XPEDITION

ER16 Getting Started Guide

Revision Date: 08.17.04

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Networks that Know

Electrical Hazard: Only qualified personnel should perform installation procedures.

Riesgo Electrico: Solamente personal calificado debe realizar procedimientos de instalacion.

Elektrischer Gefahrenhinweis: Installationen sollten nur durch ausgebildetes und qualifiziertes Personal vorgenommen werden.

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This product complies with the following: UL 60950, CSA C22.2 No. 60950, 73/23/EEC, EN 60950, IEC 60950, EN 60825, 21 CFR 1040.10.

Seguridad del Producto

El producto de Enterasys cumple con lo siguiente: UL 60950, CSA C22.2 No. 60950, 73/23/EEC, EN 60950, IEC 60950, EN 60825, 21 CFR 1040.10.

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Dieses Produkt entspricht den folgenden Richtlinien: UL 60950, CSA C22.2 No. 60950, 73/23/EEC, EN 60950, IEC 60950, EN 60825, 21 CFR 1040.10.

Electromagnetic Compatibility (EMC)

This product complies with the following: 47 CFR Parts 2 and 15, CSA C108.8, 89/336/EEC, EN 55022, EN 61000-3-2, EN 61000-3-3, EN 55024, AS/NZS CISPR 22, VCCI V-3.

Compatibilidad Electromágnetica (EMC)

Este producto de Enterasys cumple con lo siguiente: 47 CFR Partes 2 y 15, CSA C108.8, 89/336/EEC, EN 55022, EN 55024, EN 61000-3-2, EN 61000-3-3, AS/NZS CISPR 22, VCCI V-3.

Elektro- magnetische Kompatibilität (EMC)

Dieses Produkt entspricht den folgenden Richtlinien: 47 CFR Parts 2 and 15, CSA C108.8, 89/336/EEC, EN 55022, EN 61000-3-2, EN 61000-3-3, EN 55024, AS/NZS CISPR 22, VCCI V-3.

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Class 1 Laser Transceivers

The single mode interface modules use Class 1 laser transceivers.
Read the following safety information before installing or operating these modules.

The Class 1 laser transceivers use an optical feedback loop to maintain Class 1 operation limits. This control loop eliminates the need for maintenance checks or adjustments. The output is factory set, and does not allow any user adjustment. Class 1 Laser transceivers comply with the following safety standards:

• 21 CFR 1040.10 and 1040.11 U.S. Department of Health and Human Services (FDA).

• IEC Publication 825 (International Electrotechnical Commission).

• CENELEC EN 60825 (European Committee for Electrotechnical Standardization).

When operating within their performance limitations, laser transceiver output meets the Class 1 accessible emission limit of all three standards. Class 1 levels of laser radiation are not considered hazardous.

When the connector is in place, all laser radiation remains within the fiber. The maximum amount of radiant power exiting the fiber (under normal conditions) is -12.6 dBm or 55×10^{-6} watts.

Removing the optical connector from the transceiver allows laser radiation to emit directly from the optical port. The maximum radiance from the optical port (under worst case conditions) is 0.8 W cm^{-2} or 8×10^3 W m^2 sr-1.

Do not use optical instruments to view the laser output. The use of optical instruments to view laser output increases eye hazard. When viewing the output optical port, power must be removed from the network adapter.

Declaration of Conformity

Application of Council Directive(s):	**89/336/EEC** **73/23/EEC**
Manufacturer's Name:	**Enterasys Networks, Inc.**
Manufacturer's Address:	**50 Minuteman Road** **Andover, MA 01810** **USA**
European Representative Address:	**<Bold>Enterasys Networks, Ltd.** **Nexus House, Newbury Business Park** **London Road, Newbury** **Berkshire RG14 2PZ, England**
Conformance to Directive(s)/Product Standards:	**EC Directive 89/336/EEC** **EN 55022** **EN 55024** **EC Directive 73/23/EEC** **EN 60950** **EN 60825**
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Contents

About This Guide

This guide provides a general overview of the Enterasys Networks X-Pedition ER16 hardware and software features. It provides procedures for installing and setting up the ER16. For product information not available in this guide, see the manuals listed in *Related Documentation* .

What's New?

The content of the *X-Pedition ER16 Getting Started Guide* includes the addition of the following line cards as well as safety translations:

- ER16-IPV6-00

- ER16-OS16-01

Who Should Read This Guide?

Read this guide if you are a network administrator responsible for installing and setting up the ER16.

Electrical Hazard: Only qualified personnel should perform installation procedures.

Riesgo Electrico: Solamente personal calificado debe realizar procedimientos de instalacion.

Elektrischer Gefahrenhinweis: Installationen sollten nur durch ausgebildetes und qualifiziertes Personal vorgenommen werden.

How to Use This Guide

If You Want To...	See...
Get an overview of the ER16 software and hardware features	Chapter 1, *Features Overview*
Install the ER16 hardware	Chapter 2, *Hardware Installation*
Install the ER16 software, boot the software, and set up the unit	Chapter 3, *Software Installation and Setup*
Troubleshoot installation problems	Appendix A, *Troubleshooting*
Review cable specifications	Appendix B, *Hardware Components*

Related Documentation

The Enterasys Networks documentation set includes the following items. Refer to these other documents to learn more about your product.

For Information About...	See the...
How to use Command Line Interface (CLI) commands to configure and manage the ER16	*Enterasys X-Pedition User Reference Manual*
The complete syntax for all CLI commands	*Enterasys X-Pedition NATIVE Command Line Interface Reference Manual* *Enterasys X-Pedition Common Command Line Interface Reference Manual*
SYSLOG messages	*Enterasys X-Pedition Error Reference Manual*

Getting Help

For additional support related to the CLI syntax or this document, contact Enterasys Networks using one of the following methods:

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Phone	603-332-9400 1-800-872-8440 (toll-free in U.S. and Canada) For the Enterasys Networks Support toll-free number in your country: 　　http://www.enterasys.com/support/gtac-all.html
Internet mail	support@enterasys.com To expedite your message, please type **[ROUTE]** in the subject line.

To send comments or suggestions concerning this document to the Technical Writing Department: **TechWriting@enterasys.com**

To expedite your message, please type **[techwriting]** in the subject line, and include the document Part Number in the email message.

Before contacting Enterasys Networks for technical support, have the following information ready:

- Your Enterasys Networks service contract number

- A description of the failure

- A description of any action(s) already taken to resolve the problem (for example, changing mode switches, rebooting the unit, and so on)

- The serial and revision numbers of all involved Enterasys Networks products in the network

- A description of your network environment (layout, cable type, and so on)

- Network load and frame size at the time of trouble (if known)

- The device history (such as, have you returned the device before, is this a recurring problem, and so on)

- Any previous Return Material Authorization (RMA) numbers

Chapter 1

Features Overview

The Enterasys Networks X-Pedition ER16 provides non-blocking, wire-speed Layer-2 (switching), Layer-3 (routing) and Layer-4 (application) switching. This chapter provides a basic overview of the X-Pedition ER16 software and hardware feature set.

- If you want to skip this information and install the ER16 now, see Chapter 2, *Hardware Installation*.

- If you want to boot the ER16 software and perform basic configuration tasks now, see Chapter 3, *Software Installation and Setup*.

Specifications

The ER16 provides wire-speed switching and full non-blocking throughput. The hardware provides wire-speed performance regardless of the performance monitoring, filtering, and Quality of Service (QoS) features enabled by the software. You do not need to accept performance compromises to run QoS or access control lists (ACLs).

The following table lists the basic hardware and software specifications for the ER16. Refer to the *X-Pedition User Reference Manual* and the Release Notes for your X-Pedition software version for additional information about the software features.

Feature	Specification
Throughput	• Up to 128-Gbps non-blocking switching fabric • Up to 70 million packets-per-second routing throughput
Capacity	• Up to 250,000 Layer-3 routes • Up to 8,000,000 Layer-4 application flows • 1,600,000 Layer-2 MAC addresses • 4,096 Virtual LANs (VLANs) • 20,000 Layer-2 security and access-control filters
Routing protocols	• IP: RIP v1/v2, OSPF, BGP • IPv6: RIPng • IPX: RIP, SAP • Multicast: IGMP, DVMRP, PIM-SM • AppleTalk
Bridging and VLAN protocols	• 802.1D Spanning Tree • 802.1w Rapid Spanning Tree Protocol (RSTP) • 802.1s Multiple Spanning Tree Protocol (MSTP) • 802.1Q (VLAN trunking)
Media interface protocols	• 802.3 (10Base-T) • 802.3u (100Base-TX) • 802.3x (1000Base-SX, 1000Base-LX) • 802.3z (1000Base-SX, 1000Base-LX)
Quality of Service (QoS)	• Layer-2 prioritization (802.1p) • Layer-3 source-destination flows • Layer-4 source-destination flows • Layer-4 application flows
RMON	• RMON v1/v2 for each port

Feature	Specification
Management	• SNMP • Emacs-like Command Line Interface (CLI)
Port mirroring	• Traffic to the control module • Traffic from specific ports • Traffic to specific chassis slots (line cards)
Hot swapping	• Line cards • Control module (when redundant control module is installed and online) • Switching Fabric Modules • Power Supply (when redundant supply is installed and online)
Load balancing/ sharing	• Enterasys Networks SmartTRUNK support • Load Sharing Network Address Translation (LSNAT)
Redundancy	• Redundant and hot-swappable power supplies • Redundant and hot-swappable control modules • Redundant and hot-swappable Switching Fabric Modules • Virtual Router Redundancy Protocol (VRRP)

This guide and other ER16 documentation refers to the ER16's Layer-2 (L2), Layer-3 (L3), and Layer-4 (L4) switching and routing. These layers are based on the International Standards Organization (ISO) 7-layer reference model. Here is an example of that model. The ER16 operates within the layers that are not shaded. Notice that Layer 2 is divided into an LLC layer and a MAC layer. The ER16 operates at the MAC layer but not the LLC layer.

Layer 7	Application
Layer 6	Presentation
Layer 5	Session
Layer 4	TCP/UDP - application
Layer 3	IP/IPX - routing
Layer 2	LLC
Layer 2	MAC -bridging
Layer 1	Physical Interfaces

TCP/UDP Services

The following table lists some well-known TCP/UDP services provided by the ER16.

TCP Port	UDP Port	Description
23		Telnet
	161	SNMP
	67	BOOTP/DHCP Relay Agent
	520	Routed

Management Platforms

You can manage the ER16 using the following management platforms:

• Command Line Interface (CLI) – The X-Pedition family is unique in that it offers the user two CLI syntax choices. Both CLIs feature an Emacs editor-like interface, which accepts typed commands and responds when applicable with messages or tables. The original syntax, called the **Native** CLI, allows you to display data and configure the system using a powerful series of command sets. You will use the CLI to perform the basic setup procedures described in Chapter 3 of this guide. Alternatively, you may select the **Common** CLI in order to display data in a syntax commonly used by different manufacturers of routing equipment. This syntax may be used to display data only, and does not exists for configuration purposes.

• SNMP MIBs and traps – The ER16 supports SNMP v1, SNMP v2C, SNMP v3, and many standard networking MIBs. You access the ER16's SNMP agent using integration software for HP OpenView 5.x on Windows NT or Solaris 2.x, or Enterasys NetSight Atlas. Chapter 3 in this guide explains how to set up SNMP on the ER16.

Hardware Overview

This section describes the following ER16 hardware modules. Chapter 2 in this guide describes how to install the hardware.

- • Chassis

- • Backplane

- • Fan module

- • Control Module

- • Power Supply

- • Switching Fabric Module

- • Line cards

Chassis

The ER16 chassis (Figure 1) contains 16 vertical slots for line cards, numbered from 1 to 16. Slot 1 is on the left side of the chassis and slot 16 is on the right side. Slot 8 must be occupied by a Control Module, with slot 9 available for a redundant Control Module or a line card. The ER16 chassis also contains two horizontal slots for at least one Switching Fabric module; the second slot can contain a redundant Switching Fabric module. Power supplies are installed in the bottom portion of the chassis. Two AC power supplies are required; four AC power supplies are supported for redundant operation.

Slot 8 is labeled "CM" and contains the primary control module. The CM slot cannot be used for line cards. The primary control module must be installed in this slot. Slot 9 can contain a redundant control module (if you install one) or it can contain a line card. Slots 1-7 and slots 10-16 can contain any line cards. (See *Control Module* on page 8 and *Line Cards* on page 15 for information about these items.)

You can install line cards in any order in the slots. For example, you could install line cards in slots 2 and 5 and leave the other line card slots empty. The ER16 provides non-blocking throughput regardless of the software features you are using. Therefore, you do not need to "load balance" line cards by placing them in certain relationships to balance the load on the backplane. Regardless of where you install the line cards, the backplane can provide full, non-blocking throughput.

Figure 1. Front View of an ER16 Chassis
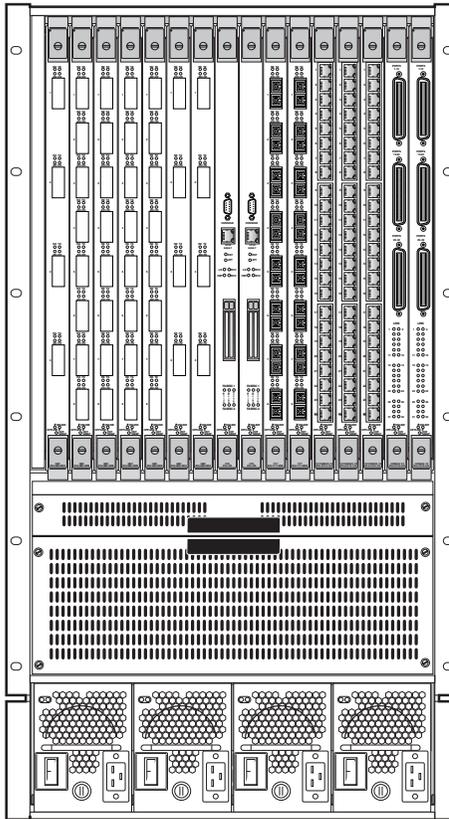
Backplane

The backplane occupies the rear of the chassis and connects the power supplies, control modules, and line cards together. The power supplies use the backplane to provide power to the rest of the system. The line cards and control modules use the backplane to exchange control information and packets. The backplane is installed at the factory.

Fan Module

The ER16 contains a fan module to provide a cooling air flow across the control module(s) and line cards. The fan module is located below the vertical slots. The ER16 fan module contains four fans.

Note: To ensure that the fan module can provide adequate cooling, always provide a minimum of 3 inches of clearance on each side of the chassis.

Hot Swapping a Fan Tray

Note: Before you hot swap a fan tray on the ER16, have the replacement fan nearby and ready to install—delays in completing the swap may cause the router to overheat.

1. **Loosen the captive screws**.

2. **Remove the fan tray** (the fans will wind down and stop). Although the system will continue to operate normally with the fans removed, if the fans are removed long enough the system will overheat, power off, and reboot. When the fan tray is removed, the following message will appear on the console:

```
%SYS-W-FANFAILED, system fan(s) have failed or fan tray is not installed
```

3. **Slide the new fan tray completely into the slot**. Fans will start up and the LED on the front of the fan tray will light if the fan is installed properly. Once the fan tray is installed, the following message is displayed on the console:

```
%SYS-I-FANSOKAY, system fans are operational.
```

4. **Tighten the captive screws**.

Control Module

The control module (Figure 2) is the ER16's central processing unit. It contains system-wide bridging and routing tables. Traffic that does not yet have an entry in the L2 and L3/L4 lookup tables on individual line cards is sent to the control module. After processing traffic, the control module updates the L2 and L3/L4 tables on the line cards that received the traffic. The line cards thus "learn" about how to forward traffic.

Note: You may install the Control Module in slots 8 and 9 only.

Figure 2. Front Panel of the Control Module
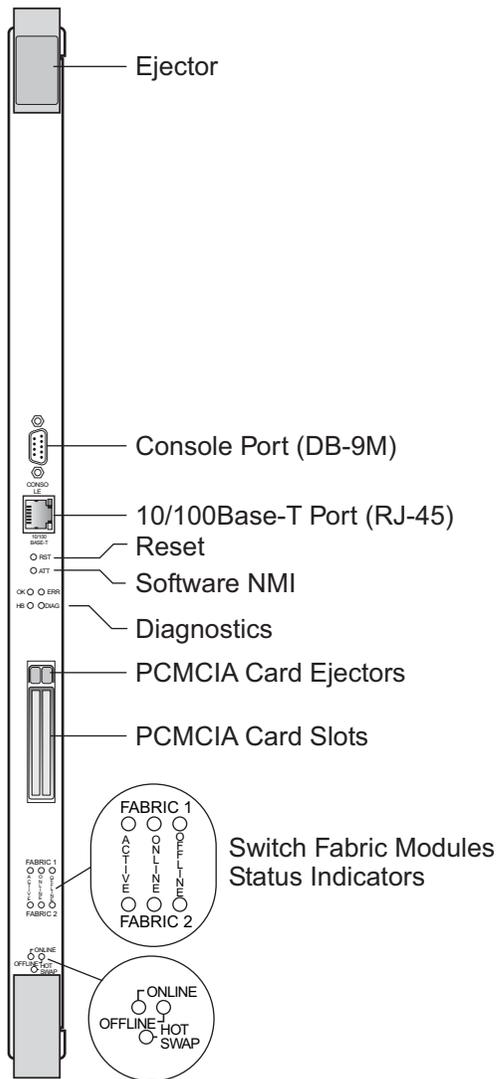
Boot Flash

The control module has a boot flash containing the ER16's boot software and configuration files. The system software image file resides on a PCMCIA card or a TFTP server.

Memory Module

The control module uses memory to hold the routing tables and other tables. The minimum factory configuration for the control module includes 128MB of memory (in a 128MB DIMM). You can obtain ER16 memory upgrade kits from Enterasys Networks to increase memory to 192MB (in one 64MB DIMM and one 128MB DIMM), or 256MB (in two 128MB DIMMs). See *Installing a Memory Upgrade* on page 79 for details on how to perform this upgrade.

External Controls

The control module has the following external controls. Where appropriate, this guide describes how to use the controls.

• Male DB-9 Data Communications Equipment (DCE) port for serial connection from a management terminal. Use this port to establish a direct CLI connection to the ER16. The default baud rate is 9600.

• 10/100Base-TX Data Terminal Equipment (DTE) port for network ("in-band") connection from a management terminal. The port is configured as a Media Data Interface (MDI).

• Reset switch (RST). Use this switch to reboot the ER16's CPU.

• Hot Swap switch. Use this switch to deactivate the module for hot swapping. See the *X-Pedition User Reference Manual* for information on how to hot swap the control module.

• PCMCIA card flash memory slots. These slots let you install system image software upgrades as well as older system image software versions.

Note: You may install a PCMCIA card in either slot, however you may not use two PCMCIA cards at the same time.

LEDs

Table 1. Control Module LED Indicators

LED	Condition	Status
10/100 RJ45 Port Link	On (Green)	A valid link has been established on the port.
10/100 RJ45 Port Activity	Flashing (Yellow)	Traffic is passing through the port.
OK	On	Functioning properly / Power on
ERR	On	Remains lit after power-up if a configuration prevents the board from starting correctly (e.g., the wrong backplane speed or a bad slot) or if the card fails diagnostic tests.
HBT	Flashing	Sending heartbeat packets to or receiving them from the redundant (2nd) CPU.
DIAG	Flashing	Booting image or boot failed.
Fabric 1 and 2	Active	Switch fabric is active.
	Online	Switch fabric is online.
	Offline	Switch fabric is offline.
Hotswap	Online	CPU is active.
	Offline	CPU is redundant or offline.

AC Power Supply

The power supply (Figure 3) delivers 100-120V (16A) or 200-240V (8A) to the ER16's components; each component regulates its power needs. Two power supplies provide enough current to operate a fully-configured chassis; one or two additional power supplies provide redundant power. The power supply has its own internal cooling fan. The vent on the front of the power supply is the inlet vent for the cooling fan.

Note: A minimum of two (2) power supplies is required at all times to power the ER16.

Figure 3. Front View of an ER16 Power Supply
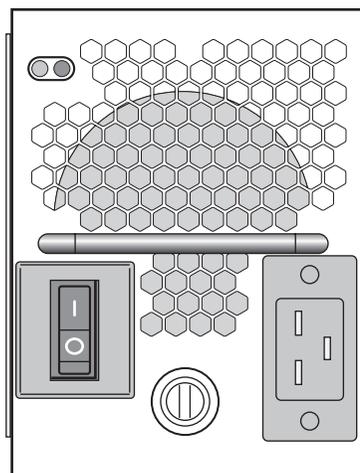
The following table lists the specifications for the ER16's AC power supplies.

	ER16 AC Power Supply
Dimensions	5.19 in. H x 4.06 W x 17.25 D 13.18 cm H x 10.31 W x 43.82 D
Weight	Pounds: 24Lbs Kilograms: 10.8 Kg
AC Power	100-125 VAC, 5A maximum 200-240 VAC, 3A maximum 50/60 Hz
Output Wattage	1200 Watts 48v
Operating Temperature	Fahrenheit: 41°F to 104°F Centigrade: 5°C to 40°C

To ensure against equipment failure, you can install one or two redundant power supplies. Each power supply provides 1200W for a total power output of 2400W. When three or more power supplies are active in the ER16, they load share with each supply delivering a prorated percentage of the current needed. Moreover, if one power supply fails, the other power supplies immediately assume the entire load, thus preventing any system outage.

The power supply has a green status LED. When the LED is lit, the power supply is connected to an appropriate power source and is active. The status LED is lit when you switch the power supply on, not when you plug it into a power source.

When two redundant power supplies are installed in the X-Pedition ER16 chassis, one of the following may occur under light loads (example: three or more power supplies are installed, with two or fewer line cards drawing power):

• The power supply status LED may turn amber on at least one power supply

• Both LEDs may be off on one or two power supplies.

This is normal, based upon the load sharing method employed in ER16 design, and should not affect the overall operation of the power supplies.

In addition, power supply configuration and status will be displayed during the system discovery process at start-up:

```
%SYS-I-PWRSPLY, power supply PS1(AC) is PRESENT and ON.
%SYS-I-PWRSPLY, power supply PS2(AC) is PRESENT and ON.
%SYS-I-PWRSPLY, power supply PS3(AC) is PRESENT and ON.
%SYS-I-PWRSPLY, power supply PS4(AC) is PRESENT and ON.
```

DC Power Supply

The ER16 DC power supply (Figure 4) delivers 3.3 and 12 volts DC to the ER16's control module(s), fan modules, and other components. A single DC power supply provides enough current to operate a fully configured chassis. The DC power supply is approximately twice the size of an AC supply, but provides twice the power—however, for full redundancy and current sharing, users must install two DC supplies.

The DC power supply has a three-terminal wiring block on the front panel, consisting of a positive (+) terminal, a negative (-) terminal, and a safety ground. The DC supply is designed to be powered by a 48- to 60-Volt DC source.

Figure 4. Front View of an ER16 DC Power Supply
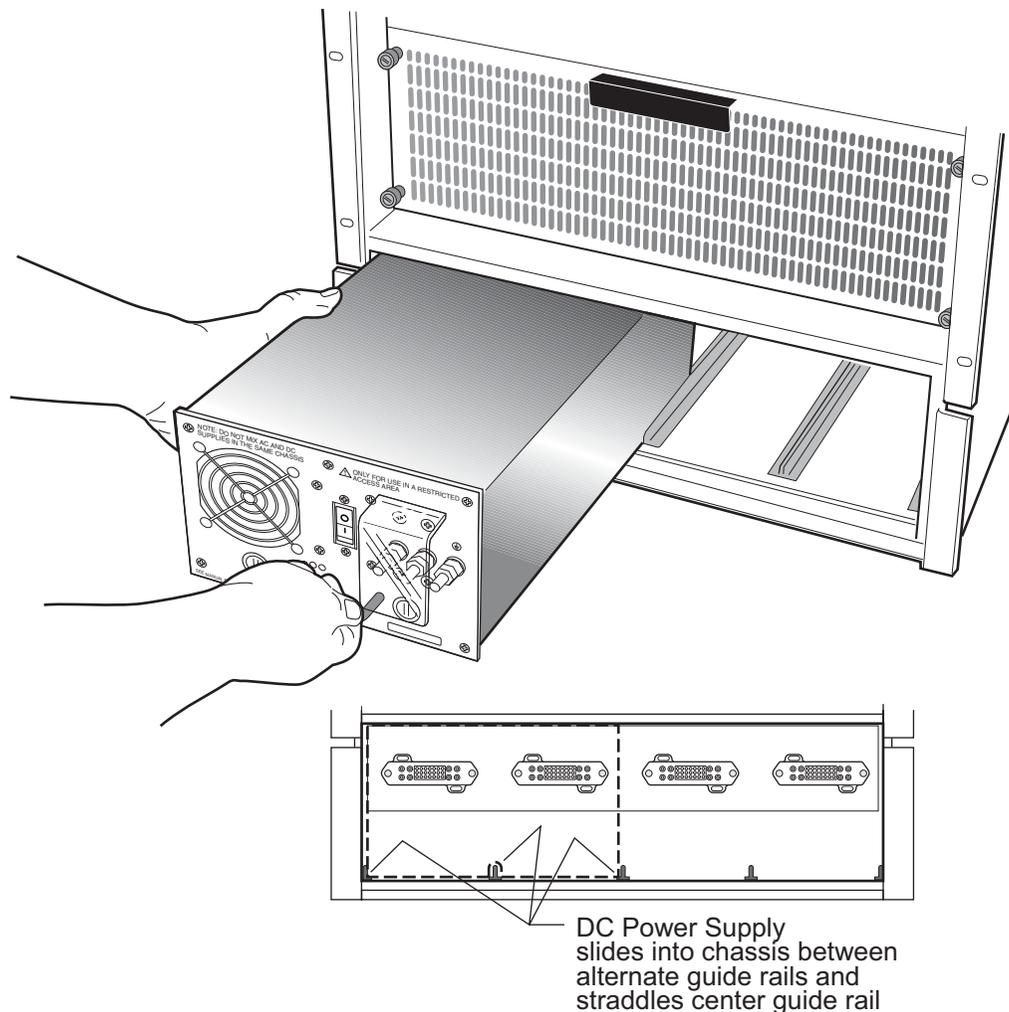
DC Power Supply
slides into chassis between
alternate guide rails and
straddles center guide rail

DC Power Supply Specifications

The following table lists the physical specifications for the ER16's DC power supply.

	ER16
Input Voltage	48 to 60 VDC (14 Amperes Max.)
Output Wattage	2,400 Watts 50 Amps
Dimensions	17.00 in. L x 8.25 W x 5.25 H 43.18 cm L x 20.95 W x 13.33 H
Weight	13 lbs (5.89 kg)
Other	Thermal protection and audible reverse polarity alarm

The following table lists the environmental specifications for the ER16's DC power supplies.

Operating Temperature	+5 to +40 °C (41 to 104 °F)
Non-operating Temperature	-30 to +73 °C (-22 to 164 °F)
Operating Humidity	15 to 90% (non-condensing)

Switching Fabric Module

On the ER16, the switching fabric is contained on a separate plug-in module (Figure 5). The ER16 has slots for two of these modules. When two switching fabric modules are installed, the module in the slot labeled "Fabric 1" serves as the primary switching fabric module, and the module in the slot labeled "Fabric 2" serves as a redundant switching fabric module. The front panel of the control module contains LEDs that indicate the status of the switching fabric (see *AC Power Supply on page 10*).

Figure 5. Front Panel of the ER16 Switching Fabric Module

Line Cards

The following line cards are available for the ER16:

Note: When using line cards introduced prior to the "AA" series, SNA/DLC/NetBIOS traffic may not bridge properly. The issue in bridging DLC packets occurs where the length field within an IEEE 802.3 frame indicates less than 46 bytes of data.

The ER16 removes the length field information of incoming IEEE 802.3, 802.2, and Ethernet SNAP packets, then recalculates the field prior to re-transmission. Consequently, the calculation is based on the length of the entire data field. A packet entering the ER16 whose length field indicates a data field of less than 46 bytes will exit with the length field recalculated incorrectly. This can be a problem with LLC2 and legacy IPX applications. Typically, such packets exist only in SNA and NetBIOS/NetBEUI environments.

ER16-04 and ER16-08

The ER16-04 is a 4-port Gigabit Ethernet module and the ER16-08 is an 8-port Gigabit Ethernet module. Figure 6 shows the front panels of the 4- and 8-port Gigabit Ethernet GBIC line cards.

Figure 6. Front Panels of ER16-04 and ER16-08 GBIC Line Cards
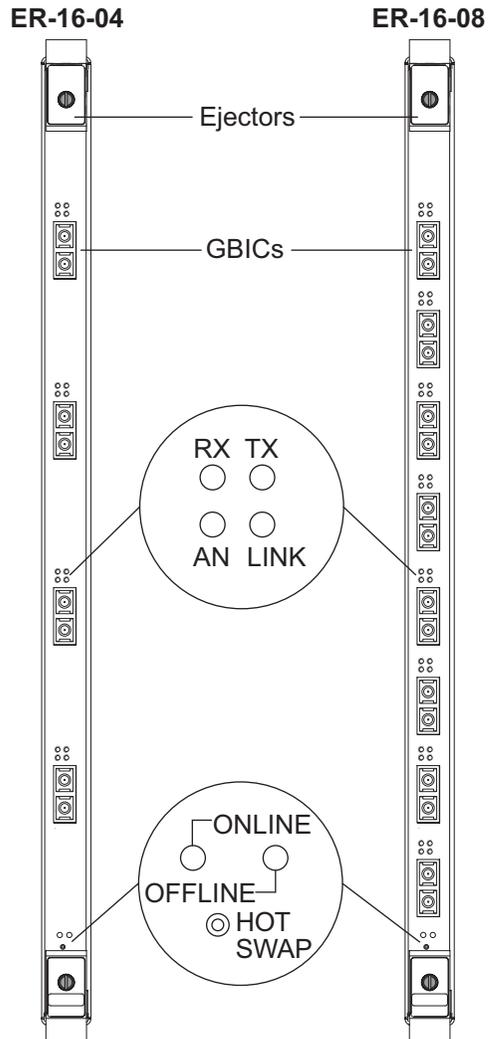
Ports

4 or 8 1000-base (Gigabit) GBICs.

Network Interfaces

Depends on GBIC selected. WAN INTERFACES V.35, EIA-530, EIA-449, and X.21.

Physical Dimensions

Size: 52.9 cm H x 2.9 W x 40.1 D (20.9 in. H x 1.15 W x 15.8 D)
Weight: 2.26 kg (5.0 lbs)

Power Consumption

ER16-04
    BTU/hr = 334.2
    AC Volt Amps = 98.91

ER16-08
    BTU/hr = 552.63
    AC Volt Amps = 163.56

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

15% to 90% (non-condensing)

Options Available

The ER16-04 and ER16-08 support the following GBIC options:
        multi-mode
        single mode
        single mode long range
        copper transceiver

LEDs

Table 2. LED Indicators

LED	Condition	Status
Online	Green	Ready to receive, process, and send packets.
Offline	Amber	Powered off, ready for hotswap.
Per-Phy Rx	Green	Phy's receiver is receiving packets.
	Amber	Phy's receiver is receiving flow-control frames.
Per-Phy Tx	Green	Phy's transceiver is sending packets.
	Amber	Phy's transceiver is sending flow-control packets.
Per-Phy AN	Green	Auto-negotiation between full-duplex and half-duplex mode.
	Flashing Orange	Auto-negotiation in progress.
	Orange	Problem with auto-negotiation.
	Red	Auto-negotiation failure.
	Off	Auto-negotiation disabled or link is down.
Per-Phy Link	Green	Link is established.
	Flashing Red	Port hardware received an error.
	Red	Bad link established.
	Off	No link.

The GBIC line cards actually house various GBIC modules in its available slots. GBIC modules provide the media-specific portion of a GBIC interface to support Ethernet connectivity across multiple platforms using different media types. The host system provides the power, initialization, and control for the module.

Figure 7. GBIC Modules

Single Mode   Multi Mode   Single Mode Long Reach   Copper Transceiver
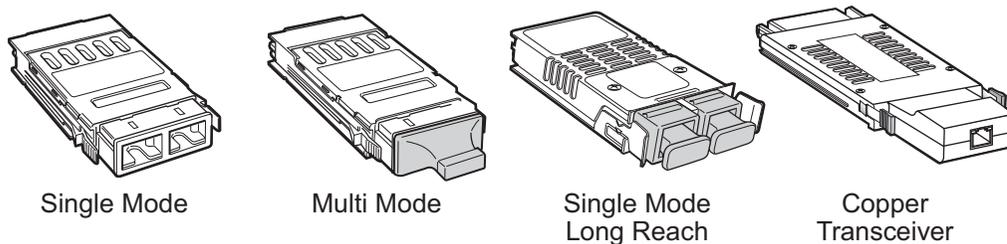
See *Installing the GBIC Modules* on page 103 for installation instructions for the GBIC modules into the line card.

The GBIC line card has either four or eight available slots. Each slot accepts the following GBIC modules:

Interface	Specification
GPIM-01 Multi-Mode Fiber (MMF)	• 50 or 62.5 microns 125-mm cladding multi-mode fiber cable terminated with SC connectors • Maximum of 300 m of cable
GPIM-09 Single-Mode Fiber - Intermediate Range (SMF-IR)	• 8 or 9 microns 125-mm cladding single-mode fiber cable terminated with SC connectors • Maximum of 10 km of cable
GPIM-08 Single Mode Fiber - Long Range (SMF-LR)	• 8 or 9 microns 125-mm cladding single-mode fiber cable terminated with SC connectors • Maximum of 70 km of cable
GPIM-02 Copper Transceiver (RJ-45)	• 4 pair Cat-5 copper cable with RJ-45 connector supports 1Gb line rate only—will not link to 10 or 100Mb) • Maximum of 100 m of cable **Note:** External loopback is not supported in diagnostics for this GBIC.

ER16-ATM29-02

The fully integrated design of the X-Pedition family increases the value of the product line by providing a seamless solution to support the industry's most complete range of technology and media options. This scalable framework ensures full cross-platform compatibility and allows for the smoothest possible migration as customers' technology and interface requirements evolve.

The combination of the X-Pedition and the ER16-ATM29-02 OC-3c module provide a complete solution for both the service provider and enterprise markets. Interconnecting IP networks over an ATM backbone is done by many service provider and enterprise customers. The OC-3c module provides the vital link between the network's switch-router solutions and the ATM-based solution in the WAN. Each PVC on the module can be configured as a routed IP interface, and the ATM backbone can provide connectivity from one routed backbone to another.

The ER16-ATM29-02 is a modular, high-performance OC-3c ATM interface for the X-Pedition ER16. The module is optimized to provide an ATM uplink to an ATM backbone, and supports two modular slots, each of which accepts T1/E1, T3/E3 and OC-3c (single mode and multi-mode fiber, as well as unshielded twisted pair) interface.

Figure 8. ER16-ATM29-02
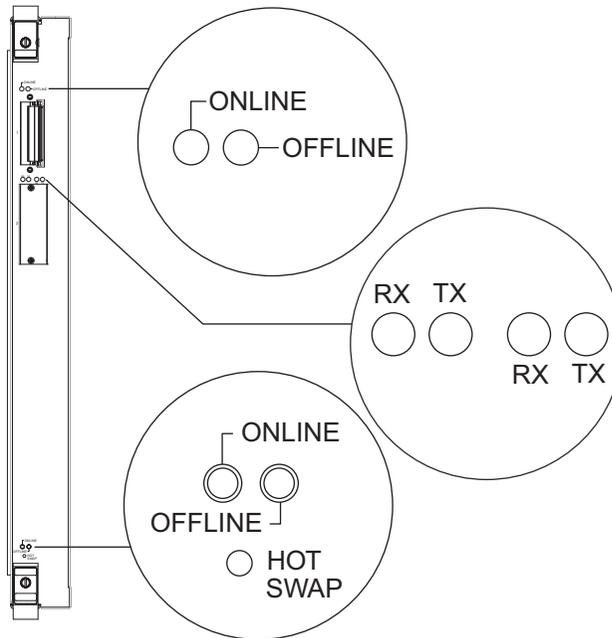
Options Available

This module operates with the following APHYs (you may purchase them separately from the module) connected to the outside world. For information about these APHYs, consult the Enterasys Networks web site.

XP-APHY-67	XP-APHY-21	XP-APHY-82V
XP-APHY-77	XP-APHY-29IR	
XP-APHY-92V	XP-APHY-22	

The XP-APHY-21 and XP-APHY-29IR use Class 1 Lasers.

Warning: Do not use optical instruments to view laser output. The use of optical instruments to view laser output increases eye hazard.

Advertencia: No utilizar instrumentos opticos para ver el laser. El uso de instrumentos opticos para ver el laser incrementa el riesgo de perdida de la vision.

Warnhinweis: Benutzen sie keinesfalls optische Hilfmittel, um die Funktion des Lasers zu überprüfen, es könnte ihr Augenlicht gefährden.

Note: Before you can remove an APHY, hot swap the host ATM module.

The ATM line card has two available slots. Each slot accepts the following PHY interface modules:

Port type	Specification
APHY-67 PHY / APHY-67	• 1 DS-3/T-3 interface (BNC Coax); see *APHY-67 and APHY-77* on page 101 for attaching cables • 75 coaxial (RG-59B or equivalent) terminated with 75-ohm BNC connectors • Maximum of 450 ft (137 m) of cable
APHY-77 PHY / APHY-77	• 1 E-3 interface (BNC); see *APHY-67 and APHY-77* on page 101 for attaching cables • 75 coaxial (RG-59B or equivalent) terminated with 75-ohm BNC connectors • Maximum of 450 ft (137 m) of cable
APHY-82V PHY / APHY-82V	• 1 T-1 interface (UTP); see *APHY-82V* on page 101 for attaching cables Note: The APHY-82V is not a T1 interface. It merely allows you to connect to a T1 CSU—the T1 CSU will allow you to connect to a T1 circuit. • ITU-T G.703 for a symmetrical pair • 100 ohm symmetrical pair • Maximum of 655 ft (200 m) of cable • 0 through 6 dB loss at 200 m
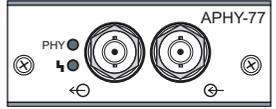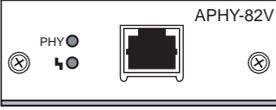
APHY-92V	• 1 E-1 interface (UTP); see *APHY-82V* on page 101 for attaching cables
	Note: The APHY-92V is not an E1 interface. It merely allows you to connect to an E1 CSU—the E1 CSU will allow you to connect to an E1 circuit.
	• ITU-T G.703 for a symmetrical pair
	• 120 ohm symmetrical pair
	• Maximum of 655 ft (200 m) of cable
	• 0 through 6 dB loss at 200 m
APHY-21	• 1 OC-3c MMF interface (SC-style); see *APHY-21 and APHY-29IR* on page 102 for attaching cables
	• EIA/TIA 492-AAAA
	• 62.5/125 µm
	• Maximum cable length cannot exceed 2 kilometers (maximum will allow up to three cables—two splices). Additional cables/splices will reduce the maximum cable length.
	• 0 to 9 dB loss at 1300 nm
APHY-29IR	• 1 OC-3c SMF-IR interface (SC-style); see *APHY-21 and APHY-29IR* on page 102 for attaching cables
	• EIA/TIA 492-CAAA
	• 9/125 µm
	• Maximum cable length cannot exceed 15 kilometers (maximum will allow up to three cables—two splices). Additional cables/splices will reduce the maximum cable length.
	• 0 to 15 dB loss at 1300 nm
	• Receiver sensitivity: -32.5 dB min; -8 dB max
	• Transmit Output: -14 dB min; -8dB max into 9um/125 fiber
APHY-22	• 1 OC-3c interface (UTP); see *APHY-22* on page 102 for attaching cables
	• EIA/TIA 568B
	• 295 ft (90 m) of Category 5 building cable
	• 33 ft (10 m) of Category 5 patch cords
	• 1 punchdown block (Category 5)
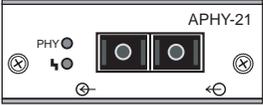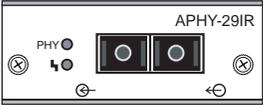
Ports

Depending on the APHY used, 1 or 2.

Interface

ER16 2-port base module

Physical Dimensions

Size: 52.9 cm H x 5.5 W x 40.1 D (20.9 in. H x 2.17 W x 15.8 D)
Weight: 3.22 kg (7.1 lbs)

Power Consumption

(Depending on which APHY is installed)

BTU/hr = 200.96
AC Volt Amps = 59.47

Temperature

Operating: 41° to 104°F (5° to 40°C)
Storage: -22° to 164°F (-30° to 73°C)

Humidity

5% to 95% (non-condensing)

LEDs

Table 3. LED Indicators

LED	Condition	Status
Offline LED	Yellow	Unit is not functioning, cannot hotswap.
Online LED	Green	Unit is operational.
Port 1 Traffic LEDs (2)	(Tx) Green	Indicates when the transceiver receives packets.
	(Rx) Green	Indicates when the transceiver receives flow-control packets.
Port 2 Traffic LEDs (2)	(Tx) Green	Indicates when the transceiver transmits packets.
	(Rx) Green	Indicates when the transceiver transmits flow-control packets.
PHY (Left)	Green	The PHY is operating properly and a link is established.
	Yellow	The PHY is inactive due to media errors.
	Blinking Green	The PHY was disabled by management.
	Off	No connection.

Table 3. LED Indicators (Continued)

LED	Condition	Status
Lightning (Right)	Yellow	The diagnostics have detected a fault.
	Blinking Green	The PHY port has been redirected elsewhere.
	Off	Unit is operating properly.

ER16-CM3-128 and ER16-CM4-256

The ER16-CM3-128 and ER16-CM4-256 are Control Modules for the ER16 chassis. The CM3 uses a 300Mhz MIPS processor with a 128MB memory card and an ATA compatible PCMCIA slot. The CM4 uses a 400Mhz MIPS processor with a 256MB memory card and an ATA compatible PCMCIA slot. The CM4 is targeted for applications that require higher processing power.

Figure 9. ER16-CM3-128 and ER16-CM4-256 Faceplate
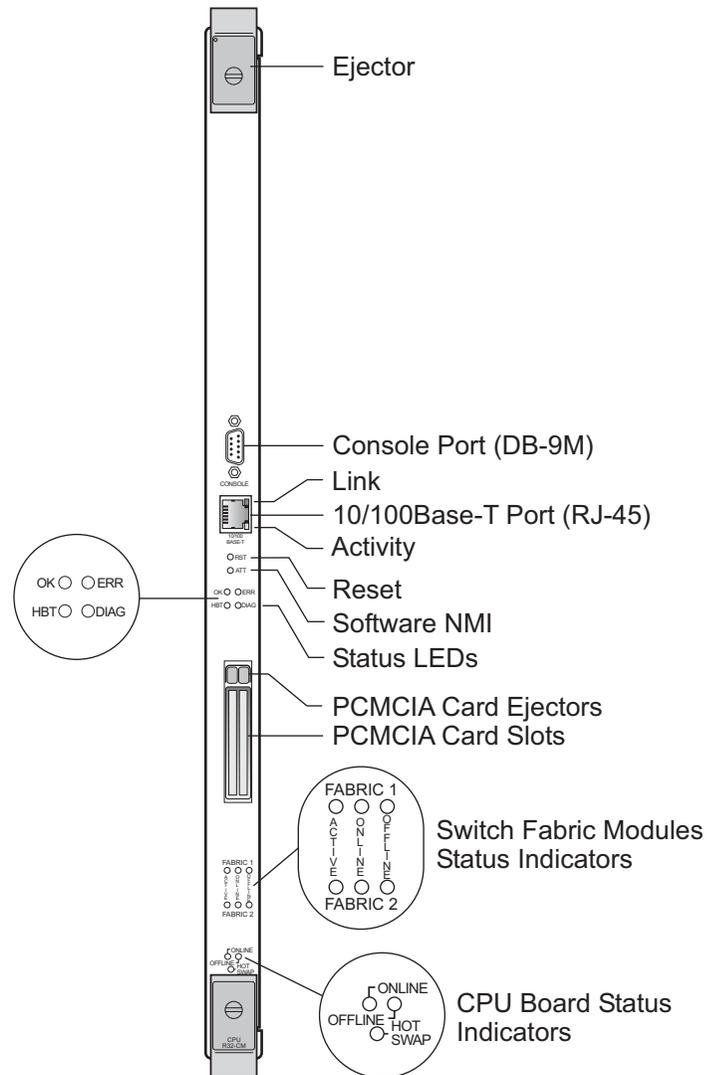
Ports

1 DB9 RS232 Serial Local Management Port

Network Interfaces

1 10/100 Ethernet (Management). WAN INTERFACES V.35, EIA-530, EIA-449, and X.21.

MAC Addresses

64 Internal MAC Addresses

Physical Dimensions

Size: 52.9 cm H x 2.9 W x 40.1 D (20.9 in. H x 1.15 W x 15.8 D)
Weight: 2.26 kg (5.0 lbs)

Power Consumption

ER16-CM3-128
    BTU/hr = 179.11
    AC Volt Amps = 53.01

ER16-CM4-256
    BTU/hr = 196.59
    AC Volt Amps = 58.18

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

5% to 90% (non-condensing)

Options Available

The ER16-CM3-128 and ER16-CM4-256 will operate only in slots 8 and 9 of the ER16 chassis.

LEDs

Table 4. LED Indicators

LED	Condition	Status
10/100 RJ45 Port Link	On (Green)	A valid link has been established on the port.
10/100 RJ45 Port Activity	Flashing (Yellow)	Traffic is passing through the port.
OK	On	Functioning properly \ Power on
ERR	On	Remains lit after power-up if a configuration prevents the board from starting correctly (e.g., the wrong backplane speed or a bad slot) or if the card fails diagnostic tests.
HBT	Flashing	Sending heartbeat packets to or receiving them from the redundant (2nd) CPU.
DIAG	Flashing	Booting image or boot failed.
Fabric 1 and 2	Active	Switch fabric is active.
	Online	Switch fabric is online.
	Offline	Switch fabric is offline.
Hotswap	Online	CPU is active.
	Offline	CPU is redundant or offline.

ER16-FDDI-02

The ER16-FDDI-02 module supports high-performance translation from Ethernet, Fast Ethernet, Gigabit Ethernet, and ATM to FDDI, as well as connectivity between FDDI modules. IP Fragmentation support allows the module to fragment FDDI frames into multiple, smaller Ethernet frames. MTU path discovery support allows the module to transport the maximum size of packet to its end destination. FDDI full-duplex support is available for point to point connections with only two stations on a FDDI ring that support full duplex. The ER16-FDDI-02 module also supports the ring and DEC ring purger protocols, an extension to the FDDI specification.

Figure 10. ER16-FDDI-02
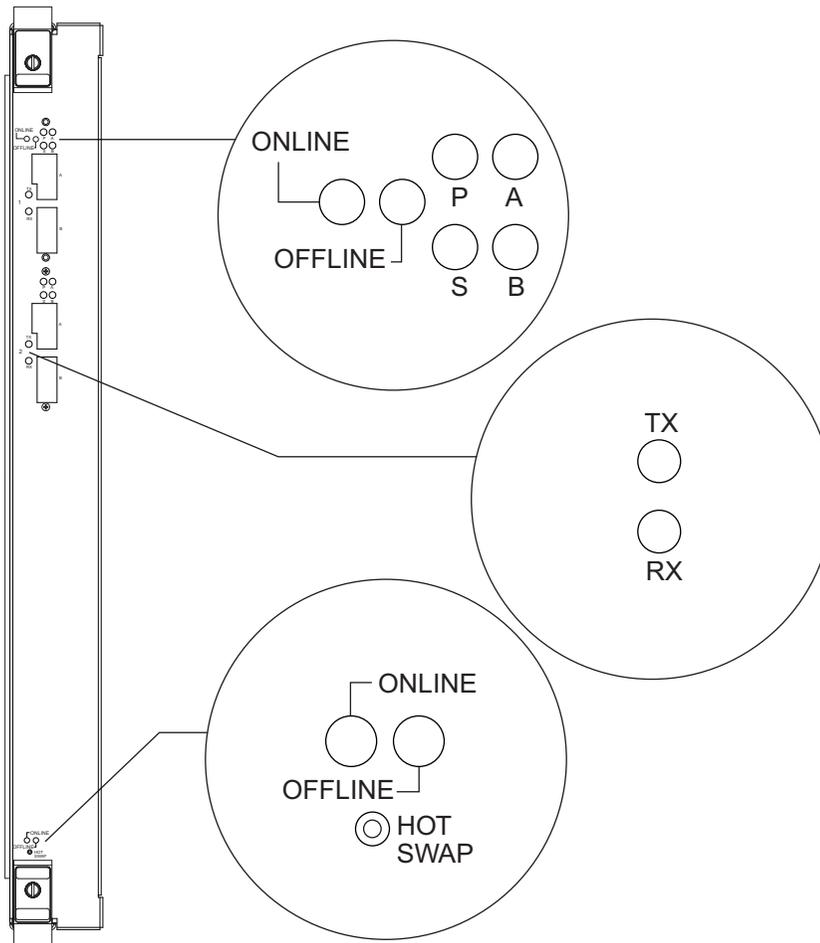
Ports

2 Port FDDI Base Module

ASIC Type

T-Series

Network Interfaces

XP-FPHY-01 MMF DAS
XP-FPHY-02 UTP SAS
XP-FPHY-09 SMF DAS
WAN INTERFACES V.35, EIA-530, EIA-449, and X.21

Number of Flows/Routes

Up to 128,000 Layer-2 entries per port
Up to 256,000 Layer-3/4 entries

Queue Buffer

Packet memory size: 8MB

Physical Dimensions

Size: 52.9 cm H x 5.5 W x 40.1 D (20.9 in. H x 2.17 W x 15.8 D)
Weight: 1.4 kg (3.0 lbs)

Power Consumption

BTU/hr = 203.14
AC Volt Amps = 60.12

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

5% to 90% (non-condensing)

LEDs

Table 5. LED Indicators

LED	Condition				Status
Rx	Off				No activity
	Flashing Yellow				Activity
	Red				Diagnostic failure
Tx	Off				No activity
	Flashing Green				Activity
	Blinking Yellow				Port on standby
	Red				Diagnostic failure
Primary/Secondary Port LEDs (A, B, P, S)	A	B	P	S	
	Yellow	Yellow	Off	Off	Port enabled, not active
	Off	Off	Off	Off	Ports disabled
	Green	Green	Off	Off	Ports enabled
	Green	Green	Green	Off	THRU A
	Green	Green	Off	Green	THRU B
	Green	Off	Green	Yellow	WRAP A
	Off	Green	Green	Yellow	WRAP B
	Green	Green	Green	Yellow	WRAP AB
	Green	Off	Green	Off	WRAP S (in S mode)
	Green	Green	Off	Off	BYPASS Board
	Green	Green	Red	Red	TWISTED A-A, B-B
	Red	Red	Red	Red	Diagnostic Failure

ER16-GTX32-04

The ER16-GTX32-04 is a copper-based 1000Base-T Gigabit Ethernet module for the Enterasys X-Pedition platform. The ER16-GTX32-04 provides four ports of 1000Base-T switched and routed connectivity through Category 5 RJ45 connectors and is ideal for high-speed collapsed backbones and server-farm connections. The ER16-GTX32-04 delivers full-function Layer-2, Layer-3, and Layer-4 switching and routing.

Figure 11. ER16-GTX32-04
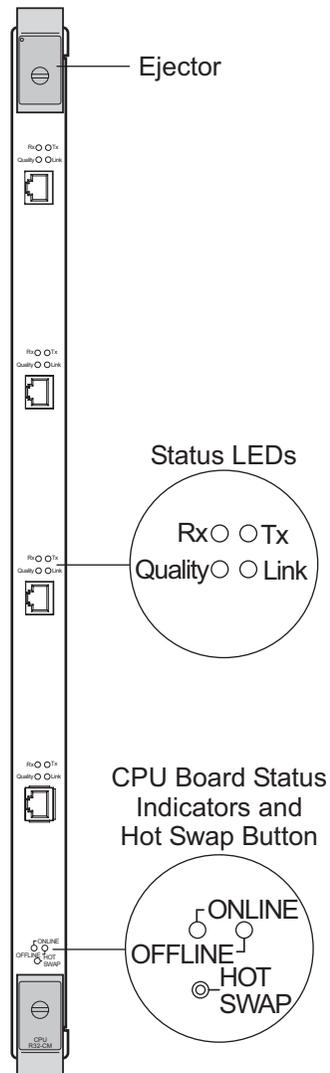
Ports

4 1000Base-T Ports

ASIC Type

T-Series

Network Interface

RJ45 100 m Cat. 5 UTP Cabling per ANSI/TIA/EIA-568-A. WAN INTERFACES V.35, EIA-530, EIA-449, and X.21.

Number of Flows/Routes

Layer-2 Entries = 512,000 (memory size = 64 MB)
Layer-3 Entries = 512,000 (memory size = 32 MB)

Switch Method

Address-based and Flow-based.

Physical Dimensions

Size: 45.16 cm H x 2.54 W x 35.24 D (17.78 in. H x 1 W x 13.88 D)
Weight: 2.3 kg (5.0 lbs)

Power Consumption

BTU/hr = 362.6
AC Volt Amps = 107.31

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

15% to 90% (non-condensing)

LEDs

Table 6. LED Indicators

LED	Condition	Status
Online	On (Green)	The module is online and ready to receive, process, and send packets (if configured to do so).
Offline	On (Amber)	The module is offline (powered down) and ready to hotswap.
Per-Port Transmit	Green	The port transmitted a packet. The OCMAC controls this LED.
	Orange	The port transmitted a flow-control packet. The OCMAC controls this LED.
Per-Port Receive	Green	The port received a packet. The OCMAC controls this LED.
	Orange	The port received a flow-control packet. The OCMAC controls this LED.
Per-Port Link	Green	The port hardware detected a cable plugged into the port and established a good link.
	Off	No link exists from the port.
Per-Port Quality	Green	Auto-negotiation completed successfully and the phy is attempting to establish a link. This LED remains green while the link operates with good signal-to-noise ratio.
	Fast blink	Low signal-to-noise ratio, close to data errors.
	Slow blink	Receive bit errors detected.
	Off	Auto-negotiation is still in progress or the phy cannot receive packet data.

Options Available

The ER16-GTX32-04 provides switching and routing on hardware, thereby eliminating the performance bottleneck caused by a single processor. The module supports application switching (i.e., Network Address Translation, Server Load Balancing, Per-Flow Rate Limiting, Access Control Lists, and full RMON/RMON 2) and extra features like the Local Hardware Routing Table, Port Rate Limiting, Aggregate Rate Limiting, and Jumbo Frames that are essential for Application Service Providers, Multi-Dwelling Unit (MDU) Service Providers, and Large Enterprise Networks.

The ER16-GTX32-04 offers ten times the bandwidth available through the existing Category 5 infrastructure and interoperates with all existing X-Pedition Router modules. This allows network managers to leverage their existing cabling infrastructure and equipment without an extensive upgrade.

ER16-GTX32-08

The ER16-GTX32-08 is a copper-based 1000Base-T Gigabit Ethernet module for the Enterasys X-Pedition platform. The ER16-GTX32-08 provides eight ports of 1000Base-T switched and routed connectivity through Category 5 RJ45 connectors and is ideal for high-speed collapsed backbones and server-farm connections. The ER16-GTX32-08 delivers full-function Layer-2, Layer-3, and Layer-4 switching and routing.

Figure 12. ER16-GTX32-08
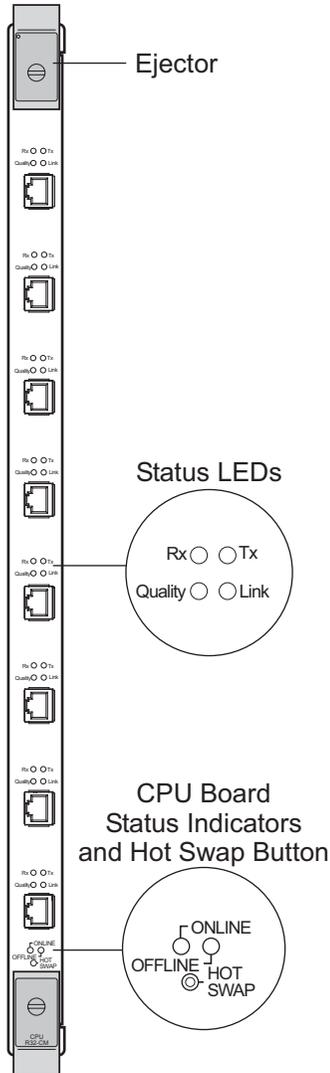
Ports

8 1000Base-T Ports

Network Interface

RJ45 100 m Cat. 5 UTP Cabling per ANSI/TIA/EIA-568-A. WAN INTERFACES V.35, EIA-530, EIA-449, and X.21.

Number of Flows/Routes

Layer-2 Entries = 1,024,000 (memory size = 64 MB)
Layer-3 Entries = 512,000 (memory size = 32 MB)

Physical Dimensions

Size: 45.16 cm H x 2.54 W x 35.24 D (17.78 in. H x 1 W x 13.88 D)
Weight: 2.3 kg (5.0 lbs)

Power Consumption

BTU/hr = 578.85
AC Volt Amps = 171.92

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

15% to 90% (non-condensing)

LEDs

Table 7. LED Indicators

LED	Condition	Status
Online	On (Green)	The module is online and ready to receive, process, and send packets (if configured to do so).
Offline	On (Amber)	The module is offline (powered down) and ready to hotswap.
Per-Port Transmit	Green	The port transmitted a packet. The OCMAC controls this LED.
	Orange	The port transmitted a flow-control packet. The OCMAC controls this LED.
Per-Port Receive	Green	The port received a packet. The OCMAC controls this LED.
	Orange	The port received a flow-control packet. The OCMAC controls this LED.
Per-Port Link	Green	The port hardware detected a cable plugged into the port and established a good link.
	Off	No link exists from the port.
Per-Port Quality	Green	Auto-negotiation completed successfully and the phy is attempting to establish a link. This LED remains green while the link operates with good signal-to-noise ratio.
	Fast blink	Low signal-to-noise ratio, close to data errors.
	Slow blink	Receive bit errors detected.
	Off	Auto-negotiation is in progress or the phy cannot receive packet data.

Options Available

The ER16-GTX32-08 provides switching and routing on hardware, thereby eliminating the performance bottleneck caused by a single processor. The module supports application switching (i.e., Network Address Translation, Server Load Balancing, Per-Flow Rate Limiting, Access Control Lists, and full RMON/RMON 2) and extra features like the Local Hardware Routing Table, Port Rate Limiting, Aggregate Rate Limiting, and Jumbo Frames that are essential for Application Service Providers, Multi-Dwelling Unit (MDU) Service Providers, and Large Enterprise Networks.

The ER16-GTX32-08 offers ten times the bandwidth available through the existing Category 5 infrastructure and interoperates with all existing X-Pedition Router modules. This allows network managers to leverage their existing cabling infrastructure and equipment without an extensive upgrade.

ER16-HFX31-24 and ER16-HFX39-24

The ER16-HFX39-24 and ER16-HFX31-24 are 24-port, 100Base-FX Ethernet Modules for the ER16 platform. The ER16-HFX39-24 and ER16-HFX31-24 use 24 MT-RJ connectors and deliver full-function Layer-2, Layer-3, and Layer-4 switching and routing.

Figure 13. ER16-HFX31-24 and ER16-HFX39-24 Faceplate
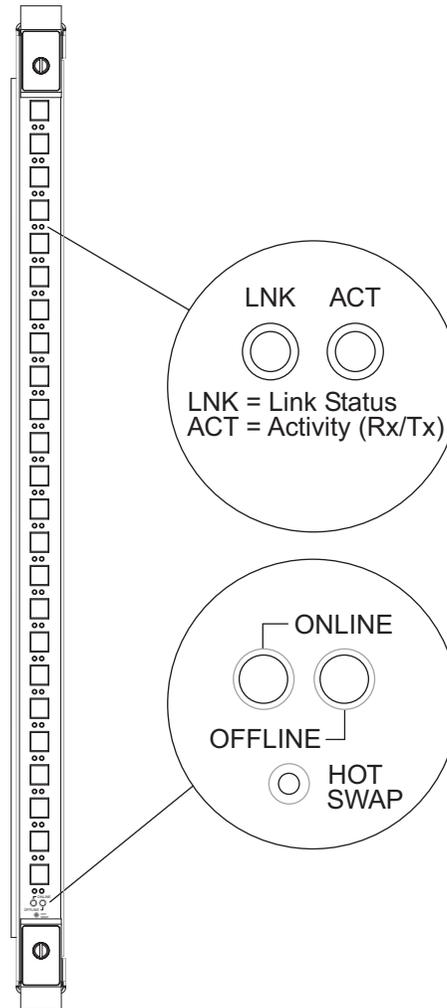
Ports

24 Ports with 24 MT-RJ connectors

ASIC Type

T-series (Enterasys)

Network Interfaces

MT-RJ Connectors. WAN INTERFACES V.35, EIA-530, EIA-449, and X.21.

Switch Method

Address-based and Flow-based.

Queue Buffer

Packet memory size: 4MB per port

Physical Dimensions

Size: 52.9 cm H x 2.9 W x 40.1 D (20.9 in. H x 1.15 W x 15.8 D)
Weight: 3.27 kg (7.2 lbs)

Power Consumption

BTU/hr = 306
AC Volt Amps = 90

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

15% to 90% (non-condensing)

LEDs

Table 8. LED Indicators

LED	Condition	Status
Link	Green	A valid link has been established on the port.
Activity	Flashing Yellow	Traffic is passing through the port.
Online	Green	The module is online, or the module was hot swapped successfully.
Offline	Yellow	The module is receiving power, but is dormant or hot swapped out.

ER16-HSSI-02-CK

The ER16-HSSI-02-CK serial card provides wide area connectivity via 2 T3 ports (without compression or encryption). These ports have the same switching and routing capabilities as those provided by the ethernet line cards, and can switch at Layer-2, Layer-3, and Layer-4. The ER16-HSSI-02-CK serial card performs both destination-based and flow-based switching, and all ports are capable of bridging at Layer-2, switching IP/IPX frames at Layer-3, and switching on Layer-4 flows.

Figure 14. ER16-HSSI-02-CK Faceplate
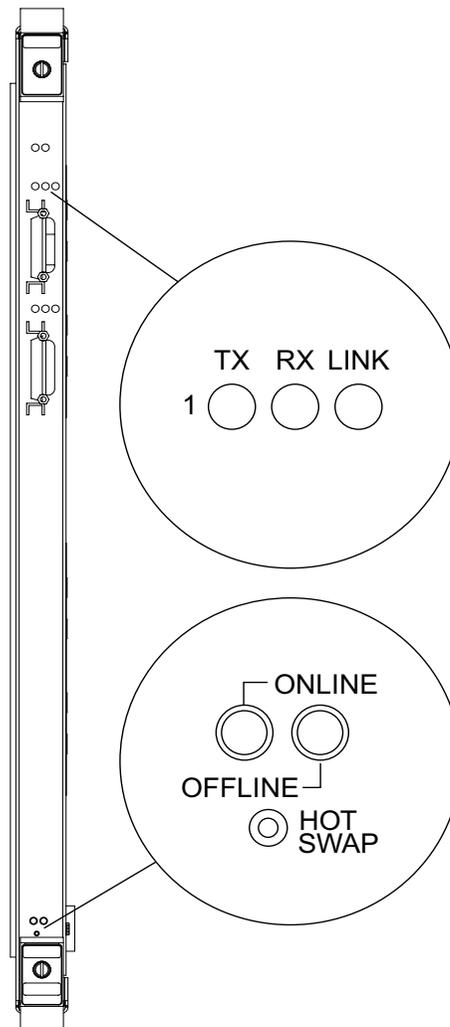
Ports

2 High-speed ports without compression or encryption (STS-1 or up to 52MBs).

ASIC Type

-AA (Advanced ASIC)
DMAC, IPP, OPP

Network Interfaces

50-Pin Connector supporting 1 HSSI interface. WAN INTERFACES V.35, EIA-530, EIA-449, and X.21.

Physical Dimensions

Size: 52.9 cm H x 2.9 W x 40.1 D (20.9 in. H x 1.15 W x 15.8 D)
Weight: 2.77 kg (6.1 lbs)

Power Consumption

BTU/hr = 148.53
AC Volt Amps = 43.96

Temperature

Operating: 32° to 104° F (0° to 40° C)
Storage: -22° to 194° F (-30° to 90° C)

Humidity

5% to 95% (non-condensing)

LEDs

Table 9. LED Indicators

LED	Condition	Status
Online (2)	Green	The unit is operational and functioning properly.
Offline (2)	Amber	The unit is not operational. You may remove the unit from the chassis.
Tx (2)	Amber	A frame was transmitted.
Rx (2)	Amber	A frame was received.
Link (2)	Green	A valid link is established on the port.

ER16-IPV6-00

The ER16-IPV6-00 line card adds support for IPv6. The line card can be plugged in any line card slot, and the ER16 can support multiple IPV6-00 line cards in the same chassis.

Note: The line card supports AA-series or better hardware.

Figure 15. ER16-IPV6-00
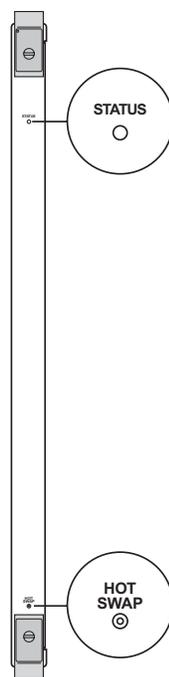
Ports

None.

Physical Dimensions

Size: 52.9 cm H x 2.9 W x 40.1 D (20.9 in. H x 1.15 W x 15.8 D)
Weight: 2.26 kg (5.0 lbs)

Power Consumption

AC Volt Amps: 20.0Vac

Temperature

Operating: 0° to 40°C (32° to 104°F)
Storage: -30° to 73°C (-22° to 164°F)

Humidity

5% to 90% (non-condensing)

LEDs

Table 10. LED Indicators

LED	Condition	Status
Status	Yellow	Line card is in standby mode
	Green	Line card is in active mode

ER16-OS16-01 and ER16-OS26-01

The IEEE 10-Gigabit Ethernet Standard (802.3ae) differs significantly from earlier Ethernet standards. 10-Gigabit Ethernet operates over optical fiber only and always in full-duplex mode— this renders collision detection protocols unnecessary, yet maintains existing Ethernet packet format and capabilities. With the current balance of network traffic heavily favoring packet-switched data to voice over IP, 10-Gigabit Ethernet will help networks designed primarily for voice to converge with new data-centric networks without making current investments in network infrastructure obsolete.

The accelerated growth of worldwide network traffic forces service providers, enterprise network managers, and architects who typically use Ethernet as their backbone technology to look to even higher-speed network technologies to solve bandwidth demands. With the development of 10 Gigabit Ethernet, networks can increase Ethernet speed to 10 Gbps and extend operating distances and interconnectivity. Future networks will be able to use 10-Gigabit Ethernet as a corner stone for network architectures that encompass LANs, MANs, and WANs using Ethernet as the end-to-end Layer-2 transport method.

The ER16-OS16-01 installs in one slot of the backplane and provides one 10-Gbps port for the ER16 chassis. The ER16-OS26-01 installs in two slots of the backplane and provides one 10-Gbps port for the ER16 chassis.

Figure 16. ER16-OS26-01
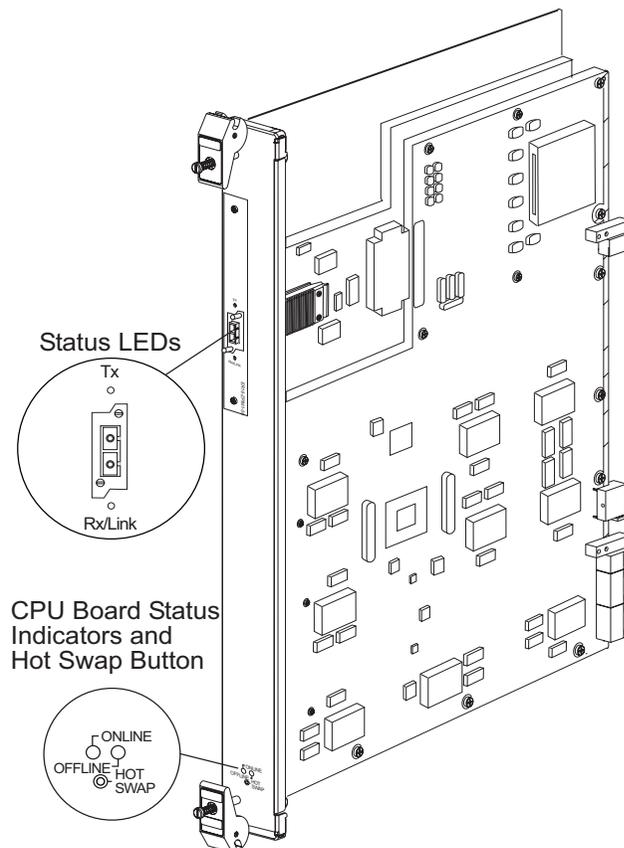
LAN XENPAK PHYs

The ER16-OS16-01 and ER16-OS26-01 support LAN XENPAK PHYs to provide inexpensive, high-speed ethernet connectivity. The PHYs provide network managers the ability to use 10-Gigabit Ethernet technologies to provide high-speed, local backbone interconnections between large capacity switches. As demand for bandwidth increases, network administrators can deploy 10-Gigabit Ethernet throughout the entire network to improve server farm, backbone, and campus-wide connectivity. As the size of transmitted packets increases, the ER16-OS16-01 and ER16-OS26-01 increases the throughput rate to meet the demand.

Figure 17. XENPAK PHY
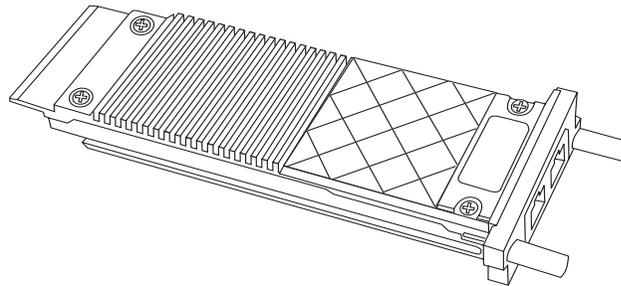
The ER16-OS16-01 and ER16-OS26-01 supports the following 10-Gbps PHYs:

- 10GBASE-LR

- 10GBASE-ER

- 10GBASE-LX4

- 10GBASE-SR

XENPAK PHY SPECIFICATIONS

Ports

1 10-Gbps Port

Physical Dimensions

Size: 11.33 cm H x 3.48 W x 1.17 D (4.76 in. H x 1.37 W x 0.46 D)
Weight: 0.13 kg (0.29 lbs)

Link Budget

XENPAK PHY	Output Power	Extinction Ratio	Received Sensitivity	Link Budget
10GBASE-LR	<0.5 dBm	>4 dB	-10.28 dBm	0 to 9.4 dBm
10GBASE-ER	<4.0 dBm	>3 dB	-10.3 dBm	5 to 11 dBm
10GBASE-LX4	<0.5 dBm	>3.5 dB	-10.3 dBm	0 to 7.5 dBm
			-13.4 dBm (on 10um fiber)	0 to 8.2 db (on 10um fiber)
10GBASE-LX4	<-1 dBm	>3 dB	-11.1 dBm	7.3 dB

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

5% to 90% (non-condensing)

Installing a XENPAK PHY

CAUTION: The XENPAK PHYs are sensitive to static discharge. Use an anti-static wrist strap and observe all static precautions during this procedure. Failure to do so may result in damage to the PHY. Always store the PHY in an anti-static bag or container when not installed.

To prepare and install a XENPAK PHY, do the following:

Note: You may hot swap XENPAK PHYs.

1. Attach the anti-static wrist strap (refer to the instructions in the anti-static wrist strap package) and remove the PHY from its anti-static packaging.

2. Position the PHY with its top side oriented as shown in Figure 18 and its edge connector facing the port slot.

3. Carefully push the PHY into the slot until the back of the PHY's faceplate is flush with the faceplate of the receiving module.

4. Tighten the two thumbscrews to secure the PHY to the module. This completes the installation.

Note: The 10GBASE-ER Xenpak requires a minimum of 5dB attenuation or a cable length of about 10 km. For additional information regarding XENPAK connectivity, see *ER16-OS16-01 and ER16-OS26-01* on page 141.

Figure 18. Installing a XENPAK PHY
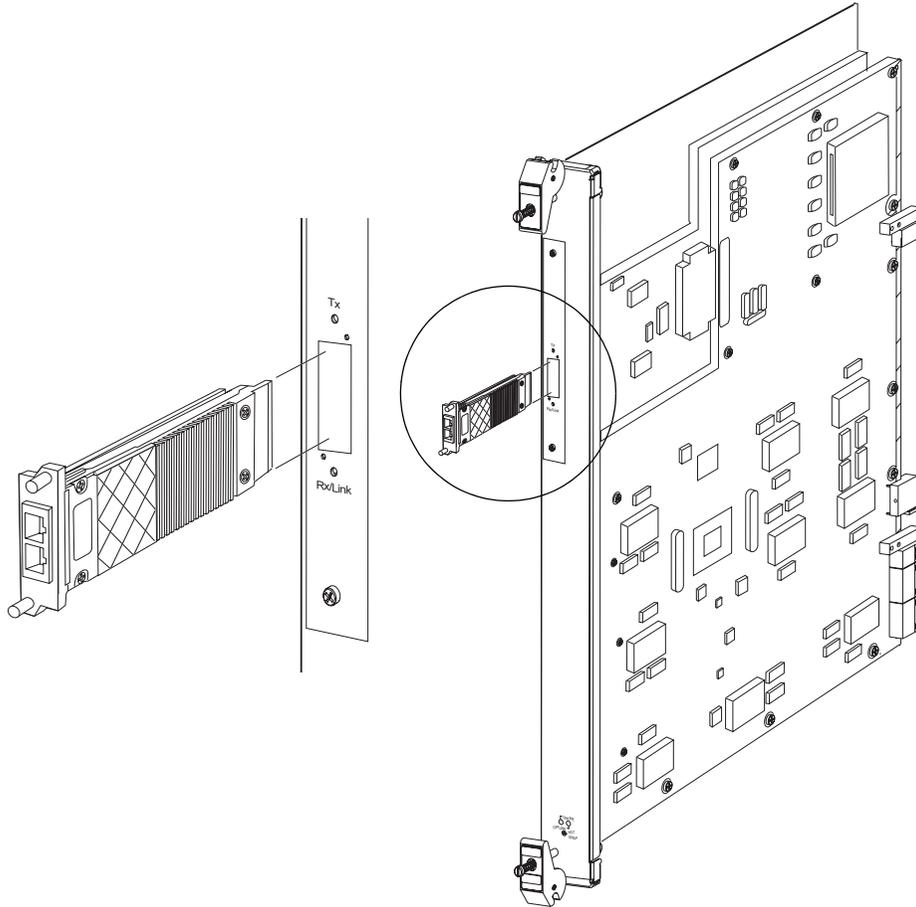
Removing a XENPAK PHY

⚠ CAUTION: The XENPAK PHYs are sensitive to static discharge. Use an anti-static wrist strap and observe all static precautions during this procedure. Failure to do so may result in damage to the PHY. Always store the PHY in an anti-static bag or container when not installed.

> **Note:**   You may hot swap only XENPAK *PHYs*, not the XENPAK *module*.

1.   Attach the anti-static wrist strap (refer to the instructions in the anti-static wrist strap package) and remove the network cable(s) connected to the PHY.

2.   Loosen the two thumbscrews that secure the PHY to the module.

3.   Grasp the thumbscrews and pull firmly.

4.   Store the PHY in an anti-static bag or container.

Traffic Distribution

Positioned as a high-speed technology for networking applications in LANs, MANs, and WANs, 10-Gigabit Ethernet is a simple way to provide high bandwidth at a relatively low cost. In LAN applications, 10-Gigabit Ethernet enables network managers to scale up their packet-based networks from 10 Mbps to 6,400 Mbps, thereby leveraging their investments in Ethernet to increase network performance without compromising intelligent networks services such as Layer-3 routing and Layer-4 to Layer-7 Quality of Service (QOS), Class of service (Cos), caching, server load balancing, security, and policy-based networking capabilities. In MAN and WAN applications, 10 Gigabit Ethernet enables Internet Service Providers (ISPs) and Network Service Providers (NSPs) to create very high-speed links at very low cost between co-located carrier-class switches and routers.

In order to achieve maximum efficiency on a multiple link trunk, each link within the trunk must share an even distribution of traffic flows from the same MAC source and destination address (this will prevent potential bottlenecks). The ER16-OS26-01 aggregates multiple link segments by distributing incoming 10-Gigabit data across two slots on the ER16 Backplane.

Note: Since all Layer-2 packets must arrive in sequence, once a flow is established for a Gigabit link, the flow must remain on that link to avoid packet sequencing errors.

Limitations

* The ER16-OS16-01 and ER16-OS26-01 cannot receive Layer-3 IPX traffic at 10 Gbps—the maximum for IPX is 1 Gbps.

ER16-OS16-01 and ER16-OS26-01 SPECIFICATIONS

Ports

One 10-Gigabit port.

Interface

Multiple optical interfaces are available based on the PHY card selected. See XENPAK Multi-Source Agreement (MSA) for details.

Physical Dimensions

ER16-OS16-01
Size: 43.2 cm H x 2.75 W x 35.6 D (17 in. H x 1.03 W x 14 D)
Weight: 4.5 kg (10 lbs)

ER16-OS26-01
Size: 43.2 cm H x 5.1 W x 35.6 D (17 in. H x 2 W x 14 D)
Weight: 4.5 kg (10 lbs)

Power Consumption

BTU/hr = 376
AC Volt Amps = 110

Temperature

Operating: 41° to 104°F (5° to 40°C)
Storage: -22° to 164°F (-30° to 73°C)

Humidity

15% to 95% (non-condensing)

LEDs

Table 11. LED Indicators

LED	Condition	Status
Rx/Link	Off	Link is not established and interface is not active. Port may be enabled or disabled.
	Green	Link is established and port enabled, but the interface is not receiving traffic.
	Blinking Green	Link is established but port is disabled. (Blinking is on/off at a steady state.)
	Amber (Solid or Flashing)	Link is established, the port is enabled, and the interface is receiving traffic. (Flashing is on/off at random length.)
Tx	Off	Port is not sending traffic.
	Green (Solid or Flashing)	Port is sending traffic. (Flashing is on/off at random length.)

ER16-POS-21-04 and ER16-POS-29-04

The ER16-POS21-04 and ER16-POS29-04 modules provide high-speed connectivity to SONET networks. These modules support ACL-based filtering, Layer-4 application-aware switching, QOS features, and Server Load Balancing. The ER16-POS21-04 and ER16-POS29-04 are available as 4-port OC-3 SMF or MMF models and are compatible with the ER16 hardware platforms. The POS OC-3c line cards use MT-RJ connectors to attach to multi-mode fiber (MMF) and single mode MT-RJ cables. To attach the segment cables to a POS OC-3c line card, obtain an MT-RJ cable and plug one end into the port connector. Plug the other end into the port of the other device. Since MT-RJ cables consist of only one line, there are no concerns about matching the receive port with the transmit port. Figure 19 shows an ER16-POS29-04 line card.

Figure 19. ER16 OC-3c POS Line Card.
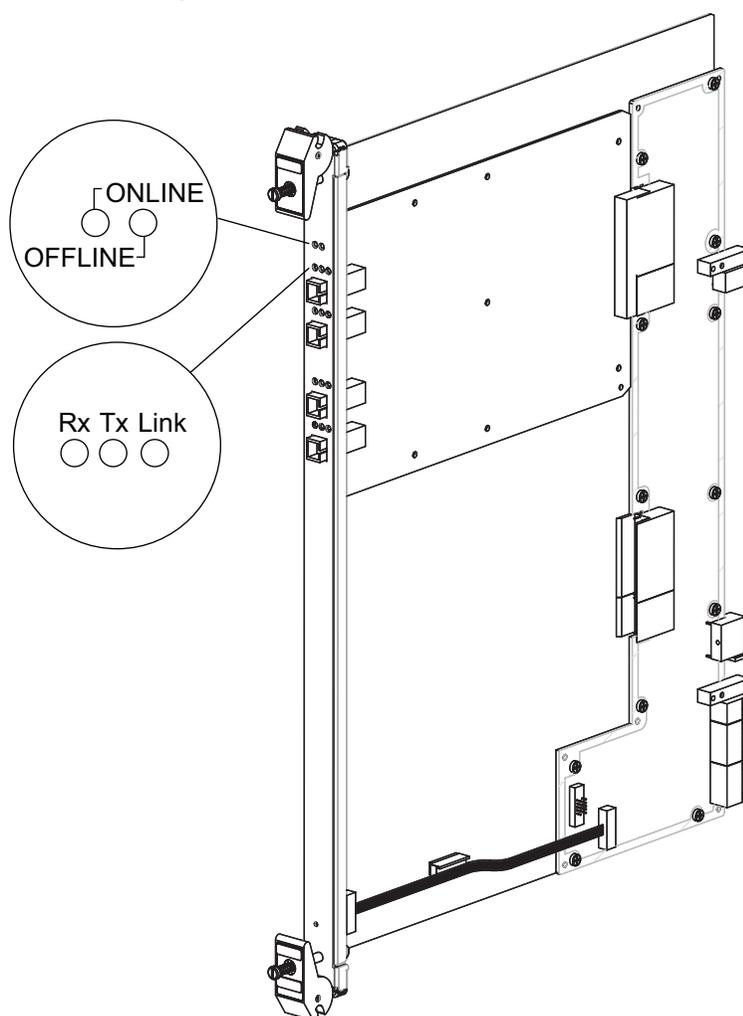
Ports

4 OC-3 MT-RJ MMF Ports
4 OC-3 MT-RJ SMF Ports

Physical Dimensions

Size: 45.16 cm H x 2.54 W x 35.24 D (17.78 in. H x 1 W x 13.88 D)
Weight: 2.3 kg (5.0 lbs)

Power Consumption

BTU/hr = 174.69
AC Volt Amps = 51.20

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

15% to 90% (non-condensing)

LEDs

Table 12. ER16-POS21-04 and ER16-POS29-04 LED Indicators

LED	Condition	Status
Online	Green	The module is online and ready to receive, process, and send packets (if configured to do so).
Offline	Amber	The module is offline (powered down) and ready to hotswap.
Transmit	Green	The port transmitted a packet.
	Red	The port transmitted a flow-control packet.
Receive	Green	The port received a packet.
	Red	The port received a flow-control packet.
Link	Green	The port hardware detected a cable plugged into the port and established a good link.
	Red	Signal is degraded or a signal fail event occurred.
	Off	No link exists from the port.

ER16-POS-31-02 and ER16-POS-39-02

The ER16-POS31-02 and ER16-POS39-02 modules provide high-speed connectivity to SONET networks. These modules support ACL-based filtering, Layer-4 application-aware switching, QOS features, and Server Load Balancing. The ER16-POS31-02 and ER16-POS39-02 are available as 2-port OC-12 SMF or MMF models and are compatible with the ER16 hardware platforms. The POS OC-12c line cards use SC-style Media Interface Connectors (MICs) to attach to multi-mode fiber (MMF) and single mode (SMF) cables. Figure 20 shows an ER16-POS39-02 line card.

Figure 20. ER16 OC-12 POS Line Card

Ports

2 OC-12 SC MMF Ports
2 OC-12 SC SMF Ports

Physical Dimensions

Size: 45.16 cm H x 2.54 W x 35.24 D (17.78 in. H x 1 W x 13.88 D)
Weight: 2.3 kg (5.0 lbs)

Power Consumption

BTU/hr = 196.69
AC Volt Amps = 57.60

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

15% to 90% (non-condensing)

LEDs

Table 13. ER16-POS3102 and ER16-POS39-02 LED Indicators

LED	Condition	Status
Online	On (Green)	The module is online and ready to receive, process, and send packets (if configured to do so).
Offline	On (Amber)	The module is offline (powered down) and ready to hotswap.
Transmit	Green	The port transmitted a packet.
	Red	The port transmitted a flow-control packet.
Receive	Green	The port received a packet.
	Red	The port received a flow-control packet.
Link	Green	The port hardware detected a cable plugged into the port and established a good link.
	Red	Signal is degraded or a signal fail event occurred.
	Off	No link exists from the port.

ER16-SERC-04-AA

The ER16-SERC-04-AA Serial card provides wide area connectivity via 4 T1/E1 ports with compression. These ports have the same switching and routing capabilities as those provided by the ethernet line cards. The ports can switch at Layer-2, Layer-3, and Layer-4, and perform both destination-based and flow-based switching. All ports are capable of bridging at Layer-2, switching IP/IPX frames at Layer-3, and switching on Layer-4 flows.

Figure 21. ER16-SERC-04-AA
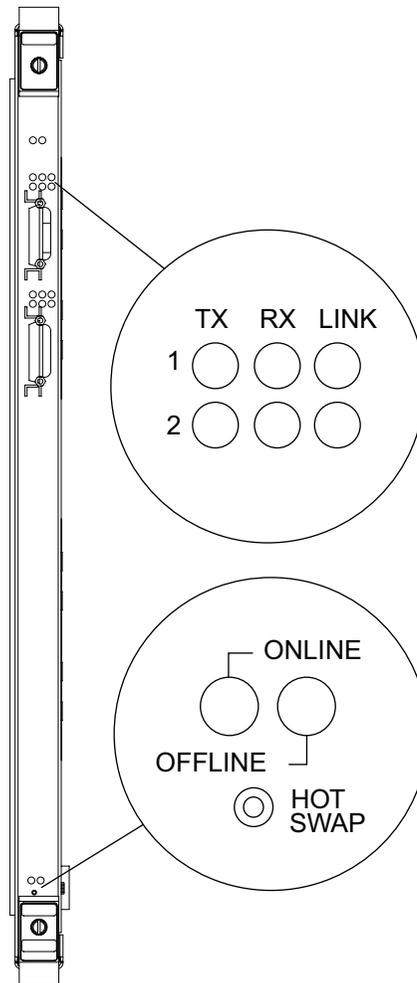
Ports

4 Serial ports with compression (up to 8MB per port)

ASIC Type

-AA (Advanced ASIC)
DMAC, IPP, OPP

Network Interfaces

60-Pin D-shell supporting 2 serial ports per connector. WAN INTERFACES V.35, EIA-530, EIA-449, and X.21.

Physical Dimensions

Size: 52.9 cm H x 2.9 W x 40.1 D (20.9 in. H x 1.15 W x 15.8 D)
Weight: 2.72 kg (6.0 lbs)

Power Consumption

BTU/hr = 146.35
AC Volt Amps = 43.31

Temperature

Operating: 32° to 104° F (0° to 40° C)
Storage: -22° to 194° F (-30° to 90° C)

Humidity

5% to 95% (non-condensing)

LEDs

Table 14. ER16-SERC-04-AA LED Indicators

LED	Condition	Status
Online (2)	Green	The unit is operational and functioning properly.
Offline (2)	Amber	The unit is not operational. You may remove the unit from the chassis.
Tx (4)	Amber	A frame was transmitted.
Rx (4)	Amber	A frame was received.
Link (4)	Green	A valid link is established on the port.

ER16-SERCE-04-A

The ER16-SERCE-04-A Serial card provides wide area connectivity via 4 T1/E1 ports with compression and encryption. These ports have the same switching and routing capabilities as those provided by the ethernet line cards. The ports can switch at Layer-2, Layer-3, and Layer-4, and perform both destination-based and flow-based switching. All ports are capable of bridging at Layer-2, switching IP/IPX frames at Layer-3, and switching on Layer-4 flows.

Figure 22. ER16-SERCE-04-A
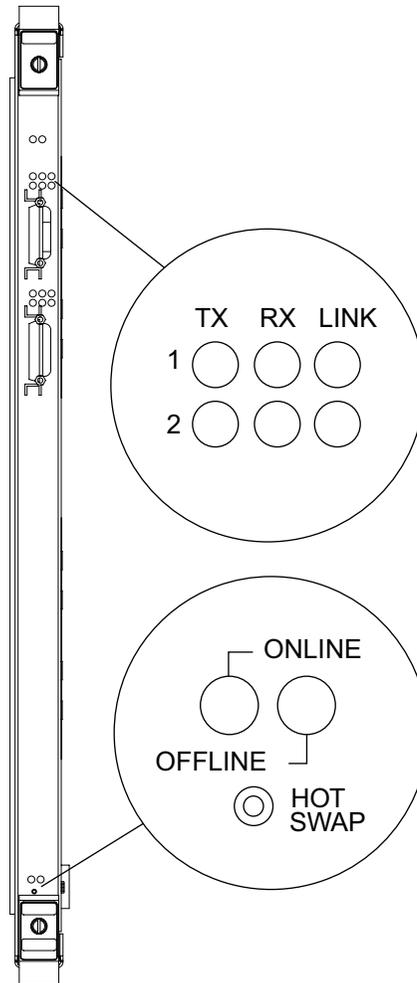
Ports

4 Serial ports with compression (up to 8MB per port) and encryption

ASIC Type

-AA (Advanced ASIC)
DMAC, IPP, OPP

Network Interfaces

60-Pin D-shell supporting 2 serial ports per connector. WAN INTERFACES V.35, EIA-530, EIA-449, and X.21.

Physical Dimensions

Size: 52.9 cm H x 2.9 W x 40.1 D (20.9 in. H x 1.15 W x 15.8 D)
Weight: 2.72 kg (6.0 lbs)

Power Consumption

BTU/hr = 126.69
AC Volt Amps = 37.49

Temperature

Operating: 32° to 104° F (0° to 40° C)
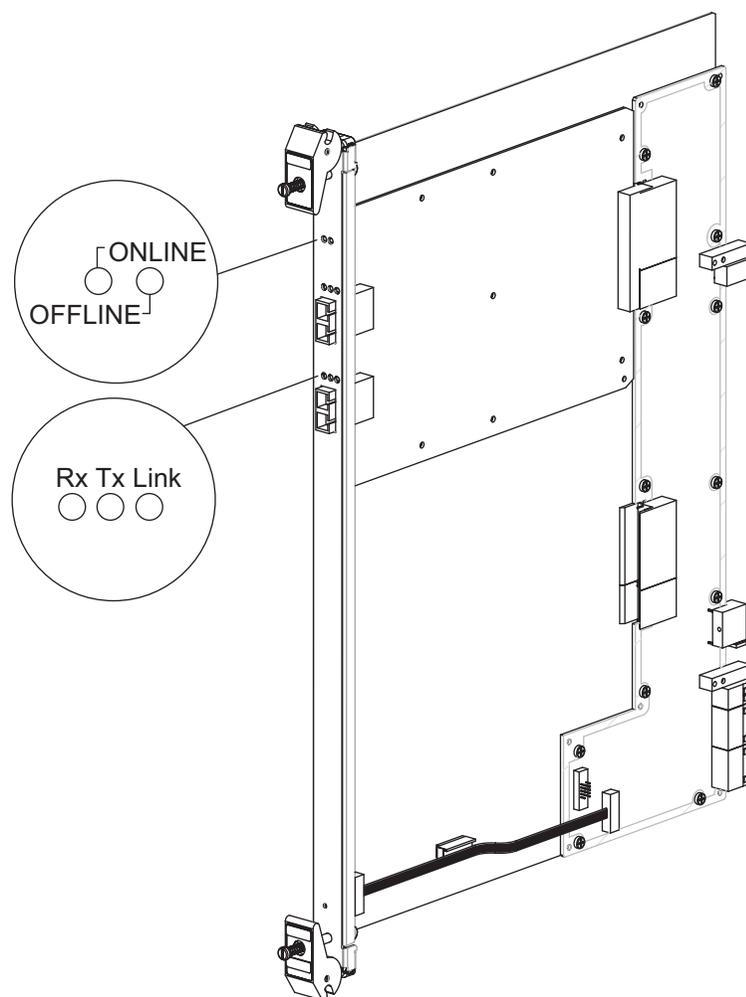Storage: -22° to 194° F (-30° to 90° C)

Humidity

5% to 95% (non-condensing)

LEDs

Table 15. LED Indicators

LED	Condition	Status
Online (2)	Green	The unit is operational and functioning properly.
Offline (2)	Amber	The unit is not operational. You may remove the unit from the chassis.
Tx (4)	Amber	A frame was transmitted.
Rx (4)	Amber	A frame was received.
Link (4)	Green	A valid link is established on the port.

ER16-SX-08

The ER16-SX-08 is an 8-port, 1000Base-SX T-Series Gigabit Line Card for the ER16 switch router. The ports are populated with dedicated 1000Base SX interfaces. See *32-Port 10/100Base-TX Line Card* on page 105 for cabling and connector specifications.

Figure 23. ER16-SX-08
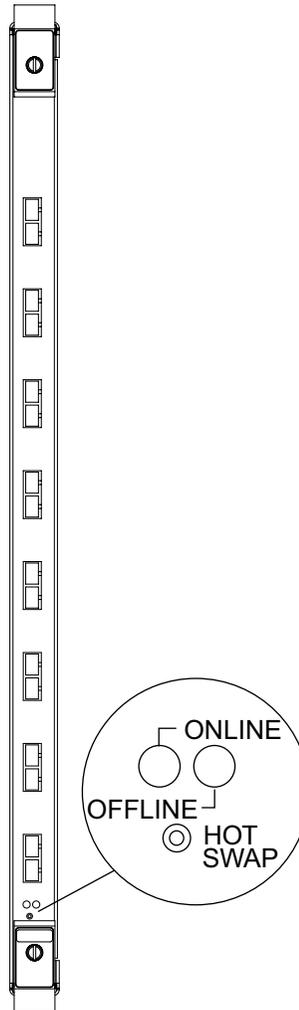
Ports

8 1000Base-SX SC connectors

Network Interfaces

SC connector—850 nm Short-Wavelength Transceiver
50/125 μm Multi-Mode Fiber-Optic Cables
62.5/125 μm Multi-Mode Fiber-Optic Cables
WAN INTERFACES V.35, EIA-530, EIA-449, and X.21

Number of Flows/Routes

Layer-2 Entries = 1,024,000 (memory size = 64 MB)
Layer-3 Entries = 512,000 (memory size = 32 MB)

Switch Method

Address-based and Flow-based.

Physical Dimensions

Size: 52.9 cm H x 2.9 W x 40.1 D (20.9 in. H x 1.15 W x 15.8 D)
Weight: 2.267 kg (5.0 lbs)

Power Consumption

BTU/hr = 513.32
AC Volt Amps = 151.92

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

15% to 90% (non-condensing)

LEDs

Table 16. LED Indicators

LED	Condition	Status
Offline	On	The ER16-SX-08 is offline (powered off) and ready to hot swap. This LED also lights briefly when you reboot or reset the ER16 but turns off as soon as the control module discovers the ER16-SX-08.
Online	On	The ER16-SX-08 is ready to receive, process, and send packets (if configured).
Per-Port Link	Green	Indicates that the port hardware detected the cable plugged into the port and a good link is established.
	Intermittent Red	The port received an error during operation.
	Red	The port hardware detected a cable plugged into the port, but a bad link was established.
	Off	No link from the port exists.
Per-port Rx	Green	The port's transceiver is receiving packets.
	Orange	The port's transceiver is receiving flow-control packets.
Per-port Tx	Green	The port's transceiver is transmitting packets.
	Orange	The port's transceiver is transmitting flow-control packets.
Per-port AN	Green	The line card auto-negotiated the operating mode of the link between full-duplex and half-duplex.
	Intermittent Orange	Auto-negotiation is in progress.
	Orange	Indicates a problem with auto-negotiation configuration.
	Red	An auto-negotiation failure occurred.This fault may occur if the link partner does not support full-duplex operation.
	Off	Auto-negotiation is disabled or the link is down.

ER16-TX-24

The ER16-TX-24 line card contains 24 independent Ethernet ports. Each port senses whether it is connected to a 10-Mbps segment or a 100-Mbps segment and automatically configures itself as a 10Base-T or 100Base-TX port. Figure 24 shows the front panel of the 24-port 10/100Base-TX line card.

Figure 24. Front Panel of ER16-TX-24 Line Card
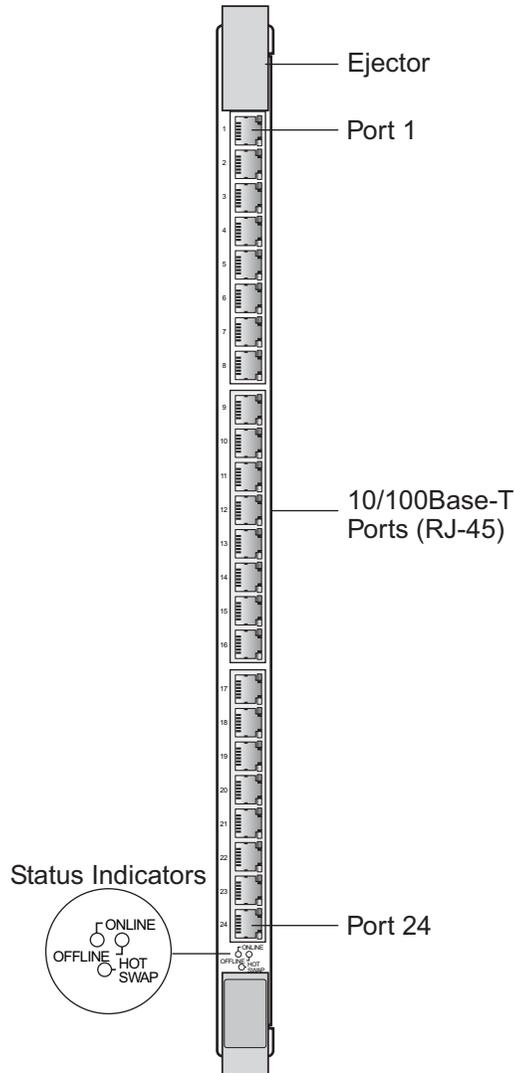
See *24-Port 10/100Base-TX Line Card* on page 105 for cabling and connector specifications.

Ports

24 10/100Base-T Ports

Network Interface

RJ45 Type Connector, MLT-3 Voltage Standard. WAN INTERFACES V.35, EIA-530, EIA-449, and X.21.

Physical Dimensions

Size: 52.9 cm H x 2.9 W x 40.1 D (20.9 in. H x 1.15 W x 15.8 D)
Weight: 3.27 kg (7.2 lbs)

Power Consumption

BTU/hr = 310.17
AC Volt Amps = 91.8

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

15% to 90% (non-condensing)

LEDs

Table 17. LED Indicators

LED	Condition	Status
Link	On (Green)	A valid link has been established on the port.
Activity	Flashing (Yellow)	Traffic is passing through the port.
Online	On (Green)	The module is online, or the module was hot swapped successfully.
Offline	On (Yellow)	The module is receiving power, but is dormant or hotswapped out.

ER16-TX-32

The ER16-TX-32 is a 32-port 10/100 Base-T Ethernet Module for the ER16 platform. The ER16-TX-32 uses three RJ-71connectors and delivers full-function Layer-2, Layer-3, and Layer-4 switching and routing. The ports are fanned out from the 50-pin RJ-71 connector using industry-standard pin assignments. Figure 25 shows the front panel of the ER16-TX-32 line card.

Figure 25. Front Panel of 32-Port 10/100Base-TX Line Card
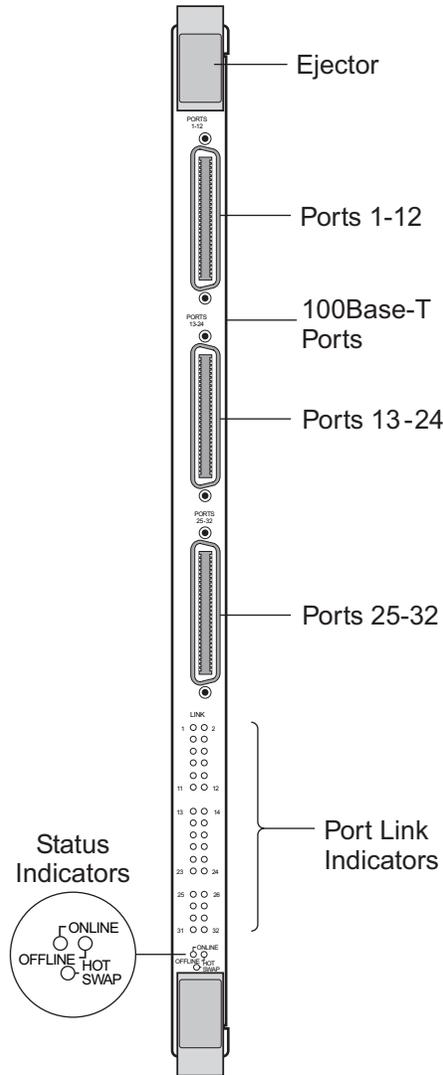
Note: The third RJ-71 connector has only 8 active ports that use 32 out of the 50 connector pins. See Table 23 on page 106 for cabling and connector specifications.

Ports

32 Ports in three RJ-21 connectors

Network Interface

RJ-21 Type Connector, MLT-3 Voltage Standard. WAN INTERFACES V.35, EIA-530, EIA-449, and X.21.

Physical Dimensions

Size: 52.9 cm H x 2.9 W x 40.1 D (20.9 in. H x 1.15 W x 15.8 D)

Power Consumption

BTU/hr = 380.07
AC Volt Amps = 112.48

Temperature

Operating: 41° to 104° F (5° to 40° C)
Storage: -22° to 164° F (-30° to 73° C)

Humidity

15% to 90% (non-condensing)

LEDs

Table 18. LED Indicators

LED	Condition	Status
Link	On (Green)	A valid link has been established on the port.
Activity	Flashing (Yellow)	Traffic is passing through the port.
Online	On (Green)	The module is online, or the module was hotswapped successfully.
Offline	On (Yellow)	The module is receiving power, but is dormant or hotswapped out.

Chapter 2

Hardware Installation

This chapter provides hardware installation information and procedures in the following sections:

- Safety considerations

- Installing the hardware

If the hardware is already installed and you are ready to install the software and perform basic system configuration, see Chapter 3, *Software Installation and Setup*.

Safety Considerations

Read the following safety warnings and product cautions to avoid personal injury or product damage.

Electrical Hazard: Only qualified personnel should perform installation procedures.

Riesgo Electrico: Solamente personal calificado debe realizar procedimientos de instalacion.

Elektrischer Gefahrenhinweis: Installationen sollten nur durch ausgebildetes und qualifiziertes Personal vorgenommen werden.

Preventing Injury

Warning: Observe the following safety warnings to prevent accidental injury when working with the device hardware.

- Never attempt to lift the chassis. It is recommended that a forklift or other mechanical device be used to lift and hold the chassis.

- Never operate the device with exposed power-supply bays or module slots.

- Never operate the device if the chassis becomes wet or the area where the chassis is installed is wet.

Warnhinweis: Beachten Sie folgende Sicherheitshinwiese, um Unfälle beim Umgang mit diesem Gerät zu vermeiden.

- Versuchen Sie niemals das Gerät anzuheben. Es wird empfohlen, mittels Gabelstabler oder anderen Hilfsmitteln das Chassis anzuheben oder es zu halten.

- Betreiben Sie das Gerät nie mit offenen Modul- oder Netzteil – Einschuböffnungen.

- Betreiben Sie das Gerät nie, wenn Nässe am Gehäuse oder in der unmittelbaren Umgebung des Gerätes ist.

Preventing Equipment Damage

Observe the precautions listed in this section to prevent accidental damage to the ER16 components.

Caution: To prevent accidental product damage, observe the following precautions:

- Always use proper electrostatic discharge (ESD) gear when handling the control module, backplane, line cards or other internal parts of the chassis.

- Make sure there are at least 3 inches (7.62 centimeters) of room above and behind the unit for air flow to the cooling fans.

- Install the ER16 as low as possible in the rack to prevent tipping of the rack.

- If the ER16 is to be installed in a closed or multi-unit rack, make sure that the ambient temperature around the unit does not exceed the temperature range listed in *Hardware Specifications*.

- It is recommended that you install a support tray under the chassis when installing in an equipment rack, especially for chassis that are completely filled (no empty control module, power supply, or line card slots).

- When installing components into the rack-mounted chassis, maintain a balanced and even distribution of components in the chassis. For example, even though power supplies and line cards can be installed in any available slot, you should not install all components on one side of the chassis.

- All line cards and Control Modules installed in the ER16 should be screwed in to ensure proper seating.

- Maintain reliable grounding of rack-mounted equipment, with particular attention to power supply connections other than direct connections to the branch circuit (i.e., use of power strips, etc.)

- The ER16 must connect to a 20 amp receptacle.

Hardware Specifications

The following table lists the physical and environmental specifications for the ER16.

Dimensions	35.0" H x 19.0" in. W x 19.0" D 88.90 cm H x 48.26 W x 48.26 D
Weight **Out of shipping crate**[a]	Pounds: 124 Kilograms: 56.25
Fully loaded[b]	Pounds: 225 Kilograms: 102.06
Power	100-120VAC, 16A maximum per power supply; 24A total maximum per system 200-240VAC, 8A maximum per power supply; 12A total maximum per system **Note:** The ER16 must connect to a 20 amp receptacle. 50-60 Hz.
Operating Temperature	Fahrenheit: 41°F to 104°F Centigrade: 5°C to 40°C
Non-Operating Temperature	Fahrenheit: -22°F to 40°F; 105°F to 164°F Centigrade: -30°C to 4°C; 41°C to 73°C
Operating Humidity	15% to 90% (non-condensing)

a. Shipping pallet and packing material weigh an additional 51 pounds (23.13 kilograms).
b. ER16 with redundant Control Modules and line cards installed in each slot.

The ER16 does not restrict the number of line cards you may install; however, you do need to calculate the number of power supplies to use based on how many line cards you use in the chassis. If you install 8 line cards or fewer, you will need 1 supply for power and 1 for redundancy. If you install more than 8 line cards, you will need 2 supplies for power and 2 more for full redundancy. Table 19 lists the power consumption for each module.

Table 19. Power Consumption

Line Module	Description	(48v Backplane) Current draw in Amps
ER16-04	4-port Gigabit Ethernet card.	1.53
ER16-08	8-port Gigabit Ethernet card.	2.53
ER16-ATM29-02	Modular, high-performance OC-3c ATM interface.	0.92
ER16-CM3-128	300Mhz Control Module with a 128MB memory card.	0.82
ER16-CM4-256	400Mhz Control Module with a 256MB memory card.	0.9
ER16-FDDI-02	Supports high-performance translation from Ethernet, Fast Ethernet, Gigabit Ethernet and ATM to FDDI. It also provides connectivity between FDDI modules.	0.93
ER16-GTX32-04	4-port copper-based 1000Base-T Gigabit Ethernet module.	1.66
ER16-GTX32-08	8-port copper-based 1000Base-T Gigabit Ethernet module.	2.65
ER16-HFX31-24	24-port, 100Base-FX MMF Ethernet Module.	1.42
ER16-HFX39-24	24-port, 100Base-FX SMF Ethernet Module.	1.24
ER16-HSSI-02-CK	Provides wide area connectivity via 2 T3 ports *without* compression or encryption. Performs destination-based and flow-based switching—all ports are capable of bridging at Layer-2, switching IP/IPX frames at Layer-3, and switching on Layer-4 flows.	0.68
ER16-IPV6-00	Provides IPv6 support.	.63
ER16-OS16-01	One port, single slot 10-Gigabit interface module.	1.72
ER16-OS26-01	One port, dual slot 10-Gigabit interface module.	2.9
ER16-POS21-04 ER16-POS29-04	4-Port OC-3c SMF or MMF line module that provides high-speed connectivity to SONET networks.	.8 .8
ER16-POS31-02 ER16-POS39-02	2-Port OC-12 SMF or MMF line module that provides high-speed connectivity to SONET networks.	.9 .9
ER16-SERC-04-AA	Provides wide area connectivity via 4 T1/E1 ports with *compression*.	0.67
ER16-SERCE-04-A	Provides wide area connectivity via 4 T1/E1 ports with *compression and encryption*.	0.58
ER16-SX-08	8-port, 1000Base-SX T-Series Gigabit Line Card.	2.35
ER16-TX-24	24-port 10/100 Base-T Ethernet Module with RJ45 connectors.	1.42
ER16-TX-32	32-port 10/100 Base-T Ethernet Module with three RJ-21connectors.	1.74

Installing the Hardware

This section describes how to perform the following tasks:

- Check the shipping box to ensure that all the parts arrived

- Install the power supply

- Install the redundant switching fabric module, if ordered

- Install the control module(s)

- Install line cards

- Attach console management cables

- Attach port cables

Verifying Your Shipment

Before you begin installing your ER16, check your shipment to ensure that everything you ordered arrived securely.

Open the shipping box(es) and verify that you received the following equipment:

- An ER16 chassis containing a backplane, fan module, and switching fabric module.

- One rack-mount shelf.

- One country-specific power cable per power supply.

- One copy of the *X-Pedition ER16 Getting Started Guide* (the book you are reading now).

Depending on your order, your shipment may also contain some or all of the following:

- One or more ER16 power supplies, if ordered.

- One control module, if ordered (Note: this is required to operate the ER16).

- One or more redundant power supplies, if ordered.

- Redundant control module, if ordered.

- Redundant Switching Fabric Module, if ordered.

- The line cards you ordered.

Installing the Chassis

Electrical Hazard: Only qualified personnel should perform installation procedures.

Riesgo Electrico: Solamente personal calificado debe realizar procedimientos de instalacion.

Elektrischer Gefahrenhinweis: Installationen sollten nur durch ausgebildetes und qualifiziertes Personal vorgenommen werden.

Rack-mount Installations

You can install the X-Pedition ER16 in a standard 19" equipment rack. The ER16 chassis is equipped with front-mounting brackets. Figure 26 shows an example of how to install an ER16 chassis in an equipment rack.

Warning: Never attempt to lift the chassis. It is recommended that a forklift or other mechanical device be used to lift and hold the chassis.

Warnhinweis: Versuchen Sie niemals das Gerät anzuheben. Es wird empfohlen, mittels Gabelstabler oder anderen Hilfsmitteln das Chassis anzuheben oder es zu halten.

Figure 26. Installing the ER16 Chassis into an Equipment Rack

Rackmount shelf

Handholds on sides
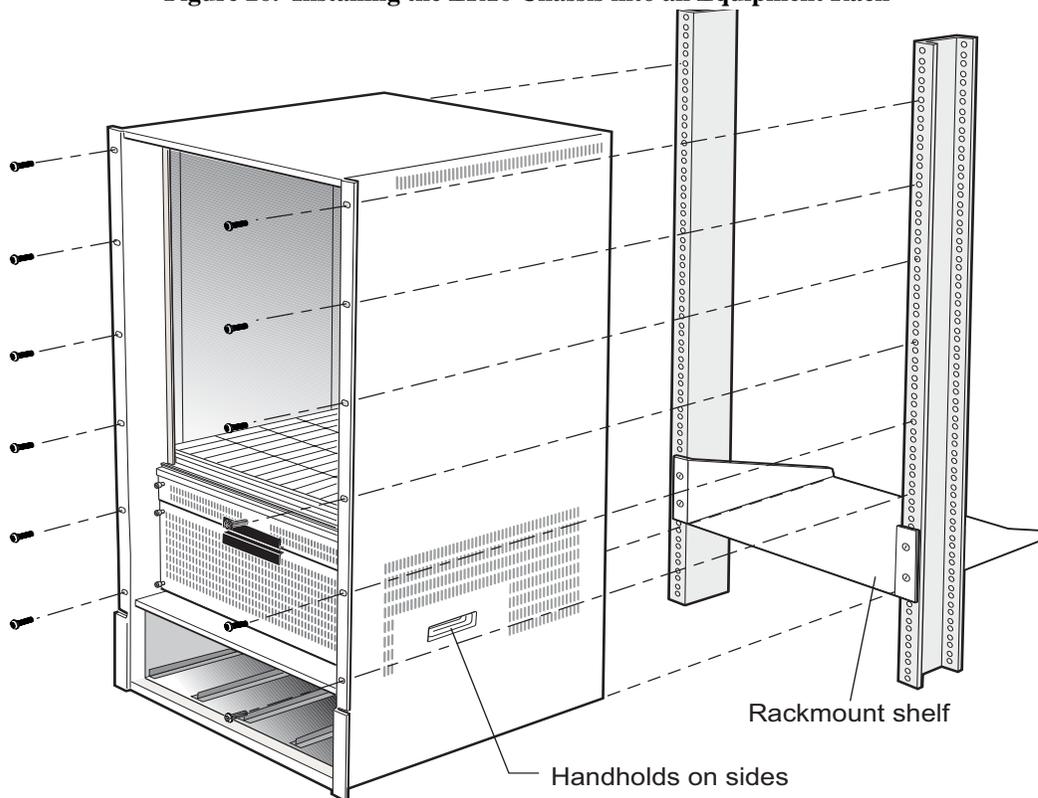
Warning: To ensure the safety of both personnel and hardware, install the chassis before you install line cards or redundant control modules and power supplies.

Warnhinweis: Um die Sicherheit von Personen und Hardware zu gewährleisten, installieren Sie zuerst das Chassis, bevor Sie I/O-Karten oder redundante Steuerungsmodule und Stromversorgungen installieren.

To install the ER16 chassis in an equipment rack, use the following procedure. You need a #2 Phillips-head screwdriver to perform this procedure.

1. With the aid of a forklift, move the chassis into place in the mounting rack.

2. Use the #2 Phillips-head screwdriver and #2 Phillips-head screws to attach the front-mounting brackets of the chassis to the mounting rack.

Note: Make sure there are at least 3 inches (7.62 centimeters) of room above and behind the unit for air flow to the cooling fans.

Caution: Make sure all screws are tight before releasing the chassis. If screws are accidentally left loose, the chassis can slip and fall, which may damage it.

Installing an AC Power Supply

Warning: Disconnect all power sources before servicing.

Advertencia: Desconectar todas las fuentes de poder antes de dar mantenimiento.

Warnhinweis: Trennen sie die komplette Stromversorgung, bevor sie das Gerät warten.

Power supplies are shipped separately from the ER16 chassis. To install or replace the primary power supplies, or if you want to install redundant power supplies, use the following procedure. These power supplies can be installed in any open power supply slot.

Note: Use a single-phase grounded power source located within 6 feet (1.89 meters) of the installation site.

AC Power Supply Specifications

The following table lists the physical specifications for the ER16's power supply.

Dimensions	16.25" (L) x 4.0" (W) x 4.625" (H)
Weight	Pounds: 12 Lbs Kilograms: 5.45 Kg
AC Power	100-125 VAC, 16A maximum 200-240 VAC, 8A maximum **Note:** The ER16 must connect to a 20 amp receptacle. 50/60 Hz
Output Wattage	1200
Operating Temperature	Fahrenheit: 41°F to 104°F Centigrade: 5°C to 40°C

The following table lists the environmental specifications for the ER16's power supply.

Operating Temperature	41° to 104°F (+5° to +40°C)
Non-operating temperature	-22°F to 40°F; 105°F to 164°F (-30°C to 4°C; 41°C to 73°C)
Operating Humidity	15% to 90% (non-condensing)

Figure 27 shows an example of how to install an AC power supply. A description of this procedure follows the figure.

Figure 27. Installing an AC Power Supply
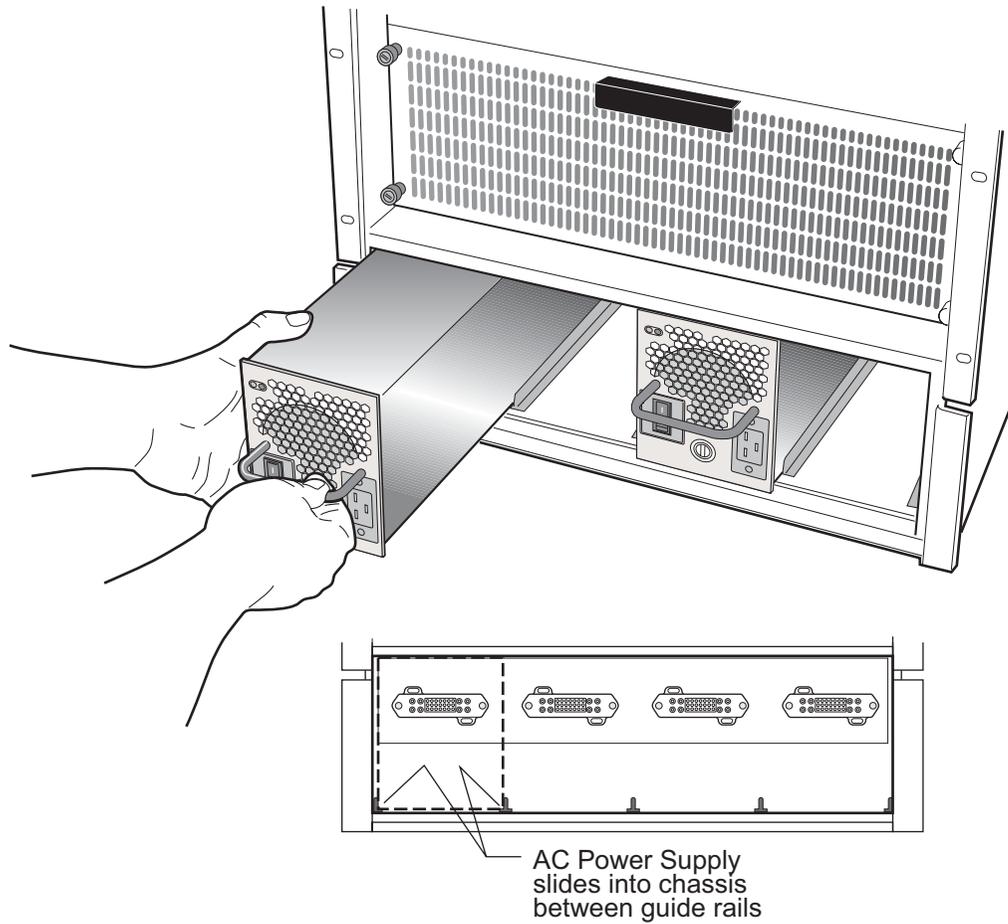
AC Power Supply
slides into chassis
between guide rails

Power Supply Installation Procedure

⚠️ **CAUTION:** To prevent equipment damage, do not install AC and DC supplies in the same chassis.

To install a power supply:

1. Ensure that the power supply is not powered on.

2. Power supplies can be installed in any available power supply slot. If you are replacing a power supply, unplug the power cable from the supply you are replacing, and unlock the screw on the power supply's front panel by turning it counter-clockwise 180 degrees. You may then pull the supply out of the chassis.

3. Position the power supply between the guides in an open power supply slot.

4. Slide the power supply all the way into the slot, firmly but gently pressing to ensure that the connectors on the back of the power supply are completely seated in the backplane.

5. Using a straight-slot screwdriver, turn the screw on the power supply's front panel clockwise 180 degrees to secure the power supply into the chassis.

6. Attach the power cable to the power supply.

Installing a DC Power Supply

The ER16 DC power supply delivers 3.3 and 12 volts DC to the ER16's control module(s), fan modules, and other components. A single DC power supply provides enough current to operate a fully configured chassis. The DC power supply is approximately twice the size of an AC supply, but provides twice the power—however, for full redundancy and current sharing, users must install two DC supplies.

DC Power Supply Specifications

The following table lists the physical specifications for the ER16's DC power supplies.

Input Voltage	48 to 60 VDC (14 Amperes Max.)
Output Wattage	2,400 Watts 50 Amps
Dimensions	17.00 in. L x 8.25 W x 5.25 H 43.18 cm L x 20.95 W x 13.33 H
Weight	13 lbs (5.89 kg)
Other	Thermal protection and audible reverse polarity alarm

Warning: To reduce the risk of electric shock or energy hazards:

1. Connect to a reliably grounded 48V source.

2. The branch circuit over current protection must be rated at a maximum 40A for the device.

3. Use only 8 AWG solid copper wires on the device.

4. A readily accessible disconnect device that is suitably approved and rated shall be incorporated in the field wiring.

5. To be installed in a restricted access area in accordance with the NEC or authority having jurisdiction.

Warnhinweis: Reduzieren sie das Risiko von Stromschlägen oder allgemeinen elektrischen Gefahren

1. Verbinden Sie das Gerät mit einer zuverlässig geerdeten 48 V Stromquelle.

2. Die maximale Absicherung des Stromkreises für dieses Gerät beträgt 40A.

3. Benutzen Sie zum Anschluß des Gerätes ausschließlich Kabel mit soliden Kupferadern des Querschnitts 8mm² (8 AWG)

4. Das Stromnetz am Installationsort sollte mit einem frei zugänglichen Spannungs-Unterbrecher (Not-Aus-Schalter) ausgestattet sein, der ausreichend ausgelegt ist und den gängigen Bestimmungen entspricht.

5. Die Installation sollte in zugangskontrollierten Räumen erfolgen, entsprechend den Vorschriften der NEC bzw. der örtlich zuständigen Behörden.

The following table lists the environmental specifications for the ER16's DC power supplies.

Operating Temperature	+5 to +40 °C (41 to 104 °F)
Non-operating Temperature	-30 to +73 °C (-22 to 164 °F)
Operating Humidity	15 to 90% (non-condensing)

DC Power Supply Installation Procedure

CAUTION: To prevent equipment damage, do not install AC and DC supplies in the same chassis.

To install a DC power supply on the ER16:

1. Ensure that the power supply is powered off.

2. Remove the coverplates installed over the two left-most or right-most power supply slots where you will install the power supply. If you are replacing a power supply, unplug the power cable from the supply you are replacing, loosen the captive screws on the supply's front panel, then pull the supply from the chassis.

3. Slide the power supply all the way into the slot, pressing firmly but gently to ensure that the pins on the back of the power supply are completely seated in the backplane.

4. Tighten the captive screws at the bottom the supply to secure it to the chassis.

5.   Remove the clear plastic shield.

6.   Attach cables to the terminal lugs on the front of the unit. To attach a cable, remove the nut and slide the cable end over the post. Replace and tighten the nut.

7.   Connect the safety ground cable to a reliable earth ground.

8.   Replace the plastic shield.

9.   Connect the DC input wiring to the DC power source. See Figure 29 on page 77 for a diagram of the wiring connections between the ER16 and a DC power source.

ER16 DC Power Supply

Figure 28 shows the front view of an ER16 DC power supply.

Figure 28. Front View of an ER16 DC Power Supply

DC Power Supply
slides into chassis between
alternate guide rails and
straddles center guide rail
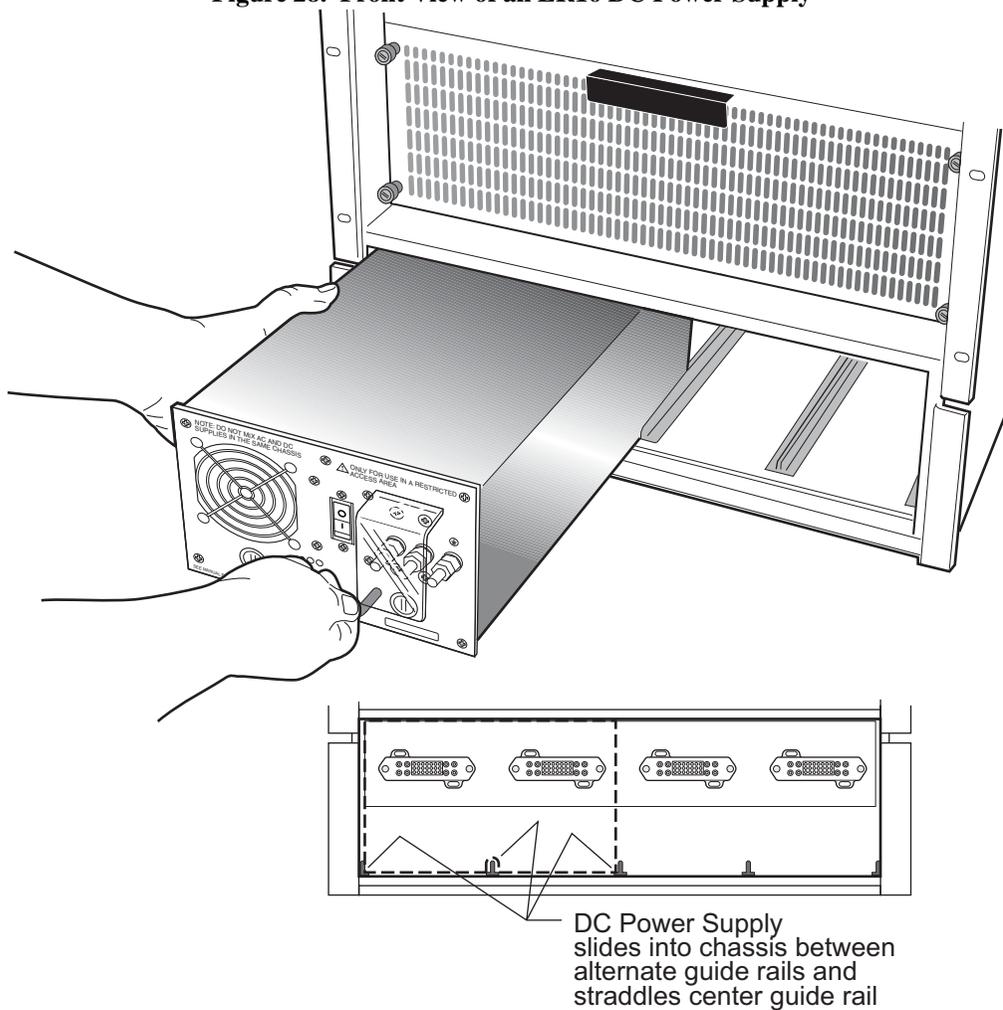
The ER16 DC power supply has a three-terminal wiring block on the front panel. The wiring block contains a positive (+) terminal, a negative (-) terminal, and a safety ground. The DC supply is designed to be powered by a 48-volt DC source.

Figure 29. ER16 DC Supply Lug Configuration
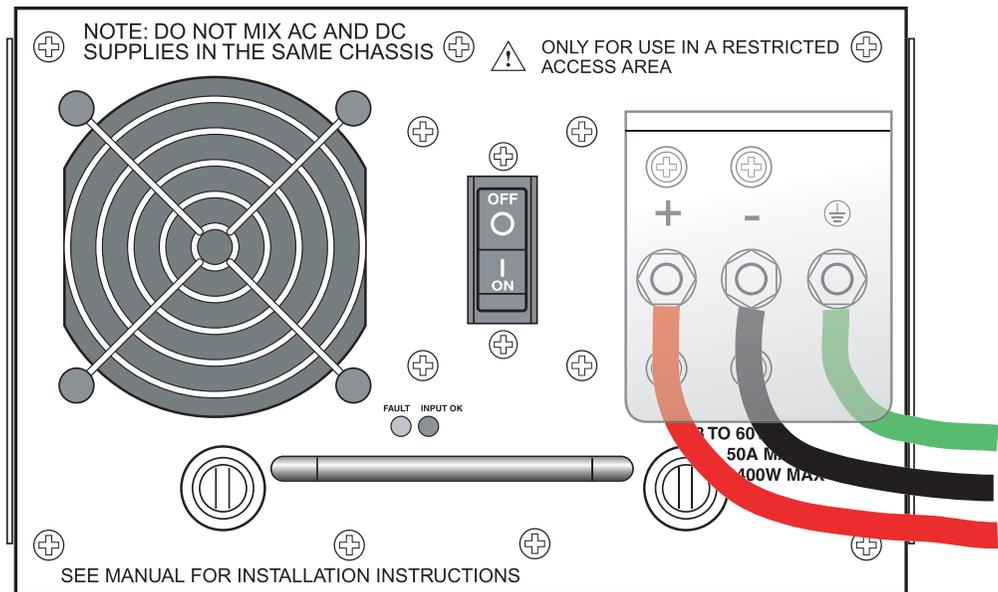
Installing the Control Module

The primary control module must be installed in slot 8. The redundant control module must be installed in slot 9. Figure 30 shows an example of how to install a control module. The procedure following the figure describes how to do this.

Figure 30. Installing a Control Module

Control modules go in slots 8 and 9 only

Rotate ejector
to lock in place

Circuit
Card

Metal
Backpanel

Card
Guides
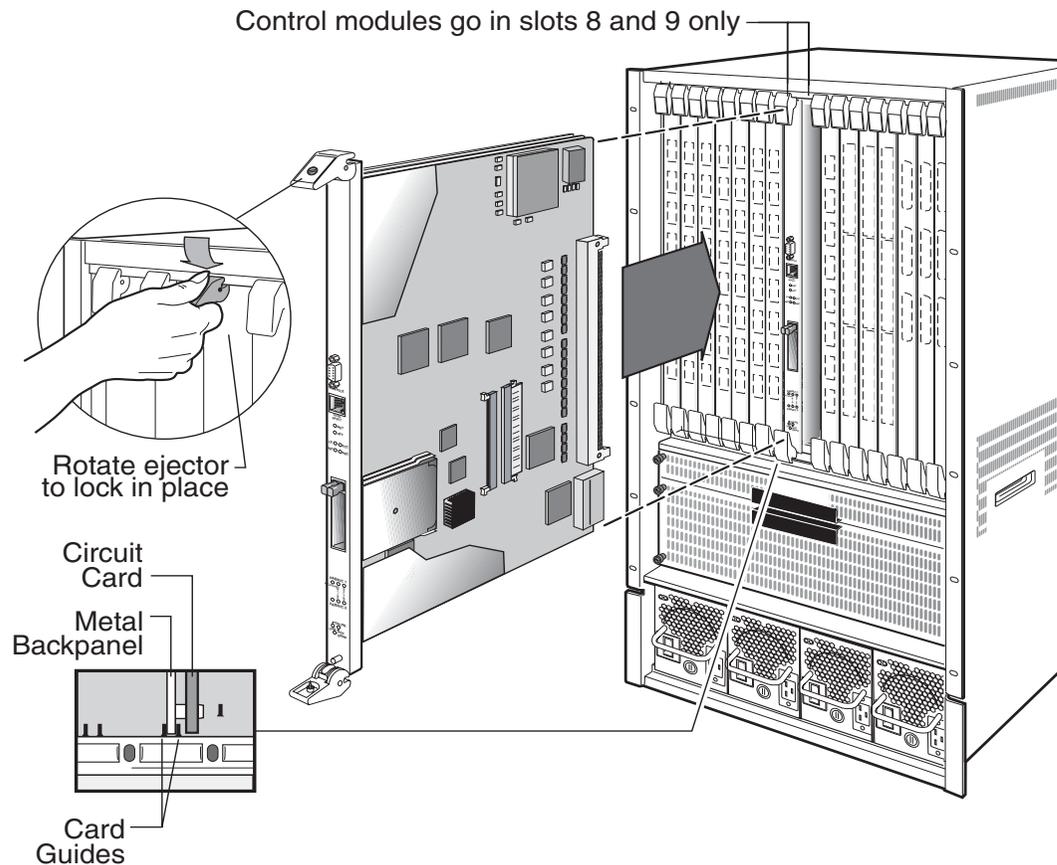
Note: If you are installing a CM4 that uses a 256 MB ECC memory module (or if you are unsure), please refer to *Installing a Memory Upgrade* on page 79 for an explanation of the firmware requirements for this type of memory.

To install the control module:

1.   If a coverplate is installed in the control module slot (slot number 8 or 9), remove the coverplate: loosen the screws on the ejectors until the screws pop out, then open the ejectors and pull out the plate.

2.   Open the ejectors at the top and bottom of the control module.

3.   Align the backsheet of the control module with the card guides at the top and the bottom of the slot opening, as shown in Figure 30.

Note: Make sure that the backsheet (metal plate) of the control module and not the circuit card is between the card guides. Check both the upper and lower tracks.

4. Slide the control module all the way into the slot, firmly but gently pressing to ensure that the pins on the back of the control module are completely seated in the backplane.

5. To lock the control module into the slot, close the ejectors. Using a straight-slot screwdriver, tighten the screw on each ejector.

6. When you are ready to attach the management cables to the control module, use the procedures in *Attaching the Console Management Cable* on page 104.

Installing a Memory Upgrade

Electrical Hazard: Only qualified personnel should perform installation procedures.

Riesgo Electrico: Solamente personal calificado debe realizar procedimientos de instalacion.

Elektrischer Gefahrenhinweis: Installationen sollten nur durch ausgebildetes und qualifiziertes Personal vorgenommen werden.

Handling the Module

CAUTION: The SSR-MEM-256 is easily damaged by electrostatic discharge.

To prevent electrostatic damage, observe the following guidelines:

*   Do not remove the module from its packaging until you are ready to install it.

*   Do not touch any of the module's pins, connectors or components.

*   Hold the module only by its edges or front panel.

*   Wear an anti-static wristband connected to a suitable earth ground whenever handling the module.

*   Store or transport this module only in appropriate anti-static packaging.

Tools

This installation requires the following tools:

Anti-static wristband　　　**Flathead screwdriver**

Preliminary Setup

Firmware Image Requirements

- Boot Firmware version E3.3.0.0 or later.

- System Firmware version E9.0.7.4 or later, or E9.1.3.0 or later.

Note: The Boot Firmware and System Firmware must be upgraded *before* installing the SSR-MEM-256 ECC memory DIMMs.

The following commands allow you to upgrade the Boot Firmware and System Firmware images on your router.

- **system promimage upgrade**
- **system image add**
- **system image choose**

Hot Swap

You may *install* a second Control Module into a live system without powering off the device. However, you may not *remove* an active Control Module from a live system unless dual Control Modules are installed and a CM fail-over occurs. To force a fail-over, do one of the following:

- Press the **Hotswap button**. The **On-line LED** will turn **off** and the **Off-line LED** will turn **on**.

OR...

- Enter the following CLI command from Enable mode where **n** is the slot containing the CM you want to hot swap:

  xp# **system hotswap out slot n**

  The On-line LED will turn off and the Off-line LED will turn on.

Instructions

⚠ **CAUTION:** Before performing any upgrade or installation, ensure that you are properly "grounded" to avoid electrostatic discharge. The switch must be powered off before installing or replacing any module.

⚠ **CAUTION:** The Boot Firmware and System Firmware must be upgraded **before installing the SSR-MEM-256 ECC memory DIMMs.** See Firmware Image Requirements above for additional information.

1. **Determine the type of Control Module and memory installed** by entering the **system show hardware** command from Enable mode to display the following information about your system. Before installing the memory upgrade, be sure that the Control Module installed is a CM4 and verify that a 256MB ECC DIMM is not already present. ECC DIMM memory module is marked "ECC."

```
xp# system show hardware
Hardware Information
        System type :              ER16, Rev. 0
        CPU Module type :          CPU-ER16 (CM4), Rev. 0
        Processor :                R7000, Rev 3.2, 380.00 MHz
             Icache size :         16 Kbytes, 32 bytes/line
             Dcache size :         16 Kbytes, 32 bytes/line
        CPU Board Frequency:       95.00 MHz
        Backplane frequency:       62.50 MHz
        System FPGA :              Rev. 20
        Switching Fabrics:         1 (Active = Fabric 2)
        PCMCIA card :              32MB flash memory card (mounted on slot0: or slot1:)
        System Memory size :       256 MBytes ECC
        Network Memory size:       16 MBytes
        MAC Addresses
             System :              0001f4:c2ff6d
             10Base-T CPU Port:    0001f4:c2ff6e
             Internal Use :        0001f4:c2ff6f -> 0001f4:c2ffac
        CPU Mode :                 Active
        Redundant CPU slot :       Not present
```

Note: The ER16-CM4-256 Control Module supports a maximum of 256MB of memory—**users may install only one 256MB ECC DIMM**. To replace existing memory, remove both 128MB memory modules and install one SSR-MEM-256.

2. **Power down the chassis and open the ejectors** on each side of the Control Module.

Note: If the router contains a Backup Control Module, enter the **system hotswap out slot n** command where **n** is the slot that contains the module you will remove.

3. **Carefully remove the Control Module** from its slot in the chassis and place it on an ESD-safe work area.

4. **Remove existing DIMMs and insert the SSR-MEM-256 memory upgrade into slot P5**.
   Gently press the memory card in place and ensure that the card is completely seated in the slot.
   Figure 31 identifies the location of the DIMM slots.

Note: If the SSR-MEM-256 is installed with a second DIMM, the Control Module will only
acknowledge the presence of memory installed in slot P5. Memory installed in slot P4 is
ignored.

Figure 31. Install the DIMM in the Memory Slot
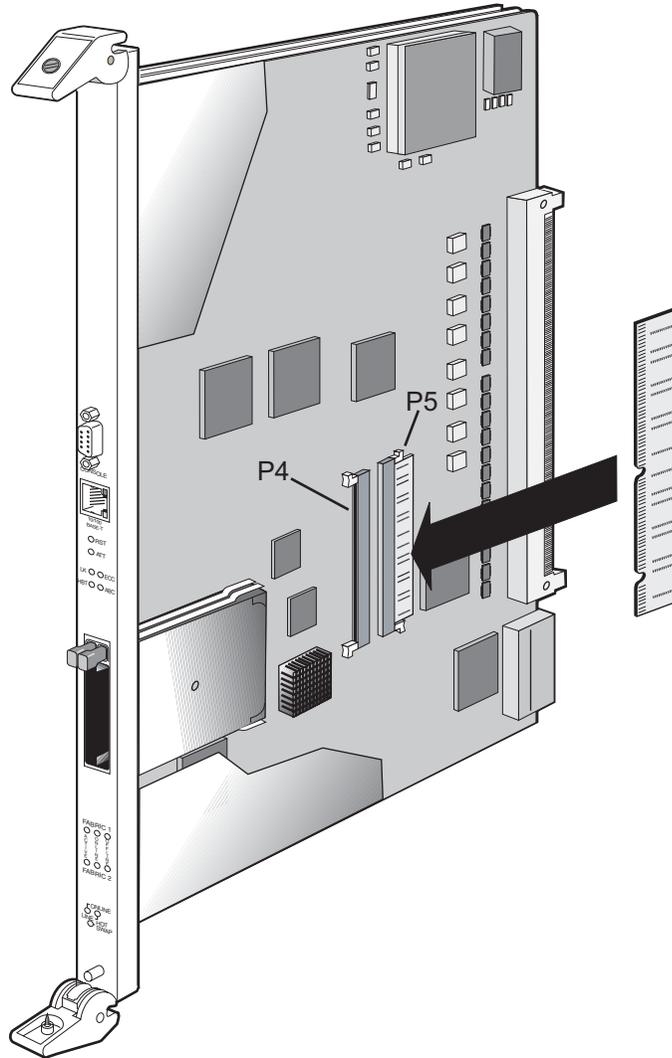
5. **Align the backsheet of the Control Module** as shown in Figure 32.

Note: Make sure that the circuit card is between the card guides. Check both tracks.

Figure 32. Insert Card Between Card Guides

Rotate ejector
to lock in place

Circuit
Card

Metal
Backpanel
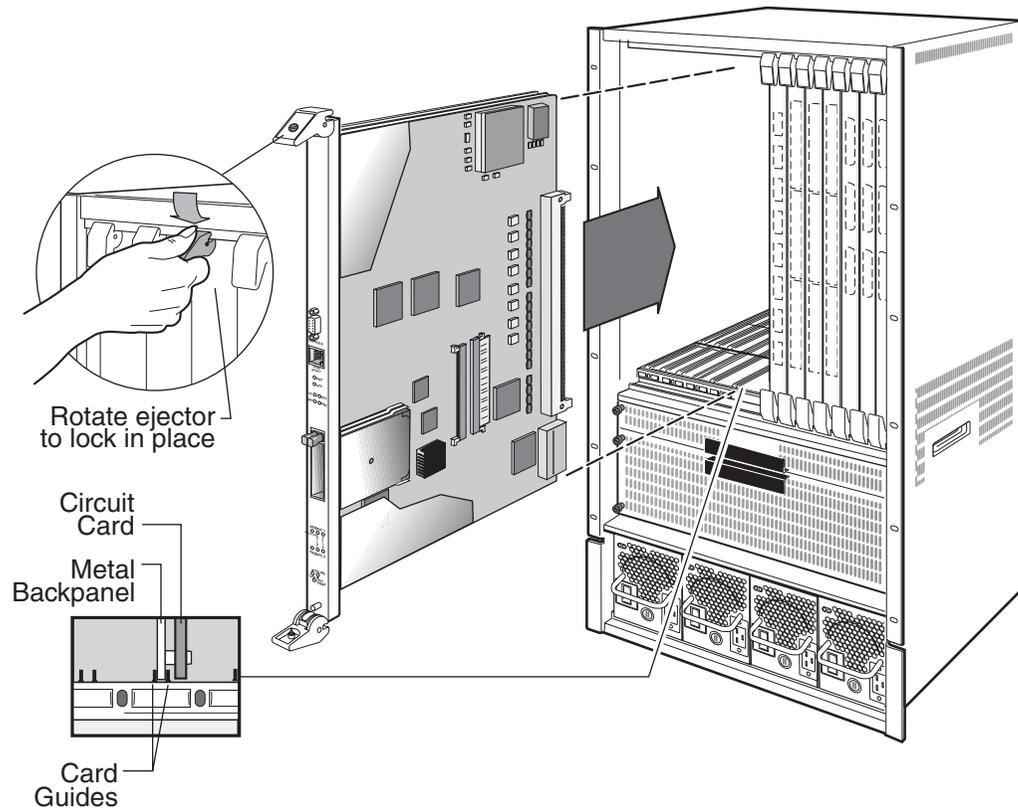
Card
Guides

6. **Slide the upgraded Control Module all the way into the slot**, firmly but gently pressing it in place to ensure that the pins on the back of the card are completely seated in the backplane.

Note: In a single-CM environment, the ER16 requires that users install the Control Module in slot 8 ("CPU").

7. **Secure the Control Module.** To secure the control module, close the ejectors and use a flathead screwdriver to tighten the screw on each ejector.

8. **Power on the chassis**. Move the power switch located on the power supply to the "On" position. As the ER16 boots, messages on the console will appear, reflecting the memory size and type on the Control Module.

Note: If you Hot Swapped the Control Module out of the router, enter the **system hotswap in slot n** command (where **n** is the slot into which you installed the module) to activate the Control Module.

Troubleshooting

Proper Boot Sequence

- Firmware loads.

- The control module for the chassis should indicate that the module was detected and is operating correctly.

- The On-line and Link LEDs will turn on and remain lit, and the Activity LED will light intermittently.

Common Errors

- A line card or Control Module is not inserted properly or seated completely in the chassis.

- Connectors for the connected lines are not seated properly.

- The CM does not connect to a terminal through a console port.

Helpful CLI Commands for Debugging

- **System show hardware**

- **System show version**

- **System show bootlog**

Installing the Redundant Switching Fabric Module

On the ER16, the primary switching fabric module is installed in the chassis at the factory. An optional redundant switching fabric module is shipped separately from the ER16 chassis.

To install a switching fabric module on the ER16:

1. **Remove the switching fabric access panel**, as shown in Figure 33

Figure 33. Opening the Switching Fabric Access Panel
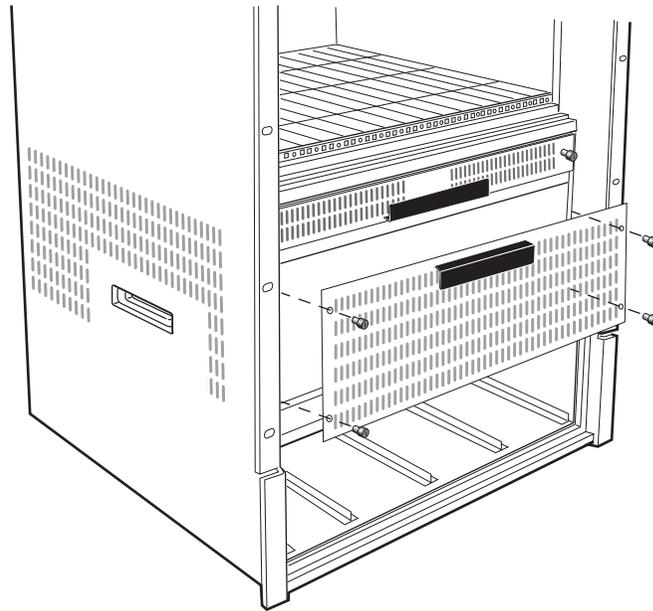
2. **Open the ejectors** on either side of the switching fabric module.

3. **Position the switching fabric module** into the available slot (See Figure 34)

Figure 34 shows an example of how to install a switching fabric module. The primary or redundant switching fabric module can be installed into either horizontal slot. A description of this procedure follows the figure.

Figure 34. Installing a Switching Fabric Module on the ER16
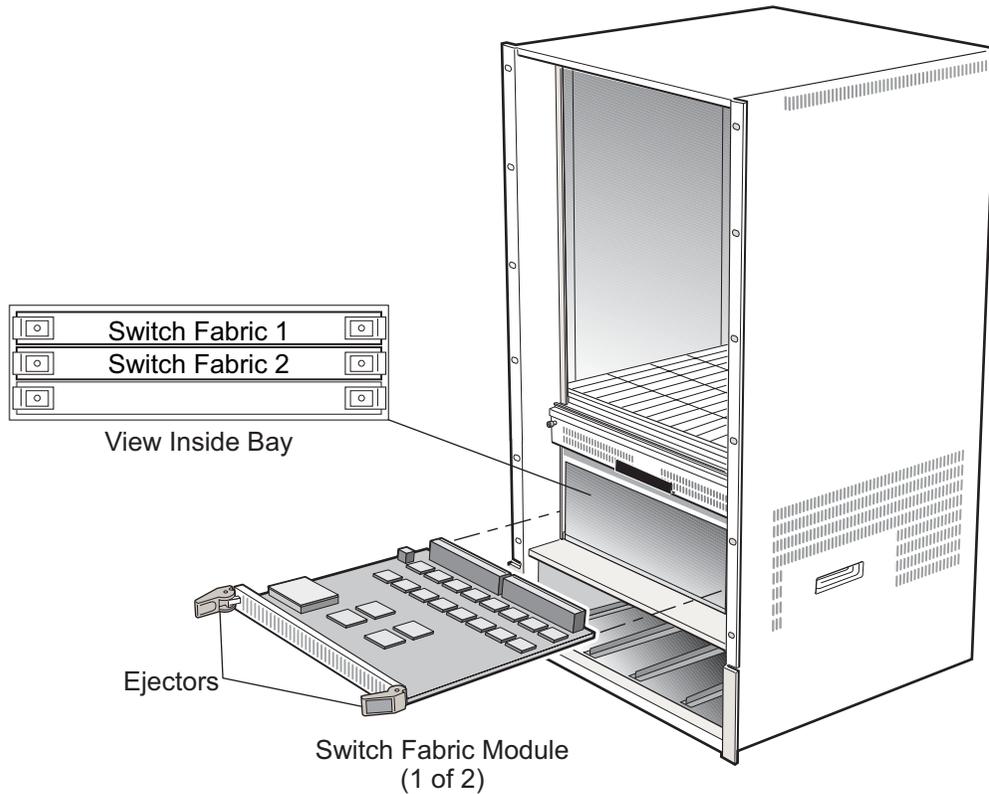
4. **Slide the switching fabric module all the way into the slot**, firmly but gently pressing to ensure that the pins on the back of the module are completely seated in the backplane.

5. To lock the module into the slot, **close the ejectors**.

6. **Replace the panel** over the switching fabric slots when you have completed installation.

Installing the Line Cards

Electrical Hazard: Only qualified personnel should perform installation procedures.

Riesgo Electrico: Solamente personal calificado debe realizar procedimientos de instalacion.

Elektrischer Gefahrenhinweis: Installationen sollten nur durch ausgebildetes und qualifiziertes Personal vorgenommen werden.

Warning: Do not insert tools or body parts in the chassis while it is powered on. Doing so may cause electrical shock or equipment damage.

Advertencia: No se debe insertar herramientas o partes del cuerpo en el chasis mientras este este encendido ya que puede causar shock eléctrico o daño al equipo.

Warnhinweis: Keinesfalls sollten Werkzeuge oder Körperteile in das Gerät eingebracht werden, während dieses eingeschaltet ist, dies könnte zu Stromstößen und elektischen Schäden führen.

Because the ER16 supports hot swapping, you can remove and insert line cards while the ER16 is operating. However, you should not insert tools or body parts inside the chassis while it is powered on. Doing so can cause electrical shock or equipment damage. For more information on hot swapping, consult the *Enterasys X-Pedition User Reference Manual*.

Before you begin, please review Table 20 for system firmware requirements, restrictions, and special instructions that apply to the line card you are installing.

Table 20. Line Card Installation Notes

	Minimum Firmware	Restrictions	Special Instructions
ER16-04 and ER16-08	E8.0.0.0	**Default Module Settings** The default mode for each port on the ER16-08 and ER16-04 is: **Full duplex/ 1000 mbs/ autonegotiation on** To view the current mode for a particular port, enter the following (where **x** is the chassis slot that contains the line card and **y** is a specific port number on the card): xp# **port show port status gi.x.y**	**Proper Boot Sequence** • Offline LED turns on and remains on until card is online. • Port LEDs turn on momentarily and CLI indicates that the system discovered the line card in proper slot. • CLI indicates all ports are initialized and offline LED turns off. • Online LED lights. • Link LED is active for connected lines. **Common Errors** • The line card is not inserted properly or seated completely in the chassis. • Connectors for the connected lines are not seated properly. • Attached device is not configured to match configuration mode of module (i.e., auto-negotiation, speed, duplex). **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **Port show port status gi.x.y** (where **x** is the chassis slot that contains the line card and **y** is a specific port number on the card). • **System show bootlog**

Table 20. Line Card Installation Notes (Continued)

	Minimum Firmware	Restrictions	Special Instructions
ER16-ATM29-02	E8.3.0.0	This module operates with the following APHYs (purchased separately) connected to the outside world. For information about these APHYs, consult the Enterasys Networks web site. XP-APHY-67 XP-APHY-21 XP-APHY-82V XP-APHY-77 XP-APHY-29IR XP-APHY-92V XP-APHY-22 **Note:** Before you can remove an APHY, hot swap the host ATM module. WARNING: The XP-APHY-21 and XP-APHY-29IR use Class 1 Lasers. Do not use optical instruments to view laser output. The use of optical instruments to view laser output increases eye hazard. **CLI Setup** Enter the following commands at the CLI before implementing any configurations. 1. **Enable** —> **Configure** —> **<Enter>**. 2. Once you reach the configuration prompt, you can create the ATM interface using CLI commands as described in the ATM section of the X-Pedition CLI manual. Enter the **?** character to view the options available to you in configuration mode.	**Proper Boot sequence** • The control module in the chassis should indicate that the ER16-ATM29-02 was detected and is operating correctly. **Common Errors** • Make sure the chassis is connected to a terminal through a console port. **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**
ER16-CM3-128	E8.0.0.0	Control modules are designed for slot 8 or 9 only. You cannot hot swap the *Primary* CM; however, you may hot swap a *Secondary* CM by pressing the hot swap button. **Preparing the Module** • You must install the PCMCIA card before you install the module. Do not remove a PCMCIA card while the unit is powered on. • If you will use the CM3 as the primary CM, turn off the power to the ER16 and install the module in slot 8. • If you will use the CM3 as the secondary CM, install the module in slot 9. To replace an existing *secondary* module, press the module's hot swap button and wait for all LED activity to stop. You may then install the new module. **Default Module Settings** The CM3 comes with the baud rate on RS232 console port set to 9600.	**Proper Boot Sequence** • The OK, HBT, and DIAG LEDs light momentarily. • DIAG LED will flash during boot sequence. • OK LED will turn on and remain lit. • If the redundant CPU is present and properly configured, the HBT LED will flash. **Common Errors** • If the DIAG LED continues to flash, a valid boot image was not found. • If the ER16 does not detect all slots with cards installed, check the CM and line modules to see that they are fully seated and flush with the front panel. • If you will use the ER16 as a layer 2 switch, you must first create a configuration file. To do this, enter the following CLI commands: **Enable–> Configure–> System–> set–> name <name>–> save active–> save startup–> CTRL+Z–> reboot–>** **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**

Table 20. Line Card Installation Notes (Continued)

	Minimum Firmware	Restrictions	Special Instructions
ER16-CM4-256	E8.2.0.0	**You cannot hot swap** the *Primary* CM; however, you may hot swap a *Secondary* CM by pressing the hot swap button. • You cannot use a CM4 with a CM3 command module. Older modules will not recognize the CM4. **Preparing the Module** • You must install the PCMCIA card **before** you install the module. Do not remove a PCMCIA card while the unit is powered on. • If you will use the CM4 as the **primary** CM, turn off the power to the ER16 and install the module in slot **8**. • If you will use the CM4 as the **secondary** CM, install the module in slot **9**. To replace an existing *secondary* module, press the module's hot swap button and wait for all LED activity to stop. You may then install the new module. • If the CM4 uses a 256 MB ECC memory module (or if you are unsure), please refer to *Installing a Memory Upgrade* on page 79 for an explanation of the firmware requirements for this type of memory. **Default Module Settings** The CM4 comes with the baud rate on RS232 console port set to 9600.	**Proper Boot Sequence** • The OK, HBT, and DIAG LEDs light momentarily. • DIAG LED will flash during boot sequence. • OK LED will turn on and remain lit. • If the redundant CPU is present and properly configured, the HBT LED will flash. **Common Errors** • If the DIAG LED continues to flash, a valid boot image was not found. • If the unit hangs at 100% image checksum verified, check to make sure the firmware image is 8.2.0.0 or higher. • If the ER16 does not detect all slots with cards installed, check the CM and line modules to see that they are fully seated and flush with the front panel. • If you will use the ER16 as a layer 2 switch, you must first create a configuration file. To do this, enter the following CLI commands: **Enable–> Configure–> System–> set–> name \<name\>–> save active–> save startup–> CTRL+Z–> reboot–>** **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**

Table 20. Line Card Installation Notes (Continued)

	Minimum Firmware	Restrictions	Special Instructions
ER16-FDDI-02	E8.3.0.1	**Preparing the Module** • Before installing the module, you must install at least one of the following XP-FPHYs (purchased separately): XP-FPHY-01, XP-FPHY-02, or XP-FPHY-09. • Because FDDI full duplex is not an industry standard, its implementation is based on the Digital Equipment Corporation (DEC) standard. FDDI full duplex will interoperate with all DEC products and most Enterasys Networks FDDI products. **Default Module Settings** The default mode for each port on the ER16 is: **Full duplex/ 1000 mbs/ autonegotiation on** To view the current mode for a particular port, enter the following (where **x** is the chassis slot that contains the line card and **y** is a specific port number on the card): **XP# port show port status gi.x.y** **CLI Setup** Enter the following commands at the CLI before implementing any configurations. 1. **Enable —> Configure —> \<Enter\>**. 2. Once you reach the configuration prompt, you can configure the ER16-GTX32-04 using CLI commands as described in the X-Pedition CLI manual. Enter the **?** character to view the options available to you in configuration mode.	**Proper Boot Sequence** • Firmware loads. • The LEDs on Port 1 light in the following order: A, B, P, S, Rx, and Tx. After the Tx LED lights, all LEDs turn off and the online LED turns green. • Diagnostic messages display for each line card. • Status lights on line cards go online. • Link lights activate for connected lines. **Common Errors** • Ensure the ER16 is powered up. • Ensure that the device attached to the module is powered up and operating correctly. • Ensure that the module is properly seated in the slot. • Check the connectors on both ends of the cable to be sure they are properly engaged. When attaching fiber cable to an SC-type port, be sure the plug clicks into place to ensure that it is properly seated. • If you are using fiber optic cable with an ST-type connector in conjunction with an SC-ST port converter, try switching the TX and RX connectors. **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**
ER16-GTX32-04	E9.0.0.0	**CAUTION:** The ER16-GTX32-04 is designed for slots 1-7 or 9-16 only, and is easily damaged by electrostatic discharge.	**Proper Boot Sequence** • Offline LED lights at power-up. • Port LEDs flicker briefly during system boot while ports initialize. • Online LED turns on once module is active. **Common Errors** • The ER16 is not powered up. • The module is not properly seated in the slot. • Connectors on both ends of the cable are not properly engaged. The copper cable did not click into place or is not properly seated. • Ensure that the attached device is configured to match the configuration mode of the ER16 module (e.g., auto-negotiation enabled). **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**

Table 20. Line Card Installation Notes (Continued)

	Minimum Firmware	Restrictions	Special Instructions
ER16-GTX32-08	E9.0.0.0	The ER16-GTX32-08 is designed for slots 1-7 or 9-16 only. **Default Module Settings** The default mode for each port on the ER16 is: **Full duplex/ 1000 mbs/ autonegotiation on** To view the current mode for a particular port, enter the following (where **x** is the chassis slot that contains the line card and **y** is a specific port number on the card): XP# **port show port status gi.x.y** **CLI Setup** Enter the following commands at the CLI before implementing any configurations. 1. **Enable** —> **Configure** —> **<Enter>**. 2. Once you reach the configuration prompt, you can configure the ER16-GTX32-08 using CLI commands as described in the X-Pedition CLI manual. Enter the **?** character to view the options available to you in configuration mode.	**Proper Boot Sequence** • Offline LED lights at power-up. • Port LEDs flicker briefly during system boot while ports initialize. • Online LED turns on once module is active. **Common Errors** • The ER16 is not powered up. • The module is not properly seated in the slot. • Connectors on both ends of the cable are not properly engaged. The copper cable did not click into place or is not properly seated. • Ensure that the attached device is configured to match the configuration mode of the ER16 module (e.g., auto-negotiation enabled). **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**
ER16-HFX31-24 ER16-HFX39-24	E8.3.0.0	WARNING: Do not use optical instruments to view the laser output. The use of optical instruments to view laser output increases eye hazard. When viewing the output optical port, power must be removed from the network adapter. CAUTION: The ER16-HFX39-24 and ER16-HFX31-24 are designed for slots 1-7 or 9-16 only, and are easily damaged by electrostatic discharge.	**Proper Boot Sequence** • Offline LED lights at power-up. • Port LEDs flicker briefly during system boot while ports initialize. • Online LED turns on once module is active. **Common Errors** • The ER16 is not powered up. • The module is not properly seated in the slot. • Connectors on both ends of the cable are not properly engaged. The cable attached to the port did not click into place or is not properly seated. **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**

Table 20. Line Card Installation Notes (Continued)

	Minimum Firmware	Restrictions	Special Instructions
ER16-HSSI-02-CK	E8.3.0.0	**CLI Setup** Enter the following command at the CLI before implementing any configurations. 1. Type the following from Enable mode to enter Configuration mode **Enable -> Configure #** 2. You may now begin configuring ports on the ER16-HSSI-04-CK. Refer to the *Enterasys X-Pedition Native Command Line Interface Reference Manual* for details.	**Proper Boot Sequence** • Firmware loads. • The control module for the chassis should indicate that the ER16-HSSI-02-CK was detected and is operating correctly. • The Online LED will turn on and remain lit (no other LEDs should illuminate during module power-up). **Common Errors** • The ER16-HSSI-02-CK is not inserted properly or seated completely in the chassis • Connectors for the connected lines are not seated properly. **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **Port show port status gi.x.y** (where **x** is the chassis slot that contains the line card and **y** is a specific port number on the card). • **System show bootlog**
ER16-IPV6-00			**Proper Boot Sequence** • The control module on the chassis should indicate that the line card was detected and is operating correctly. **Common Errors** • Make sure that the chassis is connected to a terminal through a console port. **Helpful CLI Commands for Debugging** • **System Show Hardware** **System Show Version** **System Show Bootlog**

Table 20. Line Card Installation Notes (Continued)

	Minimum Firmware	Restrictions	Special Instructions
ER16-OS16-01 ER16-OS26-01			**Proper Boot Sequence** • Main card is identified • The DB (Daughter board) is identified • Online LED turns on • Link is established **Common Errors** • Removing card before Offline LED turns on (this card takes longer to go offline than many others). • Incorrect cable type is attached (SM vs MM) **Helpful CLI Commands for Debugging** • **Port Show Port Status** • **System Show Hardware**
ER16-POS21-04 ER16-POS29-04	9.0.0.2	**CLI Setup** Enter the following commands at the CLI before implementing any configurations. 1. **Enable** —> **Configure** —> **<Enter>**. 2. Once you reach the configuration prompt, you can configure the ER16-POS21-04 or ER16-POS29-04 using CLI commands as described in the X-Pedition CLI manual. Enter the **?** character to view the options available to you in configuration mode.	**Proper Boot Sequence** • Offline LED lights at power-up. • Port LEDs flicker briefly during system boot while ports initialize. • Online LED turns on once module is active. **Common Errors** • The ER16 is not powered up. • The module is not properly seated in the slot. • Connectors on both ends of the cable are not properly engaged. The copper cable did not click into place or is not properly seated. **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**

Table 20. Line Card Installation Notes (Continued)

	Minimum Firmware	Restrictions	Special Instructions
ER16-POS31-02 ER16-POS39-02	9.0.0.2	**CLI Setup** Enter the following commands at the CLI before implementing any configurations. 1. **Enable** —> **Configure** —> **<Enter>**. 2. Once you reach the configuration prompt, you can configure the ER16-POS39-02 or ER16-POS31-02 using CLI commands as described in the X-Pedition CLI manual. Enter the **?** character to view the options available to you in configuration mode.	**Proper Boot Sequence** • Offline LED lights at power-up. • Port LEDs flicker briefly during system boot while ports initialize. • Online LED turns on once module is active. **Common Errors** • The ER16 is not powered up. • The module is not properly seated in the slot. • Connectors on both ends of the cable are not properly engaged. The copper cable did not click into place or is not properly seated. **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**
ER16-SERC-04-AA	E8.3.0.0	**CLI Setup** Enter the following command at the CLI before implementing any configurations. 1. Type the following from Enable mode to enter Configuration mode **Enable -> Configure #** 2. You may now begin configuring ports on the ER16-SERC-04-AA. Refer to the *Enterasys X-Pedition Native Command Line Interface Reference Manual* for details.	**Proper Boot Sequence** • Firmware loads. • The control module for the chassis should indicate that the ER16-SERC-04-AA was detected and is operating correctly. • The Online LED will turn on and remain lit (no other LEDs should illuminate during module power-up). **Common Errors** • The ER16-SERC-04-AA is not inserted properly or seated completely in the chassis • Connectors for the connected lines are not seated properly. **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **Port show port status se.x.y** (where **x** is the chassis slot that contains the line card and **y** is a specific port number on the card). • **System show bootlog**

Table 20. Line Card Installation Notes (Continued)

	Minimum Firmware	Restrictions	Special Instructions
ER16-SERCE-04-A	E8.3.0.0	**CLI Setup** Enter the following command at the CLI before implementing any configurations. 1. Type the following from Enable mode to enter Configuration mode **Enable -> Configure #** 2. You may now begin configuring ports on the ER16-SERCE-04-A. Refer to the *Enterasys X-Pedition Native Command Line Interface Reference Manual* for details.	**Proper Boot Sequence** • Firmware loads. • The control module for the chassis should indicate that the ER16-SERCE-04-A was detected and is operating correctly. • The Online LED will turn on and remain lit (no other LEDs should illuminate during module power-up). **Common Errors** • The ER16-SERCE-04-A is not inserted properly or seated completely in the chassis • Connectors for the connected lines are not seated properly. **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **Port show port status se.x.y** (where **x** is the chassis slot that contains the line card and **y** is a specific port number on the card). • **System show bootlog**
ER16-SX-08	E8.0.0.0	**Note:** You may install the ER16-SX-08 in line card slots 1-7 or 9-16—slot 8 supports a control module only (you may install a redundant control module in slot 9). **Default Module Settings** The default mode for each port on the ER16-SX-08 is: **Full duplex/ 1000 mbs/ autonegotiation on** To view the current mode for a particular port, enter the following (where **x** is the chassis slot that contains the line card and **y** is a specific port number on the card): XP# **port show port status gi.x.y** **CLI Setup** Enter the following commands at the CLI before implementing any configurations. 1. Type the following from Enable mode to enter Configuration mode **Enable -> Configure** 2. You may now begin configuring ports on the ER16-SX-08. Refer to the *Enterasys X-Pedition Native Command Line Interface Reference Manual* for details.	**Proper Boot Sequence** • Offline LED turns on and remains on until card is online. • Port LEDs turn on momentarily and CLI indicates that the system discovered the line card in proper slot. • CLI indicates all ports are initialized and offline LED turns off. • Online LED lights. • Link LED is active for connected lines. **Common Errors** • The line card is not inserted properly or seated completely in the chassis • Connectors for the connected lines are not seated properly. • Attached device is not configured to match configuration mode of module (i.e., auto-negotiation, speed, duplex). **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **Port show port status gi.x.y** (where **x** is the chassis slot that contains the line card and **y** is a specific port number on the card). • **System show bootlog**

Table 20. Line Card Installation Notes (Continued)

	Minimum Firmware	Restrictions	Special Instructions
ER16-TX-24	E8.3.0.0	**Note:** The ER16-TX-24 is designed for slots 1-7 or 9-16 only. **Default Module Settings** • Full duplex • 10/100 MBS • Auto-negotiation ON	**Proper Boot Sequence** • Offline LED lights at power-up. • Port LEDs flicker briefly during system boot while ports initialize. • Online LED turns on once module is active. **Common Errors** • The ER16 is not powered up. • The module is not properly seated in the slot. • Connectors on both ends of the cable are not properly engaged. The copper cable did not click into place or is not properly seated. **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**
ER16-TX-32	E8.3.0.0	**Note:** The ER16-TX-32 normally uses an RJ-21 bundle to connect to a patch panel of RJ45 connectors. The maximum length in the table above includes the patch cable and bundle used to connect the panel. **Default Module Settings** • Full duplex • 10/100 MBS • Auto-negotiation ON	**Proper Boot Sequence** • Offline LED lights at power-up. • Port LEDs flicker briefly during system boot while ports initialize. • Online LED turns on once module is active. **Common Errors** • The ER16 is not powered up. • The module is not properly seated in the slot. • Connectors on both ends of the cable are not properly engaged. The copper cable attached to the port did not click into place or is not properly seated. **Helpful CLI Commands for Debugging** • **System show hardware** • **System show version** • **System show bootlog**

Handling the Module

> ⚠️ **Caution:** Line cards are easily damaged by electrostatic discharge.
>
> To prevent electrostatic damage, observe the following guidelines:
>
> • Do not remove the module from its packaging until you are ready to install it.
>
> • Do not touch any of the module's pins, connectors or components.
>
> • Hold the module only by its edges or front panel.
>
> • Wear an anti-static wristband connected to a suitable earth ground whenever handling the module.
>
> • Store or transport this module only in appropriate anti-static packaging.

Tools

Typical installations require the following tools:

Anti-static wristband   **Phillips screwdriver**   **Flathead screwdriver**

Hot Swap

You may *install* most modules into a live system without powering off the device. However, do not remove an active module from a live system except under the following conditions:

• Press the **Hot Swap** button on the front panel. The **Online LED** will turn **off** and the **Offline LED** will turn **on**.

OR...

• Enter the following from the CLI and click enter: **Enable -> System -> Hotswap -> Out -> Slot -> #**. The **Online LED** will turn **off** and the **Offline LED** will turn **on**.

• **Remove the module**.

For more information on hot swapping, see *Hot Swapping Line Cards and* Control Module*s* in the *Enterasys X-Pedition User Reference Manual*.

> ⚠️ **Warning:** Do not insert tools or body parts in the chassis while it is powered on. Doing so may cause electrical shock or equipment damage.
>
> **Advertencia:** No se debe insertar herramientas o partes del cuerpo en el chasis mientras este este encendido ya que puede causar shock eléctrico o daño al equipo.
>
> **Warnhinweis:** Keinesfalls sollten Werkzeuge oder Körperteile in das Gerät eingebracht werden, während dieses eingeschaltet ist, dies könnte zu Stromstößen und elektischen Schäden führen.

Instructions

To install a line card:

1. If a coverplate is installed in the line module slot, **remove the coverplate**: loosen the screws on the ejectors until the screws pop out, then open the ejectors and pull out the plate.

2. **Open the ejectors** at the top and bottom of the line card.

3. **Align the backsheet of the line card between the card guides**, as shown in Figure 35.

Note: Make sure that the backsheet (metal plate) of the line card and not the circuit card is between the card guides. Check both the upper and lower tracks.

Figure 35. Installing a Line Card
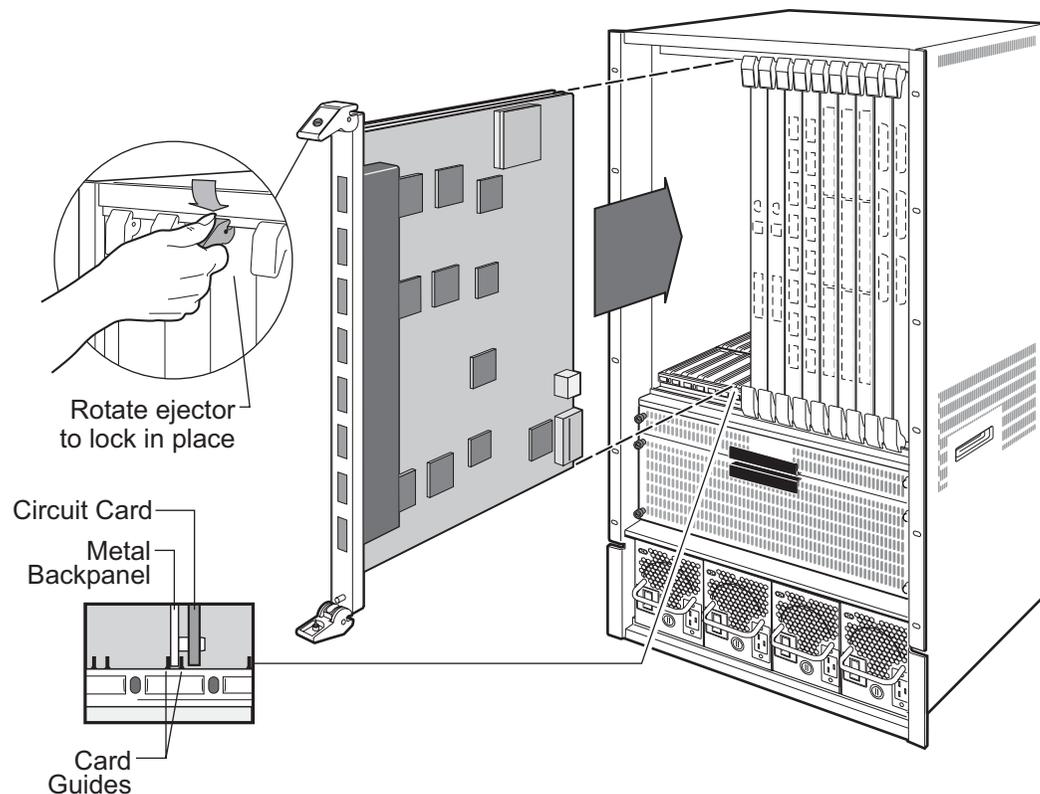
4. **Slide the line card all the way into the slot**, firmly but gently pressing the line card fully in place to ensure that the pins on the back of the line card are completely seated in the backplane.

5. To lock the line card into the slot, **close the ejectors**. Using a straight-slot screwdriver, tighten the screw on each ejector.

6. **Repeat the above steps** for the remaining cards.

7. When you are ready to **attach the segment cables**, use the procedures in *Attaching the Patch Cables* on page 105.

Installing the ATM PHY Cards

Each ATM line card has two slots available for PHY cards. One ATM PHY card can be installed into each available slot. You will need a #2 Phillips screwdriver to perform this procedure. Figure 36 shows an example of how to install a PHY card. The procedure following the figure describes how to do this.

Figure 36. Installing an ATM PHY Card

Captive Screw
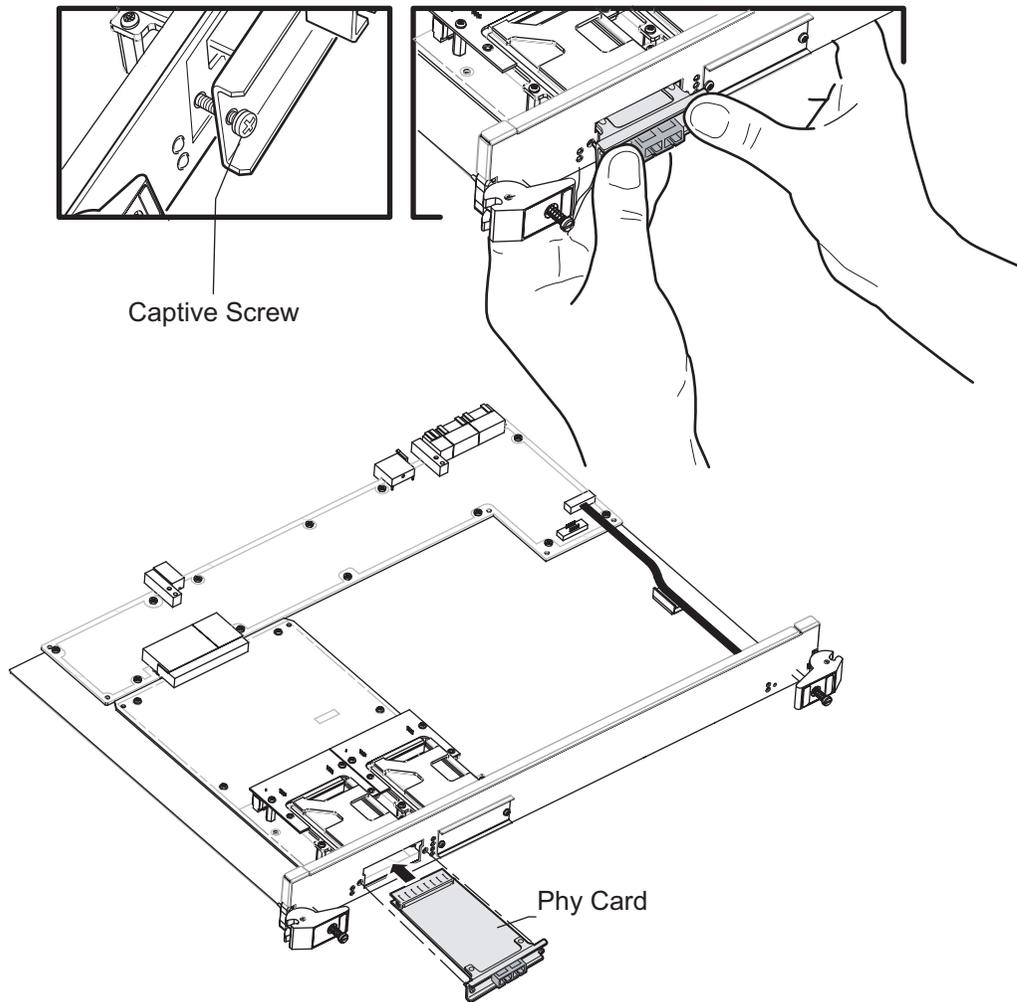
Phy Card

To install a PHY card into an ATM line card:

1. Use a Phillips screwdriver to loosen the two captive screws that hold the option slot cover in place.

2. Save the option slot cover.

3. Hold the PHY card by the edges and position it so that it is parallel with the slot opening.

4. Insert the PHY card through the opening in the system unit by aligning the sides of the PHY card with the card guide.

5. Push the PHY card into the slot until the 96-pin connector is firmly seated on the motherboard.

6. Fasten the PHY card to the system unit with the two captive screws. Torque to 5 in-lb (0.56 N-m).

Connecting ATM PHY Cards

The following are instructions on how to attach cables to the various PHY interface cards.

APHY-67 and APHY-77

To attach the segment cables to your APHY-67 and APHY-77 card:

1. Align the transmit cable connector with the transmit port and the receive cable connector with the receive port.

2. Push one connector into the PHY port and rotate clockwise 1/4 turn to lock it in place.

3. Repeat step 2 for the second cable.

APHY-82V

To attach the segment cables to your APHY-82V card:

1. Align the key of the modular jack (MJ) plug with the locking key of the MJ receptacle.

2. Push the MJ plug into the receptacle until the plug mates fully with the locking key. You will hear a snapping sound when the locking key engages.

Note: The APHY-82V is not a T1 interface. It merely allows you to connect to a T1 CSU—the T1 CSU will allow you to connect to a T1 circuit.

APHY-92V

To attach the segment cables to your APHY-92V card:

1. Align the key of the modular jack (MJ) plug with the locking key of the MJ receptacle.

2. Push the MJ plug into the receptacle until the plug mates fully with the locking key. You will hear a snapping sound when the locking key engages.

Note: The APHY-92V is not an E1 interface. It merely allows you to connect to an E1 CSU— the E1 CSU will allow you to connect to an E1 circuit.

APHY-21 and APHY-29IR

To attach the segment cables to your APHY-21 and APHY-29IR card:

1. Remove the dust caps from the PHY port and cable.

2. Line up the transmit cable connector with the transmit port and the receive cable connector with the receive port. Insert the connectors, ensuring that the key is correctly positioned.

APHY-22

To attach the segment cables to your APHY-22 card:

1. Align the key of the modular jack (MJ) plug with the locking key of the MJ receptacle.

2. Push the MJ plug into the receptacle until the plug mates fully with the locking key. You will hear a snapping sound when the locking key engages.

Installing the GBIC Modules

Each GBIC line card has four or eight slots available for GBIC modules. One GBIC module can be installed into each available slot. Figure 37 shows an example of a GBIC module. The procedure following the figure describes how to install the module into the GBIC line card.

Figure 37. GBIC Module
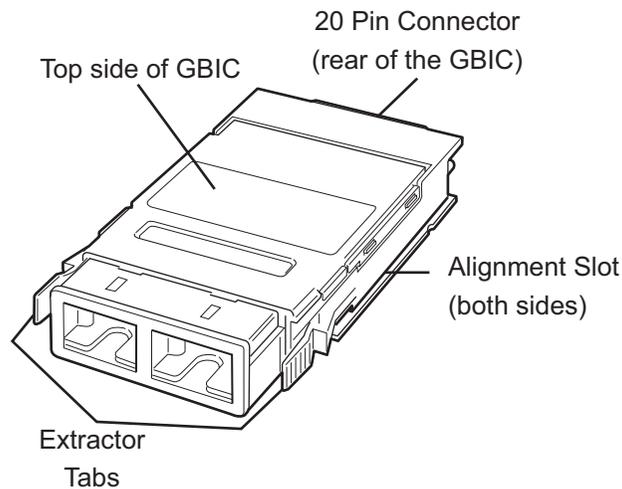
To install a GBIC module into a GBIC line card:

1. Hold the GBIC module by the edges with the network port facing away from the line card. Position it so that it is parallel with the slot opening. The 20-pin connector should be facing toward the empty GBIC slot of the line card, as in Figure 38.

Figure 38. Inserting a GBIC Module
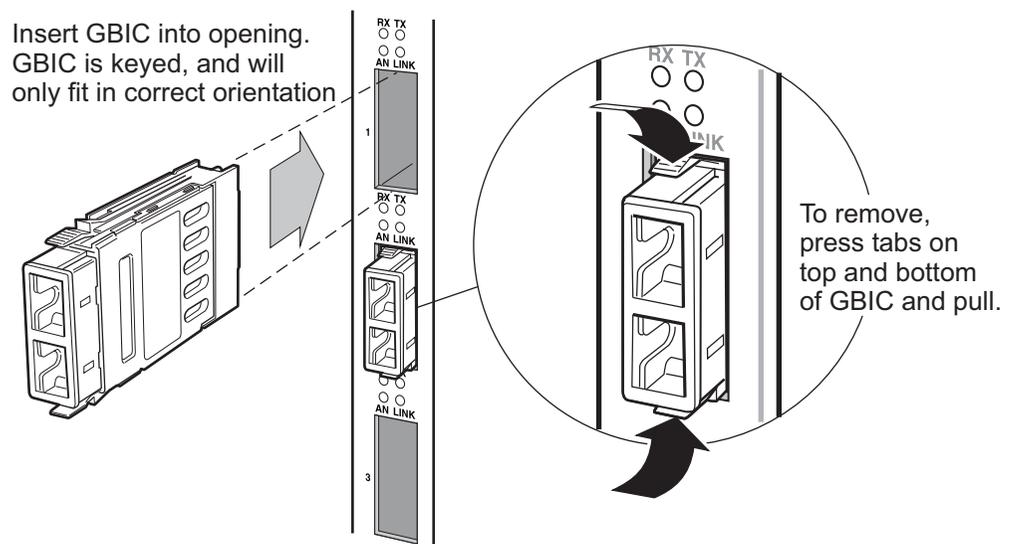
The alignment slot on the GBIC module must line up with the alignment guides inside the GBIC slot. The top of the GBIC must be next to the hinged side of the GBIC slot door of the line card, as shown in Figure 38.

2. Gently insert the GBIC module into the GBIC slot opening in the line card. The GBIC door on the line card folds in and the hinges engage the alignment slots on the sides of the GBIC module.

Note: If the GBIC module does not go in easily, do not force it. If the GBIC is not oriented properly, it will stop about one quarter of the way into the slot and it should not be forced any further. Remove and reorient the GBIC module so that it slides easily into the slot.

3. Push the GBIC module in until the connector engages the 20-pin port. The GBIC is now installed.

Attaching the Console Management Cable

The control module has one port for attaching management consoles to the ER16. An RJ-45 10/100Base-T DTE port for Telnet connection from a host on the network. The port is configured for Media Data Interface (MDI). You use this port to manage the ER16 using the Command Line Interface (CLI) or SNMP.

Connecting to the 10/100Base-TX Port

To attach a cable to the 10/100Base-TX port:

1. Obtain a cable with an RJ-45 connector. Pin 1 (TXD or "transmit data") must emerge on the management console's end of the connection as RXD ("receive data") and so on. See Table 21 for pin assignments for the RJ-45 connectors. Figure 39 shows the pin positions in the RJ-45 connector.

Table 21. RJ-45 10/100Base-TX DTE Port Pin Assignments

Pin	Connection
1	TX + Diff Output
2	TX - Diff Output
3	RX + Diff Output
4	Unused
5	Unused
6	RX - Diff Output
7	Unused
8	Unused

Figure 39. RJ-45 connector

87654321
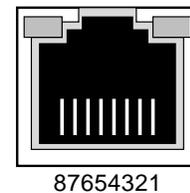
2. After ensuring that the pin assignments on both ends of the connection are correct, plug the appropriate end of the connection into the control module's RJ-45 10/100Base-TX port.

3. Plug the other end of the connection into the management console's port.

4. When you are ready to begin configuring the ER16, use the procedures in Chapter 3 to power on the switch and boot the software. You will perform initial setup by entering CLI commands on the management console.

Attaching the Patch Cables

The following sections describe how to connect the ER16 line cards to your network.

24-Port 10/100Base-TX Line Card

To attach the patch cables to your 24-port 10/100Base-TX line cards:

1. For all the 10/100-Mbps ports, obtain copper cables that have the pin assignments shown in Table 22 below. The RJ-45 connectors on the 10/100Base-TX line cards are configured as Media Data Interface Crossed (MDIX). You can use Category 3 ("Cat-3") or higher wire for 10-Mbps segments. For 100-Mbps segments, use Cat-5 or higher wire. The ports automatically sense which type of segment they are connected to and configure themselves to transmit and receive at the appropriate bandwidth. Figure 40 shows the pin positions in the RJ-45 connector.

Table 22. RJ-45 10/100Base-TX DTE Port Pin Assignments

Pin	Connection
1	RX + Diff Output
2	RX - Diff Output
3	TX + Diff Output
4	Unused
5	Unused
6	TX - Diff Output
7	Unused
8	Unused

Figure 40. RJ-45 Connector

87654321
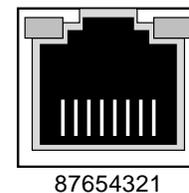
2. Plug one end of the cable into the line card and the other end into the hardware at the other end of the connection.

32-Port 10/100Base-TX Line Card

To attach the patch cables to your 32-port 10/100Base-TX line cards:

1. Obtain cables with 50-pin RJ-71 Telco connectors. (See *RJ-71 Pin Assignments* on page 106 for RJ-71 connector port pin assignments.)

2. Attach a cable from the patch panel to the RJ-71 connector on the line module.

Note: The third RJ-71 connector has only 8 active ports. Therefore, it uses only 32 of the 50 connector pins.

Table 23. RJ-71 Pin Assignments

Pin	Connection	Pin	Connection
1	RX 1 - Crossed twisted pair	2	TX 1 - Crossed twisted pair
3	RX 2 - Crossed twisted pair	4	TX 2 - Crossed twisted pair
5	RX 3 - Crossed twisted pair	6	TX 3 - Crossed twisted pair
7	RX 4 - Crossed twisted pair	8	TX 4 - Crossed twisted pair
9	RX 5 - Crossed twisted pair	10	TX 5 - Crossed twisted pair
11	RX 6 - Crossed twisted pair	12	TX 6 - Crossed twisted pair
13	RX 7 - Crossed twisted pair	14	TX 7 - Crossed twisted pair
15	RX 8 - Crossed twisted pair	16	TX 8 - Crossed twisted pair
17	RX 9 - Crossed twisted pair	18	TX 9 - Crossed twisted pair
19	RX 10 - Crossed twisted pair	20	TX 10 - Crossed twisted pair
21	RX 11 - Crossed twisted pair	22	TX 11 - Crossed twisted pair
23	RX 12 - Crossed twisted pair	24	TX 12 - Crossed twisted pair
25	Unused	26	RX 1 + Crossed twisted pair
27	TX 1 + Crossed twisted pair	28	RX 2 + Crossed twisted pair
29	TX 2 + Crossed twisted pair	30	RX 3 + Crossed twisted pair
31	TX 3 + Crossed twisted pair	32	RX 4 + Crossed twisted pair
33	TX 4 + Crossed twisted pair	34	RX 5 + Crossed twisted pair
35	TX 5 + Crossed twisted pair	36	RX 6 + Crossed twisted pair
37	TX 6 + Crossed twisted pair	38	RX 7 + Crossed twisted pair
39	TX 7 + Crossed twisted pair	40	RX 8 + Crossed twisted pair
41	TX 8 + Crossed twisted pair	42	RX 9 + Crossed twisted pair
43	TX 9 + Crossed twisted pair	44	RX 10 + Crossed twisted pair
45	TX 10 + Crossed twisted pair	46	RX 11 + Crossed twisted pair
47	TX 11 + Crossed twisted pair	48	RX 12 + Crossed twisted pair
49	TX 12 + Crossed twisted pair	50	Unused

Figure 41 shows the pin positions in the RJ-71 connector.

Figure 41. RJ-71 Connector

Pins 1-25 (top row)

Pins 26-50 (bottom row)
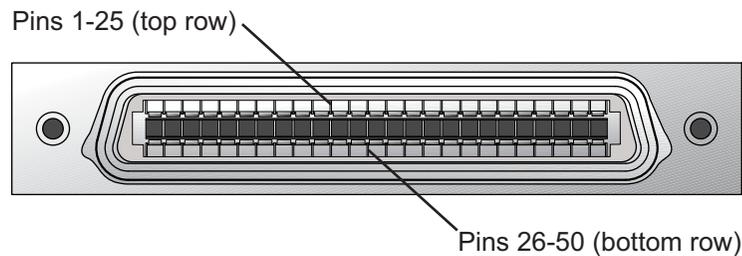
8-port Gigabit Ethernet 1000Base-SX Line Card

The 1000Base-SX line card uses SC-style Media Interface Connectors (MICs) to attach to multi-mode fiber (MMF) cables.

To attach the segment cables to your 1000Base-SX line card:

1. Obtain an MMF cable with an SC MIC and plug the MIC into the port connector.

2. When you plug the other end of the cable into another device, ensure that the cable connected to the transmit port on the ER16 is connected to the receive port on the other device. The receive port on the ER16 should be connected to the transmit port on the other device.

GBIC Line Card

The following are instructions on how to attach segment cables to the PHY interface cards for the GBIC line cards:

1. Remove the dust caps from the PHY port and cable.

2. Line up the transmit cable connector with the transmit port and the receive cable with the receive port. Insert the connectors, ensuring that the key is correctly positioned.

Chapter 3

Software Installation and Setup

This chapter provides the following X-Pedition ER16 software installation and basic setup procedures:

- Installing the PCMCIA card (if you are upgrading from the software version on the ER16's boot flash)

- Powering on the ER16 and booting the software

- Starting the Command Line Interface (CLI)

- Using the CLI to add an IP interface, subnet mask, and default gateway

- Setting up passwords

- Setting up an SNMP community string and trap target

- Setting the DNS server's IP address(es) and domain name

- Setting the SYSLOG server and message level

- Activating and saving configuration changes

Installing a PCMCIA Flash Card

The control module PCMCIA flash card contains a version of the system image software that is installed at the factory. If you have a more recent system image and want to boot the ER16 using the newer software, you must boot either from a PCMCIA card or from a TFTP server.

To install a PCMCIA card:

1. Power off the ER16. You cannot install or remove a PCMCIA card while the ER16 is running.

2. Insert the PCMCIA card into the right slot of the control module. Alternately, you may manually configure the left slot to accept the PCMCIA card.

Note: Even though there are two slots on the control module, you cannot use two PCMCIA cards at the same time

Figure 42. Install a PCMCIA Flash Card in a Control Module
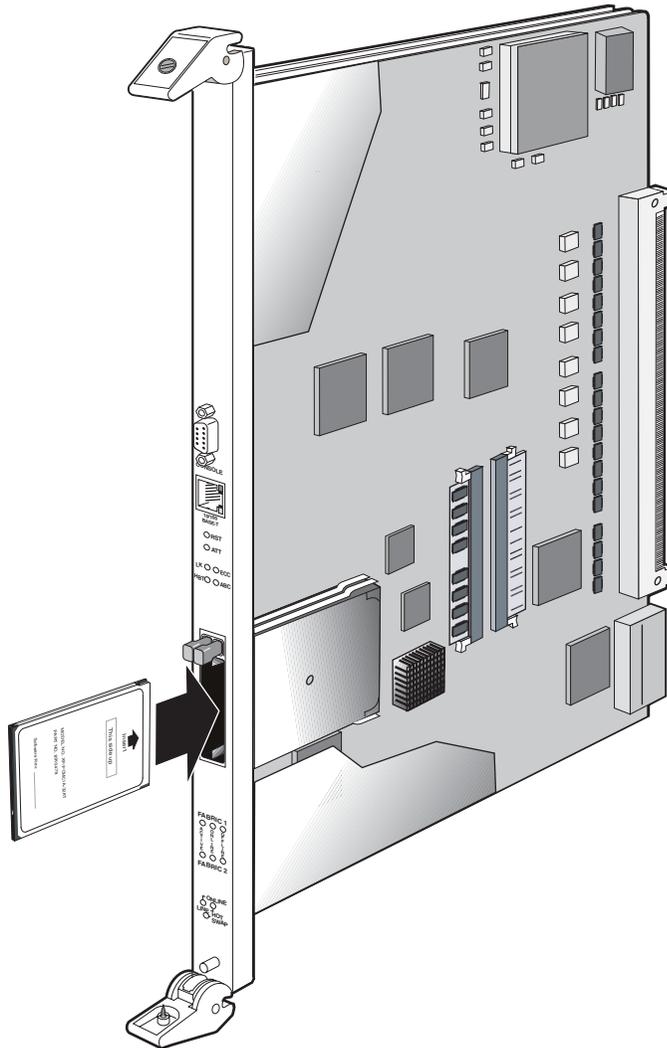
3. Lock the PCMCIA card into the slot by pushing the PCMCIA card all the way into the slot.

4. Power on the ER16. (See *Powering On and Booting the Software* on page 112.)

5. To verify proper installation of the PCMCIA card, do one of the following:

   – Reboot the system and watch the boot messages for the messages shown in bold type in the following example:

   ```
   %SYS-I-FLASHCRD, Mounting 8MB Flash card
   %SYS-I-FLASHMNTD, 8MB Flash card mounted
   %SYS-I-INITSYS, initializing system (unknown)
   %SYS-I-DSCVMOD, discovered 'control module' module in slot CM
   %SYS-I-DSCVMOD, discovered '10/100-TX' module in slot CM/1
   %SYS-I-DSCVMOD, discovered '10/100-TX' module in slot 3
   %SYS-I-DSCVMOD, discovered '10/100-TX' module in slot 4
   %SYS-I-DSCVMOD, discovered '10/100-TX' module in slot 7
   %SYS-I-INITPORT, initialized slot CM/1, port 1
   %SYS-I-INITPORT, initialized slot CM/1, port 2
   %SYS-I-INITPORT, initialized slot CM/1, port 3
   %SYS-I-INITPORT, initialized slot CM/1, port 4
   %SYS-I-INITPORT, initialized slot CM/1, port 5
   %SYS-I-INITPORT, initialized slot CM/1, port 6
   %SYS-I-INITPORT, initialized slot CM/1, port 7
   %SYS-I-INITPORT, initialized slot CM/1, port 8
   %SYS-I-INITPORT, initialized slot 3, port 1
   %SYS-I-INITPORT, initialized slot 3, port 2
   %SYS-I-INITPORT, initialized slot 3, port 3
   %SYS-I-INITPORT, initialized slot 3, port 4
   %SYS-I-INITPORT, initialized slot 3, port 5
   %SYS-I-INITPORT, initialized slot 3, port 6
   %SYS-I-INITPORT, initialized slot 3, port 7
   %SYS-I-INITPORT, initialized slot 3, port 8
   ```

   – Run the following command to display the boot log and look for the messages shown in the example above:

   ```
   system show bootlog
   ```

Note: If the message "SYS-E-NOFLASHCARD" appears, the system has not detected a PCMCIA card. Check to ensure that the card is properly inserted, then reboot. If the system still does not recognize the card, contact Enterasys Networks. (See *Getting Help* on page xi.)

Powering On and Booting the Software

To power on the ER16 and boot the software:

1. Make sure any exposed expansion slots are free of foreign objects, such as tools or your hands, and are covered with coverplates.

2. Plug the ER16's power supplies into a power source. Assuming that your power source is currently active, the router will automatically power on and attempt to boot using the software image in the motherboard's boot flash.

   While the software is booting, the HBT (heartbeat) LED on the chassis flashes. When the software finishes booting, the HBT LED goes dark and the OK LED lights up, indicating that the ER16 software is online.

   As the software boots, the management console attached to the ER16's DB-9 DCE port displays messages related to the phases of the boot sequence. When the software is fully booted, the following message appears on the management console:

Press RETURN to activate console...

3. Press Return (or Enter) to activate the CLI on the console.

Starting the Command Line Interface

After the software has successfully booted, and you press Return (or Enter) to activate the CLI, the CLI prompts you for a password. You can define separate passwords for login access and Enable mode. The factory default password for both of these is set to blank. (Simply press Return.)

Access Modes

The CLI has the following access modes:

*   **User** – Allows you to display basic information and use basic utilities such as ping but does not allow you to display SNMP, filter and access control list information, or make other configuration changes. You can tell you are in User mode when the command prompt ends with a "\>" character.

*   **Enable** – Allows you to display SNMP, filter, and access control information as well as all the information you can display in User mode. To enter Enable mode, enter the **enable** command, then supply the password when prompted. When you are in Enable mode, the command prompt ends with a "#" character.

*   **Configure** – Allows you to make configuration changes. To enter Configure mode, first enter Enable mode (**enable** command), then enter the **configure** command from the Enable command prompt. When you are in Configure mode, the command prompt ends with "(config)#."

*   **Boot** – This mode appears when the system image is not found during bootup. You should enter the **reboot** command to reset the router. If the ER16 still fails to boot up, please call Enterasys Networks Technical Support.

    Note: The command prompt will show the name of the ER16 in front of the mode character(s). The default name is "xp." The procedure in *Setting Basic System Information* on page 114 describes how to change the system name.

When you are in Configure or Enable mode, use the **exit** command or press Ctrl+Z to exit to the previous access mode.

Note: When you exit Configure mode, the CLI will ask you whether you want to activate the configuration commands you have issued. If you enter **yes** or **y**, the configuration commands you issued are placed into effect and the ER16's configuration is changed accordingly. However, the changes are not written to the Startup configuration file in the ER16's boot flash and therefore are not reinstated after a reboot. See *Activating Configuration Changes and Saving the Configuration File* on page 123 for information about saving configuration changes.

Basic Line Editing Commands

The CLI supports EMACs-like line editing commands. The following table lists some commonly used commands. For a complete set of commands, see the *X-Pedition User Reference Manual*.

Table 24. Some Commonly Used CLI Commands

Key sequence	Command
Ctrl+A	Move cursor to beginning of line
Ctrl+B	Move cursor back one character
Ctrl+D	Delete character
Ctrl+E	Move cursor to end of line
Ctrl+F	Move cursor forward one character
Ctrl+N	Scroll to next command in command history (use the **cli show history** command to display the history)
Ctrl+P	Scroll to previous command in command history
Ctrl+U	Erase command line up to cursor
Ctrl+X	Move cursor to beginning of the next word in the command line
Ctrl+Z	Exit current access mode to previous access mode

Setting Basic System Information

Use the procedure in this section to set the following system information:

- System time and date

- System name

- System location

- Contact name (the person to contact regarding this router)

Note: Some of the commands in this procedure accept a string value. String values can be up to a maximum of 255 characters in length, including blank spaces. Surround strings that contain blanks with quotation marks (example: **"string with internal blanks"**).

To set the system information:

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.

2. Use the following commands to set the system time and date. Then verify the setting through the **system show date** command.

> system set date year *<number>* month *<month-name>* day *<day>* hour *<hour>* minute *<minute>* second *<second>*

3. Ensure that you are in Configure mode by entering the **configure** command in the CLI. The commands in Step 4 through Step 9 can be entered only from Configure mode.

4. Use the following commands to set the system name, location, and contact information:

> system set name *<string>*
> system set location *<string>*
> system set contact *<string>*

5. Use the **interface add ip** command to set the IP address and netmask for the en0 Ethernet interface.

   Note: The en0 interface is automatically created by the system and is reserved for the ER16's management port.

6. To show the changes accumulated in the scratchpad, enter the **show** command while in Configure mode.

   When you enter commands in Configure mode, the ER16 does not immediately execute the commands. Instead, the ER16 checks the syntax of the commands and if they are syntactically correct, stores them in a temporary scratchpad in memory. The scratchpad is automatically cleared when you log out of the X-Pedition router, so you must activate the changes and then save them to the Startup configuration file to retain the changes, as explained below.

   The scratchpad allows you to make configuration changes without worrying about the order in which you issue the commands. Also, if you change your mind about configuration changes you are making, you do not need to incrementally back out of the changes. You can simply choose not to activate them. As you become more familiar with the ER16 and the CLI and begin to make detailed configuration changes, you may find the scratchpad quite useful. For simple changes such as the ones in this procedure, you might instead want to activate the changes as you go, then use CLI commands to view the results of the changes.

7. Enter the **save active** command to activate commands, such as the **"system set..."** commands used in Step 4, in the scratchpad. Then enter the **exit** command or press Ctrl+Z to exit Configure mode.

   Or

   If you exit Configure mode (by entering the **exit** command or pressing Ctrl+Z) before activating any of your changes in the scratchpad, the CLI will ask you whether you want to make the changes in the scratchpad active. Enter **yes** or **y** to activate the changes.

8. To display the active configuration, enter the **system show active-config** command.

   Changes in the active configuration take effect on the running system but will not be restored following a reboot.

9. To ensure that changes are restored following a reboot, you must save the active database to the Startup configuration file by taking the following steps:

   a. Ensure that you are in Enable mode by entering the **enable** command in the CLI.

   b. Enter the **copy active to startup** command.

   The CLI displays the following message:

   > **Are you sure you want to overwrite the Startup configuration [no]?**

10. Enter **yes** or **y** to add the active configuration to the Startup configuration file.

Note: You also can save active changes to the Startup configuration file from within Configure mode by entering the **save startup** command.

See *Activating Configuration Changes and Saving the Configuration File* on page 123 for more information about the scratchpad, active database, and Startup configuration.

Setting Up SNMP Community Strings

To use SNMP to manage the ER16, you need to set up an SNMP community on the ER16. Otherwise, the ER16's SNMP agent runs in local trap process mode until you disable it using the **snmp stop** command. In addition, if you want to be able to access the SNMP traps issued by the ER16's SNMP agent, you need to specify the IP address of the target for the SNMP traps.

To add the SNMP community string and specify the target for traps, take the following steps:

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.

2. Ensure that you are in Configure mode by entering the **configure** command in the CLI.

3. Use the **snmp set community** and **snmp set target** commands to add an SNMP community string and set a target for the traps.

   Note: Because the ER16 is not yet running a routing protocol, the target IP address must be locally attached to the router. You may not specify a target that is connected to the ER16 by another router. If the IP address is more than one hop away from the ER16, configure the router with a static route to the target so that the SNMP traps may be sent.

4. Enter the **show** command to examine the changes accumulated in the scratchpad.

5. Enter the **save active** command to activate the commands you entered in the previous steps.

6. Enter the **exit** command or press Ctrl+Z to exit Configure mode.

7. To verify the changes, enter the **snmp show all** command.

8. After verifying the SNMP configuration, save the changes to the Startup configuration file by entering the **copy active to startup** command.

Remember to enter **yes** or **y** when the CLI asks you whether you want to overwrite the Startup configuration.

Setting Up Passwords

By default, the ER16 operates in single-user mode with password access enabled and no passwords defined. To define a password for Login, Enable, or Configure mode, use the **system set password** command from Configure mode. The following example sets an Enable mode password:

```
xp(config)# system set password enable MyPassword
```

Note: Passwords are *case sensitive*. In other words, the ER16 recognizes upper- and lower-case letters as different characters (for example, "M" is not the same as "m").

Note: You must set the password for each mode individually (that is, you may use a different password for each mode). If a password is configured for Enable mode, the ER16 asks for the password when you enter the **enable** command. If no password is defined, the ER16 will advise you to configure a password, then switch to Enable mode—from here you can access Configure mode and make configuration changes. Access to Configuration mode may be configured to require a password.

Multi-user mode password security employs individual user accounts to grant CLI permissions on a case-by-case basis—this requires that each user log in via username and password. The ER16 supports up to 256 concurrent user accounts (although you may still employ either protocol, multi-user accounting no longer requires TACACS+ or RADIUS).

The default password for each access level is blank. (Simply press Enter or Return without entering a password.) If you want to add password protection to the CLI, use the following procedure. For detailed information on passwords and configuring a password policy, consult the *X-Pedition User Reference Manual*.

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.

2. Ensure that you are in Configure mode by entering the **configure** command in the CLI.

3. Use the **system set password** command for each password you want to set.

4. Enter the **show** command to examine the changes accumulated in the scratchpad.

5. Enter the **save active** command to activate the commands.

6. Enter the **exit** command or press Ctrl+Z to exit Configure mode.

7. Enter the **system show active-config** command to verify the active changes.

Caution: Test all the new passwords before saving the active configuration to the Startup configuration file. As shown in the example above, the passwords are shown in the active configuration in an encrypted format and will also appear this way in the Startup configuration.

To keep your passwords secure, the ER16 does not have a command for displaying passwords. If you forget a password, you can remove the password by entering the following command while in Configure mode. (See the *X-Pedition NATIVE Command Line Interface Reference Manual* for more information.)

```
system set password login|enable none
```

Setting the DNS Domain Name and Address

If you want the ER16 to be able to access a DNS server, use the following procedure to specify the domain name and IP address for the DNS server.

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.

2. Use the **ping** command to verify that the ER16 can reach the DNS server.

3. Ensure that you are in Configure mode by entering the **configure** command in the CLI.

4. If you have not done so already, use the **interface add ip** command to set the IP address and netmask for the en0 Ethernet interface.

    Note: The en0 interface is automatically created by the system and is reserved for the ER16's management port.

5. Use the **system set dns domain** command to specify the domain name for which the DNS server(s) have authority:

```
system set dns domain <domain-name>
```

    where *<domain-name>* is your specified domain name (example: **mktg.company.com**).

6. Use the following command to "add" one or more DNS servers to the ER16:

```
system set dns server ["]<IP-address> [<IP-address>] [<IP-address>]["]
```

    where *<IP-address>* is the IP address of the DNS server. You can specify up to three DNS servers.

    Note: If you specify more than one IP address, you must separate the addresses with a space and surround them with a single pair of quotes. You do not need to surround a single IP address with quotes.

7. Enter the **save active** command to activate the commands and enter **yes** or **y** to activate the changes.

8. Return to Enable mode by entering the **enable** command in the CLI.

9. Enter the **system show dns** command to verify the new DNS settings.

10. Use the **ping** command to verify that the ER16 can resolve the DNS server name into its IP address.

Setting SYSLOG Parameters

The CLI can use SYSLOG messages to communicate the following types of messages to a SYSLOG server:

- **Fatal**—Provide information about events that caused the ER16 to crash and reset.

- **Error**—Provide information about errors.

- **Warning**—Provide warnings against invalid configuration information and other conditions that are not necessarily errors. This is the default.

- **Audit**—Audit messages are used as an audit *trail* to aid in keeping the router secure by reporting events as they occur and information about the user who caused each event.

- **Informational**—Provide informational messages such as status messages. The SYSLOG messages that the ER16 displays while booting the software and reading the startup configuration file are examples of Informational messages.

The ER16 writes the SYSLOG messages to a SYSLOG daemon on UDP port 514. You can set the CLI to send all or only some of the message types. By default, the CLI sends warning, error, and fatal messages but not informational messages to the specified SYSLOG server.

Use the following procedure to specify the SYSLOG server and the types of messages you want the CLI to log on the server.

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.

2. Use the **ping** command to verify that the ER16 can reach the SYSLOG server.

3. Ensure that you are in Configure mode by entering the **configure** command in the CLI.

4. If you have not already done so, use the **interface add ip** command to set the IP address and netmask for the en0 Ethernet interface.

   Note: The en0 interface is automatically created by the system and is reserved for the ER16's management port.

5. Use the following command to "add" the SYSLOG server to the ER16, set the message level, and set the SYSLOG facility:

   > **system set syslog** [**server** *<hostname-or-IPaddr>*] [**local**] [**level** *<level-type>*] [**facility** *<syslog-facility-type>*] [**source** *<source-IPaddr>*] [**buffer-size** *<size>*]

6. Enter the **show** command to verify that the command you just entered is listed in the scratchpad section of the output.

   Note: The other configuration changes made during this CLI session are also listed. Active changes are listed in the "Running system configuration section" and un-activated changes are listed in the "Non-committed changes in Scratchpad" section.

7. To activate the SYSLOG commands, enter the **save active** command.

Loading System Image Software

The ER16 operates using the system image software installed on the external PCMCIA flash card. To upgrade the system software and operate using the upgraded image, use the following procedure:

1. Enter the **enable** command in the CLI to enter Enable mode.

2. To display the current boot settings, enter the **system show version** command.

```
xp-1# system show version
 Software Information
 Software Version : E9.1.3.0
 Copyright       : Copyright (c) 2003 Enterasys Networks
 Image Information  : Version E9.1.3.0, built on Mon Mar 24 16:33:45 2003
 Image Boot Location: slot0:boot/E9130/
 Boot Prom Version  : prom-E3.2.0.0
```

Note: In this example, the location "slot0:boot" indicates that the ER16 is set to use the factory-installed system software on the external PCMCIA flash card in the upper slot.

3. Copy the software upgrade you want to install onto a TFTP server that the ER16 can access. Use the **ping** command to verify that the ER16 can reach the TFTP server.

4. Enter the **system image add** command to copy the software upgrade onto the X-Pedition's external PCMCIA flash card.

5. Enter the **system image list** command to verify that the new image exists on the external PCMCIA flash card.

6. Use the **system image choose** command to select the image file the ER16 will use the next time you reboot.

```
system image choose <file-name>
```

7. Enter the **system image list** command to verify the change.

Note: You do not need to activate this change.

Loading Boot Firmware

The ER16 boots using the Boot Firmware installed in its internal PROM memory. To upgrade the Boot Firmware and boot using the upgraded image, use the following procedure.

Note: X-Pedition routers use two versions of the boot PROM Firmware—one for the X-Pedition 2000 line and another for the X-Pedition 8000/8600 and ER16 lines. When you install a new boot PROM image, check the version before you begin. Installing the incorrect image may cause serious problems.

1. Enter the **enable** command in the CLI to enter Enable mode.

2. Enter the **system show version** command to display the current boot settings.

```
xp-1# system show version
 Software Information
 Software Version   : E9.1.3.0
 Copyright        : Copyright (c) 2003 Enterasys Networks
 Image Information  : Version E9.1.3.0, built on Mon Mar 24 16:33:45 2003
 Image Boot Location: slot0:boot/E9130/
 Boot Prom Version  : prom-E3.2.0.0
```

3. Copy the boot firmware upgrade you want to install onto a TFTP server that the ER16 can access. Use the **ping** command to verify that the ER16 can reach the TFTP server.

4. Use the **system promimage upgrade** command to copy the boot firmware upgrade into the ER16's internal PROM memory.

```
system promimage upgrade tftp-server <IPaddr-or-hostname> file-name <filename> destination
primary-cm
```

When this procedure is complete, the phrase "Programming complete" appears on the screen.

5. To verify that the new Boot Firmware is on the ER16's internal PROM memory, reboot the router and enter the **system show version** command.

Note: Until you reboot the router, entering the **system show version** command will display the old bootprom version.

Activating Configuration Changes and Saving the Configuration File

The ER16 uses three special configuration files:

- **Active** – The commands from the Startup configuration file and any configuration commands that you have made active from the scratchpad (see below).

Caution: The active configuration remains in effect only during the current power cycle. If you power down or reboot the ER16 without saving the active configuration changes to the Startup configuration file, the changes are lost.

- **Startup** – The configuration file that the ER16 uses to configure itself when the system is powered on.

- **Scratchpad** – The configuration commands you have entered during a management session. These commands do not become active until you explicitly activate them. Because some commands depend on other commands for successful execution, the ER16 scratchpad simplifies system configuration by allowing you to enter configuration commands in any order, even when dependencies exist. When you activate the commands in the scratchpad, the ER16 sorts out the dependencies and executes the command in the proper sequence.

Activating the Configuration Commands in the Scratchpad

The configuration commands you have entered using procedures in this chapter may be in the Scratchpad only, and have not yet been activated. Use the following procedure to activate the configuration commands in the scratchpad:

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.

2. Ensure that you are in Configure mode by entering the **configure** command in the CLI.

3. Enter the **save active** command.

   If you exit Configure mode (by entering the **exit** command or pressing Ctrl+Z) before activating any of your changes in the scratchpad, the CLI will ask you whether you want to make the changes in the scratchpad active by displaying the following message:

Do you want to make the changes Active [yes]?

4. Enter **yes** or **y** to activate the changes.

Saving the Active Configuration to the Startup Configuration File

After you save the configuration commands in the scratchpad, the ER16 executes the commands and makes the corresponding configuration changes. However, if you power down or reboot the ER16, the new changes are lost. Use the following procedure to save the changes into the Startup configuration file so that the ER16 reinstates the changes when you reboot the software.

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.

2. Enter the **copy active to startup** command to copy the configuration changes in the Active configuration to the Startup configuration.

    The CLI displays the following message:

Are you sure you want to overwrite the Startup configuration [no]?

3. Enter **yes** or **y** to save the changes.

Note: You also can save active changes to the Startup configuration file from within Configure mode by entering the **save startup** command.

The new configuration changes are added to the Startup configuration file stored in the ER16's boot flash.

Viewing the Current Configuration

If you want to view the current configuration:

1. Ensure that you are in Enable mode by entering the **enable** command in the CLI.

2. Enter the following command to display the status of each command line:

system show active-config

    The CLI displays the active configuration file with the following possible annotations:

    –   Commands without errors are displayed without any annotation.

    –   Commands with errors are annotated with an "E".

– If a particular command has been applied such that it can be expanded on additional interfaces/modules, then it is annotated with a "P". For example, if you enabled stp on all ports in the current system, however, the ER16 contains only 1 module, then that particular command could be expanded at a later date when more modules have been added to the ER16.

A command like **stp enable et.*.*** would be displayed as follows:

P: stp enable et.*.*

indicating that it is only partially applied. If you add more modules to the ER16 at a later date and then update the configuration file to encompass all of the available modules in the ER16, then the "P:" portion of the above command line would disappear when displaying this configuration file.

If a potentially partial command, which was originally configured to encompass all of the available modules on the ER16, becomes only partially activated (after a hot swap or some such chassis reconfiguration), then the status of that command line will automatically change to indicate a partial completion status, complete with "P:".

Note: Commands with no annotation or annotated with a "P:" are not in error.

Appendix A

Troubleshooting

If you experience difficulty with the basic hardware or software setup procedures in this guide, check the following table. If you find a description of the difficulty you are experiencing, try the recommended resolution.

If the resolution does not remove the difficulty or it is not listed in this appendix, see *Getting Help on page xi* for information about contacting Enterasys Networks for technical support.

If You Experience This Difficulty...	Try this Remedy...
The X-Pedition ER16 exhibits no activity (no LEDs are on, the fan module is not operating, and so on).	Make sure the power supply is installed and plugged into a power source and the power source is active. Also check to see whether the switch on the power supply is in the ON position.
The power supply is installed but is not operating.	Check the power cable and the circuit to which the power supply is connected.

If You Experience This Difficulty...	Try this Remedy...
The fan module is not active.	Check the power cord and the circuit to which the power supply is connected. If the green status LED on the power supply indicates that the fan is active, power down the chassis immediately, unplug the power supply, and contact Enterasys Networks Technical Support. The fan module may be improperly connected or damaged. If the status LED is red, at least one fan is slow or has failed. Check to see that the fan is not obstructed. If clearing the obstruction does not resolve the problem (or if the problem persists), change the fan tray. If the status LED is not on, the power is turned off or the fan tray is faulty.
The control module is not active.	Check the power cable and the circuit to which the power supply is connected. If the power supply is working, make sure the control module is inserted all the way into its slot in the chassis and the captive screws are screwed in. The control module must be in either slot 8 or 9, and not in a line card slot.
No line cards are active.	Check the power cable and the circuit to which the power supply is connected.
A specific line card is inactive.	Make sure the line card is inserted all the way into the chassis and the captive screws are screwed in.
The chassis LEDs indicate activity but you cannot tell what the ER16 is doing.	Make sure you have properly connected the primary control module to a management console and the console is powered on.
An older software version continues to boot instead of the newer version on a PCMCIA card or TFTP server.	Use the procedure in *Loading System Image Software* on page 121 to configure the ER16 to boot using newer software.
You are unable to access the configuration commands in the CLI.	Enter the **enable** command to access the Enable mode, then enter the **configure** command to access the Configuration mode.
Configuration changes do not seem to be taking effect.	Use the procedure in *Activating Configuration Changes and Saving the Configuration File* on page 123 to activate the changes.

If You Experience This Difficulty...	Try this Remedy...
Configuration changes are not reinstated after a reboot.	Use the procedure in *Activating Configuration Changes and Saving the Configuration File* on page 123 to save the configuration changes to the Startup configuration file.
The ER16 is not resolving DNS names.	Use the procedure in *Setting the DNS Domain Name and Address* on page 119 to set up DNS. If you have already performed this procedure, make sure you can use NS lookup on the DNS server to get the default domain.
An SNMP manager cannot access the ER16.	Use the procedure in *Setting Up SNMP Community Strings* on page 117 to set up an SNMP community string and specify a target for SNMP traps. If you have already performed this procedure, enter the **snmp show all** command to check the SNMP settings. Use the **traceroute** and **ping** commands to verify that the ER16 can reach the SNMP management station.
You are unable to ping a certain host.	Create and add an IP or IPX interface for the host. See the *Enterasys X-Pedition User Reference Manual* for information.

Appendix B

Hardware Components

This appendix contains cabling information about the following hardware components:

- *ER16-04 and ER16-08* on page 132

- *ER16-ATM29-02* on page 133

- *ER16-CM3-128* on page 134

- *ER16-CM4-256* on page 135

- *ER16-FDDI-02* on page 136

- *ER16-GTX32-04* on page 137

- *ER16-GTX32-08* on page 138

- *ER16-HFX31-24 and ER16-HFX39-24* on page 139

- *ER16-HSSI-02-CK* on page 140

- *ER16-OS16-01 and ER16-OS26-01* on page 141

- *ER16-POS21-04 and ER16-POS29-04* on page 142

- *ER16-POS31-02 and ER16-POS39-02* on page 142

- *ER16-SERC-04-AA* on page 143

- *ER16-SERCE-04-A* on page 143

- *ER16-SX-08* on page 144

- *ER16-TX-24* on page 145

- *ER16-TX-32* on page 145

ER16-04 and ER16-08

Table 25. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
MMF	Multi-mode Fiber	300 m (984 ft)	SC
SMF-IR	Single-mode Fiber (Intermediate Range)	10 km (6.21 mi)	SC
SMF-LR	Single-mode Fiber (Long Range)	70 km (43.49 mi)	SC

ER16-ATM29-02

This module operates with the following APHYs (you may purchase them separately from the module) connected to the outside world. For information about these APHYs, consult the Enterasys Networks web site.

XP-APHY-67	XP-APHY-21	XP-APHY-82V
XP-APHY-77	XP-APHY-29IR	
XP-APHY-92V	XP-APHY-22	

The XP-APHY-21 and XP-APHY-29IR use Class 1 Lasers.

Warning: Do not use optical instruments to view laser output. The use of optical instruments to view laser output increases eye hazard.

Advertencia: No utilizar instrumentos opticos para ver el laser. El uso de instrumentos opticos para ver el laser incrementa el riesgo de perdida de la vision.

Warnhinweis: Benutzen sie keinesfalls optische Hilfmittel, um die Funktion des Lasers zu überprüfen, es könnte ihr Augenlicht gefährden.

Note: Before you can remove an APHY, hot swap the host ATM module.

Table 26. Recommended Cable Types and Specifications

Cable	Type	Connector
XP-APHY-82V	Cat 3,4,5 100 ohm UTP (special pinout)	RJ45
XP-APHY-92V	Cat 3,4,5 100 ohm UTP (special pinout)	RJ45

Connector Pin Assignments XP-APHY-82 and XP-APHY-92	
Pin	Connection
1	Receive analog signal
2	Receive reference
3	Pin used for shield reference if you use a shielded cable
4	Transmit analog positive pulse
5	Transmit analog negative pulse
6	Pin used for shield reference if you use a shielded cable

XP-APHY-22	Cat 3,4,5 100 ohm	RJ45
XP-APHY-21	Multi-Mode Fiber	SC
XP-APHY-29IR	Single-Mode Fiber	SC
XP-APHY-67	Co-ax	BNC
XP-APHY-77	Co-ax	BNC

ER16-CM3-128

The ER16-CM3-128 will operate only in slots 8 and 9 of the ER16 chassis.

Table 27. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
Console Port RS232	Serial Cable	7.6 m (25 ft)	DB9
Management Port 10Base-T	Cat. 3, 4, 5 100-ohm UTP	100 m (328 ft)	RJ45
Management Port 100Base-TX	Cat. 5 100-ohm UTP	100 m (328 ft)	RJ45

Table 28. DB9-RS232 Console Port Pin Assignments

Pin	Connection
1	Unused
2	TXD (transmit data)
3	RXD (receive data)
4	Unused
5	Ground
6	DTR (data terminal ready)
7	CTS (clear to send)
8	RTS (request to send)
9	Unused

Table 29. 10/100 Ethernet Management Port Pin Assignments

Pin	Connection
1	TX + Diff Output
2	TX - Diff Output
3	RX + Diff Output
4	Unused
5	Unused
6	RX - Diff Output
7	Unused
8	Unused

ER16-CM4-256

The ER16-CM4-256 will operate only in slots 8 and 9 of the ER16 chassis.

Table 30. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
Console Port RS232	Serial Cable	7.6 m (25 ft)	DB9
Management Port 10Base-T	Cat. 3, 4, 5 100-ohm UTP	100 m (328 ft)	RJ45
Management Port 100Base-TX	Cat. 5 100-ohm UTP	100 m (328 ft)	RJ45

Table 31. DB9-RS232 Console Port Pin Assignments

Pin	Connection
1	Unused
2	TXD (transmit data)
3	RXD (receive data)
4	Unused
5	Ground
6	DTR (data terminal ready)
7	CTS (clear to send)
8	RTS (request to send)
9	Unused

Table 32. 10/100 Ethernet Management Port Pin Assignments

Pin	Connection
1	TX + Diff Output
2	TX - Diff Output
3	RX + Diff Output
4	Unused
5	Unused
6	RX - Diff Output
7	Unused
8	Unused

ER16-FDDI-02

Table 33. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
FDDI Copper	Cat. 3, 4, 5 100-ohm UTP	100 m (328 ft)	RJ45 (XP-FPHY-02)
Multi-mode Fiber	62.5/125	2 km (1.24 mi)	SC (XP-FPHY-01)
Single-mode Fiber	10/125	30 km (18.64 mi)	SC (XP-FPHY-09)

Table 34. Receiver/Transmitter

Receiver Sensitivity		
	MMF	SMF
Minimum	-34 dBm	-33 dBm
Maximum	-31 dBm	-3 dBm

Transmit Power		
	MMF	SMF
Minimum	-20 dBm	-8 dBm
Maximum	-14 dBm	-3 dBm

Table 35. Links

Link Power Budget	
MMF	11 dB
SMF	>10 dB

ER16-GTX32-04

Table 36. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
100Base-TX	Cat. 5 100-ohm UTP	100 m (328 ft)	RJ45

Table 37. RJ45 Connector Pin Assignments

Pin	Connection
1	TRD0 + Diff Output
2	TRD0 - Diff Output
3	TRD1 + Diff Output
4	TRD2 + Diff Output
5	TRD2 - Diff Output
6	TRD1 - Diff Output
7	TRD3 + Diff Output
8	TRD3 - Diff Output

ER16-GTX32-08

Table 38. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
1000Base-TX	Cat. 5 100-ohm UTP	100 m (328 ft)	RJ45

Table 39. RJ45 Connector Pin Assignments

Pin	Connection
1	TRD0 + Diff Output
2	TRD0 - Diff Output
3	TRD1 + Diff Output
4	TRD2 + Diff Output
5	TRD2 - Diff Output
6	TRD1 - Diff Output
7	TRD3 + Diff Output
8	TRD3 - Diff Output

ER16-HFX31-24 and ER16-HFX39-24

ER16-HFX31-24 Connectivity Guidelines

Table 40. 100Base-FX Multi-Mode Fiber Specifications

Fiber Diameter	Modal Bandwidth	Range	Connector
62.5/125 μm	160 MHz/km	2-220 m (7-722 ft)	MT-RJ
	200 MHz/km	2-275 m (7-902 ft)	MT-RJ
50/125 μm	400 MHz/km	2-500 m (7-1641 ft)	MT-RJ
	500 MHz/km	2-550 m (7-1805 ft)	MT-RJ

ER16-HFX39-24 Connectivity Guidelines

Table 41. 100Base-FX Single-Mode Fiber Specifications

Fiber Diameter	Modal Bandwidth	Range	Connector
10/125 μm	N/A	2-10000 m (6.2 mi)	MT-RJ

Optics

Table 42. ER16-HFX31-24 Multi-Mode 1300 nm

Receiver Sensitivity		Transmit Power 62.5/125 μm		Transmit Power 50/125 μm	
Minimum	-31.8 dBm	Minimum	-20 dBm	Minimum	-23.5 dBm
Maximum	-14 dBm	Maximum	-14 dBm	Maximum	-14 dBm

Table 43. ER16-HFX39-24 Single-Mode 1300 nm

Receiver Sensitivity		Transmit Power	
Minimum	-31.8 dBm	Minimum	-20 dBm
Maximum	-8 dBm	Maximum	-14 dBm

ER16-HSSI-02-CK

Table 44. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
HSSI	EIA/TIA-612/613		50-Pin

ER16-OS16-01 and ER16-OS26-01

This module operates with the following PHYs (purchased separately) connected to the outside world. For information about these PHYs, please refer to the XENPAK web site at **www.xenpak.org**.

XENPAK-LR

XENPAK-ER

XENPAK-LX4

XENPAK-SR

These PHYs use Class 1 Lasers. Although the output is limited to safe levels until the connector is plugged in and the link is established, do not use optical instruments to view laser output. Use of such instruments to view laser output increases eye hazard.

Warning: Do not use optical instruments to view laser output. The use of optical instruments to view laser output increases eye hazard.

Advertencia: No utilizar instrumentos opticos para ver el laser. El uso de instrumentos opticos para ver el laser incrementa el riesgo de perdida de la vision.

Warnhinweis: Benutzen sie keinesfalls optische Hilfmittel, um die Funktion des Lasers zu überprüfen, es könnte ihr Augenlicht gefährden.

Table 45. Recommended Cable Types and Specifications

Xenpak PHY	Type	Max. Length	Connector
10GBASE-LR	SMF	10 km (6.21 mi)	SC
10GBASE-ER	SMF	40 km (24.85 mi)	SC
10GBASE-LX4	SMF MMF	10 km (6.21 mi) 300 m (984.25 ft)	SC
10GBASE-SR	62.5 um MMF 200Mhz/km 50 um MMF 400Mhz/km 50 um MMF 2000Mhz/km	33 m (108 ft) 66 m (217 ft) 300 m (884 ft)	SC SC SC

Note: The 10GBASE-ER Xenpak requires a minimum of 5dB attenuation or a cable length of about 10 km.

ER16-POS21-04 and ER16-POS29-04

Table 46. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
1300 nm MMF	62.5/125 um	2,000 m (1.24 mi)	MT-RJ
1300 nm SMF	9/125 um	15,000 m (9.32 mi)	MT-RJ

ER16-POS31-02 and ER16-POS39-02

Table 47. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
1300 nm MMF	62.5/125 um	500 m (1,640.41 ft)	SC
1300 nm SMF	9/125 um	15,000 m (9.32 mi)	SC

ER16-SERC-04-AA

Table 48. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
Serial	V.35, EIA-530, EIA-449, X.21		60-Pin D-Shell

ER16-SERCE-04-A

Table 49. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
Serial	V.35, EIA-530, EIA-449, X.21		60-Pin D-Shell

ER16-SX-08

Table 50. 1000Base-SX Fiber Specifications

Fiber Diameter	Modal Bandwidth	Range	Connector
62.5/125 μm	160 MHz/km	2-220 m (7-722 ft)	SC
	200 MHz/km	2-275 m (7-902 ft)	SC
50/125 μm	400 MHz/km	2-500 m (7-1641 ft)	SC
	500 MHz/km	2-550 m (7-1805 ft)	SC

Table 51. Receiver Sensitivity and Transmit Power

Receiver Sensitivity		Transmit Power	
Minimum	-17 dBm	Minimum	-10 dBm
Maximum	0 dBm	Maximum	-4 dBm

The connector pins are assigned as follows:

Table 52. Rx/Tx Pin Assignments

Pin	Connection
Rx	When mated with the cable connector, the SC connector
Tx	is keyed to run the proper Tx to Rx and Rx to Tx connections.

ER16-TX-24

Table 53. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
10Base-T	Cat. 3, 4, 5 100-ohm UTP	100 m (328 ft)	RJ45
100Base-TX	Cat. 5 100-ohm UTP	100 m (328 ft)	RJ45

ER16-TX-32

Table 54. Recommended Cable Types and Specifications

Cable	Type	Max. Length	Connector
10Base-T	Cat. 3, 4, 5 100-ohm UTP	100 m (328 ft)	RJ-21
100Base-TX	Cat. 5 100-ohm UTP	100 m (328 ft)	RJ-21

Note: The ER16-TX-32 normally uses an RJ-21 bundle to connect to a patch panel of RJ-45 connectors. The maximum length in the table above includes the patch cable and bundle used to connect the panel.

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