processor after choosing the error/alarm type.

Important: To activate the email notification function for *multiple protocols* you must select **All Tests** after the configurations are completed.

11. Select a desired error/alarm type or All errors and alarms. When monitoring multiple protocols, each protocol can be configured for its own error/alarm type.

Important: These configuration settings DO NOT persist after the unit has been restarted.

To terminate email alerts:

1. From the **System** tab, select **User Preference**. The User Preference screen appears.

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2. Select the **Mail Interval** button. The Select Duration of Test dialog box appears.
3. Select **OFF**.

Setting the External Clock

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

To set the external clock:

1. Select **System** and choose **Misc**.
2. Select **External Clock**. The External Clock dialog box appears.
3. Select **BITS** or **SETS**.

FTP Processing

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.

Using 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 the graphs function:

1. Select a protocol processor that has been configured for Error Alarm testing.
2. From **Results**, select **Graph**. The Graph screen appears. It contains two graphs which allow you to display incoming alarms and errors.
3. Use the following buttons to control graphing parameters:
    - **Sample Rate** - Sets the timing for graph results at increments of 1 Second, 1 Minute, or 15 Minutes.
    - **Change Scale** - Compresses or expands the displayed time scale for the graphed errors and alarms at time intervals of 30 minutes, 90 minutes, 3 hours, 6 hours, 12 hours, 24 hours, or 72 hours.
    - **Change Upper** - Sets the type of errors or alarms that appear in the upper graph.
    - **Change Lower** - Sets the type of errors or alarms that appear in the lower graph.
    - **Shift Left and Shift Right** - Adjusts the graph's time scale to an earlier or later time.
    - **Print Report** - Prints a graph report to printer or file.
    - **Save Graphs** - Saves a graph to file as a .grp file that can be replayed at a later time.

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> Important: This is not a text file; when replayed, it appears as the original graph plot. Choose *Print a Graph to Report* if you desire graph information that can be printed out.)

- **Replay Graphs/Stop Replay** - Replays or stops saved graphs (.grp).

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.
2. Select the **Results** button.
3. Events can be viewed on the **Scan**, **Err**, **Alarm**, **PTR**, or **Graphs** screens.

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

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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.

Inserting 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 **OK**. The system will transmit this pattern as the payload.

Inserting 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**.

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4. Select **Alarm Generated**. The **Select Alarm to Insert** window appears.
5. Select **Off**. Alarm transmission stops.

Inserting Multiple 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. Inserting multiple errors not only allows you to initiate a continuous test, but it also allows you to set up a specific test duration and action to take when the duration ends. For example, you could set the test duration to run for five minutes, the action after test to repeat the test, and print the statistics to a file or printer.

To insert multiple errors:

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

 Selecting **None** will stop the error transmission.

To set up duration and after test actions:

1. Choose **Test**. The Test window appears, which provides the Duration and Action After Test options.
2. Select **Duration** and choose how long you want to run the test for.
3. Select **Action After Duration** button and choose the desired actions.

See Print or View Saved Files, for additional information.

Inserting Single 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. After defining the error parameters, the Error Insert button injects single errors into the transmitted protocol processor's signal.

To insert single errors:

1. Select a protocol processor and choose **Transmit**.
2. Select **Error Alarm**.
3. Select **Error to Insert**. The Select Error to Insert window appears.

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4. Select an error.

Important: DO NOT set Error Insert Rate when inserting a single error.

Important: Select **Restart** from the Common Function buttons to clear any previously collected data.

5. Select **Error Insert** from the Common Function buttons to inject the error.
6. To view the event statistics, choose the protocol's **Results** button.
7. To print or record the statistics, see the topic Print Report.

Displaying Large LEDs

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

Entering 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. From the **System** tab, select **Misc**.
2. Select **License Key**. A keypad appears.
3. Enter the new license key into the text box.
4. Select **Enter** when done.
5. Restart the unit for the new functions to take effect.

Locking and Unlocking a Test Set

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.

When a test set is locked by someone else, the  icon is displayed.

To unlock a test set locked by someone else:

1. Select the icon. The Lock/Unlock dialog box appears.
2. Select **Force Unlock**. The command buttons change to "Lock and Exit" and "Lock".

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You must have **Admin** privileges to be able to force the unlock.

3. Selecting one of the following causes the command buttons to change to "Unlock and Exit" and "Unlock", and the information boxes become available.
    - **Lock and Exit** - Locks the unit and automatically closes the dialog box. To enter notes after the dialog box closes, select the locked icon to reopen the dialog box.
    - **Lock** - Allows you to enter note information in the Circuit Info: and Contact Info: boxes before closing the dialog box. The notes carry over to all protocol processors in the test set. When a different test set is locked the user can enter notes pertinent to it.
4. To enter note information, select **Circuit Info:** and/or **Contact Info:**. The Enter User String keyboard opens.
5. Type notes and select **Enter**. The notes appear in their associated information box.
6. Select **Exit** to close the Lock/Unlock dialog box.

When you have the test set locked, the  icon is displayed.

To unlock a test set that you have locked:

1. Select the icon. The Lock/Unlock dialog box appears.
2. Selecting one of the following causes the command buttons to change to "Lock and Exit" and "Lock":
    - **Unlock and Exit** - Unlocks the unit and automatically closes the dialog box.
    - **Unlock** - Unlocks the unit without closing the dialog box. Select **Exit** to close the Lock/Unlock dialog box.

When the test set is unlocked, the  icon is displayed.

To lock a test set:

1. Select the icon. The Lock/Unlock dialog box appears.
2. Selecting one of the following causes the command buttons to change to "Unlock and Exit" and "Unlock", and the information boxes become available.
    - **Lock and Exit** - Locks the unit and automatically closes the dialog box.
    - **Lock** - Allows you to enter note information in the **Circuit Info:** and **Contact Info:** boxes before closing the dialog box. The notes carry over to all protocol processors in the test set. When a different test set is locked the user can enter notes pertinent to it. Select **Exit** to close the dialog box.

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Locking/Unlocking Screen Access

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 **Off/Lock** 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**. The Lock Unit dialog box appears.

 If the unit is locked because critical testing is in progress, select the **Unlock** button and enter the **User ID** and **Password** again. Select **OK**.

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 in entered.

To unlock the screen:

1. Select the **Off/Lock** button that appears on the Locked Unit screen.
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.

 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 in entered.

4. Select **OK**.

Measuring Service Disruption Activity

The NIC unit can measure service disruption switching intervals in your network and can be configured to monitor for a specific event that will cause a service disruption 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 service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

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To measure Service Disruption activity:

1. Select a protocol processor.
2. Select the **Test** button.
3. Select the **Service Disruptn** button. The Service Disruption measurement screen appears.
4. From **Protection Switch Criteria**, select the alarms, errors, and patterns to use for triggering a service disruption.


The Protection Switch Criteria for PDH protocols is automatically set.

5. The measurement parameters that appear on the Service Disruption screen are dependant upon the protocol. A description of the possible parameters is provided below. Selecting the parameter button displays a key pad, from which you will enter the desired setting.
    - **Consecutive Good Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. The range is 0.106 to 27.133 milliseconds and is entered using a keypad. The Good Time and Good Frames settings are coupled.
    - **Consecutive Good Frames Required**: This function allows you to enter the number of consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 255 frames and is entered using a keypad.
    - **Consecutive Bad Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive errored frames to elapse before Protection Switch measurements begin to accumulate. The range is 0.106 to 27.133 milliseconds and is entered using a keypad. The Bad Time and Bad Frames settings are coupled.
    - **Consecutive Bad Frames Required**: This function allows you to enter the number of consecutive errored frames to occur before Protection Switch measurements begin to accumulate. The range is 1 to 255 frames and is entered using a keypad.
6. From **Action**, select **State.** The Select APS Action dialog box appears.
7. Select **Single APS** or **Continuous APS** to begin measuring. The unit will begin monitoring the incoming signal for the 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements.

A history of event is recorded in the History Recent Milli Seconds and History Recent Frames fields. The complete summary of event can be viewed on the Service Disruption Summary screen.

To stop monitoring Service Disruption measurement activity:

1. From **Action**, select **State.** The Select APS Action dialog box appears.

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2. Select **Stop APS**.

To view the Service Disruption Summary:

1. Select the **System** tab.
2. Select the **Service Disruption** button. The Service Disruption Summary screen appears.

Monitoring 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.)

Monitoring Incoming Errors, Alarms, or Pointer Activity

1. Select a protocol processor mode.
2. Select **Results**.
3. Select the following Results tabs to monitor events:
   - 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.
   - Select **Err** 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
   - Select **Alarm** to view more details about incoming alarms. This function reports the number of seconds that an alarm is present.

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- 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
- Select **Event** to view a summary of events (alarms, errors, and Pointer activity) recorded by the unit. For more information, refer to the Recording in the Event Log section.
- Select **APS** to display the incoming bit values of the K1 and K2 bytes. For more information, refer to the Monitoring SONET/SDH APS Commands section.
- 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.
- Select **Graph** displays incoming errors and alarms in the form of a line or bar graph.

Monitoring Signal Status

1. Select **Receive**.
2. Select **SIG**. 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.

Monitoring SCPI or TL1 Commands

The Monitor screen is a command window that allows you to view SCPI or TL1 commands issued to the unit, command responses (for valid commands entered), and the error code (if an invalid command is entered).

To use the Monitor feature, the communications port must be configured. The Ethernet and GPIB ports are always enabled for SCPI commands and, when licensed, they are automatically enabled for TL1. However, the port assignment for the Serial port must be configured.

To open the monitor:

1. From the **System** tab, select **Monitor**.
2. Choose **Select Command Processor** and select **SCPI** or **TL1**.

To issue SCPI commands to the unit:

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- Refer to the *SCPI Command Reference Guide* for procedures. The guide can be found in the Technical Documentation Library at http://www.lightwave.com.

To issue TL1 commands to the unit

- Refer to the *TL1 Command Reference Guide* for procedures. The guide can be found in the Technical Documentation Library at http://www.lightwave.com.

Monitoring SONET/SDH APS Commands

 The following only applies to SONET and SDH 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 SONET or SDH protocol processor.
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.

Monitoring the TC Trace

Before monitoring TC trace:

- Make sure the unit is configured for TCM receive mode.

To view the TC trace:

1. Select an SDH or SONET protocol processor.
2. Select **Receive**.
3. Select **POH** to view the incoming TC trace, which appears at the bottom of the screen.

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A TC-TIM alarm occurs if the incoming TC trace does not match the expected TC Trace. The alarm's duration appears on the Results' Alarm screen.

Setting Oscillator Value

1. Select **System** and choose **Misc**.
2. Select **Oscillator Value**. The Enter User Data keypad appears.
3. Enter a value between 1 and 255 and select **OK**.

Pausing/Resuming a Test

To pause a test:

1. Select **Test** and choose Set 1.
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.

Making 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 **Transmit** and choose **PTR**.
3. Configure the Pointer Adjustment parameters. For example,
   - Select **NDF Flag** to allow a New Data Flag to be set when a new Pointer value has been transmitted.
   - Select **Pointer Value** to change the Pointer value from 0 to 782.
   - Select **Frequency Offset** to increase or decrease the speed of the Pointer adjustments.

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- Select **Pointer Action** to select the type of Pointer activity that occurs when the Increment Pointer or Decrement Pointer buttons are selected.
- Use **Burst Count** to set the number of repetitions for Pointer adjustments.

4. Select **INC Pointer** to make a positive pointer adjustment, or select **DEC 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.

Presets Function

The Presets function provides a quick and convenient way to set up the system for operation. Using Presets involves selecting a starting protocol and its interface, and then making an internal connection to another protocol. See Adding/Dropping SDH/PDH Signals for more information.

To set up a connection using the Presets function:

1. Select **Presets** from the Common Function Buttons row.
2. Select **Interface**. All line interfaces available for your unit appear.
3. Select an interface as a starting point.
4. Select **Configuration**. The protocols available for the selected interface appear.
5. Select a protocol to connect to the selected interface. If desired, select the **Configuration** button again to create additional connections.

 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.

6. 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. A protocol processor will now expect to receive a signal using its line interface.

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.

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For Serial Printing:

Important: The following steps must be performed from the NIC unit touch screen. "Printer" is not an available Serial port assignment from the Remote Control Application.

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. Select the **Serial** button.
5. Select the **Port Assignment** button. The Select Serial Port Assignment dialog box appears.
6. Select **Printer**.

Printing a Graph Report

To print a graph report:

1. From the **Results** tab, select **Graph**.
2. Select **Print Report**. The Report Setup menu appears.
3. Choose one of the following:
   - From **Destination Printer**, select **Graphs** to print reports to a printer.

     If printing a report from the NIC unit, make sure that a printer is attached to the unit's parallel or serial port.
   - From **Destination File**, select **Graphs to File** to print reports to a file. The File Browser dialog box appears.
     - Enter a filename and select **OK**. The file extension for a graph is .rep.

Important: Files saved when working with the Remote Control Application will not be accessible from the NIC unit touch-screen and visa-versa. The remote application saves the files to the Remote Control (GalaxyNIC) directory on the PC. The NIC unit saves the files to its default D:\DLI... drive on the test unit.

4. Select **OK**.

For information on retrieving a graph saved to file, see Print or View Saved Files.

Printing a Real-Time Test

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

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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 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 continues from where it was prior to the power interruption. The power interruption event will appear in the real-time report.

To set up and start a real-time test:

1. Select **Test**.
2. Select **SET 1**. The Duration and Action After Duration functions appear.
3. Select **Action After Duration**, and then select **Realtime Actions**. The Select Realtime Actions after Test dialog box appears.
4. Select one of the following real-time test options:
    - 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
5. The Realtime Setup Parameters dialog box appears. Select **User Header**. The Enter User String keyboard appears.
6. Type a header name using the keypad that appears and select **Enter**. The header, which can be up to 64-bytes in length, serves as a brief description of the test.
7. Select **Print Alive** message. The Enter Duration window appears.
8. Set the time parameter, which determines if and when a Print Alive message is generated. A value of 0 disables the messaging function. Select **OK**. The header name and duration setting appear on the Realtime Setup Parameters window.
9. Select **OK**. The Realtime Setup Parameters window closes.

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10. Select **Duration** and enter how long a test will run.
11. Select the **Restart** button to start the real-time test. The Elapsed Time counter, located in the top right corner, resets to 0.
12. 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.

Printing a Report

The Print Report Common Function Button allows you to print reports to a printer or file.

1. Select **Print Report**. The Report Setup menu appears.
2. Choose one of the following:
   - From **Destination Printer**, select one or multiple reports to print directly to a printer. If printing a report from the NIC unit, make sure that a printer is attached to the unit's parallel or serial port. The following reports are available:
     - **Settings** - (.set extension) Reports current values for all Transmit and Receive Set functions.
     - **Statistics** - (.stat extension) Reports results for the Scan, Errors, Alarms, and PTR.
     - **Events** - (.evt extension) Reports a detailed summary of events, such as alarms, errors, and pointer activity. This report includes the event, the number of events logged, the start and stop time of the event, and the duration of the event.
     - **APS** - (.aps extension) Reports the results of the K1 and K2 byte sequences received by the unit.
     - **Performance** - (.perf extension) Reports Performance Monitor results.
   - From **Destination File**, choose one or multiple reports to print to a file. The File Browser dialog box appears.

     The **Comma Delimiter** option can be applied to the Settings To File and Statistics To File reports.

     ▸ Enter a filename and select **OK**.

Important: Files saved when working with the Remote Control Application will not be accessible from the NIC unit touch-screen and visa-versa. The remote application

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saves the files to the Remote Control (GalaxyNIC) directory on the PC. The NIC unit saves the files to its default D:\DLI... drive on the test unit.

3. Select **OK**.

For information on retrieving saved files, see Print or View Saved Files.

Files that are created when using the Remote Control Application are saved on your PC in the Remote Control 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 Remote Control Application 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.

Capturing Screens

This function allows you to print the currently displayed screen and converts it to a bitmap (.bmp) image, which is saved to your test set or PC's hard drive in the GalaxyNIC folder.

Important: You cannot print or view a saved .bmp from the System File Services list box. You must locate the .bmp in the GalaxyNIC directory on your PC. To locate the .bmp:

a. Open the Remote NIC (**GalaxyNIC**) directory. For example, the default directory is C:\Program Files\GalaxyNIC.

b. Locate the **Compat** folder from which the Remote NIC is running. The folder name represents the Feature Set operating on the NIC unit. For example, the Compat folder for Feature Set 4.1.28 appears in the GalaxyNIC directory as Compat400010028.

c. Open the .bmp file and print to a local printer.

To capture a screen:

1. Select the **Print Report** Common Function Button.
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

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transfer procedures. After the file is copied to your PC, it can be opened and printed.

Printing or Viewing Saved Files

While running tests, you have the option to save the information to a file. The instructions below tell you where and how to print or view a saved file.

Important: Files saved when working with the Remote Control Application will not be accessible from the NIC unit touch-screen and visa-versa. The remote application saves the files to the Remote Control (GalaxyNIC) directory on the PC. The NIC unit saves the files to its default D:\DLI... drive on the test unit.

To print or view a saved file:

1. From the **System** tab, select **File Services**.
2. Select a file from the **Disk** directory box. The desired report may display in the main Disk directory, or it may be stored in one of the folders in the directory. Folder names are enclosed in brackets **[foldername]**. To return to the main Disk directory after opening a folder, select **[. .]** or the **Disk** button.

Important: Real-time reports generated from the NIC unit touch-screen, using the Action after Duration function, are automatically stored in the [APP] folder. Select the folder to display those reports.

The following is a list of file extension used for files generated from the Print Report, Graph, or Action after Duration functions:

- **.aps** - APS Report
- **.evt** - Event Report
- **.perf** - Performance Report
- **.real** - Real-time Test Report (Stored in [APP} folder on NIC unit.)
- **.rep** - Graph Report, BERT Analysis, RFC Thru Put Analysis
- **.set** - Settings Report
- **.stat** - Results Report
- **.statE** - Event Report
- **.grp** - Graph (This is not a text file. It can only be viewed as a graph by selecting **Results,** pointing to **Graph** and choosing the **Replay Graphs** button.)

3. Choose one of the following

To **Print** the file:

a. Select **Print**. A standard Print dialog box appears.

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

b. Select the printer **Name** and choose **OK**.

To **View** the file:

a. Select **View**. The View File window appears. Use the **Display Hex** / **Display ASCII** toggle button to display the file in Hex or ASCII format.

> The following file details display below the File List box.

- File name
- File size and date
- File attributes

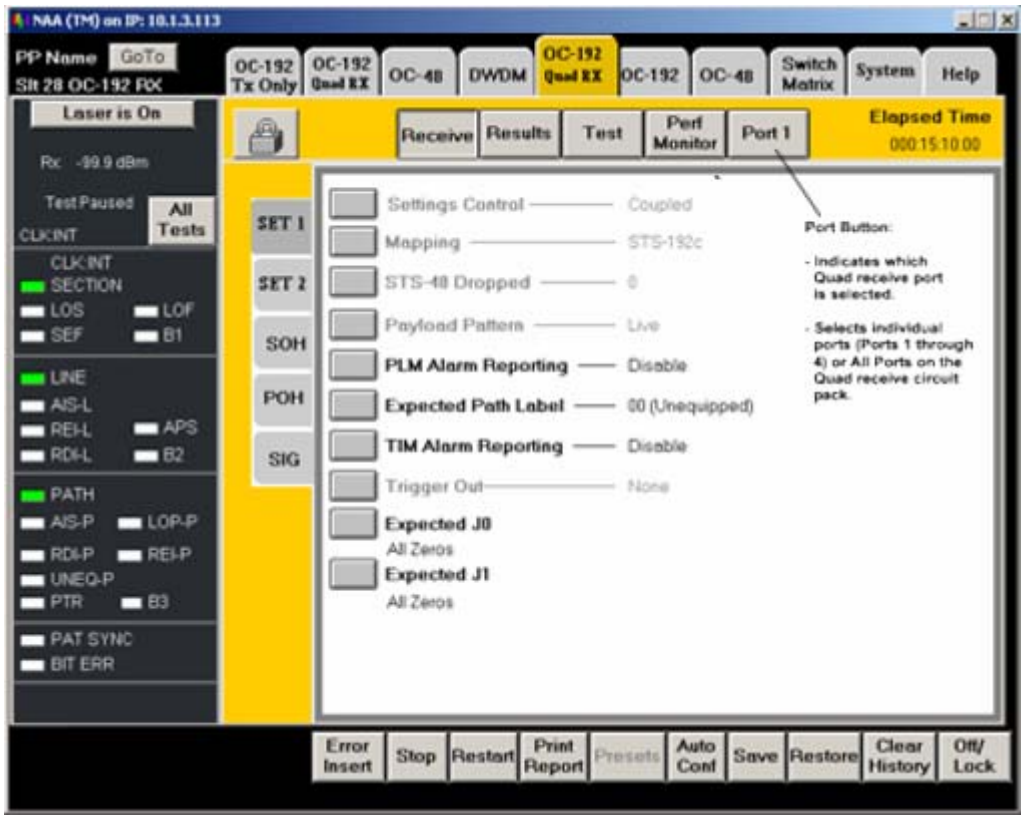
b. Select **Exit** to close the View File window.

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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, all of the ports must be locked.

   To lock the ports before using the All Ports option:

   a. Select the **Port <#>** button and choose a port from the Select Port dialog box.

   b. Select the **Lock** icon. See Locking and Unlocking a Test Set for information about using the Lock/Unlock dialog box.

   c. Repeat Steps a and b until all ports are locked.

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d. Select the **Port <#>** button and choose **All Ports**.

Important: When in All Ports mode, the results that appear when the **Results** button 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.

Rebooting the Test Set

This function allows the system to write unsaved data to the disk before you reboot the unit. You can perform this task from the System I/O window or by selecting the Off/Lock button on a protocol processor tab or Switch Matrix.

Important: Rebooting the test set must be done from the NIC touch screen.

To reboot the unit from the System, I/O Settings window:

1. Select the **System** tab and choose **I/O Settings**.
2. Select **Reboot**. The Reboot dialog box appears.
3. Select **OK** to continue with the reboot process, or Cancel to keep the unit on. The Shutdown in Progress message box appears.
4. After all unsaved data is written to the disk, the unit restarts.

Important: If the unit does not successfully reboot turn it off manually by toggling the On/Off switch to **Off**.

To reboot the unit from a protocol processor tab or Switch Matrix:

1. Select the **Off/Lock** common function button. The Unlock Login dialog box appears.

Important: Do not enter the User ID or Password.

2. Select **Reboot**. The Reboot dialog box appears.
3. Select **OK** to continue with the reboot process, or Cancel to keep the unit on. The Shutdown in Progress message box appears.
4. After all unsaved data is written to the disk, the unit restarts.

Important: If the unit does not successfully reboot turn it off manually by toggling the On/Off switch to **Off**.

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Replaying Graphs

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.

Recording in 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.

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.

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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.

Important: 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.

Automating the Remote Control Application Icon

The Remote Control Application software is a graphical user interface (GUI) 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 choose 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.

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Remote Control Application Removal

Important: Reports that were saved to the Compat4030 folder, located in the Remote Control Application directory (for example, C:\Program Files\GalaxyNIC\Compat4030) will be deleted during the uninstall process. To save historical reports, copy the data files to a folder located outside of the Remote Control Application directory before proceeding with the uninstall process.

To remove the Remote Control Application

1. Close the Remote Control Application.
2. Click the **Windows Start** button and choose **Settings**.
3. Select **Control Panel** and choose **Add/Remove Programs**.
4. Select **Remote NIC** and click the **Add/Remove** button.
5. Follow the on-screen instructions.
6. Open Windows Explorer and locate the Remote Control Application (GalaxyNIC) directory. For example, C:\Program Files\GalaxyNIC.
7. Delete the **GalaxyNIC** folder.
8. Install the new Remote Control Application.

Renaming 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 Action After 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.
    - PERF is the default extension for a Performance Monitor report.
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.

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Establishing a Required User Login

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

Important: Establishing a required user login can only be done from the NIC touch screen.

To establish a required login:

1. From the **System** tab, choose **Misc**.
2. From **Local Setting**, select the **User Login Required** check box. When this box is checked, a required login has been established.

   To disable the required login, clear the **User Login Required** check box.

The User Login Required check box is only available from the NIC touch screen.

Resetting the 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. From the **System** tab, select **Security**.
2. Select **Reset System**.
3. A message asking to confirm that you want to reset the system appears. Select **Yes**.
4. A message stating that the system must be restarted for changes to take affect appears. Select **OK**.
5. Restart the system.

Restarting an Error, Alarm, or Event Test

The Restart Common Function Button is used to initiate the following test activities:

- **Starts** error, alarm, or event activity that was stopped using the Stop button.

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- **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** Common function button located at the bottom of the touch screen. Configured testing on the current protocol processor is restarted.

Restoring 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 processor 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 Testing

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 one of the following is 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.

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- 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**.

Saving 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 a name for the configuration to be saved, and select **Enter** when done. The file is saved with an automatic file extension of .set.

Saving Graphs for Replay

Select the Save Graphs button to save the graphed results to a file for replay at a later time. The graph is saved with a .grp extension. To view the graph select the **Replay Graphs** button and choose the desired .grp file from the Browser dialog box.

Important: Files saved when working with the Remote Control Application will not be accessible from the NIC unit touch-screen and visa-versa. The remote application saves the files to the Remote Control (GalaxyNIC) directory on the PC. The NIC unit saves the files to its default D:\DLI... drive on the test unit.

For instructions on accessing a saved file see Print or View Saved Files.

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Configuring the Screen Saver

The screen saver can be turned off or configured to activate after a set period of time. When the screen saver is operating, you can clear it by touching anywhere on the touch screen.

To enable the screen saver:

1. From the **System** tab, select **Misc**.
2. Select **Start Screen Saver**. The Select Screen Saver Delay dialog box appears.
3. Select the desired delay period. Choosing Off, disables the screen saver.

To disable the screen saver:

1. From the **System** tab, select **Misc**.
2. Select **Start Screen Saver** and choose **Off**.

Changing SONET or SDH Overhead Bytes

 The following only applies to SONET and SDH 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.

Altering the OH bytes allows other equipment to detect, and if necessary, react to these changes.

To change overhead bytes:

1. Select a SONET or SDH protocol processor.
2. Select the **Transmit** and choose **SOH** or **POH** to display overhead bytes.
    - In *SDH* mode, select a slot using the **Showing** button.
    - In *SONET* mode, select a slot using the **STS** button.
3. 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.

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

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

Displaying SDH/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 a SONET or SDH protocol processor.
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 **Changing SONET and SDH Overhead Bytes**.
4. To view Overhead bytes for other slots, select the **Showing** or **STS** button 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 **Showing** or **STS** button to view Overhead bytes for other slots.

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

Changing SDH/SONET Overhead Bytes in Passthru Mode

The following only applies to SONET and SDH 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,

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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 a SONET or SDH protocol processor.
2. Select the **Transmit** and choose **SET 1**.
3. Select the **Passthru Mode**. The Select Passthru Mode dialog box appears.
4. 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.

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

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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 2**.
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 Settings

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, NT/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 ( Default User only appears on the NIC touch screen.)

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

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appear giving you the option of logging in with Read-Only permissions only. When the user logs on with Read-Only permission, all functionality will be disabled with the exception of the online help and the About this product function.

System Services

System Services allows an administrator to disable specific network services to meet their network's security policies. To enable a system service, select its check box. To disable a system service, clear the check box.

NT/FTP Administrator

NT/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

Reset System restores default Security settings.

Displaying Serial Numbers and Software Revision

This function displays the following information:

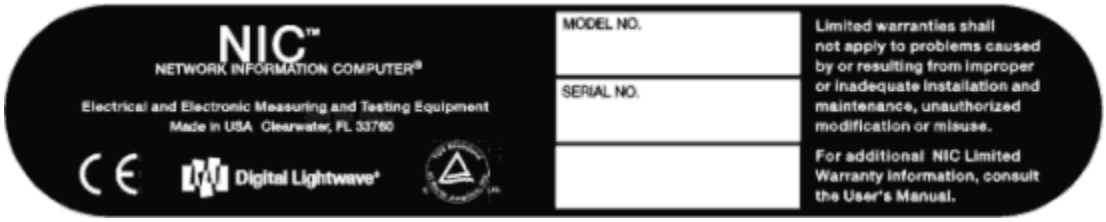
- Copyright Information
- Feature set number
- Graphical User Interface Version
- Customer Service Information
- Circuit Pack Information
    - Product Serial Number
    - Kit Number
    - System Control Version
    - SCPI Version
    - TL1 Version
    - SNMP Version
    - OmniOrb Version
    - UPX Version
    - zlib Version
    - Kit Numbers and Versions

To view this information:

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

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



Increasing or Decreasing 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 **System** tab, choose **Misc**.
2. From **Speaker Volume**, select the **Low** arrow to decrease the volume, or **High** arrow to increase the volume.

Starting 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**.

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Stopping a Test

The Stop Common Function 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** Common Function 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 disengage the configured protocol connections:

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

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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.

Enabling/Disabling 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. From the **System** tab, select **Security**.
2. From **Default Entry**, select the **Security System Lock** check box. A checked box indicates that the Security System Lock function is enabled.

To disable Security System Lock:

1. From the **System** tab, select **Security**.
2. From **Default Entry**, clear the **Security System Lock** check box. A cleared check box indicates that the Security System Lock function is disabled.

Changing a Tab Name

1. From the **System** tab, select **User Preference**.
2. Under **Label Preferences**, select **Local** or **Global**.
   - Local – Only changes the tab label for your session. Other users will not see the tab name that you enter.
   - Global – Changes the tab label on the unit so that all users see the same tab name that you enter.
3. Select a tab name from the **Assigned Name** column of the list box.
4. Under **PP Label Information**, enter a name in the **Assigned Name** text field.

   (When using the touch screen on a portable unit, select 

to open a keypad.)

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5. Select **Update List Entry**, to add the name to the User Defined Name column of the list box.
6. Repeat steps 3 through 5 to continue adding user-defined names, as desired.
7. Select **Save All List Entries**. The new tab names appear in the PP Name/Go To area of the screen when the protocol processor tab is selected.
8. Select **PP Name / Go To**, located in the top-left corner of the touch screen. The Select Protocol Processor Entry dialog box appears displaying the new name.

When the protocol is selected the new name appears below the PP Name text on the touch screen; however, the name on the tab remains the same.

Restoring Default Tab Names

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

To change tab names, select Changing a Tab Name.

TC Summary

The **TC Summary** LED indicates if a TCM error or alarm has been detected.

- If the LED is red, select the **TC Summary** text to display the TC LEDs



The TC LEDs appear in the center of the screen. The following describes the TC LEDs.

LED	Description
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

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	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-TIM	Tandem Connection-Trace Identifier Mismatch. Indicates that the incoming TC trace does not match the expected TC trace. This appears as an alarm count on the Results' Alarm screen.
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.

TCM

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

For more information about TCM transmit and receive procedures:

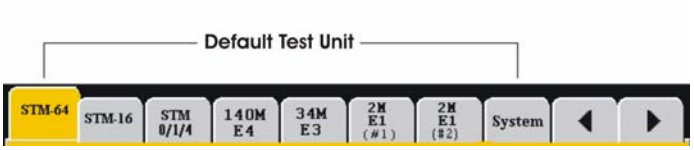
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- Select **Configuring TCM Transmit Mode** for transmit preparation procedures and links to error, alarm, and trace generation.
- Select **Configuring TCM Receive Mode** for receive preparation procedures and links to error, alarm, trace, and overhead monitoring.
- Select **TC Summary LED** for information about the TCM LEDs,

Understanding Test Units

A test unit is a series of adjacent circuit packs that are installed in a NIC/NAA (test set). The test unit is based on a circuit pack's internal addressing and starts from the highest to the lowest speed.

For example, a test set can contain multiple circuit packs of the same type (two 10Gbps circuit packs). When this type of configuration occurs, the first instance of the higher speed circuit pack is considered a test unit. Any lower speed circuit packs immediately to the right of this card are included in the test unit.



However, when the second instance of a higher speed circuit pack is encountered, it is considered the beginning of the second test unit. The image displayed to the right shows a NIC that has eight protocol tabs, representing four test units.



Preset configuration options that appear will be those available for the specified test unit. When the NIC/NAA has multiple test units you must first select the desired test unit protocol tab before selecting the Presets button.

Setting 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. From the **System** tab, select **Set Unit's Date and Time**. The Set Date and Time window appear.

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

To set the date:

1. From the **System** tab, select **Set Unit's Date and Time**. The Set Date and Time window appear.
2. Select the **Date** button.
3. Select **Month** and enter the month using a 2-digit format.
4. Select **Day** and enter the day using a 2-digit format.
5. Select **Year** and enter the year using a 4-digit format.
6. Select **Set**. The date change appears next to the Set Unit's Date and Time field.

Adjusting Touch Screen Brightness

Adjusting the touch screen brightness can only be performed from the NIC touch screen.

To adjust a portable unit's touch screen intensity:

1. From the **System** tab, choose **Misc**.
2. Select **Backlight Intensity**. A keypad appears.
3. Enter the intensity setting by typing a value range from **0** (brightest setting) to **255** (dimmest setting).
4. Select **OK**.

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Turning the 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



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.

From the **Transmit** screen, select **Initial Laser Setting** and choose one of the following:

- **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.

Configuring and Transmitting OC-1/3/12 and STM-0/1/4 APS Commands

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**.

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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:
   - **K1 Full Byte** - Sets all eight bits of the K1 byte at once.
   - **K1 Bits 1-4** - Sets the first four bits of the K1 byte.
   - **K1 Bits 5-8** - Sets the last four bits of 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:
   - **K2 Full Byte** - Sets all eight bits of the K2 byte at once.
   - **K2 Bits 1-4** - Sets the first four bits of the K2 byte.
   - **K2 Bit 5 (provisioned)** - Sets the fifth bit of the K2 byte.
   - **K2 Bits 6-8** - Sets the last three bits of the K2 byte.
7. Use the following options to transmit bit values:
   - Use 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.
   - Use 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.
   - Use the **Transmit Illegal** button to transmit the illegal bit values (11111111) for the K1 and K2 bytes. When pressed, the illegal bit values appear in the Transmit column.

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Configuring and Transmitting OC-192/STM-64 and OC-48/STM-16 APS Commands

The following only applies to OC-192/STM-64 and OC-48/STM-16 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 OC-192/STM-64 or OC-48/STM-16 protocol processor.
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. To make a new entry:
   - Select **New Item**

   To edit an item:
   - Select **Item <#>**, for example, Item 12.

   The Apply Maintenance to Entry screen appears, which contains functions used to configure and set the measurement criteria of the K1 and K2 bytes.
5. Select **APS Mode**. The APS Mode dialog box appears.
6. Choose **Linear** protection switching mode or **Ring** APS signaling mode.
7. Select a **K1** byte/bit. A value dialog box associated with the K1 selection appears

   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.
8. Select a K2 byte/bit. A value dialog box associated with the K2 selection appears.

   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:

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- 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.

9. Select the desired K1 and/or K2 byte/bit value.
10. From the Apply Maintenance to Entry dialog box, select **Duration in Frames** to set up the number of frames that will be transmitted containing the newly configured K1 and K2 bytes.
11. Select **Update**. The initial APS screen appears on the touch screen.
12. To configure additional K1 and K2 bytes, repeat steps 3-11 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**.

Upgrading Test Set Software from CD

The instructions outlined below provide a quick set of steps for upgrading your NIC/NAA test set and troubleshooting a cancelled upgrade. For more in-depth information, see the NIC/NAA Software Upgrade Online Help.

Warning: You must have the **Java® Runtime Environment (JRE)** installed on your PC before proceeding with the upgrade.

To upgrade the test set software from the CD:

1. Turn the NIC test set **On**.
2. From the **System** tab, select **I/O Settings**.

If the NIC test set is not on the network, use a cross-over cable to connect it to the PC.

3. Insert the **Software and Remote CD**, which you received with your NIC test set, into your computer's CD-ROM drive. The CD should automatically open the Remote NIC Software window.
4. From the **Software** tab, select **Upgrade NIC Software**.
5. Select **Install**. A DOS prompt window displays and then the Digital Lightwave's Software Upgrade dialog box appears. No action is required for the DOS prompt window.

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6. From the Software Upgrade dialog box, select **Device Logon**. The Device Logon dialog box appears.
7. In the **New IP Address** box, type the IP Address for the NIC test set that is being upgraded. You can find the IP Address on the NIC test set's I/O screen.
8. Select **Add IP to List**. The address appears in the IP Address List box.

Up to 32 device IP Addresses can be stored in the IP Address List box.

9. Select the **IP Address** and click the > button. The IP Address moves to the IP Addresses Selected box.

Warning: Do not attempt to upgrade more than one test unit (device) at a time. Devices moved into the IP Addresses Selected box are scheduled for upgrade. Therefore, select only one device from the IP Address List box before proceeding to the next step.

10. Select **OK**. The upgrade software connects to the NIC test set and then the Scheduled Upgrades Notice dialog box appears.
11. Select **OK**. The notice box closes and you are returned to the Software Upgrade dialog box.
12. Select **Upgrade**. The Upgrade Activity Status dialog box appears and then the Upgrade Alert! dialog box.

This automatically upgrades all circuit packs in the NIC test set. The upgrade process may take several minutes.

13. Select **OK**.
14. Toggle the test set's On/Off switch to **Off**.

Warning: Leave the test set off for a minimum of 10 seconds before rebooting it.

15. Turn the test set **On**.
16. From the NIC Common Function buttons, select **Restore**. The Select Type of Restore dialog box appears.
17. Select **Factory Defaults**.
18. This completes the software upgrade.

Uploading 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**).

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- If using *FTP*,
  a. 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) in the **FTP Site Information** box.
  b. If this device is secured with a User ID and Password, then enter this information.
  c. Enter an FTP session on the connecting device.
- If using *PCMCIA*,
  - 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.

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

Updating 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. From the **System** tab, select **Security**.
2. From the User List, select the user profile to be updated. The user name, password, and permission appears in the Account Information box.
3. Select , which is next to the field to be updated.
   - If *User Name* 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.
4. When you are done updating the user's profile, select **Update**. The updated information appears on the User List.

Viewing Added/Dropped Signal Activity

1. Select **Results**.
2. Select the following Results tabs to monitor events:

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- 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.
- Select **Err** 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
- Select **Alarm** to view more details about incoming alarms. This function reports the number of seconds that an alarm is present.
- 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
- Select **Event** to view a summary of events (alarms, errors, and Pointer activity) recorded by the unit. For more information, refer to the Recording in the Event Log section.
- Select **APS** to display the incoming bit values of the K1 and K2 bytes. For more information, refer to the Monitoring SONET/SDH APS Commands section.
- 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.
- Select **Graph** displays incoming errors and alarms in the form of a line or bar graph.

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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 restart the unit if it is still not responding.
Touch Screen	Too much or too little sensitivity.	Adjusting the touch screen sensitivity must be done by a trained Digital Lightwave representative. Contact Customer Support for assistance.
Speaker	Volume too loud or too soft	Adjust desired volume from the System, Misc screen.

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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.

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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	Contact Customer Support to ensure the PCMCIA is properly licensed and enabled.
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" from the System, Misc screen and enabled on the protocol processor's Transmit screen, Clock Reference option. • Verify that the input clock source is a clean signal with a frequency of 1.544 MHz into a 100-ohm termination.

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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" from the System, Misc screen and enabled on the protocol processor's Transmit screen, Clock Reference option. • Verify that the input clock source is a clean signal with a frequency of 2.048 MHz into a 120-ohm termination.

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Index

A

AC 18
Account Information 85
Act/Duration button 52, 54, 64, 73
Action After Duration 54, 73
Action menu 73
Add 53
Add/Drop 19, 53
Add/Dropped Signals
  View Activity 85
Add/Dropped Signals 85
Adjust Touch Screen Brightness 79
Agency Approvals 4
Alarm Beeper Status 22
Alarm button 42
Alarm Sounds 22
Alarms 42, 49, 56, 65
All Test Status 23
APS 51, 56, 64
APS Commands 35, 51, 82
Assign
  GPIB Port#To 30
Assign 30
AU-4-4c 53

B

B2 87

C

Calibration 26, 27, 38, 75, 85
CDRH Accession No 5, 80
Chat 28
Circuit Pack Information 72
Clear History 29
Clock
  Bits 41
Clock 41
Common Function Buttons 67
Common Tasks 1
Communication Ports 29
Configuring and Assigning the Ethernet Port 29
Configuring and Assigning the Serial Port 31
Customer Service 87
Customized Settings Configuration
  Save 67
Customized Settings Configuration 67

D

D1-D3 ..... 68, 69
D4-D12 ..... 68, 69
Date 78
DBdsx 50
DBm 50
DEC Pointer 35, 52, 82
Decrease Speaker Volume 73
Default button 37
Default Login
  Establish 37
Default Login 37
Default User 37
Delete
  File 38
  User 38
Delete 38
Delete 38
Digital Lightwave 5, 10, 11
Display All Test Status 23

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Display History 42
Display Serial Numbers..... 72
Download
File 38
Download 38
DS1/DS3 34
DS3 53
DS3 Line Interface 53
DS3 Mapping 53
DS3 Tx/Rx..... 53
Duration..... 54, 73
E
E1..... 42, 43, 44, 49, 53
E1 Line Interface 53
E3..... 42, 43, 44, 49, 53
E3 Line Interface 53
E3 Mapping 53
E3 Payload..... 53
E4..... 43, 53
E4 Line Interface 53
E4 Mapping 53
E4 TX/RX 53
Elapsed Time 73
Email Alerts
Sending 39
Email Alerts 39
EMC Standards..... 4
Error Count..... 42
Error Insert button 44
Errors
Insert 44
Restart..... 65
select..... 42
Errors 42
Errors 44
Errors 49
Errors 56
Errors 65
Errors button 42
Ethernet 29, 87
Ethernet Communication 29
Event Log
Use 62
Event Log 62
Events Report..... 56
External Clock
Set 41
External Clock 41
F
F1 Intrude 69
Factory Defaults 66
Fiber-Optic Cleaning Procedure 8
File
Delete 38
Download..... 38
Graphs..... 54
Print 58
Rename 64
Upload 84
File Browser..... 54, 56
File List 37, 38, 58, 64, 66, 84
File Services ... 28, 37, 38, 57, 58, 64, 84
FTP 38, 71, 84
FTP Administrator..... 71
FTP Site Information..... 84
Functions 41, 73
G
GPIB 87
Graphs..... 41, 42, 54, 64
Graphs button..... 41, 42

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

GRP 54, 62, 64
GUI 63
H
Hardware configuration 34
Help 18
I
Insert Errors 44
Insert Single Errors 44
Inserting
STM-64/16/4 39
Inserting 39
Intrusive Overhead button 69
IP Address 38, 84
K
K1 56
K2 56
Kit Number 72
L
Label Preferences 75, 76
Large LEDs 16, 29
Laser button 80
Laser Safety 5, 80
LED/Quick Status 78
LEDs 16, 29, 42, 65
Line Interface 53
Lock Screen 47
Locking/Unlocking
Screen 47
Locking/Unlocking 47
Login 37, 65
Loopback
OC-48/STM-16 87
Loopback 87
M
Make Pointer Adjustments 52
Map 43
MHZ 87
Misc 87
Monitor Incoming Errors 49
Monitor Signal Status 50
Monitor Tab 50
N
N.NNe-N 42, 49
NDF 49
NDF Count 42
Negative Justification 42
Negative Pulse 50
New Data Flags 42, 49
New Directory 37
O
Off 18
Overhead 68
Overhead Bytes 69
P
Parallel Port 53, 58
Parallel Printing 53
Passthru Mode 69
Password 38, 84, 85
Pause 52
Payload 53
PC 38, 84
PC Card 38, 84
PCMCIA 38, 84, 87
PCMCIA Modem 62
PC's 58
PDH 19, 34, 50
Performance Monitoring 74
Periodic Maintenance 8
Permissions 85
Pointer

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

adjusting 52
incoming 49
Pointer 42
Pointer 49
Pointer 56
Pointer 62
Pointer Activity 49
Pointer Adjustments 52
Pointer Justification Seconds 42
Port Selection 29, 31, 60
Positive Justification 42
Presets 53
Print 54, 58
Print a Real-Time Test 54
Print Report 54, 56, 62
Print Screen 28, 57
Printer Port Configuration 53
Product Serial Number 72
Protocol Mode 34
Protocol Processor 41, 73
PTR 42, 56

Q

Quad RX 60
Quick Status LEDs 16, 29, 80
Quick Status LEDs Color Description 16

R

RAS 31
Real-Time Test 54
Reboot 61
Receive Settings 67
Refresh button 62
Remote Access 62
Remote Control 56, 62, 63
Remote Control Software 84
Remote GUI 56, 62, 63
Rename
File 64
Rename 64
Replay Graphs/Stop Replay 62
Required User Login
Establish 65
Required User Login 65
Reset System 65
Restart
Error 65
Restart 16
Restart 65
Restart button 29, 65, 74
Restore
Settings Configuration 66
Restore 66
Results
Scan 56
Results 29, 54
Results 56
Results 74
Results button 42, 62
Resume 52
Return Policies 11
Return Shipping Instructions 10
RMA 10, 11
Round-Trip Delay 66
RS-232 53

S

Safety Guidelines 5
Safety Standards 4
Save
Customized Settings Configuration 67
Save 67
Save Graphs 67

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Scan
results ... 56
Scan ... 56
SCPI ... 29
SCPI Version ... 72
Screen
Locking/Unlocking ... 47
Screen ... 47
Screen Capture ... 28, 57, 64
Screen Lock ... 47
Screen Print ... 28, 57
Screen Saver
Start ... 68
Screen Saver ... 68
SDH ... 19, 29, 43, 50
Security ... 38, 85
Security System Lock
enable ... 75
select ... 75
Security System Lock ... 75
Selecting a Port ... 60
Sending
Email Alerts ... 39
Sending ... 39
Serial Configuration ... 31
Serial Port ... 53
Serial Printer ... 53
Serial Printing ... 53
Set Date ... 78
Set Oscillator Value ... 52
Set Time ... 78
SETS ... 41, 87
Settings ... 56, 64, 87
Settings Configuration
Restore ... 66
Settings Configuration ... 66
Shipping ... 10
Signal ... 19
Signal Detection ... 70
SNMP ... 29
SONET ... 29
SONET Service Disruption Activity ... 47
Sounds ... 22
SS Bits ... 70
SS Mismatch LED ... 70
Start Screen Saver ... 68
Status ... 23
STM-16 ... 42, 44, 49
STM-16/622Mb Payload ... 53
STM-4 ... 42, 44, 49, 53
STM-64/16/4
Inserting ... 39
STM-64/16/4 ... 39
Stop ... 74
System 16, 37, 38, 41, 58, 64, 73, 84, 87
System Lock ... 38, 85
System Services ... 71, 75
System Tab ... 16

T

Tab ... 75, 76
TC Summary LED ... 76
TCM ... 77
TCM Configuration ... 32
TCM LEDs ... 76
TC-TIM ... 32
Technical Support ... 4
Test ... 52, 73, 74
Time ... 78
TL1 ... 29
Touch Screen ... 27, 87

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Transmit APS Commands
OC-1/3/12 ..... 34, 80
Transmit APS Commands 34
Transmit APS Commands 80
Transmit button 73
Transmit Clock 87
Transmit Illegal 34, 80
Turning
Unit On 18
Turning 18
TUV File No 4
TX/RX 53
U
Unavailable errored 42
Unit On
Turning 18
Unit On 18
Unit Serial Number 10
Unlock Touch Screen 54
Update
User Profile 85
Update 85
Upload
File 84
Upload 84
User
Delete 38
User 38
User File 66
User ID 38, 84, 85
User List 37, 38, 85
User Login Required 37, 65
User Profile
Update 85
User Profile 85
User Setup 34, 80
V
VAC 5, 87
W
Warranty 11
Wireless Port#Dynamic_IP_Addressing 33
Work Area 73

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STM-16 Online Help

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Table Of Contents

STM-16 Overview 1
STM-16 Specific Tasks 3
Calibrate STM-16 Optical Power 3
Before You Begin 3
Restoring Raw Power Readings 3
Obtaining Zero Optical Power Input 4
Obtaining -20 dBm Power Reading 4
Obtaining -10 dBm Power Reading 4
Entering Optical Power Readings 5
STM-16 Screen and Function Descriptions 7
STM-16 LEDs 7
STM-16 Transmit 11
Transmit Settings 1 11
Transmit Settings 2 12
Transmit SOH 14
Transmit POH 15
Transmit Pointer 17
Transmit APS 18
Transmit Error Alarm 19
STM-16 Receive 24
Receive Settings 1 24
Receive Settings 2 26
Receive SOH 30
Receive POH 30
Receive Signal Status 31
STM-16 Results 32
Results SCAN 32
Results Errors 32
Results Alarms 33
Results PTR 33
Results Event 33
Results APS 34
Results Graphs 34

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Results Large LEDs 34
STM-16 Test 34
Test SET 1 35
Test Service Disruption 35
Test RTD (Round-Trip Delay) 36
Performance Monitoring 37
Performance Monitoring RS 37
Performance Monitoring MS 37
Performance Monitoring HP 38
Performance Monitoring BIT 39
Perf Monitoring LP 40
Index 43

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STM-16 Overview

This section of the online help includes the following:

- STM-16 Specific Tasks
- STM-16 Screen and Function Descriptions

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

22 March 2005

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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 **System** tab, select **Misc**.
4. From **Local Setting**, select **Enable Calibration**.

   The user must have Admin. or Calibrate privileges to enable the calibration mode.

5. From the **STM-16** tab, select **Receive**.
6. Select **SIG** from the tabs along the left-side of the Receive screen and choose **Update Signal Calibration**.
7. Select **Zero power reading**. A touch screen keypad appears.
8. Enter **0** and select **OK**.

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9. 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
4. From **Local Setting**, select **Enable Calibration**.
5. From the **STM-16** tab, select **Receive**.
6. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
7. Record the optical power reading, which is the **Zero power reading** value.

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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
7. From **Local Setting**, select **Enable Calibration**.
8. From the **STM-16** tab, select **Receive**.
9. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
10. Record the optical power reading, which is the **-20 dBm power reading** value.

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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
5. From **Local Setting**, select **Enable Calibration**.
6. From the **STM-16** tab, select **Receive**.

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7. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
8. Record the optical power reading, which is the **-10 dBm power reading** value.

Entering Optical Power Readings

1. If calibration has not been enabled, select the **System** tab and choose **Misc**.
2. From **Local Setting**, select **Enable Calibration**.
3. From the **STM-16** tab, select **Receive**.
4. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
5. Select **Zero power reading**. A touch screen keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
6. Select **-20 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -20 dBm power reading and select **OK**.
7. Select **-10 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -10 dBm power reading and select **OK**.
8. Select **Save** to save the new calibration values. This completes the unit's optical calibration procedure.

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STM-16 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	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	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.

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B3	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	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.

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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.
SS MisMatch	Displays when the expected SS bit setting does not match what is received. SS Bits Alarm Reporting must be enabled for this alarm to generate. This is an alarm LED.

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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.

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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:

- Settings 1
- Settings 2
- SOH
- POH
- Pointer
- APS
- Error Alarm

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.  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.  This function is not available in systems that do not contain circuit packs lower than 2.5G.

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Background AU Pattern	Enter any 32 bit value as the background channel.  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.

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

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	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.  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

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	defined by **Trigger Out**) when an external pulse is received. • **None:** The protocol processor does not respond to an external pulse.
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 SOH

The STM-16 Transmit SOH screen contains the following options:

Function	Description
Showing	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.
RS Overhead	Select the Regenerator Section Overhead to include: A1, A2, Z0, B1, E1, F1, D1, D2, and D3.
MS Overhead	Select the Multiplex Section Overhead to include: H1, H2, H3, B2, K1, K2, D4-12, Z1, Z2, and E2.
Intrusive Overhead	Select an intrusive overhead button.  This option is only enabled if Pass Thru is enabled.
J0	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

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	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.

Transmit POH

The STM-16 Transmit POH screen contains the following options:

Function	**Description**
AU-4-16 Added -1	Select 1 to 4, All, or None.
HP Overhead	Select the Higher-Order Path Overhead to include: B3, J1, C2, G1, F2, H4, Z3, Z4, and Z5.  This option will be disabled if Passthru mode is enabled, or if AU-4 is set to None.
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

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	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.  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.

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Transmit Pointer

The STM-16 Transmit Pointer screen contains the following options.

Option	Description
NDF Flag	The NDF Flag 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.
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.
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.

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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.
INC Pointer/DEC Pointer	Alternates the Pointer insertion from increment to decrement with a 200-msec delay in between.

Transmit APS

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 on the APS screen:

- **New Item** - Opens the Apply Maintenance to Entry window, from which you configure K1 and K2 bytes.
- **Start** - Begins transmission of the K1 and K2 byte configuration.
- **Clear** - Clears the table.

The following Apply Maintenance to Entry window APS Transmit functions are available:

Linear

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

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 Bit 5 (Provisioned) (Ring Mode)

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- K2 Bits 1-4 (Ring Mode)
- K2 Bits 6-8 (Ring Mode)

Duration in Frames

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.

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.

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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.

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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.

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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

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	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.

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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 Receive

The STM-16 Receive screen contains the following functions:

- Settings 1
- Settings 2
- SOH
- POH
- SIG

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.

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*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.  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.  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.  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.

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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.

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

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	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

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	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.

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	• **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

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	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.

Receive SOH

The STM-16 Receive SOH screen contains the following options:

Function	Description
Showing	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.
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.
J0	Displays the J0 trace received on the incoming SDH signal. This is a read-only function.

Receive POH

The STM-16 Receive POH screen contains the following functions:

Function	Description
AU-4-4 Dropped - 1	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:

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	• **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.
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.
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.

Receive Signal Status

This function displays the following measurements of the incoming SDH signal:

- Frequency in MHz.
- Line Frequency offset received in Hz and ppm
- Optical Power
- Update Signal Calibration - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.


The user must have Admin or Calibrate privileges to enable the calibration mode.

3. See Calibrate Optical Power for specific calibration instructions before proceeding.
4. After setting the **Zero power reading**, -**20 dBm power reading**, and **-10 dBm power reading**, select the **Save** button to update the signal calibration.

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STM-16 Results

The STM-16 Results screen contains the following functions:

- Scan
- Err
- Alarm
- PTR
- Event
- APS
- Graph
- Large LEDs

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."

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

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- Average error rate using an N.NNe-N format
- Current error rate using an N.NNe-N format

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)
- Pat Sync (Pattern Synchronization)
- CONCAT (Concatenated)
- 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 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 Bytes (in Hex) and Value (in decimal): Valid Pointers range from 0 to 782.

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.

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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 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 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.

STM-16 Test

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

The Test screen contains the following functions:

- SET 1
- Service Disrptn
- RTD

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Test 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.

Test Service Disruption

The unit can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Protection Switch Criteria:** Protection Switch Criteria: Determines the type of alarm, error, or pattern event that is used as a trigger to generate service disruption 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 service disruption measurement has an accuracy of 0.5 milliseconds. Options include: None, B1, B2, B3, OOF, MS-AIS, AU-AIS, or PRBS.
- **Consecutive Good Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. 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 consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 16383 frames and is entered using a keypad.
- **State**: Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

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- **Single APS**: Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.
- **Continuous APS**: Constantly monitors for service disruption events, and updates the seconds and frames reported.
- **Stop APS:** Stops service disruption monitoring. The State returns to Inactive.

- **Protection Switch Time (MilliSecs)**: Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.
- **Protection Switch Time (Frames)**: Indicates the number of errored frames received during the service disruption event.

For more information about monitoring service disruption activity, select *Measuring Service Disruption Activity* in the Common Tasks section of the online help.

Test 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 (milliSecs):** Indicates the duration in seconds that it took for the known frame to return to the unit.
- **Round-trip Delay Time (Frames):** Indicates the number of frames received during the measurement.
- **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.

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For more information about round-trip delay, select *Round-Trip Delay* 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
- LP

Performance Monitoring RS

This provides a detailed breakdown for Regenerator Section errors detected and logged by the STM-16 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.
- Error Free Seconds (EFS) 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

Performance Monitoring MS

This provides a detailed breakdown for Multiplex Section errors detected and logged by the STM-16 protocol processor.

In addition to monitoring the errors, you can set **allocation** percentages and **durations** by selecting their respective buttons.

For the ITU Standards option, you can select the **G.826/G.829 toggle button** in the lower-right corner of the ITU Standards error window to toggle the statistics between G.826 and G.829 results.

This section is broken down into the following areas:

IMPORTANT: Select the **G.826/G.829** button in the lower-right corner of the ITU Standards window to toggle between G.826 and G.829 statistics. Toggling the Near B2 Errors output also toggles the Far MS REI Errors output.

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G. 826 and G.829 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.
- Error Free Seconds (EFS) 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/G.829: Select the command button to toggle between G.826 and G.829 error statistics.

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.
- Duration: Set to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

Performance Monitoring HP

This provides a detailed breakdown for Higher-Order Path errors detected and logged by the STM-16 protocol processor.

For the ITU Standards option, you can select the **G.826/G.828** toggle button in the lower-right corner of the ITU Standards error window to toggle the statistics between G.826 and G.828 results.

This section is broken down into the following areas:

IMPORTANT: Select the **G.826/G.828** button in the lower-right corner of the ITU Standards window to toggle between G.826 and G.828 statistics. Toggling the Near LP BIP Errors output also toggles the Far LP REI Errors output.

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.
- Error Free Seconds (EFS) by count, rate percentage, and objective percentage.
- Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.

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- 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/G.828: Select the command button to toggle between G.826 and G.828 error statistics.

M.2101.1 Near B3 Errors and 1 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.
- Duration: Set to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure.

Performance Monitoring BIT

This provides a detailed breakdown for BIT errors detected and logged by the STM-16 protocol processor.

In addition to monitoring the errors, you can set allocation percentages and durations by selecting their respective buttons.

This section is broken down into the following areas:

G.821 BIT Errors

- Errored Seconds (ES) by count, rate percentage, and objective percentage.
- Error Free Seconds (EFS) by count and rate 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.
- Error Free Seconds (EFS) by count and rate 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

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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 LP

This provides a detailed breakdown for Lower-Order Path errors detected and logged by the STM-16 protocol processor.

In addition to monitoring the errors, you can set **allocation** percentages and **durations** by selecting their respective buttons.

For the ITU Standards option, you can select the **G.826/G.828 toggle button** in the lower-right corner of the ITU Standards error window to toggle the statistics between G.826 and G.828 results.

This section is broken down into the following areas:

IMPORTANT: Select the **G.826/G.828** button in the lower-right corner of the ITU Standards window to toggle between G.826 and G.828 statistics. Toggling the Near B2 Errors output also toggles the Far MS REI Errors output.

This section is broken down into the following areas:

G.826 and G.828 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.
- Error Free Seconds (EFS) 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/G.828: Select the command button to toggle between G.826 and G.828 error statistics.

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.
- Duration: Set to 2 hours, 1 day, or 7 days.

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- Status: Pass, Uncertain, or failure.

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Index

B

Bit 37

C

Calibration 3

H

Higher-Order Path 37

M

Multiplex Section 37

P

Performance Monitoring 37

R

Regenerator Section 37

S

STM-16 1

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STM-4 Online Help

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Table Of Contents

STM-0/1/4 Overview 1
SDH Technical Specifications 3
STM-0/1/4 Specific Tasks 7
Add a DCC Channel 7
Calibrate STM-0/1/4 Optical Power 7
Before You Begin 7
Calibrate Channel 1 8
Calibrate Channel 2 10
Change STM-0/1/4 Section Overhead 12
Change STM-0/1/4 Path Overhead 13
Monitor STM-0/1/4 Path Overhead 13
Monitor STM-0/1/4 Section Overhead 13
Start/Stop an STM-0/1/4 TU Scan 14
STM-0/1/4 Screen and Function Descriptions 15
STM-0/1/4 LEDs 15
STM-0/1/4 Transmit Screen 20
Transmit Settings 1 21
Transmit Settings 2 (SET 2) 24
Transmit SOH 26
Transmit POH 26
Transmit PTR 28
Transmit Errors and Alarms 30
STM-0/1/4 Receive 31
Receive Settings 1 31
Receive Settings 2 34
Receive Section Overhead 36
Receive Path Overhead 36
Receive Signal Status 37
STM-0/1/4 Results 38
Results Scan 38
Results Errors 38
Results Alarms 39
Results PTR 40

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Results Graphs 40
Results Event Log 40
Results DCC Mon 40
STM-0/1/4 Test 41
Test SET 1 41
Test Service Disruption 41
Test RTD (Round-Trip Delay) 42
Test TU Scan 43
STM-0/1/4 Performance Monitoring 43
Performance Monitoring RS 43
G.826 Near B1 Errors 43
Performance Monitoring MS 44
Performance Monitoring HP 45
Performance Monitoring LP 46
Performance Monitoring BIT 46
Index 49

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STM-0/1/4 Overview

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.

22 March 05

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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

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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

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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:** • Section OH: all bytes • LP OH: V5, J2 (Trace), N2, K4 **Drop & Insert (for terminated element):** E1, E3 • **Pass Thru 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

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	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).

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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 1**.
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 PRBS 2^7 - 1
    - MS PRBS 2^7 - 1 Inv
    - MS DCC Port
    - None

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

Calibrate STM-0/1/4 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.

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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

Calibrate Channel 1

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. Make sure that the dust caps are on the unit's TX and RX optical ports.
4. Turn the unit on.
5. From the **System** tab, select **Misc**.
6. From **Local Setting**, select **Enable Calibration**.


The user must have Admin. or Calibrate privileges to enable the calibration mode.

7. From the **STM-0/1/4** tab, select **Receive**.
8. Select **SIG** from the tabs along the left-side of the Receive screen and choose **Update Signal Calibration**.
9. Select **Channel 1**.
10. Select **Zero power reading**. A touch screen keypad appears.
11. Enter **0** and select **OK**.
12. 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
4. From **Local Setting**, select **Enable Calibration**.

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5. From the **STM-0/1/4** tab, select **Receive**.
6. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
7. Record the optical power reading, which is the **Zero power reading** value.

Obtaining -10 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 -30 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
7. From **Local Setting**, select **Enable Calibration**.
8. From the **STM-0/1/4** tab, select **Receive**.
9. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
10. Record the optical power reading, which is the **-10 dBm power reading** value.

Obtaining -5 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 -5 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
5. From **Local Setting**, select **Enable Calibration**.
6. From the **STM-0/1/4** tab, select **Receive**.
7. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
8. Record the optical power reading, which is the **-5 dBm power reading** value.

Entering Power Readings

1. If calibration has not been enabled, select the **System** tab and choose **Misc**.
2. From **Local Setting**, select **Enable Calibration**.
3. From the **STM-0/1/4** tab, select **Receive**.

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4. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
5. Select **Channel 1**.
6. Select **Zero power reading**. A touch screen keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
7. Select **-10 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -10 dBm power reading and select **OK**.
8. Select **-5 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -5 dBm power reading and select **OK**.
9. Select **Save** to save the new calibration values. This completes the unit's optical calibration procedure.

Calibrate Channel 2

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. Make sure that the dust caps are on the unit's TX and RX optical ports.
4. Turn the unit on.
5. From the **System** tab, select **Misc**.
6. From **Local Setting**, select **Enable Calibration**.


The user must have Admin. or Calibrate privileges to enable the calibration mode.

7. From the **STM-0/1/4** tab, select **Receive**.
8. Select **SIG** from the tabs along the left-side of the Receive screen and choose **Update Signal Calibration**.
9. Select **Channel 2**.
10. Select **Zero power reading**. A touch screen keypad appears.
11. Enter **0** and select **OK**.
12. 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.

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4. From **Local Setting**, select **Enable Calibration**.
5. From the **STM-0/1/4** tab, select **Receive**.
6. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
7. Record the optical power reading, which is the **Zero power reading** value.

Obtaining -30 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 -30 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
7. From **Local Setting**, select **Enable Calibration**.
8. From the **STM-0/1/4** tab, select **Receive**.
9. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
10. Record the optical power reading, which is the **-30 dBm power reading** value.

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 -5 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
5. From **Local Setting**, select **Enable Calibration**.
6. From the **STM-0/1/4** tab, select **Receive**.
7. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
8. Record the optical power reading, which is the **-10 dBm power reading** value.

Entering Power Readings

1. If calibration has not been enabled, select the **System** tab and choose **Misc**.
2. From **Local Setting**, select **Enable Calibration**.
3. From the **STM-0/1/4** tab, select **Receive**.

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4. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
5. Select **Channel 2**.
6. Select **Zero power reading**. A touch screen keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
7. Select **-30 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -10 dBm power reading and select **OK**.
8. Select **-10 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -5 dBm power reading and select **OK**.
9. Select **Save** to save the new calibration values. This completes the unit's optical calibration procedure.

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 **Showing** to select an SOH Slot.

   For example, if you select Slot 3 from the Select Showing Slot Entry list then 'Slot 3 (STM-1 #3.Col #'s 3, 6, 9' appears next to the Showing button.
5. Select an RS or MS OH byte button.

   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.

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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.

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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 **Test**.
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.

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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.

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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.

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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.

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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.  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.  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.  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.

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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.  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.  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.  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.  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.  This LED is only displayed if C-11, C-12, C-2, or AU-4 with C-3 is selected.

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PAT SYNC	Indicates a loss of pattern synchronization. This is an alarm LED.  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.  This LED is enabled only if the container contents selected are Bulk Filled.
SS MisMatch	Displays when the expected SS bit setting does not match what is received. SS Bits Alarm Reporting must be enabled for this alarm to generate. This is an alarm LED.

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

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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**.

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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.

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.
SS Bits in H1 Label	Set to SONET (00) or SDH (10).

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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.

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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. 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. 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 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. 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.

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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 Trib# Inserted	Select 1 to 21 Foreground TUs or All.  Default is **None** if C-4, C-4c or AU-3 and C3 is selected.
Background TU Pattern	Select 0 to 8 bits.  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.

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

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
Showing	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, and D4 through D12, Z1, Z2, or E2.
J0 Trace	Select Default (16 byte), All Ones, All Zeros, or User Defined.

Transmit POH

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

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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.

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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.
J1 Trace	Opens the Select 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.
J2 Trace	Opens the Select 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.

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 alignment of VC-3 within the TU-3 frame, independent of the actual content of the VC-3.

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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.
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.
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

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	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.
Pointer Action	This function allows you to set the AU/TU pointer action to single, increment/decrement, or continuous.
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.

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.

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.

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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:

- Set 1
- Set 2
- SOH
- POH
- SOG

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.

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*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

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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 TUG-3 Dropped	Select 1 through 3 as the foreground Tributary Unit-3 to be dropped.  *None* will display unless AU-4 is set as the AU type.
*Foreground Trib# Dropped	Select 1 through 28 for the number of foreground Tributary Units to be dropped.  *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  If Container Contents is not set to *Bulk*, this option will not be available.

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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.

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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.

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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.

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**
Showing	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)
J0Trace	Displays the Regenerator Section trace.

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

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J1 Trace	The J1 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.
J2 Trace	Displays the Lower-Order Path Trace.

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

By selecting the Update Signal Calibration button you can 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

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.

> The user must have Admin or Calibrate privileges to enable the calibration mode.

3. See Calibrate STM-0/1/4 Power for specific calibration instructions before proceeding.
4. After setting the **Zero power reading**, **-10 / 30 dBm power reading**, and **-5 / 10 dBm power reading**, select the **Save** button to update the signal calibration.

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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

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."

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)
- TU-NDF (Tributary Unit - New Data Flag)

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- 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

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:

- 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-LOM (Tributary Unit Loss of Multiframe alignment)
- TU-AIS (Tributary Unit - Alarm Indication Signal)
- LP-RDI (Lower-Order Path - Remote Defect Indicator)
- LP-RFI (Lower-Order Path - Remote Fault Indicator)
- LP-UNEQ (Lower-Order Path - Unequipped Payload)
- LP-TIM (Lower-Order Path - Trace Identifier Mismatch)
- LP-PLM (Lower-Order Path - Payload Label Mismatch)
- PAT Sync (Pattern Synchronization)
- CONCAT - (Concatenated)

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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 (DEC) format: Valid Pointers range from 0 to 782.

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.

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 **Pause** button to obtain current event log activity.

Results DCC Mon

The DCC Monitor lets you view the following Datacom channel TX/RX configuration data:

- DataCom Channel Drop from SDH TX/RX Setting or DCC Connector
- LEDs
- PAT Sync Seconds
- Bit Error
    - Count
    - Seconds
    - Current Rate
    - Average Rate

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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
- Service Disruption
- RTD
- TU Scan

Test 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.

Test Service Disruption

The unit can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Protection Switch Criteria**: Determines the type of alarm, error, or pattern event that is used as a trigger to generate service disruption 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 service disruption measurement has an accuracy of 0.5 milliseconds. Options include: None, B1, OOF, MS-AIS, AU-AIS, or PRBS.
- **Consecutive Good Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. 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 consecutive error-free frames to occur before Protection Switch

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measurements stop accumulating. The range is 1 to 16383 frames and is entered using a keypad.

- **State**: Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

  - **Single APS**: Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.

  - **Continuous APS**: Constantly monitors for service disruption events, and updates the seconds and frames reported.

  - **Stop APS:** Stops service disruption monitoring. The State returns to Inactive.

- **Protection Switch Time (MilliSecs)**: Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.

- **Protection Switch Time (Frames)**: Indicates the number of errored frames received during the service disruption event.

For more information about monitoring service disruption activity, select *Measure Service Disruption Activity* in the Common Tasks section of the online help.

Test 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 (milliSec):** Indicates the duration in seconds that it took for the known frame to return to the unit.

- **Round Trip Delay Time (Frames):** Indicates the number of frames received during the measurement.

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- **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.

Test 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.

Select **Start Scan** to view the Foreground TUG framing and pattern activity on each of the 28 TU drops. The Foreground TUG was configured from the Receive / Set 1 screen.

Select **Stop Scan** to halt the process.

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 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.
- Error Free Seconds (EFS) by count and rate percentage.

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- 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.

Performance Monitoring MS

This provides a detailed breakdown for Multiplexor section errors detected and logged by the STM-0/1/4 protocol processor.

In addition to monitoring the errors, you can set **allocation** percentages and **durations** by selecting their respective buttons.

For the ITU Standards option, you can select the **G.826/G.829 toggle button** in the lower-right corner of the ITU Standards error window to toggle the statistics between G.826 and G.829 results.

This section is broken down into the following areas:

IMPORTANT: Select the **G.826/G.829** button in the lower-right corner of the ITU Standards window to toggle between G.826 and G.829 statistics. Toggling the Near B2 Errors output also toggles the Far MS REI Errors output.

G.826 and G.829 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.
- Error Free Seconds (EFS) by count and rate 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.
- G.826/G.829: Select the command button to toggle between G.826 and G.829 error statistics.

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.

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- Duration: Set to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, Failure.

Performance Monitoring HP

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

In addition to monitoring the errors, you can set **allocation** percentages and **durations** by selecting their respective buttons.

For the ITU Standards option, you can select the **G.826/G.828** toggle button in the lower-right corner of the ITU Standards error window to toggle the statistics between G.826 and G.828 results.

This section is broken down into the following areas:

G.826 and G.828 Near B3 Errors and Far HP REI Errors

IMPORTANT: Select the **G.826/G.828** button in the lower-right corner of the ITU Standards window to toggle between G.826 and G.828 statistics. Toggling the Near B3 Errors output also toggles the Far HP REI Errors output.

- 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.
- Error Free Seconds (EFS) by count and rate 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/G.828: Select the command button to toggle between G.826 and G.828 error statistics.

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.
- Duration: Set to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure.

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Performance Monitoring LP

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

For the ITU Standards option, you can select the **G.826/G.828** toggle button in the lower-right corner of the ITU Standards error window to toggle the statistics between G.826 and G.828 results.

This section is broken down into the following areas:

IMPORTANT: Select the **G.826/G.828** button in the lower-right corner of the ITU Standards window to toggle between G.826 and G.828 statistics. Toggling the Near LP BIP Errors output also toggles the Far LP REI Errors output.

G.826 and G.828 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.
- Error Free Seconds (EFS) by count and rate 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/G.828: Select the command button to toggle between G.826 and G.828 error statistics.

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.
- Duration: Set to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure.

Performance Monitoring BIT

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

In addition to monitoring the errors, you can set allocation percentages and durations by selecting their respective buttons.

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This section is broken down into the following areas:

G.821 BIT Errors

- Errored Seconds (ES) by count, rate percentage, and objective percentage.
- Error Free Seconds (EFS) by count and rate 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 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.
- Error Free Seconds (EFS) by count and rate 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.
- Duration: Set to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or Failure

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Index

A

Action After Duration 20
Administrative Unit 15
AIS 15
Alarm Generated 20
Alarm Indication Signal 15
APS 15
ATM 15
AU 15
AU-AIS 15, 20
AU-LOP 15, 20
AU-PTR 15
Automated Protection Switching 15

B

B1 ..... 15, 20
B2 ..... 15, 20
B3 ..... 15, 20
Bit Interleaved Parity 15
Bits 15

C

C2 15
Calibration 7
CLK 15
Clock Reference 20
Code Violation 15

D

DataCom Channel Added 20
DCC Channels 7

E

E1 ..... 15, 20
E2 20
E3 15
Error Insert Rate 20

F

Frame
  Loss 15
Frame 15

H

Higher-Order Path 15
HP 15, 20
HP Terminating Equipment 15
HP-OK 15
HP-RDI 15, 20
HP-REI 15, 20
HP-UNEQ 20
HP-UNQ 15

I

Incoming
  STM 15
  STM-4 15
Incoming 15

K

K1 15
K2 15

L

LEDs 15
LEDs Quick Status Area 15
Line Frequency Offset 20
LOF 15, 20
LOS 15, 20
Loss
  Frame 15
  Pointer 15
Loss 15
Lower-Order Path 15
LP 15

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LP OK 15
LP Path 20
LP Terminating Equipment 15
LP-BIP 15, 20
LP-RDI 15, 20
LP-REI 15, 20
LP-RFI 15, 20
LP-UNQ 15

M

MS OK 15
MS Terminating Equipment 15
MS-AIS 15, 20
MS-RDI 15
MS-REI 15, 20
Multiplex Section 15, 20
Multiplex Section Bit Interleaved Parity Code 15
Multiplex Section Overhead OK 15

N

NDFs 15

O

OOF 15
Orderwire 20

P

Path 20
Path BIP-8 15
Path Bit Interleaved Parity Code 15
PATLOSS 15
Pointer Loss 15
Pointer 15
Pointer Adjustments 15
PRBS 2^7-1 20

R

Regenerater Section 20
Regenerator Section Overhead OK 15
Remote Defect Indicator 15
Remote Error Indication 15
Remote Failure Indicator 15
RS 20
RS DCC Port 20
RS OK 15
RS PRBS 2^7-1 20
RS Section 20
RS-RDI 20
RX Power 15

S

SDH 15
Section Bit Interleaved Parity 15
SEF 15
SETS 15, 20
Settings Control 20
STM-0 20
STM-0e 20
STM-1e 20
STM-4 ..... 15, 20
STM-4 LEDs 15
STM-4 Performance Monitoring 43
STM-4 Receive 31
STM-4 Results 38
STM-4 Transmit 20
STM-4 Transmit Settings 20
Synchronous Equipment Timing Source 20

T

Transmit 15, 20
Transmit Patterns 7
Tributary Unit 15
TU 15
TU-AIS 15, 20

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TU-LOP 15, 20
TU-PTR 15
TU-UNEQ 20

U

Unequipped 15

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OC-48 Online Help

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Table Of Contents

OC-48 Overview 1
OC-48 Specific Tasks 3
Calibrate Optical Power 3
Before You Begin 3
Restoring Raw Power Readings 3
Obtaining Zero Optical Power Input 4
Obtaining -20 dBm Power Reading 4
Obtaining -10 dBm Power Reading 4
Entering Optical Power Readings 5
Screen and Function Descriptions 7
OC-48 LEDs 7
OC-48 Transmit 11
Transmit Settings 1 11
Transmit Settings 2 13
Transmit SOH 14
Transmit POH 15
Transmit Pointer Generation 15
Transmit APS 16
Transmit Error Alarm 17
OC-48 Receive 18
Receive Settings 1 18
Receive Settings 2 19
Receive SOH 23
Receive POH 24
Receive Signal Status 24
OC-48 Results 25
Results Scan 25
Results Errors 25
Results Alarms 26
Results PTR 27
Results Event 27
Results APS 27
Results Large LEDs 27

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Results Graphs 28
OC-48 Test 28
Test SET 1 28
Test Service Disruption 28
Test RTD (Round-Trip Delay) 29
OC-48 Performance Monitoring 30
Performance Monitor Section Analysis 30
Performance Monitor Line Analysis 31
Performance Monitor Path Analysis 32
Bit Analysis 33
Virtual Tributary Path Analysis 34
Index 35

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OC-48 Overview

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

- OC-48 Specific Tasks
- OC-48 Screen and Function Descriptions

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

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OC-48 Specific Tasks

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 **System** tab, select **Misc**.
4. From **Local Setting**, select **Enable Calibration**.

The user must have Admin. or Calibrate privileges to enable the calibration mode.

5. From the **OC-48** tab, select **Receive**.
6. Select **SIG** from the tabs along the left-side of the Receive screen and choose **Update Signal Calibration**.

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7. Select **Zero power reading**. A touch screen keypad appears. Enter **0** and select **OK**.
8. 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
4. From **Local Setting**, select **Enable Calibration**.
5. From the **OC-48** tab, select **Receive**.
6. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
7. Record the optical power reading, which is the **Zero power reading** value.

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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
7. From **Local Setting**, select **Enable Calibration**.
8. From the **OC-48** tab, select **Receive**.
9. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
10. Record the optical power reading, which is the **-20 dBm power reading** value.

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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
5. From **Local Setting**, select **Enable Calibration**.

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6. From the **OC-48** tab, select **Receive**.
7. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
8. Record the optical power reading, which is the **-10 dBm power reading** value.

Entering Optical Power Readings

1. If calibration has not been enabled, select the **System** tab and choose **Misc**.
2. From **Local Setting**, select **Enable Calibration**.
3. From the **OC-48** tab, select **Receive**.
4. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
5. Select **Zero power reading**. A touch screen keypad appears. Enter the value recorded earlier for the Zero Power Reading and select **OK**.
6. Select **-20 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -20 dBm Power Reading and select **OK**.
7. Select **-10 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -10 dBm Power Reading and select **OK**.
8. Select **Save** to save the new calibration values. This completes the optical calibration procedure.

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Screen and Function Descriptions

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 LEDs

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

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	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	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.

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B3	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 indicator.
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.

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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.
RDL-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-48, the optimum input range is from -5 dBm to -24 dBm. A value of -30 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.

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SEF	Severely Errored Frame. Declared when four or more consecutive errored frames are detected on the incoming SONET signal. This is an alarm LED.
SS MisMatch	Displays when the expected SS bit setting does not match what is received. SS Bits Alarm Reporting must be enabled for this alarm to generate. 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 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.

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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.
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-48 Transmit

The Transmit screen contains the following functions:

- Settings 1
- Settings 2
- SOH
- POH
- Pointer
- APS
- Error Alarm

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.

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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.  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.  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.  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.

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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) • Async Mapping for DS3 (04) • Async 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.  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.

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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.

Transmit SOH

The OC-48 SOH screen contains the following functions:

Function	**Description**
Showing	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.
Section Overhead	Select and edit the following Overhead bytes: A1, A2, Z0, B1, E1, F1, D1, D2, and D3.

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Line Overhead	Select and edit the following Overhead bytes: H1, H2, H3, B2, K1, K2, D4-D12, Z1, Z2, and E2.
J0	Selects a default or customized pattern to be used as the J0 trace.

Transmit POH

The OC-48 Transmit POH screen contains the following functions:

Function	Description
STS-48 Added - 1	Select 1 to 4, All, or None as the foreground channel.
Path Overhead	Select and edit the following Overhead bytes: B3, J1, C2, G1, F2, H4, Z3, Z4, and Z5.
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.

Transmit Pointer Generation

The OC-48 Transmit Pointer screen contains the following functions.

Functions	Description
NDF Flag	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.
Freq Offset	Adjusts the rate at which Pointer adjustments are needed in the Synchronous Payload Envelope (the payload).
Pointer Action	Determines the type of Pointer activity that occurs when the **Inc Pointer** and **Dec Pointer** buttons are selected.

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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.
INC Pointer/DEC Pointer	Alternates the Pointer insertion from increment to decrement with a 200-msec delay in between.

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

Transmit APS

The STM-64 Transmit APS function is used to configure APS transmit activity.

The following functions are available on the APS screen:

- **New Item** - Opens the Apply Maintenance to Entry window, from which you configure K1 and K2 bytes.
- **Start** - Begins transmission of the K1 and K2 byte configuration.
- **Clear** - Clears the table

The following Apply Maintenance to Entry window 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)

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- 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.

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.

The following functions are available:

Function	Description
Error to Insert	Inserts an error that is transmitted by the OC-48 protocol processor. The options available include: None, B1, B2, REI-L, B3, REI-P, and Bit.
Error Insert Rate	Sets the insertion rate of the OC-48 Transmit error from 1e-3 through 1e-10. A user-defined rate and Max (the maximum rate) is also available.
Alarm Generated	Generates a specific alarm on the transmit side of the OC-48 protocol process. The following options are available: None, LOS, LOF, AIS-L, RDI-L, RDI-P, UNEQ-P, LOP-P, and AIS-P.

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OC-48 Receive

The Receive screen contains the following functions:

- Settings 1
- Settings 2
- SOH
- POH
- Signal Status

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.  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.  This function is not available in systems that do not contain circuit packs lower than 2.5G.

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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.

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 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

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	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.

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	• **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).

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	• **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.

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	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.

Receive SOH

The Receive SOH screen contains the following functions:

Function	Description
Showing	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.
Section Overhead	Displays the Section Overhead bytes for the selected STS-1 on the incoming OC-48 signal. This is a read-only function.
Line Overhead	Displays the Line Overhead bytes for the selected STS-1 on the incoming OC-48 signal. This is a read-only function.
J0	Displays the J0 trace received on the incoming OC-48 signal. This is a read-only function.

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Receive POH

The Receive POH screen contains the following functions:

Function	Description
STS-12 Dropped	Selects a specific STS-12 signal to monitor in the STS-48 signal.
Path Overhead	Displays the Path Overhead for the selected STS-1 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.

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 - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.


The user must have Admin or Calibrate privileges to enable the calibration mode.

3. See Calibrate Optical Power for specific calibration instructions before proceeding.
4. After setting the **Zero power reading**, -**20 dBm power reading**, and **-10 dBm power reading**, select the **Save** button to update the signal calibration.

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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
- Err
- Alarm
- PTR
- Event
- APS
- Large LEDs
- Graphs

Results 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.

Results 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)

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- 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

Results 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
- CONCAT (Concatenated)
- TC-RDI (Tandem Connection-Remote Defect Indicator)
- TC-ODI (Tandem Connection-Outgoing Defect Indicator)
- TC-AIS (Tandem Connection-Alarm Indication Signal)

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- TC-UNEQ (Tandem Connection-Unequipped Signal)
- TC-TIM (Tandem Connection-Trace Identifier Mismatch)
- TC-LOF (Tandem Connection-Loss of Frame)

Results 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 Bytes (in Hex) and Value (in decimal). Valid Pointers range from 0 to 782.

Results Event

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.

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 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.

Results Large LEDs

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.

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Results 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 *Using Graphs* in the Common Tasks section of the online help.

OC-48 Test

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

The Test screen contains the following functions:

- SET 1
- Service Disrptn
- RTD

Test 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.

Test Service Disruption

The unit can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Protection Switch Criteria**: Determines the type of alarm, error, or pattern event that is used as a trigger to generate service disruption 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 service disruption measurement has an accuracy of 0.5 milliseconds. Options include: None, B1, B2, B3, SEF, AIS-L, AIS-P, or PRBS.
- **Consecutive Good Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before

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Protection Switch measurements stop accumulating. 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 consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 16383 frames and is entered using a keypad.
- **State**: Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

  - **Single APS**: Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.
  - **Continuous APS**: Constantly monitors for service disruption events, and updates the seconds and frames reported.
  - **Stop APS:** Stops service disruption monitoring. The State returns to Inactive.

- **Protection Switch Time (MilliSecs)**: Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.
- **Protection Switch Time (Frames)**: Indicates the number of errored frames received during the service disruption event.

For more information about monitoring service disruption activity, select *Measuring Service Disruption Activity* in the Common Tasks section of the online help.

Test 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 (milliSec):** Indicates the duration in seconds that it took for the known frame to return to the unit.

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- **Round-trip Delay Time (Frames):** Indicates the number of frames received during the measurement.
- **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.

OC-48 Performance Monitoring

Performance Monitoring provides greater detail about incoming Section, Line, and Path errors.

- Section Analysis
- Line Analysis
- Path Analysis
- Bit Analysis
- Virtual Tributary Path Analysis

Performance Monitor 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:

Statistic	Description
Near End Coding Violations (CV)	This is an error count of incoming B1 errors.
Near End Errored Seconds (ES)	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.
Error-Free Seconds (EFS)	This reports the duration of the incoming B1 error free seconds. This statistic also reports the percentage of error-free seconds compared to the duration of errored seconds.

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Near End Severely Errored Seconds (SES)	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.

Performance Monitor 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.
Error-free Seconds (EFS)	This reports the duration of the incoming B1 error free seconds. This statistic also reports the percentage of error-free seconds compared to the duration of errored 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.

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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.

Performance Monitor 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:

Statistic	**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.
Error-free Seconds (EFS-P)	This reports the duration of the incoming B1 error free seconds. This statistic also reports the percentage of error-free seconds compared to the duration of errored seconds.

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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 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.

Bit Analysis

Bit analysis provides a detailed breakdown for detected Payload Bit errors.

The following statistics are reported:

Statistic	**Description**
CV	Code violations by count.
ES	Errored seconds by count, rate percentage, and objective percentage.

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EFS	Error-free seconds by count, rate percentage, and objective percentage.
SES	Severely Errored Seconds by count, rate percentage, and objective percentage.
UAS	Unavailable seconds by count, rate percentage, and objective percentage.

Virtual Tributary Path Analysis

This function displays a detailed breakdown of incoming Virtual Tributary path BIP (Section BIP-8, also known as Coding Violations) errors and Virtual Tributary path Remote Error Indicator (REI-P) errors.

Statistic	**Description**
CV	Code violations by count.
ES	Errored seconds by count, rate percentage, and objective percentage.
EFS	Error-free seconds by count, rate percentage, and objective percentage.
SES	Severely Errored Seconds by count, rate percentage, and objective percentage.
UAS	Unavailable seconds by count, rate percentage, and objective percentage.

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Index

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Calibration 3

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OC-48 Overview 1

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OC-1/3/12 Online Help

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Table Of Contents

OC-1/3/12 Overview 1
OC-1/3/12 Specific Tasks 3
Calibrate OC-1/3/12 Optical Power 3
Before You Begin 3
Calibrate Channel 1 3
Obtaining -10 dBm Power Reading 4
Calibrate Channel 2 5
Monitor Incoming Overhead Bytes 7
OC-1/3/12 Screen and Function Definitions 9
OC-1/3/12 LEDs 9
OC-1/3/12 Transmit Screen 13
Transmit Settings 1 (SET 1) 14
Transmit Settings 2 (SET 2) 16
Transmit SOH 18
Transmit POH 19
Transmit PTR 20
Transmit APS 21
Transmit Errors and Alarms 23
OC-1/3/12 Receive 23
Receive Settings 1 (SET 1) 24
Receive Settings 2 (SET 2) 26
Receive SOH 28
Receive POH 28
Receive Signal Status 29
OC-1/3/12 Results 29
Results Scan 30
Results Errors 30
Results Alarms 30
Results PTR 31
Results Event 31
Results Large LEDs 31
Results Graphs 32
Results DCC Mon 32

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Table Of Contents

OC-1/3/12 Test....33
Test SET 1....33
Test Service Disruption....33
Test RTD (Round-Trip Delay)....34
OC-1/3/12 Performance Monitoring....35
Performance Monitoring Section....35
Performance Monitoring Line....36
Performance Monitoring Path....37
Performance Monitoring VT Path....39
Performance Monitoring VT Path....39
Performance Monitoring BIT....40
Index....41

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OC-1/3/12 Overview

The OC-1/3/12 function is broken down into the following sections:

- OC-1/3/12 Specific Tasks
- OC-1/3/12 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.

22 March 2005

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OC-1/3/12 Specific Tasks

This section includes tasks that are specific to the OC-1/3/12 protocol processor. For a list of general tasks, see Common Tasks located in the Getting Started section.

Calibrate 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

Calibrate Channel 1

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. Make sure that the dust caps are on the unit's TX and RX optical ports.
4. Turn the unit on.
5. From the **System** tab, select **Misc**.
6. From **Local Setting**, select **Enable Calibration**.

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> The user must have Admin. or Calibrate privileges to enable the calibration mode.

7. From the **OC-1/3/12** tab, select **Receive**.
8. Select **SIG** from the tabs along the left side of the Receive screen and choose **Update Signal Calibration**.
9. Select **Channel 1**.
10. Select **Zero power reading**. A touch screen keypad appears.
11. Enter **0** and select **OK**.
12. 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
4. From **Local Setting**, select **Enable Calibration**.
5. From the **OC-1/3/12** tab, select **Receive**.
6. Select **SIG** from the tabs along the left side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
7. Record the optical power reading, which is the **Zero power reading** value.

Obtaining -10 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 -30 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
7. From **Local Setting**, select **Enable Calibration**.
8. From the **OC-1/3/12** tab, select **Receive**.
9. Select **SIG** from the tabs along the left side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
10. Record the optical power reading, which is the **-10 dBm power reading** value.

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Obtaining -5 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 -5 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
5. From **Local Setting**, select **Enable Calibration**.
6. From the **OC-1/3/12** tab, select **Receive**.
7. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
8. Record the optical power reading, which is the **-5 dBm power reading** value.

Entering Power Readings

1. If calibration has not been enabled, select the **System** tab and choose **Misc**.
2. From **Local Setting**, select **Enable Calibration**.
3. From the **OC-1/3/12** tab, select **Receive**.
4. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
5. Select **Channel 1**.
6. Select **Zero power reading**. A touch screen keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
7. Select **-10 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -10 dBm power reading and select **OK**.
8. Select **-5 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -5 dBm power reading and select **OK**.
9. Select **Save** to save the new calibration values. This completes the unit's optical calibration procedure.

Calibrate Channel 2

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. Make sure that the dust caps are on the unit's TX and RX optical ports.
4. Turn the unit on.
5. From the **System** tab, select **Misc**.

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6. From **Local Setting**, select **Enable Calibration**.

> The user must have Admin. or Calibrate privileges to enable the calibration mode.

7. From the **OC-1/3/12** tab, select **Receive**.
8. Select **SIG** from the tabs along the left-side of the Receive screen and choose **Update Signal Calibration**.
9. Select **Channel 2**.
10. Select **Zero power reading**. A touch screen keypad appears.
11. Enter **0** and select **OK**.
12. 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
4. From **Local Setting**, select **Enable Calibration**.
5. From the **OC-1/3/12** tab, select **Receive**.
6. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
7. Record the optical power reading, which is the **Zero power reading** value.

Obtaining -30 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 -30 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
7. From **Local Setting**, select **Enable Calibration**.
8. From the **OC-1/3/12** tab, select **Receive**.
9. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
10. Record the optical power reading, which is the **-30 dBm power reading** value.

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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 -5 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. If calibration has not been enabled, select the **System** tab and choose **Misc**.
5. From **Local Setting**, select **Enable Calibration**.
6. From the **OC-1/3/12** tab, select **Receive**.
7. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
8. Record the optical power reading, which is the **-10 dBm power reading** value.

Entering Power Readings

1. If calibration has not been enabled, select the **System** tab and choose **Misc**.
2. From **Local Setting**, select **Enable Calibration**.
3. From the **OC-1/3/12** tab, select **Receive**.
4. Select **SIG** from the tabs along the left-side of the Receive screen. If necessary, choose **Update Signal Calibration** to reveal the calibration settings.
5. Select **Channel 2**.
6. Select **Zero power reading**. A touch screen keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
7. Select **-30 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -10 dBm power reading and select **OK**.
8. Select **-10 dBm power reading**. A touch screen keypad appears. Enter the value recorded earlier for the -5 dBm power reading and select **OK**.
9. Select **Save** to save the new calibration values. This completes the unit's optical calibration procedure.

Monitor Incoming Overhead Bytes

The system can monitor and display the Transport Overhead bytes (Section OH and Line OH), the Path OH bytes, and the J0 and J1 Trace bytes.

The Transport Overhead consists of the Section Overhead bytes and the Line Overhead bytes. You can monitor the incoming signal and view individual bytes for any of the slots in the signal.

To view incoming overhead bytes:

1. Select **OC-1/3/12**.
2. Select **Receive**.
3. Select **SOH**. The Overhead bytes appear.

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4. Select the **Showing** button to choose an SOH slot.

   For example, if you select Slot 2 from the Select Showing Slot Entry list then 'Slot 3 (STS 2)' appears next to the Showing button.

5. The Receive / SOH screen shows the Section OH, Line OH and J0 Trace for the selected slot, while the Receive / POH screen shows the STS Path OH and J1 trace for the selected STS.

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OC-1/3/12 Screen and Function Definitions

The following function screens are available through the OC-1/3/12 protocol processor tab.

- OC-1/3/12 LEDs
- OC-1/3/12 Transmit
- OC-1/3/12 Receive
- OC-1/3/12 Results
- OC-1/3/12 Test
- OC-1/3/12 Performance Monitoring

OC-1/3/12 LEDs

When the OC-1/3/12 protocol processor is selected, the following LEDs are displayed in the LEDs Quick Status Area of the touch screen.

 The errors and alarms that appear depend on what mapping is selected.

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. If both an error and alarm is being generated concurrently, a slash (/) will separate the error and alarm. If neither is generated, "None" will display.
Test Paused	Indicates if a timed test has been paused using the Action/Duration button.
SECT	Section Overhead status LED.
LOS	Loss of Signal. An alarm LED indicating a valid 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.

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LOF	Loss of Frame. An alarm LED indicating that a frame alignment problem with the incoming signal has been detected. An LOF is reported if a severely errored framing (SEF) defect continues for three milliseconds or longer.
SEF	Severely Errored Framing. A SONET defect alarm that is the first indication of trouble in detecting valid signal framing patterns. Four consecutive errored framing patterns constitute an SEF defect.
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.
Line	Line status LED.
AIS -L	Alarm Indication Signal - Line. An alarm LED Indicating an all-ones characteristic or adapted information signal was detected on the line. 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.
RDI - L	Remote Defect Indicator - Line. An alarm LED indicating a signal returned to the transmitting Line Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect.
REI - L	Remote Error Indication - Line. An error LED indication returned to a transmitting node that an errored block has been detected at the Line receiving node.
APS - L	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 OC-12.

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Path	Path status LED.
AIS-P	Alarm Indication Signal - Path. An alarm LED indicating an all-ones characteristic or adapted information signal was detected on the path. 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.
LOP - P	Loss of Pointer - Path. An alarm LED indicating a consecutive number of invalid pointers of NDFs were received on the Path.
PTR-P	Pointer - Path. Pointer Adjustment. An event LED indicating there was pointer movement occurring on the STS.
UNEQ-P	Path - Unequipped. An alarm LED indicating an all-zeros patterns was detected in the C2 byte. This byte is received from the Path terminating equipment.
RDI-P	Remote Defect Indicator - Path. An alarm LED indicating a signal was returned to the transmitting Path Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect.
REI-P	Remote Error Indication - Path. An error LED indicating to the transmitting node that an errored block has been detected at the Path 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.
VT	Virtual Tributary status LED.

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AIS-V	Alarm Indication Signal - Virtual Tributary. An alarm LED indicating an all-ones characteristic or adapted information signal was detected on the VT. 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 alarm appears only if Mapping is set to VT1.5 or VT2.
LOP-V	Loss of Pointer - Virtual Tributary. An alarm LED indicating a consecutive number of invalid pointers or NDFs were received on the VT.
PTR V	Virtual Tributary Pointer Adjustment. An event/status LED indicating pointer movement is occurring on the VT. This LED flashes red during a Pointer Adjustment event.
LOM-V	Loss of Multiframe Alignment - Virtual Tributary.
BIP-V	Bit Interleaved Parity 2. An error LED indicating an error 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.
RDI-V	Remote Defect Indicator - Virtual Tributary. An alarm LED indicating a signal was returned to the transmitting VT Terminating Equipment upon detecting a Loss of Signal, Loss of Frame, or AIS defect.
RFI-V	Remote Failure Indicator - Virtual Tributary. An alarm LED indicating a defect on the VT at 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.

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REI-V	Remote Error Indication - Virtual Tributary. And error LED indicating to the transmitting node that an errored block has been detected at the VT receiving node.
UNEQ-V	Unequipped - Virtual Tributary. An alarm LED indicating that an all-zeros patterns has been detected in the C2 byte. This byte is being received from VT terminating equipment.
PAT Sync	An alarm LED indicating a loss of pattern synchronization.  This LED is enabled only if the Payload contents selected are Bulk Filled and Bulk Filled Pattern is not set to "Live."
Bit ERR	An error LED indicating a bit error was detected in the payload.  This LED is enabled only if the Payload contents selected are Bulk Filled and Bulk Filled Pattern is not Live.
SS Mismatch	Displays when the expected SS bit setting does not match what is received. SS Bits Alarm Reporting must be enabled for this alarm to generate. This is an alarm LED.

OC-1/3/12 Transmit Screen

This screen allows you to configure the transmit signal parameters for the OC-1/3/12 line interface and the OC-1/3/12 protocol processor to match the OC-1/3/12 signal used in your test environment.

The OC-1/3/12 Transmit screen contains the following functions:

- Settings 1
- Settings 2
- SOH
- POH
- PTR
- APS
- Errors and Alarms

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Transmit Settings 1 (SET 1)

The OC-1/3/12 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. Select **Off**, **Intrusive**, or **Intrusive Add/Drop**.
Interface	Selects the optical or electrical interface. The following options are available: **OC-1**, **STS-1**, **OC-3**, and **OC-12**.

Clock Reference	Determines the timing source for the OC-1/3/12 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

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	selected, but SETS clocking is not available, then this function defaults to Internal.
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.
SS Bits in H1 Label	Allows you to select the SS Bit.
DataCom Channel Added	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 • Section PRBS 2^7-1 • Section 2^7-1 (Inverted) • Section DCC Port • Line DCC Port • Line PRBS 2^7-1 • Line PRBS 2^7-1 (Inverted)
Orderwire Add	Allows you to add or drop an orderwire circuit. The following options are available: • None • E1 • E2
Laser Type	Select the laser type: 1310 nm or 1550 nm for the OC-1/3/12 protocol processors.
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.

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Transmit Settings 2 (SET 2)

This function selects the type of SONET Transmit mapping and patterns used by the OC-1/3/12 protocol processor.

The following options are available:

Option	Description
Mapping	Select one of the following mappings: • DS1/E1 • DS3/E3 • E4 • VT1.5 Bulk Fill • VT2 Bulk Fill • VT6 Bulk Fill • Full SPE Bulk Fill • STS-3c Bulk Fill • STS-12c Bulk Fill • VT1.5 ATM • VT2 ATM • VT6 ATM • Full SPE ATM • STS-3c ATM • STS-12c ATM  E1 and DS1 mappings may be disabled depending on selections made in the Options, Protocol, and System settings. Additionally, ATM options will only appear if ATM hardware is installed on your system.
AU Type	This option is not available for the OC-1/3/12 protocol processor.
SPE Under Test	Select 1 to N, where N is equal to: • OC-1/STSX-1 = 1 • OC-3 and mapping is not STS-3c = 3 • OC-3 and mapping is STS-3c = 1 • OC-12 and mapping is STS-12c = 1 • OC-12 and mapping is STS-3c = 4 • OC-12 and mapping is not STS-12c or STS-3c = 12
Pattern in Other SPEs	Select any eight bits.
Path Signal Label	Set the C2 byte to:

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	• 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.  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.
Foreground TUG - 3 Inserted	Select 1 to 3 TUGs. Default is None.
VT Under Test	Select the VT tributary.
Pattern in Other VTs	Set the pattern for other VTs in the configuration.
VT Signal Label Inserted	Set to Unequipped (00), Equipped (01), or User Defined (any eight bit pattern 00 to FF). **Note:** This function is disabled if mapping is not set to VT1.5 or VT2.

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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 SOH

This function displays the Section, Line, and Intrusive overhead bytes for a selected OC-1/3/12. 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
Showing	Select an Section Overhead slot. If you are mapped to: • **OC-3:** Select 1 through 3. • **OC-12:** Select 1 through 12.
Section Overhead	Select a Section overhead byte. These bytes consist of the first nine bytes of the SOH. Options are: A1, A2, Z0, B1, E1, F1, D1, D2, and D3.
Line Overhead	Select Line overhead bytes. These include: H1, H2, H3, K1, K2, D4 through D12, Z1, Z2, or E2.
Intrusive Overhead	Select an Intrusive Overhead byte to transmit. This is a toggle button that switches between intrude and pass. Options include: A1, A2, J0/Z0, B1, E1, F1, D1-3, H1-3, D4-12, B2, K1, K2, S1/Z1, MI, and E2.
J0 Trace	The J0 byte is part of the Section OH and is known as the Section trace or J0 trace. The J0 trace is a 64-byte pattern that can be created for repeated transmission. The pattern is a string of ASCII characters. The J0 trace can be configured to send the system's default pattern or a customized pattern. The following options are available: • **Default:** Selects the Digital Lightwave ASCII message as the J0 trace pattern. The message consists of 62 characters appended with a CR and LF.

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	• **User Defined:** 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.

Transmit POH

The OC-1/3/12 Transmit Path Overhead consists of eight bytes that are responsible for monitoring performance and transporting the OC-1/3/12 SPE payload.

The system allows direct access and editing of the Path, VT Overhead bytes, and J1 and J2 Trace 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 OC-1/3/12 STS Overhead bytes can be edited.

Option	Description
B3	STS Path BIP-8
C2	STS Path Signal Label
G1	Path Status
F2	Path User Channel
H4	Indicator
Z3	Path Growth
Z4	Path Growth
Z5	Tandem Connection.
V5	Virtual Tributary Path Overhead 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 signaling for protection at the VT path level. Bits 5-7 are reserved for optional use. Bit 8 is reserved for future use and has no defined value.

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J1 Trace	STS Path Trace. This user-programmable byte repetitively transmits a 15-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.
J2 Trace	VT Path Trace.

Transmit PTR

The beginning of a SONET payload is identified by a Pointer, located in the H1 and H2 Pointer bytes. A SONET 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 SONET Pointer and payload.

What is a Pointer?

The beginning of a SONET payload is identified by a Pointer. A Pointer is a reference marker indicating the beginning of the Virtual Tributary.

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 options are available on the PTR screen for STS and VT pointers.

Option	**Description**
NDF Flag	**Yes (On):** Generates an NDF when a new Pointer is transmitted. **No (Off):** Disables NDF functionality.
Pointer Value	The Pointer Value function provides another method for stressing a SONET network to verify if the receiving SONET equipment can detect Pointer Value changes. The Pointer Value indicates the offset between the H1/H2 bytes and the first byte of the VT. 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

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	ranging from 0 to 782. After entering the new value, the Pointer automatically moves to the new position.
Freq Offset	Frequency Offset function adjusts the rate at which Pointer adjustments are needed in the VT. By slowing the rate, the SONET network is forced to increment the H1 and H2 Pointer bytes. This is known as positive frequency justification. By increasing the rate, the SONET 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 SONET equipment to compensate by decrementing or incrementing the H1 and H2 Pointer bytes. The Frequency Offset function uses a keypad to enter a frequency offset ranging from -100.0 ppm to +100.0 ppm.
Pointer Action	Select a pointer action to include STS or VT single, increment/decrement, or continuous.
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.

Under The **INC** Pointer button starts a positive Pointer adjustment movement.

The **DEC** 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.

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

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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

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K2 Bit 5 (provisioned)	1:n	LNG/OTN
K2 Bits 6-8	AIS-L	AIS-L

Transmit Errors and Alarms

This function allows you to enter errors and alarms. The following options are available on the OC-1/3/12 Errors and Alarms screen.

Option	Description
Error Inserted	Inserts an error that is transmitted by the OC-1/3/12 protocol processor. The available options include: None, B1, B2, REI-L, B3, REI-P, BIP-V, REI-V, HP-REI, and Bit.
Error Insert Rate	Sets the insertion rate of the OC-1/3/12 Transmit error from 1e-3 through 1e-9. A user-defined rate and Max (the maximum rate) is also available.
Alarm Generated	Generates a specific alarm on the transmit side of the OC-1/3/12 protocol process. The following options are available: None, LOS, LOF, AIS-L, RDI-L, RDI-P, UNEQ-P, LOP-P, AIS-P, UNEQ-V, RDI-V, RFI-V, and LOM-V.

OC-1/3/12 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 unit.

The OC-1/3/12 Receive screen contains the following functions:

- Receive Settings 1
- Receive Settings 2
- SOH
- POH
- SIG

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Receive Settings 1 (SET 1)

This function configures the unit's Receive parameters for the OC-1/3/12 test environment.

The OC-1/3/12 Receive 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.
Interface	Selects the optical or electrical interface. The following options are available: OC-1, STS-1, OC-3, and OC-12.
Mapping	Maps the OC-1/3/12 interface to one of the following: • DS1/E1#1 • DS1/E1 #2 • DS3/E3 • VT1.5 Bulk Fill • VT 1.5 ATM • VT2 Bulk Fill • VT2 ATM • VT6 Bulk Fill • STS-1 Bulk Fill • STS-1 ATM • STS-3c Bulk Fill • STS-3c ATM • STS-12c Bulk Fill • STS-12c ATM  Some options may not appear depending on your current configuration and hardware.
SPE Under Test	Select 1 to N, where N is equal to: • OC-1/STSX-1 = 1 • OC-3 and mapping is not STS-3c = 3 • OC-3 and mapping is STS-3c = 1 • OC-12 and mapping is STS-12c = 1 • OC-12 and mapping is STS-3c = 4 • OC-12 and mapping is not STS-12c

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	or STS-3c = 12
Orderwire Drop	Allows you to drop an orderwire circuit. The following options are available: • None • E1 • E2
DataCom Channel Dropped	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 • Section PRBS 2^7-1 • Section 2^7-1 (Inv) • Section DCC Port • Line PRBS 2^7-1 • Line PRBS 2^7-1 (Inv) • Line DCC Port
Foreground TUG-3 Dropped	Selects a TUG-3 to be dropped.
VT Under Test	Selects a Virtual Tributary to be dropped. Select 1 to N, where N is equal to: • VT2=21 • VT1.5=28  This function is disabled if VT1.5 or VT2 is not selected.
Foreground Pattern Expected	Selects the expected Foreground Pattern. The following options are available: Live, User Defined, 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, Live, and User Defined.

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Receive Settings 2 (SET 2)

This function configures the OC-1/3/12 Receive mapping, which maps a pattern into the OC-1/3/12 interface.

The following options appear on the OC-1/3/12 Receive Settings 2 screen.

Option	Description
PLM Alarm Reporting	Enables or disables reporting of Payload Label Mismatch alarms.
Expected Path Signal Label	Enter any eight bits for Path Signal Label expected.
Expected VT Signal Label	Select any eight bits for Virtual Tributary Signal Label Expected.
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 J0 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	Defines the expected J0 trace received on the incoming SONET signal. A TIM-S alarm occurs if the incoming J0 trace does not match the expected J0 trace. The following options are available: • **Default:** Selects the Digital Lightwave ASCII message as the expected J0 trace pattern. The message consists of 62 characters

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	appended with a CR and LF. • **All Ones:** Selects an All Ones pattern as the expected J0 trace pattern. • **User String:** 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).
Expected J1 Trace	Defines the expected J1 trace received on the incoming SONET signal. A TIM-P alarm occurs if the incoming J1 trace does not match the expected J1 trace. The following options are available: • **Default:** Selects the Digital Lightwave ASCII message as the expected J1 trace pattern. The message consists of 62 characters appended with a CR and LF. • **All Ones:** Selects an All Ones pattern as the expected J1 trace pattern. • **User String:** 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).
Expected J2 Trace	Defines the expected J2 trace received on the incoming SONET signal. The following options are available: • **Default:** Selects the Digital Lightwave ASCII message as the expected J2 trace pattern. The message consists of 62 characters appended with a CR and LF.

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	• **All Ones:** Selects an All Ones pattern as the expected J2 trace pattern. • **User String:** Selects a user-defined ASCII message as the expected J2 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).

Receive SOH

This function displays the Transport Overhead bytes for a specific STS-1 slot on the incoming SONET signal. This is a read-only function.

The following options are available in the OC-1/3/12 Receive Transport Overhead screen.

Options	Description
Showing	Selects the Section Overhead slot being monitored on the incoming side SOH signal.
Section Overhead	Displays the Section Overhead bytes (A1, A2, Z0, B1, E1, F1, D1, D2, and D3).
Line Overhead	Displays the Line Overhead bytes (H1, H2, H3, B2, K1, K2, D4–D12, Z1, Z2, and E2).
J0 Trace	Displays the J0 trace.

Receive POH

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

The following are viewed on the Receive Path Overhead screen.

Options	Description
STS Overhead	Displays the STS Overhead bytes to include: B3, C2, G1, F2, H4, F3, K3, and N1.
VT Overhead	Displays the VT Overhead bytes to include: V5, N2, and K4.
J1 Trace	Displays the J1 Trace pattern.
J2 Trace	Displays the J2 Trace pattern.

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Receive Signal Status

This function displays the following measurements of the incoming SONET signal:

- Frequency in MHz.
- Optical Power in dBm
- Line Frequency offset received in Hz and ppm
- Update Signal Calibration - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

  By selecting the Update Signal Calibration button you can 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

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.

> The user must have Admin or Calibrate privileges to enable the calibration mode.

3. See Calibrate OC-1/3/12 Optical Power for specific calibration instructions before proceeding.
4. After setting the **Zero power reading**, **-10 / 30 dBm power reading**, and **-5 / 10 dBm power reading**, select the **Save** button to update the signal calibration.

OC-1/3/12 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

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

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."

Results Errors

The system can monitor and report errors on the incoming OC-1/3/12 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 SONET network, or
- Errors being intentionally generated by the system when it is used in a loopback environment

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

Results Alarms

This function monitors and reports alarms and their duration on the incoming OC-1/3/12 signal. The Alarms function lists the duration of the alarm in seconds.

 The alarms that appear depend on what mapping is selected.

The following alarms can be monitored:

- LOS
- LOF
- OOF
- SEF
- TIM-S
- AIS-L
- APS-L
- RDI-L

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- APS-L
- LOP-P
- RDI-P
- PLM-P
- LOP-V
- UNEQ-V
- RFI-V
- TIM-V
- CONCAT
- AIS- P
- UNEQ -P
- TIM-P
- AIS-V
- LOM-V
- RDI-V
- Pat Sync
- PLM-V
-

Results PTR

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

- 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 Bytes and Value (in HEX and decimal format): Valid Pointers range from 0 to 782.

Results Event

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 **Pause** button to obtain current event log activity. Select the **Resume** button to start event activity again.

Results Large LEDs

This button displays the 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.

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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.

Results Graphs

Use the Graphs button to view error and alarm results for the OC-1/3/12 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 OC-1/3/12 alarms and errors.

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

Results DCC Mon

The DCC Monitor allows you to view the following Datacom channel TX/RX configuration data:

The following options are available for this command.

Option	Description
DataCom Channel Drop	Specifies the bytes that have been dropped over the DataCom channel.
LEDs	Displays Pay Sync and Bit Error LEDs as a status check.
Pat Sync	If a Loss of Pattern Synchronization occurred, displays how long, in seconds, the error occurred.
Bit Error	If Bit errors occurred, displays the count, how long they occurred (in seconds), the current rate, and average rate.

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OC-1/3/12 Test

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

The Test screen contains the following functions:

- SET 1
- Service Disruption
- RTD
- VT Scan

Test 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.

Test Service Disruption

The unit can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Protection Switch Criteria**: Determines the type of alarm, error, or pattern event that is used as a trigger to generate service disruption 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 service disruption measurement has an accuracy of 0.5 milliseconds. Options include: None, B1, SEF, AIS-L, AIS-P, or PRBS.
- **Consecutive Good Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. 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 consecutive error-free frames to occur before Protection Switch

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measurements stop accumulating. The range is 1 to 16383 frames and is entered using a keypad.

- **State**: Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

  - **Single APS**: Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.

  - **Continuous APS**: Constantly monitors for service disruption events, and updates the seconds and frames reported.

  - **Stop APS:** Stops service disruption monitoring. The State returns to Inactive.

- **Protection Switch Time (MilliSecs)**: Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.
- **Protection Switch Time (Frames)**: Indicates the number of errored frames received during the service disruption event.

For more information about monitoring service disruption activity, select *Measuring Service Disruption Activity* in the Common Tasks section of the online help.

Test 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 indicate the number of frames received before the AIS frame is received by the unit. Milliseconds indicate 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 (milliSec):** Indicates the duration in seconds that it took for the known frame to return to the unit.
- **Round-trip Delay Time (Frames):** Indicates the number of frames received during the measurement.

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- **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.

OC-1/3/12 Performance Monitoring

Performance Monitoring provides greater detail about GR-253 incoming Section, Line, STS Path, VT Path, and Bit errors.

The following functions are available on the OC-1/3/12 Performance Monitoring screen:

- Section
- Line
- STS Path
- VT Path
- Bit

Performance Monitoring Section

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 (CV)	This is an error count of incoming B1 errors.
Near End Errored Seconds (ES)	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.
Error-Free Seconds (EFS)	This reports the duration of the incoming B1 error free seconds. This statistic also reports the percentage of error-free seconds compared to the duration of errored seconds.

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Near End Severely Errored Seconds (SES)	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.

Performance Monitoring Line

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:

Statistics	**Description**
Near End Coding Violations (CV)	This is an error count of incoming B2 errors.
Near End Errored Seconds (ES)	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.
Error-free Seconds (EFS)	This reports the duration of the incoming B1 error free seconds. This statistic also reports the percentage of error-free seconds compared to the duration of errored seconds.
Near End Severely Errored Seconds (SES)	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)	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	This is an error count of the number of B2

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REI-L)	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.

Performance Monitoring Path

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.
Error-Free Seconds (EFS-P)	This reports the duration of the incoming B1 error free seconds. This statistic also reports the percentage of error-free seconds compared to the duration of errored seconds.

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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.

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Performance Monitoring VT Path

This function displays a detailed breakdown of incoming Virtual Tributary path BIP (Section BIP-8, also known as Coding Violations) errors and Virtual Tributary path Remote Error Indicator (REI-P) errors.

The following statistics are reported:

Statistics	Description
CV	Code violations by count.
ES	Errored seconds by count, rate percentage, and objective percentage.
EFS	Error-free seconds by count, rate percentage, and objective percentage.
SES	Severely Errored Seconds by count, rate percentage, and objective percentage.
UAS	Unavailable seconds by count, rate percentage, and objective percentage.

Performance Monitoring VT Path

This function displays a detailed breakdown of incoming Virtual Tributary path BIP (Section BIP-8, also known as Coding Violations) errors and Virtual Tributary path Remote Error Indicator (REI-P) errors.

The following statistics are reported:

Statistics	Description
CV	Code violations by count.
ES	Errored seconds by count, rate percentage, and objective percentage.
EFS	Error-free seconds by count, rate percentage, and objective percentage.
SES	Severely Errored Seconds by count, rate percentage, and objective percentage.
UAS	Unavailable seconds by count, rate percentage, and objective percentage.

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Performance Monitoring BIT

This provides a detailed breakdown for BIT errors detected and logged by the OC-1/3/12 protocol processor.

The following statistics are reported:

Statistics	Description
CV	Code violations by count.
ES	Errored seconds by count, rate percentage, and objective percentage.
EFS	Error-free seconds by count, rate percentage, and objective percentage.
SES	Severely Errored Seconds by count, rate percentage, and objective percentage.
UAS	Unavailable seconds by count, rate percentage, and objective percentage.

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Index

C

Calibration 3

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E1 Online Help

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Table Of Contents

E1 Protocol Processor Overview 1
Technical Specifications 2
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 Electrical Power Calibration 6
Required Equipment 6
Hardware Setup 7
Restoring Raw Power Readings for E1 7
Calibrating the E1 Signal 8
Calibrating the E1 #2 Bridged Signal 10
Modify Overhead Bytes 11
E1 Screen Functions and Descriptions 13
LED Quick Status Area 13
Transmit Screens and Functions 14
Transmit - Settings 1 (SET 1) 14
Transmit - Overhead (OH) 17
Transmit - ERROR ALARM 18
Receive Screens and Functions 19
Receive - Settings 1 (SET 1) 19
Receive - Overhead (OH) 23
Receive - Signal Status (SIG) 24
Results Screens and Functions 24
Results - SCAN 25
Results - Errors (ERR) 25
Results - ALARM 25
Results - EVENT 25
Results - GRAPH 26
Results - LARGE LEDs 26
Test Screens and Functions 26
TEST - SET 1 26
Test - Service Disruption 27

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Table Of Contents

Performance Monitoring Screens and Functions 28
Perf Monitor - FAS 28
Perf Monitor - CRC 29
Perf Monitor - FEBE 30
Perf Monitor - BIT 31
Index 32
A 32

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E1 Protocol Processor Overview

This section includes:

- E1 Specific Tasks
- E1 Screen Functions and Descriptions

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

22 March 2005

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Technical Specifications

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

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	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%

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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.

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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 1**.
4. Select **Fractional E1**. A keypad appears.
5. 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**.
6. Select **Background 64K Pattern**. A keypad appears.
7. 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 **Presets**, from the Common Function buttons.
2. Select **Interface** and choose **STM-1** from the Select Interface list.
3. Select **Configuration** and choose **E1 #1 A/D** or **E1 #2 A/D** from the Select To Configuration list.

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.

Required Equipment

The following equipment is required to perform E1 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

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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 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

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

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

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

1. From the **System** tab, select **Misc**.
2. From **Local Setting**, select **Enable Calibration**.


The user must have Admin. or Calibrate privileges to enable the calibration mode.

3. From the **E1** tab, select **Receive**.
4. Select **SIG** from the tabs along the left-side of the Receive screen and choose **Update Signal Calibration**.
5. Select the **Negative** button. The Negative Signal Calibration functions appear.
6. Select **Zero power reading**. A keypad appears. Enter **0** and select **OK**.
7. Select **0.5 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
8. Select **2.0 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
9. Select **Save**.

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

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

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

Raw Negative Bridged Power Readings for E1 #2

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

1. From the **Receive** screen, select **SIG**.
2. Select the **Update Signal Calibration** button and choose **Negative Bridged**. The Negative Bridged Signal Calibration functions appear.
3. Select **Zero power reading**. A keypad appears. Enter **0** and select **OK** to accept the new value.
4. Select **0.5 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
5. Select **2.0 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
6. Select **Save**.

Raw Positive Bridged Power Readings E1 #2

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

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

Calibrating the E1 Signal

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

Obtain Zero Power Reading

1. Using the oscilloscope, measure and record the average positive and negative peak values.

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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 **Receive 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 **Receive 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 **Receive SIG** screen. This is the **0.5 Volts Reading** value.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This is the **0.5 Volts Reading** value.

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 **Receive SIG** screen. This is the **2.0 Volts Reading** value.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This is the **2.0 Volts Reading** value.

Enter Negative Signal Power Readings

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

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

This concludes signal calibration for the E1 #1 tab.

If you are performing calibration using the E1 #2 tab, continue to the next section to perform Negative Bridged and Positive Bridged signal calibration.

Calibrating the E1 #2 Bridged Signal

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

Configure the Unit for Bridged Termination

The following procedures only apply to the E1 #2 tab.

1. From the **Receive** screen, select **SET 1**.
2. Select **Termination Type** and choose **Bridged**.
3. Select **SIG** from the tabs along the left-side of the Receive screen.
4. Select **Update Signal Calibration**.

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 **Receive 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 **Receive 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 **Receive SIG** screen. This value is the **0.5 Volts Reading** for **Positive Bridged** Signal Calibration.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This value is the **0.5 Volts Reading** for **Negative Bridged** Signal Calibration.

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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 **Receive SIG** screen. This value is the **2.0 Volts Reading** for **Positive Bridged** Signal Calibration.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This value is the **2.0 Volts 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 **Receive SIG** screen.
2. Select **Zero power reading**. A keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
3. Select **0.5 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
4. Select **2.0 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**.
5. 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 **Receive SIG** screen.
2. Select **Zero power reading**. A keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
3. Select **0.5 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
4. Select **2.0 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**.
5. Select **Save** to save the new Positive Bridged Signal Calibration values.

This completes the unit's E1 signal calibration.

Modify Overhead Bytes

The Modify Overhead (OH) function allows you to stress an E1 network by directly editing CAS signaling 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.

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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.)

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E1 Screen Functions and Descriptions

The following function screens are available through the E1 protocol processor tab.

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

LED Quick Status Area

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.
E/A	Displays the error and/or alarm generated. If both an error and alarm is being generated concurrently, a slash (/) will separate the error and alarm. If neither are generated, "None" will display
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

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	indicating an Alarm Indication Signal occurred on the line layer.
FRAME ERR	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.

Transmit Screens and Functions

This function allows you to define the parameters used in E1 Transmit operations.

The following functions are available through the E1 Transmit screen.

- SET 1
- OH
- ERROR ALARM

Transmit - Settings 1 (SET 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 SET 1 screen contains the following parameters:

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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

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	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

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	• 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 64K Pattern	A customized DS0 pattern can be entered in hex, decimal, or bin format.

Transmit - Overhead (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.

O**verhead 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.

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	• **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).

Transmit - ERROR ALARM

This function allows you to insert errors and alarms.

The following options are available on the E1 ERROR ALARM 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.

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	• **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.

Receive Screens and Functions

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.

- SET 1
- OH
- SIG

Receive - Settings 1 (SET 1)

This screen allows you to configure your unit's Receive parameters for your E1 test environment.

The E1 Receive SET1 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.

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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.
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).

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	• 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

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	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.

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	• **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.
64K Channel Dropped	Select the DS0 channel to be dropped, 1-31.
Speaker On/Off	This button that turns the speaker on and off.
Volume	Controls the speaker volume level. Click **High** to increase volume. Click **Low** to decrease volume.

Receive - Overhead (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.

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Receive - Signal Status (SIG)

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 SIG 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 - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

  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:
    - Zero Power Reading
    - 0.5 Volts Reading
    - 2.0 Volt Reading

  To enable protocol processor calibration:

  1. From the **System** tab, select **Misc**.
  2. From **Local Settings**, select **Enable Calibration**.

  > The user must have Admin or Calibrate privileges to enable the calibration mode.

  3. See E1 Electrical Power Calibration for specific calibration instructions before proceeding.
  4. After setting the power and volt readings, select the **Save** button to update the signal calibration.

Results Screens and Functions

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

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- ALARM
- EVENT
- GRAPH
- LARGE LED

Results - SCAN

The SCAN function provides a list of received errors and alarms for the E1 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.

Results - Errors (ERR)

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 ERR screen:

- BIT
- BPV
- Frame
- CRC
- FEBE

Results - ALARM

This function displays how long E1 alarms were detected by the system. Results for the following alarms display.

- AIS
- LOF
- LOS
- PAT Sync
- RAI
- RMFAI
- CASMFL

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 view types.
- Select **Pause** to temporarily halt the display of results.

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- Select **Resume** to list event activity.

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.

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.

Test Screens and Functions

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

The Test screen contains the following functions:

- SET 1
- Service Disrptn

TEST - 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.

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

Test - Service Disruption

The unit can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Consecutive Good Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. The range is 0.125 to 31.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required**: This function allows you to enter the number of consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 255 frames and is entered using a keypad.
- **Consecutive Bad Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive errored frames to elapse before Protection Switch measurements begin to accumulate. The range is 0.125 to 31.875 milliseconds and is entered using a keypad.
- **Consecutive Bad Frames Required**: This function allows you to enter the number of consecutive errored frames to occur before Protection Switch measurements begin to accumulate. The range is 1 to 255 frames and is entered using a keypad.
- **State**: Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

  - **Single APS**: Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.
  - **Continuous APS**: Constantly monitors for service disruption events, and updates the seconds and frames reported.
  - **Stop APS:** Stops service disruption monitoring. The State returns to Inactive.

- **Protection Switch Time (MilliSecs)**: Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.

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- **Protection Switch Time (Frames)**: Indicates the number of errored frames received during the service disruption event.

For more information about monitoring service disruption activity, select *Measuring Service Disruption Activity* in the Common Tasks section of the online help.

Performance Monitoring Screens and Functions

The E1 Performance Monitoring screen includes the following functions:

- FAS
- CRC
- FEBE
- BIT

Perf Monitor - 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.
- Error-free Seconds (EFS) 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.
- Error-free Seconds (EFS) by count, rate percentage, and objective percentage.
- Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.
- Unavailable Seconds (UAS) by count, rate percentage, and objective percentage.
- G.826 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

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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

Perf Monitor - 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.
- Error-free Seconds (EFS) 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.
- Error-free Seconds (EFS) 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.

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- M.2100 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

Perf Monitor - 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.
- Error-free Seconds (EFS) 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.
- Error-free Seconds (EFS) 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

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Perf Monitor - 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.
- Error-free Seconds (EFS) 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.
- Error-free Seconds (EFS) 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

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Index

A

AIS 13

Alarm Indication Signal 13

ATM 13

B

Bipolar Violation 13

BIT ERR 13

Bit Error 13

BPV 13

C

Calibration 6

CASMFL 13

Channel Associated Signaling Multiframe Loss 13

CLK 13

COFA 13

CRC 13

Cyclic Redundancy Check 13

E

E1 13

E1 LEDs 13

E1 Performance Monitoring 28

E1 Results 24

E3 13

F

Far End Block Error 13

FEBE 13

Frame 13

Frame Alignment Change 13

Frame Alignment 13

L

LEDs 13

LEDs Quick Status Area 13

LOF 13

LOS 13

M

Multiframe 13

P

PAT LOSS 13

Pattern Loss 13

R

RAI 13

Remote Alarm Indication 13

Remote Multiframe Alarm Indication 13

RMFAI 13

RX PWR 13

S

SDH 13

SETS 13

Signal 13

Synchronization 13

T

Time Slot 16 13

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E3 Online Help

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Table of Contents

E3 Overview 1
E3/E4 Technical Specifications 3
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 Function Definitions 9
E3 LEDs 9
E3 Transmit 10
Transmit Settings 1 10
Transmit Settings 2 11
E3 Transmit Errors and Alarms 12
E3 Receive 13
Receive Settings 1 13
Receive Signal Status 15
Receive Channel Scan 16
E3 Results 16
Results Scan 17
Results Errors 17
E3 Results Alarm 17
Results Event 18
Results Large LEDs 18
Results Graph 18
E3 Test 18
SET 1 18
Test - Service Disruption 19
E3 Performance Monitoring 20
E3 Performance Monitoring FAS 20
Index 23

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E3 Overview

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.

23 March 2005

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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

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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

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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 0.8 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 **System** tab, select **Misc**.
2. From **Local Setting**, select **Enable Calibration**.

 The user must have Admin. or Calibrate privileges to enable the calibration mode.

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3. From the **E3** or **DS3** tab on the unit, select **Receive**.
4. Select **SIG** from the tabs along the left-side of the Receive screen and choose **Update Signal Calibration**.
5. Select **Negative**. The Negative Signal Calibration functions appear.
6. Select **Zero power reading**. A keypad appears. Enter **0** and select **OK**.
7. Select the **Save** button to restore the raw power reading.
8. Select **Positive**. The Positive Signal Calibration functions appear.
9. Select **Zero power reading**. A keypad appears. Enter **0** and select **OK**.
10. Select **0.2 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
11. Select **0.8 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
12. 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 **Receive 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 **Receive 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 **Receive SIG** screen. This is the **0.2 Volts Reading** value.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This is the **0.2 Volts Reading** value.

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 **Receive SIG** screen. This is the **0.8 Volts Reading** value.

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4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This is the **0.8 Volts Reading** value.

Enter Negative Signal Power Readings

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

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E3 Screen and Function Definitions

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	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 ERR	Indicates if the E3 protocol processor has received framing errors. This is an error LED.

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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

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

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	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.

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

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	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 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

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	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 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

Receive Settings 1

This screen allows you to configure your unit's Receive parameters for your E3 test environment.

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.

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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.

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	• **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.

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
- Update Signal Calibration - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

  The following calibration functions are available:

  - Select **Negative** or **Positive** to calibrate the following readings:
    - Zero Power Reading
    - 0.2 Volts Reading

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- 0.8 Volts Reading

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.

> The user must have Admin or Calibrate privileges to enable the calibration mode.

3. See E3 Electrical Power Calibration for specific calibration instructions before proceeding.
4. After setting the power and volt readings, select the **Save** button to update the signal calibration.

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 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

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- Graph

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 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 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)

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- Remote Defect Indicator (RDI)

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 the order you wish to view the results in.

Select **Pause** to temporarily halt the display of results. Select **Resume** to list event activity.

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.

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 Test

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

The Test screen contains the following functions:

- SET 1
- Service Disrptn

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**

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- **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.

Test - Service Disruption

The unit can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Consecutive Good Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. The range is 0.045 to 11.397 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required**: This function allows you to enter the number of consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 255 frames and is entered using a keypad.
- **Consecutive Bad Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive errored frames to elapse before Protection Switch measurements begin to accumulate. The range is 0.045 to 11.397 milliseconds and is entered using a keypad.
- **Consecutive Bad Frames Required**: This function allows you to enter the number of consecutive errored frames to occur before Protection Switch measurements begin to accumulate. The range is 1 to 255 frames and is entered using a keypad.
- **State**: Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

  - **Single APS**: Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.
  - **Continuous APS**: Constantly monitors for service disruption events, and updates the seconds and frames reported.
  - **Stop APS:** Stops service disruption monitoring. The State returns to Inactive.

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- **Protection Switch Time (MilliSecs)**: Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.
- **Protection Switch Time (Frames)**: Indicates the number of errored frames received during the service disruption event.

For more information about monitoring service disruption activity, select *Measuring Service Disruption Activity* 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 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.
- Error-free Seconds (EFS) 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.
- Error-free Seconds (EFS) 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.

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- Duration: Select the monitoring duration to be 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or Failure

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Index

A

AIS 9

Alarm Indication Signal 9

B

Bipolar Violation 9

Bit Error 9

BPV 9

C

Calibration 5

CLK 9

E

E3 ..... 1, 9, 16

E3 LEDs 9

E3 Performance Monitoring 20

E3 Receive 13

F

Frame

Loss 9

Frame 9

L

LEDs 9

LEDs Quick Status Area 9

LOF 9

LOS 9

P

PAT LOSS 9

Pattern Loss 9

R

RCVD 9

RDI 9

Remote Defect Indicator 9

S

SETS 9

Signal 9

Synchronization 9

T

Terminating Equipment 9

Transmit 9

TX/RX PWR 9

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E4 Online Help

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Table of Contents

E4 Protocol Processor Overview 1
E4 Specific Tasks 3
Add an E3 into an E4 Signal 3
Specify Frames and Patterns for the Dropped/Inserted Signal 3
View the Event Activity of the Dropped and Inserted Signals 3
E4 Electrical Power Calibration 4
Required Equipment 4
Hardware Setup 4
Restoring Raw Power Readings for E4 4
Calibrating E4 Signal Calibration 5
E4 Screen Functions and Descriptions 7
LED Quick Status Area 7
Transmit Screens and Functions 8
Transmit - Settings 1 (SET 1) 8
Transmit - Settings 2 (SET 2) 9
Transmit - Errors and Alarms (Error Alarm) 9
Receive Screens and Functions 10
Receive - Settings 1 (SET 1) 10
Receive - Signal Status (SIG) 12
Result Screens and Functions 13
Results - SCAN 13
Results - Errors (ERR) 14
Results - ALARM 14
Results - EVENT 14
Results - Large LEDs 14
Results - GRAPH 15
Test Screens and Functions 15
Test - Settings 1 (SET 1) 15
Test - Service Disruption 15
Performance Monitoring Screens and Functions 16
Perf Monitor - FAS 17
Perf Monitor - BIT 17
Index 19

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E4 Protocol Processor Overview

The E4 protocol processor section includes:

- E4 Specific Tasks
- E4 Screen Functions and Descriptions

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

23 March 2005

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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 **Interface**. All line interfaces available for your unit appear.
3. Select **E4**.
4. Select **Configuration**. The available protocols appear.
5. Select **E3 A/D**.
6. Select **Apply**.

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

Specify Frames and Patterns for the Dropped/Inserted Signal

1. Select **Transmit**.
2. Select **SET 2**.
3. Select **E3 Channel Inserted**. Choose the channel to insert.
4. Select **E3 Background Frame.** Choose the background framing.
5. Select **E3 Background Pattern**. Using the calculator that appears, set the background pattern for the specified channel. Select **OK**.

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.
7. Select **Graph** to view a graph of the errors and alarms.

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E4 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 0.1 and 0.4 volt reading for E4.

Required Equipment

The following equipment is required to perform E4 calibration:

- Digital oscilloscope (use highest bandwidth available) or equivalent measuring equipment
- Variable attenuator
- Electrical power meter or a calibrated NIC that can provide 0.1 and 0.4 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 **E4 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 **E4 RX** BNC connector and connect the other end of the cable to the BNC connector attached to the oscilloscope.

Restoring Raw Power Readings for E4

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

1. From the **System** tab, select **Misc**.
2. From **Local Setting**, select **Enable Calibration**.

> The user must have Admin. or Calibrate privileges to enable the calibration mode.

3. From the **E4** tab on the unit, select **Receive**.
4. Select **SIG** from the tabs along the left side of the Receive screen and choose **Update Signal Calibration**.
5. Select **Negative**. The Negative Signal Calibration functions appear.
6. Select **Zero power reading**. A keypad appears. Enter **0** and select **OK**.

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7. Select the **Save** button to restore the raw power reading.
8. Select **Positive**. The Positive Signal Calibration functions appear.
9. Select **Zero power reading**. A keypad appears. Enter **0** and select **OK**.
10. Select **0.1 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
11. Select **0.4 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
12. Select the **Save** button to restore the raw power reading.

Calibrating E4 Signal Calibration

The following procedures describe how to perform E4 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 **Receive 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 **Receive SIG** screen. This value is the **Zero power reading** for **Negative Signal Calibration**.

Obtain 0.1 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 0.1 volts.
3. Record the value for the Peak Positive Pulse Voltage that appears on the **Receive SIG** screen. This is the **0.1 Volts Reading** value.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This is the **0.1 Volts Reading** value.

Obtain 0.4 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 0.4 volts.
3. Record the value for the Peak Positive Pulse Voltage that appears on the **Receive SIG** screen. This is the **0.4 Volts Reading** value.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This is the **0.4 Volts Reading** value.

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Enter Negative Signal Power Readings

1. Make sure that the **Negative Signal Calibration** functions appear on the **Receive SIG** screen. If necessary, select the **Negative** button.
2. Select **Zero power reading**. A keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
3. Select **0.1 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.1 volts power reading and select **OK**.
4. Select **0.4 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.4 volts power reading and select **OK**.
5. 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 **Receive SIG** screen.
2. Select **Zero power reading**. A keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
3. Select **0.1 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.1 volts power reading and select **OK**.
4. Select **0.4 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.4 volts power reading and select **OK**.
5. Select **Save** to save the new Positive Signal Calibration values. This completes the unit's E4 signal calibration.

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E4 Screen Functions and Descriptions

The following functions are available through the E4 protocol processor.

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

LED Quick Status Area

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

LED	Description
TX / RX	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.
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.

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Transmit Screens and Functions

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

The following functions are available through the E4 Transmit screen.

- SET 1
- SET 2
- Error Alarm

Transmit - Settings 1 (SET 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

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	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.

Transmit - Settings 2 (SET 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.

Transmit - Errors and Alarms (Error Alarm)

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

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	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.

Receive Screens and Functions

Functions on the Receive screens allow you to configure settings for the parameters used in E4 Receive operations.

The following functions are available through the E4 Receive screen.

- SET 1
- SIG

Receive - Settings 1 (SET 1)

This screen allows you to configure your unit's Receive parameters for your E4 test environment.

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

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	Independent is selected, settings established on the Transmit screen will only affect Transmit mode.
Termination Type	Configures the E4 line input termination. Select one of the following options: • **Terminated**: Sets the Receive Sensitivity of the E4 Line Interface. Use this setting if the E4 line terminates at the system's Line Interface. • **Monitor**: Sets the Receive Sensitivity of the E4 Line Interface. Use this setting if the E4 line connects to a monitor jack.
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.

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	• **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.

Receive - Signal Status (SIG)

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

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- Update Signal Calibration - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

  The following calibration functions are available:

  - Select **Negative** or **Positive** to calibrate the following readings:
    - Zero Power Reading
    - 0.1 Volts Reading
    - 0.4 Volts Reading

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.

> The user must have Admin or Calibrate privileges to enable the calibration mode.

3. See E4 Electrical Power Calibration for specific calibration instructions before proceeding.
4. After setting the power and volt readings, select the **Save** button to update the signal calibration.

Result Screens and Functions

Result screens allow 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
- LARGE LED
- GRAPH

Results - SCAN

The SCAN function provides a list of received errors and alarms for the E4 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.

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Results - Errors (ERR)

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

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)

Results - EVENT

The Event function provides a detailed summary of alarm and error event and activity that have occurred and have been recorded by the unit.

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

Select the **Descending/Ascending** button to toggle the order you wish to view the results in.

Select **Pause** to temporarily halt the display of results.

Select **Resume** to list event activity.

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.

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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.

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.

Test Screens and Functions

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

The Test screen contains the following functions:

- SET 1
- Service Disrptn

Test - Settings 1 (SET 1)

The SET 1 function determines 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.

Test - Service Disruption

The unit can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

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- **Consecutive Good Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. The range is 0.021 to 5.361 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required**: This function allows you to enter the number of consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 255 frames and is entered using a keypad.
- **Consecutive Bad Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive errored frames to elapse before Protection Switch measurements begin to accumulate. The range is 0.021 to 5.361 milliseconds and is entered using a keypad.
- **Consecutive Bad Frames Required**: This function allows you to enter the number of consecutive errored frames to occur before Protection Switch measurements begin to accumulate. The range is 1 to 255 frames and is entered using a keypad.
- **State**: Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

    - **Single APS**: Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.
    - **Continuous APS**: Constantly monitors for service disruption events, and updates the seconds and frames reported.
    - **Stop APS:** Stops service disruption monitoring. The State returns to Inactive.

- **Protection Switch Time (MilliSecs)**: Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.
- **Protection Switch Time (Frames)**: Indicates the number of errored frames received during the service disruption event.

For more information about monitoring service disruption activity, select *Measuring Service Disruption Activity* in the Common Tasks section of the online help.

Performance Monitoring Screens and Functions

The E4 Performance Monitoring screen includes the following functions:

- FAS
- BIT

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Perf Monitor - FAS

This provides a detailed breakdown for Frame Alignment Signal (FAS) 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.
- Error-free Seconds (EFS) by count and rate 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.
- Error-free Seconds (EFS) by count and rate 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

Perf Monitor - 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.

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- Error-free Seconds (EFS) by count and rate 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.
- Error-free Seconds (EFS) by count and rate 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

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Index

E

E3 3

E4 ..... 1, 7, 8, 10, 13, 16

E4 LEDs 7

E4 Performance 16

E4 Receive 10

E4 Results 13

E4 Transmit 8

L

LEDs 7

P

Performance 16

R

Receive 10

Results 13

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DS1 Online Help

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Table of Contents

DS1 Protocol Processor Overview 1
DS1 Specific Tasks Overview 3
DS1 Electrical Power Calibration 3
Required Equipment 3
Hardware Setup 3
Restoring Raw Power Readings for DS1 4
Calibrating the DS1 Signal 5
Calibrating the DS1 #2 Bridged Signal 6
DS1 Screen Functions and Descriptions Overview 9
LED Quick Status Area 9
Transmit Screens and Functions 10
Transmit - Settings 1 (SET 1) 11
Transmit - Loop Code 14
Transmit - ERROR ALARM 18
Receive Screens and Functions 20
Receive - Settings 1 (SET 1) 20
Receive - DS0 24
Receive - Signal (SIG) 26
Result Screens and Functions 26
Results - SCAN 27
Results - ERR 27
Results - ALARM 27
Results - EVENT 27
Results - LARGE LED 28
Results - Graph 28
Test Screens and Functions 28
Test - Settings 1 (SET 1) 28
Test - Service Disruption 29
Performance Monitoring Screens and Functions 30
Perf Monitor - Frame 30
Perf Monitor - CRC 30
Perf Monitor - BIT 31
Index 33

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DS1 Protocol Processor Overview

This section includes:

- DS1 Specific Tasks Overview
- DS1 Screen Functions and Descriptions

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

22 March 2005

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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 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 DS1.

Required Equipment

The following equipment is required to perform 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
- 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 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.

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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 DS1

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

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

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

1. From the **System** tab, select **Misc**.
2. From **Local Setting**, select **Enable Calibration**.

> The user must have Admin. or Calibrate privileges to enable the calibration mode.

3. From the **DS1** tab, select **Receive**.
4. Select **SIG** from the tabs along the left side of the Receive screen and choose **Update Signal Calibration**.
5. Select the **Negative** button. The Negative Signal Calibration functions appear.
6. Select **Zero power reading**. A keypad appears. Enter **0** and select **OK**.
7. Select **0.5 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
8. Select **2.0 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
9. Select **Save**.

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

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

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

Raw Negative Bridged Power Readings for DS1 #2

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

1. From the **Receive** screen, select **SIG**.
2. Select the **Update Signal Calibration** button and choose **Negative Bridged**. The Negative Bridged Signal Calibration functions appear.

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3. Select **Zero power reading**. A keypad appears. Enter **0** and select **OK** to accept the new value.
4. Select **0.5 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
5. Select **2.0 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
6. Select **Save**.

Raw Positive Bridged Power Readings DS1 #2

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

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

Calibrating the DS1 Signal

The following procedures describe how to perform DS1 calibration using the unit and an oscilloscope. These procedures apply to both the Negative and Positive buttons that appear under the **DS1 #1** 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 **Receive 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 **Receive 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 **Receive SIG** screen. This is the **0.5 Volts Reading** value.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This is the **0.5 Volts Reading** value.

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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 **Receive SIG** screen. This is the **2.0 Volts Reading** value.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This is the **2.0 Volts Reading** value.

Enter Negative Signal Power Readings

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

This concludes signal calibration for the DS1 #1 tab.

If you are performing calibration using the DS1 #2 tab, continue to the next section to perform Negative Bridged and Positive Bridged signal calibration.

Calibrating the DS1 #2 Bridged Signal

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

Configure the Unit for Bridged Termination

The following procedures only apply to the DS1 #2 tab.

1. From the **Receive** screen, select **SET 1**.
2. Select **Termination Type** and choose **Bridged**.

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3. Select **SIG** from the tabs along the left side of the Receive screen.
4. Select **Update Signal Calibration**.

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 **Receive 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 **Receive 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 **Receive SIG** screen. This value is the **0.5 Volts Reading** for **Positive Bridged** Signal Calibration.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This value is the **0.5 Volts 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 **Receive SIG** screen. This value is the **2.0 Volts Reading** for **Positive Bridged** Signal Calibration.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This value is the **2.0 Volts 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 **Receive SIG** screen.
2. Select **Zero power reading**. A keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.

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3. Select **0.5 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
4. Select **2.0 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**.
5. 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 **Receive SIG** screen.
2. Select **Zero power reading**. A keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
3. Select **0.5 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.5 volts power reading and select **OK**.
4. Select **2.0 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 2.0 volts power reading and select **OK**.
5. Select **Save** to save the new Positive Bridged Signal Calibration values.

This completes the unit's DS1 signal calibration.

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DS1 Screen Functions and Descriptions Overview

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

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

LED Quick Status Area

When the DS1 protocol processor is selected, the following LEDs and status indicators are displayed in the LED Quick Status Area of the touch screen. They are also located under Results Large LEDs.

LED	Description
TX	TX indicates the current transmit DS1 Line Interface Signal Level.
RX	RX indicates the current value of the DS1 Line Interface Input Termination.
E/A BIT	Displays the error and/or alarm currently generated by the unit.
CLK	A status indicator that displays the type of transmit clock specified in the setting. Clock settings include SETS, Internal, or RCVD.
Test Paused	Indicates a test has been paused, when LED is red.
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.
LOF	Loss of Frame. An alarm LED indicating an alarm signal was generated due to a frame alignment problem.

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OOF	Out of Frame. Indicates that four consecutive frames have been received with invalid or errored framing patterns.
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.

Transmit Screens and Functions

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.

- SET 1
- Loop Code
- ERROR ALARM

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Transmit - Settings 1 (SET 1)

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

The following parameters are available through the DS1 Transmit SET 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.

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	• **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 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

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	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 6** • **PRBS 6 Inv** • **PRBS 9** • **PRBS 9 Inv** • **PRBS 11** • **PRBS 11 Inv** • **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 regulator 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

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	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. • **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.

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.

Some option selections may be dependent on other settings.

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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

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	(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

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	available for In-Band signaling.
Auto Response	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.
Tester Line Looped	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.
Tester Payload Looped	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 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

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	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 - 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 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 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.

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	• **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.

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	• **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.

Receive Screens and Functions

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:

- SET 1
- DS0
- SIG

Receive - Settings 1 (SET 1)

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

Some option selections may be dependent on other settings.

The following options are available from the Receive SET 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.

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	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**

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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 received. • **55-Octet:** A 55-octet pattern is

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	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

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	following patterns are performed in 5-minute increments: All Ones, 1-in-8, 2-in-8, 3-in-24, and QRSS. • **Live:** Uses live data traffic; no pattern. This is used primarily for monitoring errors and alarms within a live data stream. When selected, the Pattern Sync LED becomes non-functional. • **User Defined:** Allows you to enter up to a 32-bit pattern.
Fractional T1 (1-24)	Configures the system for Fractional T1 testing.
CODEC	Select A-law, MU-law, or True A-law.

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 • Network-Prov-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

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	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.
Speaker	Provides audible VF outputs for the selected DS0 channel. You can control the volume of the output using the Volume arrow button options.

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Receive - Signal (SIG)

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 DS1 Receive SIG 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 - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

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:
- Zero Power Reading
- 0.5 Volts Reading
- 2.0 Volt Reading

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From Local Settings, select Enable Calibration.


The user must have Admin or Calibrate privileges to enable the calibration mode.

3. See Calibrate DS 1 Electrical Power for specific calibration instructions before proceeding.
4. After setting the power and volt readings, select the **Save** button to update the signal calibration.

Result Screens and Functions

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
- ERR

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- ALARM
- EVENT
- LARGE LED
- GRAPH

Results - 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.

Results - ERR

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

Results - 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.

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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.

Results - LARGE LED

This screen displays the LEDs and status indicators for in a large, easy to read format that covers the entire screen area. This is especially useful for viewing 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.

Results - Graph

The Graph screen allows you 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.

Test Screens and Functions

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

The Test screen contains the following functions:

- SET 1
- Service Disrpt

Test - Settings 1 (SET 1)

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**

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- **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.

Test - Service Disruption

The unit can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Consecutive Good Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. The range is 0.125 to 31.875 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required**: This function allows you to enter the number of consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 255 frames and is entered using a keypad.
- **Consecutive Bad Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive errored frames to elapse before Protection Switch measurements begin to accumulate. The range is 0.125 to 31.875 milliseconds and is entered using a keypad.
- **Consecutive Bad Frames Required**: This function allows you to enter the number of consecutive errored frames to occur before Protection Switch measurements begin to accumulate. The range is 1 to 255 frames and is entered using a keypad.
- **State**: Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

  - **Single APS**: Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.
  - **Continuous APS**: Constantly monitors for service disruption events, and updates the seconds and frames reported.

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- **Stop APS:** Stops service disruption monitoring. The State returns to Inactive.

- **Protection Switch Time (MilliSecs)**: Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.
- **Protection Switch Time (Frames)**: Indicates the number of errored frames received during the service disruption event.

For more information about monitoring service disruption activity, select *Measuring Service Disruption Activity* in the Common Tasks section of the online help.

Performance Monitoring Screens and Functions

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

The following options are available:

- Frame
- CRC
- BIT

Perf Monitor - 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:

Statistics	Description
CV	Code violations by count.
ES	Errored seconds by count, rate percentage, and objective percentage.
EFS	Error-free seconds by count, rate percentage, and objective percentage.
SES	Severely Errored Seconds by count, rate percentage, and objective percentage.
UAS	Unavailable seconds by count, rate percentage, and objective percentage.

Perf Monitor - 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:

Statistics	Description

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CV	Code violations by count.
ES	Errored seconds by count, rate percentage, and objective percentage.
EFS	Error-free seconds by count, rate percentage, and objective percentage.
SES	Severely Errored Seconds by count, rate percentage, and objective percentage.
UAS	Unavailable seconds by count, rate percentage, and objective percentage.

Perf Monitor - 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:

Statistics	**Description**
CV	Code violations by count.
ES	Errored seconds by count, rate percentage, and objective percentage.
EFS	Error-free seconds by count, rate percentage, and objective percentage.
SES	Severely Errored Seconds by count, rate percentage, and objective percentage.
UAS	Unavailable seconds by count, rate percentage, and objective percentage.

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Index

C

Calibration 3

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DS3 Online Help

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Table Of Contents

DS3 Protocol Processor Overview 1
DS3 Specific Tasks 3
Drop an E1 Signal from 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 Functions and Descriptions 9
LED Quick Status Area 9
Transmit Screens and Functions 10
Transmit - Settings 1 (SET 1) 11
Transmit - Settings 2 (SET 2) 13
Transmit - Errors and Alarms (ERROR ALARM) 13
Transmit - FEAC CODES 15
Receive Screens and Functions 16
Receive - Settings 1 (SET 1) 16
Receive - Signal Status (SIG) 18
Receive - Channel Scan (Chan Scan) 19
Result Screens and Functions 19
Results - SCAN 19
Results - ERRORS 19
Results - ALARM 20
Results - EVENT 20
Results - LARGE LEDs 20
Results - GRAPH 21
Test Screens and Functions 21
Test - Settings 1 (SET 1) 21
Test - Service Disruption 21

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Table Of Contents

Performance Monitoring Screens and Functions 22
Perf Monitor - LINE 22
Perf Monitor - PATH 23
Perf Monitor - PATH 23
Index 25

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DS3 Protocol Processor Overview

The DS3 online help is divided into the following sections:

- DS3 Specific Tasks
- DS3 Screen Functions and Descriptions

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

23 March 2005

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DS3 Specific Tasks

This section includes a series 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 of the NIC unit's online help.

Drop an E1 Signal from 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 the **Interface** button and choose **DS-3** from the Select from Interface list.
3. Select the **Configuration** button and choose **E1 #1 A/D** or **E1 #2 A/D**.
4. Select the **Apply** button.

   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** and **Set 1**.
3. Select the **Mapping** button and set the mapping mode.
4. If you wish to enable Pass Thru Mode, select **Pass Thru Mode** and select **On**. Otherwise, keep this option turned off.
5. If you dropped the E1 #1 signal, select **E1 #1 Channel Inserted** and select the channel in which you want to drop the E1 signal.
6. If you dropped the E1 #2 signal, select **E1 #2 Channel Inserted** and select the channel in which you want to drop the E1 signal.
7. Select **E1 Background Frame** and select the background frame for the specified channel.
8. Select **E1 Background Pattern**. Using the keyboard that appears, enter up to a 32-bit background pattern for the specified channel.

View the Event Activity of the Dropped and Inserted Signals

- Select **Results** and choose the how you want to view the activity.
  - Select **Scan** to view a summary of the error and alarm counts that have occurred.
  - Select **Err** to view the count, average rate, and current rate of the errors that have occurred.
  - Select **Alarm** to view the alarms (in seconds) that have occurred.

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- Select **Event** to view a list of event activity, number of events, the time they occurred, and how long they occurred.
- Select **Large LED** to view errors and alarms in the form of LEDs.
- Select **Graph** to view errors and alarms in the form of a graph.

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 0.8 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 **System** tab, select **Misc**.
2. From **Local Setting**, select **Enable Calibration**.

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 The user must have Admin. or Calibrate privileges to enable the calibration mode.

3. From the **E3** or **DS3** tab on the unit, select **Receive**.
4. Select **SIG** from the tabs along the left-side of the Receive screen and choose **Update Signal Calibration**.
5. Select **Negative**. The Negative Signal Calibration functions appear.
6. Select **Zero power reading**. A keypad appears. Enter **0** and select **OK**.
7. Select the **Save** button to restore the raw power reading.
8. Select **Positive**. The Positive Signal Calibration functions appear.
9. Select **Zero power reading**. A keypad appears. Enter **0** and select **OK**.
10. Select **0.2 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
11. Select **0.8 Volts Reading**. A keypad appears. Enter **0** and select **OK**.
12. 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 **Receive 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 **Receive 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 **Receive SIG** screen. This is the **0.2 Volts Reading** value.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This is the **0.2 Volts Reading** value.

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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 **Receive SIG** screen. This is the **0.8 Volts Reading** value.
4. Record the value for the Peak Negative Pulse Voltage that appears on the **Receive SIG** screen. This is the **0.8 Volts Reading** value.

Enter Negative Signal Power Readings

1. Make sure that the **Negative Signal Calibration** functions appear on the **Receive SIG** screen. If necessary, select the **Negative** button.
2. Select **Zero power reading**. A keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
3. Select **0.2 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.2 volts power reading and select **OK**.
4. Select **0.8 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.8 volts power reading and select **OK**.
5. 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 **Receive SIG** screen.
2. Select **Zero power reading**. A keypad appears. Enter the value recorded earlier for the zero power reading and select **OK**.
3. Select **0.2 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.2 volts power reading and select **OK**.
4. Select **0.8 Volts Reading**. A keypad appears. Enter the value recorded earlier for the 0.8 volts power reading and select **OK**.
5. 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 **SET 1**.
3. Select **Framing**.
4. Select **C-BIT**.

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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.

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DS3 Screen Functions and Descriptions

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

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

LED Quick Status Area

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.

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OOF	Out of Frame. Indicates that four consecutive frames have been received with invalid or errored framing patterns. This is an alarm LED.
Frame Err	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.

Transmit Screens and Functions

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

The following functions are available through the DS3 Transmit screen.

- SET 1
- SET 2
- ERROR ALARM

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- FEAC CODES

Transmit - Settings 1 (SET 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 SET 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.

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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.

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Transmit - Settings 2 (SET 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.

Transmit - Errors and Alarms (ERROR ALARM)

This function allow you to enter errors or alarms.

The following options are available for the DS3 ERROR ALARM screen:

Option	Description
Error to Insert	Inserts an error that is transmitted by the DS3 protocol processor. The options available include:

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	• **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

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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.

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**
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**).
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.
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 Code	Displays the last alarm or status detected by the unit and how long ago (in seconds) it was detected.

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Last RX Loopback Status	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.
Burst	Resets the number of seconds since an alarm to zero.

Receive Screens and Functions

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.

- SET 1
- SIG
- Chan Scan

Receive - Settings 1 (SET 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 SET 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.
Termination Type	Configures the DS3 line input termination. Select one of the following options: • **Terminated:** Sets the Receive

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	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.

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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.

Receive - Signal Status (SIG)

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 SIG 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 - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

  The following calibration functions are available:

  - Select **Negative** or **Positive** to calibrate the following readings:
    - Zero Power Reading
    - 0.2 Volts Reading
    - 0.8 Volts Reading

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.

> The user must have Admin or Calibrate privileges to enable the calibration mode.

3. See Calibrate DS 1 Electrical Power for specific calibration instructions before proceeding.
4. After setting the power and volt readings, select the **Save** button to update the signal calibration.

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Receive - Channel Scan (Chan 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.

Result Screens and Functions

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
- ERR
- ALARM
- EVENT
- LARGE LED
- GRAPH

Results - SCAN

The SCAN function provides a list of received errors and alarms for the DS3 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.

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 Error
- P-Parity
- C-Parity
- FEBE

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Results - ALARM

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

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.

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.

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Results - GRAPH

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 Graphs in the Common Tasks section of the Online Help.

Test Screens and Functions

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

The Test screen contains the following functions:

- SET 1
- Service Disrptn

Test - Settings 1 (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.

Test - Service Disruption

The unit can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Consecutive Good Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. The range is 0.106 to 27.133 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required**: This function allows you to enter the number of consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 255 frames and is entered using a keypad.

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- **Consecutive Bad Time Required**: This function allows you to enter the time-duration (in milliseconds) of consecutive errored frames to elapse before Protection Switch measurements begin to accumulate. The range is 0.106 to 27.133 milliseconds and is entered using a keypad.
- **Consecutive Bad Frames Required**: This function allows you to enter the number of consecutive errored frames to occur before Protection Switch measurements begin to accumulate. The range is 1 to 255 frames and is entered using a keypad.
- **State**: Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

  - **Single APS**: Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.
  - **Continuous APS**: Constantly monitors for service disruption events, and updates the seconds and frames reported.
  - **Stop APS:** Stops service disruption monitoring. The State returns to Inactive.
- **Protection Switch Time (MilliSecs)**: Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.
- **Protection Switch Time (Frames)**: Indicates the number of errored frames received during the service disruption event.

For more information about monitoring service disruption activity, select *Measuring Service Disruption Activity* in the Common Tasks section of the online help.

Performance Monitoring Screens and Functions

The DS3 Perf Monitor screen includes the following functions:

- LINE
- Path
- BIT

Perf Monitor - LINE

Performance Monitoring provides greater detail about incoming Line errors.

The following statistics are reported on the LINE screen:

DS3 Line Statistics	Description
CV	Line Code Violation. This is an error count of incoming B2 errors.

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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.

Perf Monitor - PATH

Performance Monitoring provides greater detail about incoming P-Parity and C-Parity errors.

The following statistics are reported on the PATH screen:

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.

Perf Monitor - PATH

Performance Monitoring provides greater detail about incoming P-Parity and C-Parity errors.

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The following statistics are reported on the PATH screen:

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.

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Index

C

Calibration 4

F

FEAC Codes 6

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ATM Online Help

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Table of Contents

ATM Protocol Processor Overview 1
Technical Specifications 2
ATM Specific Tasks Overview 5
Activate or Disable VCC Table Data Transmission and Monitoring 5
Add an SVC 5
Edit an SVC 7
Add a VCC Table 7
Permanent Virtual Circuit (PVC) 8
Edit a VCC Table 12
Delete a VCC Entry or Table 12
Enable Signaling 12
Filter Signaling Messages 13
Initiate a Loopback Test 13
Insert ATM Alarms 14
Insert ATM Errors 14
Monitor ATM Activity 15
Perform Load Tests 15
Print a Report 15
Recall a VCC Table 16
Save a VCC Table 16
Start and Stop a VCC Scan 16
Transmit a Burst Count 17
Use Turbo Add to Add Multiple VCCs 17
ATM Screen Functions and Descriptions Overview 19
LED Quick Status Area 19
Configuration (Config) Screens and Functions 20
Config - Settings (SET) 20
Config - SVC 24
QoS Class 24
AAL Type 24
CPCS SDU Size 25
Traffic Type 25
Peak Cell Rate (PCR) 26

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Sustained Cell Rate (SCR) 27
Traffic Combination 28
Tagging 28
Default Called Party Address 28
Optional SVC 28
Config - TMR 29
Config - Signaling Filters (SIG FTRS) 29
Config - Load Test 31
VCC Table Screens and Functions 32
VCC Table - VCC CNTRL 33
TX On/Off 33
RX On/Off 34
All TX Mode 34
All RX Mode 35
VCC TX Mode 35
VCC RX Mode 35
VCC Table - Edit Table (EDIT TBL) 36
Edit VCC 36
Add VCC 36
Turbo Add 36
Delete Table 37
Save Table 37
Recall Table 37
VCC Table - Background (BKGND) 38
VCC Table - Summary (SUM) 38
VCC Table - VCC Results (VCC RES) 39
VCC Table - QoS Results (QoS RES) 39
VCC Table - O.191 Results (O.191 RES) 40
VCC Table – Qos Analysis (QoS ANAL) 42
Function (Functns) Screens and Functions 43
Functns - VCC Burst 43
Functns - Error Generation (ERR GEN) 43
Functns – Alarm Generation (ALARM GEN) 45
Functns - Network Impairment (NET IMP) 46
Cell Error Generation 46

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Cell Loss....47
Cell Misinsertion....48
Cell Delay Variation....49
Cell Reordering....49
CLP Tagging....49
CI Setting....50
VPI/VCI Remapping....50
Functns - LOOP BACK....50
Functns - VCC SCAN....51
Functns - PM OAM....52
Functns - Capture Settings (CAPT)....53
Test Screens and Functions....54
Test - Settings 1 (SET 1)....54
Results Screens and Functions....58
Results - SCAN....58
Results - ERR....58
Results - ALARM....59
Results - EVENT....59
Results - LARGE LED....59
Results - GRAPH....60
Results – CALL RESULTS (CALL RES)....60
Index....62

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ATM Protocol Processor Overview

This ATM section is divided into two areas:

- ATM Specific Tasks
- ATM Screen Functions and Descriptions

28 September 04

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Technical Specifications

Specification	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;

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	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 SVCs, Called SVCs
SVC Signaling Support	Call establishment, Cyclic calls, Call bursts, user defined SETUP message, background traffic
SVC Monitoring	All statistics, UNI signaling, 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

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ATM Specific Tasks Overview

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 Help 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**.
3. Select **Signaling** 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 Type.**

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- 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 Forward Traffic Descriptor screen.
    - Select **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 Backward Traffic Descriptor portion of the screen.
    - Select **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.

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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**.

Edit an SVC

This function allows you to edit an SVC.

The Edit VCC button modifies parameters of an existing virtual channel listed in the VCC Table. If there are no virtual channels listed in the VCC Table, then this button is disabled. Also this button is changed to View VCC when transmission or reception is on. View VCC allows you to view the parameters of the VCC without being able to edit them.

1. Select **VCC Table**.
2. Select **Edit Tbl**.
3. Choose the SVC table to be edited from the VCC Table grid and select the **Edit VCC** button. The Edit VCC <#> Type: SVC dialog box appears.

    You can also scroll to the table to be edited by selecting the Prev or Next buttons on the Edit VCC window.
4. See the section *Add an SVC* for descriptions of the options on the Edit screen. After the appropriate parameters are modified, select **Save**.

Add a VCC Table

The Add VCC function allows you to create or edit a new virtual channel in the VCC Table.

1. Select **VCC Table**.
2. Select **Edit Tbl**.
3. Select **Add VCC**. The Select VCC Type window appears.
   - When Signaling is not enabled, the Add VCC function adds a PVC. When Signaling is enabled the Add function opens the Select VCC Type list box from which you can select PVC or SVC.
4. Select **PVC** or **SVC**.
   - The PVC function allows you to add a permanent virtual channel. When selected, the Add VCC screen appears. Modify the appropriate PVC parameters. See the section *Permanent Virtual Circuit (PVC)* for additional information.
   - The SVC function allows you to add a switched virtual channel (SVC). When selected, the Add SVC screen appears. Modify the appropriate SVC parameters. See the section *Add an SVC* for additional information on adding SVCs.
5. When the appropriate parameters are modified, select **Save**.

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Permanent Virtual Circuit (PVC)

The following options are available on the Add or Edit VCC screen when Signaling is disabled, or when Signaling is enabled and Add VCC - PVC is selected.

Option	Description
Header Field	The Header Field is responsible for describing the type and destination of the ATM cell. For the Edit VCC button, the Header Field command displays the header components for the current virtual channel. If you press the Header Field button, then the Header Field Entry keypad appears. After entering a Header Field, select **Save** to confirm your entries. **GFC:** Generic Flow Control. Sets the first four bits of the ATM cell header for a UNI interface. The GFC field allows the use of wild card characters. A wild card is transmitted as a 0 and can be received as a 0 or 1. **VPI:** Virtual Path Identifier. This is a routing field for the network. If the connection is set for UNI, then is field is an 8 bit value. If the ATM connection is set for NNI, then this field is a 12 bit value (there is no GFC). **VCI:** Virtual Channel Identifier. This field, used together with the VPI, is the routing field for a cell. It is a 16 bit value. VCI values of 3, 4, 6, and 7 are reserved for F4 and Resource Management OAM cells and cannot be entered using the keypad. In addition, a VCI of 0 with a VPI of 0 is an idle cell and is not allowed. **PTI:** Payload Type Indicator. Only the last two bits, which are used for congestion indication, can be set. If the PTI is set to 0 then the value is User Data and No Congestion. If the PTI is set to 1, then the value is User Data with Congestion. The PTI field allows the use of wild card characters. A wild card is transmitted as a 0 and can be received as a 0 or 1. **CLP:** Cell Loss Priority. Sets bit 32 of the cell header. CLP can be set to either 0 or 1 (binary). A 0 indicates a high-priority cell and a 1 indicates a low-priority cell. The CLP field allows the use of wild card characters. A wild card is transmitted as a 0 and can be received as a 0 or 1.
Transmit Pattern	Selects the payload pattern sent in the transmit ATM stream for an individual virtual channel. **2^15-1 PRBS** - Payload pattern transmitted is a random test pattern at 2^15-1 length. **2^15 PRBS (INV)** - Payload pattern transmitted is an inverted PRBS pattern of 2^15-1 length. **All Zeros** - Payload pattern transmitted is a continuous all-zeros pattern (000000. . .). **All Ones** - Payload pattern transmitted is a continuous all ones pattern (111111. . .). **1010** - Payload pattern is a repeating pattern of alternating ones and zeros (101010. . .). **Full PDU Programmable** - Full Protocol Data Unit (PDU)

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	Programmable. A PDU length is entered using a keypad. Values can range up to 100 bytes in length. **User Defined** - Define any 32 bit (four byte) pattern that is repeated 48 times to make up the ATM Cell Payload. **O.191 REV-0** - O.191 Revision-0 Cell format **O.191 REV-1** - O.191 Revision-1 Cell format
Receive Pattern	This function defines the payload pattern that is checked for bit errors if detailed monitoring is enabled. **2^15-1 PRBS** - Payload pattern received is a random test pattern at 2^15-1 length. **2^15 PRBS (INV)** - Payload pattern received is an inverted PRBS pattern of 2^15-1 length. **All Zeros** - Payload pattern received is a continuous all-zeros pattern (000000. . .). **All Ones** - Payload pattern received is a continuous all ones pattern (111111. . .). **1010** - Payload pattern is a repeating pattern of alternating ones and zeros (101010. . .). **Full PDU Programmable -** Full Protocol Data Unit (PDU) Programmable. A PDU length is entered using a keypad. Values can range up to 100 bytes in length. The number of full PDU connections allowed is four each on the Transmit and Receive sides. **User Defined -** Define any four byte pattern that is repeated 12 times to make up the ATM Cell Payload. **O.191 REV-0** - O.191 Revision-0 Cell format **O.191 REV-1** - O.191 Revision-1 Cell format
AAL	Sets the ATM Adaptation Layer (AAL) protocol for both transmit and receive. The AAL accomplishes a conversion from a higher level protocol into the ATM layer, that is, segmentation of the original and larger set of data into the size and format of an ATM cell (5 octet header and 48 octets of data or payload). **0** - ATM Adaptation Layer 0 is used. AAL0 denotes an absence of any AAL function, meaning that AAL0 is not really an AAL type in the true sense of the term. AAL0 simply is the transfer of individual cells with no protocol processing of the cell payloads. **1** - ATM Adaptation Layer 1 protocol is used. The ATM Cell consists of a 47 byte payload, a 1 byte sequence number, sequence number protection field and convergence ID field, and a 5 byte header. **5** - ATM Adaptation Layer 5 protocol is used. AAL 5 supports variable length data packets or PDUs (1 to 65512 octets). AAL5 utilizes a minimum of overhead for each PDU it sends. The entire payload is used for data except for the last cell in the PDU. Functionally, this larger type supports variable bit rate, delay tolerant, connection-oriented data traffic requiring minimal sequencing or error detection support.
AAL1 CSI Byte Does not appear if AAL1 IS NOT selected.	Sets the AAL1 protocol's Convergence Sublayer Indication (CSI) bit 0 or 1. Use the buttons on the keypad to toggle between 0 and 1. Up to

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	eight bits can be entered (value is equivalent to 255 in decimal). The default value is 0 bit.  This command is available only when using AAL1 protocol.
AAL5 PDU Length Does not appear if AAL5 IS NOT selected.	Sets the length of the AAL5 Protocol Data Unit (PDU). A PDU length is entered using a keypad. Values can range from 2048 to 65,512 bytes in length. The default value is 4800 bytes. There are PDU length limitations for CRC, LEN, and Padding errors.  This command is available only when using AAL5 protocol.
AAL5 COCS UU Octet Does not appear if AAL5 IS NOT selected.	This parameter sets the ATM Adaptation Layer 5 (AAL5) Common Part Convergence Sublayer (CPCS) User-to-User (UU) information octet. A CPCS UU length can be up to eight bits and is entered using a keypad.  This command is available only when using AAL5 protocol.
Traffic Shaping	This function selects the type of data algorithm used to buffer cells before transmitting data to the network. **Rt-VBR** - Real-time Variable Bit Rate. Uses a real-time dual leaky bucket algorithm (GCRA) and characterized by Sustained Cell Rate (SCR) and Peak Cell Rate (PCR). **Nrt-VBR** - Non-real-time Variable Bit Rate. Uses a non-real-time dual leaky bucket algorithm (GCRA) and characterized by Sustained Cell Rate (SCR) and Peak Cell Rate (PCR). **CBR** - Constant Bit Rate. Supports CBR traffic. CBR is used by connections that request a static amount of bandwidth that is continuously available during the connection lifetime. The amount of bandwidth is characterized by Peak Cell Rate (PCR). **UBR** - Unspecified Bit Rate. If this option is selected then the Peak Cell Rate (PCR), Sustained Cell Rate (SCR), and Max Burst Size (MBS) commands are disabled. Specifically, UBR does not include the notation of a per-connection negotiated bandwidth. UBR channels will attempt to equally share, but not guarantee, any remaining bandwidth after all CBR or VBR channels are allocated.
Peak Cell Rate Does not appear if UBR Traffic Shaping IS NOT selected.	For more information see the section *Peak Cell Rate*.
Sustained Cell Rate Does not appear if UBR or CBR Traffic Shaping IS NOT selected.	This function sets the Sustained Cell Rate (SCR) for VBR traffic, and is only available only for VBR Traffic Shaping. The SCR is entered using a keypad and can be represented in the following units of measure: • Bandwidth Percentage • Mbps • Kbps • Cells per Second

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	These units are defined by the Units of Measure command located in the Config Set function.
Max Burst Size Does not appear if UBR or CBR Traffic Shaping IS selected.	This function sets the maximum number of cells that can transmit at the peak rate and still be in conformance with the Traffic Shaping algorithm. It is only available for VBR Traffic Shaping. If the maximum burst size (MBS) is changed from a value of 2, then the Peak Cell Rate defaults to 100 percent.
CDVT Does not appear if UBR or CBR Traffic Shaping IS selected.	Cell Delay Variation Tolerance. Set CDVT to maximum of 1047552.
Edit ABR Parameters Appears only if Traffic Shaping is ABR.	This function allows you to set the default ABR parameters for SVCs. **ICR** - This function sets the Initial Cell Rate (ICR) for ABR traffic, and is available only for ABR Traffic Shaping. The ICR is entered using a keypad and can be represented in the following units of measure: • Bandwidth Percentage • Mbps • Kbps • Cells per Second These units are defined by the Units of Measure command located in the Config Set screen. **RIF** - This function allows you to set the Rate Increase Factor and controls the amount by which the cell transmission rate may increase upon receipt of a Resource Management (RM) cell. RIF is a power of two, ranging from ½^15 to 1. RIF is entered using a keypad, which allows you to enter the value of n, and the RIF is calculated as ½^n. **RDF** - This function allows you to set the Rate Decrease Factor and controls the amount by which the cell transmission rate may decrease upon receipt of a Resource Management (RM) cell. RIF is a power of two, ranging from ½^15 to 1. RDF is entered using a keypad which allows you to enter the value of n and the RDF is calculated as ½^n. **MCR** - This function sets the Minimum Cell Rate (MCR) for ABR traffic, and is available only for ABR Traffic Shaping. The MCR is entered using a keypad and can be represented in the following units of measure: • Bandwidth Percentage • Mbps • Kbps • Cells per Second These units are defined by the Units of Measure command located in the Config Set screen.

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O.191 Block Size	Appears only if Receive Pattern is O.191 REV-0 or O.191 REV-1.
O.191 CLP Flow	Appears only if Receive Pattern is O.191 REV-0 or O.191 REV-1.

Edit a VCC Table

The Edit VCC button modifies parameters of an existing virtual channel listed in the VCC Table. If there are no virtual channels listed in the VCC Table, then the button is disabled. The button changes to 'View VCC' when transmission or reception is on, which allows you to view the parameters of the VCC but not edit them.

1. Select **VCC Table**.
2. Select **Edit Tbl**.
3. Choose the table to be edited from the VCC Table grid and select the **Edit VCC** button. The Edit VCC <#> dialog box appears.

   You can also scroll to the table to be edited by selecting the **Prev** or **Next** buttons on the Edit VCC window.
4. When the appropriate parameters are modified, select **Save**.

Delete a VCC Entry or Table

1. Select **VCC Table**.
2. Select **Edit Tbl**.
3. You can delete a single entry or entire table.
   - 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** button 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 Signaling

1. Select **Config** and **SET**.
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 signaling PCR, select **Signaling PCR** and set the value.
5. To specify the Timer values, select **TMR**.
6. Select **Signaling** and select **Enable**.

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Filter Signaling Messages

1. Select **Config**.
2. Enable **Signaling**.
3. Select **SIG FTRS**.
4. Select **Signaling Filter** and select **Enable**.
5. Select **Filter Type** and choose a filter.
   a. If the filter type selected is Message Filter, Message and Call Reference Flag, or Message and Call Reference Value, then
      - Select the **Add** button at the bottom of SIG FTRS screen to open the Select Signaling Message Type dialog box.
      - Select the signaling message to be filtered.
   b. If the filter type selected is Call Reference Flag, Message and Call Reference Flag, or Call Reference Value and Flag, then
      - Select the **Call Reference Flag** button to open the Select Call Reference list box.
      - Set the value to **1** or **0**.
   c. If the filter type selected is Call Reference Value, Message and Call Reference Value, or Call Reference Value and Flag, then
      - Select the **Call Reference Value** button to open the Enter Call Reference Value with Mask calculator 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**.
4. Select **Loopback Response**.
5. Select **Enable**.
6. Select **Functns**.
7. Select **Loopback**.
8. Choose 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.

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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 set 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 choose an error type.
6. Select **Error Insertion Rate** and set 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 choose 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.

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5. Select **Error Insertion Rate** or **Duration of Error Insertion**.
6. Select **Off**.

Monitor ATM Activity

Various ATM test and event activity can be viewed by selecting the ATM Results button. For more information about the Results screen see the section *Results Screens and Functions*.

You can also display a summary report of current cell activity, bandwidth percentage used, virtual channel status, and virtual channel totals for a VCC table by using the SUM function.

To access the SUM function:

1. From the ATM protocol processor, select **VCC Table**.
2. Select **SUM**.

Perform Load Tests

1. Select **Config** and **SET**.
2. Select the **signaling** button and choose **Enable**.
3. Select **Load Test**.
4. Select **Type of Test** and choose a test type.
5. Select **Calls per Second** and enter a value.
    - If the type of test selected is Call Burst Test, 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:

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1. Select the Common Function button **Print Report** located 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.

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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.

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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**.

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ATM Screen Functions and Descriptions Overview

The following function screens are available through the ATM protocol processor tab:

- LEDs
- Config
- VCC Table
- Functions
- Results

LED Quick Status Area

The ATM Processor Alarm and Status Indicators serve 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

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	any active details channel.
STA	Status. Indicates that a VCC has received cells with the CLP = 1.
CLP	Cell Loss Priority. 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.

Configuration (Config) Screens and Functions

The Config function provides access to functions that configure the system. The following options are available:

- SET

The options below only appear when ATM Interface is not set to NNI:

- SVC
- TMR

The options below only appear when ATM Interface is not set to NNI, ATM Mapping is configured, and Signaling is enabled:

- SIG FTRS
- LOAD TEST

Config - Settings (SET)

The SET button allows you to configure the system for a specific type of ATM interface (UNI or NNI). You can also set the unit of measure for the ATM interface (which defaults

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to a percentage of bandwidth), define how you numerically enter values for the VPI and VCI (these values default to Hex representation), and enable signaling.

The following options are available:

Option	Description
ATM Interface	Configures the system for User-to-Network Interface (UNI) or Network Node Interface (NNI) mode. Set this command based on the type of connection used by your ATM equipment. The following options are available for this command. • **User-UNI3.0:** User Network Interface version 3.0. If UNI is selected, then the Header Field uses a 4-bit GFC and an 8-bit VPI. • **User-UNI3.1:** User Network Interface version 3.1. If UNI is selected, then the Header Field uses a 4-bit GFC and an 8-bit VPI. • **User-UNI4.0:** User Network Interface version 4.0. If UNI is selected, then the Header Field uses a 4-bit GFC and an 8-bit VPI. • **NNI:** Network Node Interface. If NNI is selected, then the Header Field uses a 12-bit VPI and no GFC.

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ATM Mapping	Physically maps ATM to one of the following interfaces (some mappings will only appear if you are currently running in that protocol processor mode): **For SDH:** None, STM-0 C11 ATM, STM-0 C12 ATM, STM-0 C2 ATM, STM-0 C3 ATM, STM-1 C11 ATM, STM-1 C12 ATM, STM-1 C2 ATM, STM-1 C3 ATM, STM-1 C4 ATM, STM-0e C11 ATM, STM-0e C12 ATM, STM-0e C2 ATM, STM-0e C3 ATM, STM-1e C11 ATM, STM-1e C2 ATM, STM-1e C3 ATM, STM-1e C4 ATM, STM-1e C11 ATM, STM-4 C11 ATM, STM-4 C12 ATM, STM-4 C2 ATM, STM-4 C3 ATM, STM-4 C4 ATM, STM-4 C4-4c ATM **For SONET:** OC-1 VT1.5 ATM, OC-1 VT2 ATM, OC-1 VT6 ATM, OC-1 Full SPE ATM, OC-3 VT1.5 ATM, OC-3 VT2 ATM, OC-3 VT6 ATM, OC-3 Full SPE ATM, OC-3 STS-3c ATM, STS-1 VT1.5 ATM, STS-1 VT2 ATM, STS-1 VT6 ATM, STS-1 Full SPE ATM, STS-3 VT2 ATM, STS-3 VT6 ATM, STS-3 Full SPE ATM, STS-3 STS-3c ATM, OC-12 VT1.5 ATM, OC-12 VT2 ATM, OC-12 VT6 ATM, OC-12 Full SPE ATM, OC-12 STS-3c ATM, OC-12 STS-12c ATM **For PDH:** None, E1 #1 ATM Direct, E1 # 1 ATM PLCP, E1 #2 ATM Direct, E1 #2 ATM PLCP, E3 ATM Direct (G.751), E3 ATM PLCP **For DS1/DS3:** DS1 #1 ATM Direct, DS1 #1 ATM PLCP, DS1 #2 ATM Direct, DS1 #2 ATM PLCP, DS3 ATM Direct, DS3 ATM PLCP, ATM STSX-1, ATM STS-3c, ATM STS-3c in STS-12, ATM STS-12c
Unit of Measure	Determines how the bandwidth of the ATM interface is represented in units of measure. The following options are available for this command. **% Bandwidth:** The bandwidth of the ATM Interface is entered and displayed as bandwidth percentage. **Mbps:** The bandwidth of the ATM Interface is entered and displayed as Mbps. **Kbps:** The bandwidth of the ATM Interface is entered and displayed as Kbps. **Cells/Second:** The bandwidth of the ATM Interface is entered and displayed as cells-per-second.

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VPI/VCI Numeric Representation	Determines whether the VPI (Virtual Path Identifier) and VCI (Virtual Circuit Identifier) are represented as Hexadecimal or Decimal values. This affects how the VPI and VCI values are displayed on screen and how these values are entered using the Header Field keypad. The following options are available for this command. **Hex:** Uses hexadecimal values for the VPI and VCI. **Decimal:** Uses decimal values for the VPI and VCI.
Cell Scrambling	Enables or disables ATM cell payload scrambling. The default setting is **Disable**. When on, ATM cell payloads are scrambled when transmitted and descrambled when received.
Loopback Response	Enabling this function allows the system to generate a loopback test to ATM equipment on the network. Note: This function is only workable if connected to another test unit.
ADTF	Allowed Cell Rate Decrease Time Factor. Sets the ACR Decrease Time Factor for ABR traffic. This is entered using a keypad, and the range is from 0.01 to 10.23 seconds.
TRM	This function allows you to set the value for upper bound on the time between forward RM (Resource Management) cells. This is entered using a keypad. The TRM value can take 100*2n, where n can range from –7 to 0.
O.191 Cell Scrambling	Enables or disables O.191 cell scrambling. The default setting is Enable. When enabled, O.191 cells are scrambled when transmitted and descrambled when received.
Signaling	**Note**: For Signaling options to be active the ATM Interface must NOT be set to NNI and ATM Mapping must be configured. Configures the system to enable or disable signaling. The following options are available for this command: **Enable:** Enables signaling **Disable:** Disables Signaling.

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Signaling PCR	**Note**: For Signaling options to be active the ATM Interface must NOT be set to NNI and ATM Mapping must be configured. Sets the Peak Cell Rate for the Signaling channel.
Address Plan	**Note**: For this option to be active, the ATM Interface must NOT be set to NNI. Sets the address of the system. Two addressing format options are available for this command: **NSAP-AESA:** The Network Service - Access Point ATM End System Address is set by this command. Three fields can be edited: N/W Prefix, ESI, and Selector. **E.164 Native:** The End system address is set by this command. N/W Prefix field can be edited

Config - SVC

The SVC function allows you to set the default SVC setup parameters QoS class, traffic parameters and called party address. The SVC screen is only available when ATM Interface is not set to NNI.

The following options are available:

- QoS Class
- AAL Type
- CPCS SDU Size
- Traffic Type
- Peak Cell Rate (PCR for CLP0, PCR for CLP0 + 1)
- Sustained Cell Rate (SCR for CLP0, SCR for CLP0 + 1)
- Max Burst Size (MBS for CLP0, MBS for CLP0 + 1)
- Traffic Combination
- Tagging
- ABR Parameters
- Default Called Party Address

QoS Class

Sets the QoS class. The options available for this command are 0, 1, 2, 3 and 4.

AAL Type

Sets the ATM Adaptation Layer (AAL) protocol for both Transmit and Receive. The AAL accomplishes a conversion from a higher level protocol into the ATM layer that is

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segmentation of the original and larger set of data into the size and format of an ATM cell (5 octet header and 48 octets of data or payload).

The following options are available for this command:

Option	Description
0	ATM Adaptation Layer 0 is used. AAL0 denotes an absence of any AAL function, meaning that AAL0 is not really an AAL type in the true sense of the term. AAL0 simply is the transfer of individual cells with no protocol processing of the cell payloads.
1	ATM Adaptation Layer 1 protocol is used. The ATM Cell consists of a 47-byte payload, a 1-byte sequence number, sequence number protection field and convergence ID field, and a 5 byte header.
5	ATM Adaptation Layer 5 protocol is used. AAL 5 supports variable length data packets or PDUs (1 to 65,535 octets). AAL5 utilizes a minimum of overhead for each PDU it sends. The entire payload is used for data except for the last cell in the PDU. Functionally, this larger type supports variable bit rate, delay tolerant, connection-oriented data traffic requiring minimal sequencing or error detection support.
CPCS SDU Size	This command sets the size in bytes of a Service Data Unit of the Common Part Convergence Sublayer. SDU Size is entered using a keypad. Values can range from 2,048 bytes to 65,512 bytes in length. The default value is 4,800 bytes.

CPCS SDU Size

This command sets the size in bytes of a Service Data Unit of the Common Part Convergence Sublayer. SDU Size is entered using a keypad. Values can range from 2048 bytes to 65,512 bytes in length. The default value is 4800 bytes.

Traffic Type

This function selects the type of data algorithm used to buffer cells before transmitting data to the network. The following options are available for this command.

Option	Description
Rt-VBR	Real-time Variable Bit Rate. Uses a real-time single leaky bucket algorithm (GCRA)

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	and characterized by Sustained Cell Rate (SCR) and Peak Cell Rate (PCR).
Nrt-VBR	Non-Real-Time Variable Bit Rate. Uses a non-real-time single leaky bucket algorithm (GCRA) and characterized by Sustained Cell Rate (SCR) and Peak Cell Rate (PCR).
CBR	Constant Bit Rate. Supports CBR traffic as a subclass of VBR traffic. CBR is used by connections that request a static amount of bandwidth that is continuously available during the connection life time.
UBR	Unspecified Bit Rate. Specifically, UBR does not include the notation of a per-connection negotiated bandwidth. UBR channels will attempt to equally share, but not guarantee any remaining bandwidth after all CBR or VBR channels are allocated.
ABR	Available Bit Rate. Performs dynamic traffic shaping based on feedback received from the network.
CBR with CLR	Constant Bit Rate. Supports CBR traffic as a subclass of VBR traffic. CBR is used by connections that request a static amount of bandwidth that is continuously available during the connection lifetime. The maximum cell loss ratio can be specified. This can be set only if the ATM Interface is User-UNI4.0
RtVBR with CLR	Real-Time Variable Bit Rate. Uses a real-time single leaky bucket algorithm (GCRA) and characterized by Sustained Cell Rate (SCR) and Peak Cell Rate (PCR). The maximum cell loss ratio can be specified. This can be set only if the ATM Interface is User-UNI4.0
NrtVBR with CLR	Non-Real-Time Variable Bit Rate. Uses a non-real-time single leaky bucket algorithm (GCRA) and characterized by Sustained Cell Rate (SCR) and Peak Cell Rate (PCR). The maximum cell loss ratio can be specified. This can be set only if the ATM Interface is User-UNI4.0

Peak Cell Rate (PCR)

This function sets the Peak Cell Rate (PCR) for VBR and CBR traffic and is available only for VBR and CBR Traffic Shaping.

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If the PCR is not at 100 percent of line rate for non-OC-12 (or 25 percent for OC-12), then the Max Burst Size defaults to two. If the PCR is changed for a single CBR virtual channel, then all CBR channels are changed to the new PCR value.

The PCR is entered using a keypad and can be represented in the following units of measure:

- Bandwidth Percentage
- Mbps
- Kbps
- Cells per Second

These units are defined by the Units of Measure command located in the Config Set screen.

PCR for CLP0 sets the Peak Cell Rate for all cells with CLP field in the Header equal to 0.

PCR for CLP0+1 sets the Peak Cell Rate for all cells with CLP field in the Header equal to 0 or 1.

Sustained Cell Rate (SCR)

This function sets the Sustained Cell Rate (SCR) for VBR traffic, and is only available only for VBR Traffic Shaping. For VBR traffic shaping, the SCR is closely related to the Maximum Burst Size (MBS).

The SCR is entered using a keypad and can be represented in the following units of measure:

- Bandwidth Percentage
- Mbps
- Kbps
- Cells per Second

These units are defined by the Units of Measure command located in the Config Set function.

SCR for CLP0 sets the Sustained Cell Rate for all cells with CLP field in the Header equal to 0.

SCR for CLP0+1 sets the Sustained Cell Rate for all cells with CLP field in the Header equal to 0 or 1.

Max Burst Size (MBS)

This function sets the maximum number of cells that can transmit at the peak rate and still be in conformance with the Traffic Shaping algorithm. It is only available for VBR Traffic Shaping.

If the maximum burst size (MBS) is changed from a value of two, then the Peak Cell Rate defaults to 100 percent.

For VBR traffic shaping, MBS and SCR are related by the following equation:

SCR MBS / (MBS+1), where MBS > 2

MBS for CLP0 sets the Max Burst Size for all cells with CLP field in the Header equal to 0.

MBS for CLP0+1 sets the Max Burst Size for all cells with CLP field in the Header equal to 0 or 1.

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Traffic Combination

This function sets the traffic combination for SVC setup. The following options are available.

Option	Description
1	PCR CLP0 and PCR CLP0+1
2	PCR CLP0, PCR CLP0+1 and Tagging = Tagging Requested
3	PCR CLP0+1, SCR CLP0 and MBS CLP0
4	PCR CLP0+1, SCR CLP0, MBS CLP0 and Tagging = Tagging Requested
5	PCR CLP0+1
6	PCR CLP0+1, SCR CLP0+1 and MBS CLP0+1

Tagging

The following options are available for the Tagging function:

- **Yes**: Tagging Requested
- **No**: Tagging not requested

Default Called Party Address

Set the address of the called party. Two addressing format options are available for this command

- **NSAP-AESA:** Network Service Access Point ATM End System Address is set by this command. Three fields can be edited. N/W Prefix, ESI and Selector.
- **E.164 Native:** End system address is set by this command. N/W Prefix field can be edited.

Optional SVC

The Optional button appears when ATM Interface is set to UNI4.0. The Optional button allows you to set UNI4.0 parameters to valid or invalid states. When the optional parameters are validated, you are able to edit:

- Alternate Traffic Descriptor
- Extended QoS Parameters
- End to end Transmit Delay Parameters
- Min Acceptable Traffic Descriptor
- ABR Setup Parameters

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Config - TMR

This function allows you to set the timer values. All timer values are set using keypad and the range is from 1 second to 65535 seconds. The TMR screen is only available when ATM Interface is not set to NNI.

The following timer values can be set:

Timer	Description
T301	Timer for Alert
T303	Timer for Setup
T308	Timer for Release
T309	Timer for Link Connection
T310	Timer for Call Proceeding Received
T313	Timer for Connect
T316	Timer for Restart
T317	Timer for Restart Received
T322	Timer for Status
Timer for polling Message	Timer for polling Message
Timer for Keep Alive Message	Timer for Keep Alive Message
Timer for No Response	Timer for No Response
Timer for CC	Timer for Connection Control
Timer for idle	Timer for the Idle phase

Config - Signaling Filters (SIG FTRS)

This function allows filtering of Signaling messages. The SIG FTRS screen is only available when ATM Interface is not set to NNI, ATM Mapping is configured, and Signaling is enabled.

The following options are available:

Option	Description

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Signaling Filter	This function enables or disables the filtering of signaling messages. The following options are available: • **Enable:** Enables Signaling filter. • **Disable:** Disables Signaling filter.
Filter Type	This function specifies what the filtering should be based on. The following options are available: • Message Filter • Call Reference Value • Call Reference Flag • Call Reference Value and Flag • Message and Call Reference Flag • Message and Call Reference Value
Call Reference Value	This function specifies the Call Reference Value based on which filtering is to be done.
Call Reference Flag	This function specifies the Call Reference Flag value based on which filtering is to be done. The value can be either 0 or 1.
Filtering Messages	This function specifies the message to be filtered based on the filter type. One or more messages can be filtered. The following options are available: • Call Proceeding • Connect • Connect Acknowledge • Setup • Release • Release Complete • Signaling Status • Signaling Status Enquiry • Connection Restart • Restart Acknowledge • Alert
Add	Adds the message to the list of messages to be filtered.

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Delete	Deletes the message from the list of messages to be filtered.

Config - Load Test

This function allows you to perform load tests. The Load Test screen is only available when ATM Interface is not set to NNI, ATM Mapping is configured, and Signaling is enabled.

The following options are available:

Option	Description
Type of Test	This function allows you to set the type of Load Test to be performed. The following options are available. **Call Setup:** This function allows you to setup SVC at the rate of the number of calls per second specified for the duration mentioned. After the duration expires, the SVC is cleared. **Cyclic Load:** This function allows you to establish and release SVC connection at the rate of the number of calls per second specified for the duration mentioned. **Call Burst:** This function allows you to initiate setup calls at the rate of the number of calls per second specified for the duration mentioned with calls being initiated during the Burst Period specified and no calls being initiated during the Skip Period.
Calls Per Second	This function allows you to set the maximum number of calls per second. This is set using a keypad and the range is from 1 to 20. The Calls per Second can be set only if Type of Test is one of the options above.
Burst Period	This function allows you to set the Burst period. Burst period Defines the number of contiguous seconds during which SVC establishment takes place. The following options are available. • User Defined: Entered using a keypad and the range is from 1 to 4000. • Random Burst: A random number generated.

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Skip Period	This function allows you to set the Skip period. Skip period Defines the number of contiguous seconds during which no SVC are established. The following option is available: User Defined: Entered using a keypad and the range is from 1 to 256.
Duration	This function allows you to set the duration of the load test. The load test starts once the duration is set. The following options are available • Off: To stop the load test. • 1 Sec: Set the duration to 1 second. • 10 Sec: Set the duration to 10 seconds. • User Defined: Entered using a keypad and the range is from 1 to 65535. • Random: A random number generated.

VCC Table Screens and Functions

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 colors 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

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VCC Table - VCC CNTRL

The VCC Control function controls the transmission and monitoring of data traffic activity for an individual virtual channel or for multiple virtual channels. When selected, this function displays the virtual channels configured in the VCC Table.

The transmit (TX) and monitor (RX) states for each virtual channel appear in the TX and RX columns of the VCC Table screen display. A maximum of 20 virtual channels can appear on this screen. Use the **Page Up** and **Page Down** buttons (double arrows) to display the previous or next 20 entries in the VCC Table, or use the **Scroll Down** and **Scroll Up** buttons (single arrows) to scroll through the VCC Table one virtual channel at a time.

The following buttons are located at the bottom of the VCC Cntrl table:

- TX On/Off
- RX On/Off
- All TX Mode
- All RX Mode
- VCC TX Mode
- VCC RX Mode

TX On/Off

This button starts or stops the transmission of ATM cells on all enabled virtual channels listed in the VCC Table. The transmission status for each virtual channel appears in the TX column of the VCC Table, and displays the following values.

Option	Description
<on>	Indicates that the virtual channel is idle (enabled, but not transmitting data). When this value displays, the ATM TX Alarm and Status Indicator displays OFF.
ON	Indicates that the channel is enabled and transmitting ATM cells. The ATM TX Alarm and Status indicator displays ON.
(No Value Appears)	If the TX column is blank, then the channel is disabled. Refer to the All TX Mode and VCC TX Mode button descriptions for more information.

Note: When turned ON, all Enabled channels generate traffic. When Off (<on>), these channels are idle. If you do not want a specific virtual channel to transmit data, then you must Disable that channel before generating traffic flow.

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RX On/Off

This button starts or stops data traffic reception and monitoring on all enabled virtual channels listed in the VCC Table.

The monitor and detection status for each virtual channel appears in the RX column of the VCC Table and displays the following values.

Option	Description
<mon>	Indicates that the virtual channel is idle (enabled, but not receiving ATM Cells). When this value displays, the ATM RX Alarm and Status Indicator displays OFF.
MON	Indicates that the circuit is enabled and is receiving ATM Cells. The ATM RX Alarm and Status Indicator displays ON.
<det>	Indicates that the virtual channel is idle, and configured for Detailed Detection mode. This means that the virtual channel is monitoring for Bit, pattern sync, CRC, padding, length, SN/SNP, lost cells, misinserted cells errors (depending on the AAL type). A maximum of 34 channels can be detailed for AAL0, AAL1, or AAL5 (30 non-Full PDU and 4 Full PDU).
DET	Indicates that the channels are actively detecting for Bit, pattern sync, CRC, padding, length, SN/SNP, lost cells, misinserted cells errors (depending on the AAL type). A maximum of 34 channels can be detailed for AAL0, AAL1, or AAL5 (30 non-Full PDU and 4 Full PDU).
(No Value Appears)	If the RX column is blank, then that virtual channel is disabled. Refer to the All RX Mode button and VCC RX Mode button descriptions for more information.

All TX Mode

This button enables data transmission for up to 16 Transmit connections, starting from the current selection in VCC table. This button is only active when data transmission is Off (as displayed by the Tx-OFF indicator in the ATM LED Alarm and Status Indicators area).

If some channels are already disabled, and you press this button, then all channels are disabled. Selecting this button again enables all channels including any previously disabled channels. This button toggles all virtual channels between an enabled and disabled state.

The transmission status appears in the TX column and displays the following values.

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Option	Description
<on>	Indicates that the virtual channel is idle (enabled, but not transmitting ATM cells). When this value displays, the ATM TX Alarm and Status Indicator displays OFF.
(No Value Appears)	If the TX column is blank, then the virtual channel is disabled.

All RX Mode

This button globally enables or disables data monitoring for all virtual channels listed in the VCC Table. This button is only active when data monitoring is Off (as displayed by the Rx OFF indicator in the ATM LED Alarm and Status Indicators area).

If some channels are already disabled, and you press this button, then all channels are disabled. Selecting this button again enables all channels including any previously disabled channels. This button toggles all virtual channels between an enabled and disabled state.

Option	Description
<mon>	Indicates that the virtual channel is idle (enabled, but not receiving ATM cells). When this value displays, the ATM RX Alarm and Status Indicator displays OFF.
(No Value Displays)	If the RX column is blank, then the channel is disabled.

VCC TX Mode

This button enables or disables ATM Cell transmission for individual virtual channels in the VCC Table. This button is only active when data transmission is Off (Tx - OFF) as indicated in the ATM LED area. The typical button action sequence is to toggle between enable (<on>) and disable.

Option	Description
<on>	Indicates that the virtual channel is idle (enabled, but not transmitting ATM Cells). When this value displays, the ATM TX Alarm and Status Indicator displays OFF.
(No Value Displays)	If the TX column is blank, then the channel is disabled.

VCC RX Mode

This button enables or disables ATM Cell monitoring for individual virtual channels in the VCC Table. This button is only active when data monitoring is Off (Rx - OFF) as

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indicated in the ATM LED area. The typical button action sequence is to toggle between enabled (<mon> or <det>) and disabled.

Option	Description
<mon>	Indicates that the virtual channel is idle (enabled, but not receiving ATM Cells). When this value displays, the ATM RX Alarm and Status Indicator displays OFF.
<det>	Indicates that the virtual channel is idle, and configured for Detailed Detection mode. This means that the virtual channel is monitoring for Bit, pattern sync, CRC, padding, length, SN/SNP, lost cells, misinserted cells errors (depending on the AAL type). A maximum of 34 channels can be detailed for AAL0, AAL1, or AAL5 (30 non-Full PDU and 4 Full PDU).
(No Value Appears)	If the RX column is blank, then the channel is disabled.

VCC Table - Edit Table (EDIT TBL)

The Edit Table function allows you to modify the parameters of an existing virtual channel listed in the VCC table.

The EDIT TBL function includes the following commands:

- Edit VCC
- Add VCC
- Turbo Add
- Delete
- Save Table
- Recall Table

Edit VCC

For information on editing VCC tables see the section *Edit a VCC Table* on page 12 and *Edit an SVC* on page 7.

Add VCC

For information on adding VCC tables see the section *Add a VCC Table* on page 7 and *Add an SVC* on page 5.

Turbo Add

The Turbo Add button allows you to add several virtual channels to a VCC Table at once instead of having to enter ATM cell parameters for each individual virtual channel.

A total of up to 256 PVCs or 20 SVCs (if Signaling is Enabled) can be added at once.

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Channels added using this feature increment the VCI value based on the VCI starting point for the first virtual channel. Likewise, the parameter values entered are replicated for all virtual channels added using this feature. This includes all receive and transmit parameters, AAL settings, and traffic shaping. Once these channels are entered into the VCC Table, their parameters can be changed later, if necessary, using the Edit VCC button.

Only valid user VCIs above 32 decimal (20 Hex)VPI/ VCIs can be entered using Turbo Add. The following are invalid values for VPI/ VCI.

- VPI=0 and VCI=0
- VCI=3
- VCI=4
- VCI=6
- VCI=7

The Turbo Add button operates similar to the Add VCC button. The major difference is that you must identify the number of virtual channels to add. This is performed using the Number of VCCs to Add keypad. The Turbo Add button accepts values ranging from 1 to 256 (for PVCs) or from 1 to 20 (for SVCs).

Defining the Number of Virtual Channels to Add Using Turbo Add

After defining the number of virtual channels, the *Add VCC* Main Menu displays. This allows you to modify parameters for this group of virtual channels. For more information on these parameters, refer to Add VCC and Edit VCC.

Delete Table

Use this button to delete the current VCC Table. When selected, you are able to delete:

- **Single Entry:** Deletes the currently selected item.
- **Table:** Deletes the entire table.
- **Exit**: Cancels this function.

Once the active table is deleted using this button, it cannot be recalled unless it was previously saved using the **Save Table** command.

Save Table

Selecting the Save Table button opens a File Browser dialog box where you can enter a filename for the saved VCC Table. This button also allows access to the RAM drive (if using locally) or to your PC's hard drive (if using remotely).

Recall Table

When the Recall Table button is selected the File Browser dialog box appears displaying a list of files on the Flash drive or RAM drive. Saved VCC tables are included in this list. Choose the desired VCC table and select the **OK** button to load the table. VCC tables are designated by a .vcc extension.

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VCC Table - Background (BKGND)

This function allows you to configure a background pattern.

The following options are available from the BKGND function:

- **Add Sequence** – Select this button to open the Background Sequence Setting dialog box. The dialog box allows you to configure the following:
  - Header – See *Header Field* on page 8.
  - Payload – Allows you to specify an eight bit payload pattern.
  - Burst – Allows you to specify burst count from 1 to 255.
  - Skip – Allows you to specify a skip size from 1 to 255.
  - Delete – Allows you to delete a background sequence.
  - Save – After background settings are completed select the **Save** button to add the new sequence to the Background Sequence Setting table. Once saved, the following options are activated:
    - Enable/Disable (EN/Dis) – Allows you to disable or enable the selected sequence.
    - View/Edit – Allows you to view or edit the current settings for the selected sequence.
  - Cancel – Allows you to cancel any changes or additions you are in the process of making to a sequence.
- Start Traffic – Starts background traffic activity. Button changes to Stop Traffic.

VCC Table - Summary (SUM)

The Summary button displays a summary report of current cell activity, bandwidth percentage used, virtual channel status, and virtual channel totals for the current VCC Table.

All count values can be reset to zero using the **Restart** button in the Common Function Buttons.

The following information appears for a Summary Counts report:

- **Total Monitor Cells:** Displays the cell count and bandwidth of all virtual channels in the VCC Table that are currently configured with an active monitor (MON or DET) status.
- **Idle Cells:** Reports Cell Count and Bandwidth Percentage.
- **Discarded Cells:** Reports the total number of user cells (non-zero VCI and VPI cells) that are not part of the monitored traffic. The cell count and bandwidth percentage display.
- **Valid OAM Cells:** Reports the total number and bandwidth of valid Operation and Maintenance cells.
- **Errored OAM Cells:** Reports the total number and bandwidth of errored Operation and Maintenance cells.

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- **Transmit VCCs:** Reports the total number of virtual channels that are configured to transmit data. These channels are identified with the <on> status value in the VCC Table's TX column.
- **FNC Enabled VCCs:** Reports the total number of virtual channels that are error enabled.
- **Monitor VCCs:** Reports the total number of virtual channels that are configured to receive and monitor data traffic. These channels are identified with the <mon> status value in the VCC Table's RX column.
- **Detailed VCCs:** Reports the total number of detailed virtual channels.
- **VCC Table Entries:** Reports the total number of virtual channels (regardless of their TX and RX values) entered in the selected VCC Table.

VCC Table - VCC Results (VCC RES)

The VCC RES option displays a current status report for individual virtual channels defined in the VCC Table.

Use the **Previous** and **Next** buttons to scroll through and display other virtual channels in the VCC Table.

VCC Header Information

This line of information displays which virtual channel is currently selected (represented by #) and the associated values for GFC, VPI, VCI, PTI, and CLP.

As you display different virtual channels using the Previous and Next buttons, the status line is updated to reflect the selected virtual channel and its header settings.

VCC Error Counts and Rates Table

The following information can be reported on the Error Counts and Rates Table, depending on configuration settings.

- Cells Received
- Bit Errors
- Misinserted
- AAL0
- AAL5
- AAL5 PDUs
- Lost Cells
- SN + SNP
- AAL1

Alarm Seconds

- VPI (F4) AIS
- VCI (F5) AIS
- Pat Sync
- VPI (F4) RDI
- VCI (F5) RDI
- STA

VCC Table - QoS Results (QoS RES)

The Quality of Service (QOS) Results (Res) button displays a summary report of current ratio, rate, and count of cell transfer delay and cell delay variation activity.

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In order to receive QOS results, the *PM OAM* function must be enabled.

The following options are available:

Option	Description
Errored Cells	Displays the ratio of errored cells during the test.
Aggregate Cell Loss	Displays the ratio of cells lost during the test.
CLR for CLP=0	Displays the Cell Loss Ratio (CLR) for cells with Cell Loss Priority (CLP) bit 0 in ATM header.
CLR for CLP=1	Displays the CLR for CLP signaling bit in ATM header cell (1=low priority).
Misinserted Cells	Display the ratio of misinserted cells received.
SECB	Displays the ratio of Severely Errored Cell Blocks (SECB) received.
Non-Compliant to GCRA1	Displays the number of cells non-compliant to Generic Cell Rate Algorithm1.
Non-Compliant to GCRA2	Displays the number of cells non-compliant to Generic Cell Rate Algorithm 2 (valid for VBR channels).
CLP1 Cells	Displays the number of CLP cells in ATM header cell 1.

At the top of the screen, the VCC Header appears. This line of information displays which virtual channel is currently selected (represented by #) and the associated values for GFC, VPI, VCI, PTI, and CLP.

VCC Table - O.191 Results (O.191 RES)

The ITU defined O.191 test cell provides the most accurate method to calculate ATM-layer performance parameters for QoS tests.

The O.191 RES button displays a summary report of the ATM layer statistics for measuring ATM QoS.

VCC Header Information

At the top of the screen, the VCC Header appears. This line of information displays which virtual channel is currently selected (represented by #) and the associated values for GFC, VPI, VCI, PTI, and CLP.

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Use the **Previous** and **Next** buttons to scroll through and display other virtual channels in the VCC Table. As you display different virtual channels using the Previous and Next buttons, the status line is updated to reflect the selected virtual channel and its header settings.

Summary Report Table

O.191 testing returns the following information:

Data Type	Description
Minimum Cell Transfer Delay (CTD)	Minimum round-trip time for transmitted (foreground) test cells.
Maximum CTD	Maximum round-trip time for transmitted (foreground) test cells.
Mean CTD	Average round-trip time for transmitted (foreground) test cells.
Lost Count	The number of cells not received.
Errored Count	The number of cells received with payload bit errors.
Misinsertion Count	The number of cells detected on one virtual channel (VC) having payload information belonging to another VC.
SECB Count	The number of severely errored cell blocks (SECBs) received.
Loss Ratio	A measurement of the difference between the number of foreground test cells transmitted and the number of test cells received.
Error Ratio	The number of foreground test cells received with payload bit errors divided by the total number of transmitted test cells.
Misinsertion Rate	The rate of cells detected on one VC having payload information belonging to another VC.
SECB Ratio	The number of SECBs received divided by the total number of transmitted test cells.
Unavailable Seconds	The number of seconds for which switch equipment was unavailable to transmit test cells.
Availability Ratio	The number of unavailable switch equipment seconds divided by the total

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	number of available seconds.
MTBO	Mean time between outages (MTBO) represents the average time between equipment failures or significant outages that essentially render transmission useless.

VCC Table – QoS Analysis (QoS ANAL)

This function configures the protocol to receive and analyze ATM cell streams to ensure they conform to certain QoS parameters.

The **QoS Analysis Settings** box provides the following configuration options:

Option	Description
Type of Analysis	Allows analysis of One Point Cell Delay Variation (CDV) or Inter Arrival Time.
Header	Provides access to the following configuration settings: **Generic Flow Control (GFC)** - The first four bits of the ATM cell header for a UNI interface. **Virtual path identifier (VPI)** - The virtual path address over which the transmitted data will flow from the transmitting device to the target device. **Virtual Channel Identifier (VCI)** - The address or label of a Virtual Channel (VC). **Payload Type Indicator (PTI)** - The payload type field value distinguishing the various management and user cells. **Cell Loss Priority (CLP**) - A signaling bit in the ATM header cell (0=high priority, 1=low priority).
Expected Cell Rate	Keypad entry allows setting the minimum and maximum cell rate value.
Start (Stop)	Starts and stops the QoS analysis test. Test results display in the QoS Analysis Results table.

The QoS Analysis Results table provides the following output data:

Result Parameter	Description
Max CDV	Maximum cell delay variation (CDV) experienced because of buffering and cell

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	scheduling.
Min CDV	Minimum CDV experienced because of buffering and cell scheduling.

Function (Functns) Screens and 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

Functns - VCC Burst

This function transmits a controlled amount of traffic using either AAL0 cells, AAL1 PDUs, or AAL5 PDUs. The type of traffic transmitted is determined by the configured parameters of the active channel (the virtual channel currently highlighted in the VCC Table).

- **Burst Count:** This value represents the number of cells or PDUs sent per burst. This is the value entered using the Burst Count button.
- **AAL0 Cells Sent, AAL1 PDUs Sent, or AAL5 PDUs Sent:** If the virtual channel is configured for AAL0, then the total number of cells sent is displayed. If the virtual channel is configured for AAL1 or AAL5, then the total number of PDUs sent displays.
- **Start:** Select **Start** to transmit the VCC Burst.

Functns - Error Generation (ERR GEN)

Use this function to define how the system generates and transmits errors for testing purposes. The following commands are associated with the ERR GEN button.

Select the **Edit** button to display the following options:

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Option	Description
Type of Error Added	Select one of the following errors: • **None:** No errors are selected for transmission. • **HEC - Correctable:** Header Error Control. One bit in the Header is errored. Errors are inserted on all channels. • **HEC - Uncorrectable:** Header Error Control. Two or more bits in the Header are errored. Errors are inserted on all channels. • **Bit Error:** Bit errors are inserted only on the currently active channel as selected from the VCC Table. Bit errors are only inserted on AAL 0 or AAL 1 virtual channels. • **SN Error:** Inserts a Sequence Number error. • **SNP Error:** Inserts a Sequence Number Protection error. • **CRC Error:** Inserts a Cyclic Redundancy Check error. • **Padding Error:** Inserts a Padding error. • **PDU Length Error:** Inserts a Protocol Data Unit length error.
Error Insertion Rate	Sets the insertion rate for errors in the transmission stream. The following options are available for this command. • **Off:** No errors are inserted for transmission. • **Continuous (1):** Generates continuous errors into the transmission stream. If the system is configured to generate Bit errors, then this option does not display. • **1e-X:** Selects an error rate. Error rates range from 1e-1 through 1e-9. (For Bit errors, the error rates range from 1e-2 through 1e-9.) • **User Defined:** Allows you to enter a desired error insertion rate. Values are entered using a keypad display.

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Error Burst Count	Defines the number of contiguous cells that contain an error. Selects burst count X, where X ranges from 1 to 10.
Duration of Error Insertion	Determines how long errors are inserted into the data transmission stream. Error insertion begins once you have selected a duration value. The following options are available: • **Off:** Turns Off any error that is in progress by setting the timer to 0 seconds. • **1 second** • **10 seconds** • **60 seconds** • **User Defined:** Allows you to enter the duration of the error burst. Values are entered using a keypad display and range from 1 second to 32,765 seconds. • **Continuous:** Errors are constantly inserted at the selected error insertion rate.

Functns – Alarm Generation (ALARM GEN)

The Alarm Gen function allows you to define the type and duration of alarms transmitted by the system. This allows you to solicit a response from a specific network element and verify if that element is correct.

Option	Description
ATM Alarm Generated	Selects the type of alarm generated by the system. The following options are available for this command: • None • LOCS • F4 AIS (Segment) • F4 RDI (Segment) • F4 AIS (End-to-End) • F4 RDI (End-to-End) • F5 RDI (Segment) • F5 AIS (End-to-End) • F5 RDI (End-to-End) • Patten Sync

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Duration of Alarm Generation	Determines how long an alarm is generated. This alarm timer counts down to 0. • **Off:** Turns Off any alarm that is in progress by setting the timer to 0 seconds. • **1 second** • **10 seconds** • **60 seconds** • **Continuous:** Alarms are constantly reported at an interval of one per second for AIS and RDI alarms. • **User Defined:** Allows you to enter the duration of the alarm. Values are entered using a keypad display and range from 1 second to 32,765 seconds.
Defect Type	Select the type of alarm defect to transmit up to eight bits. **Note:** This function is only applicable for OAM alarms.

Functns - Network Impairment (NET IMP)

This function allows you to insert impairment types into an ATM cell stream to emulate real-world network impairments. You are able to insert the following impairment types:

- Cell Error Generation
- Cell Loss
- Cell Misinsertion
- Cell Delay Variation
- Cell Reordering
- CLP Tagging
- CI Setting
- VPI/VCI Remapping

Cell Error Generation

Cell errors are a result of bit errors caused by line noise. When **Cell Error Generation** is selected from the **Type** button on the **Functns** | **NET IMP** screen, the following parameters can be configured.

Option	**Description**

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Error Mask	Select up to eight bits of an octet for corruption.
Octet Select	Select 1 through 53 octets.
Header Select	Specify the VCC Header (to include GFC, VPI, VCI, and CLP) to be compared with these bits.
Burst Size	Select the number of consecutive cells (1-10) to be corrupted.
Burst Rate	Select the number of unerrored cells that should occur between cell errors. • **Off:** No cells are inserted for transmission. • **Continuous (1):** Generates cell generation into the transmission stream. • **1e-X:** Selects a cell generation rate. Error rates range from 1e-1 through 1e-9. • **User Defined:** Allows you to enter a desired cell generation rate. Values are entered using a keypad display.
Duration	Select how long the impairment will occur. The options are: Off, 1 second, 10 seconds, 60 seconds, continuous, and user defined.

Cell Loss

Cell loss results from network problems as buffer overflow, switch malfunction, traffic policing and uncorrectable header errors. When **Cell Loss** is selected from the **Type** button on the **Functns** | **NET IMP** screen, the following parameters can be configured.

Option	**Description**
Header Select	Specify the VCC Header (to include GFC, VPI, VCI, and CLP) to be compared with these bits.
Burst Size	Select the number of consecutive cells (1-10) to be corrupted.
Burst Rate	Select the number of unerrored cells that should occur between cell errors. • **Off:** No cells are inserted for transmission. • **Continuous (1):** Generates

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	continuous cell insertion into the transmission stream. • **1e-X:** Selects a cell insertion rate. Error rates range from 1e-1 through 1e-9. • **User Defined:** Allows you to enter a desired cell insertion rate. Values are entered using a keypad display.
Duration	Select how long the impairment will occur. The options are: Off, 1 second, 10 seconds, 60 seconds, continuous, and user defined.

Cell Misinsertion

Cell misinsertion is caused by transmission errors and situations in which an undetected header error matches an existing VPI/VCI. The misinserted cell is introduced in lieu of an idle cell. The header of the misinserted cell can be fully specified by the user. When **Cell Mis-insertion** is selected from the **Type** button on the **Functns** | **NET IMP** screen, the following parameters can be configured.

Option	**Description**
Mis-inserted Header	Specify the header (to include GFC, VPI, VCI, PTI, and CLP) of the misinserted cell.
Payload Octet	Select up to eight bits for the payload octet that the misinserted cells will have.
Burst Size	Specify the number of consecutive cells to be misinserted (select 1 through 10).
Burst Rate	Specify the number of cells between misinserted cells. The following options are available: • **Off:** No cells are inserted for transmission. • **Continuous (1):** Generates continuous cell insertion into the transmission stream. • **1e-X:** Selects a cell insertion rate. Error rates range from 1e-1 through 1e-9. • **User Defined:** Allows you to enter a desired cell insertion rate. Values are entered using a keypad display.
Duration	Specify the duration of the impairment. The options are: Off, 1 second, 10 seconds, 60 seconds, Continuous, and User Defined.

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Cell Delay Variation

Cell Delay Variation results from variation in the delay inserted because of problems as congestion, cell blocking, multiplexing cells from two or more connections, OAM cell insertion and physical layer overhead insertion. When **Cell Delay Variation** is selected from the **Type** button on the **Functns** | **NET IMP** screen, the following parameters can be configured.

Option	Description
Header Select	Specify the Header (to include GFC, VPI, VCI, and CLP) of the VCC on which impairment should occur.
Burst Size	Select the number of consecutive cells (1-15) to be delayed.
Duration	Select how long the impairment will occur. The options are: Off, 1 second, 10 seconds, 60 seconds, continuous, and user defined.

Cell Reordering

Cell Reordering results from transmission errors. When **Cell Reordering** is selected from the **Type** button on the **Functns** | **NET IMP** screen, the following parameters can be configured.

Option	Description
Header Select	Specify the Header (to include GFC, VPI, VCI, and CLP) of the VCC on which impairment should occur.
Do Cell Reordering	Performs cell reordering once on two consecutive cells with the header specified.

CLP Tagging

CLP Tagging results from network problems due to buffer overflow and traffic policing. When **CLP Tagging** is selected from the **Type** button on the **Functns** | **NET IMP** screen, the following parameters can be configured.

Option	Description
Header Select	Specify the Header (to include GFC, VPI, VCI, and CLP) of the VCC on which impairment should occur.
Duration	Select how long the impairment will occur. The options are: Off, 1 second, 10 seconds, 60 seconds, continuous, and user defined.

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CI Setting

CI settings result from congestion in the network. When the CI Setting impairment type is selected, the following parameters can be specified.

Option	Description
Header Select	Specify the Header (to include GFC, VPI, VCI, and CLP) of the VCC on which impairment should occur.
Duration	Select how long the impairment will occur. The options are: Off, 1 second, 10 seconds, 60 seconds, continuous, and user defined.

VPI/VCI Remapping

This function simulates behavior of a switch. When **VPI/VCI Remapping** is selected from the **Type** button on the **Functns** | **NET IMP** screen, the following parameters can be configured.

Option	Description
Header Select	Specify the Header (to include GFC, VPI, VCI, and CLP) of the VCC on which impairment should occur.
New Header	Specify the Header (to include GFC, VPI, VCI, and CLP) of the VCC to which the received cells are to be sent.
Duration	Select how long the impairment will occur. The options are: Off, 1 second, 10 seconds, 60 seconds, continuous, and user defined.

Functns - LOOP BACK

This function allows the system to generate a loopback test to ATM equipment on the network. The commands associated with this function define the parameters for the loopback test.

Select the **Edit** button to display the following options are available.

Option	Description

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Connection Type	Determines whether the loopback cells are looped at a virtual channel segment or throughout the network to an endpoint. The following options are available for this command. • **Segment:** Sends loopback cells though a portion of the ATM network. For this type of connection, the PTI defaults to 100. • **End-to-End:** Sends loopback cells to the endpoint of the ATM network. For this type of connection, the PTI defaults to 101.
Duration of Insertion	Sets the period of the loopback test. The test consists of the number of cells per second sent for the length of time defined by this command. Loopback cell results are displays in the Loopback Cell Received status box. The following options are available for this command. • **Off:** Stops any loopback test that is in progress. • **Seconds:** Sets the loopback cell test to last for 1, 10, or 60 seconds. • **User Defined:** Allows you to specify the duration of the test. Values are entered using a keypad and range from 1 second to 32765 seconds. • **Continuous:** Loopbacks are constantly inserted at the selected loopback insertion rate.
Single Loopback	Generates one loopback cell. This provides the ability to quickly send a loopback cell without having to configure the Loopback Insertion Rate or Duration of Loopback Insertion commands.
Clear Count	Sets the Cells Received counter to zero.

Functns - 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 enter 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.

The following commands are available.

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Option	Description
Scan Header (Hex)	Displays a keypad. From here, you can enter specific ATM Cell Header address that will be scanned. Wild card characters can be entered to represent any value.
Start Scan	Initiates a scan. The Scan Status box displays the message "Active."
Stop Scan	Stops the scan in progress. The Scan Status box displays the message "Inactive."
Add to VCC Tbl	Selects the highlighted virtual channel and adds it to the VCC Table.
Add All	Selects all virtual channels identified (displayed in the scroll box) and adds them to the VCC Table.
Clear	Removes any identified virtual channels from the scroll box.

Functns - PM OAM

This function allows you to view and edit performance management settings for Operation, Administration, and Maintenance cells. When Forward Monitoring and Backward Reporting are enabled for a connection, you are able to view the OAM-related information for a specified cell block.

The results of this function are viewable through the QOS Res function when the system is set up in Loopback mode.

The following options are available from this screen:

Option	Description
VPI/VCI	Displays which Virtual Path Indicator/Virtual Channel Indicator are currently being monitored.
Forward Monitoring	Displays whether Forward Monitoring mode is enabled or disabled on the transmitting unit.
Backward Reporting	Displays whether Backward Reporting mode is enabled or disabled on the receiving unit.

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Block Size	Displays the interval in which the PM OAM cell sets (or blocks) will be sent. For example, if 256 is selected for Block Size, the cells will be sent after every 256 cells. The options include: • 128 • 256 • 512 • 1024 • 2048 • 4096 • 8192 • 16384 • 32768
Edit	The Edit button includes the following functions: • **VPI/VCI:** Displays the VPI/VCI currently being managed. • **Forward Monitoring:** A toggable button that enables or disables Forward Monitoring. • **Backward Reporting:** A toggable button that enables or disables Backward Reporting. • **Block Size:** Allows you to select the cell set (block) interval in which the PM OAM cells will be sent. • **Save:** Saves your changes. • **Exit:** Exits the function. If **Save** is not selected before exiting, no changes are made.

Functns - Capture Settings (CAPT)

This function allows you to specify VPI/VCI and the number of bytes to be captured. This function is enabled only when the VCC table contains a Capture-capable connection.

Capture Settings

Setting	Description
VPI/VCI	This function allows you to set the VPI/VCI. Cells on this VPI/VCI will be captured.
Bytes	This function specifies the number of bytes to be captured. This is entered using a keypad and the range is from 1 to 4096.

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Start	This function starts the capture of cells.
Start/Stop	This function starts or stops the capture of cells.

Send Options

This function allows you to specify the VPI/VCI on which the captured (and modified) cells are to be sent. This function is enabled only when a Full PDU programmable connection exists in the VCC Table.

Setting	Description
VPI/VCI	This function allows you to set the VPI/VCI on which the captured cells will be transmitted.
Send	This function sends the captured cells on the specified VPI/ VCI.

Captured Data

After settings are configured and Capture is initialized, the capture data is displayed under the Captured Data portion of the screen. Use the Arrow Keys on the right-hand side of the screen to scroll through the data view.

Additionally, you may select the **Edit** button

Test Screens and Functions

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

The Test screen contains the following functions:

- SET 1

Test - Settings 1 (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.

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Duration

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

Option	Description
Continuous	Test is not times 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.

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:

Option	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 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

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	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.

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	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.

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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.

Results Screens and Functions

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

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 Trouble."

Results - ERR

This function reports percentage and error count values. It displays the number of errors detected, and the average error rate (using an N.NNe-N format) and current error rate (using an N.NNe-N format for current seconds only). The errors detected are generated either by the ATM network or intentionally by the system.

The following ATM errors are reported:

- HEC - Correctable
- HEC - Uncorrectable

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- BIT Error
- Misinserted Cells
- CRC Error
- Padding Error
- Lost Cells
- SN + SNP Error
- PDU Length Error

The types of errors that appear vary depending on the type of Preset/Mapping selected.

Results - ALARM

This function displays how long (in seconds) alarms were received by the system.

The following ATM alarms can appear:

- LOCS Seconds
- CLP Seconds
- LOPS Seconds
- VPI (F4) RDI Seconds
- VCI (F5) RDI Seconds
- SCNR Seconds
- STA Seconds
- VPI (F4) AIS Seconds
- VCI (F5) AIS Seconds

The types of alarms that appear vary depending on the type of Preset and Mapping selected.

Results - EVENT

The Results Event function provides a detailed summary of alarm and error 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 the order in which you wish to view the results. Select Pause to temporarily halt the display of results, and press **Resume** to start displaying results.

Results - LARGE LED

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 touch screen: the ATM Quick Status LEDs, which are located on the left side of the touch screen, and the **Large LEDS** tab. The following tables describe what is indicated by the LED color.

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.

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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.

Results - GRAPH

This function displays alarm and error results as graphs. For more information see *Using Graphs* in the Common Tasks section of online Help.

- Sample Rate
- Change Scale
- Change Upper
- Change Lower
- Shift Left/Shift Right
- Print Report (Graph)
- Save Graphs
- Replay Graphs

Results – CALL RESULTS (CALL RES)

This function reports Signaling results and is visible only when Signaling is enabled. This gives the values for the number of calls attempted, connected, rejected and cleared, setup time and teardown time. This also gives the SSCOP error statistics.

The following Call Results statistics appear

- TX Calls Attempted
- TX Calls Connected
- TX Calls Rejected
- TX Calls Cleared
- RX Calls Attempted
- RX Calls Connected
- RX Calls Rejected
- RX Calls Cleared

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- Avg. Setup Time
- Max Setup Time
- Min Teardown Time
- Min Setup Time
- Avg. Teardown Time
- Max Teardown Time

The following SSCOP error statistics appear:

- Protocol Discriminator: Indicates error in Protocol Discriminator field.
- IE Content: Indicates that the content of the information element is errored.
- Message Type: Indicates that the message type field is errored.
- SSCOP PDU Length: Indicates that the PDU length is errored.
- SSCOP PDU Align: Indicates error in PDU alignment.
- Call Reference Value: Indicates error in Call reference value.
- IE missing: Indicates that information element is missing.
- Unrecognized IE: Indicates that the information element is unrecognizable.
- Message Length: Indicates that the message length field is errored.
- SSCOP Unknown PDU: Indicates that the PDU is not known.
- Call Reference Format: Indicates error in call reference format.

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Index

A

AAL 9
Activate
  data monitoring 5
  data transmission 5
Add
  SVC 5
  VCC table 7
Address
  called party 28
Address Plan 24
Alarm Generation 45
Alarms
  insert 14
  results 59
  stop 14
All RX Mode 35
All TX Mode 34

B

Background 38
Block Size 12
Burst 43
Burst Count
  transmit 17

C

Call Results 61
Called Party Address 28
Capture Settings (CAPT) 53
Cell
  delay variation 49
  error generation 47
  loss 48
  misinsertion 48
  reordering 49
Cell Delay Variation Tolerance (CDVT) 11
Cell Loss Parity (CLP) 8
CI Setting 50
CLP
  Flow 12
  tagging 50
Configure 20

D

Define
  number or VCs 37
Delete
  VCC entry or table 12
Disable
  data monitoring 5
  data transmission 5

E

Edit
  SVC 7
  VCC table 12
ERR 59
Error Generation 44
Errors
  insert 14
  results 59
  stop 15
Event
  results 59

F

Filter Signaling Messages 13

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G
Generic Flow Control (GFC) 8
Graphs 60
H
Header Field..... 8
I
Insert
alarms 14
errors..... 14
Interface 21
L
LEDs 19
large 59
Load Test 15
configure 31
Loopback..... 51
response 23
Loopback Test
initiate..... 13
M
Mapping 22
Max Burst Size 11, 27
Monitor
activity 15
N
Network Impairment..... 46
O
O.191 Results 40
P
Payload Type Indicator (PTI) 8
Peak Cell Rate (PCR) 26
Permanent Virtual Circuit 8
PM OAM..... 52
Print..... 55
reports..... 15
PVC 8
Q
QoS Analysis 42
Qos Res..... 40
R
Recall..... 16, 37
Receive Pattern 9
Record Statistics..... 56
Remapping 50
Results..... 39
RX On/Off 34
S
Save 37
VCC table 16
Scambling..... 23
Scan 52
results 58
Send 54
Signaling
enable..... 12
filter messages..... 13
Signaling Filters
configure..... 29
Start
VCC scan..... 17
Stop
VCC scan..... 17
SUM..... 38
Sustained Cell Rate (SCR)..... 10, 26
SVC
add..... 5
configure..... 24
edit..... 7
optional 28

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

T

Technical Specification 2

Tests

action after duration 55

duration 55

settings 54

TMR

configure 29

Traffic Combination 28

Traffic Shaping 10

Traffic Type 25

Transmit Pattern 8

TRM 23

Turbo Add 17, 36

TX On/Off 33

U

Unit of Measure 22

V

VCC RX Mode 35

VCC Scan

start and stop 17

VCC Table

add 7

Bkgnd 38

delete entry or table 12

edit 12

Edit Tble 36

O.191 Res 40

QoS Anal 42

QoS results 40

recall 16

RES 39

save 16

Summary (Sum) 38

VCC Cntrl 33

VCC TX Mode 35

Virtual Channel Identifier (VCI)

numeric representation 23

Virtual Channel Identifier (VCI) 8

Virtual Path Indentifier (VPI) 8

VPI

numeric representation 23

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Multirate/OTN

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Table of Contents

Multirate / OTN Online Help Overview 1
OTN Overview 1
OTN Specific Tasks 1
Calibrating OTN Optical Power 1
Calibrating Optical Interfaces 2
Configuring the OTN Mode 2
Configuring OTN Mappings and Payloads 2
Enabling OTN FEC Mode 4
Monitoring OTN SAPI and DAPI Traces 4
OTN Screen Functions and Descriptions 4
OTN LED Quick Status Area 4
OTN Transmit Screens and Functions 7
OTN Transmit – SET 1 7
OTN Transmit - SET 2 10
OTN Transmit - Overhead (OTN OH) 10
OTN Transmit - Error Alarm 11
OTN Receive Screens and Functions 12
OTN Receive - Set 1 12
OTN Receive - Set 2 13
OTN Receive - OTN OH 13
OTN Receive - Signal Status (SIG) 14
OTN Results Screens and Functions 14
OTN Results - Err 15
OTN Results - Event 16
OTN Results - Large LED 16
OTN Results - Graph 17
OTN Test Screens and Functions 17
OTN Test - SET 1 17
OTN Test - Service Disruption 17
OTN Test - Round-Trip Delay (RTD) 18
SDH Overview 19
SDH Specific Tasks 19
Calibrating SDH/SONET Optical and Electrical Power 19

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Before You Begin 19
Calibrating Optical Interfaces 20
Calibrating Electrical Interfaces 20
Configuring SDH/SONET APS Commands 20
SDH VCAT Low-Order Mapping 21
SDH Screen Functions and Descriptions 22
SDH LED Quick Status Area 22
SDH Transmit Screens and Functions 25
SDH Transmit - Set / Set 1 25
SDH Transmit - Set / Set 2 27
SDH Transmit - Set / Set 3 29
SDH Transmit - SOH 30
SDH Transmit - POH 31
SDH Transmit - PTR 32
SDH Transmit - APS 33
SDH Transmit - VCAT 34
SDH Transmit - Error Alarm 35
SDH Receive Screens and Functions 40
SDH Receive - Set / Set 1 40
SDH Receive - Set / Set 2 43
SDH Receive - Set / Set 3 48
SDH Receive - SOH 48
SDH Receive - POH 49
SDH Receive - SIG 49
SDH Receive - VCAT 50
SDH Results Screens and Functions 50
SDH Results - ERR 51
SDH Results - PTR 53
SDH Results - Event 53
SDH Results - APS 53
SDH Results - Large LED 53
SDH Results - Graph 54
SDH Results - VCAT 54
SDH Test Screens and Functions 55
SDH Test - Set 1 55

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SDH Test - Service Disruption 55
SDH Test - RTD (Round-Trip Delay) 56
SDH Performance Monitor Screens and Functions 57
SDH Perf Monitor - RS 57
SDH Perf Monitor - MS 58
SDH Perf Monitor - HP 58
SDH Perf Monitor - LP 59
SDH Perf Monitor = BIT 60
SONET Overview 60
SONET Specific Tasks 60
SONET Screen Functions and Descriptions 61
SONET LED Quick Status Area 61
SONET Transmit Screens and Functions 63
SONET Transmit - Set / Set 1 63
SONET Transmit - Set / Set 2 66
SONET Transmit - Set / Set 3 67
SONET Transmit - SOH 68
SONET Transmit - POH 69
SONET Transmit - PTR 71
SONET Transmit - APS 72
SONET Transmit - Error Alarm 72
SONET Receive Screens and Functions 77
SONET Receive - Set / Set 1 78
SONET Receive - Set / Set 2 80
SONET Receive - Set / Set 3 85
SONET Receive - SOH 85
SONET Receive - POH 86
SONET Receive - SIG 86
SONET Results Screens and Functions 87
SONET Results - ERR 87
SONET Results - PTR 89
SONET Results - Event 89
SONET Results - APS 89
SONET Results - Large LED 90
SONET Results - Graph 90

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SONET Test Screens and Functions 90
SONET Test - Set 1 90
SONET Test - Service Disruption 90
SONET Test - RTD 91
SONET Performance Monitor Screens and Functions 92
SONET Perf Monitor - Sect 92
SONET Perf Monitor - Line 93
SONET Perf Monitor - Path 94
SONET Perf Monitor - VT Path 95
SONET Perf Monitor - BIT 95
Dual DS3 Overview 95
Dual DS3 Specific Tasks 95
Configuring Dual DS3 Mode 96
Dual DS3 Screen Functions and Descriptions 96
Dual DS3 LED Quick Status Area 96
Dual DS3 Transmit Screens and Functions 98
Dual DS3 Transmit - Set 1 98
Dual DS3 Transmit - Set 2 98
Dual DS3 Transmit - Error Alarm 99
Dual DS3 Receive Screens and Functions 100
Dual DS3 Receive - Set 1 101
Dual DS3 Receive - SIG 101
Dual DS3 Results Screens and Functions 102
Dual DS3 Results - Scan 102
Dual DS3 Results - ERR 102
Dual DS3 Results - Alarm 102
Dual DS3 Results - Event 103
Dual DS3 Results - Large LEDs 103
Dual DS3 Results - Graph 103
Dual DS3 Test Screen and Function 103
Dual DS3 Performance Monitor Screens and Functions 104
Dual DS3 Performance Monitor - BIT 104
Dual DS3 Performance Monitor - Path 104

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Multirate / OTN Online Help Overview

The Optical Multirate (Multirate) is an optional circuit pack that combines the functionality of OC-192, OC-48, and SDH circuit packs on one circuit card. This offers multiple interface and mapping functionalities from one location.

The Multirate also provides testing of OTN, GG.709 (OTU 1 and OTU 2) networks and SONET/SDH protocols.

To use Multirate functionalities your unit must contain the Multirate circuit pack and be licensed for Optical Multirate mode.

The Multirate / OTN Online Help is divided into the following sections:

- OTN
- SDH
- SONET
- Dual DS3

OTN Overview

This section of the online help system discusses the following topics:

- OTN Specific Tasks
- OTN Screen and Function Descriptions

OTN Specific Tasks

This section includes tasks that are specific to the OTN 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.

Calibrating OTN Optical Power

The following procedures describe optical power calibration. While performing this task, you will measure, record, and enter the power readings for various interfaces.

Before You Begin

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

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- Optical power meter
- Fiber-optics cleaning kit
- Pencil and paper to record optical power measurements

Calibrating Optical Interfaces

For calibrating 10G interfaces see the calibration procedures for OC-192 or STM-64. Use the Contents tab on the left side of the online help window to locate and open the appropriate topic. Calibration procedures are located under Specific Tasks.

For calibrating all other optical interfaces see the calibration procedures for OC-48 or STM-16. Use the Contents tab on the left side of the online help window to locate and open the appropriate topic. Calibration procedures are located under Specific Tasks.

Configuring the OTN Mode

The OMR circuit pack supports testing and verification of OTN, G.709 (OTU-1 and OTU-2) optical networks. Configure the unit for OTN operation, using G.709 mapping with a line rate of 10.709 Gbps or 2.666 Gbps.

To configure the OTN mode:

1. Select the **OTN** protocol processor tab.
2. Select the **Transmit** button.
3. Select the **Set** tab along the left side of the screen and choose **SET 1**.
4. Select the **Interface** button. The Select Interface window appears.
5. Select one of the following:
    - **G.709 2.5G (2.666 GHZ) 1310.000 nm** - Provides OTU 1 testing, including asynchronous and synchronous SDH/SONET capability using 1310.000 nm laser type.
    - **G.709 2.5G (2.666 GHZ) 1550.000 nm** - Provides OTU 1 testing, including asynchronous and synchronous SDH/SONET capability using 1550.000 nm laser type.
    - **G.709 10G (10.709 GHz) 1550.000 nm** - Provides OTU 2 testing, including synchronous SDH/SONET capability using 1550.000 nm laser type. Note: Asynchronous capability is currently unsupported by OTU 2.

Configuring OTN Mappings and Payloads

The ITU G.709 standard allows the mapping of a pattern directly into an OTN payload. Use the procedures in this section to select the OTN mapping payload.

To configure an OTN mapping:

1. Select the **Transmit** button and choose the **Set** tab from the left side of the screen.
2. Select **Set 1**.
3. Select the **Mapping** button. The Select Mapping screen appears.
4. Select the desired mapping.

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To configure an OTN payload:

1. Select the **Transmit** button and choose the **Set** tab from the left side of the screen.
2. Select **Set 1**.
3. Select the **Payload Pattern** button. The Select Payload Pattern screen appears.

 The Payload Pattern button will be active contingent on the OTN mapping settings.

Use the following table as a guide for configuring payload settings.

If Mapping is set to:	**Then:**
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	The unit is configured for OTN synchronous SONET/SDH mappings (**G.709 2.5G or G.709 10G**). Refer to the OC-192/STM-64 Online Help Guide or the NIC Reference Guide for configuring settings on the SONET/SDH tab.
SONET/SDH Asynchronous	The unit is configured for OTN asynchronous SONET/SDH mapping (**G.709 2.5G**). Refer to the OC-192/STM-64 Online Help Guide or the NIC Reference Guide for configuring settings on the SONET/SDH tab.

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Enabling OTN FEC Mode

1. Select the **OTN** tab.
2. Select **Transmit** and **Set**.
3. Select the **SET 2** button from the Transmit/Set window.
4. Select **Forward Error Correction** and then **Enable**.

If Settings Control is set to Couple, FEC is automatically enabled under the Receive settings. If the Transmit and Receive settings operate independently, then FEC mode can be enabled for the receive signal by selecting Receive, SET 1, and then Forward Error Correction.

Monitoring OTN SAPI and DAPI Traces

1. Select the **Receive** button from the **OTN** tab.
2. Select the **OTN OH** tab along the left side of the screen.
3. Select one of the following OTN structures:

   OTU, **ODU-1**, **ODU-2**, **TCM**, or **OPU**
4. The incoming SAPI, DAPI, and Operator Specific traces appear at the bottom of the screen.

 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.

OTN Screen Functions and Descriptions

This section of the online help system describes the various functions, buttons, and tabs that control OTN configuration and operation.

The following screens and functions are discussed:

- LEDs
- Transmit
- Receive
- Results
- Test

OTN LED Quick Status Area

This section defines the OTN LEDs that appear on the touch screen's LED area or the Large LED screen when the Large LED button is selected from the Results screen.

LED	Description
TX	Indicates current OTN transmit interface setting. If the OTN interface is configured for G.709, the laser value appears.

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RX	Displays the received optical power in dBm. This is a status LED.
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 Tests	Displays a general status summary for all circuit packs (which appear as protocol processor tabs) installed in the unit.
OTU	Optical Channel Transport Unit. Indicates current error, alarm, and event activity for the OTU. This is a status LED.
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.
UNICOR	FEC Uncorrected. This is an error LED.
LOM	Loss of Multiframe. This is an alarm LED.
BIP8	OTU Section Monitoring error detection code. This is an error LED.
BDI	OTU Section Monitoring Backward Defect Indication. This is an alarm LED.
AIS	OTU Alarm Indication Signal. 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.
COR	FEC Corrected. This is an error LED.
OOM	Out of Multiframe. This is an alarm LED.
BEI	OTU Section Monitoring Backward Error Indication. This is an error LED.

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IAE	OTU Section Monitoring Incoming Alignment Error. This is an alarm LED.
ODU	Optical Channel Data Unit. Indicates current error, alarm, and event activity for the ODU. This is a status LED.
BIP8	ODU Path Monitoring error detection code. This is an error LED.
AIS	ODU Alarm Indication Signal. This is an alarm LED.
OCI	ODU Open Connection Indication. This is an alarm LED.
BEI	ODU Path Monitoring Backward Error Indication. This is an error LED.
LCK	ODU Lock Indication. This is an alarm LED.
BDI	ODU Path Monitoring Backward Defect Indication. This is an alarm LED.
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.
PAT SYNC	Loss of Pattern Synchronization. Displays the status of loss of Pattern Synchronization on any active details channel.
BIT ERR	Indicates a Bit error has been received on the active detail channel.
*** Select TCM Summary text to display these LEDs.**	

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OTN Transmit Screens and Functions

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

The following transmit functionalities are available through the OTN Transmit screen:

- Set (Set 1 and Set 2)
- OTN OH
- ERROR ALARM

OTN Transmit – SET 1

Use the SET 1 screen to configure OTN transmit parameters. The following describes the functions that appear on this screen.

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 passthru mode, allowing an incoming STM/STS signal to pass through the unit without altering the data in the signal. The following options are available: **On** and **Off**.
Interface	Sets the OTN transmit interface and configures the laser. The following options are available: **G.707/GR-253:** The payload of an OTN frame is defined by the configuration created using the SDH/SONET tab's functions. G.707 is the ITU standard for SDH networks. GR-253 is the Telcordia standard for SONET networks. **G.709 2.5G (2.666 GHZ) 1310.000 nm:** Provides OTU 1 testing, including asynchronous and synchronous SDH/SONET capability using 1310.000 nm laser type. **G.709 2.5G (2.666 GHZ) 1550.000 nm:** Provides OTU 1 testing, including asynchronous and synchronous SDH/SONET capability using 1550.000 nm

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	laser type. **G.709 10G (10.709 GHz) 1550.000 nm:** Provides OTU 2 testing, including synchronous SDH/SONET capability using 1550.000 nm laser type. Note: Asynchronous capability is currently unsupported by OTU 2.
Clock Reference	Determines the timing source for the transmit signal. Select one of the following: **Internal.** Derives the transmit data's timing source from the unit's internal clock. The *CLK:INT* displays when configured for Internal clocking. **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. The *CLK:REC* displays when configured for Recovered clocking. **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. The *CLK:BITS 1.5MHz* displays when configured for BITS clocking. • 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. The *CLK:SETS 2.0MHz* displays when configured for SETS clocking. **External 8 KHz.** Derives timing from an external 8 KHz timing source attached to the Clock In connector. **External 10.0 MHz External.** Derives

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	timing from an external 10 MHz timing source attached to the Clock In connector.
Mapping **Note:** The Mapping function is not available when the Interface is configured for G.707/GR-253.	Selects the type of signals that are combined and inserted into the OTN transmit signal. **Framed BERT:** Transmits a framed BERT pattern. Note: This option only appears when the OTN Interface is set to G.975. **Unframed BERT:** Transmits an unframed BERT signal in the OTN frame. **SDH Synchronous:** Transmits the SDH signal (as defined by the SDH tab) in the OTN frame. **SDH Asynchronous:** Transmits the SDH signal (as defined by the SDH tab) in the OTN frame. Note: This option does not appear when the OTN Interface is set to G.975. **SONET Synchronous:** Transmits the SONET signal (as defined by the SONET tab) in the OTN frame. **SONET Asynchronous:** Transmits the SONET signal (as defined by the SONET tab) in the OTN frame. Note: This option does not appear when the OTN Interface is set to G.975. **PRBS:** Inserts a PRBS pattern into the OTN frame. **Null Client:** Inserts an All Zeros pattern into the OTN frame.
Payload Pattern	Selects a test pattern to insert into the payload of an OTN signal. Select one of the following: **PRBS 9**; **PRBS 9 Inverted**; **PRBS 11**; **PRBS 11 Inverted**; **PRBS 15**, **PRBS 15 Inverted**; **PRBS 20**; **PRBS 20 Inverted**; **PRBS 23**; **PRBS 23 Inverted**; **PRBS 31**; **PRBS 31 Inverted**; or a User Defined pattern (32-bit value)
Line Frequency Offset	Adjusts the offset of the signal frequency of the transmitted SDH/SONET signal. The frequency can be adjusted in parts per million (PPM).

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	The offset value is entered using an on-screen keypad. The frequency offset ranges from -100.0 ppm to 100.0 ppm in increments of 0.1. The default value is 00.0 (Off).
OPU Frequency Offset	Sets the OPU-2 frequency offset. The offset can be adjusted in ppm ranging from -65.928 ppm to 65.928 ppm.
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.

OTN Transmit - SET 2

Use the Settings 2 screen to configure OTN transmit parameters. The following describes the functions that appear on this screen.

Functions	**Description**
Trigger In	Allows the protocol processor to insert an error or restart an error test.
Scramble	Scrambles the OTN frame. The default value is Enable.
Forward Error Correction	Disables or enables FEC error correction.

OTN Transmit - Overhead (OTN OH)

The OTN OH screen allows you to configure the following overhead signals:

- OTU
- ODU-1
- ODU-2
- TCM
- OPU
- INTRUDE

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OTN Transmit - Error Alarm

Use this screen to configure and transmit OTN errors and alarms.

For information on inserting errors and alarms see the online help topics, Inserting Errors and Inserting Alarms in the Common Tasks section.

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

Option	**Description**
Error to Insert	Allows the user to select an error that is transmitted by the OTN signal. Selecting the **Error to Insert** button opens the Select Error Insert list. Available errors include: • FEC:UNCOR, FEC:COR, Frame, MFAS, OTU:BIP8, OTU:BEI, ODU:BIP8, ODU:BEI, BIT, TCM1:BIP8 – TCM6:BIP8, and TCM1:BEI – TCM6:BEI, More Selecting **More** opens the Select Alarms to Burst list. Available alarms to burst include: • OTU:IAE, OTU:BDI, ODU:BDI, TCM1:BDI - TCM6:BDI
Error Insert Rate	Sets the insertion rate of the OTN Transmit error from 1e-3 through 1e-10. A user-defined rate is also available.
Error Burst Size	Sets the duration, either in Frames or MilliSec, for the alarm selected from the Alarms to Burst list to be inserted.  This option is not available unless an Alarm to Burst has been selected from the Error to Insert function.
Error Burst Period	Sets the elapsed time (in MilliSec) or Frame count between alarm insertion bursts. This is a repeating action.
Alarm Generated	Generates a specific alarm that is transmitted by the OTN signal. The following alarms are available: • LOS, LOF, LOM, OTU:AIS, OTU:IAE, OTU:BDI, ODU:AIS, ODU:LCK, ODU:OCI, ODU:BDI, TCM1:BDI – TCM6:BDI, and None.

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OTN Receive Screens and Functions

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

The following functions are available through the OTN Receive screen:

- Set (Set 1 and Set 2)
- OTN OH
- SIG

OTN Receive - Set 1

Use the Settings 1 screen to configure OTN receive parameters. The following describes the functions that appear on this screen.

Functions	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.
Interface	Sets the OTN receive interface and configures the laser. The following options are available: **G.707/GR-253:** The payload of an OTN frame is defined by the configuration created using the SDH/SONET tab's functions. G.707 is the ITU standard for SDH networks. GR-253 is the Telcordia standard for SONET networks. **G.709 2.5G (2.666 GHZ) 1310.000 nm:** Provides OTU 1 testing, including asynchronous and synchronous SDH/SONET capability using 1310.000 nm laser type. **G.709 2.5G (2.666 GHZ) 1550.000 nm:** Provides OTU 1 testing, including asynchronous and synchronous SDH/SONET capability using 1550.000 nm laser type. **G.709 10G (10.709 GHz) 1550.000 nm:** Provides OTU 2 testing, including synchronous SDH/SONET capability using 1550.000 nm laser type.

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	 Asynchronous capability is currently unsupported by OTU 2.
Mapping	Selects desired signal mapping.
Payload Pattern	Selects the type of signal pattern that is transmitted by the signal.
Power Low Threshold	Sets the power low threshold.
Out of Frequency Threshold	Sets the out of frequency threshold (when enabled).
Scramble	Enables/disables the scramble option.
Forward Error Correction	Enables/disables forward error correction (FEC).
Trigger Out	Selects an event allowing the protocol processor to respond to a received external "pulse."

OTN Receive - Set 2

Use the Settings 2 screen to enable and disable the following alarm reporting:

- Section Alarm Reporting
- Path Alarm Reporting
- Tandem Connection Monitoring Alarm #1 Reporting
- Tandem Connection Monitoring Alarm #2 Reporting
- Tandem Connection Monitoring Alarm #3 Reporting
- Tandem Connection Monitoring Alarm #4 Reporting
- Tandem Connection Monitoring Alarm #5 Reporting
- Tandem Connection Monitoring Alarm #6 Reporting
- OPU PLM Alarm Reporting

OTN Receive - OTN OH

The OTN Receive Overhead screen contains the following read-only functions.

Function	**Options**
OTU Overhead	Displays the Optical ... overhead bytes on the incoming signal. This is a read-only function.
ODU-1 Overhead	Displays the ODU-1 Overhead bytes on the incoming signal. This is a read-only function.
ODU-2 Overhead	Displays the ODU-2 Overhead bytes on the incoming signal. This is a read-only function.

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TCM Overhead	Displays the TCM Overhead on the incoming signal. This is a read-only function.
OPU Overhead	Displays the OPU Overhead bytes on the incoming signal. This is a read-only function.
SAPI Trace	Displays the SAPI trace received on the incoming signal.
DAPI Trace	Displays the DAPI trace received on the incoming signal.

OTN Receive - Signal Status (SIG)

Displays the following measurements of the incoming OTN signal:

- Frequency in Hz
- Line Frequency Offset Received in Hz
- Optical Power source
- OPU Justify Frequency Offset
- Update Signal Calibration - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.


The user must have Admin or Calibrate privileges to enable the calibration mode.

3. See Calibrating OTN Optical Power for specific calibration instructions before proceeding.
4. After setting the Zero power reading and dBm power readings select the **Save** button to update the signal calibration.

OTN Results Screens and Functions

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 Results screen provides different ways of viewing received statistics. From the left side of the Result screen, select one of the following tabs:

- Err
- Event Log

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- Large LED
- Graphs

OTN Results - Err

The Err screens provides the following options:

- **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**, and error count is reports.
  - The message No Errors or Alarms appears if not events are received by the unit.
- **Errors** - 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 OTN network, or errors intentionally generated by the system when it is used in a Loopback environment.

  The following errors can be monitored:
  - Frame
  - MFAS
  - FEC: Uncorrected
  - FEC: Corrected
  - OTU: BIP8
  - OTU: BEI
  - ODU: BIP8
  - ODU: BEI
  - TCM1: BIP8 – TCM6:BIP8
  - TCM1: BEI – TCM6:BEI
  - **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

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

  The following alarms can be monitored:

Frequency Wide	**Power Hot**	**Power Low**	**Clock Loss**	**LOS**
LOF	OOF	LOM	OOM	OTU:AIS
OTU:IAE	OTU:BDI	OTU:SAPI	OTU:DAPI	ODU:AIS
ODU:LCK	ODU:OCI	ODU:BDI	ODU:SAPI	ODU:DAPI
TCM1:BDI – TCM6:BDI	TCM1:SAPI – TCM6:SAPI	TCM1:DAPI – TCM6:DAPI	OPU:PLM	Paused
Loss of Power				

- **Counts** - The Count screen displays the following statistics:

Count	**Description**
Positive Justification	Reports the total number of frames sent and the duration in seconds.
Negative Justification	Reports the total number of frames received and the duration in seconds.
Pointer Justification Seconds	Reports the total number of bytes received and the duration in seconds.

OTN Results - Event

The Event Log provides a detailed summary of OTN 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.

OTN Results - Large LED

This screen displays the OTN 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.

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OTN Results - Graph

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.

OTN Test Screens and Functions

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

The Test screen contains the following functions:

- SET 1
- Service Disruption
- RTD

OTN Test - 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.

OTN Test - Service Disruption

The test set can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Protection Switch Criteria** - Determines the type of alarm, error, or pattern event that is used as a trigger to generate service disruption 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 service disruption measurement has an accuracy of 0.5 milliseconds. Options include: OOF, OTU-AIS, OTU-BIP8, ODU-AIS, ODU-BIP8, and BIT.
- **Consecutive Good Time Required** - This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before

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Protection Switch measurements stop accumulating. The range is 0.049 to 802.302 milliseconds and is entered using a keypad.

- **Consecutive Good Frames Required** - This function allows you to enter the number of consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 16383 frames and is entered using a keypad.
- **State** - Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

    - **Single APS** - Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.
    - **Continuous APS** - Constantly monitors for service disruption events, and updates the seconds and frames reported.
    - **Stop APS** - Stops service disruption monitoring. The State returns to Inactive.

- **Protection Switch Time (MilliSecs)** - Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.
- **Protection Switch Time (Frames)** - Indicates the number of errored frames received during the service disruption event.

For instruction on monitoring service disruption activity, select Measuring Service Disruption Activity in the Common Tasks section of the online help.

OTN Test - Round-Trip Delay (RTD)

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.

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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 time-duration (in milliseconds) of consecutive error-free frames to elapse before round-trip measurements stop accumulating. The range is 0.0449 to 802.302 milliseconds and is entered using a keypad.
- **Consecutive Good Frames Required:** This function allows you to enter the number of consecutive error-free frames to occur before round-trip measurements stop accumulating. 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.

SDH Overview

This section of the online help system discusses the following topics:

- SDH Specific Tasks
- SDH Screen and Function Descriptions

SDH Specific Tasks

This section includes tasks that are specific to the SDH 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.

Calibrating SDH/SONET Optical and Electrical Power

The following procedures describe the optical and electrical power calibration. While performing this task, you will measure, record, and enter the power readings for various interfaces.

Before You Begin

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

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- Variable optical attenuator
- Optical power meter
- Fiber-optics cleaning kit
- Pencil and paper to record optical power measurements

Calibrating Optical Interfaces

For calibrating 10G interfaces see the calibration procedures for OC-192 or STM-64. Use the Contents tab on the left side of the online help window to locate and open the appropriate topic. Calibration procedures are located under Specific Tasks.

For calibrating all other optical interfaces see the calibration procedures for OC-48 or STM-16. Use the Contents tab on the left side of the online help window to locate and open the appropriate topic. Calibration procedures are located under Specific Tasks.

Calibrating Electrical Interfaces

For calibrating 155 Mbps electrical interfaces see the calibration procedures for E4. Use the Contents tab on the left side of the online help window to locate and open the appropriate topic. Calibration procedures are located under Specific Tasks.

For calibrating 52 Mbps electrical interfaces see the calibration procedures for E3. Use the Contents tab on the left side of the online help window to locate and open the appropriate topic. Calibration procedures are located under Specific Tasks.

Configuring SDH/SONET APS Commands

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. From the **SDH/SONET** tab, select **Transmit** button.
2. 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.
3. To make a new entry:
   - Select **New Item**

   To edit an item:
   - Select **Item <#>**, for example, Item 12.

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

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4. Select **APS Mode**. The APS Mode dialog box appears.
5. Choose **Linear** protection switching mode or **Ring** signaling mode.
6. Select a K1 byte/bit option. A value dialog box associated with the K1 selection appears. 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. Select a K2 byte/bit. A value dialog box associated with the K2 selection appears. The K2 byte provides additional information about SONET/SDH 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 the K1 and/or K2 byte/bit value.
9. From the Apply Maintenance to Entry dialog box, select **Duration** in Frames to set up the number of frames that will be transmitted containing the newly configured K1 and K2 bytes.
10. Select **Update**. The initial APS screen appears on the touch screen.
11. To configure additional K1 and K2 bytes, repeat steps 3-11 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. From the **SDH/SONET** tab, select **Transmit**.
2. Select the **APS** button and choose **Stop**.

SDH VCAT Low-Order Mapping

NIC test sets licensed for VCAT functionality allow Digital Lightwave® customers to optimize SONET/SDH data traffic by allowing easy configuration and monitoring of VCAT channels from the SDH protocol processor. The protocol processor's Transmit, Receive, and Results screens provide multiple configuration and result drill-down features.

- Configuring SDH for VCAT Low-Order Mapping
- Adding VCAT Channels
- Editing VCAT Channel Configurations

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- Inserting VCAT Errors and Alarms
- Viewing VCAT Alarm and Error Result Statistics
- Viewing VCAT Alarm and Error LED Statuses

SDH Screen Functions and Descriptions

This section of the online help system describes the various functions, buttons, and tabs that control SDH configuration and operation.

The following screens and functions are discussed:

- LEDs
- Transmit
- Receive
- Results
- Test
- Perf Monitor

SDH LED Quick Status Area

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

LED	Descriptions
TX	Indicates current SDH transmit interface setting. If the SDH interface is configured for G.709, the laser value appears.
RX	Displays the received optical power in dBm. This is a status LED.
E/A	Indicates the current error/alarm configured for transmission in the SDH 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 Tests	Displays a general status summary for all circuit packs (which appear as protocol processor tabs) installed in the unit.
RS	Regenerator Section. Indicates current error, alarm, and event activity for the Regenerator Section on the incoming SDH signal. This a status LED.
LOS	Loss of Signal. Indicates that a valid SDH 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

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	received with invalid or errored framing patterns. This is an alarm LED.
B1	Regenerator Section BIP-8 Code Violation. Indicated parity errors occurred on one of the eight parity checks when evaluated by byte 1 of the SDH frame. This is an error LED.
MS	Multiplex Section - Indicates if errors or alarms are being received from upstream Multiplex terminating equipment. This is an status 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.
MS-AIS	Multiplex Section - Alarm Indication Signal. Indicates if an alarm is being received from upstream Multiplex terminating equipment. This is an alarm LED.
APS	Automated Protection Switching. Indicates that the K1 and K2 bytes on the incoming STM signal have changed. 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.
B2	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.
HP	Higher Order Path. Indicates if errors or alarms are being received for VC-3 and VC-4. This is an status 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.
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.
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.
HP-REI	Higher-Order Path - Remote Error Indication. Indicates to the transmitting node that an errored block has been detected at the

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	HP receiving node. This is an error LED.
PTR	Pointer: Indicates the offset between the VC payload and the STM-N frame.
B3	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.
HP-UNEQ	Higher-Order Path - Unequipped. Indicates that an all-zeros pattern was detected in the C2 Byte. This byte is received from the HP terminating equipment. 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
TCM	Tandem Connection. Indicates if a TCM error or alarm has been detected. If this LED is red, select the TCM LED text to display the TCM LEDs.
SSM	Signal Status Mismatch - Displays when the expected SS bits setting in the H1 byte do not match what is received. SS Bits Alarm Reporting must be enabled for this alarm to generate. This is an alarm LED.
VCAT  Only appears when the test set is configured for VCAT.	To view the individual LEDs you must drill-down to the VCAT Member LEDs window. See Viewing Alarm and Error LED Statuses for instructions. The following VCAT errors and alarms may appear: • **LOM** - Loss of Multiframe alignment. Indicates that an OOM condition has persisted, in the receiver, for at least 200 TU frames on a given channel. • **OOM** - Out of Multiframe. Indicates that the receiver either cannot synchronize on the MFAS sequence, or the MFI frame numbers are out of sequence, for a given channel in the VCG. • **SQM** - Sequence Number Mismatch. Indicates that the channel sequence number does not match the expected value. • **MSU** - Member Signal Unavailable. Indicates that a LOM, SQM, or LOA is being detected. • **Path-LP** - Lower-order Path. A summary LED for a single member of the VCG. The member displayed is dependent on which member was selected in the VCAT Channels window. A red LED indicates that a LP error/alarm is occurring. Red text indicates a LP error or alarm has

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	occurred sometime since the test was started. • **Path-TU-AIS** - Tributary Unit – Alarm Indication Signal (TU Pointer = all ones). • **Path-TU-LOP** - Tributary Unit – Loss of TU Pointer (from V1/V2 byte). • **VC Group LOA** - Loss of Alignment. Indicates that the receiver is unable to align all members of the VCG.

SDH Transmit Screens and Functions

The Transmit functions allow you to define the parameters used for SDH transmitting operations.

The following parameter setting options are available from the Transmit screen:

- Set (Set 1, Set 2, Set 3)
- SOH
- POH
- PTR
- APS
- VCAT (Only appears when the test set is configured for VCAT.)
- Error Alarm

SDH Transmit - Set / Set 1

The SDH Transmit Settings 1 screen configures the unit's transmit parameters. It contains the following functions:

Function	Description
Settings Controls	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.
Pass Thru Mode	Activates or deactivates passthru 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**.
Interface	Selects the optical or electrical interface. The following options are available: **STM-0**, **STM-1**, **STM-4**, and **STM-16**, **STM-64**.

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	If the test set is licensed for Jitter operation, the following options are also available: **STM-1-Jitter**, **STM-4-Jitter**, **STM-16-Jitter**
Mapping	Defines the type of signals that are combined to create an SDH signal. For example, four AU-4-16c's can be mapped into an SDH signal. Mapping options are dependent on the selected Interface. The following options may be available: • **Unframed Bulk Fill** • **AU-4-64c Bulk Fill** • **AU-4-16c Bulk Fill** • **AU-4-4c Bulk Fill** • **AU-4 C-4 Bulk Fill** • **AU-3 C-3 Bulk Fill** If the test set is licensed for VCAT operation and the STM-4 or STM-1 Interface is selected, then the **AU-4 VC-12-Xv Bulk Fill** mapping option is available. If the test set is licensed for Dual DS3 and the STM-16 Interface is selected, then the **Dual DS3 Async (AU3)** mapping option is available.
AU-<#-#> Added	Displays the mapped signal. When available, select the **AU-<##> Added** button to enter the number of the specific AU channel to set as the *foreground* (source) channel. The default setting is 1. The source channel can be used to transmit alarms, errors, or patterns.
VCAT Channel Appears only when an STM-4 or STM-1 Interface is selected and the AU-4 VC-12-Xv Bulk Fill mapping option is chosen.	Displays the VCAT channel selected from the Transmit Error Alarm screen for error insertion. The user can change the channel by selecting the VCAT Channel button. If no VCAT channel has been selected for error insertion this defaults to the first VCAT member.

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Background AU-<#-##> Pattern	Allows the user to select the type of pattern to be inserted into the remaining *background* channels for the SDH signal. Select one of the following: **User-Defined (32 bit value), 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.**
Payload Pattern	Allows the user to select a test pattern to transmit over the SDH signal. This command is automatically coupled to its equivalent Receive command. Select one of the following: **User-Defined (32 bit value), 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.**
Clock Reference	Allows the user to select the timing source for the SDH transmit signal. Select one of the following: **Internal, Recovered, Bits/Sets, External 8 KHz, External 1.544 MHz, External 2.048 MHz, External 10 MHz.**

SDH Transmit - Set / Set 2

The SDH Transmit Settings 2 screen contains the following functions:

Function	**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). Use the data calculator to enter the offset frequency. The frequency offset ranges from -100.0 to 100.0 in increments of 0.1 A **0 (zero)** value equals **Off**.
Initial Laser Setting	Controls whether the laser is on or off when the unit is turned on. The following options are available: • **Off** - The unit's laser will be off when the unit

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	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.
SS Bits in the H1 Label	This function allows bits 5 and 6, which are the SS bits, of the H1 Pointer byte to be set to support a SONET or SDH Transport OH. Changes to the Transport OH are another way to stress an SDH network by simulating errors, alarms, and other stress conditions. The following options are available: **SONET (00)**, **SDH (10)**, or **Undefined**.
HP Signal Label	The Higher-Order Path Signal Label is part of the HPOH and identifies the type of traffic contained in the Virtual Container (VC). The C2 byte is used to indicate the content of the SPE, including the status of the mapped payload. The following options are available: • **00 (Unequipped)** • **01 (Equipped)** • **02 (TUG Structured)** • **03 (Lock TU Mode)** • **04 (Async 34M/45M Mapping)** • **12 (Async 140M Mapping)** • **13 (ATM Mapping)** • **14 (DQDB Mapping)** • **15 (FDDI Mapping)** • **FE (O.181 Test Signal)** • **FF (VC-AIS)** • **User Defined** (any eight bit pattern 0 to FF).  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)	Allows the user to set the S1 byte to one of the following: • **00 (Quality Unknown)**: Sets byte value to 00000000. • **02 (Rec. G.811)**: Sets byte value to

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	00000010. • **04 (Rec. G.812 Transit)**: Sets byte value to 00000100. • **08 (Rec. G.812 Local)**: Sets byte value to 00001000. • **0B (Sync Eqip Timing Src)**: Sets byte value to 00001011. • **0F (Do Not Use for Sync)** • **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.

SDH Transmit - Set / Set 3

The SDH Transmit Settings 2 screen contains the following functions:

Function	**Description**
Orderwire Add	Allows you to add or drop an orderwire circuit. The following options are available: • **None** • **E1** • **E2** • **F1** • **HP-F2** • **HP-F3**

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Datacom Channel Add	Adds a DCC Channel into the STM payload. Select one of the following: • **None** • **RS DCC Port** • **RS PRBS 2^7-1** • **RS PRBS 2^7- 1 Inv** • **MS DCC Port** • **MS PRBS 2^7-1** • **MS PRBS 2^7-1 Inv**

SDH Transmit - SOH

The Transmit SOH screen contains the following options:

Function	**Description**
Showing	Select **Showing** to choose an Overhead slot within the SDH signal. The overhead bytes that appear on the SOH screen are associated with this slot.
Overbyte bytes	Allows the user to select an Overhead byte to edit its value.
J0 Trace	The J0 byte is part of the Regenerator Section Overhead and is known as the RS trace or J0 trace. The J0 trace is a 64-byte pattern that can be created for repeated transmission. The pattern is a string of ASCII characters. The J0 trace can be configured to send the system's default pattern or a customized pattern. The following options are available: • **Default (64 byte)** - Selects the 64-byte 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 64-byte 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

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	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 16-byte Digital Lightwave ASCII message as the J0 trace pattern. • **User Defined (16 byte)** - Selects a 16-byte user-defined ASCII message as the J0 trace pattern. The message is entered and saved using a touch screen keyboard.

SDH Transmit - POH

The Transmit POH screen contains the following options:

Function	**Description**
AU-4-<#> Added	Allows the user to enter the number (1 - 4) of the specific AU channel to set as the *foreground* (source) channel. The default setting is 1.
HP Overhead	Select the Higher-Order Path Overhead to include: B3, J1, C2, G1, F2, H4, F3, K3, and N1.
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

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	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.  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.

SDH Transmit - PTR

The Transmit PTR screen contains the following options:

Function	**Description**
NDF Flag	The NDF Flag 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

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	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.
Frequency Offset	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.
Pointer Action	Determines the type of Pointer activity that occurs when the INC Pointer and DEC Pointer buttons are selected. **Single options** - Inserts a single Pointer movement with each selection of the INC Pointer or DEC Pointer button. The Pointer value changes by one. **Increment/Decrement option** - Determines the type of Pointer activity that occurs when the INC Pointer and DEC Pointer buttons are selected. **Continuous options** - Inserts a continuous Pointer movement with the selection of the INC Pointer or DEC Pointer button. The movement continues until the Stop Sequence button is selected.
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.
Ms between Bursts	Allows the user to set the number of Milliseconds between bursts. Valid valued are 34 - 10000.
INC Pointer / DEC Pointer	Alternates the Pointer insertion from increment to decrement with a 200-msec delay in between.

SDH Transmit - APS

The SDH Transmit APS function is used to configure APS transmit activity. The APS functionality allows the LTE to switch to a backup line in case of errors or failures on the main line. 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

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messages and monitor the response. See Configuring APS Commands for instructions on configuring, starting, and stopping APS commands.

The following functions are available on the APS screen:

Function	Description
Item <#>  Only appears when K1/K2 bytes have been added.	Opens the Apply Maintenance to Entry <#> dialog box, from which you can edit a byte's configuration.
New Item	Opens the Apply Maintenance to Entry window, from which you configure K1 and K2 bytes.
Start	Begins transmission of the K1 and K2 byte configuration.
Clear	Clears all K1/K2 bytes from the table.

SDH Transmit - VCAT

The Transmit VCAT function allows you to add and configure VCAT channels for transmitting operations.

For instructions on configuring VCAT see VCAT Low-Order Mapping.

The following parameters are available on the Transmit screen:

Function	Description
Delete All	Deletes all channels from the VCAT table.
Clear Delays	Returns any edited delay settings to their original values.
Member	Displays a sequential list of the VCAT channels. The Member number is used as an identifier for a channel.
Chan	Channel. Displays the VCAT Member's channel number. The TU address is displayed in the format AU# N K,L,M (where N is the AU-4 number; K is the TUG-3 number; L is the TUG-2 number; M is the TU-12 number).
Seq #	Sequence Indicator Number. Displays the VC sequence number.

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Delay (ms)	Combined Delay. The amount of time to delay this Member as compared to the earliest member. This delay is the same as Frame Delay; however, combined delay is expressed in ms.
Fr Delay	Frame Delay. The number of TU multiframes to delay this Member as compared to the earliest member.

SDH Transmit - Error Alarm

The test unit can transmit errors and alarms to simulate various defects and anomalies to determine if the receiving equipment can detect an error or alarm in the incoming signal.

For information on inserting errors and alarms see the online help topics, Inserting Errors and Inserting Alarms in the Common Tasks section.

The following options are available one the Error Alarm screen:

- **Error to Insert** - This SDH Transmit function determines the type of error transmitted by the system. The purpose of generating an error with system 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:

Option	**Description**
None	No errors are generated. Turns errors off.
Frame	Inserts a frame alignment error in the A1 and A2 bytes.
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.

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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.
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.
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 system transmits this error, it simulates a downstream NE sending an error count back to the source of its incoming SDH signal. The system 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	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 system transmits this error, it simulates an NE sending an error count back to the source of its incoming SDH signal. The system 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.

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HP-TC-IEC Only appears when the test set is configured for TC Overhead Processing.	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.
HP-TC-REI Only appears when the test set is configured for TC Overhead Processing.	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.
HP-TC-OEI Only appears when the test set is configured for TC Overhead Processing.	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.
VCAT OOM-MFAS Only appears when the test set is configured for VCAT.	Out of Multiframe. This error generates two consecutive VCAT MFAS errors which should cause a receiver to detect a single OOM defect.
VCAT OOM-Frame Only appears when the test set is configured for VCAT.	Out of Multiframe. This error generates two consecutive VCAT FRAME errors which should cause a receiver to detect a single OOM defect.

- **Error Insert Rate** - This SDH Transmit function sets the error rate for the selected error. The system starts transmitting errors after the insertion rate is selected. For information about inserting errors, see Inserting Errors in the Common Tasks section of the online help.

  The following Error Insert Rate options are available:

Option	**Description**
Off	Turns error transmission off.
Maximum	Generates errors at the maximum rate listed below.
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.
User Defined	Allows the user to enter a custom error. Valid values are 1e-6 to 1e-10.

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- **Alarm Generated** - This function configures the system to generate an alarm in the transmit SDH signal. Alarm generation by the system 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:

Alarm	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 SDH equipment to generate an AIS alarm to its downstream network elements (NE)and generate an RDI alarm to its upstream NEs.
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 at the Line layer, reporting a failure to an upstream NE. The downstream NE has encountered a downstream failure and is alerting upstream SDH equipment. To do this, the system 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-LOP	Administrative Unit Loss of Pointer. This simulates a loss of a valid Pointer. When the downstream NE receives an AU-LOP, it generates a DSn AIS

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	alarm to its downstream equipment and an HP-RDI alarm to its upstream equipment.
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 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 HPOH. 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.
HP-TC-RDI Only appears when the test set is configured for TC Overhead Processing.	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.
HP-TC-ODI Only appears when the test set is configured for TC Overhead Processing.	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.
HP-TC-AIS Only appears when the test set is configured for TC Overhead Processing.	Tandem Connection-Alarm Indication Signal. Generates an AIS alarm to downstream TCM equipment by setting Bits 1-4 of the N1 byte to 1110.

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HP-TC-UNEQ  Only appears when the test set is configured for TC Overhead Processing.	Tandem Connection-Unequipped. An all-zeros pattern is inserted into the N1 byte of the Path OH.
HP-TC-LOF  Only appears when the test set is configured for TC Overhead Processing.	Tandem Connection-Loss of Frame. Generates a loss of a valid multiframe pattern to downstream equipment.
VCAT-LOM  Only appears when the test set is configured for VCAT.	Loss of Multiframe alignment. Indicates that an OOM condition has persisted, in the receiver, for at least 200 TU frames on a given channel.
VCAT-SQM  Only appears when the test set is configured for VCAT.	Sequence Number Mismatch. Indicates that the channel sequence number does not match the expected value.

SDH Receive Screens and Functions

The Receive function allows you to define the parameters used in SDH receiving operations.

The following parameter setting options are available from the Receive screen:

- Set (Set 1, Set 2, Set 3)
- SOH
- POH
- SIG
- VCAT (Only appears when the test set is configured for VCAT)

SDH Receive - Set / Set 1

The SDH Receive Settings 1 screen configures the unit's receive parameters. It 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

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	affect Receive mode.
Interface	Selects the optical or electrical interface. The following options are available: **STM-0, STM-0e, STM-1, STM-1e, STM-4,** and **STM-16, STM-64.** If the test set is licensed for Jitter operation, the following options are also available: **STM-1-Jitter**, **STM-4-Jitter**, **STM-16-Jitter**
Mapping	Defines the type of signals that are combined to create an SDH signal. For example, four AU-4-16c's can be mapped into an SDH signal. Mapping options are dependent on the selected Interface. The following options may be available: • **Unframed Bulk Fill** • **AU-4-64c Bulk Fill** • **AU-4-16c Bulk Fill** • **AU-4-4c Bulk Fill** • **AU-4 C-4 Bulk Fill** • **AU-3 C-3 Bulk Fill** If the test set is licensed for VCAT operation and the STM-4 or STM-1 Interface is selected, then the **AU-4 VC-12-Xv Bulk Fill** mapping option is available. If the test set is licensed for Dual DS3 and the STM-16 Interface is selected, then the **Dual DS3 Async (AU3)** mapping option is available.
AU Type	Selects an Administrative Unit type to include AU-3 or AU-4.
AU-<#> Dropped	Select the foreground Administrative Unit to be dropped. The options that appear will depend on your current configuration. The default setting is 1.

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TUG-<#> Dropped	Select the foreground Tributary Unit to be dropped.  No TUG will display unless AU-4 is set as the AU type.
VCAT Channel  Appears only when an STM-4 or STM-1 Interface is selected and the AU-4 VC-12-Xv Bulk Fill mapping option is chosen.	Allows the user to select a VCAT channel.
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 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**
Power Low Threshold	Sets the power threshold. If the power drops below the threshold, the Power Low alarm initiates. When the threshold is reached, the LOS alarm signals.
Out of Frequency Threshold	Sets the frequency threshold for the Line Frequency Offset. When the threshold is reached, the Frequency Wide alarm is triggered.
Trigger Out	Allows the user to select the way that the protocol processor will respond to an external "pulse" received.

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SDH Receive - Set / Set 2

The SDH Receive Settings 2 screen configures the unit's receive parameters. It contains the following functions:

Function	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: • **00 (Unequipped)** • **01 (Equipped)** • **02 (TUG Structured)** • **03 (Lock TU Mode)** • **04 (Async 34M/45M Mapping)** • **12 (Async 140M Mapping)** • **13 (ATM Mapping)** • **14 (DQDB Mapping)** • **15 (FDDI Mapping)** • **FE (O.181 Test Signal)** • **FF (VC-AIS)** • **User Defined** (any eight bit pattern 0 to FF) 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.
Expected LP Signal Label	Select one of the following values for the expected Lower Order Path Signal: • **00 (Unequipped)** • **01 (Equipped)** • **02 (TUG Structured)** • **03 (Lock TU Mode)** • **04 (Async 34M/45M Mapping)** • **12 (Async 140M Mapping)** • **13 (ATM Mapping)** • **14 (DQDB Mapping)** • **15 (FDDI Mapping)** • **FE (O.181 Test Signal)** • **FF (VC-AIS)** • **User Defined** (any eight bit pattern

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	0 to FF) 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.
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.

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	• **Default (16 byte)** - 0 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 HP 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.

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	The message can be up to 16 characters in length.
Expected LP J1	Defines the expected J1 trace received on the incoming SDH signal. A LP-TIM alarm occurs if the incoming J1 trace does not match the expected J1 trace. The J1 byte is part of the Lower-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

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	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. • **HP Enable** - Turns on N1 byte for TCM error and alarm reporting mode. • **LP Enable** - Turns on the N2 byte for TCM error and alarm reporting mode. • **Disable** - Turns off TCM error and alarm reporting mode.  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 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

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	expected TC trace pattern. The message is entered and saved using a screen keypad.

SDH Receive - Set / Set 3

The SDH Receive Settings 3 screen configures the unit's receive parameters. It contains the following functions:

Function	Description
Orderwire Drop	Allows you to drop an orderwire circuit for a protocol processor. The following options are available: **None**, **E1**, **E2**, **F1**, **HP-F2, HP-F3**, **LP-F2**, **LP-F3**
Datacom Channel Drop	Defines specific bytes in the Section overhead that is used to send operation and maintenance information between the Section and Line equipment. The following options are available: • **None** • **RS DCC Port** • **RS PRBS 2^7-1** • **RS PRBS 2^7-1 (Inverted)** • **MS DCC Port** • **MS PRBS 2^7-1** • **MS PRBS 2^7-1 (Inverted)**

SDH Receive - SOH

The Receive SOH screen contains the following options:

Option	Description
Showing	Selects a specific SOH slot to monitor on the incoming SDH signal. 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

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	(B3, C2, G1, F2, H4, Z3, Z4, and Z5), • J0 Trace byte, and J1 Trace byte.
J0	Displays the J0 trace received on the incoming SDH signal. This is a read-only function.

SDH Receive - POH

The Receive POH screen contains the following options:

Option	**Description**
AU-<#> Dropped	Allows the user to enter the number (1 - 4) of the specific AU channel to monitor. The default setting is 1.
HP Overhead	Displays the Overhead bytes for a specific Higher-Order Path OH slot 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.

SDH Receive - SIG

Displays the following measurements for 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 - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.


The user must have Admin or Calibrate privileges to enable the calibration mode.

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3. See Calibrating SDH/SONET Optical and Electrical Power for specific calibration instructions before proceeding.
4. After setting the **Zero power reading** and **dBm power readings** select the **Save** button to update the signal calibration.

SDH Receive - VCAT

The Receive VCAT screen contains several functions and options that configure the receive channel parameters.

For instructions on configuring VCAT see VCAT Low-Order Mapping.

The following functions are available on the Receive screen:

Function	Description
Delete All	Deletes all channels from the VCAT table.
Member	Displays a sequential list of the VCAT channels. The Member number is used as an identifier for a channel.
Chan	Channel. Displays the VCAT Member's channel number.
Exp Seq	Expected Sequence number. Defined as Member Number – 1.
Seq #	Sequence Indicator Number. Displays the VC sequence number.
Delay (ms)	The amount of Frame Delay plus Pointer Delay expressed in ms.
Fr Delay	After VCG alignment, the number of multiframes this Member is delayed as compared to the earliest arrival. At least one Member will always have a frame delay of 0.
Ptr Delay	After VCG alignment, the number of TU pointer bytes this Member is delayed as compared to the earliest arrival. At least one Member will always have a pointer delay of 0.

SDH Results Screens and Functions

All monitored activity that the system receives is reported to the Results screen for viewing and analyzing. The Results screen provides information used for analyzing the incoming signal, pattern, errors, and alarms.

The following options are available from the Results screen:

- Err

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- PTR
- Event
- APS
- Large LED
- Graph
- VCAT (Only appears when the test set is configured for VCAT.)

SDH Results - ERR

The Results ERR screen contains the following options:

- **Scan** - Select Scan to access 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."

- **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 reported errors are a result of incoming errors that are generated by the SDH network, or errors that are intentionally generated by the system when it is used in a loopback environment.

  The following errors can be monitored:

▸ Frame	▸ MS-REI
▸ B1 (Section BIP-8, also known as a Section Coding Violation - CV-S)	▸ BIT (BIT errors reported in the payload)
▸ B2 (Line BIP-8, also known as a Line Coding Violation - CV-L)	▸ AU-NDF
▸ B3 (Path BIP-8, also known as an STS Path Coding Violation - CV-P)	▸ TU-NDF
▸ HP-REI	▸ TC-IEC (Tandem Connection-Incoming Error Count)
▸ LP-BIP	▸ TC-REI (Tandem Connection-Remote Error Indicator)
▸ LP-REI	▸ TC-OEI (Tandem Connection-Outgoing Error Indicator)

  The following parameters are measured for the incoming errors:

  ▸ Error count using an 11-digit format

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- 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

- **Alarms** - The system can monitor and report alarms and their duration on the incoming SDH signal. The alarms are shown in duration of the alarm in seconds.

  The following alarms can be monitored:

LOS (Loss of Signal)	HP-TIM (Higher Order Path Trace Identifier Mismatch for the J1 byte)
Power Hot	Frequency Wide
Power Low	OPU Generic AIS
LOF (Loss of Frame)	HP-PLM (Higher-Order Path Payload Label Mismatch)
OOF (Out of Frame)	Pattern Sync
RS-TIM (Regenerator Section Trace Identifier Mismatch for J0 byte)	TC-RDI (Tandem Connection-Remote Defect Indicator)
MS-AIS (Multiplex Section Alarm Indication Signal)	TC-ODI (Tandem Connection-Outgoing Defect Indicator)
MS-RDI (Multiplex Section Remote Defect Indicator)	TC-AIS (Tandem Connection-Alarm Indication Signal)
APS-L (Automatic Protection Switching)	TC-UNEQ (Tandem Connection-Unequipped)
AU-AIS (Administrative Unit Alarm Indication Signal)	TC-TIM (Tandem Connection-Trace Identifier Mismatch)
AU-LOP (Administrative Unit Loss of Pointer)	TC-LOF (Tandem Connection-Trace Identifier Mismatch)
HP-UNEQ (Higher-Order Path Unequipped Payload)	TU-LOP (Tributary Unit - Loss of Pointer)
HP-RDI (Higher-Order Path Remote Defect Indicator)	TU-AIS (Tributary Unit - Alarm Indication Signal)

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SDH Results - PTR

This PTR 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 Coun**t - Indicates the New Data Flag count.
- **Rx Pointer Bytes (HEX)** and **Rx Pointer Value** (in decimal) - Valid Pointers range from 0 to 782.

When lower-order mapping is configured TU Pointer results also appear.

SDH Results - Event

The 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 the order of the results. Select **Pause** to temporarily halt the display of results.

SDH Results - APS

The APS function monitors 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.

SDH Results - Large LED

This Large LED screen 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.

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SDH Results - Graph

The Graph 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 Using Graphs in the Common Tasks section of the online help.

SDH Results - VCAT

All monitored VCAT channel activity that the system receives is reported to the Results screen. The Results functionalility provides several drill-down layers for analyzing the incoming signal, alarms, and errors.

For instructions on viewing VCAT results see Viewing VCAT Alarm and Error Result Statistics.

The following options are found on the Results screen:

Options	**Description**
Alarm	The following statistics are displayed: • **Alarm** - Displays the alarm types that are common to the entire VCG. • **Seconds** - Displays the number of seconds that an alarm was present.
Error	The following statistics are displayed: **Error Description** - Displays the error types that are common to the entire VCG. **Count** - Displays the error count using an 11-digit format. **Average Rate** - Displays the average error rate over the error duration using an N.NNe+NNN format. **Current Rate** - Displays the current error rate using an N.NNe+NNN format.
Detail View	The following statistics are displayed: # - Displays the Member number. **Chan** - Displays the AU Path/TU Channel number. **Seq** - Displays the VC sequence number. **LOM** - Loss of Multiframe alignment. [X] indicates a LOM is detected on this channel. **OOM** - Out of Multiframe alarm. [X]

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	indicates an OOM is detected on this channel. **SQM** - Sequence Number Mismatch. [X] indicates a SQM is detected on this channel. **Path** - Path summary indication. [X] indicates a Path error/alarm is detected on the channel.  You can drill down to channel-specific details by selecting a **Member** in the Detail View table. This opens the **VCAT Detail View** dialog box that allows you to select a specific channel and view its errors and alarms.

SDH Test Screens and Functions

The Test function allows you to configure test parameters, such as how long the test will run, printing and recording events, and what action will take place after the test is complete.

The following options are available from the Test screen:

- Set 1
- Service Disrptn
- RTD

SDH Test - Set 1

Set 1 functions determine how long an SDH protocol processor test runs for and what activities occur at the end of the test.

The following functions are available:

- Duration
- Action After Duration
- **Pause Test/Resume Test** - When selected the test toggles between pausing an active test and resuming the test. The button's label indicates the action that will happen when it is selected.

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

SDH Test - Service Disruption

The test set can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

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The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Protection Switch Criteria** - Determines the type of alarm, error, or pattern event that is used as a trigger to generate service disruption 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 service disruption measurement has an accuracy of 0.5 milliseconds. Options include: B1, OOF, MS-AIS, AU-AIS, TU-AIS, or PRBS.
- **Consecutive Good Time Required** - This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. 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 consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 16383 frames and is entered using a keypad.
- **State** - Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

  - **Single APS** - Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.
  - **Continuous APS** - Constantly monitors for service disruption events, and updates the seconds and frames reported.
  - **Stop APS** - Stops service disruption monitoring. The State returns to Inactive.

- **Protection Switch Time (MilliSecs)** - Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.
- **Protection Switch Time (Frames)** - Indicates the number of errored frames received during the service disruption event.

For instruction on monitoring service disruption activity, select Measuring Service Disruption Activity in the Common Tasks section of the online help.

SDH Test - 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. The following options are available:

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- **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 (milliSec)** - Indicates the duration in seconds that it took for the known frame to return to the unit.
- **Round-trip Delay Time (Frames)** - Indicates the number of frames received during the measurement.
- **Consecutive Good Time Required** - This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before round-trip measurements stop accumulating. 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 consecutive error-free frames to occur before round-trip measurements stop accumulating. 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.

SDH Performance Monitor Screens and Functions

Performance Monitoring provides greater detail about incoming Regenerator Section (RS), Multiplex Section (MS), Higher-Order Path (HP), and BIT errors.

The following options are available:

SDH Perf Monitor - RS

This provides a detailed breakdown for Regenerator Section errors detected and logged by the SDH 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.
- Error Free Seconds (EFS) by count, rate percentage, and objective percentage.
- Severely Errored Seconds (SES) by count, rate percentage, and objective percentage.
- G.826 Allocation: Select an allocation percentage from 0 to 100.
- Status: Pass, Uncertain, or failure

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SDH Perf Monitor - MS

The MS screen provides a detailed breakdown for Multiplexor section errors detected and logged by the SDH protocol processor. In addition to monitoring the errors, you can set **allocation** percentages and **durations** by selecting their respective buttons. For the ITU Standards option, you can select the **G.826/G.829** toggle button in the lower-right corner of the ITU Standards error window to toggle the statistics between G.826 and G.829 results.

Important: Select the G.826/G.829 button in the lower-right corner of the ITU Standards window to toggle between G.826 and G.829 statistics. Toggling the Near B2 Errors output also toggles the Far MS REI Errors output.

G.826 and G.829 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.
- Error Free Seconds (EFS) 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
- G.826/G.829: Select the command button to toggle between G.826 and G.829 error statistics.

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.
- Duration: Set to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

SDH Perf Monitor - HP

The HP screen provides a detailed breakdown for Higher-Order Path errors detected and logged by the SDH protocol processor. In addition to monitoring the errors, you can set **allocation** percentages and **durations** by selecting their respective buttons. For the ITU Standards option, you can select the **G.826/G.828** toggle button in the lower-right corner of the ITU Standards error window to toggle the statistics between G.826 and G.828 results.

IMPORTANT: Select the G.826/G.828 button in the lower-right corner of the ITU Standards window to toggle between G.826 and G.828 statistics. Toggling the Near B3 Errors output also toggles the Far HP REI Errors output.

G.826 and G.828 Near B3 Errors and Far HP REI Errors

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- 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.
- Error Free Seconds (EFS) 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/G.828: Select the command button to toggle between G.826 and G.828 error statistics.

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.
- Duration: Set to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

SDH Perf Monitor - LP

The LP screen provides a detailed breakdown for Lower-Order Path errors detected and logged by the SDH protocol processor. In addition to monitoring the errors, you can set **allocation** percentages and **durations** by selecting their respective buttons. For the ITU Standards option, you can select the G.826/G.828 toggle button in the lower-right corner of the ITU Standards error window to toggle the statistics between G.826 and G.828 results.

IMPORTANT: Select the G.826/G.828 button in the lower-right corner of the ITU Standards window to toggle between G.826 and G.828 statistics. Toggling the Near B2 Errors output also toggles the Far MS REI Errors output.

G.826 and G.828 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.
- Error Free Seconds (EFS) 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/G.828: Select the command button to toggle between G.826 and G.828 error statistics.

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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.
- Duration: Set to 2 hours, 1 day, or 7 days.
- Status: Pass, Uncertain, or failure

SDH Perf Monitor = BIT

The BIT screen provides a detailed breakdown for BIT errors detected and logged by the SDH protocol processor. In addition to monitoring the errors, you can set allocation percentages and durations by selecting their respective buttons.

G.821 BIT Errors

- Errored Seconds (ES) by count, rate percentage, and objective percentage.
- Error Free Seconds (EFS) by count and rate 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 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.
- Error Free Seconds (EFS) by count and rate 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

SONET Overview

This section of the online help system discusses the following topics:

- SONET Specific Tasks
- SONET Screen and Function Descriptions

SONET Specific Tasks

This section includes tasks that are specific to the SONET 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.

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SONET Screen Functions and Descriptions

This section of the online help system describes the various functions, buttons, and tabs that control SONET configuration and operation.

The following screens and functions are discussed:

- LEDs
- Transmit
- Receive
- Results
- Test
- Perf Monitor

SONET LED Quick Status Area

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

LED	Description
TX	Indicates current SONET transmit interface setting. If the SONET interface is configured for G.709, the laser value appears.
RX	Displays the received optical power in dBm. This is a status LED.
E/A	Indicates the current error/alarm configured for transmission in the SONET 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 Tests	Displays a general status summary for all circuit packs (which appear as protocol processor tabs) installed in the unit.
Section	Section Status. Indicates current error, alarm, and event activity for the Section layer on the incoming SONET signal. This is a status 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.
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 alarm 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.

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B1	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 B1 error. This is an error LED.
Line	Line Status. Indicates if errors or alarms are being received from upstream Line terminating equipment. This is a status 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.
AIS-L	Line Alarm Indication Signal. Indicates if an alarm is being received from upstream Line 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. This is a status 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.
B2	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
Path	Path Status. Indicates if errors or alarms are being received from upstream Path terminating equipment. This is a status 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.
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.
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.
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.

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PTR	Pointer: Indicates the offset between the VC payload and the STMN-N frame.
B3	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.
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.
PAT SYNC	Pattern 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.
TCM	Tandem Connection. Indicates if a TCM error or alarm has been detected. If this LED is red, select the TCM LED text to display the TCM LEDs.
SSM	Signal Status Mismatch - Displays when the expected SS bits setting in the H1 byte do not match what is received. SS Bits Alarm Reporting must be enabled for this alarm to generate. This is an alarm LED.

SONET Transmit Screens and Functions

The Transmit functions allow you to define the parameters used for SONET transmitting operations.

The following parameter setting options are available from the Transmit screen:

- Set (Set 1, Set 2, Set 3)
- SOH
- POH
- PTR
- APS
- Error Alarm

SONET Transmit - Set / Set 1

The SONET Transmit Settings 1 screen configures the unit's transmit parameters. It contains the following functions:

Function	**Description**
Settings Controls	If **Coupled** is selected, settings changed on the Transmit screen will automatically change on the Receive screen as well.

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	If **Independent** is selected, settings established on the Transmit screen will only affect Transmit mode.
Pass Thru Mode	Activates or deactivates passthru 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**.
Interface	Selects the optical or electrical interface. The following options are available: **OC-1**, **OC-3**, **OC-12**, **OC-48**, **OC-192**, **EC-3**, or **EC-1**  If the test set is licensed for Jitter operation, the following options are also available: **OC-3-Jitter**, **OC-12-Jitter**, **OC-48-Jitter**
Mapping	Defines the type of signals that are combined to create an SDH signal. For example, four STS-48s can be mapped into an SDH signal. Mapping options are dependent on the selected Interface. The following options may be available: • **Unframed Bulk Fill** • **STS 192c Bulk Fill** • **STS-48c Bulk Fill** • **STS-12c Bulk Fill** • **STS-3c Bulk Fill** • **STS-1 Bulk Fill** • **VT-6 Bulk Fill** • **VT-2 Bulk Fill** • **VT-1.5 Bulk Fill**  If the test set is licensed for Dual DS3 and the OC-48 Interface is selected, then the **Dual DS3 Async** mapping option is available.
STS-<#-#> Added	Displays the mapped signal. When available, select the **STS-<##> Added** button to enter the number of the specific STS channel to set as the *foreground* (source) channel. The default setting is 1. The source channel can be

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	used to transmit alarms, errors, or patterns.
Background AU-<#-##> Pattern	Allows the user to select the type of pattern to be inserted into the remaining *background* channels for the SONET signal. Select one of the following: **User-Defined (32 bit value), 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.**
Payload Pattern	Allows the user to select a test pattern to transmit over the SONET signal. This command is automatically coupled to its equivalent Receive command. Select one of the following: **User-Defined (32 bit value), 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.**
Clock Reference	Allows the user to select the timing source for the SONET transmit signal. Select one of the following: **Internal, Recovered, Bits/Sets, External 8 KHz, External 1.544 MHz, External 2.048 MHz, External 10 MHz.**

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SONET Transmit - Set / Set 2

The SONET 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). Use the data calculator to enter the offset frequency. The frequency offset ranges from -100.0 to 100.0 in increments of 0.1 A **0 (zero)** value equals **Off**.
Initial Laser Setting	Controls whether the laser is on or off when the unit is turned on. The following options are available: • **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.
SS Bits in the H1 Label	This function allows bits 5 and 6, which are the SS bits, of the H1 Pointer byte to be set to support a SONET or SDH Transport OH. Changes to the Transport OH are another way to stress an SDH network by simulating errors, alarms, and other stress conditions. The following options are available: **SONET (00)**, **SDH (10)**, or **Undefined**.
Path Signal Label	The Path Signal Label is part of the POH and identifies the type of traffic contained in the SPE. The C2 byte is used to indicate the content of the SPE, including the status of the mapped payload. The following options are available: • **00 (Unequipped)** • **01 (Equipped)** • **02 (VT Structured STS)** • **03 (Lock VT Mode)** • **04 (Async DS3 Mapping)** • **12 (Async DS4NA Mapping)**

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	• **13 (ATM Mapping)** • **14 (DQDB Mapping)** • **15 (Async FDDI Mapping)** • **16 (HDLC Over SONET)** • **User Defined** (any eight bit pattern 0 to FF).  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)	Allows the user to set the S1 byte to one of the following: • **00 (Sync Trace Unknown-STU)** • **01 (Stratum 1 Trace-PRS)** • **04 (Transit Node Clock-TNC)** • **07 (Stratum 2 Trace-ST2)** • **0A (Stratum 3 Trace-ST3)** • **0C (SONET Minimum Clk-SMC)** • **0D (Stratum 3E Trace-ST3E)** • **0F (Do Not Use for Sync-DUS)** • **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.

SONET Transmit - Set / Set 3

The SONET Transmit Settings 2 screen contains the following functions:

Function	**Description**
Orderwire Add	Allows you to add or drop an orderwire circuit. The following options are available: • **None** • **E1** • **E2** • **F1**

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	• **F2-P** • **Z3P**
Datacom Channel Add	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** • **Section DCC Port** • **Section PRBS 2^7-1** • **Section PRBS 2^7- 1 Inv** • **Line DCC Port** • **Line PRBS 2^7-1** • **Line PRBS 2^7-1 Inv**

SONET Transmit - SOH

The Transmit SOH screen contains the following options:

Function	**Description**
Showing	Select **Showing** to choose an Overhead slot within the SONET signal. The overhead bytes that appear on the SOH screen are associated with this slot.
Overbyte bytes	Allows the user to select an Overhead byte to edit its value.
J0 Trace	The J0 byte is part of the Section Overhead and is known as the Section trace or J0 trace. The J0 trace is a 64-byte pattern that can be created for repeated transmission. The pattern is a string of ASCII characters. The J0 trace can be configured to send the system's default pattern or a customized pattern. The following options are available: • **Default (64 byte)** - Selects the 64-byte 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 64-byte user-defined ASCII

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	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 16-byte Digital Lightwave ASCII message as the J0 trace pattern. • **User Defined (16 byte)** - Selects a 16-byte user-defined ASCII message as the J0 trace pattern. The message is entered and saved using a touch screen keyboard.

SONET Transmit - POH

The Transmit POH screen contains the following options:

Function	**Description**
STS-<#> Added	Allows the user to enter the number of the specific STS channel to set as the *foreground* (source) channel. The default setting is 1.
Path Overhead	Select the Path Overhead to include: B3, J1, C2, G1, F2, H4, Z3, Z4, and Z5.
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

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	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.  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. • **All Ones** - Selects an All Ones pattern as the TC Trace pattern. • **All Zeros** - Selects an All Zeros pattern 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.

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SONET Transmit - PTR

The Transmit PTR screen contains the following options:

Function	Description
NDF Flag	The NDF Flag 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.
Frequency Offset	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.
Pointer Action	Determines the type of Pointer activity that occurs when the INC Pointer and DEC Pointer buttons are selected. **Single options** - Inserts a single Pointer movement with each selection of the INC Pointer or DEC Pointer button. The Pointer value changes by one. **Increment/Decrement option** - Determines the type of Pointer activity that occurs when the INC Pointer and DEC Pointer buttons are selected. **Continuous options** - Inserts a continuous Pointer movement with the selection of the INC Pointer or DEC Pointer button. The movement continues until the Stop Sequence button is selected.

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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.
Ms between Bursts	Allows the user to set the number of Milliseconds between bursts. Valid valued are 34 - 10000.
INC Pointer / DEC Pointer	Alternates the Pointer insertion from increment to decrement with a 200-msec delay in between.

SONET Transmit - APS

The SONET Transmit APS function is used to configure APS transmit activity. The APS functionality allows the LTE to switch to a backup line in case of errors or failures on the main line. 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. See Configuring APS Commands for instructions on configuring, starting, and stopping APS commands.

The following functions are available on the APS screen:

Function	**Description**
Item <#>  Only appears when K1/K2 bytes have been added.	Opens the Apply Maintenance to Entry <#> dialog box, from which you can edit a byte's configuration.
New Item	Opens the Apply Maintenance to Entry window, from which you configure K1 and K2 bytes.
Start	Begins transmission of the K1 and K2 byte configuration.
Clear	Clears all K1/K2 bytes from the table.

SONET Transmit - Error Alarm

The test unit can transmit errors and alarms to simulate various defects and anomalies to determine if the receiving equipment can detect an error or alarm in the incoming signal.

For information on inserting errors and alarms see the online help topics, Inserting Errors and Inserting Alarms in the Common Tasks section.

The following options are available one the Error Alarm screen:

- Error to Insert - This SONET Transmit function determines the type of error transmitted by the system. The purpose of generating an error with system is to

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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:

Option	Description
None	No errors are generated. Turns errors off.
Frame	Inserts a frame alignment error in the A1 and A2 bytes.
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.
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.
REI-L	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

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	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	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.)
TC-IEC-P Only appears when the test set is configured for TC Overhead Processing.	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-P Only appears when the test set is configured for TC Overhead Processing.	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-P Only appears when the test set is configured for TC Overhead Processing.	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 - This SONET Transmit function sets the error rate for the selected error. The system starts transmitting errors after the insertion rate is selected. For information about inserting errors, see Inserting Errors in the Common Tasks section of the online help.

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The following Error Insert Rate options are available:

Option	Description
Off	Turns error transmission off.
Maximum	Generates errors at the maximum rate listed below.
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.
User Defined	Allows the user to enter a custom error. Valid values are 1e-6 to 1e-10.

- 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:

Alarm	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.
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).

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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.
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-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.

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TC-RDI-P Only appears when the test set is configured for TC Overhead Processing.	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-P Only appears when the test set is configured for TC Overhead Processing.	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-P Only appears when the test set is configured for TC Overhead Processing.	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-P Only appears when the test set is configured for TC Overhead Processing.	Tandem Connection-Unequipped. An all-zeros pattern is inserted into the N1 byte of the Path OH.
TC-LOF-P Only appears when the test set is configured for TC Overhead Processing.	Tandem Connection-Loss of Frame. Generates a loss of a valid multiframe pattern to downstream equipment.

SONET Receive Screens and Functions

The Receive function allows you to define the parameters used in SONET receiving operations.

The following parameter setting options are available from the Receive screen:

- Set (Set 1, Set 2, Set 3)
- SOH
- POH
- SIG

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SONET Receive - Set / Set 1

The SONET Receive Settings 1 screen configures the unit's receive parameters. It 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.
Interface	Selects the optical or electrical interface. The following options are available: **OC-192**, **OC-48**, **OC-12**, **OC-3**, **OC-1**, **EC-3**, **EC-1**  If the test set is licensed for Jitter operation, the following options are also available: **OC-3-Jitter**, **OC-12-Jitter**, **OC-48-Jitter**
Mapping	Defines the type of signals that are combined to create an SDH signal. For example, four AU-4-16c's can be mapped into an SDH signal. Mapping options are dependent on the selected Interface. The following options may be available: • **Unframed Bulk Fill** • **STS-192c Bulk Fill** • **STS-48c Bulk Fill** • **STS-12c Bulk Fill** • **STS-3c Bulk Fill** • **STS-1 Bulk Fill** • **VT-6 Bulk Fill** • **VT-2 Bulk Fill** • **VT-1.5 Bulk Fill**  If the test set is licensed for Dual DS3 and the OC-48 Interface is selected, then the **Dual DS3 Async** mapping option is available.

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STS-<#> Dropped	Selects a specific signal to monitor in the SONET signal. The test set receives the SONET signal that is demuxed into dropped signals and then processed. The options that appear will depend on your current configuration. The default setting is 1.
VT Dropped	Selects a Virtual Tributary to dropped. This option appears when VT mapping is 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 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**
Power Low Threshold	Sets the power threshold. If the power drops below the threshold, the Power Low alarm initiates. When the threshold is reached, the LOS alarm signals.
Out of Frequency Threshold	Sets the frequency threshold for the Line Frequency Offset. When the threshold is reached, the Frequency Wide alarm is triggered.
Trigger Out	Allows the user to select the way that the protocol processor will respond to an external "pulse" received.

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SONET Receive - Set / Set 2

The SONET Receive Settings 2 screen configures the unit's receive parameters. It contains the following functions:

Function	Description
PLM Alarm Reporting	**Disable** or **Enable** Payload Label Mismatch reporting.
Expected Path 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: • **00 (Unequipped)** • **01 (Equipped)** • **02 (VT Structured STS)** • **03 (Lock VT Mode)** • **04 (Async 34M/45M Mapping)** • **12 (Async DS4NA Mapping)** • **13 (ATM Mapping)** • **14 (DQDB Mapping)** • **15 (Async FDDI Mapping)** • **16 (HDLC Over SONET)** • **User Defined** (any eight bit pattern 0 to FF)  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.
Expected VT Signal Label	Select one of the following values for the expected Lower Order Path Signal: • **00 (Unequipped)** • **01 (Equipped)** • **02 (Asynchronous)** • **03 (Bit Synchronous)** • **04 (Byte Synchronous)** • **User Defined** (any eight bit pattern 0 to FF)  This option only appears when VT mapping is configured. It is coupled with the C2 byte option in the Transmit Overhead screen. If it is changed in this

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	screen, it will change in the Overhead screen as well.
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. A TIM-S alarm occurs if the incoming J0 trace does not match the expected J0 trace. The J0 byte is part of the 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)** - 0 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

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	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. A TIM-P 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.
Expected J2	Defines the expected J2 trace received on the incoming SONET signal. A TIM-P

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	alarm occurs if the incoming J2 trace does not match the expected J2 trace. The J2 byte is part of the Lower-order Path OH. The J2 trace is a pattern that can be created for repeated transmission. This 16-byte frame is identical to the 16-byte frame of the J1 and J0 bytes. 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.

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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. • **Path Enable** - Turns on N1 byte for TCM error and alarm reporting mode. • **VT Enable** - Turns on the N2 byte for TCM error and alarm reporting mode. • **Disable** - Turns off TCM error and alarm reporting mode.  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 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.

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SONET Receive - Set / Set 3

The SONET Receive Settings 3 screen configures the unit's receive parameters. It contains the following functions:

Function	Description
Orderwire Drop	Allows you to drop an orderwire circuit for a protocol processor. The following options are available: **None**, **E1**, **E2**, **F1**, **F2-P, Z3-P**
Datacom Channel Drop	Defines specific bytes in the Section overhead that is used to send operation and maintenance information between the Section and Line equipment. The following options are available: • **None** • **Section DCC Port** • **Section PRBS 2^7-1** • **Section PRBS 2^7-1 (Inverted)** • **Line DCC Port** • **Line PRBS 2^7-1** • **Line PRBS 2^7-1 (Inverted)**

SONET Receive - SOH

The Receive SOH screen contains the following options:

Option	Description
Showing	Selects a specific SOH slot to monitor on the incoming SDH signal. The following bytes appear for the selected SOH slot: • Section Overhead bytes (A1, A2, Z0, B1, E1, F1, D1, D2, and D3), • Lower Path Overhead bytes (B2, K1, K2, D4-D12, Z1, Z2, and E2), • Pointer bytes (H1, H2, and H3), • Path Overhead bytes (B3, C2, G1, F2, H4, Z3, Z4, and Z5), • J0 Trace byte, and J1 Trace byte.
J0	Displays the J0 trace received on the incoming SDH signal. This is a read-only function.

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SONET Receive - POH

The Receive POH screen contains the following options:

Option	Description
STS-<#> Dropped	Allows the user to enter the number (1 - 4) of the specific STS channel to monitor. The default setting is 1.
Path Overhead	Displays the Overhead bytes for a specific Path OH slot on the incoming SONET signal. This is a read-only function.
J1 Trace	Displays the J1 trace received on the incoming SONET signal. This is a read-only function.
J2 Trace	Displays the J2 trace received on the incoming SONET signal. This is a read-only function.
TC Trace	Displays the TC trace received on the incoming SONET signal. This is a read-only function.

SONET Receive - SIG

Displays the following measurements of the incoming SDH signal:

- Frequency in Hz
- Line Frequency Offset Received in Hz and ppm
- Optical power in dBm
- STS Pointer Frequency Offset in ppm
- VT Pointer Frequency Offset in ppm
- Update Signal Calibration - Calibrating the system's optical power should be done carefully. To keep unauthorized users from changing calibration settings, the Update Signal Calibration button on the protocol processor's Receive SIG screen is unavailable by default. To change the setting, a user with Admin or Calibrate privileges must enable the calibration mode.

To enable protocol processor calibration:

1. From the **System** tab, select **Misc**.
2. From **Local Settings**, select **Enable Calibration**.


The user must have Admin or Calibrate privileges to enable the calibration mode.

3. See Calibrating SDH/SONET Optical and Electrical Power for specific calibration instructions before proceeding.

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4. After setting the **Zero power reading** and **dBm power readings** select the **Save** button to update the signal calibration.

SONET Results Screens and Functions

All monitored activity that the system receives is reported to the Results screen for viewing and analyzing. The Results screen provides information used for analyzing the incoming signal, pattern, errors, and alarms.

The following options are available from the Results screen:

- ERR
- PTR
- Event
- APS
- Large LED
- Graph

SONET Results - ERR

The Results ERR screen contains the following options:

- **Scan** - Select Scan to access 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."

- **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 reported errors are a result of incoming errors that are generated by the SDH network, or errors that are intentionally generated by the system when it is used in a loopback environment.

  The following errors can be monitored:

▶ Frame	▶ REI-V (Remote Error Indication - Virtual Tributary)
▶ B1 (Section BIP-8, also known as a Section Coding Violation - CV-S)	▶ BIT (BIT errors reported in the payload)
▶ B2 (Line BIP-8, also known as a Line Coding Violation - CV-L)	▶ NDF-P (New Data Flag - Path)
▶ B3 (Path BIP-8, also known as a Path Coding Violation - CV-P)	▶ NDF-V (New Data Flag - Virtual Tributary)

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▸ REI-P (Remote Error Indication - Path)	▸ TC-IEC-P (Tandem Connection-Incoming Error Count)
▸ BIP-V (Bit Interleaved Parity - Virtual Tributary)	▸ TC-REI-P (Tandem Connection-Remote Error Indicator)
▸REI-L (Remote Error Indication - Line)	▸ TC-OEI-P (Tandem Connection-Outgoing Error Indicator)

The following parameters are measured for the 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

- **Alarms** - The system can monitor and report alarms and their duration on the incoming SDH signal. The alarms are shown in duration of the alarm in seconds.

  The following alarms can be monitored:

▸ LOS (Loss of Signal)	▸ Concat (Concatenated)
▸ Power Hot	▸ AIS-P (Alarm Indication Signal - Path)
▸ Power Low	▸ LOP-P (Loss of Pointer - Path)
▸ Frequency Wide	▸ UNEQ-P (Unequipped - Path)
▸ OPU Generic AIS	▸ RDI-P (Remote Defect Indicator - Path)
▸ LOF (Loss of Frame)	▸ TIM-P (Trace Identifier Mismatch - Path)
▸ AIS-L (Alarm Indication Signal - Line)	▸ TIM-S (Trace Identifier Mismatch - Section)
▸ APS-L (Automatic Protection Switching-Line)	▸ AIS-V (Alarm Indication Signal - Virtual Transport)
▸ SEF (Severely Errored Frame)	▸ LOP-V (Loss of Pointer - VT)
▸ RDI-L (Remote Defect Indicator - Line)	▸ LOM-V (Loss of Multiframe Alignment - VT)
▸ Pat Sync (Pattern Synchronization)	▸ UNEQ-V (Unequipped - Virtual Transport)

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▶ PLM-P (Payload Label Mismatch - Path)	

SONET Results - PTR

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

The following STS Pointer results 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 Coun**t - Indicates the New Data Flag count.
- **Rx Pointer Bytes (HEX)** and **Rx Pointer Value** (in decimal) - Valid Pointers range from 0 to 782.

When lower-order mapping is configured VT Pointer results also appear.

SONET Results - Event

The 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 the order of the results. Select **Pause** to temporarily halt the display of results.

SONET Results - APS

The APS function monitors 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.

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SONET Results - Large LED

This Large LED screen 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.

SONET Results - Graph

The Graph 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 Using Graphs in the Common Tasks section of the online help.

SONET Test Screens and Functions

The Test function allows you to configure test parameters, such as how long the test will run, printing and recording events, and what action will take place after the test is complete.

The following options are available from the Test screen:

- Set 1
- Service Disrptn
- RTD

SONET Test - Set 1

Set 1 functions determine how long an SONET protocol processor test runs for and what activities occur at the end of the test.

The following functions are available:

- Duration
- Action After Duration
- **Pause Test/Resume Test** - When selected the test toggles between pausing an active test and resuming the test. The button's label indicates the action that will happen when it is selected.

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

SONET Test - Service Disruption

The test set can measure service disruption intervals in your network. The unit can be configured to monitor for a specific event that will cause a service disruption. 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 a service disruption event and switch to a backup path.

The SDH/SONET/OTN service disruption measurement has an accuracy of 1 µs (microsecond). GigE service disruption tests show an accuracy of 0.1 ms (millisecond).

Test Service Disruption functions include:

- **Protection Switch Criteria** - Determines the type of alarm, error, or pattern event that is used as a trigger to generate service disruption activity in your

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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 service disruption measurement has an accuracy of 0.5 milliseconds. Options include: B1, SEF, AIS-L, AIS-P, AIS-V, or PRBS.

- **Consecutive Good Time Required** - This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before Protection Switch measurements stop accumulating. 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 consecutive error-free frames to occur before Protection Switch measurements stop accumulating. The range is 1 to 16383 frames and is entered using a keypad.
- **State** - Starts and stops Service Disruption mode. If an 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 errored frames that occur before the first good frame. This is based on the previously selected criteria for the consecutive time and frame requirements. The unit begins monitoring the incoming signal for a service disruption measurement event as soon as one of the following State options is selected:

  - **Single APS** - Monitors for a single service disruption event. Seconds and frames are reported and the State returns to Inactive.
  - **Continuous APS** - Constantly monitors for service disruption events, and updates the seconds and frames reported.
  - **Stop APS** - Stops service disruption monitoring. The State returns to Inactive.

- **Protection Switch Time (MilliSecs)** - Indicates the duration in seconds that it took for the service disruption event (errored frames) to occur.
- **Protection Switch Time (Frames)** - Indicates the number of errored frames received during the service disruption event.

For instruction on monitoring service disruption activity, select Measuring Service Disruption Activity in the Common Tasks section of the online help.

SONET Test - RTD

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. The following options are available:

  - **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

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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 (milliSec)** - Indicates the duration in seconds that it took for the known frame to return to the unit.
- **Round-trip Delay Time (Frames)** - Indicates the number of frames received during the measurement.
- **Consecutive Good Time Required** - This function allows you to enter the time-duration (in milliseconds) of consecutive error-free frames to elapse before round-trip measurements stop accumulating. 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 consecutive error-free frames to occur before round-trip measurements stop accumulating. 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.

SONET Performance Monitor Screens and Functions

Performance Monitoring provides greater detail about incoming Section, Line, Path, and BIT errors.

The following options are available:

- Sect
- Line
- Path
- VT Path
- BIT

SONET Perf Monitor - Sect

This Section screen provides a detailed breakdown for Section errors detected and logged by the SONET protocol processor.

Section - Near End B1 Errors

- **CV** - Coding Violations. Error count of incoming B1 errors.
- **ES** - Errored Seconds. Reports the duration of the incoming B1 errors in seconds and the percentage of errored seconds compared to the duration of error free seconds.

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- **EFS** - Error Free Seconds. Reports the duration of the incoming B1 error free seconds and the percentage of error free seconds compared to the duration of errored seconds.
- **SES** - Severely Errored Seconds. 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.

SONET Perf Monitor - Line

The Line screen 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:

Line - Near End B2 Errors

- **CV** - Coding Violations. Reports an error count of incoming B2 errors.
- **ES** - Errored Seconds. Reports the duration of the incoming B2 errors in seconds and the percentage of errored seconds compared to the duration of error free seconds.
- **EFS** - Error Free Seconds. Reports the duration of the incoming B2 error free seconds and the percentage of error free seconds compared to the duration of errored seconds.
- **SES** - Severely Errored Seconds. Reports the duration of 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.
- **UAS** - Unavailable Seconds. 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.

Line - Far End REI Errors

- **CV** - Coding Violations. Reports 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.)
- **ES** - Errored Seconds. This counter reports the number of seconds that an REI-L alarm is reported
- **EFS** - Error Free Seconds. Reports the duration of the incoming REI-L error free seconds and the percentage of error free seconds compared to the duration of errored seconds.
- **SES** - Severely Errored Seconds. 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.
- **UAS** - Reports a count of 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.

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SONET Perf Monitor - Path

The Path screen 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:

Path - Near End B3 Errors

- **CV** - Code Violations. This is an error count of incoming B3 errors.
- **ES** - Errored Seconds. 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.
- **EFS** - Error Free Seconds. This reports the duration of the incoming B1 error free seconds. This statistic also reports the percentage of error-free seconds compared to the duration of errored seconds.
- **SES** - Severely Errored Seconds. 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.
- **UAS** - Unavailable Seconds. 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.

Path - Far End REI Errors

- **CV** - Code Violations. 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.)
- **ES** - Errored Seconds. This is a counter that indicates the number of seconds that an REI-P alarm is reported.
- **EFS** - Error Free Seconds. Reports the duration of the incoming REI-P error free seconds and the percentage of error free seconds compared to the duration of errored seconds.
- **SES** - Severely Errored Seconds. 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.
- **UAS** - Unavailable Seconds. 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.

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SONET Perf Monitor - VT Path

The VT Path screen displays a detailed breakdown of incoming Virtual Tributary path BIP (Section BIP-8, also known as Coding Violations) errors and Virtual Tributary path Remote Error Indicator (REI-P) errors.

The following statistics are reported:

Payload - BIT Errors

- **CV** - Code Violations. Reports the code violations by count.
- **ES** - Errored Seconds. Reports the errored seconds by count, rate, and objective percentage.
- **EFS** - Error Free Seconds. Reports the error free seconds by count, rate percentage, and objective percentage.
- **SES** - Severely Errored Seconds. Reports the error free seconds by count, rate percentage, and objective percentage.
- **UAS** - Unavailable Seconds. Reports the unavailable seconds by count, rate percentage, and objective percentage.

SONET Perf Monitor - BIT

Bit analysis provides a detailed breakdown for detected Payload Bit errors.

The following statistics are reported:

Payload - BIT Errors

- **CV** - Code Violations. Reports the code violations by count.
- **ES** - Errored Seconds. Reports the errored seconds by count, rate, and objective percentage.
- **EFS** - Error Free Seconds. Reports the error free seconds by count, rate percentage, and objective percentage.
- **SES** - Severely Errored Seconds. Reports the error free seconds by count, rate percentage, and objective percentage.
- **UAS** - Unavailable Seconds. Reports the unavailable seconds by count, rate percentage, and objective percentage.

Dual DS3 Overview

This section of the online help system discusses the following topics:

- Dual DS3 Specific Tasks
- Dual DS3 Screen and Function Descriptions

Dual DS3 Specific Tasks

This section includes tasks that are specific to the Dual DS3 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.

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Configuring Dual DS3 Mode

Through mapping, the Dual DS3 functionality provides the capability to monitor the two DS3s on Channels 1 and 4 and insert errors and alarms.

Important: The test set must be licensed for Dual DS3 in order to use this functionality.

To configure Dual DS3 mode:

1. From the **SONET/SDH** tab, select **Transmit**.
2. Select **Set** from the tabs along the left side of the **Transmit** screen and choose **Set 1**.
3. Select **Interface** and choose **OC-48/STM-16**.
4. Select **Mapping** and choose **Dual DS3 Async**. The dual DS3 tabs become available.

Dual DS3 Screen Functions and Descriptions

This section of the online help system describes the various functions, buttons, and tabs that control Dual DS3 configuration and operation.

The following screens and functions are discussed:

- LEDs
- Transmit
- Receive
- Results
- Test
- Perf Monitor

Dual DS3 LED Quick Status Area

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

LED	Description
TX	Displays the DS3 transmit framing value.
RX	Displays the DS3 receive 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.

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Test Paused	Indicates when a test has been paused from the Test Set 1 screen.
OOF	Out of Frame. Indicates that four consecutive frames have been received with invalid or errored framing patterns. This is an alarm LED.
Frame Err	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.

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Dual DS3 Transmit Screens and Functions

The Transmit function allows you to define the parameters for using the Dual DS3 functionality.

The following parameter setting options are available from the Transmit screen:

- Set 1
- Set 2
- Error Alarm

Dual DS3 Transmit - Set 1

The Transmit Settings 1 screen configures the framing format for the transmit signal.

The Set 1 screen contains the following options:

Option	Description
Settings Control	This setting is automatically set to Coupled. When a setting is changed on the Transmit screen it also changes on the Receive screen.
Clock	Displays the clock source.
Framing	Configures the framing format used for the DS3 transmit signal. The following options are available: **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.

Dual DS3 Transmit - Set 2

The Settings 2 screens allows the user to configure the payload pattern

Option	Description
Mapping	Mapping is automatically set to Bulk Filled.
Pass Thru Mode	Displays the status of Pass Thru Mode.

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Payload Pattern	Sets a test pattern to transmit over the DS3 signal. The following options are available: PRBS 15, PRBS 15 Inv, PRBS 20, PRBS 20 Inv, PRBS 23, PRBS 23 Inv, User Defined (1 bit to 32-bit)

Dual DS3 Transmit - Error Alarm

To determine if receiving equipment can detect errors and alarms on the incoming signal, the Transmit Error Alarm screen allows the user to insert errors and alarms to simulate various defects and anomalies.

For information on inserting errors and alarms see the online help topics, Inserting Errors and Inserting Alarms in the Common Tasks section.

The following options are available:

Option	**Description**
Error to Insert	Allows the user to select an error that will be transmitted for the DS3. The following options are available: • **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.  This option is only available when M13 or C-Bit framing is selected. • **P-Parity** - Results in an error in the P-bit channel (P1 and P2) that provides parity information for the preceding M-frame.  This option is only available when M13 or C-Bit framing is selected. • **C-Parity** - Results in an error in the

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	C-bit channel which is used to denote the presence or absence of stuffed bits. This option is only available when C-Bit framing is selected. • **FEBE** - Results in a error in one of the three C-Bits in the M-subframe designated as the Far End Block Error (FEBE) bit. This option is only available when C-Bit framing is selected.
Error Insert Rate	Allows the user to set the insertion rate for the selected DS3 transmit error. 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 • **User Defined** - Insert a customized error insertion rate. Valid values are 1e-3 to 1e-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. OOF, Idle, and Yellow alarms are not available if DS3 Framing is set to unframed.

Dual DS3 Receive Screens and Functions

The Receive function allows you to define the parameters used in Dual DS3 receiving operations.

The following parameter setting options are available from the Receive screen:

- Set 1
- SIG

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Dual DS3 Receive - Set 1

The Receive Settings 1 screen configures the unit's incoming signal parameters.

The following options are available:

Option	Description
Settings Control	This setting is automatically set to Coupled. When a setting is changed on the Receive screen it also changes on the Transmit screen.
Framing	Configures the framing format used for the DS3 received 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 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.
Mapping	Mapping is automatically set to Bulk Filled.
Payload Pattern	Sets the type of DS3 signal pattern that the system expects to receive. The following options are available: PRBS 15, PRBS 15 Inv, PRBS 20, PRBS 20 Inv, PRBS 23, PRBS 23 Inv, User Defined (1 bit to 32-bit)

Dual DS3 Receive - SIG

The Receive screen displays the line frequency and line frequency offset of the incoming DS3 signal.

The following information is displayed:

- Line Frequency in MHz
- Line Frequency Offset Received in Hz and ppm

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Dual DS3 Results Screens and Functions

All monitored activity that the DS3 receives is reported to the Results screen for viewing and analyzing. The Results screen provides information used for analyzing the incoming signal errors and alarms.

The following options are available from the Results screen:

- Scan
- ERR
- Alarm
- Event
- Large LED
- Graph

Dual DS3 Results - Scan

The SCAN screen provides a list of received errors and alarms for the DS3 signal and the duration or count of each event. 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.

Dual DS3 Results - ERR

The ERR screen 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:

- **Frame Error** - Reports invalid frames.
- **P-Parity** - Reports errors in the P-bit channel (P1 and P2) that provides parity information for the preceding M-frame.
- **C-Parity** - Reports errors in the C-bit channel of the DS3 channel, which is used to denote the presence or absence of stuffed bits.
- **FEBE** - Far End Block Errors. Reports a count of E-Bit errors, which are SMFs in error at the far end, as determined by a CRC-4 error.
- **BIT** - Errors in the expected bit pattern of the payload.

Dual DS3 Results - Alarm

This function displays how long DS3 alarms were detected by the system.

Results for the following alarms display:

- **Clock** - Indicates an error in clock synchronization.
- **OOF** - Out of Frame. Reports when four consecutive frames are received with invalid (errored) framing patterns.
- **AIS** - Alarm Indication Signal. Reports an alarm indication signal occurrence on the line layer.
- **Idle** - Reports idle alarms.
- **Yellow** - Reports service-affect failure at a terminal.

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- **Pat Sync** - Reports a loss of the pattern synchronization.

Dual DS3 Results - Event

The Event screen 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.

Dual DS3 Results - Large LEDs

This Large LED screen displays the DS3 Quick Status 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.

Dual DS3 Results - Graph

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

Dual DS3 Test Screen and Function

Set 1 screen functionality determines how long a error/alarm 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.

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

Dual DS3 Performance Monitor Screens and Functions

Performance Monitoring provides greater detail about incoming BIT and Path errors.

The following options are available:

- BIT
- Path

Dual DS3 Performance Monitor - BIT

The BIT screen provides a detailed breakdown for BIT errors detected and logged by the DS3 protocol processor.

The following statistics are reported on the BIT screen:

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.

Dual DS3 Performance Monitor - Path

The Path screen displays a detailed breakdown of incoming P-Parity and C-Parity errors.

The following statistics are reported:

Statistic	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.

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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.

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Glossary

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Table Of Contents

Glossary 1

SONET Versus SDH Terminology 43

SONET Overhead bytes Versus SDH 46

SONET Versus SDH Mappings 46

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Glossary

A	B	C	D	E	F	G	H	I	J
K	L	M	N	O	P	Q	R	S	T
U	V	W	X	Y	Z				

A

A1 and A2 bytes

Framing bytes. These two bytes indicate the beginning of the STM-N frame. The A1 and A2 bytes are unscrambled. A1 has the binary value 11110110, and A2 has the binary value 00101000. The frame alignment work of an STM-N frame is composed of (3 x N) A1 bytes followed by (3 x N) A2 bytes.

AAL

ATM Adaptation layer. (1) Two sublayers concerned with segmenting large PDUs into ATM cells; type 1 = CBR, 2 = VBR, 5 = for LAN and FR frames. (2) An ATM LED indicating that an AAL1 SN or SNP error, or a lost or misinserted cell, occurred; or an AAL5 PDU length or CRC error occurred.

AAL0

ATM Adaptation Layer 0. AAL0 denotes an absence of any AAL function, meaning that AAL0 is not really an AAL type in the true sense of the term. AAL0 simply is the transfer of individual cells with no protocol processing of the cell payloads.

AAL1

ATM Adaptation Layer 1 protocol. The ATM Cell consists of a 47 byte payload, a 1 byte sequence number, sequence number protection field and convergence ID field, and a 5 byte header.

AAL5

ATM Adaptation Layer 5 protocol. AAL 5 supports variable length data packets or PDUs (1 to 65,535 octets). AAL5 utilizes a minimum of overhead for each PDU it sends. The entire payload is used for data except for the last cell in the PDU. Functionally, this larger type supports variable bit rate, delay tolerant, connection-oriented data traffic requiring minimal sequencing or error detection support.

A-Bit

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Eight bits of the E1 multiframe located in the third bit of TS0 of odd-numbered E1 frames. They carry the RAI (yellow signal) and are set on when the remote end has a defect such as LOS or LOF.

AIS

Also known as a *Blue Alarm*. A signal that replaces the normal traffic signal when a maintenance alarm indication has been activated. In DS1, AIS replaces the entire frame structure with a predetermined signal (bit pattern). This is done to inhibit alarms in downstream sections caused by identified upstream failures. In DS1, AIS is an unframed all ones signal. In DS3, AIS is a signal with a valid M-frame Alignment channel, M-subframe Alignment and valid P bits. The information bits are set to 10...sequence, starting with a one (1) after each M-frame Alignment bit, M-subframe Alignment bit, X-bit, P-bit, and C-bit channel. The C-bits are set to zero and the X-bits are set to one. For ATM, AIS is an all ones signal. For SONET, AIS can occur due to an LOS, LOF, or LOP failure on Line layer, Path layer, or Virtual Tributary.

AIS-L

Line Alarm Indication Signal. All ones pattern used to indicate if an alarm is being received from upstream Line terminating equipment.

AIS-P

Path Alarm Indication Signal. Indicates if an alarm is being received from upstream Path terminating equipment.

AISS

Alarm Indication Signal Seconds.

ANSI

American National Standards Institute. A standards setting, non-government organization founded in 1918, which develops and publishes standards for transmission codes, protocols, and high-level languages for voluntary use in the United States.

APS

Automatic Protection Switching. The K1 and K2 bytes of the line overhead section of the Synchronous Payload Envelope are reserved for APS signaling. APS commands are those signals loaded in the K1 and K2 bytes that control the APS functions. Also see Line Overhead and Synchronous Payload Envelope.

ASA 312

Asynchronous/Synchronous Analyzer. Digital Lightwaves first-generation functionally and technologically innovative diagnostic analyzer for high-speed telecommunications.

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ATM

Asynchronous Transfer Mode. A multiplexing/switching technique in which information is organized into fixed-length cells with each cell consisting of an identification header field and an information field. The transfer mode is asynchronous in the sense that the use of the cells depends on the required or instantaneous bit rate.

AU

Administrative Unit. The information structure which provides adaptation between the Higher-Order path layer and the Multiplex Section layer. The Virtual Container (VC) plus the pointers (H1, H2, H3 bytes) is called the AU.

B

B1 byte

RS Bit interleaved parity code (BIP-8) byte. This is a parity code (even parity) used to check for transmission errors over a Regenerator Section. Its value is calculated over all bits of the previous STM-N frame after scrambling, then placed in the B1 byte of STM-1 before scrambling. Therefore, this byte is defined only for STM-1 number 1 of an STM-N signal.

B2 byte

Multiplex Section (MS) bit interleaved parity code (MS BIP-8). This bit interleaved parity N x 24 code is used to determine if a transmission error has occurred over a multiplex section. It's even parity and is calculated overall bits of the MS Overhead and the STM-N frame of the previous STM-N frame before scrambling. The value is placed in the three B2 bytes of the MS Overhead before scrambling. These bytes are provided for all STM-1 signals in an STM-N signals.

B3 byte

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.

B1 ERR

B1 Error. 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. A B1 error is also known as a Section BIP-8.

B2 ERR

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B2 Error. A B2 error is also known as a Line BIP-8. Indicates the number of parity errors 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.

B3 ERR

B3 Error. A B3 error is also known as a Path BIP-8. 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.

BBE

Background Block Errors. This is a count of errored blocks which do not occur during a severely errored second

BPV

Bipolar Violation. Indicates that two consecutive pulses of the same polarity occurred in the same digital bit stream

BGP

Border Gateway Protocol

Bit Errors

Errors in the expected bit pattern in the payload (data channels)

BITS

Building Integrated Timing Supply 1.544 MHz.

BIP-8

Bit Interleaved Parity, 8-bit code. An error monitoring code

Burst Count

Determines the number of Pointer location movements when the Increment or Decrement Pointer buttons on the unit are pressed. The Pointer burst count ranges from one to eight.

C

C2 byte

Path Signal Label byte. This byte specifies the mapping type in the VC-N.

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CAS

Channel Associated Signaling. An E1 signaling protocol that utilizes all of TS16, where each byte is broken into two nibbles, and each nibble contains the ABCD bits for one of the 30 data channels

CASMFL

Channel Associated Signaling Multiframe Loss. Occurs when the four zeros at the start of TS16 in frame 0 cannot be found.

CBR

Constant Bit Rate. Supports a constant or guaranteed rate to transport services.

CDV

Cell Delay Variation. A component of cell transfer delay induced by call scheduling and buffering.

CDVT

Cell Delay Variation Tolerance. The upper limit of acceptable random arrival times between consecutive cells of a connection.

CLK

Indicates the timing source for the SONET transmit signal. The timing source is set using the **Clock Reference** function. This is a status indicator.

CLP

Cell Loss Priority, signaling bit in ATM header cell (0=high priority, 1=low priority).

CLR

Cell Loss Ratio. Lost Cells/Total Transmitted Cells. It is also a parameter that the network agrees to offer as an objective over the lifetime of a connection.

CMR

Cell Misinsertion Rate. The ratio of cells that were received (but were not transmitted by the source) in relation to the total number of cells correctly transmitted.

CONCAT

Concatenated

C-Parity Error

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An error in the C-bit channel of the DS3 channel, which is used to denote the presence or absence of stuffed bits.

CPCS

Common Part Convergence Sub-layer.

CRC

Cyclic Redundancy Check. In E1, this consist of 4 bits, and is a CRC-4.

CTD

Cell Transfer Delay. Elapsed time between a cell exit event at the source and the corresponding cell entry event at the destination.

CTS

Clear to Send. RS-530 control signal from the DCE that alerts the DTE device that the DCE is ready to receive data.

CV-L

Line Coding Violation. This is an error count of incoming B2 errors (also known as a Line BIP-8).

CV-LFE

Far End Coding Violation. This is an error count of the number of B2 errors detected by the far end Line Terminating Equipment. These errors are reported to the unit using the M1 byte of the Line overhead.

CV-P

Path Coding Violation. This is a B3 error, which is also known as a Path BIP-8.

CV-PFE

Far End Coding Violation. 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.

CV-S

Section Coding Violation. This is a B1 error, which is also known as a Section BIP-8.

D

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-dBm

Power level expressed in relation to 1 milliwatt. For example: 0dBm = 1 milliwatt, +3 dBm = 2 milliwatt, -3 dBm = 0.5 milliwatt.

D1 - D3 bytes

Regenerator Section Data Communications Channel (DCC) bytes. These three bytes form a 192 kbits/s message channel providing a message-based channel for Operations, Administration and Maintenance (OAM) between pieces of section terminating equipment. The channel can be used from a central location for control, monitoring, administration, and other communication needs.

D4 - D12

Multiplex Section (MS) Data Communications Channel (DCC) bytes. These nine bytes form a 576 kbits/s message channel from a central location for OAM information (control, maintenance, remote provisioning, monitoring, administration another communication needs).

DCD

Data Carrier Detect. RS-530 signal control. DCD shares the same pin with RLSD (Receive Line Signal Detect).

DCE

Data Communications Equipment. A device that communicates with a DTE device in RS-232C communications. An example is a modem. In a typical RS-232 or RS-530 link a DTE device, such as a PC, talks to a DCE device, such as a modem DTE and DCE are complimentary interfaces.

Drop and Insert

The process in which a signal, or part of a signal, in transit is dropped off at an intermediate location, and other information is inserted into the signal for subsequent transmission.

DS

Digital Service. A hierarchy of digital signal speeds used to classify capacities of signal lines. The fundamental speed level is DS-0 (64 kilobits per second) and the highest is DS-4 (about 274 million bits per second).

DS-0

Digital Service, level 0. It is 64,000 bps, the worldwide standard speed for digitizing one voice conversation using Pulse Code Modulation. There are 24 DS-0 channels in a DS-1.

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DS-1

Digital Service, level 1. It is 1.544 Mbps signal rate. The standard for 1.544 Mbps is 24 voice conversations each encoded at 64 Kbps. DS-1 is also called T-1.

DS-2

Digital Service, level 2. Equivalent of 4 DS-1 channels, and operating at 6.312 Mbps. Also called T-2.

DS-3

Digital Service, level 3. Equivalent of 28 DS-1 channels, and operating at 44.736 Mbps. Also called T-3. Framing specification used for transmitting a digital signal at 45 Mbps through the telephone switching network on a T3 digital WAN carrier facility.

DSR

Data Set Ready. RS-530 control signal that is sent by a DCE device indicating to the DTE device that the DCE is ready to transmit or receive data.

DTE

Data Terminal Equipment. A device that controls data flow to or from a computer. An example would be a PC serial port. In a typical RS-232 or RS-530 link a DTE device, such as a PC, talks to a DCE device, such as a modem. DTE and DCE are complimentary interfaces.

DTR

Data Terminal Ready. RS-530 control signal sent by the DTE device to the DCE, letting it know that the DTE is ready.

DWDM

Dense Wavelength Division Multiplexing. The higher-capacity version of WDM, which is a means of increasing the capacity of fiber-optic data transmission systems through the multiplexing of multiple wavelengths of light.

E

E1

The European equivalent of the North American 1.544 million bits per second (Mbps) T1, except that E1 carries information at the rate of 2.048 million bits per second.

E1 byte

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RS orderwire byte. This byte is allocated to be used as a local orderwire channel for voice communication between regenerators.

E1 Frame

32-byte frame containing the framing byte in the first byte (TS0) that signals information for a 64k-bit data channel in TS16 and 64k bit data channels in the other time slots.

E2 byte

MS Orderwire byte. This orderwire byte provides a 64 kbits/s channel between multiplex entities for an express orderwire. It's a voice channel for use by craftspeople and can be accessed at multiplex section terminations.

E3

Wide-area digital transmission scheme used predominantly in Europe that carries data at a rate of 34.368 Mbps. E3 lines can be leased for private use from common carriers.

EB

Errored Block. In E1, a block is an SMF, consisting of 8 E1 frames or half of a Multi-frame. Each block contains one CRC-4 in E1. An E1 block occurs 1000 times per second.

E-Bit

Two bits of the E1 multiframe, located in the first bit of the last two odd-numbered E1 frames. They carry the FEBE, one for each SMF, and are set when the corresponding CRC-4 at the remote end is in error.

EC

Error Count. An incrementing value indicating the cumulative singular occurrences of any specific error.

EFS

Error Free Seconds. A measurement of the time, in seconds, in which there were no errors detected in the signal being monitored.

EFSR

Error Free Seconds Rate. A measurement of the time, in seconds, in which there were no errors detected in the signal being monitored.

EIA-530

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Electrical interface for the RS-530 Serial Protocol Processor that can be configured to act as DTE or DCE, operating in balanced mode with data transmission supported in asynchronous or synchronous timing. Asynchronous data analysis can be performed at speeds up to 120 Kbps, while synchronous data analysis can be performed at speeds up to 40 Mbps. For EIA-530 interfaces, all signals are balanced with exception of Remote Loop (RL) and Local Loop (LL).

EIA-530A

Electrical interface for the RS-530 Serial Protocol Processor that can be configured to act as DTE or DCE, operating in balanced mode with data transmission supported in asynchronous or synchronous timing. Asynchronous data analysis can be performed at speeds up to 120 Kbps, while synchronous data analysis can be performed at speeds up to 40 Mbps. For EIA-530A interfaces, the Data Terminal Ready (DTR) signal changes to single ended.

Error Checking

A procedure performed by computer-based communications programs, hardware, software, or firmware in a network monitoring device, instrument or equipment to ensure complete and accurate data transfer.

Error Injection

The process of purposely adding errors into a data transmission in order to see if the errors are detected.

Error Ratio

In data transmission, the ratio of the number of incorrect elements transmitted to the total number of elements transmitted.

ES

Errored Seconds. An incrementing value showing the number of seconds in which errors were detected in the transmitted signal.

ESA

Errored Seconds Type A. This is an errored second that has a single error, and has no defects that make it an SES.

ESB

Errored Seconds Type B. This is an errored second that has more than one error, but not enough errors to be an SES, and no defects that would make it an SES.

ES-L

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Errored Seconds - Line. 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.

ES-LFE

Errored Seconds - Line Far End. This is a counter that indicates the number of seconds that an REI-L alarm is reported.

ES-P

Near End Coding Violations - Path. Reports the duration of Severely Errored Seconds (SES) on the incoming SONET signal.

ES-PFE

Far End Errored Seconds. This is a counter that indicates the number of seconds that an REI-P alarm is reported.

ESR

Errored Seconds Ratio. The percentage of errored seconds for available seconds.

ET

Elapsed Time. The duration in seconds of a test.

ETSI

European Telecommunications Standards Institute. The European counterpart to ANSI.

F

F1 byte

Regenerator Section user channel byte. This byte is set aside for the user's purposes. It can be read and/or written to at each section terminating equipment in that line.

F2 byte

Path user channel byte. This byte is used for user communication between path elements.

F3 byte

Path user channel byte. This byte is allocated for communication purposes between path elements and is payload dependent.

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F4 AIS (End-to-End)

In ATM, an Alarm Indication Signal detected throughout the virtual path.

F4 AIS (Segment)

In ATM, an Alarm Indication Signal detected over a segment of a virtual path.

F5 AIS (End-to-End)

In ATM, an Alarm Indication Signal detected throughout the virtual channel.

F5 AIS (Segment)

In ATM, an Alarm Indication Signal detected over a segment of the virtual channel.

F4 RDI (End-to-End)

In ATM, a Remote Defect Indication detected throughout the virtual path.

F4 RDI (Segment)

In ATM, a Remote Defect Indication detected over a segment of the virtual path.

F5 RDI (End-to-End)

In ATM, a Remote Defect Indication detected throughout the virtual channel.

F5 RDI (Segment)

In ATM, a Remote Defect Indication detected over a segment of the virtual channel.

FAS

Frame Alignment Signal. Refers to either TS0 or Bits 2-8 of the first byte of even-numbered E1 frames.

FC

Failure Count. The number of times a particular failure has been started.

FEBE

Far End Block Errors. Count of E-Bit errors, which are SMFs in error at the far end, as determined by a CRC-4 error.

FERF

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Far End Receive Failure. A signal generated and sent upstream that informs the transmitting line terminating equipment that the receiving equipment has detected an incoming failure.

Flow Control

A method of using a particular character (XON and XOFF codes) for controlling when a device sends (or does not send) data.

FOS

Frequency Offset Alarm

Frame Error

An invalid frame identified by the unit.

G

GCRA

Generic Cell Rate Algorithm.

GFC

Generic Flow Control. Available for UNI Interface only. Sets the first four bits of the ATM cell header for a UNI interface. The GFC field allows the use of wild card characters. A wild card is transmitted as a 0 and can be received as a 0 or 1.

Go To

This button allows you to quickly select and jump to a specific tabbed function, a protocol processor, or a chassis.

H

H1 byte

STM Pointer byte. Bits 1 through 4 represent the New Data Flag (NDF) value. Bits 5 and 6 are reserved. Bits 7 and 8 are combined with the H2 byte to identify the beginning of a payload. This marker is called a Pointer.

H2 byte

STM Pointer byte. This byte is combined with the H1 byte to create the Pointer.

H3 byte

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STM Pointer Action.

H4 byte

Position and Sequence Indicator byte. This byte provides a multiframe and sequence indicator for virtual VC-3/4 concatenation and a generalized position indicator for payloads.

HDB3

High Density Bipolar 3. Bipolar coding method that does not allow more than three zeros.

Header

Protocol control information located at the beginning of a protocol data unit (PDU).

HEC

Header Error Control. **(1)** Provides error correction for the ATM Cell Header. It is the last byte of the 5-byte ATM Cell Header. **(2)** It also appears as an ATM LED and indicates if a correctable or uncorrectable HEC error has been received.

HP

For SDH, refers to Higher-Order Path of Section Overhead.

I

Idle Alarm

In DS3, an alarm LED that Indicates an idle alarm was received.

IGMP

Internet Group Management Protocol. Used by IP hosts to report multicast group memberships to neighboring multicast routers.

Insert

That process wherein part of the information carried in a transmission system is modulated (inserted) into a higher speed signal.

Invert

Changes a control signal from 0 to 1 (Off to On), or 1 to 0 (On to Off), depending on its current setting. The signal remains at this setting when the NIC unit is rebooted.

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J

J0 Byte

The J0 byte is part of the Section OH and is known as the Section trace or J0 trace.

J0 Trace

A 64-byte pattern that can be created for repeated transmission. The pattern is a string of ASCII characters. The J0 trace can be configured to send the unit's default pattern or a customized pattern.

J1 byte

Higher-Order VC-N path trace byte. This user-programmable byte repetitively transmits a 15-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.

J2 byte

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.

J1 Trace

The 64-byte fixed length string transmitted in the J1 Byte. See J1 Byte.

Jitter

On a network where all devices must operate in a synchronized manner, relative to the same timing source, jitter is the lack of synchronization between network devices caused by mechanical or electrical changes. Jitter is the phase shift of digital pulses over a transmission medium.

K

K1 Bits 1-4

K1 Bits 1-4 indicates the type of APS request.

K1 Bits 5-8

In Linear APS mode, indicates the number of the channel. Code 0 = Null Channel, Code 1-14 Working channel, Code 15 = Extra traffic channel. In Ring APS mode, Bit 5-8 contains Destination Code Identification.

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K1 Byte

The K1 byte is used to indicate a request by a channel for a switch action. K1 is used by APS (Automatic Protection Switching).

K1 Full Byte

The K1 Full byte configures the bit pattern of the K1 byte using either predefined settings (00000000; 1010101010 - default; or 11111111 - illegal) or user defined settings, which are set using the touch screen keypad, to set the eight bits of the K1 byte.

K2 Bits 1-4

In APS Linear Mode: Bits 1-4 indicate the number of the channel that is bridged onto protection unless channel 0 is received on bits 5-8 of K1 byte, when they shall be set to zero. In APS Ring Mode: Bits 1-4 is Source Node Identification. Source node ID is set to the nodes own ID.

K2 Bits 5

In APS Linear Mode: 0 = provisioned for 1 + 1 mode, 1 = provisioned for 1:n mode. In APS Ring Mode, it indicates short or long path code. 0 = Short Path Code and 1 = Long Path Code.

K2 Bits 6-8

In APS Linear mode: Bits 6-8 indicate the status, such as idle, Br, Br&Sw, or Unused. In APS Ring mode: Bits 6-8 indicate the status such as idle, Ex Tr, or L-RDI.

K2 Byte

The K1 byte is used to indicate a request by a channel for a switch action. K1 is used by APS.

K2 Full Byte

The K2 Full byte configures the bit pattern of the K2 byte using either predefined settings (00000000; 1010101010 - default; or 11111111 - illegal) or user defined settings, which are set using the touch screen keypad, to set the eight bits of the K2 byte.

L

-L

Suffix indicating line level.

Laser

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An acronym for Light Amplification by Stimulated Emission of Radiation. A device which is able to produce light at a single frequency and phase. Light that has a single frequency and a single phase is said to be coherent, in contrast to normal light which has multiple frequencies and random phase combinations. The waves of non-coherent light can be likened to a crowd of people rushing down the street in contrast to coherent light which in the same example, is more like a group of soldiers marching down the street in row formation with each soldier in step.

LCV

Line Code Violation. A signal error in the physical layer of a link. An example would be a BPV error.

Lightwave

Refers to the use of light as a communication signal when transmitted over fiber-optic cable. Light itself can travel over distances as a wave of energy, hence lightwave. The light signal communication travels as a discrete series of pulses of light.

Line

A line is a transport entity that provides the means of moving a digital signal between two consecutive NE (Network Elements) - one originating the line signal and the other terminating it. A SONET network Line comprises the transmission medium, together with the associated equipment, and provides the means of transporting information between two consecutive network elements. One of the network elements originates the Line Overhead and the other terminates the Line Overhead. A Line span in the SONET network has special significance as it is protected in case of equipment failure or deterioration in performance. The transportation of information across a network Line span will be maintained by switching to standby (or protection) facilities provided in case of failure.

Line AIS

Line Alarm Indication Signal. An alarm signal generated when an error is detected in the Line Overhead portion of the Synchronous Transport Frame. See AIS and Line Overhead.

Linear

(1.) Refers to the unit's ability to transmit APS functions for a Linear (span) network. (2.) A Linear network refers to the design of a Local Area Network in which the wiring loops from one workstation to another is structured in a linear direction (as opposed to a Ring Network).

Line B2 Error

The B2 byte is a parity code in the Line Overhead section of the Transport Overhead in the Synchronous Transport Frame. It is even parity, and is calculated over all the bits of

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the Line Overhead and STS-1 envelope capacity of the previous STS-1 frame before scrambling. Used at the receiving end to determine if a transmission error has occurred over the line.

Line FEBE

Line Far End Block Error. An alarm signal generated and sent upstream to the transmitting Line Terminating Equipment, signaling that errors have been detected in the data block at the receiving Line Terminating Equipment.

Line FERF

Line Far End Receive Failure. A signal generated and sent upstream that informs the transmitting line terminating equipment upstream that the receiving equipment has detected an incoming failure in the Line Overhead portion of the Synchronous Transport Frame. See FERF.

Line Frequency

The frequency of the transmitted signal on the network line, measured in megahertz (MHZ).

Line Overhead

In a Synchronous Transport Frame, 18 bytes are delegated in the Transport Overhead section of the frame for monitoring and maintenance of the frame signal across a line span. The Line Overhead data is updated each time the frame passes through a Line Terminating Equipment. The functions of the Line Overhead include the Payload Pointer bytes, a parity byte, Automated Protection Switching signaling, a data communications channel for message based administration, monitoring, maintenance, alarm and other communications needs between line terminating equipment, and an order-wire channel for voice communications between line terminating equipment.

Line Terminating Equipment (LTE)

Equipment, at either end of a Line span in a SONET network, that originates the Line Overhead or terminates the Line Overhead.

LL

Local Loopback. RS-530 loopback signal control. Provides a way for a DTE to check the functioning of the DTE/DCE interface and the transmit and receive sections of the local DCE.

LOCS

Loss of Cell Synchronization. An ATM LED that indicates the loss of Cell Sync. This happens when seven consecutive bad HECs are received. Cell Sync returns when six consecutive good HECs are received.

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LOF-P

Loss of Frame - Path.

LOFS

Loss of Frame Seconds.

LOF-V

Loss of Frame - Virtual Tributary.

LOM

Loss of Multiframe alignment (H4).

LOM-V

Loss of Multiframe alignment - Virtual Tributary.

Looped (Signal Timing)

A method of synchronizing a circuit by taking a synchronizing clock signal from incoming digital pulses.

LOP-P

Loss of STS pointer.

LOP-V

Loss of VT pointer.

LOSS

Loss of Signal Seconds.

Loss of Frame (LOF)

(1.) DS-1, a loss of frame is declared when an OOF condition has existed for a certain period of time. DS-1 criteria to declare LOF is 2.5 s. (0.5 s. of persistent OOF. DS-1 criteria to clear LOF is twenty of fewer contiguous seconds with no OOF defects. (2.) DS-3, a loss of frame is declared when an OOF condition has existed for a certain period of time. DS-3 criteria to declare LOF is 2.5 s. (s. 3. SONET, a loss of Frame failure is declared when a Loss of Frame Defect persists for 2.5 s (an alarm signal generated when an Out of Frame condition exists for 3 microseconds or longer). (3.) An ATM LED that indicates a loss of frame. See **Out of Frame.**

Loss of Frame Defects

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Loss of Frame Defects, in SONET, is synonymous to Out of Frame (OOF).

Loss of Pattern (LOP)

An alarm signal generated for a DS3 signal when the signal pattern is errored.

Loss of Pattern Synchronization (LOPS)

An ATM LED that Indicates a loss of Cell Sync on any active detail channel. Detail channels are available only on virtual channels configured for AAL0.

Loss of Pointer (LOP)

An alarm signal generated when no valid pointer is received in eight consecutive frames, or when eight consecutive New Data Flags are received.

Loss of Signal (LOS)

An alarm signal generated when the data signal has an all zeros pattern lasting 55 microseconds or longer.

LP

For SDH, Lower-Order Path. This is comparable to a VT Path in SONET for VC-11, VC-12, and VC-2.

LP

Lockout of Protection (111). See K1 Bits 1-4.

LP-PLM

For SDH, Lower Path Order - Payload Level Mismatch from a V5 byte.

LP-RDI

For SDH, Lower Path Order - Remote Defect Indication from a V5 byte.

LP-REI

For SDH, Lower Path Order - Remote Error Indication from a V5 byte.

LP-TIM

For SDH, Lower Path Order - Trace Identifier Mismatch from a J2 byte.

LP-UNEQ

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For SDH, Lower Path Order - Unequipped from a V5 byte.

LSS

Loss of Sequence Synchronization. Also known as Loss of Pattern Sync.

M

MBS

Maximum Burst Size. The maximum number of cells which can be transmitted at peak cell rate.

MF

Multiframe. Consists of 16 E1 frames, and broken into two SMFs. The E1 multiframe is used for all types of framing (except unframed). Its purpose is to supply bits for CRC-4 checking, remote errors and alarms, and spare bits which can be used for signaling or other purposes.

MS

Multiplex Section. Contains the information required between the multiplex section termination equipment at each end of the MS (that is, between consecutive network elements excluding the regenerators).

MS-AIS

Multiplex Section - Alarm Indication Signal. MS-AIS is generated by Section Terminating Equipment (STE) upon the detection of a Loss of Signal or Loss of Frame defect, on an equipment failure. MS-AIS maintains operation of the downstream regenerators, and therefore prevents generation of unnecessary alarms. At the same time, data and orderwire communication is retained with the downstream equipment.

MS-RDI

Multiplex Section - Remote Defect Indication from a K2 byte. A signal returned to the transmitting equipment upon detecting a Loss of Signal, Loss of Frame, or MS-AIS defect. MS-RDI was previously known as MS-FERF.

MS-REI

Multiplex Section - Remote Error Indication from a K2 byte. A signal returned to the transmitting equipment upon detecting a Loss of Signal, Loss of Frame, or MS-AIS defect

MSOH

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18 bytes of overhead accessed, generated, and processed by MS terminating equipment. This overhead supports functions such as locating the payload in the frame, multiplexing, or concatenating signals, performance monitoring, automatic protection switching, and line maintenance.

Multiplexor

A device for combining several channels to be carried by a single physical channel.

MUX

To transmit two or more signals over a single channel.

N

N2 byte

Allocated for Tandem Connection Monitoring for the VC2, VC-12, and VC-11 level.

NDF

New Data Flag. The first four bits of the Payload Pointer in the Transport Overhead portion of the Synchronous Transport Frame. These bits indicate a change in the payload, and thus a change in the Payload Pointer.

NIC

Digital Lightwave's second-generation Network Information Computer (NIC) is a portable test unit used to verify and qualify the performance of OC-192 SONET telecommunications and PDH networks.

NNI

Network Node Interface. For ATM, if NNI is selected, then the Header Field uses a 12-bit VPI and no GFC.

NPJ

Negative Pointer Justification.

NPJC

Negative Pointer Justification Count.

NRT

Non-real-time.

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O

OA1

The OTU FAS is a 6-byte structure that occupies row 1, columns 1 to 6 of the OTU overhead. The first three bytes (columns 1 to 3) of the OTU FAS are OA1. The default value is 111 0110.

OA2

The OTU FAS is a 6-byte structure that occupies row 1, columns 1 to 6 of the OTU overhead. The second three bytes (columns 4 to 6) of the OTU FAS are OA2. The default value is 0010 1000.

OAM Cell

Operation and Maintenance Cell. A cell that contains ATM LM information. it does not form part of the upper layer information transfer.

OC

A SONET optical signal. Results from direct electrical-to-optical mapping of the corresponding STS signal. The base rate for OC signals is 51.84 Mbps (OC-1).

OC-1

Optical Carrier level 1. OC-1 is 51.840 million bits per second. Its electrical equivalent is an STS-1.

OC-3

Optical Carrier level 3. A SONET channel equal to three DS3s, which is equal to 155.52 million bits per second.

OC-12

Optical Carrier level 12. A SONET channel of 622.08 thousand million bits per second.

OC-48

Optical Carrier level 48. A SONET channel of 2.488 thousand million bits per second (Gbps).

OC-192

Optical Carrier level 192. A SONET channel of 9.953 thousand million bits per second (Gbps).

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Orderwire

Four-pin modular handset jack for technician use at either the E1 Section Overhead Level or the E2 Line Overhead Level.

OSPF

Open Shortest Path First

Out of Frame

A condition entered when four consecutive frames are received with invalid (errored) framing patterns.

Out of Frame Event

Indicates the actual event of going from correct framing condition to an Out of Frame condition. As soon as frame is lost, this is one OOF Event regardless of how long it lasts.

Overhead (OH)

Extra bits in a digital stream used to carry information besides traffic signals. Orderwire, for example, would be considered overhead information.

P

-P

Suffix indicating Path level.

-PFE

Suffix indicating Path Far End (Remote Path).

Path Overhead

Those bytes placed in an STS-N (or OC-N) frame by the Path Terminating Equipment and that stay with the frame through its whole transport across the transmission path. The Path Overhead consists of the first 9-byte column of the Synchronous Payload Envelope and contains the identification of the originating source of the traffic, a parity check, path status, a signal label (identifying what type of traffic is in the payload envelope), and a data communications channel.

PAT Sync

Pattern Synchronization. Indicates a loss of pattern synchronization. This is an alarm LED.

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Payload

Portion of the SDH signal available to carry service signals such as E1 and E3. The contents of a VC.

Payload Pointer

Indicates the beginning of a virtual container (VC).

Payload Type Indicator (PTI)

An ATM term that means that a Payload Type Indicator is the Payload Type field value distinguishing the various management cells and user cells.

PCM30

Frame that has FAS byte in TS0, CAS in TS16, plus 30 data channels (CRC bits set to 1 on transmit, ignored on receive)

PCM31

Frame that has FAS byte in TS0, plus 31 data channels (no CAS or CRC)

PCM30CRC

Frame that has FAS byte in TS0 with the CRC bits set to do a CRC-4 check, CAS in TS16, plus 30 data channels

PCM31CRC

Frame that has FAS byte in TS0 with the CRC bits set to do a CRC-4 check, plus 31 data channels (no CAS)

PCMCIA

Personal Computer Memory Card International Association standardizes credit-card size packages for memory and input/output (modem, LAN cards, etc.) for computers, laptops, palmtops, etc.

PCR

Peak Cell Rate.

PDH

Plesiochronous Digital Hierarchy. Developed to carry digitalized voice over twisted pair cabling more efficiently. This evolved into the North American, European, and Japanese Digital Hierarchies where only a discrete set of fixed rates is available; namely, nxDS0 (DS0 is a 64 KBPS rate) and then the next levels in the respective multiplex hierarchies.

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PDU

Protocol Data Unit. A packet comprising payload and protocol-specific control information.

PJCS

Pointer Adjustment Count in Seconds.

PLCP

Physical Layer Convergence Protocol.

PLCP Yellow Alarm

Inserts a Yellow alarm on the PLCP for ATM/DS1 PLCP or ATM/DS3 PLCP mapping.

PLM

Payload Label Mismatch alarm.

Pointer

The Payload pointer indicates the offset between the VC payload and the STM-N frame by identifying the location of the first byte of the VC in the payload. In other words, the VC is allowed to "float" within the STM-1 frame capacity.

Pointer Value

The offset in bytes from the pointer to the first byte of the VC, which is the J1 byte. Because the Section Overhead bytes are not counted, and starting points are at 3-byte increments for a VC-4 payload, the possible range is: Total STM-1 bytes minus Section Overhead bytes = Pointer value range.

P-Parity Error

An error in the P-bit channel (P1 and P2) that provides parity information for the preceding M-frame.

PPJ

Positive Pointer Adjustment.

PPJC

Positive Pointer Adjustment Count.

ppm

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Parts per million.

PP Name

A section of the touch screen that displays which common function tab, protocol processor/slot, and chassis is selected. For more information, select SLT or Go To.

PRBS 6

Transmits a maximum of five consecutive zeros and six consecutive ones.

PRBS 6 Inv

Transmits an inverted PRBS 6, inverts it, and transmits a maximum of six consecutive zeros and five consecutive ones.

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

Configured to receive a 32,767-bit pseudorandom pattern, which generates a maximum of 14 sequential zeros and 15 sequential ones. This pattern simulates live data.

PRBS 2^15-1 Inverted

Configured to receive a 32,767-bit pseudorandom pattern, which generates a maximum of 15 sequential zeros and 14 sequential ones.

PRBS 2^20-1

Transmits a maximum of 19 sequential zeros and 20 sequential ones.

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PRBS 2^20-1 Inverted

Transmits an inverted 2^20-1 PRBS, which takes the 2^20-1 PRBS, inverts it, and transmits a maximum of 20 consecutive zeros and 19 consecutive ones.

PRBS 2^23-1

Configured to receive an 8,388,607-bit pseudorandom pattern, which generates a maximum of 22 sequential zeros and 23 sequential ones.

PRBS 2^23-1 Inverted

Configured to receive an 8,388,607-bit pseudorandom pattern, which generates a maximum of 23 sequential zeros and 22 sequential ones.

PRBS 2^31-1

Configured to receive a 2,147,483,647-bit pseudorandom pattern, which generates a maximum of 30 sequential zeros and 31 sequential ones.

PRBS 2^31-1 Inverted

Configured to receive a 2,147,483,647-bit pseudorandom pattern, which generates a maximum of 31 sequential zeros and 30 sequential ones.

Protocol

A specific set of rules, procedures, standards or agreements as to exactly how data is to be formatted and transmitted between two computers, devices or facilities in a network.

Protocol Control Information

Information exchanged between corresponding entities, using a lower layer connection, to coordinate their joint operation.

Protocol Data Unit (PDU)

A segment of data generated by a specific layer of a protocol stack; usually contains information from the next higher layer encapsulated with header and trailer data generated by the layer in question.

Pseudo-Random Bit Sequence (PRBS)

A test pattern having the properties of random data (generally 511 or 2047 bits), but generated in such a manner that another circuit, operating independently, can synchronize on the pattern and detect individual transmission bit errors. This test pattern is useful for simulating live data traffic.

Pulse Code Modulation (PCM)

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The most common method of encoding an analog voice signal into a digital bit stream. First, the amplitude of the voice conversation is sampled. This sample is then coded into a binary (digital) number, consisting of ones and zeros. The voice signal can then be switched, transmitted and stored digitally. The most common PCM method is to sample a voice conversation at 8000 times a second. The theory is that if the sampling is at least twice the highest frequency on the channel then the result sounds OK. Thus, the highest frequency on a voice phone line being 4,000 Hertz, the sample of it must be at 8,000 times a second. These 8,000 bytes sampled per second then become 64,000 bits per second, the base signal rate for a DS-0 signal, a single phone conversation.

PTR

Pointer

Q

QOS

Quality of Service. (1) When referring to ATM, has four classes. Class 1: Equivalent to digital private line; Class 2: Multimedia, audio and video conferencing; Class 3: Connection-oriented protocols like SDLC and Frame Relay Class; and Class 4: Connectionless data protocols like SMDS. ATM performance parameters include: CER, SECBR, CLR, CMR, CTD, MCTD, and CDV. (2) When referring to telephone service, is a subjective measurement of the quality of the phone call with clearness and loudness being important factors.

QRSS

Quasi-Random Signal Source. Transmits a modified 2^20-1 pseudorandom pattern which allows a maximum of 14 sequential zeros and 20 sequential ones. This pattern simulates live data.

Quanta

A quanta is a 512-bit timing increment used by a Pause frame. The number of quanta (N x 512-bits) indicates the duration of the pause.

R

RAI

See Remote Alarm Indication.

RDI

Remote Defect Indication (formally, FERF).

RDI-L

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For SONET, Remote Defect Indication - Line (K2).

RDI-P

For SONET, Remote Defect Indication - Path (G1).

RDI-V

For SONET, Remote Defect Indication - Virtual Tributary (V5).

Remote Alarm Indication (RAI)

A code sent upstream in a DSN network as a notification that a failure condition has been declared downstream. RAI signals were previously referred to as Yellow signals.

Remote Block Errors (RBE)

Errored blocks detected by one or more remote errors in the Remote Error Indication (REI) (formally FERF).

Remote Error Indication (REI)

An indication returned to a transmitting node (source) that an errored block has been detected at the receiving node (sink). This indication was formerly known as Far End Block Error (FEBE).

Remote Error Indication - Line (REI-L)

An indication returned to a transmitting node (source) that an errored block has been detected at the receiving node (sink) at the line level.

Remote Error Indication - Path (REI-P)

An indication returned to a transmitting node (source) that an errored block has been detected at the receiving node (sink) at the path level.

Remote Monitoring

MIB agent specification described in RFC 1271 that defines functions for the remote monitoring of networked devices. The RMON specification provides numerous monitoring, problem detection, and reporting capabilities.

RFI

Remote Failure Indicator.

RI

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Ring Indicator. RS-530 control signal used by a modem to indicate the occurrence of a telephone ring signal. Used by auto-answer modems so that they know when to answer the incoming call.

Ring

(1.) Refers to the unit's ability to transmit APS functions for a Ring network. (2.) A Ring network refers to the design of a Local Area Network in which the wiring loops from one workstation to another form a circle.

RL

Remote Loopback. RS-530 loopback signal control. Allows end-to-end testing of a circuit from a central site or DTE for checking the transmission path up to and through the remote DCE to the DTE interface and the similar return transmission path.

RLSD

Received Line Signal Detector. RS-530 signal control. RLSD shares the same pin with DCD (Data Carrier Detect).

RMFAI

Remote Multiframe Alarm Indication. Indicated by the Y-bit. Set true when the remote end experiences CASMFL.

RR

- Receiver Ready - RS-530 Signal control. RR shares the same pin with RTS (Request to Send).
- Reverse Request (0010) in APS Linear mode. See K1 Bits 1-4.

RR-R

Reverse Request-Ring (0001) in APS Ring mode. See K1 Bits 1-4.

RR-S

Reverse Request-Span (0010) in APS Ring mode. See K1 Bits 1-4.

RS

Regenerator Section. An SDH term that is equivalent to Section in SONET.

RSOH

For SDH, Regenerator Section Overhead. This is equal to a SOH in SONET.

RS-TIM

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For SDH, Regenerator Section Overhead - Trace Identifier Mismatch for J0.

RT

Real Time.

RTS

Request to Send. RS-530 control signal sent by a DTE device to a DCE device to inform the DCE that the DTE has data ready to send. RTS shares the same pin with RR (Receiver Ready).

RX

Receive Clock Indicator.

RXC

Receive Clock. RS-530 clock signal control.

RXCE

Receive Signal Element. RS-530 signal control.

RXD

Receive Data. RS-530 clock signal control.

S

Scan

Trouble Scan. A scan function that lists received errors and alarms.

SCNR (Selected Cells Not Received)

An ATM LED that indicates if monitor or detail channels are not receiving cells.

SCPI

Standard Commands for Programmable Instrumentation. The new instrument command language for controlling instruments that goes beyond IEEE 488.2 to address a wide variety of instrument functions in a standard manner. SCPI promotes consistency, from the remote programming standpoint, between instruments of the same class and between instruments with the same functional capability.

SCR (Sustained Cell Rate)

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The average or constant traffic that the network agrees to carry with the Quality of Service specified in the traffic contract. SCR is less than or equal to the Peak Cell Rate (PCR). Several time intervals are defined to fit in the Generic Cell Rate Algorithm that allow for clumping, CDV, etc. and a Maximum Burst Size (MBS).

SDH

Synchronous Digital Hierarchy. A set of standard fiber-optic-based serial standards planned for use with SONET and ATM in Europe. Some of the SDH and SONET standards are identical.

SECBR

Severely Errored Cell Block Ratio.

Section

A SONET network Section span comprises the transmission medium and associated equipment between a network element and a regenerator, or two regenerators. The associated equipment includes optical interface and SONET processing equipment which originates the Section Overhead or terminates the Section Overhead.

Section Overhead

In a Synchronous Transport Frame, nine bytes are delegated in the Frame Overhead area of the frame for monitoring and maintenance of the frame signal across a section span. The Section Overhead data is updated each time the frame passes through Section Terminating Equipment. The functions of the Section Overhead include a frame alignment pattern, a byte giving the order of appearance of this frame in a multiplexed higher-rate signal, a parity check byte, a local orderwire channel for voice communications between section terminating equipment, a data communications channel for message-based network management and maintenance information, and a user channel for network operator communications. See Section Terminating Equipment.

Section Terminating Equipment (STE)

Equipment at either end of a Section span in a SONET network which either originates the Section Overhead or terminates the Section Overhead.

SEF

Severely Errored Frame. A SONET defect that is the first indication of trouble in detecting valid signal framing patterns. Four consecutive errored framing patterns constitutes an SEF defect.

SEFS

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Severely Errored Frame Seconds. The number of seconds in which an entity has an extremely high frame error rate or major defect.

SES

Severely Errored Seconds. The number of seconds in which an entity has an extremely high error rate.

SES-L

Severely Errored Seconds - Line. This reports the duration of Severely Errored Seconds on the incoming SONET signal. An SES is reported when 9,835 or more B2 errors occur in one second or when a SEF, LOF, LOS, or AIS-L alarm occurs.

SES-LFE

This reports the duration when 9,835 or more REI-L errors are present at the far-end LTE, or when a Line Remote Defect Indicator **(RDI-L)** alarm is present.

SES-P

Severely Errored Seconds - Path. Reports the duration of Severely Errored Seconds (SES) on the incoming SONET signal.

SES-PFE

This reports the duration when 2400 or more REI-P errors are present at the far end LTE or when a Path Remote Defect Indicator (RDI-P) alarm is present.

SESR

Severely Errored Seconds Ratio. The percentage of severely errored seconds for available seconds.

SETS

Synchronous Equipment Timing Source 2.048 MHz.

signal status

Indicates line frequency received by the unit.

SLT

Slot Number. For a portable unit, such as the NIC, the slot number indicates which protocol processor tab is selected. For a rackmounted product, such as an NAA IV, the slot number indicates which slot you are connected to in the chassis. Slots are numbered from left to right beginning with slot number 1. The protocol processor name associated with the slot appears next to the slot number.

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SN Error

Sequence Number error.

SNP Error

Sequence Number Protection error.

SONET

Synchronous Optical Network. A family of fiber-optic transmission rates from 51.84 million bits per second to 13.27 gigabits (thousand million) per second (with time, this will go higher), which was created to provide the flexibility needed to transport many digital signals with different capabilities and to provide a design standard for manufacturers.

SMF

Sub-multiframe. Eight E1 frames; each having its own optional CRC-4 bits.

SPE

See Synchronous Payload Envelope.

STA (Status)

An ATM LED indicating that one or more of the active VCCs has the status field set in the VCC table. For example, the RX CLP bit has been set on a received cell.

STM

Synchronous Transport Module. A structure in the SDH transmission hierarchy. STM-1 is SDH's base-level transmission rate equal to 155.52 MBit/s. Higher rates of STM-4, STM-16, and STM-64 are also defined.

STS-1

Synchronous Transport Signal Level 1. Basic building block of a SONET signal. It has a bit rate of 51.84 Mbps. Its optical equivalent is an OC-1.

STS-48c

Synchronous Transport Signal Level 48 concatenated.

STS-192

Synchronous Transport Signal Level 192.

Synchronous Payload Envelope

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That section of the STS-N or OC-N frame that carries the data payload plus the Path Overhead. Also see Payload and Path Overhead.

T

TCA

Threshold Crossing Alert. A message sent when the preset value in one of the predefined bins (15 minute or 1 day) of a Performance Parameter has been met or exceeded.

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.

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.

TC-LOF

Tandem Connection-Loss of Frame. Indicates the loss of a valid multiframe pattern from upstream TCM equipment. This is an alarm.

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.

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.

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.

TC-REI

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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.

TC Summary LED

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-TIM

Tandem-Connection Trace Identifier Mismatch. Indicates an alarm has occurred because the incoming TC trace does not match the expected TC trace. The alarm's duration-in-seconds appears on the Results' Alarm screen.

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.

TIM

Trace Identifier Mismatch alarm. Enabled from the Receive/SET page. Records the number of seconds that the J0, J1, J2, or TC traces do not match the expected values.

Time Slot (TS)

One of the 32 bytes in an E1 Frame, numbered from 0 to 31.

TM

Test Mode. RS-530 loopback signal control. Provides indication from the DCE to the DTE that the DCE is in a test condition and verifies completion of a requested action.

Touch Screen

The interactive interface screen on the unit that is touch sensitive, and that the user touches to make selections of menu items, thereby controlling the functions of the tester.

Tributary Unit Group (TUG)

Contains several Tributary Units.

TU

A Tributary Unit is an information structure which provides adaption between the Lower-Order path layer and the Higher-Order path layer. It contains the VC, plus a tributary unit pointer.

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TXC

Transmit Clock. RS-530 clock signal control.

TXCE

Transmit Signal Element Time. RS-530 signal control.

TXD

Transmit Data. RS-530 clock signal control.

U

UAS

Unavailable Seconds.

UAS-L

Near End Unavailable Seconds - Line. 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.

UAS-P

Near End Unavailable Seconds - Path. 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.

UAS-PFE

Far End Unavailable Seconds. 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.

UASR

Unavailable Seconds Ratio.

UBR

Undefined or Unassigned Bit Rate. UBR is an ATM service category which does not specify traffic related service guarantees. Specifically, UBR does not include the notion of a per connection negotiated bandwidth.

UDP

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User Data Protocol.

UNEQ-P

Unequipped STS Payload. Indicates that an all-zeros pattern is being received from Path terminating equipment. The C2 byte is used for this indicator. This is an alarm LED.

UNI

User-to-Network Interface. For ATM, if UNI is selected, then the Header Field uses a 4-bit GFC and an 8-bit VPI.

UUI

User-to-user information. An ISDN term. UUI comprises information of end-to-end significance sent over the ISDN D (data) channel in the context of UUS (User-to-User Signaling) as defined by the ITU-T and ETSI.

V

-V

Suffix indicating SONET Virtual Tributary Near End.

-VFE

Suffix indicating SONET Virtual Tributary Far End.

V5

Virtual Tributary Path Overhead byte.

VBR

Variable Bit Rate. A voice service over an ATM switch.

VC

Virtual Container. A signal designed for transport and switching of sub-SDH payloads.

VCC

Virtual Channel Connection. As an ATM term, it is a concatenation of VCLs that extend between the points where the ATM service users access the ATM layer. The points at which the ATM cell payload is passed to or received from the users of the ATM layer (i.e., a higher layer or ATM entity) for processing signify the endpoints of a VCC. VCCs are unidirectional.

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VCI

Virtual Channel Identifier. The address or label of a Virtual Channel (VC).

Virtual Channel

A communications path between two nodes identified by label rather than fixed physical path.

Virtual Channel Link

A means of unidirectional transport of ATM cells between the point where a VCI value is assigned and the point where that value is translated or removed.

Virtual Channel Link

A network element that connects VCLs. It terminates VPCs and translates VCI values. It is directed by Control Plane functions and relays the cells of a VC.

Virtual Path

A unidirectional logical association or bundle of VCs traveling between common points.

Virtual Path Connection (VPC)

A concatenation of VPLs between virtual path Terminators (VPTs). VPCs are unidirectional.

Virtual Path Identifier (VPI)

The address of a Virtual Path. An eight-bit field in the ATM header that identifies the Virtual Path (i.e., virtual circuit) over which the transmitted data will flow from the transmitting device to the target device.

Virtual Path Link

A means of unidirectional transport of ATM cells between the point where a VPI value is assigned and the point where that value is translated or removed.

VT Path Remote Defect Indication (RDI-V)

A signal returned to the transmitting VT PTE upon detection of certain defects on the incoming path.

VT Path Remote Failure Indication (RFI-V)

A signal, applicable only to a VT1.5 with byte-synchronous DS1 mapping that is returned to the transmitting VT PTE upon declaring certain failures.

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Virtual Path Switch

A network element that connects VPLs. It translates VPI (not VCI) values and is directed by Control Plane functions. it relays the cells of the VP.

W

X

X-Bit

For E1, bits 5,7, and 8 of the CAS channel (Timeslot 16) in the first frame of the multiframe.

X-Bit Alarm

The two X-Bits in the frame are set to 00 and returned to the near end when there is an SEF or AIS at the far end. Otherwise, they are set to 11.

XON

RS-530 Signal Control. Available when one of the following interfaces are selected: RS-232, EIA-530 Async, and EIA-530A Async. Sends a message to the transmitting device advising that the receiver is able to accept more data.

XOFF

RS-530 Signal Control. Available when one of the following interfaces are selected: RS-232, EIA-530 Async, and EIA-530A Async. Sends a message to the transmitting device advising that the receiver is unable to accept more data.

Y

Y-bit

Bit 6 of frame 0 of TS16 (the CAS byte). Used to indicate RMFAI.

Yellow Signal

A Yellow Signal is sent to the far-end network element that terminates a service when a service-affecting failure is detected at a terminal. Once a Yellow Signal has been sent, automatic service management process are initiated, and these processes are maintained for the duration of the failure. See Remote Alarm Indication (RAI).

Z

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Z0 byte

Section growth byte. These bytes, which are located at positions S[1, 6N+2] to S[1, 7N] of an STM-N signal (N>1), are reserved for future international standardization.

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SONET Versus SDH Terminology

Many of the terms used in SONET have a one-to-one correspondence with SDH terms. This table lists terms used in both.

SONET	SDH
Section	Regenerator Section (RS)
Line	Multiplex Section (MS)
Path	Higher-order Path (HP)
Virtual Tributary Path (VT-P)	Lower-order Path (LP)
Section Overhead (SOH)	Regenerator Section Overhead (RSOH)
Lower Path Overhead (LOH)	Multiplex Section Overhead (MSOH)
Path Overhead (POH)	Higher-Order Path (HPOH)
Transport Overhead (TOH)	Transport Overhead (TOH)
Virtual Tributary Overhead (VTOH)	Lower-Order Path Overhead (LPOH)
OC-1	STM-0
OC-3	STM-1
OC-12	STM-4
OC-48	STM-16
OC-192	STM-64
STSX-1	STM-0e
Virtual Tributary (VT)	Tributary Unit (TU)
VT 1.5	TU-11
VT 2	TU-12
VT 3	Not applicable
VT 6	TU-2
VT Group (VTG)	Tributary Unit Group (TUG)-2
Not applicable	TU-3
Not applicable	TUG-3
Payload	Container
VT 1.5 payload	C-11
VT 2 payload	C-12
VT 6 payload	C-2

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Loss of Signal (LOS)	Loss of Signal (LOS)
Severely Errored Frame (SEF)	Out of Frame (OOF)
Loss of Frame (LOF)	Loss of Frame (LOF)
Trace Identifier Mismatch - Section (TIM-S)	Regenerator Section - Trace Identifier Mismatch (RS-TIM)
Alarm Indication Signal - Line (AIS-L)	Multiplex Section Alarm Indication Section (MS-AIS)
Remote Defect Indicator - Line (RDI-L) Far End Receive Failure - Line (FERF-L)	Multiplex Section - Remote Defect Indicator (MS-RDI)
Loss of Pointer - Path (LOP-P)	Administrative Unit - Loss of Pointer (AU-LOP)
New Data Flag - Path (NDF-P)	Administrative Unit - New Data Flag (AU-NDF)
Alarm Indication Signal - Path (AIS-P)	Administrative Unit - Alarm Indication Signal (AU-AIS)
Path Unequipped (UNEQ-P)	Higher-Order Path - Unequipped (HP-UNEQ)
Remote Defect Indicator - Path (RDI-P) Far-End Receive Failure - Path (FERF-P)	Higher Order Path - Remote Defect Indicator (HP-RDI)
Trace Identifier Mismatch - Path (TIM-P)	Higher-Order Path - Trace Identifier Mismatch (HP-TIM)
Payload Label Mismatch - Path (PLM-P)	Higher-Order Path - Payload Label Mismatch (HP-PLM)
Loss of VT Pointer (LOP-V)	Tributary Unit - Loss of Pointer (TU-LOP)
New Data Flag - Virtual Transport (NDF-V)	Tributary Unit - New Data Flag (TU-NDF)
Alarm Indication Signal - Virtual Transport (AIS-V)	Tributary Unit - Alarm Indication Signal (TU-AIS)
Loss of Multiframe Alignment (LOM)	Tributary Unit - Loss of Multiframe Alignment (TU-LOM)
Unequipped - Virtual Transport (UNEQ-V)	Lower-Order Path - Unequipped (LP-UNEQ)
Remote Defect Indicator -	Lower-Order Path - Remote Defect Indicator (LP-RDI)

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Virtual Tributary (RDI-V) Far End Remote Failure - Virtual Tributary (FERF-V)	
Remote Failure Indication - Virtual Tributary (RFI-V)	Lower-Order Path - Remote Failure Indication (LP-RFI)
Trace Identifier Mismatch - Virtual Tributary (TIM-V)	Lower-Order Path -Trace Identifier Mismatch (LP-TIM)
Payload Label Mismatch - Virtual Tributary (PLM-V)	Lower-Order Path - Payload Label Mismatch (LP-PLM)
B1	B1
B2	B2
B3	B3
Virtual Tributary Bit Interleaved Parity (VT BIP-2) BIP-2 or V BIP-2	BIP-2
Remote Error Indication - Line (REI-L)	Multiplex Section - Remote Error Indication (MS-REI)
Remote Error Indication - Path (REI-P)	Higher-Order Path - Remote Error Indication (HP-REI)
Remote Error Indication - Virtual Tributary (REI-V)	Virtual Tributary - Remote Error Indication (VT-REI)
Bit Errors	Bit Errors
Synchronous Payload Envelope (SPE)	Comparable to Virtual Container (VC)-3 or VC-4
Synchronous Transport Structure (STS)	Comparable to Synchronous Transport Module (STM)
Synchronous Transport Structure (STS)-1 Synchronous Payload Envelope (SPE)	Virtual Container (VC)-3
STS-3c SPE	VC-4
STS-12c SPE	VC-4-4c
STS-48c SPE	VC-4-16c
STS-192c SPE	VC-4-64c
SPE plus H1, H2, and H3	AU

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SONET Overhead bytes Versus SDH

SONET Overhead Bytes	SDH
Z3	F3
Z4	K3
Z5	N1
Z6	N2
Z7	K4

SONET Versus SDH Mappings

SONET Mappings	SDH Mappings
VT 1.5	TU-11/AU-3 or TU-11/AU-4
DS3	TU-3/AU-4 (comparable, but different)
STSX-1 D/I	STM-0e D/I
ATM	ATM
STS-3c/Pattern	C-4 Bulk Filled
STS-12c/Pattern	C4-4c Bulk Filled
STS-48c/Pattern	C4-16c Bulk Filled
STS-192c/Pattern	C4-64c Bulk Filled

SONET Settings	**SDH Settings**
STS-12 Under Test	STM-4 Under Test
Pattern in other STS-12s	Pattern in other STM-4s
SPE Under Test	STM-1 channel, times either AU-3 or TUG3 channel, depending on mapping (AU-3 or AU-4)
Pattern in Other STS1s	Pattern in other STM-1s
VT Under Test	TU channel times TUG-2 channel. Parallels VT/Group combination.
Pattern in other VTs	Pattern in other TUs
	LP Signal Label

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Path Signal Label (C2)	HP Signal Label

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