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EPX16 System Guide

Third Edition

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EPX16 System Guide

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Warranty and Service

Warranty Information

The EPX16 Chassis and all associated EPX16 Modules are warranted by gnubi communications, Inc. against defects in materials and workmanship for one year after shipment to the customer. The one-year warranty applies only to the original purchaser and is not transferable without the express written permission of gnubi communications, Inc. If gnubi communications, Inc. receives notice of such defects during the one-year warranty period, gnubi communications, Inc. will, at its option, either repair or replace the equipment which proves to be defective. gnubi communications, Inc. does not warrant that the operation of the equipment will be uninterrupted or error free.

This warranty does not apply to defects resulting from improper or inadequate maintenance or calibration by the customer, customer supplied software, customer applied interfacing, customer modification, improper use, operation outside of the published environmental specifications for the equipment, or improper site preparation or maintenance by the customer.

THE ABOVE WARRANTIES ARE EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED. gnubi communications, Inc. SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT WILL gnubi communications, Inc. OR ITS SUBCONTRACTORS BE LIABLE FOR LOSS OF DATA OR FOR DIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT), OR OTHER DAMAGE WHETHER BASED IN CONTRACT, TORT, OR OTHERWISE.

Calibration

The EPX16 Chassis and all associated EPX16 Modules require no adjustments to operate. gnubi communications, Inc., however, recommends that the external Telecom interfaces of the EPX16 modules be tested every two years for conformance to their specified operation.

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Service

If the EPX16 Chassis or any of the associated EPX16 Modules appear to be operating improperly, carefully verify all configuration parameters and connections. If problems are still present, contact gnubi communications, Inc. Technical Support in any of the following ways:

E-Mail: support@gnubi.com

See www.gnubi.com for more contact information.

Trained personnel are available to help solve your problem or determine if the unit must be returned for repair.

Unpacking

Do not discard packing materials and box. The product can be reliably protected against damage if the original packing materials are used when transporting or returning a unit for repair.

Checking for Damage

After unpacking the unit, check it for shipping damage.

If you find that the unit does not work, follow the procedures in "Returning a Unit for Repair."

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Returning a Unit for Repair

If the EPX16 Chassis or any EPX16 Modules must be returned for repair, a Technical Support representative will assign a return material authorization (RMA) number. No product will be accepted for service without an RMA number.

Ship the unit or module(s) to:

Repair Department

gnubi communications, Inc.

4275 Kellway Circle, Suite 121

Addison, TX 75001 USA

Be sure to mark the RMA number on the outside of the shipping container. In addition, be sure to include the following information:

- Model number and description of the unit or module(s)
- Serial number of the unit or module(s)
- Your name and phone number
- A written description of the problem (more detail typically yields quicker solutions)
- Return shipping address
- Invoice address
- Payment information (if unit is out of warranty)

Use the original shipping materials if possible.

If the original packing is not available, use a double-corrugated cardboard box and rigid foam padding.

The padding should ensure that the unit does not does move within the box. You can use polystyrene chips or similar product for additional packing.

Using only polystyrene chips is unacceptable.

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Chapter 1. Overview

Introduction

This guide provides:

- Safety Instructions
- Installation and setup instructions
- Maintenance procedures
- A guide on using the EPX16 GUI
- Physical and electrical specifications for the EPX16 and its modules
- Contact information for gnubi communications, Inc.

Overview of the EPX16

The EPX16 System is a telecom test system that provides simultaneous testing of multiple signal rates and protocols, including OC-N, DS3, DS1, E1, and STM-N.

The combination of multiple rates, protocols, and channels within a single chassis makes the EPX16 ideal for Cross-Connect, ADM, MT Fiber and WDM testing and loading. The EPX16 can even extend the usefulness of your current test equipment by providing a multi-channel active regenerator with error and alarm insertion.

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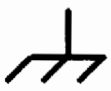
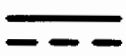
Chapter 2. Safety Instructions

Not using and maintaining the EPX16 according to this guide may incur equipment damage and personal injury.

Installation category II, Pollution Degree 2 applies to this product.

Symbols

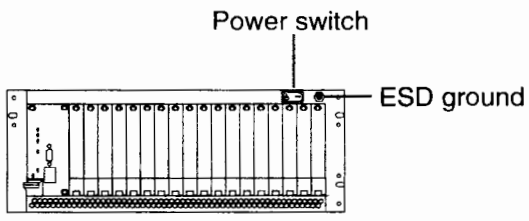
The following symbols are used on the EPX16.

Symbol	Description	Notes
	DC terminal block	See "Connecting a -48VDC Power Source" on page 16
	Protective conductor terminal	ESD connector on chassis front and earth ground terminal used inside the chassis.
	On status on DC Power switch on chassis front	
	Caution (Refer to accompanying to documents)	
	Standby status on DC Power switch on chassis front	
	DC terminal connection	

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AC Power

Turn AC power switch on the front of the EPX16 chassis to Standby (⏻) when adding or removing modules.



Disconnect input power when unscrewing or removing the back or top of the EPX16.

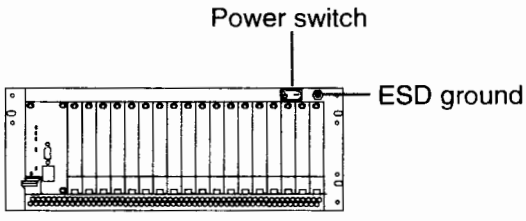
See "Power Specifications" in Appendix A.

For connection procedures, see "Connecting an AC Power Source" on page 13.

CAUTION: Turning off power switch does not remove AC power from the power supply.

DC Power

Turn DC power switch to Standby (⏻) on the front of the EPX16 chassis when adding or removing modules.



Disconnect input power when unscrewing or removing the back or top of the EPX16.

See "Power Specifications" in Appendix A.

For connection procedures, see "Connecting a -48VDC Power Source" on page 16.

WARNING: Input connections must be correct. Reverse polarity will damage the unit. -48VRNT = 0 VOLTS

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Grounding

Before supplying power to and turning on the EPX16, follow these steps:

- Ensure that all devices connected to the EPX16 are connected to the protective (earth) ground.
- Ensure that the line power plug is connected to a three-conductor line power outlet that has a protective (earth) ground.

CAUTION: Do not open chassis without turning off and disconnecting power to the EPX16 chassis.

CAUTION: Do not remove or install modules without turning off the EPX16. The EPX16 does not support hot swapping.

Laser Safety

This product uses a laser system which meets the FDA's DHHS Rules 21CFR chapter 1, subchapter J and IEC 60825-1, Safety of Laser Products.

The EPX16 product is manufactured by:

gnubi communications, Inc.
4275 Kellway Circle, Suite 121
Addison, TX 75001

Stacking

This product can be used in a rack or on a flat service.

However, you should not stack these units or place other equipment on top of them.

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Chapter 3. Hardware Setup

Overview

The EPX16 must be properly connected and energized before you can begin using it.

Step 1. Connect the appropriate power source (230VAC, 120 VAC, or -48 VDC) based on your environment.

Step 2. Connect to the RS-232 port to configure the EPX16's systems settings using the SCPI command-line interface.

Step 3. Configure the EPX16's Network settings (TCP/IP address, Subnet mask, and Domain Name Server (DNS) address). If you intend to connect the EPX16 to your network, you may need to change the default factory values for these settings.

Step 4. Connect the EPX16 Ethernet port to your network or computer's Ethernet connection. This port enables you to access the EPX16 through a Java-based Graphical User Interface (GUI.)

Step 1: Connect the power source

The EPX16 supports both 230VAC, 120VAC and -48VDC power source options. You must ensure that the appropriate power source connection is made based on your environment. The following section outlines instructions for using either an AC or DC power source.

CAUTION: Use the shielded power cable supplied by gnubi.

Connecting to an AC Power Source

The following information applies to EPX16 systems with the AC power source option.

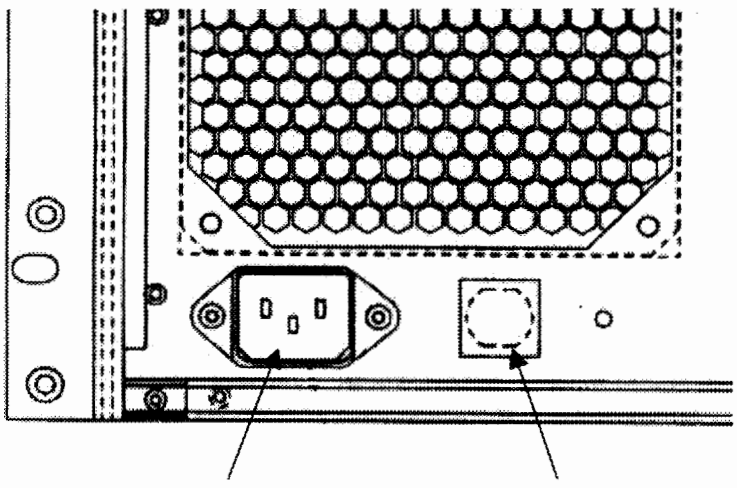
The EPX16 uses a standard 230VAC or 120VAC connection.

The unit autodetects the AC power source (230VAC or 120VAC).

Step 1. Read "Chapter 2. Safety " on page 10.

Step 2. Connect the power cable to the EPX16 plug. The figure below is the lower left-hand corner of the rear of the EPX16 chassis.

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Step 3. Turn the power to the EPX16 on. The power switch is located on the upper righthand corner of the front of the unit.

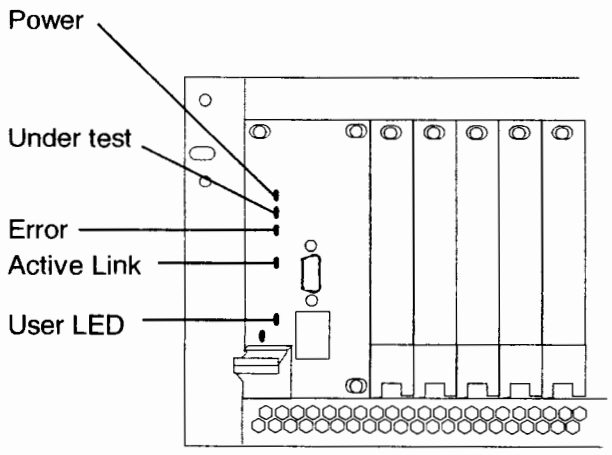
The EPX16 begins its boot sequence. During the boot sequence, each module in the system is initialized, starting with slot #1. The LEDs on each module reflect its initial state.

This boot sequence may take over a minute, depending on the type and quantity of modules installed.

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Step 4. Ensure that the EPX16 user LED indicator is blinking. The user LED indicator is located on the lower lefthand side of the EPX000 cpu module in slot 0.

The blinking LED (shown in the following figure) indicates that the operating system is running and the modules are being monitored.

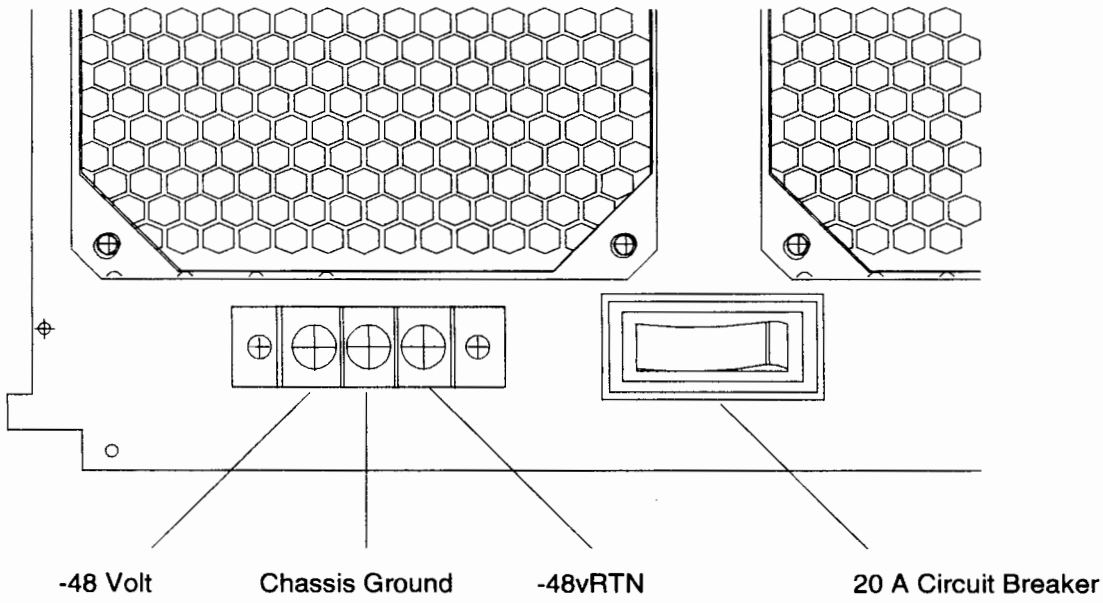


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Connecting a -48VDC Power Source

The following information applies to those EPX16 Systems with the DC Power source option.

The power entry interface for the -48VDC power source uses a three-conductor terminal. The terminal block is located on the backside of the EPX16 Unit in the lower left-hand corner. The three terminals are labeled directly above the terminal block as follows: -48VDC, (Chassis Ground), and -48RTN.



The following items are requirements for interfacing to the terminal block and to supply -48VDC power to the EPX16 System:

- ring lugs (mfg: PANDUIT; p/n: PN10-10R or equivalent)
- 12 AWG wire (minimum)

NOTE: Maximum input power cannot exceed 860 Watts.

WARNING: The -48RTN terminal must be 0 Volts. Reverse polarity of the inputs will damage the system.

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Step 1. Connect the DC power source to the EPX16 as shown above.

Step 2. Turn on the power to the EPX16.

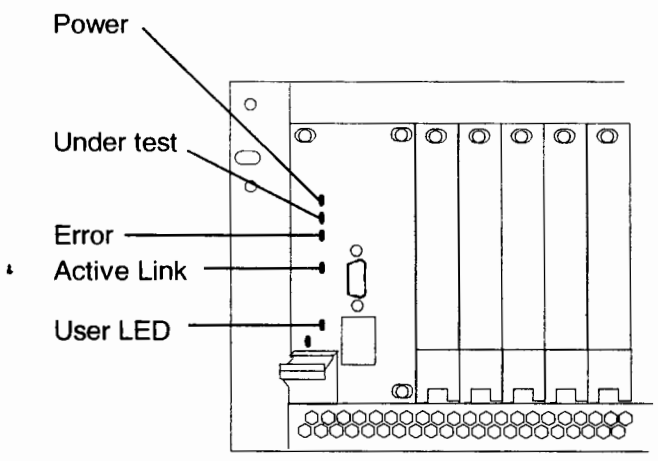
The EPX16 begins its boot sequence. During the boot sequence, each module in the system is initialized, starting with slot #1. The LEDs on each module reflect its initial state.

This boot sequence may take over a minute, depending on the type and quantity of modules installed.

Step 3. Ensure that the EPX16 user LED indicator is blinking.

The user LED indicator is located on the lower left side of the EPX000 CPU module in slot 0.

The blinking LED (shown in the following figure) indicates that the operating system is running and the modules are being monitored.



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Step 2: Connecting to the EPX16 RS-232 Port

The RS-232 port provides a command-line interface for issuing SCPI commands to the EPX16. The following instructions explain how to connect using the RS-232 port and how to configure the EPX16 once you have connected.

The IP address, Subnet mask, and Domain Name Server (DNS) of the EPX16 can be configured through the RS-232 interface.

Requirements

To connect to the EPX16 through an RS-232 port, you need:

- An available serial port (also called a COM port) on your computer
- 9-pin female to 9-pin (or 25-pin depending on your computer serial port) female RS-232 null-modem cable
- Communication software that can access your computer's serial port, such as Hilgraeve's HyperTerminal (a standard accessory of Microsoft Windows 95) or Intersoft International's NetTerm

NOTE: Do not use Windows 98 Hyperterminal: it does not support local echo of SCPI commands.

gnubi communications recommends using Intersoft International's NetTerm; a shareware version is available at http://starbase.neosoft.com/~zkrr01/.

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Procedure

These procedures use COM2 port as an example.

Step 1. Connect the RS-232 null-modem cable to the EPX16 and your computer.

Step 2. Turn on your computer and the EPX16.

Step 3. Start your communication software.

Step 4. Set the software to connect to the serial port that the null-modem cable is connected to (typically COM2 on a PC).

In NetTerm, select **Options > Setup > Modem...** from the menu. The Communications Setup window appears. Use this dialog even though you are configuring for a COM port, not a modem connection.

If you use HyperTerminal, it prompts for the information in the next step as well as the name of the connection. HyperTerminal will create an icon to launch HyperTerminal using these settings.

Step 5. Define the connection settings as shown below.

Serial Port Settings	
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Line Control	Local Echo
Line Terminator	CR/LF

The RS-232 port on the EPX16 is pre-configured with these serial port settings. These settings cannot be re-configured.

Step 6. If using NetTerm, select **File > Connect** to establish a connection to the EPX16.

You can now issue SCPI commands to control the EPX16 over the RS-232 port.

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Step 3: Configuring the EPX16 network settings

This step enables you to configure the EPX16's TCP/IP address, Subnet mask, and Domain Name Server address settings.

The EPX16 is shipped with default values for these settings. If you intend to connect to the EPX16 through the Ethernet port, you may need to change these values to match your network configuration.

Contact your system administrator to obtain the IP address, subnet mask and DNS address.

You may need to make these changes via a telnet application using the RS-232 connection. See "Step 4: Connecting to Ethernet Ports" for procedures on using a telnet application.

The EPX16 documentation packet contains the unit's pre-configured TCP/IP address, subnet mask and DNS address.

Setting the TCP/IP address

The SCPI command SYST:HOST:IPADDRESS <###.###.###.###> sets the TCP/IP address for the EPX16. In this example, the address is set to 192.168.0.54.

```
SYST:HOST:IPADDRESS 192.168.0.54
Ok system IP address 192.168.0.54 : restart epx system
```

Setting the Subnet mask

The SCPI command SYSTEM:HOST:SUBNET <###.###.###.###> sets the Subnet mask for the EPX16. In this example, the address is set to 255.255.255.0 (the factory default):

```
SYSTEM:HOST:SUBNET 255.255.255.0
Ok system subnet mask 255.255.255.0 : restart epx
system
```

Setting the Domain Name Server (DNS)

The SCPI command SYSTEM:HOST:DNS <###.###.###.###> sets the Domain Name Server for the EPX16. In this example, the DNS is set to something else:

```
SYSTEM:HOST:DNS 192.167.0.1
Ok system DNS 192.167.0.1 : restart epx system
```

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Setting Gateway

The SCPI command SYST:HOST:GAT <###.###.###.###> configures the EPX16 TCP/IP protocol stack to use the gateway to route IP traffic back to the client. You must restart the machine after setting the gateway.

In this example, the gateway is set to 192.167.1.28.

```
SYSTem:HOST:GATeway 192.167.1.28
```

Restarting the EPX16

Turn the EPX16 off and then back on to restart the system. You do not have to restart your PC.

Step 4: Connecting to Ethernet ports

To configure the EPX16 to work on a LAN, the TCP/IP address and subnet mask must be set. Make sure you have completed "Step 3: Configuring the EPX16 network settings."

Requirements

- 10BaseT LAN port connection
- Standard RJ-45 Ethernet cable
- PC or Workstation with Ethernet/LAN connection.
- Telnet application. gnubi communications recommends using Intersoft International's NetTerm; a shareware version is available at http://starbase.neosoft.com/~zkrr01/.

Procedure

The following procedure describes how to create a command channel with the telnet connection and a subscription channel with a second telnet connection.

NOTE: You can use a web browser to connect to the EPX16. See Chapter 4 "Software Setup" for details.

The *Command Channel* is a command-line interface from which you can issue SCPI commands.

The *Subscription Channel* is used to deliver system information and Module dependent data to the client as events change. This eliminates the need to poll Modules through the command channel. By subscribing only to the information that is needed, the client (user) can control what and how much data to monitor on the subscription channel.

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NOTE: The EPX16 can support the command channel and a maximum of 5 subscription channels.

Step 1. Connect the ethernet cable to the EPX16 and the Ethernet hub.

Step 2. Start a telnet application.

Step 3. Set the telnet application settings for connecting to the EPX16 Command Channel.

The default settings are given in the table below. If you changed the TCP/IP address in "Step 3: Configuring the EPX16 network setting" above, you need to set the Telnet settings accordingly.

Telnet Settings for Command Channel	
Port number	10179
Line Control	Local Echo
Return Sends	CR/LF
Received LF converted to	CR/LF

Step 4. Determine the Subscription channel port by issuing a SYSTEM:CLIENT:PORT command.

NOTE: You have 1 minute from the time that you issued the SYSTEM:CLIENT:PORT command (Step 4) to the time to complete Steps 5 and 6.

The command returns the telnet port that you can subscribe to as a subscription channel. This value is between 10180 and 10184.

```
SYSTEM:CLIENT:PORT

OK 10181
```

Step 5. Launch a second telnet connection from the telnet application.

This may be as simple as opening another window, or you may need to launch the application again.

Step 6. Set the port number to the value returned by the SYSTEM:CLIENT:PORT command issued above.

Step 7. If the telnet application does not successfully connect after 1 minute, re-issue the SYSTEM:CLIENT:PORT command and try connecting again.

The port number may have changed, and you may need to change the settings in your telnet application.

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Telnet Settings for Subscription Channel	
Port number	10180-10184
Line Control	N/A
Return Sends	N/A
Received LF converted to	CR/LF

Once you have established both a Command Channel and Subscription Channel, you can issue SCPI commands on the Command Channel.

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Chapter 4. Software Setup

You can interact with the EPX16 through a Java™-based GUI using your favorite browser or through a command-line interface using SCPI commands.

The web interface to the EPX16 provides complete functionality, using a sophisticated GUI for accessing and viewing the EPX16 modules. The EPX16 Web GUI uses only SCPI commands to talk to the EPX16. There are no hidden commands or "back-doors" used by the EPX16 Web GUI that cannot be accessed via SCPI commands.

Alternatively, you can issue SCPI commands yourself by opening a telnet session on the EPX16 command channel.

Both methods of accessing the EPX16 require some software setup, as detailed below.

Getting SCPI Help

All SCPI commands are available in the form of HTML documents that are accessible from the gnubi web-site (www.gnubi.com) or from the EPX16 itself.

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Using the EPX16 GUI through a Web browser

Because the EPX16 is Java™ based, you can access the GUI interface through any web browser with full support of Java v1.1.

Selecting a Browser

gpib recommends Microsoft® Internet Explorer V5.0 because of its GUI performance: it implements dialog boxes correctly and provides provides a fast Java Virtual Machine (JVM).

Microsoft Internet Explorer 5.0 or later users must install the Java Virtual Machine:

Step 1. Start the Microsoft Internet Explorer setup program.

Step 2. Select **Customize your browser**. The Component Options appear.

Step 3. Select **Microsoft virtual machine** under **Internet Explorer**.

Step 4. Select the Web browser and other components that you wish to install.

Step 5. Complete the installation.

The following browsers support most of the features of Java 1.1:

- Sun's HotJava™ v1.1
- Microsoft Internet Explorer v4.0.1 or later

  I.E. v4.0.1 does not implement dialog boxes correctly so the SCPI button does not work properly.
- Netscape® Communicator v.4.0.6 or later

Most browsers (such as Netscape Communicator or HotJava Applet Viewer) use *piers* to render GUI (graphical user interface) controls. Due to limitations of Windows 95 / 98 and to the large number of GUI objects created by the EPX16 application, not very many module views can be opened simultaneously before Windows 95/98 runs out of resources.

By selecting Windows '9x Compatible in the EPX16 Login dialog, the EPX16 allows only one module view to be open on the EPX16 GUI. Each time a new module is selected the currently open module will be automatically closed and its resources will be reused.

Microsoft Internet Explorer does not have this limitation.

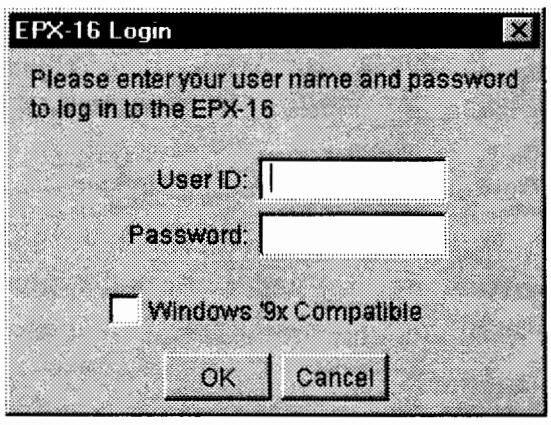
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Connecting to the EPX16

Step 1. Launch your Web browser.

Step 2. Direct your browser to the URL for your installed EPX16. The URL is http://*EPX16_tcpip_address*

When the browser has successfully connected, the EPX16 login window appears, as shown below:



Step 3. If your machine runs Windows 95/98, select Windows '9x Compatible to conserve resources.

NOTE: If using Microsoft Internet Explorer, you do not need to select this option.

Step 4. Type in your user name and password.

By factory default, the EPX16 GUI does not check for security features, so any user name and password is accepted.

NOTE: Do not use blanks (spaces). Do not leave fields blank.

The EPX16 GUI window appears.

Step 5. Continue to "Using the EPX16."

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Using the Standalone EPX16 GUI

gnubi offers a standalone Windows 95/98 or Windows NT application for connecting to the EPX16. This application is a compiled version of the Java GUI and provides the same core functionality as the Web version.

This standalone application is available for those users who cannot get access to the supported browsers listed list in "Selecting a Browser" on page 25.

Contact gnubi communications, Inc. for information on pricing and availability of this application.

Starting the Standalone EPX16 GUI

Step 1. From the Windows Start menu, select **Programs > EPX16 Simulator > EPX16Gui**.

The EPX16 address dialog appears.

NOTE: Do not exit the DOS window. This action closes the standalone EPX16 GUI.

Step 2. Enter the IP address of the EPX16, and select **OK**.

The EPX16 GUI Application starts, and the login dialog appears.

Step 3. If your machine runs Windows 95/98, select **Windows '9x Compatible** to conserve resources.

Step 4. Type your user name and password, and select **OK**.

By factory default, the EPX16 GUI does not check for security features, so any user name and password is accepted.

NOTE: Do not use spaces in the user name or password. Do not leave fields blank.

You can now use the GUI.

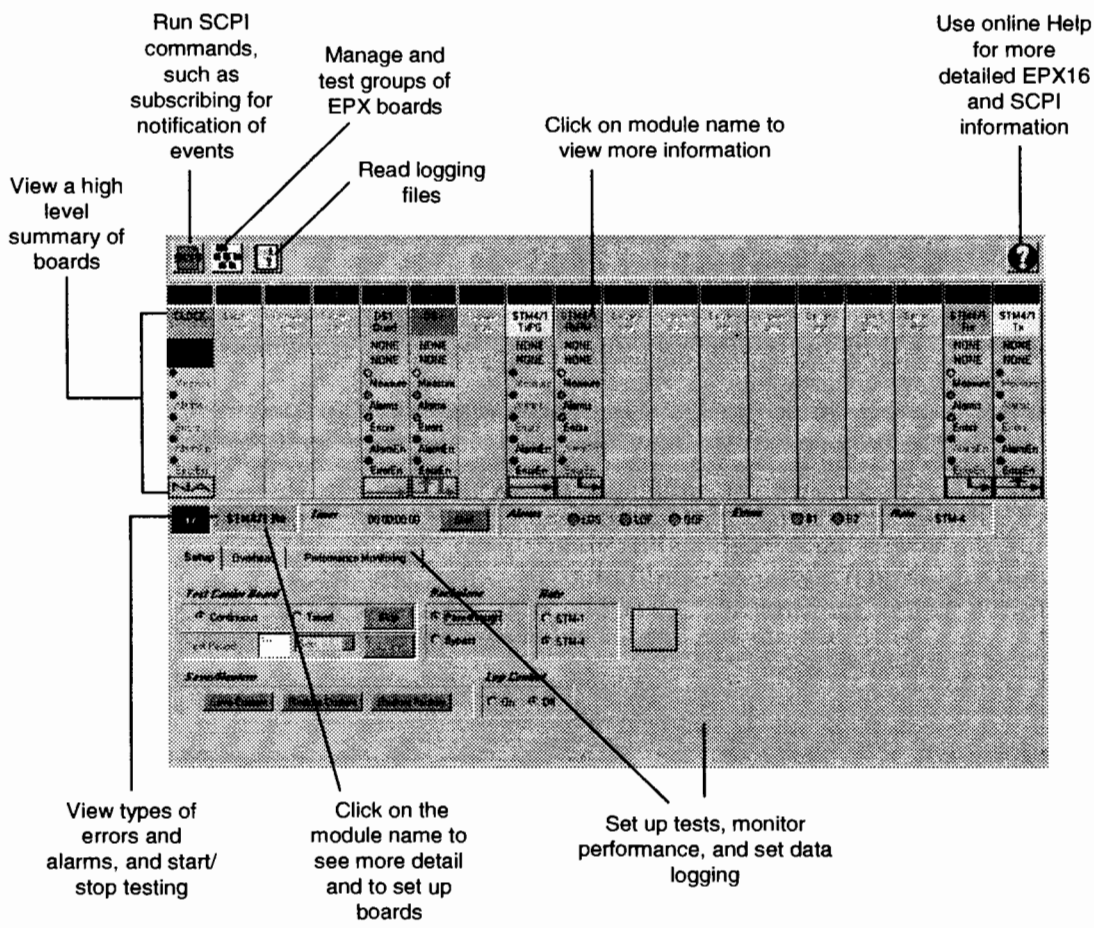
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Chapter 5. EPX16 GUI Reference

This section describes the windows and dialogs in the EPX16 GUI.

The EPX16 Main View

The EPX16 Main View is the window that appears when you first connect to an EPX16. This view shows the name, type, and slot number of each module installed in the system. The following figure summarizes each part of the EPX16 GUI main view. More detailed descriptions follow.



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SCPI Dialog Button



Clicking on this button opens the SCPI Dialog. You can enter SCPI commands directly to the EPX16 through this dialog. While all module functionality is available through the GUI, some users may prefer to issue SCPI commands directly when issuing system level commands or issuing commands to multiple modules at a time.

Group Manager Button



Clicking on this button opens the Group Manager Dialog. You can create, delete, or use groups of Modules in the EPX16 System. Using the group manager also provides Module level security protected by a password mechanism.

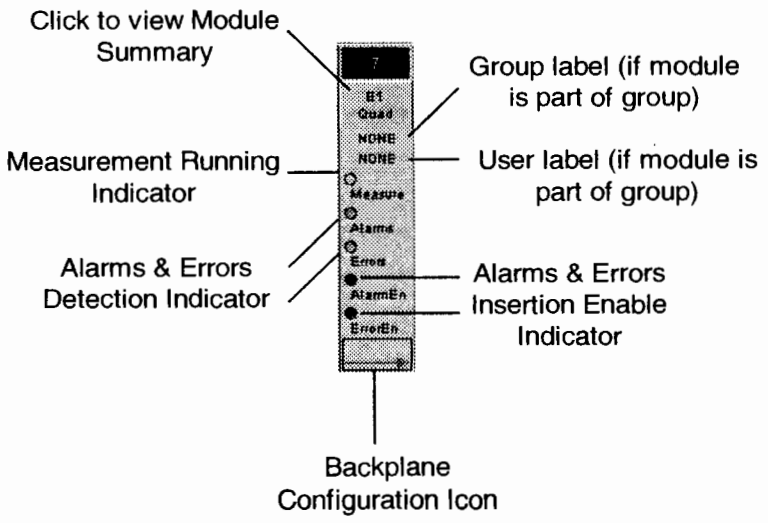
Log File Access Button



Clicking this button spawns an FTP browser window and points to the log file directory on the EPX16. Through this window users can access the log files created during a measurement session.

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Module Status Columns



These columns indicate the current status of each module in the system. If the slot is colored, a module is installed in that slot. In addition to a text description, the color of the box indicates the type of module installed.

The parts of the module status are defined in the above figure.

Module Summary View Buttons

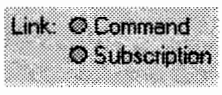
These buttons open individual Summary Views of each installed module. Clicking on the button opens the Summary View in the current window. You can have more than one module's Summary View open at a time; each view is stacked according to its slot number.

If you click on this button again when the module Summary View is open, the module Summary View is closed.

If you shift-click on this button when the module Summary View is not displayed, the module Summary View opens in a separate window that you can position on your desktop wherever you like. This enables you to customize the layout of the module views, and potentially make better use of your screen real estate.

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Connection Link Indicator



The Connection Link Indicator shows the status of the TCP/IP connection to the EPX16. A connection to the Command channel is necessary to execute commands from the GUI.

A Subscription channel can be used but is not required.

Red indicates that the link is down. Green indicates that the link is up and active.

Online Help Button

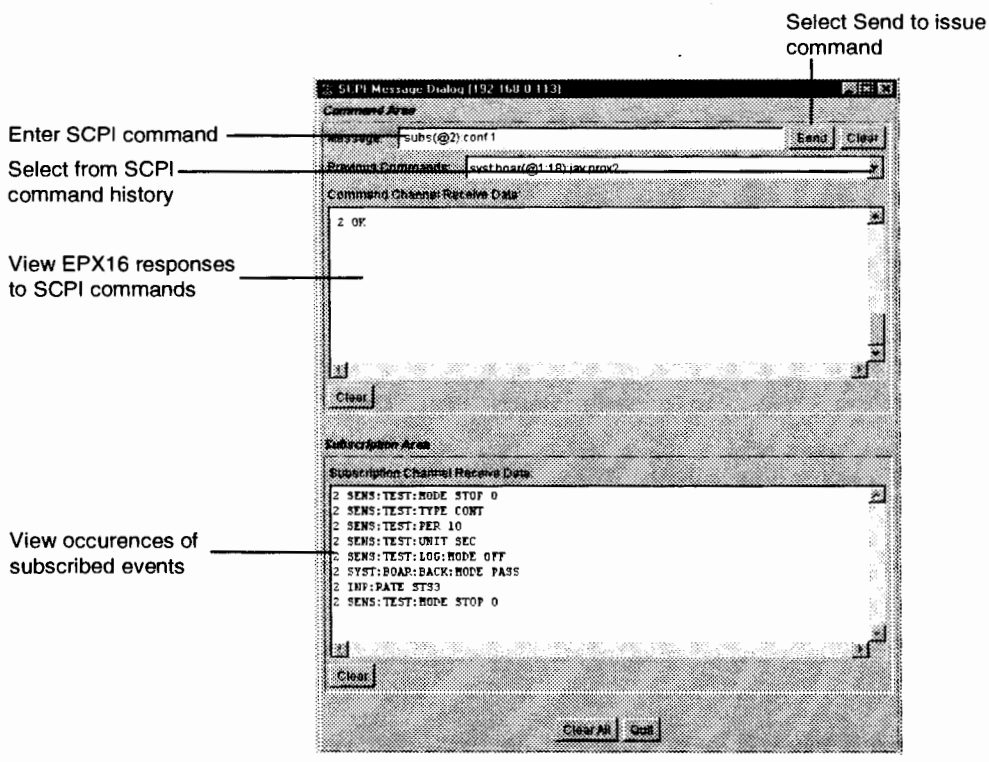


This button opens the online help window. Help is available for the entire system, as well as detailed coverage of each module. For the most up to date information about a given gnubi communication's module, please refer to the online help.

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The SCPI Dialog

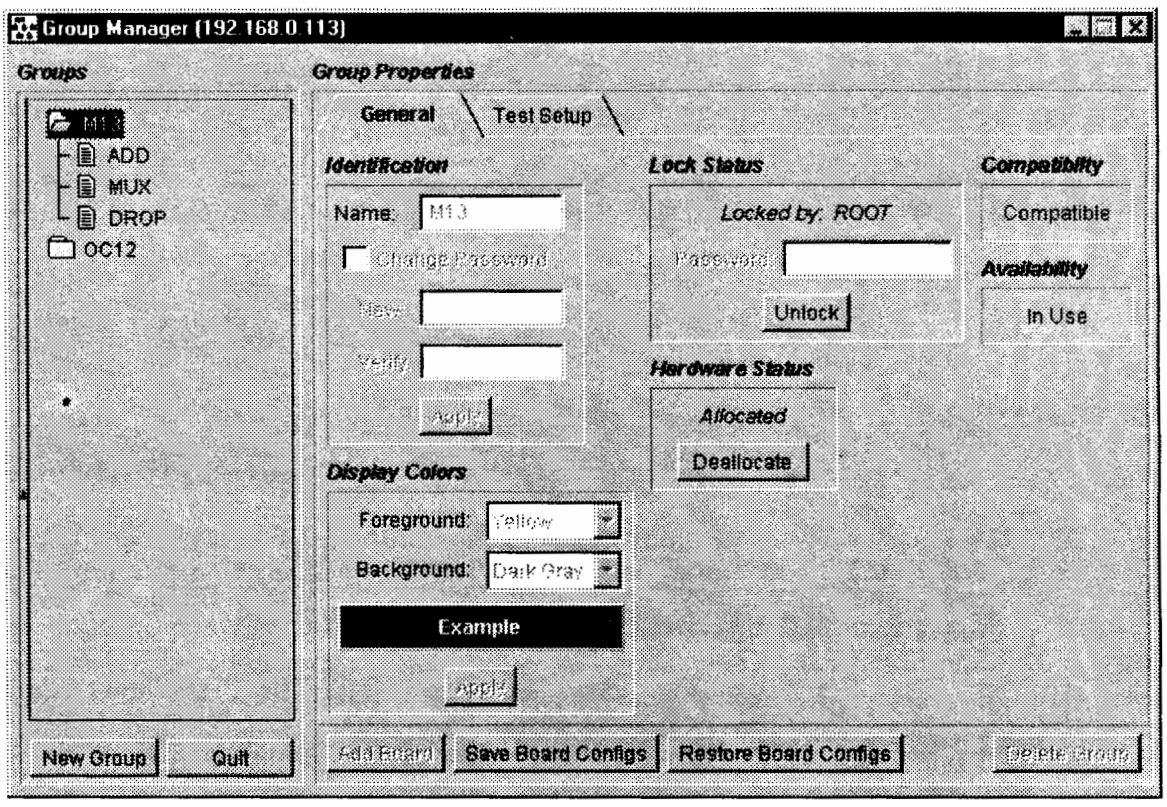
The SCPI Dialog allows you to run SCPI commands from the EPX16 GUI. The SCPI Dialog opens two telnet sessions: one for issuing SCPI commands and another (on a private channel) for subscribed events.



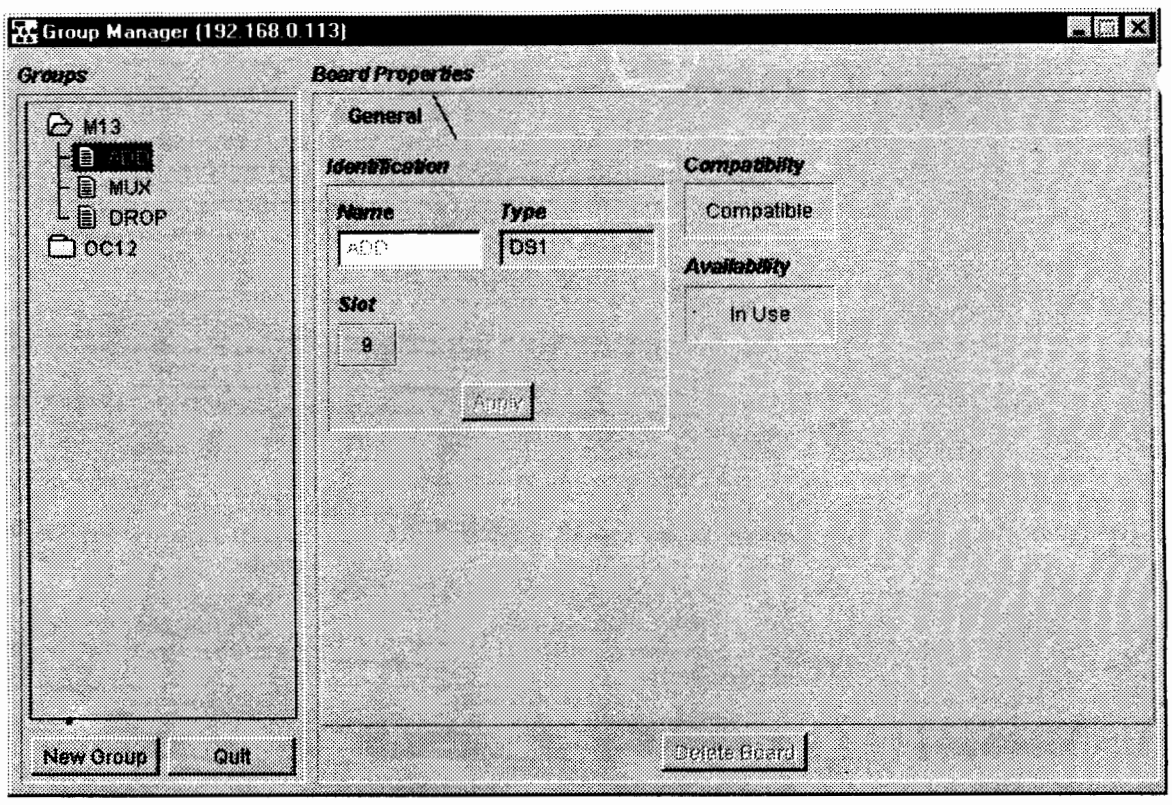
Group Manager

The Group Manager allows you to define groups of modules. Once a group of modules has been defined and activated, then the user can save and restore settings for the entire group or start and stop a measurement on all modules capable of a measurement in the group.

See "Using Groups" on page 40.

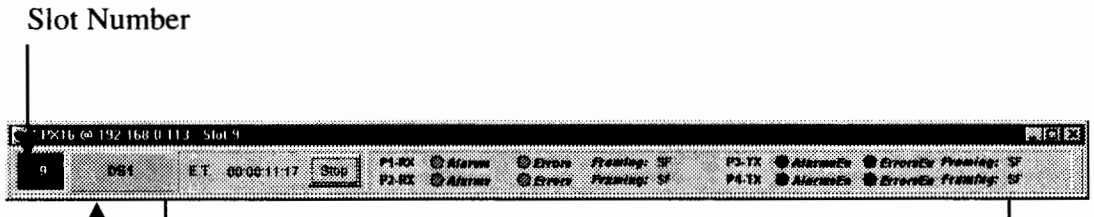


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The Module Summary View

The Module Summary View provides brief, top-level information about the settings and state of a module.



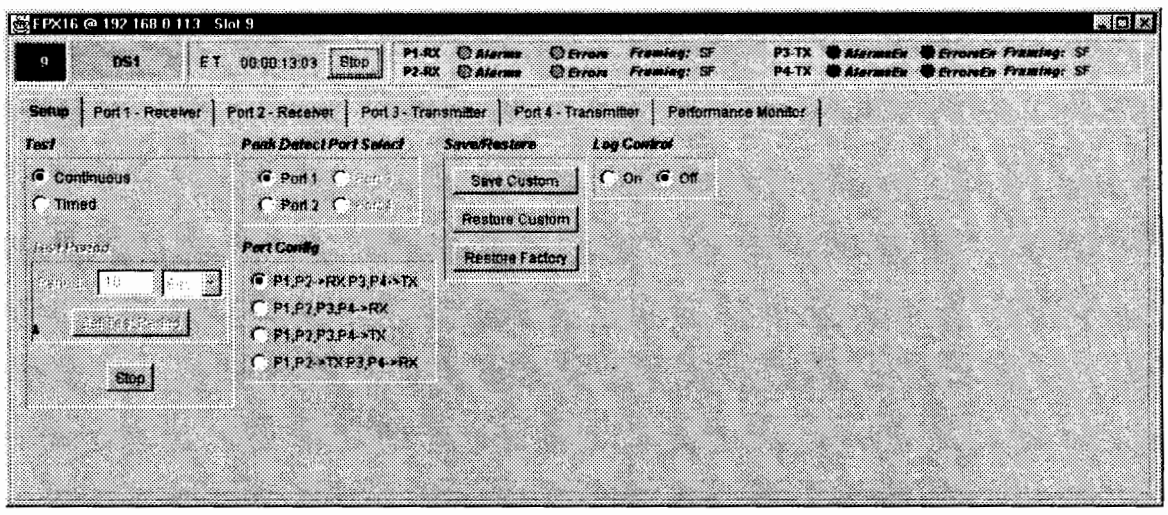
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Detail View Button

This button shows the color-coded type of the module, as well as its name. Clicking on this button will open the Detail View for the module, from which you can set all configurable options for the module and access more measurement data.

The Module Detail View

The Module Detail View provides access to all functionality of the module. Open the control panel by clicking on the colored button of the module's summary view. The following figure is an example of a Detail View for the Quad DS1 module.



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Chapter 6. Using the EPX16

Configuring the Clock Module

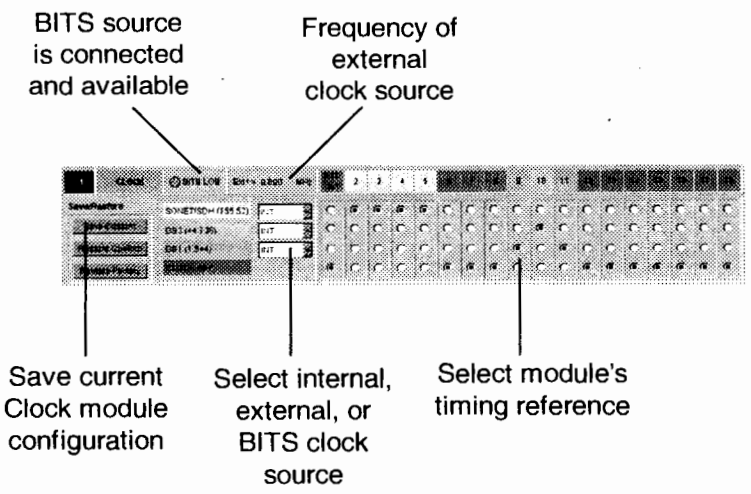
Use the following table to determine what clock source options and setting are used for each module type. Because OC12, OC48, STM4, and STM16 use multiples of 155.52, you should select 155.52 in the GUI. An external clock source must be equal to or within the specified values.

Signal	BITS	Frequency	INT selection in GUI	External Clock Frequency Range
DS1	✓	1.544	1.544	1543000 - 1545000 Hz
DS3	✓	44.736	44.736	44732645 - 44739355 Hz
OC3 Tx	✓	155.52	155.52	155508336 - 155531664 Hz
OC12 Tx	✓	622.08	155.52	155508336 - 155531664 Hz
OC3 Rx	✓	155.52	155.52	155508336 - 155531664 Hz
OC12 Rx	✓	622.08	155.52	155508336 - 155531664 Hz
OC48 Tx	✓	2.488	155.52	155508336 - 155531664 Hz
OC48 Rx	✓	2.488	155.52	155508336 - 155531664 Hz
E1	✓	2.048	Off—Has own clock source	Has own clock source
STM1 Tx	✓	155.52	155.52	155508336 - 155531664 Hz
STM4 Tx	✓	622.08	155.52	155508336 - 155531664 Hz
STM1 Rx	✓	155.52	155.52	155508336 - 155531664 Hz
STM4 Rx	✓	622.08	155.52	155508336 - 155531664 Hz
STM16 Tx	✓	155.52 2.488	155.52	155508336 - 155531664 Hz
STM16 Rx	✓	155.52 2.488	155.52	155508336 - 155531664 Hz

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Setting the Clock Source

You must configure the clock module when you when you change to or from an external or BITS clock source and when you add a module.



Step 1. Login as root.

Step 2. In the GUI, open the Clock Detail View.

Step 3. Select the clock source for the desired timing references.

- **BITS**—This option is only available if you have a BITS clock connected to the Clock module.
- **INT**—This is the internal clock source.
- **EXT**—This is a external clock source connected to the Clock module. See "Configuring the Clock Module" for what frequency range is required for each signal.

NOTE: If you use a BITS or external clock source for one timing reference, you must select only modules that can use that reference. Only one BITS and one external clock source can be connected to a clock module.

Step 4. Select the timing references for the installed modules. See "Configuring the Clock Module" for what timing references modules can use.

Step 5. If desired, save the clock module configuration.

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Setting the Clock Source for DS1, DS3, and E1 Modules

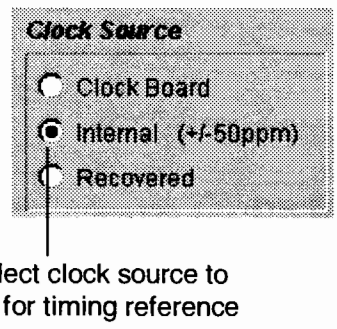
The DS1, DS3, and E1 modules have their own clock source options:

- **Clock Board**—The Clock Board is used as the timing reference (not available for E1).
- **Internal**—The module's internal clock is used.
- **Recovered**—The clock source from a receiver is used. For example with a DS1, the Port 3 Transmitter gets the timing reference from the Port 1 Receiver, and the Port 4 Transmitter gets the timing reference from the Port 2 Receiver.

Step 1. Open the Detail View of the desired module.

Step 2. Select the Transmitter tab.

Step 3. In the Clock Source area, select the desired source.



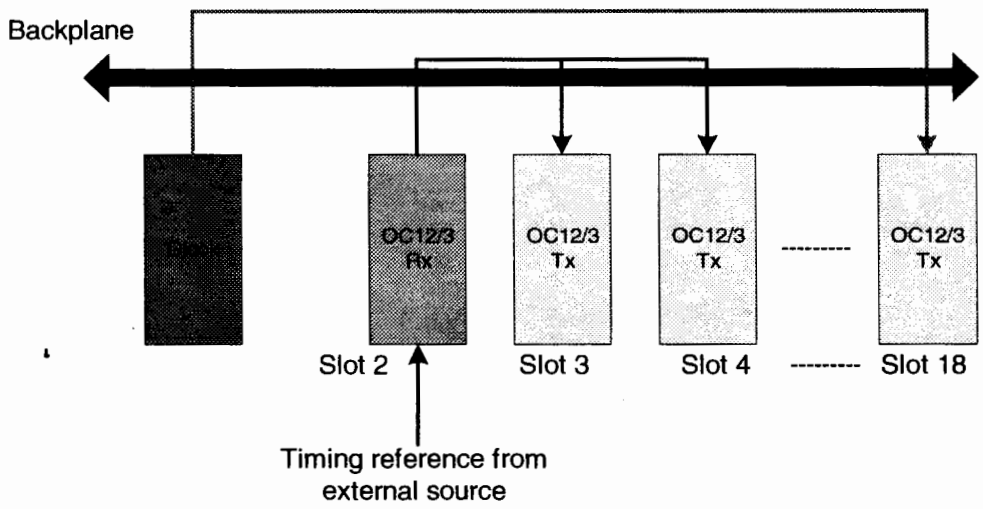
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Setting the Clock Source for Payload Generator Modules

If installed with Payload Generator modules, the OC12/3 and STM 4/1 modules can use either of the following clock sources.

- **Clock Board**—The clock module is used as the timing reference.
- **Backplane**—The timing reference is taken from the backplane.

  For example, the example below shows the modules in slots 3 and 4 getting their timing references from the backplane. That backplane timing reference is coming from an external clock source. The module in slot 18 is getting its timing reference from the clock module.



Step 1. Open the Detail View of the desired module.

Step 2. Select the Setup tab.

Step 3. In the Clock Source area, select the desired source.

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Using Groups

You can group modules together to make testing and configuration easier. Groups on an EPX16 are visible to other users.

You can put 1-17 modules in a group.

Locking controls access to a group's configuration, to avoid two users simultaneously editing a group's attributes.

Allocation reserves the physical modules to a group to prevent simultaneously use of a module or changes in its configuration.

NOTE: Allocating modules is currently only available with groups and not with individual modules.

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Creating New Groups

Currently the EPX16 GUI supports selecting groups by slot number.

Step 1. Select the Group Manager icon in the EPX16 Main Window. The Group Manager window appears.

Step 2. Select New Group. A folder named NEWGRP appears in the Groups view.

Step 3. Type a name in the Name field, and select Apply.

NOTE: Use only alphanumeric characters. Do not use spaces.

Step 4. If desired, select Change Password to protect the group. Type in the password and select Apply.

Step 5. Define the background and foreground colors, if desired, and select Apply.

This setting is shown in the EPX16 GUI main window when the modules are allocated, indicating that the modules are in use.

Step 6. Select Add Board. The Select Slot Number dialog appears.

Step 7. Click on a slot number and select OK. Repeat Steps 8 and 9 to add more modules to group.

NOTE: You cannot add the Clock module (Slot 1) to a group.

Step 8. Select Allocate to reserve the modules for your group. You cannot save the group until the modules are allocated to your group.

Step 9. In the EPX16 Main Window, select and configure the modules that you added to your group.

Step 10. Select Save Boards Configs in the Group Manager window.

These settings are saved as attributes of the group.

Allocating modules later enforces these configurations on the group modules.

Step 11. Select Deallocate in the Group Manager window when you are not using the modules.

Deallocating allows the modules to be used in other groups or individually.

Step 12. Close the window. Your group information is saved any time that the GUI runs a SCPI command.

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Renaming Groups

Step 1. In the Group Manager dialog, select a group.

This runs the GMAN:SEL *group_name* command.

Step 2. In the General tab, click Lock.

This runs the GMAN:LOCK *group_name* command.

Step 3. In the General tab, click Deallocate (if the modules are not already deallocated).

This runs the GMAN:DEAC *group_name* command.

Step 4. Select current entry in the Name field and type a new name.

Step 5. Click Apply. The group name is changed.

This runs the GMAN:GRP:REN *group_name* command.

Step 6. Click Unlock.

This runs the GMAN:GRP:UNL command.

Changing Passwords

To protect group configurations, you can create a password for each group. When someone attempts to lock a group (locking is required to modify a group), they are prompted to enter the password.

Step 1. In the Group Manager dialog, select a group.

This runs the GMAN:SEL *group_name* command.

Step 2. In the General tab, click Lock.

This runs the GMAN:LOCK *group_name* command.

Step 3. In the General tab, click Deallocate (if the modules are not already deallocated).

This runs the GMAN:DEAC *group_name* command.

Step 4. Select Change Password.

Step 5. Type password in the New and Verify fields.

NOTE: Use alphanumeric characters. Do not use spaces.

Step 6. Click Apply.

This runs the GMAN:GRP:PASS *password* command.

Step 7. Click Unlock.

This runs the GMAN:GRP:UNL command.

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Renaming Modules

Step 1. In the Group Manager dialog, select a group.

This runs the GMAN:SEL *group_name* command.

Step 2. In the General tab, click Lock.

This runs the GMAN:LOCK *group_name* command.

Step 3. In the General tab, click Deallocate (if the modules are not already deallocated).

This runs the GMAN:DEAC *group_name* command.

Step 4. Double click the locked group. The modules in the group appear.

Step 5. Select a module. The Module Properties appear.

This runs the GMAN:GRP:SEL *module_name* command.

Step 6. Select current module name and type a new name.

Step 7. Click Apply. The module name is changed.

This runs the GMAN:GRP:BOAR:REN *module_name* command.

Step 8. Click Unlock.

This runs the GMAN:GRP:UNL command.

Testing Groups

After configuring the group and its modules, you can test the group from the Group Manager window.

Step 1. In the Group Manager window, select the group that you want to test.

This runs the GMAN:SEL *group_name* command.

Step 2. Click Allocate.

This runs the GMAN:GRP:ACT command.

Step 3. Click the Test tab in Group Properties view.

Step 4. Define if the test is continuous or a timed test.

Depending on your selections, this runs the following commands:

- GMAN:GRP:TEST:TYPE *type*
- GMAN:GRP:TEST:UNIT *unit*
- GMAN:GRP:TEST:PER *period*
- GMAN:GRP:TEST:MODE *mode*

Step 5. Select Start.

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Restoring Module Configurations

If you have modified the settings for modules in a group and have not saved these settings, you can restore the previously saved module configurations.

Step 1. In the Group Manager window, select the group.

This runs the GMAN:SEL *group_name* command.

Step 2. Click Restore Board Configs. The module settings are updated.

This runs the GMAN:GRP:REST command.

Deleting Groups

Step 1. In the Group Manager window, select the group to be deleted.

This runs the GMAN:SEL *group_name* command.

Step 2. Click Lock.

This runs the GMAN:LOCK *group_name* command.

Step 3. In the General tab, click Deallocate (if the modules are not already deallocated).

This runs the GMAN:DEAC *group_name* command.

Step 4. Click Delete Group.

This runs the GMAN:GRP:DEL command.

Deleting Modules from Groups

Step 1. In the Group Manager window, select the group from which you want to delete a module.

This runs the GMAN:SEL *group_name* command.

Step 2. Click Deallocate.

This runs the GMAN:GRP:DEAC command.

Step 3. Select the module that you want delete from a group. The Board Properties appear.

This runs the GMAN:GRP:SEL *module_name* command.

Step 4. Click Delete Board in the General Tab view.

This runs the GMAN:GRP:BOAR:DEL command.

The module is deleted.

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Subscribing for Events

Using subscriptions, you can define what events that you want to notified of. These notifications appear in the Subscription Area of the SCPI Message dialog or in a subscription telnet window. (See "Connecting to the Ethernet Ports" for information on using telnet for EPX16 access.)

Unlike the logging command, subscription does not stamp the time of events. However, with subscriptions, you can track more information than you can with logging.

Subscribing to events is useful:

- To find what SCPI commands are issued by the GUI
- To find out when configurations change
- To collect data for alarms and errors
- To prevent network overloading (as an alternative to polling for data)

  However, subscribing for events can still cause load problems, depending on the data requested and the update intervals. You should consult the SCPI reference pages and test the subscription commands to see how much data is reported at what frequency.

NOTE: Subscription is available only with TCP/IP connections.

When you send a SCPI command to subscribe for notification of events, the Subscription Thread tracks the events to which you have subscribed. The Subscription Thread then checks each slot for the occurrence of subscribed events, one type of event at a time, one slot at a time.

You can subscribe to system, group manager, or module events.

See the online help for each module for details on what syntax the SCPI commands use and what events are available for subscription.

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Subscribing for System Events

You can be notified of the following events for all boards:

- When tests are enabled
- When alarms are enabled or pending
- When errors are enabled or pending
- When the backplane modes change for each module

See the System SCPI command reference on www.gnubi.com or from the EPX16 GUI online help.

NOTE: If you subscribe to events and issue SCPI commands from the SCPI Dialog, the GUI is not updated. See "Starting a New Client" for a workaround.

For example, if you wanted to know that alarms are enabled, you would use the following command:

```
syst:subs:stat:alar:enab 1
```

```
OK Subscribed for alarms enabled status events
```

The Subscription Channel may display something like the following:

```
SYST:SUBS:STAT:ALAR:ENAB
3,3,3,1,2,3,2,3,1,2,1,3,3,1,3,3,3,3
```

Each of the numbers indicates the status for all 18 slots:

1 = Alarm insertion is not enabled, or active.

2 = Alarm insertion is enabled, or active.

3 = Alarm insertion is not available. This condition may exist for one of two reasons:

a. The installed module, such as CPU or clock, does not support alarm insertion.

b. A module is not installed in that slot.

The value for these numbers depends on the SCPI subscription command. See the System SCPI reference for details.

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Subscribing for Group Manager Events

You can subscribe for all Group Manager events, including:

- When groups are added, deleted, renamed, or locked
- When modules are added to groups, deleted from groups, assigned types or positions, or renamed
- When group tests units, periods, types, and modes are set

You can subscribe to all Group Manager events or to particular events.

To subscribe to all events, you would use the following command:

```
gman:subs:all 1
```

```
OK Subscribed for all GMAN events
```

You can also unsubscribe from all events:

```
gman:subs:all 0
```

```
OK Unsubscribed for all GMAN events
```

See the Group Manager SCPI Command reference page on www.gnubi.com or from the EPX16 GUI online help for more details.

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Subscribing for Module Events

You can subscribe for events that occur for individual slots:

- Module configuration change
- Input peak voltage/ power (updated at specified intervals)
- Input frequency (updated at specified intervals)
- Status of alarm counts, seconds, and ratio
- Status of error counts and ratio
- Error-free and error seconds
- Path error types
- Overhead status
- Section (J0) and path (J1) trace messages
- Changes to section and path overhead bytes

Also, Payload Monitor and Payload Generator have their own subscriptions:

- Section (J0) and path (J1) trace messages
- Changes to section, path, and line overhead bytes
- APS information
- Pointer value and pointer-related counter changes

For example, if you wanted to know configuration status, you would use the following command:

```
SUBScribe(@2):CONFig  1
```

OK

The Subscription Channel may display something like the following:

```
2 SENS:TEST:MODE STOP 0
2 SENS:TEST:TYPE CONT
2 SENS:TEST:PER 10
2 SENS:TEST:UNIT SEC
2 SENS:TEST:LOG:MODE OFF
2 SYST:BOAR:BACK:MODE PASS
2 INP:RATE STS12
2 SENS:TEST:MODE STOP 0
```

The first number is the slot number followed by a simplified version of the configuration SCPI commands and their settings. For instance, the first line shows that the module in slot 2 is not in use for a test.

If you wanted to know the APS information for an OC12/3 Transmitter with a Payload Generator, you would use the following command:

```
SUBScribe(@4):PMODule:SOURce:APS 1
```

OK

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The Subscription Channel may display something like the following:

```
4 PMOD:SOUR:APS:K1K2 0xf1 0x14
4 PMOD:SOUR:APS:K1EN:REQ LOPS
4 PMOD:SOUR:APS:K1EN:CHAN 1
4 PMOD:SOUR:APS:K2EN:ARCH A1_1
4 PMOD:SOUR:APS:K2EN:OPER UNID
4 PMOD:SOUR:APS:K2EN:CHAN 1
4 PMOD:SOUR:APS:UPD
```

The first number is the slot number followed by a simplified version of the configuration SCPI commands and their settings.

See the SCPI command reference for individual modules on www.gnubi.com or from the EPX16 GUI online help.

Known Problems

The following are known problems and issues.

Updating EPX16 GUI for Subscriptions

Currently, if you subscribe to events from the SCPI Dialog, you cannot see the GUI updated from the same TCP/IP client. This problem only occurs for subscriptions. You can run SCPI commands from the SCPI Dialog, and the EPX16 GUI is updated.

Starting a New Client

As a solution, you can open one client to the EPX16 server for the GUI and another client for the SCPI dialog.

NOTE: Only five clients can connect to an EPX16 server at one time.

Step 1. Open a new browser window.

Step 2. Enter *EPX16_IP_address*/`scpiapp.htm` for the address.

For example, you might enter the URL `199.160.0.34/scpiapp.htm`.

The SCPI Dialog appears.

Step 3. When the SCPI dialog appears, subscribe to the desired events.

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Logging

The EPX16 has two types of logging:

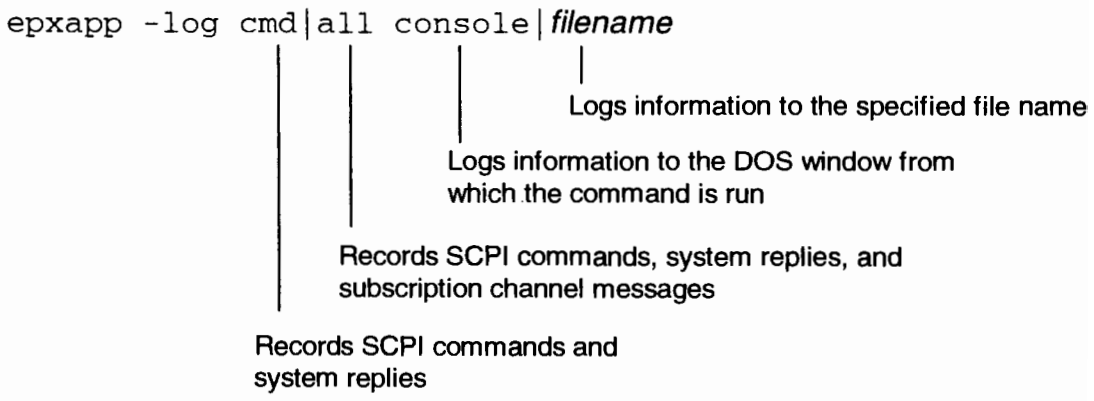
- Recording SCPI commands, responses, and subscription channel messages for actions in the EPX16 GUI
- Recording module and test settings

Logging EPX16 GUI Information

The `epxapp -log` command is useful to determine what SCPI commands are executed by the EPX16 GUI.

Run the following command from a DOS window.

NOTE: Logging GUI information is only available for the standalone GUI: it does not work with the browser version of the GUI.



For example, if you want to log the SCPI commands and replies to a log file named 10_2_99.txt, you would use the following command:

```
epxapp -log cmd 10_2_99.txt
```

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Logging Test Measurements

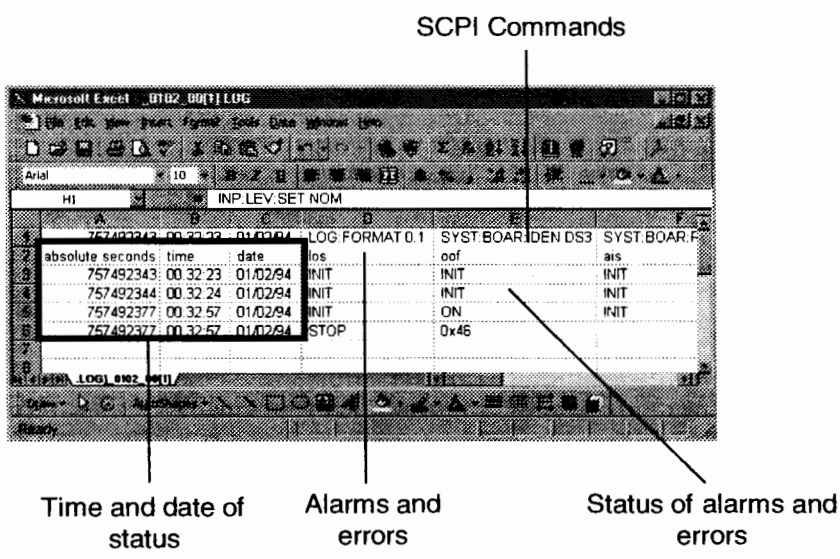
The testing log file is useful to keep a record of settings. Logging can only be turned on for transceiver and receiver modules.

You can subscribe to events, alarms, and errors with SCPI commands, viewing the results in a subscription channel window. Subscriptions provide more information than logging. See "Subscribing for Events" for more information.

This section describes:

- Log file format (what information is captured)
- Log file naming conventions

You can log test measurements and module information in a table (which can be imported into a spreadsheet program, such as Microsoft Excel).



- **Module settings**—SCPI commands are used to check status and to configure modules: each selection in the GUI uses a SCPI command.
- **Errors and alarms**—The status of alarms and errors are noted:
  - INIT—Indicates initial status of an alarm, whether on or off.
  - ON—Indicates that an alarm has been turned on.
  - OFF— Indicates that an alarm has been turned off.
  - STOP— Indicates that the test has been stopped.

  Also, settings, such as payload patterns, are logged.
- **Time**—This column displays the local time (according to the EPX16 OS clock) of events during the testing.
- **Absolute Seconds**—This column displays time on the EPX16 in seconds.

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- **Date**-- This column displays the date of the testing events.

A log file is created for each test run on a module. The names of the files follow this pattern:

_0102_*iteration*.LOG

Iteration is the test that has been run on that slot. The first iteration of a test is 00; the second is 01; etc.

Starting Testing Logs

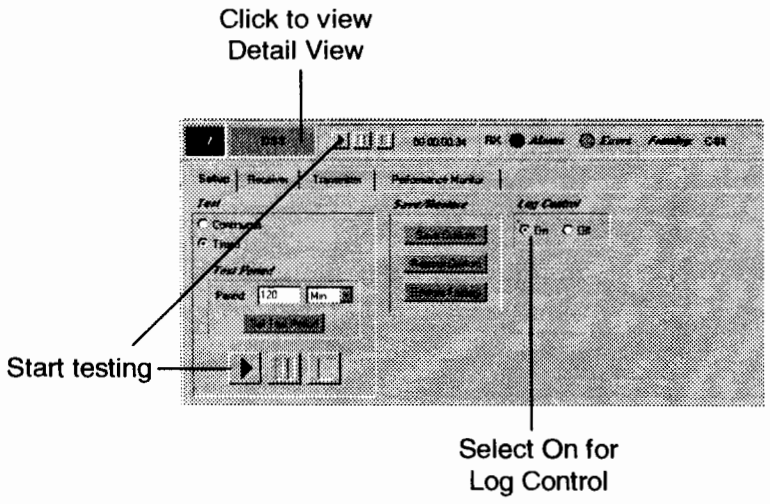
Logging can only be turned on for transceiver and receiver modules.

Step 1. Open the Detail View for the modules that you want to set up and test.

Step 2. After configuring the modules, select **On** in the **Log Control** area of the Setup tab.

Step 3. Start testing from either the Detail View or the Module Summary.

See "Reading and Saving Testing Logs" for how to read testing logs.



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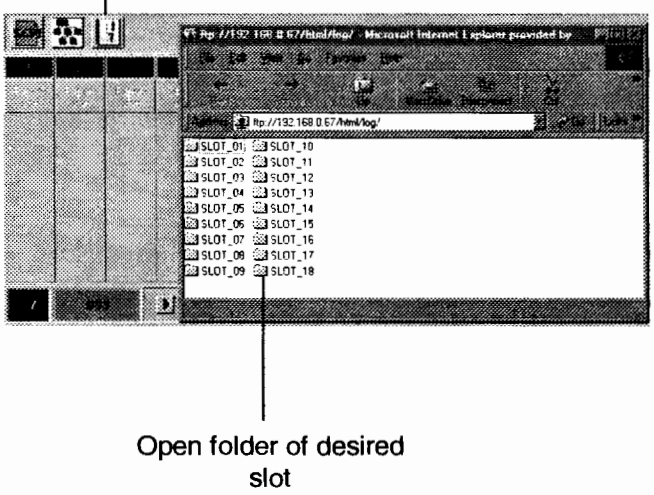
Reading and Saving Testing Logs

You can read testing logs as plain text files or, to make reading easier, as spreadsheet files. The following procedures explain how to import the log files into Microsoft Excel.

See "Logging " for information captured in testing log files.

Step 1. Click on the Log File Access button. An FTP window is opened to the log directory of the EPX16.

You must refresh the window after running tests with the FTP window open. This allows you to view the latest files.



Step 2. Open the folder of the slot whose log file you want to read.

Step 3. Open the log file. Depending on how many tests are run, there may be several log files. See "Logging " for naming conventions.

Step 4. Save the log file to a location on your computer.

Step 5. Open a spreadsheet program, such as Microsoft Excel.

Step 6. Open the saved log file.

Step 7. Format the file as delimited with commas.

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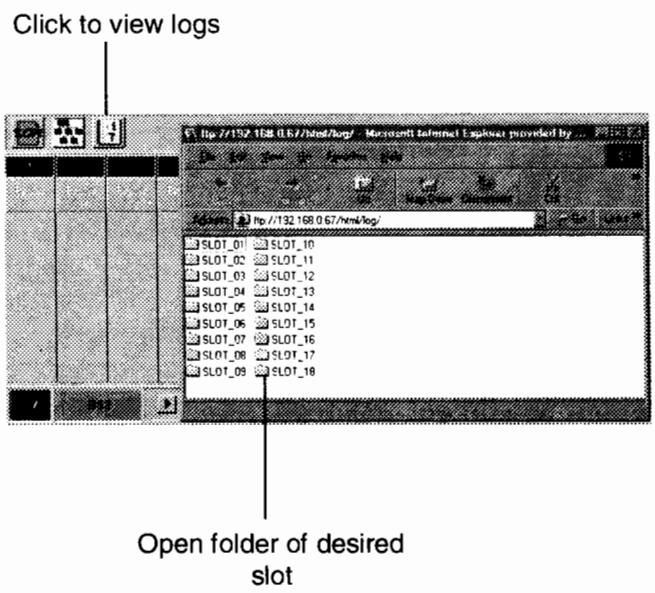
Deleting Log Files

You should periodically delete log files to finding files easier and to clear space on the EPX16.

NOTE: Only the EPX16 administrator with root access can delete log files.

Step 1. Click on the Log File Access button. An FTP window is opened to the log directory of the EPX16.

You must refresh the window after running tests with the FTP window open. This allows you to view the latest files.



Step 2. Open the folder of the slot whose log file you want to delete.

Step 3. Select the log file(s).

Step 4. Select the **Delete** key.

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Chapter 7. Maintenance

Customers can conduct the following maintenance procedures.

All other EPX16 maintenance must be done by Gould.

Changing Modules

Use these procedures when adding or replacing modules in your system.

Removing Modules

If you are not replacing a removed module, you should use a faceplate blank in the slot from where the module is removed. This ensures proper airflow and cooling.

CAUTION: Do not remove or install boards without turning off the EPX16. The EPX16 does not support hot swapping.

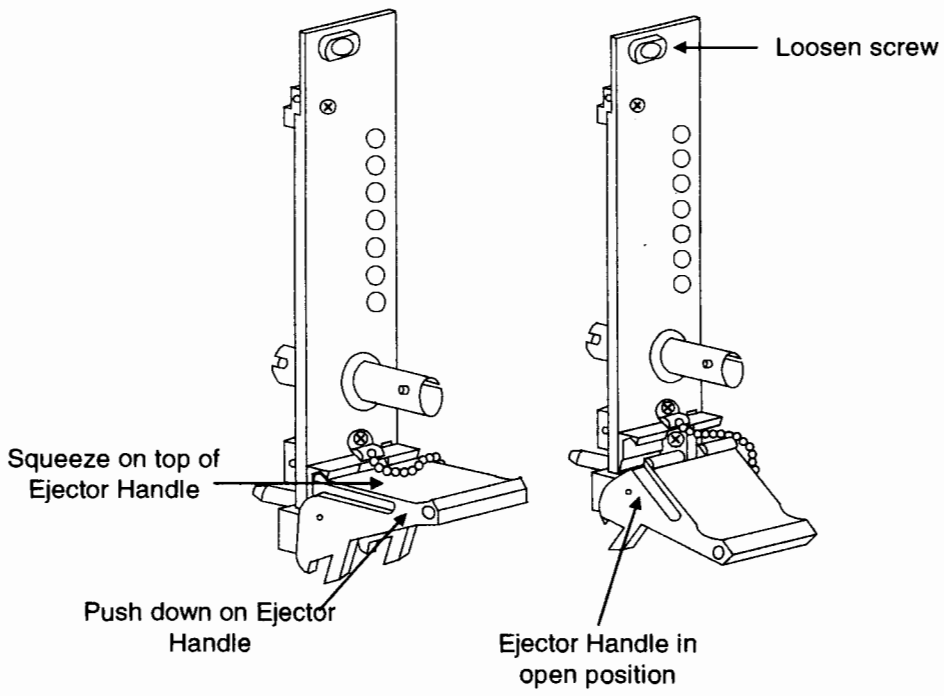
Step 1. Turn the DC power to standby (⏻) on the front of the chassis.

Step 2. Disconnect the AC or DC power supply, depending your unit's configuration.

Step 3. Loosen the screw at the top of the module faceplate.

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Module board and chassis are not shown to simplify illustration



Step 4. Move the chain out of the way.

Step 5. Squeeze the ejector handle near the top to begin to release from the catch.

Step 6. Push down on the module's ejector handle. The handle is fully released from the catch, and the module is released from the backplane.

Step 7. If you do not replace the removed module, install a blank faceplate to ensure proper airflow and cooling.

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Installing Modules

CAUTION: Do not remove or install modules without turning off the EPX16. The EPX16 does not support hot swapping.

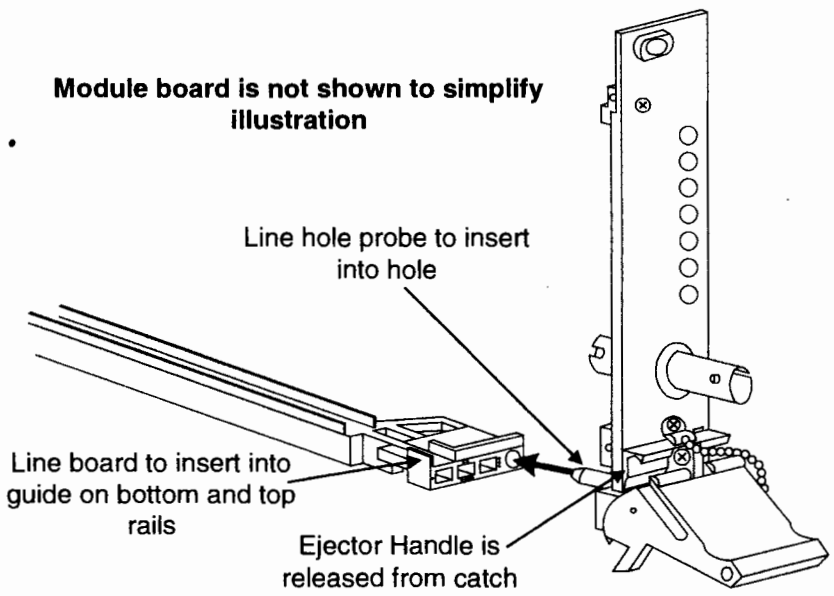
Step 1. Turn the DC power to standby (⏻) on the front of the chassis.

Step 2. Disconnect the AC or DC power supply, depending your unit's configuration.

Step 3. Make sure that the ejector handle is in the open position (down).

Step 4. Line up the module board with the guides on the top and bottom rails.

Step 5. Make sure that the hole probe is aligned to go into the hole on the bottom rail.



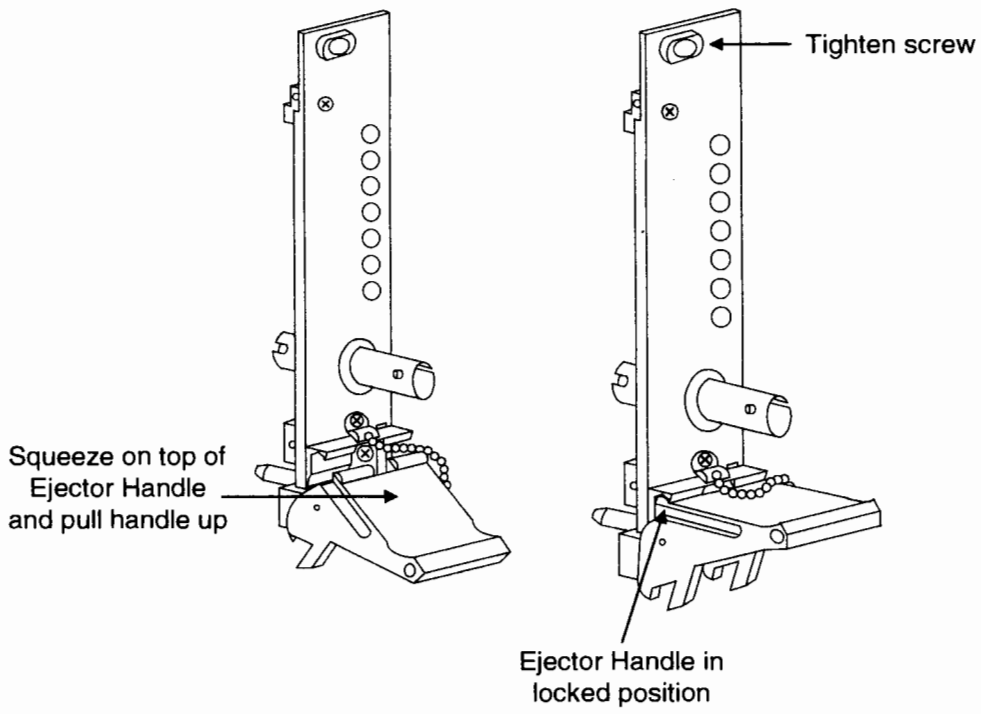
Step 6. Slide the module into the chassis until it stops. The rear feet on the ejector handle should be over holes on the chassis.

Step 7. Move the chain out of the way.

Step 8. Squeeze the ejector handle near the top so it can snap under the catch.

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Module board and chassis are not shown to simplify illustration



Step 9. Pull up on the ejector handle. The handle snaps under the catch, and the module connects firmly to the backplane.

Step 10. Tighten the screw at the top of the module faceplate.

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Cleaning

Clean the product as needed following these procedures.

Cleaning Chassis

Warning: Do not use cleaning fluids as they may damage the labelling or may enter the chassis and damage boards. Use only cloth dampened with water.

Step 1. Turn the DC power to standby (⏻) on the front of the chassis.

Step 2. Disconnect the AC or DC power supply, depending your unit's configuration.

Step 3. Wipe the chassis with a dampened cloth.

Step 4. With a dry cloth, wipe the chassis to remove excess moisture.

Warning: Do not allow water to enter the product.

Step 5. Connect the AC or DC power supply, and turn on the DC power.

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Cleaning Optic Cables

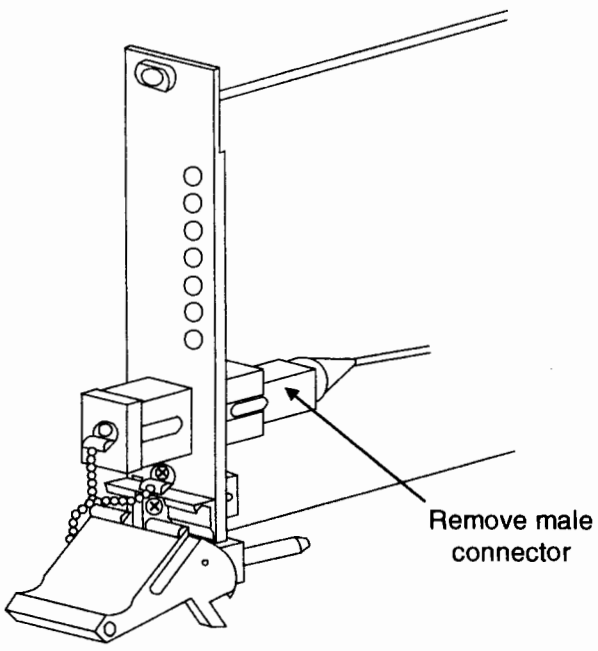
CAUTION: Do not remove or install boards without turning off the EPX16. The EPX16 does not support hot swapping.

Step 1. Turn the DC power to standby (⏻) on the front of the chassis.

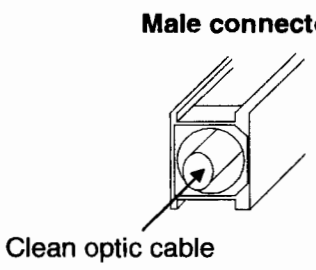
Step 2. Disconnect the AC or DC power supply, depending your unit's configuration.

Step 3. Partially remove the card from the chassis to access the optic cable.

Step 4. Remove the male optic connector from the female connector.



Step 5. Clean the optic cable.



Step 6. Reconnect the optic connector.

Step 7. Push the handle ejector lever down.

Step 8. Push the module back into the chassis.

Step 9. Pull up the handle ejector to secure the module to the backplane.

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Appendix A. EPX16 Specifications

This appendix lists the specifications for the EPX16 chassis as well as for each module group currently ships.

DS1 Specifications

Parameter	Value	Units	Notes
Connector	WECO Bantam Jack		
Line Rate	1.544	Mb/s	
Line Code	B8ZS / AMI		
Impedance	100	ohms	1
Signal Format	As defined in ANSI T1.107-1988 and ANSI T1.107a-1990		
Pulse Shape	Complies with Figure 1 of ANSI T1-102-1989		2

Table 1: DS1 (EPX200)

Notes:

1. Balanced
2. The pulse amplitude shall be between 2.4 - 3.6 V, measured at the center of the pulse, and may be scaled by a constant factor to fit the template.

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DS3 Specifications

Parameter	Value	Units	Notes
Connector	BNC		
Line Rate	44.736	Mb/s	
Line Code	B3ZS		
Impedance	75	ohms	
Equalization			1
Signal Format	As defined in ANSI T1.107-1988 and ANSI T1.107a-1990		
Pulse Shape	Complies with ANSI T1-404		
Power Level	Complies with ANSI T1-102-1989		

Table 2: DS3 (EPX300)

Notes:

1. Selectable input gain stage to be used for direct DSX-3 cross-connect feeds or proceeding external line build-out (LBO) and equalizer networks

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E1 Specifications

Two versions of the E1 board exist, one with 120 ohm balanced signal LEMO connectors or with 75-ohm BNC 75-ohm BNC connectors. The following two tables describe the physical specifications of the two versions.

Parameter	Value	Units	Notes
Connector	LEMO		
Line Rate	2.048	Mb/s	
Line Code	HDB3/ AMI		
Impedance	120	ohms	1
Signal Format	As defined in ITU-T Recommendation G.703 1991		
Pulse Shape	Complies with Figure 15 of G.703 1991		2

Table 3: Physical Specifications of E1 with 120 Ohm LEMO Connector

Notes:

1. Balanced
2. The pulse amplitude shall be nominally around 2.37 V, measured at the center of the pulse, and may be scaled by a constant factor to fit the template.

Parameter	Value	Units	Notes
Connector	BNC		
Line Rate	2.048	Mb/s	
Line Code	HDB3/ AMI		
Impedance	75	ohms	1
Signal Format	As defined in ITU-T Recommendation G.703 1991		
Pulse Shape	Complies with Figure 15 of G.703 1991		2

Table 4: Physical Specifications of E1 with 75 Ohm BNC Connector

Notes:

1. Single ended signal.
2. The pulse amplitude shall be nominally around 3.0 V, measured at the center of the pulse, and may be scaled by a constant factor to fit the template.

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OC-12/3 & STM-4/1 Transmitter Specifications

Parameter	Value	Units	Notes
Connector	SC		1
Fiber	9/125/900 (Single-mode)	µm	
Data Rates	155.52 (OC-3/STM-1) or 622.08 (OC-12/STM-4)	Mb/s	
Line Code	Non-Return to Zero (NRZ)		
Output Power	-10 +/- 2	dBm	
Typical Wavelength	1310	nm	
Wavelength Range	1292 to 1325	nm	
Spectral Width	2.5	nm	2
Extinction Ratio	8.2	dB	3
Eye Mask	Complies with GR-253-CORE (Revision 2 1/1999)		

Table 5: OC12/3 & STM4/1 Transmitter (EPX600 Standard Option)

Notes:

1. Optional connector types available: FC and ST
2. Maximum measurement, RMS
3. Minimum measurement

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Parameter	Value	Units	Notes
Connector	SC		1
Fiber	9/125/900 (Single-mode)	µm	
Data Rates	155.52 (OC-3/STM-1) or 622.08 (OC-12/STM-4)	Mb/s	
Line Code	Non-Return to Zero (NRZ)		
Output Power	-3 +/- 2	dBm	
Typical Wavelength	1310	nm	
Wavelength Range	1292 to 1325	nm	
Spectral Width	2.5	nm	2
Extinction Ratio	10	dB	3
Eye Mask	Complies with GR-253-CORE (Revision 2 1/1999)		

Table 6: OC12/3 & STM4/1 Transmitter (EPX600 Option 1)

Notes:

1. Optional connector types available: FC and ST
2. Maximum measurement, RMS
3. Minimum measurement

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Parameter	Value	Units	Notes
Connector	SC		1
Fiber	9/125/900 (Single-mode)	µm	
Data Rates	155.52 (OC-3/STM-1) or 622.08 (OC-12/STM-4)	Mb/s	
Line Code	Non-Return to Zero (NRZ)		
Output Power	0 +1.5 / -2	dBm	
Typical Wavelength	1310	nm	
Wavelength Range	1292 to 1325	nm	
Spectral Width	2.5	nm	2
Extinction Ratio	10	dB	3
Eye Mask	Complies with GR-253-CORE (Revision 2 1/1999)		

Table 7: OC12/3 & STM4/1 Transmitter (EPX600 Option 2)

Notes:

1. Optional connector types available; FC and ST
2. Maximum measurement, RMS
3. Minimum measurement

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Parameter	Value	Units	Notes
Connector	SC		1
Fiber	9/125/900 (Single-mode)	µm	
Data Rates	155.52 (OC-3/STM-1) or 622.08 (OC-12/STM-4)	Mb/s	
Line Code	Non-Return to Zero (NRZ)		
Output Power	0 +/- 2	dBm	
Typical Wavelength	1550	nm	
Wavelength Range	1530 to 1570	nm	
Spectral Width	1.0	nm	2
Sidemode Suppression	30	dB	3
Extinction Ratio	10	dB	3
Eye Mask	Complies with GR-253-CORE (Revision 2 1/1999)		

Table 8: OC12/3 & STM4/1 Transmitter (EPX600 Option 3)

Notes:

1. Optional connector types available: FC and ST
2. Maximum measurement, $\Delta\lambda$ at -20 dB
3. Minimum measurement

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OC-12/3 & STM-4/1 Receiver Specifications

Parameter	Value	Units	Notes
Connector	SC		1
Fiber	62.5/125/900 (Multi-mode)	µm	
Data Rates	155.52 (OC-3/STM-1) or 622.08 (OC-12/STM-4)	Mb/s	
Line Code	Non-Return to Zero (NRZ)		
Wavelength Range	1200 to 1600	nm	
Sensitivity	-28	dBm	2
Overload	0	dBm	3
Dynamic Range	28	dB	
LOS Declaration	-32	dBm	4
Jitter Tolerance	Complies with GR-253-CORE (Revision 2 1/1999)		

Table 9: OC-12/3 & STM-4/1 Receiver (EPX700 Option 3)

Notes:

1. Optional connector types available; FC and ST
2. Minimum measurement resulting from a signal with a minimum extinction ratio of 8.2 dB having a maximum BER of 1E-10 for a 2^{23}-1 PRBS data pattern
3. Maximum measurement
4. Nominal measurement

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OC-48 & STM-16 Transmitter Specifications

Parameter	Value	Units	Notes
Connector	FCPC		1
Fiber – Core / Cladding Diameter	9.5 / 125 (Single-mode)	µm	
Data Rates	2.488 (OC-48/STM-16)	Gb/s	
Line Code	Non-Return to Zero (NRZ)		
Typical Output Power	-6	dBm	
Min / Max Output Power	-10 / -3	dBm	2
Typical Wavelength	1310	nm	
Wavelength Range	1266 to 1360	nm	
Spectral Width	4	nm	3
Extinction Ratio	8.2	dB	4
Eye Mask	Complies with GR-253-CORE (Revision 2 1/1999)		

Table 10: OC-48 & STM-16 Transmitter (EPX400 Standard Option)

Notes:

1. Optional connector types available; SC and ST
2. Conforms to GR-253 definition for Short Reach (SR: Nominal Source λ = 1310 with Nominal Fiber Zero-Dispersion λ = 1310 for use with dispersion-unshifted, single-mode fiber per GR-253)
3. Maximum measurement, RMS
4. Minimum measurement

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Parameter	Value	Units	Notes
Connector	FCPC		1
Fiber – Core / Cladding Diameter	9.5 / 125 (Single-mode)	µm	
Data Rates	2.488 (OC-48/STM-16)	Gb/s	
Line Code	Non-Return to Zero (NRZ)		
Output Power	-3	dBm	
Min / Max Output Power	-5 / 0	dBm	2
Typical Wavelength	1310	nm	
Wavelength Range	1260 to 1360	nm	
Spectral Width	1	nm	3
Extinction Ratio	8.2	dB	4
Side Mode Suppression	30	dB	4
Eye Mask	Complies with GR-253-CORE (Revision 2 1/1999)		

Table 11: OC-48 & STM-16 Transmitter (EPX400 Option 1)

Notes:

1. Optional connector types available; SC and ST
2. Conforms to GR-253 definition for Intermediate Reach (IR-1: Nominal Source λ = 1310 with Nominal Fiber Zero-Dispersion λ = 1310 for use with dispersion-unshifted, single-mode fiber per GR-253)
3. Maximum measurement, Delta at -20 dB
4. Minimum measurement

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Parameter	Value	Units	Notes
Connector	FCPC		1
Fiber – Core / Cladding Diameter	9.5 / 125 (Single-mode)	µm	
Data Rates	2.488 (OC-48/STM-16)	Gb/s	
Line Code	Non-Return to Zero (NRZ)		
Output Power	0	dBm	
Min / Max Output Power	-2 / +3	dBm	2
Typical Wavelength	1310	nm	
Wavelength Range	1280 to 1335	nm	
Spectral Width	1	nm	3
Extinction Ratio	8.2	dB	4
Side Mode Suppression	30	dB	4
Eye Mask	Complies with GR-253-CORE (Revision 2 1/1999)		

Table 12: OC-48 & STM-16 Transmitter (EPX400 Option 2)

Notes:

1. Optional connector types available; SC and ST
2. Conforms to GR-253 definition for Long Reach (LR-1: Nominal Source λ = 1310 with Nominal Fiber Zero-Dispersion λ = 1310 for use with dispersion-unshifted, single-mode fiber per GR-253)
3. Maximum measurement, Delta at -20 dB
4. Minimum measurement

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Parameter	Value	Units	Notes
Connector	FCPC		1
Fiber – Core / Cladding Diameter	9.5 / 125 (Single-mode)	µm	
Data Rates	2.488 (OC-48/STM-16)	Gb/s	
Line Code	Non-Return to Zero (NRZ)		
Output Power	0	dBm	
Min / Max Output Power	-2 / +3	dBm	2
Typical Wavelength	1550	nm	
Wavelength Range	1500 to 1580	nm	
Reduced Wavelength Range	1530 to 1560	nm	3
Spectral Width	1	nm	4
Extinction Ratio	8.2	dB	5
Side Mode Suppression	30	dB	5
Dispersion Penalty	2	dB	6
Eye Mask	Complies with GR-253-CORE (Revision 2 1/1999)		

Table 13: OC-48 & STM-16 Transmitter (EPX400 Option 3)

Notes:

1. Optional connector types available; SC and ST
2. Conforms to GR-253 definition for Long Reach (LR-2: Nominal Source λ = 1550 with Nominal Fiber Zero-Dispersion λ = 1310 for use with dispersion-unshifted, single-mode fiber per GR-253)
3. A reduced center wavelength range can be achieved by limiting the EPX16's high ambient temperature to +35 °C.
4. Maximum measurement, Delta at -20 dB
5. Minimum measurement
6. Maximum measurement

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OC-48 & STM-16 Receiver Specifications

Parameter	Value	Units	Notes
Connector	FCPC		1
Fiber – Core / Cladding Diameter	9.5 / 125 (Single-mode)	µm	
Data Rates	2.488 +/- 50ppm	Gb/s	
Line Code	Non-Return to Zero (NRZ)		
Center Wavelength Range	1260 to 1360 1430 to 1580	nm nm	
Sensitivity	-18	dBm	2
Overload	0	dBm	3
Dynamic Range	18	dB	
Consecutive Identical Digit	72		4
LOS Declaration	-30	dBm	5
Jitter Tolerance	Compliant with GR-253 (Revision 2 1/1999) and ITU-T G.958 (11/1994)		
Optical Reflectance	-27	dBm	3

Table 14: OC-48 & STM-16 Receiver (EPX500 Option 1)

Notes:

1. Optional connector types available; SC and ST
2. Minimum measurement resulting from a signal with a minimum extinction ratio of 8.2 dB having a maximum BER of 1E-10 for a 2^{23}-1 PRBS data pattern
3. Maximum measurement
4. Minimum measurement
5. Nominal measurement

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Parameter	Value	Units	Notes
Connector	FCPC		1
Fiber – Core / Cladding Diameter	9.5 / 125 (Single-mode)	µm	
Data Rates	2.488 +/- 50ppm	Gb/s	
Line Code	Non-Return to Zero (NRZ)		
Center Wavelength Range	1260 to 1360 1430 to 1580	nm	
Sensitivity	-28	dBm	2
Overload	-9	dBm	3
Dynamic Range	19	dB	
Consecutive Identical Digit	72		4
LOS Declaration	-42	dBm	5
Jitter Tolerance	Compliant with GR-253 (Revision 2 1/1999) and ITU-T G.958 (11/1994)		
Optical Reflectance	-27	dBm	3

Table 15: OC-48 & STM-16 Receiver (EPX500 Option 2)

Notes:

1. Optional connector types available; SC and ST
2. Minimum measurement resulting from a signal with a minimum extinction ratio of 8.2 dB having a maximum BER of 1E-10 for a 2^{23}-1 PRBS data pattern
3. Maximum measurement
4. Minimum measurement
5. Nominal measurement

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Control Ports

The EPX000 (CPU module) has two ports for control access to the EPX16: an RS-232 port and an ethernet port. The pin-outs of these ports are described in the following two tables.

Pin	Signal Name
1	Data Carrier Detect
2	Receive Data
3	Transmit Data
4	Data Terminal Ready
5	Ground
6	Data Set Ready
7	Request to Send
8	Clear to Send
9	Ring Indicator

Table 16: Serial Port, RS-232 Connector Pin-Out

Pin	Signal Name
1	Positive Transmitted Data
2	Negative Transmitted Data
3	Positive Received Data
4	No Connection
5	No Connection
6	Negative Received Data
7	No Connection
8	No Connection

Table 17: Ethernet, RJ-45 Connector Pin-Out

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Ethernet Port Specifications

Parameter	Value	Units	Notes
Connector	RJ-45		
Type	10BASE-T		
Data Rate	10	Mb/s	
Cable Type	100 Ohm unshielded twisted pair		
Segment Length	100	m	1

Table 18: Ethernet Port Specifications

Notes:

1. Maximum

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Power Source Electrical Specifications

Parameter	Value	Units	Notes
Input Voltage	120/230	VAC	
Maximum Input Power	860	W	1
Maximum Input Current	10/5	A	
Frequency	50/60	Hz	
Peak Inrush Current	40	A	
Circuit Breaker	10	A	

Table 19: AC Power Source (P/N G0002-AC)

Notes

1. For a fully loaded EPX16

Parameter	Value	Units	Notes
Input Voltage	-48 +/- 10%	VDC	1
Maximum Input Power	860	W	2
Maximum Input Current	860 W/ 48 V = 7.92 A		
Peak Inrush Current	40	A	
Circuit Breaker	20	A	

Table 20: DC Power Source (P/N G0002-DC)

Notes:

1. DC input voltage connections must be correct or internal power source damage may result.
2. For a fully loaded EPX16

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Memory Back-up Battery Specifications

Parameter	Value	Units	Notes
Rated Voltage	3.6	V	
Nominal Capacity	1.9	AH	1
Mounting	Hook-and-Loop Fastener		
Manufacturer's P/N	TL-5242/W		

Table 21: Memory Back-up Battery (P/N G0003)

Notes:

1. Under 200 µA load until 3 V

Chassis Physical Specifications

Parameter	Value	Units	Note
Operation	0° to 40°	°C	
Storage	-20° to + 70°	°C	
Dimensions (WxHxD)	19 x 7 x 15.25	in	
Weight	36	lbs	1

Table 22: Chassis Physical Specifications

Notes:

1. Maximum when completely populated with 17 payload modules

Statements of Software Operating System

The EPX16 uses the TNT Embedded ToolSuite (ETS), Version 9.1 by PharLap, Inc.

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