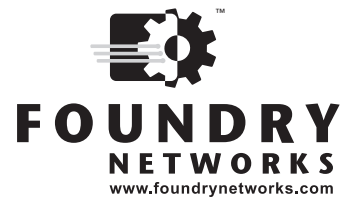

Foundry FastIron Stackable Hardware Installation Guide

FastIron Edge Switch

FastIron Edge Switch X-Series

FastIron Workgroup Switch X-Series



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December 2005

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Chapter 1

About This Guide

Introduction

This guide describes the following product families from Foundry Networks:

- FastIron Edge Switch (FES) Layer 2/Layer 3 Switch
- FastIron Edge Switch X-Series (FESX) Layer 2/Layer 3 Switch
- FastIron Workgroup Switch X-Series (FWSX) Layer 2 Switch

This guide includes procedures for installing the hardware and configuring essential, basic parameters such as permanent passwords and IP addresses. The basic software configuration procedures show how to perform tasks using the CLI. This guide also includes instructions for managing and maintaining the hardware.

This guide applies to the following products, collectively called the FastIron Family of stackable switches:

- FastIron Edge Switch products:
 - FastIron Edge Switch 2402
 - FastIron Edge Switch 4802
 - FastIron Edge Switch 9604
 - FastIron Edge Switch 12GCF
 - FastIron Edge Switch 2402-POE
 - FastIron Edge Switch 4802-POE
- FastIron Edge Switch X-Series products:
 - FastIron Edge Switch X424
 - FastIron Edge Switch X448
- FastIron Workgroup Switch X-Series products:
 - FastIron Workgroup Switch X424
 - FastIron Workgroup Switch X448

NOTE: Except where explicitly mentioned in this manual, the FES2402 and FES2402-POE are similar devices, and the FES4802 and FES4802-POE are similar devices. For example, the FES2402 and FES2402-POE have similar network interfaces and port regions. The same is true of the FES4802 and FES4802-POE.

NOTE: This guide contains the terms **FastIron Edge Switch (FES)**, **FastIron Edge Switch X-Series (FESX)**, and **FastIron WorkGroup Switch X-Series (FWSX)**. Each term refers to a specific set of devices, as shown in Table 1.1.

Table 1.1: FastIron Family of Switches

This Name	Refers to These Devices
FastIron Edge Switch (FES)	FES2402, FES4802, FES9604, FES12GCF, FES2402-POE, and FES4802-POE
FastIron Edge Switch X-Series (FESX)	FESX424 and FESX448
FastIron Workgroup Switch X-Series (FWSX)	FWSX424 and FWSX448

What's Included in This Edition?

This edition describes the following software releases:

- For the FastIron Edge Switch products:
 - 03.3.01a
 - 03.3.00
 - 03.2.00
 - 03.1.02
 - 03.1.01
 - 03.1.00
 - 03.0.00
- For the FastIron Edge Switch X-Series products:
 - 02.3.03 (combined FESX/FWSX release)
 - 02.3.02 (combined FESX/FWSX release)
 - 02.3.01 (combined FESX/FWSX release)
 - 02.2.00 (combined FESX/FWSX release)
 - 02.1.01
 - 02.0.00
 - 01.1.00
 - 01.0.00
- For the FastIron Workgroup Switch X-Series products:
 - 02.0.00

NOTE: Software releases for the FWSX devices were combined with the FESX software releases starting with FESX release 02.2.00.

Audience

This guide is designed for network installers, system administrators, and resellers who will install the FastIron hardware. This guide assumes a working knowledge of Layer 2 and Layer 3 Switching and routing concepts.

Nomenclature

This guide uses the following typographical conventions to show information:

Italic highlights the title of another publication and occasionally emphasizes a word or phrase.

Bold highlights a CLI command.

Bold Italic highlights a term that is being defined.

NOTE: A note emphasizes an important fact or calls your attention to a dependency.

CAUTION: A caution calls your attention to a possible hazard that can damage equipment.

WARNING: A warning calls your attention to a possible hazard that can cause injury or death.

Related Publications

The following Foundry Networks documents supplement the information in this guide.

- *Foundry FastIron X-Series Configuration Guide* – for X-Series devices (FESX, FSX, and FWSX), provides configuration procedures for system-level features, and provides configuration information for enterprise routing protocols including IP, RIP, IP multicast, OSPF, BGP4, VRRP and VRRPE.
- *Foundry Switch and Router Installation and Basic Configuration Guide* – for FES devices, provides basic configuration procedures for system-level features.
- *Foundry Enterprise Configuration and Management Guide* – for FES devices, provides configuration information for enterprise routing protocols including IP, RIP, IP multicast, OSPF, VRRP and VRRPE.
- *Foundry Security Guide* – provides procedures for securing management access to Foundry devices and for protecting against Denial of Service (DoS) attacks.
- *Foundry Switch and Router Command Line Interface Reference* – for FES devices, provides a list and syntax information for all CLI commands on Foundry devices.
- *Foundry Diagnostic Guide* – provides descriptions of diagnostic commands that can help you diagnose and solve issues on Foundry devices.
- *Foundry Management Information Base Reference* – contains the Simple Network Management Protocol (SNMP) Management Information Base (MIB) objects supported on Foundry devices.
- Release Notes for the FastIron Edge Switch – describes features introduced in each software release, lists features that are supported on the FES, and describes how configuration procedures or defaults differ from those on other Foundry devices, due to the FastIron Edge Switches' hardware architecture.
- Release Notes for the FastIron Edge Switch X-Series – describes features introduced in each software release, lists features that are supported on the FESX, and describes how configuration procedures or defaults differ from those on other Foundry devices, due to the FastIron Edge Switch X-Series' hardware architecture.
- Release Notes for the FastIron Workgroup Switch X-Series – describes features introduced in each software release, lists features that are supported on the FWSX, and describes how configuration procedures or

defaults differ from those on other Foundry devices, due to the FastIron Workgroup Switch X-Series' hardware architecture.

To order additional copies of these manuals, do one of the following:

- Call 1.877.TURBOCALL (887.2622) in the United States or 1.408.586.1881 outside the United States.
- Send email to info@foundrynet.com.

How to Get Help

Foundry Networks technical support will ensure that the fast and easy access that you have come to expect from your Foundry Networks products will be maintained.

Web Access

- <http://www.foundrynetworks.com>

Email Access

Technical requests can also be sent to the following email address:

- support@foundrynet.com

Telephone Access

- 1.877.TURBOCALL (887.2622) United States
- 1.408.586.1881 Outside the United States

Warranty Coverage

Contact Foundry Networks using any of the methods listed above for information about the standard and extended warranties.

Chapter 2

Product Overview

This chapter contains an overview of the following Foundry Networks product families:

- FastIron Edge Switch® (FES) Layer 2 / Layer 3 Switch
- FastIron Edge Switch X-Series® (FESX) Layer 2 / Layer 3 Switch
- FastIron Workgroup Switch X-Series® (FWSX) Layer 2 Switch

This chapter contains the following information:

Table 2.1: Chapter Contents

Description	See Page
Product overview and the benefits each product offers	2-1
Software features	2-3
Network topologies in which the devices will be commonly deployed	2-3
POE support overview	2-8
Wireless support overview	2-8
Hardware features and how each major hardware component functions	2-9
Layer 3 Routing Protocol Table Sizes	2-24

Product Overview

The FES, FESX, and FWSX deliver a full complement of standards-based, feature-rich switching and Layer 3 multiprotocol routing capabilities. The extensive feature set supports network requirements ranging from basic connectivity to multicast-enabled full streaming audio and video applications for converged services such as Voice over IP (VoIP).

The FES, FESX, and FWSX come in a variety of models, providing an integral range of network connectivity within the entire enterprise network. These switches provide high 10/100 port density and Gigabit Ethernet uplinks in a compact, stackable form factor. The FESX and FWSX optionally provide up to two 10-Gigabit Ethernet uplinks.

The FES, FESX, and FWSX models are described below.

- **Standard** - Provides enterprise network connectivity and server farm support at the wiring closet and edge of the network. When first shipped from the factory, standard models support full Layer 2 and base Layer 3 Switching.

NOTE: The FWSX is a Layer 2 Switch only. It does not support base Layer 3 and full Layer 3.

- **Premium (PREM)** – Premium devices support full Layer 2 Switching and full Layer 3 multiprotocol routing. All FES and FESX devices can be upgraded to full Layer 3 multiprotocol routing, at which time they are considered to be premium devices.
- **12GCF** - Provides distribution and backbone connectivity at the Distribution and Core Layers of the enterprise network. When first shipped from the factory, 12GCF models support full Layer 2 and base Layer 3 Switching.
- **POE** - Provides enterprise network connectivity and server farm support at the wiring closet and edge of the network. Also provides electrical power over existing Ethernet cables, supporting the need for integrated data, voice, and video applications. When first shipped from the factory, POE models support full Layer 2 and base Layer 3 Switching.
- **X-Series** - Provides enterprise network connectivity, delivering Gigabit over Copper (GoC) to the desktop, within the enterprise Distribution Layer, and the service provider data center for high-end servers, cluster computing, and network-attached storage devices. Also provides the option of a one- or two-port 10 Gigabit Ethernet module, enabling connectivity within a Metropolitan Area Network (MAN).

See Table 2.2 for a list of supported configurations.

Supported Configurations

Table 2.2 lists the FastIron stackable products and their supported configurations.

Table 2.2: FastIron Product Family Supported Configurations

Device	Standard	PREM (Premium)	P (POE)
FES2402	X	X	X
FES4802	X	X	X
FES9604	X	X	
FES12GCF	X	X	
FESX424	X	X ^a	
FESX448	X ^b	X ^b	
FWSX424 ^b	X		
FWSX448 ^c	X		

a.FESX premium devices are available starting in software release 02.0.00.

b.The FWSX424 and FWS448 devices are Layer 2 Switches only. These devices do not support base Layer 3 and full Layer 3.

NOTE: The device numbers denote the number of ports on the device. For example, the FES2402 has 24 10/100 ports and 2 Gigabit uplink ports. Likewise, the FESX424 and FWSX424 have 4 Gigabit uplink ports and 24 10/100/1000 ports.

Software Features

Software features differ depending on the software version that is loaded on the device. When first shipped, Standard and POE devices support full Layer 2 and base Layer 3 Switching. FWSX devices support full Layer 2 Switching only. Premium (PREM) devices support full Layer 2 Switching and full Layer 3 multiprotocol routing. All FES and FESX devices can be upgraded to premium models, meaning all models can support full Layer 3 multiprotocol routing.

For a complete list of software features supported on the FESX or FWSX, see the release notes or the *Foundry FastIron X-Series Configuration Guide*. For a complete list of software features supported on FES, see the FES release notes.

Application Examples

This section illustrates how the Foundry Networks FES, FESX and FWSX products fit into the enterprise network, and how the FESX and FWSX 10-Gigabit Ethernet switches fit into a Metropolitan Area Network.

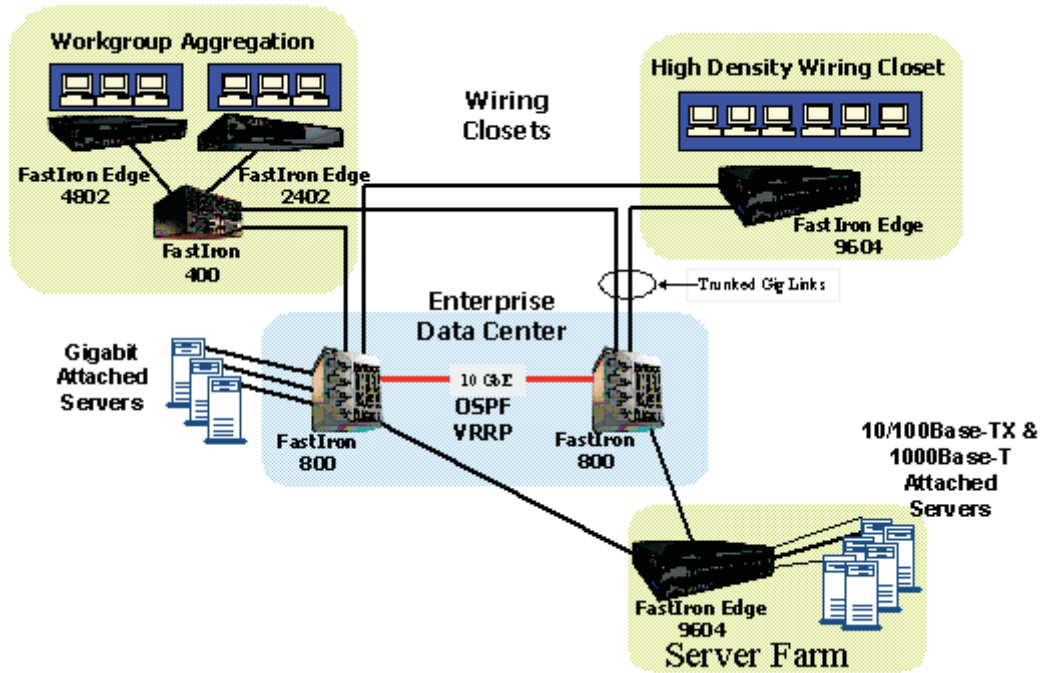
FES2402, FES4802, and FES9604

The FastIron Edge Switches 2402, 4802, and 9604 can be deployed within the enterprise network as wiring closet switches, enabling multilayer switching to desktops, workgroups, and data centers or server farms. All of these devices provide high port density within a stackable form factor.

- The FES2402 has 24 10/100Base-T ports and two copper and fiber Gigabit Ethernet ports. Two of the ports can be active simultaneously, providing redundant 1 Gb/sec links to a server or a backbone uplink.
- The FES4802 has 48 10/100Base-T ports and two copper and fiber Gigabit Ethernet ports. Two of the ports can be active simultaneously to provide redundant 1 Gb/sec links to a server or a backbone uplink.
- The FES9604 has 96 10/100Base-T ports and four copper and fiber Gigabit Ethernet ports. Four of the Gigabit Ethernet ports can be active simultaneously. The FES9604 is the alternative to a chassis-based switch in wiring closets.
- The FES2402-POE and FES4802-POE wiring closet switches provide additional support for both non-POE and POE devices, providing the means for integrating data, voice, and video over existing Ethernet cables. For more information about FES POE devices, see the *Foundry Switch and Router Installation and Basic Configuration Guide*.

Figure 2.1 illustrates how these devices fit into the network.

Figure 2.1 FES 2404, 4802, and 9604 Application Example



FES12GCF

The FES12GCF can be used at the Core Layer of the network, providing high-speed enterprise backbone connectivity. It can also be used at the Distribution Layer, connecting several FES2402, FES4802, and FES9604 devices or other vendor's devices.

The FES12GCF has 12 combination Gigabit Copper and Fiber ports that support 10/100/1000Base-T or Fiber ports using mini-GBIC optics, allowing a choice between fixed RJ-45 ports or 1000Base-X (mini-GBIC).

Figure 2.2 illustrates how the FES12GCF, as a backbone switch, fits into the Core Layer of the enterprise network.

Figure 2.2 FES12GCF Application Example

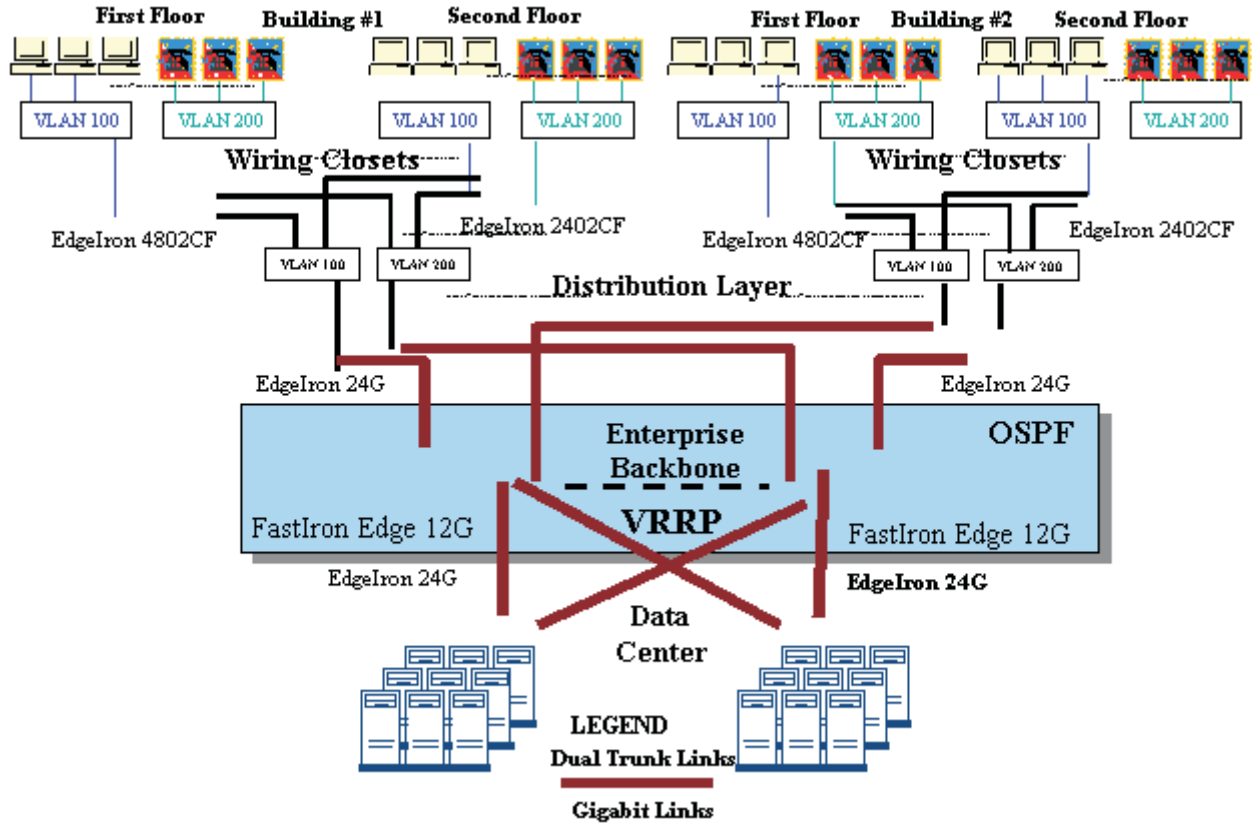
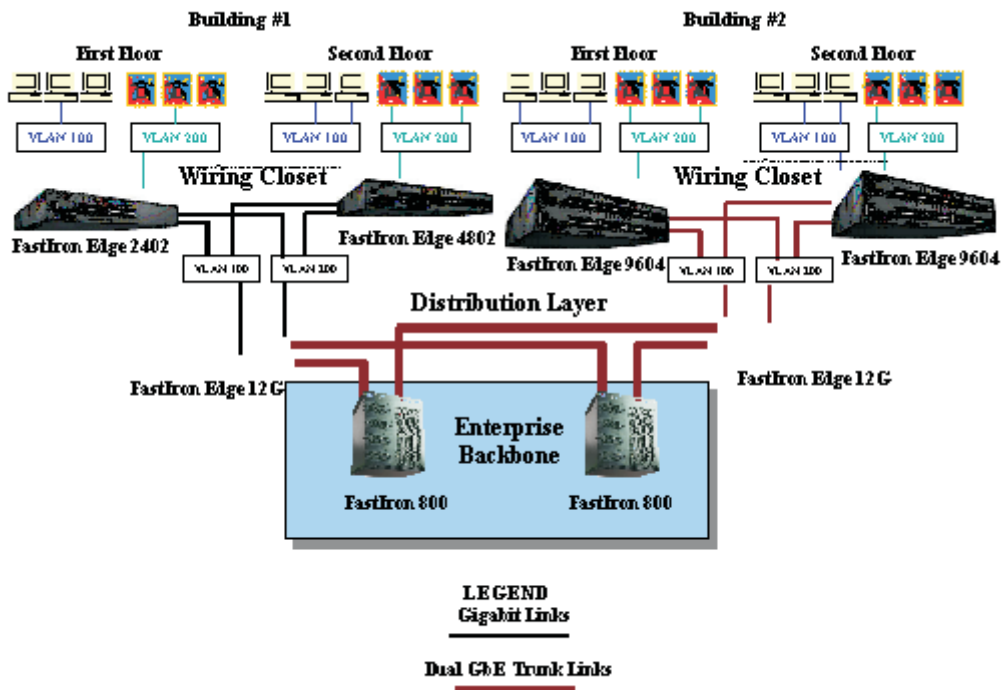


Figure 2.3 illustrates how the FES12GCF fits into the Distribution Layer of the enterprise network.

Figure 2.3 FES12GCF at the Distribution Layer



FESX and FWSX

The FastIron Edge Switch X-Series family of switches include the following:

- FESX424
- FESX448

The FastIron Workgroup Switch X-Series family of switches include the following:

- FWSX424
- FWSX448

The FESX and FWSX provide high port density within a stackable form factor. Both devices also provide 128 MB of SD RAM.

You can deploy the FESX and FWSX devices within an enterprise network. With 10-Gigabit Ethernet uplinks (optional) for LAN PHY, you can deploy the FESX and FWSX within a Metropolitan Area Network (MAN). This section provides topology examples.

Enterprise Application

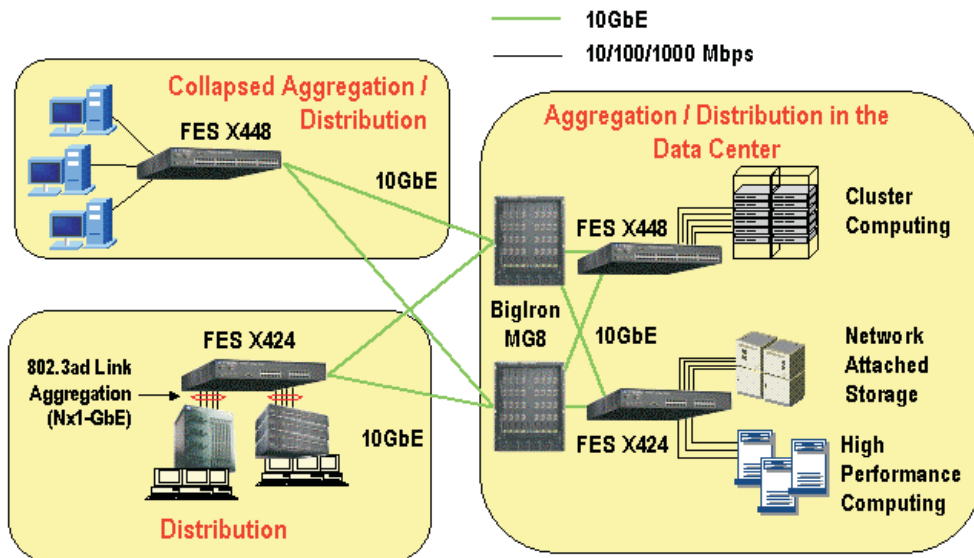
You can deploy the FESX and FWSX family of switches within the enterprise campus network, providing Gigabit over Copper (GoC) aggregation to:

- the desktop
- the network Distribution Layer

- the service provider data center or server farms – for high-end server, cluster computing, and network-attached storage

The FESX424 and FWSX424 have four Fiber uplink ports and 24 10/100/1000 Copper ports. Similarly, the FESX448 and FWSX448 have four Fiber uplink ports and 48 10/100/1000 Copper ports. One port out of the first four Copper ports or the four Fiber ports can be active at a time (see “FES 10/100/1000 Mbps Ports” on page 2-13). You can optionally install a one-port or two-port 10 Gigabit Ethernet module, enabling you to bring 10 Gigabit Ethernet (GbE) from the edge of the network to the core, powered by Foundry’s BigIron MG8, as shown in Figure 2.4.

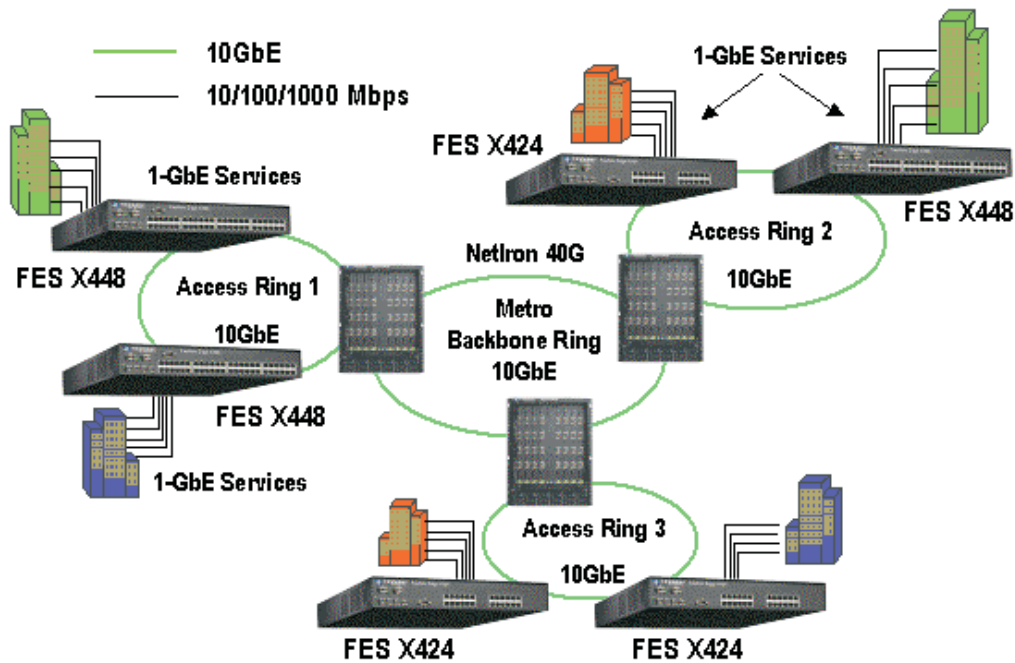
Figure 2.4 FESX Enterprise Application Example



Metro Service Provider Application

You can order the FESX or FWSX from the factory with a 10-Gigabit Ethernet (GbE) module installed, or later upgrade the device. Depending on which module you order, the 10-GbE module comes equipped with one or two ports for XFP MSA-compliant transceivers. The 10-GbE ports enable you to optimize the existing fiber infrastructure of a Metropolitan Area Network. For example, these 10-GbE ports can connect access sites within a 10-GbE metro ring, as illustrated in Figure 2.5.

Figure 2.5 FESX MAN Application Example



POE Applications

Foundry's FES2402-POE and FES4802-POE provide Power over Ethernet, compliant with the standards described in the IEEE 802.3af specification for delivering in-line power. The 802.3af specification defines the standard for delivering power over existing network cabling infrastructure, enabling multicast-enabled full streaming audio and video applications for converged services, such as, Voice over IP (VoIP), WLAN access points, IP surveillance cameras, and other IP technology devices.

POE technology eliminates the need for an electrical outlet and dedicated UPS near IP powered devices. With power sourcing devices, such as Foundry's FES2402-POE and FES4802-POE, power is consolidated and centralized in the wiring closets, improving the reliability and resiliency of the network. Because POE can provide power over Ethernet cable, power is continuous, even in the event of a power failure.

For more information about POE and how to configure it on FES devices, see the *Foundry Switch and Router Installation and Basic Configuration Guide*.

Wireless Applications

You can convert (upgrade) your FastIron Edge Switch to an IronPoint-FES device. Converting your FES to an IronPoint-FES allows you to run a software image that contains wireless feature support.

To convert your FES to an IronPoint-FES, you need an EEPROM kit, part number FESWLAN. The kit includes a Dual Inline Package (DIP) key, IronPoint-FES software, upgrade instructions, and other items. Alternatively, you can order an IronPoint-FES with the EEPROM and wireless software already installed.

You can convert the following FES devices to an IronPoint-FES:

- FastIron Edge Switch 2402
- FastIron Edge Switch 4802
- FastIron Edge Switch 9604
- FastIron Edge Switch 2402-DC
- FastIron Edge Switch 4802-DC
- FastIron Edge Switch 9402-DC
- FastIron Edge Switch 2402-POE
- FastIron Edge Switch 4802-POE

NOTE: You cannot convert the FES12GCF, FastIron Edge Switch X-Series, FastIron Workgroup Switch X-Series, and FastIron SuperX to an IronPoint-FES device.

The following IronPoint FES devices ship with the firmware required for the wireless features:

- FastIron Edge Switch 2402-WLAN
- FastIron Edge Switch 4802-WLAN
- FastIron Edge Switch 9604-WLAN
- FastIron Edge Switch 2402-WLAN-DC
- FastIron Edge Switch 4802-WLAN-DC
- FastIron Edge Switch 9604-WLAN-DC
- FastIron Edge Switch 2402-POE-WLAN
- FastIron Edge Switch 4802-POE-WLAN

Hardware Features

This section describes the physical characteristics of the Foundry FES, FESX, and FWSX. For details about physical dimensions, power supply specifications, and pinouts, see the chapter “Hardware Specifications” on page A-1.

FES2402, FES4802, FES9604

The FastIron Edge Switch (FES) family provides high 10/100 port density and 10/100/1000 Gigabit Ethernet uplinks in a compact form factor.

- The FES2402 has 24 10/100 ports and two Gigabit uplink ports.
- The FES4802 has 48 10/100 ports and two Gigabit uplink ports.
- The FES9604 has 96 10/100 ports and four Gigabit uplink ports.

The following figures show the front panels of these FastIron Edge Switches.

Figure 2.6 FastIron Edge Switch 2402

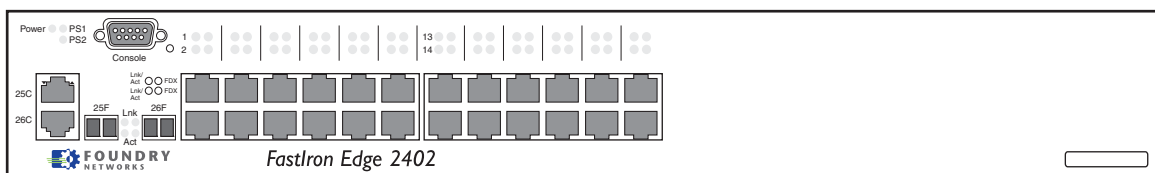


Figure 2.7 FastIron Edge Switch 4802

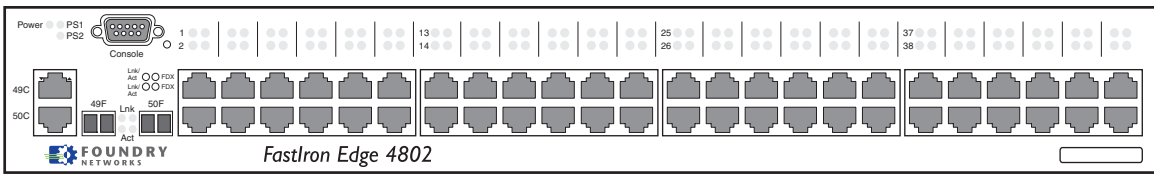
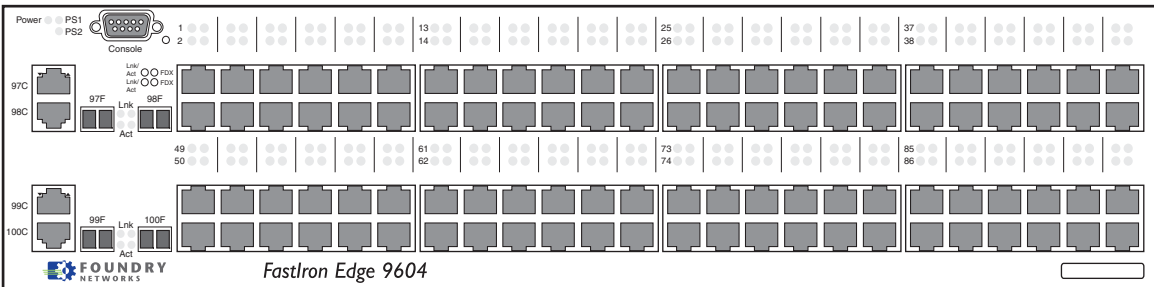


Figure 2.8 FastIron Edge Switch 9604

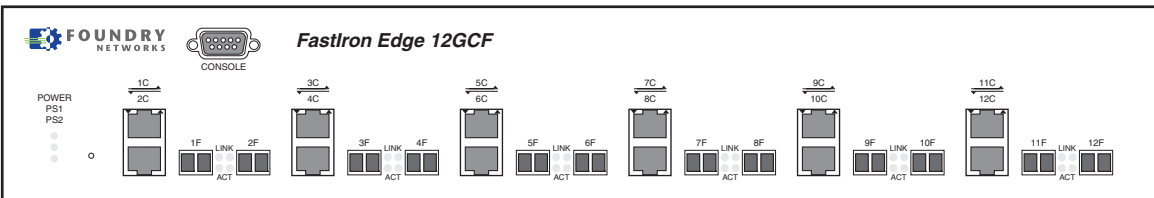


FES12GCF

The FES12GCF provides 12 combination 10/100/1000 Gigabit Ethernet Copper and Fiber ports in a compact form factor.

Figure 2.9 shows the front panel of the FES12GCF.

Figure 2.9 FastIron Edge Switch 12GCF



FES2402-POE and FES4802-POE

- The FES2402-POE has 24 10/100 ports and two Gigabit uplink ports.
- The FES4802-POE has 48 10/100 ports and two Gigabit uplink ports.

The following figures show the front panels of these FastIron Edge Switches.

Figure 2.10 FastIron Edge Switch 2402-POE

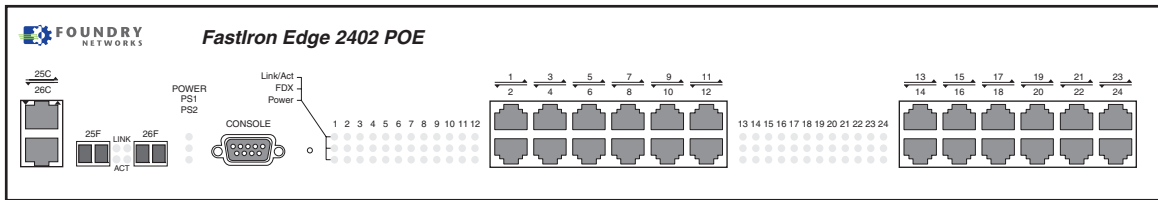
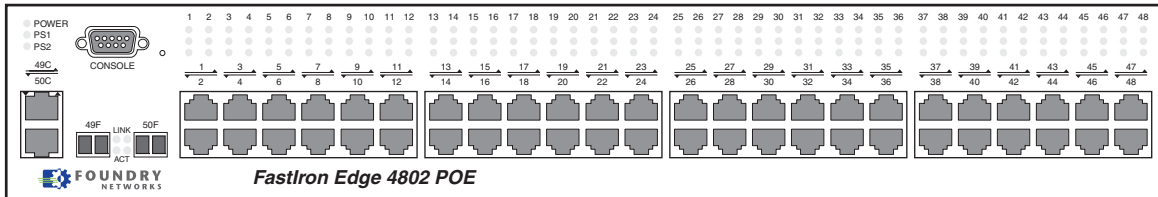


Figure 2.11 FastIron Edge Switch 4802-POE



FESX424 and FWSX424

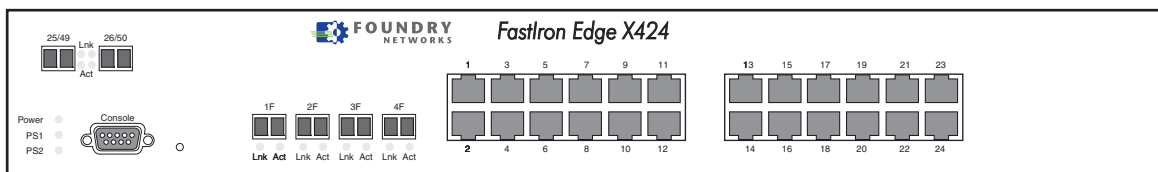
The FESX424 and FWSX424 have the following ports:

- 24 Copper ports that support 10/100/1000Base-T RJ-45 connectors
- Four Gigabit Fiber ports for mini-GBIC optical transceivers (also called Small Form Factor Pluggable (SFP) MultiSource Agreement (MSA)-compliant optical transceivers)
- Optionally, one or two 10-Gigabit Ethernet uplink ports for 10-Gigabit Small Form Factor Pluggable (XFP) MSA-compliant optical transceivers

Note that one port out of the first four Copper ports or the four Fiber ports can be active at a time (see “FES 10/100/1000 Mbps Ports” on page 2-13).

The following figure shows the front panel of the FESX424. The FWSX424 looks similar to the FESX424.

Figure 2.12 FESX424



FESX424HF

The FESX424HF has the following ports:

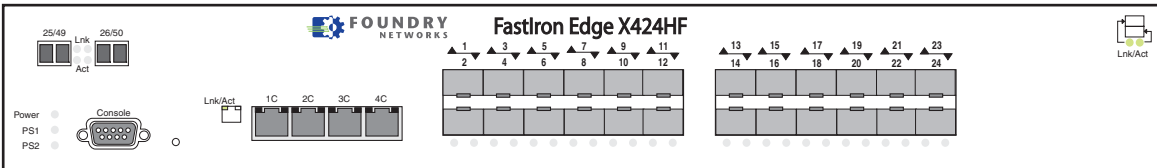
- 20 100/1000 Gigabit Ethernet fiber ports for mini-GBIC optical transceivers (also called Small Form Factor Pluggable (SFP) Multisource Agreement (MSA)-compliant optical transceivers).
- Four combination Gigabit Copper/Fiber uplink ports:
 - The copper ports support 10/100/1000Base-T RJ-45 connectors.
 - The fiber ports support 100/1000 SFPs.

- Optionally, one or two 10-Gigabit Ethernet uplink ports for 10-Gigabit Small Form Factor Pluggable (XFP) MSA-compliant optical transceivers

Note that one port out of the first four Copper ports or the four Fiber ports can be active at a time. For example, you can use ports 1C – 4C of the Gigabit Copper ports or ports 1 – 4 of the Gigabit Fiber ports. You can use a combination of fiber and copper uplink ports or all copper or all fiber ports, as needed. For more information, see see “FESX424HF Combination Ports” on page 2-16.

The following figure shows the front panel of the FESX424HF.

Figure 3 FESX424HF Front Panel



FESX448 and FWSX448

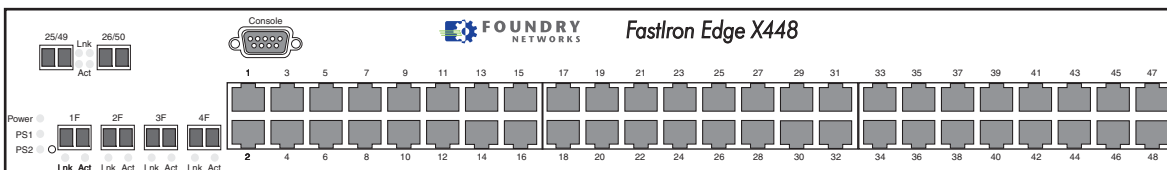
The FESX448 and FWSX448 have the following ports:

- 48 Copper ports that support 10/100/1000Base-T RJ-45 connectors
- Four Gigabit Fiber uplink ports (1F – 4F) for mini-GBIC optical transceivers (also called Small Form Factor Pluggable (SFP) Multisource Agreement (MSA)-compliant optical transceivers)
- Optionally, one or two 10-Gigabit Ethernet uplink ports for 10-Gigabit Small Form Factor Pluggable (XFP) MSA-compliant optical transceivers

Note that one port out of the first four Copper ports or the four Fiber ports can be active at a time (see “FES 10/100/1000 Mbps Ports” on page 2-13). For example, you can use ports 1 –4 of the Gigabit Copper ports or ports 1F – 4F of the Gigabit Fiber ports. You can use a combination of fiber and copper ports or all copper or all fiber ports, as needed.

The following figure shows the front panel of the FESX448. The FWSX448 looks similar to the FESX448.

Figure 3.13 FESX448 Front Panel



Control Features

Each device’s front panel has the following control features:

- Serial management interface (the port labeled **Console**)
- Reset button
- 10/100 ports with RJ-45 copper connectors (FES only)
- 10/100/1000 ports with RJ-45 copper connectors
- 10/100/1000 ports with mini-GBIC slots for SFP MSA-compliant fiber transceivers
- 100/1000 ports with mini-GBIC slots for SFP MSA-compliant fiber transceivers (FESX424HF)

- Optionally, one or two 10 Gigabit Ethernet ports for XFP MSA-compliant fiber connector(s) (FESX and FWSX only)

Serial Management Interface (Console Port)

The serial management interface enables you to configure and manage the device using a third-party terminal emulation application on a directly connected PC. A straight-through EIA/TIA DB-9 serial cable (M/F) ships with the device. The serial management interface (the port labeled **Console**) is located in the left corner of the front panel.

Reset Button

The reset button allows you to restart the system without switching the power supplies off and on or using the CLI or Web management interface. The button is located to the right of the serial management interface and is recessed to prevent it from being pushed accidentally.

FES Network Interfaces

The FES2402, 4802, and 9604 provide the following interfaces:

- 10Base-T/100Base-T (10/100) copper ports
- 10/100/1000Base-T copper or Fiber Gigabit uplink ports

The FES12GCF provides the following interfaces:

- 10/100/1000Base-T copper or Fiber Gigabit uplink ports

FES 10/100 Mbps Ports

The 10/100 copper ports support automatic MDI/MDIX detection, and use auto-sensing and auto-negotiating to determine the speed (10 Mbps or 100 Mbps) and mode (full-duplex or half-duplex) of the port at the other end of the link and adjust port speed accordingly. In addition, the 10/100 ports on the FES POE models can detect 802.3af compatible IP devices and provide power accordingly.

For more information about automatic MDI/MDIX detection, see the *Foundry Switch and Router Installation and Basic Configuration Guide*.

The 10/100 ports use RJ-45 connectors. For pinout information, see the chapter "Hardware Specifications" on page A-1".

The 10/100 Mbps ports on FES devices provide status information using the LEDs listed in Table 3.3.

FES 10/100/1000 Mbps Ports

The 10/100/1000 ports use auto-sensing and auto-negotiating to determine the speed (10 Mbps, 100 Mbps, or 1000 Mbps) and mode (full-duplex or half-duplex) of the port at the other end of the link and adjust port speed accordingly. 10/100/1000 ports on the devices have the following interfaces:

- RJ-45 copper interface for 10/100/1000Base-T – Cat5 copper cabling
- Mini-GBIC slot for CWDM, 1000Base-SX, 1000Base-LX, or 1000Base-LHA – fiber cabling

The copper ports provide auto MDI/MDIX detection (see the *Foundry Switch and Router Installation and Basic Configuration Guide*).

One port out of each pair of copper and fiber ports can be active at a time. For example, on the FES12GCF, you can use either Copper port 10 or Fiber port 10, but not both at the same time. You can use a combination of fiber and copper ports or all copper or all fiber ports, as needed. On the FES, if you attach both the copper and fiber connectors for a port to the network, the fiber connector takes precedence over the copper connector and will be the active connector for the port. Insertion of a fiber mini-GBIC disables the copper connector. To enable a port's copper connector, you must remove the port's fiber mini-GBIC.

The 10/100/1000 Mbps ports on the FES provide status information using the LEDs listed in Table 3.3. The fiber connectors on the FES devices use the Lnk and Act LEDs located between the mini-GBIC slots for the fiber ports. The copper connectors use triangular LEDs located in the upper right and left corners of the upper Gigabit copper connector. The LED on the left side is for the upper copper connector. The LED on the right side is for the lower copper connector.

LEDs for FES Ports

The 10/100 Mbps and 10/100/1000 Mbps ports on FES devices provide status information using the LEDs listed in Table 3.3.

Table 3.3: LEDs for FES Ports


LED	Position	State	Meaning
10/100 Port LEDs			
Lnk/Act	Left LED above port OR Top LED above port	On	Link is up.
		Off	Link is down.
		Blinking	Port is transmitting or receiving.
FDX	Right LED above port OR Middle LED above port	On	Full-duplex connection found or configured.
		Off	Half-duplex connection or no port connection exists.
		Blinking	Collisions are being detected.
Power (POE devices only)	Bottom LED above port (POE devices only)	On	The port is providing in-line power to the power consuming device, such as a VoIP phone or other device, that is connected to the port.
		Off	The port is not providing in-line power.
10/100/1000 Port LEDs			
Lnk/Act	Top	On	Link is up.
		Off	Link is down.
		Blinking	Port is transmitting or receiving traffic
FDX	Bottom	On	Full-duplex connection found or configured. Note: This LED also is lit if you configure the port to 10 Mbps full-duplex or 100 Mbps full-duplex. This is true even when no link is present.
		Off	Half-duplex connection or no port connection exists.
		Blinking	Collisions are being detected.
	Upper left corner of upper copper connector for upper copper connector	Off	No copper port connection exists on upper copper connector.
		Green	Copper port is connected on upper copper connector.
		Amber	Traffic is being transmitted and received on upper copper connector.

Table 3.3: LEDs for FES Ports

LED	Position	State	Meaning
▲	Upper right corner of upper copper connector for lower copper connector	Off	No copper port connection exists on lower copper connector.
		Green	Copper port is connected on lower copper connector.
		Amber	Traffic is being transmitted and received on lower copper connector.

FESX and FWSX Network Interfaces

The FESX and FWSX devices provide the following interfaces:

- 10/100/1000Base-T copper ports
- 10/100/1000Base-SX, LX, LHA, or CWDM Fiber Gigabit uplink ports
- Optionally, one or two 10GBase-LR, SR, or ER Gigabit uplink ports

The FESX424HF switch provides the following interfaces:

- 100/1000BaseBX, FX, LHA, LX, SX, or CWDM Fiber ports
- 10/100/1000BaseT or TX ports
- Optionally, one or two 10GBaseER, LR, or SR Gigabit uplink ports

The FES X-Series product family supports auto MDI/MDIX detection for 10/100 ports and Gigabit Copper ports. For more information about this feature, see "Configuring MDI/MDIX" in the *FastIron Edge Switch and FastIron Edge Switch X-Series Installation and Basic Configuration Guide*.

FESX and FWSX 10/100/1000 Mbps Ports

The 10/100/1000 ports use auto-sensing and auto-negotiating to determine the speed (10 Mbps, 100 Mbps, or 1000 Mbps) and mode (full-duplex or half-duplex) of the port at the other end of the link and adjust port speed accordingly. 10/100/1000 ports on the devices have the following interfaces:

- RJ-45 copper interface for 10/100/1000Base-T – Cat5 copper cabling
- Mini-GBIC slot for CWDM, 1000Base-SX, 1000Base-LX, or 1000Base-LHA – fiber cabling

The copper ports provide auto MDI/MDIX detection (see the *Foundry FastIron X-Series Configuration Guide*).

One port out of each pair of copper and fiber ports can be active at a time. For example, you can use ports 1–4 of the Gigabit Copper ports or ports 1F–4F of the Gigabit Fiber ports. You can use a combination of fiber and copper ports or all copper or all fiber ports, as needed.

On the FESX and FWSX, if you attach both the copper and fiber connectors for a port to the network, the fiber connector takes precedence over the copper connector. These ports support **true media automatic detection**, meaning the device selects the fiber or copper connector based on link availability. If a fiber link cannot be established, the device selects the copper media.

FESX424HF 100/1000 Mbps Ports

The 100/1000 ports on the FESX424HF are configurable to support either of the following:

- 100 Mbps using 100BaseFX or 100BaseBX optics
- 1000 Mbps using the following Gigabit Ethernet optics
 - 1000BaseBX
 - 1000BaseLHA

- 1000BaseLX
- 1000BaseSX
- CWDM

The output of the **show media** command displays the type of media installed in the ports.

FESX424HF Combination Ports

One port out of the four fiber ports or the first four copper ports can be active at a time. For example, you can use ports 1C –4C of the Gigabit Copper ports or ports 1 – 4 of the Gigabit Fiber ports. You can use a combination of fiber and copper ports or all copper or all fiber ports, as needed.

If you attach both the copper and fiber connectors for a port to the network, the fiber connectors take precedence over the copper connectors. These ports support true media automatic detection, meaning the device selects the fiber or copper connector based on link availability. If a fiber link cannot be established, the device selects the copper media.

FESX and FWSX 10 Gbps Ports

The 10 Gigabit Ethernet module on the FESX and FWSX is optional. If one is installed on your device, it has either a one- or two-port optical interface for XFP MSA-compliant 10GBase-LR, 10GBase-SR, or 10GBase-ER – fiber cabling.


The 10 Gigabit Ethernet ports use 10-Gigabit Small Form Factor Pluggable (XFP) MSA-compliant transceivers. These transceivers support SR and LR optics for LAN PHY.

LEDs for FESX and FWSX Ports

The 10/100/1000 Mbps copper and fiber ports, and the 10 Gbps fiber ports on the FESX and FWSX provide status information using the LEDs listed in Table 3.4.

- The copper ports use square LEDs located in the upper right and left corners of the upper Gigabit copper connector. The LEDs are combined Lnk/Act LEDs. The LED on the left side is for the upper copper connector. The LED on the right side is for the lower copper connector.
- The Gigabit fiber connectors use the Lnk and Act LEDs located beneath the mini-GBIC slots for the fiber ports.
- The 10 Gbps fiber connectors use the LEDs located next to the fiber ports.

Table 3.4: LEDs for FESX and FWSX Ports

LED	Position	State	Meaning
10/100/1000 Copper Port LEDs			
	Left for upper copper Right for lower copper connector	On	Link is up.
		Off	Link is down.
		Blinking	The port is transmitting or receiving traffic
10/100/1000 Fiber Port LEDs			
Lnk	Bottom left	On	Fiber port is connected.
		Off	No fiber port connection exists.
Act	Bottom right	On	Traffic is being transmitted and received on the fiber port.
		Off	No traffic is being transmitted on the fiber port.
		Blinking	Traffic is being transmitted and received on the fiber port.
100/1000 Fiber Port LEDs on FESX424HF			
	Left for upper copper Right for lower copper connector	On	Link is up.
		Off	Link is down.
		Blinking	The port is transmitting or receiving traffic
10 Gbps Port LEDs			
Lnk	Top right for left-most connector	On	Fiber port is connected.
	Top left for right-most connector	Off	No fiber port connection exists.
Act	Bottom right for left-most connector	On or Blinking	Traffic is being transmitted and received on the fiber port.
	Bottom left for right-most connector	Off	No traffic is being transmitted on the fiber port.

Port Regions

Except for the FES12GCF, ports on the FES, FESX, and FWSX are grouped into regions. For a few features, including trunk group configuration and port monitoring, you will need to know the region to which a port belongs. However, for most features, a port's region does not affect configuration or operation of the feature.

NOTE: Port regions do not apply to trunk group configurations on the FESX and FWSX. However, port regions do apply to port monitoring and unknown unicast configurations on the FESX and FWSX.

FastIron Edge Switch 2402 port regions:

- Ports 1 – 8
- Ports 9 – 16
- Ports 17 – 24
- Port 25
- Port 26

FastIron Edge Switch 4802 port regions:

- Ports 1 – 8
- Ports 9 – 16
- Ports 17 – 24
- Ports 25 – 32
- Ports 33 – 40
- Ports 41 – 48
- Port 49
- Port 50

FastIron Edge Switch 9604 port regions:

- Ports 1 – 8
- Ports 9 – 16
- Ports 17 – 24
- Ports 25 – 32
- Ports 33 – 40
- Ports 41 – 48
- Ports 49 – 56
- Ports 57 – 64
- Ports 65 – 72
- Ports 73 – 80
- Ports 81 – 88
- Ports 89 – 96
- Port 97
- Port 98
- Port 99

- Port 100

FastIron Edge Switch 12GCF:

- There are no port ranges on the FES12GCF

FastIron Edge Switch X424 and X424HF, and FastIron Workgroup Switch X424:

- Ports 1 – 12
- Ports 13 – 24
- Port 25
- Port 26

NOTE: Port regions do not apply to trunk group configurations on the FESX424HF. However, port regions do apply to port monitoring and unknown unicast configurations on the FESX424HF.

FastIron Edge Switch X448 and FastIron Workgroup Switch X448:

- Ports 1 – 12
- Ports 13 – 24
- Port 25 – 36
- Port 37 – 48
- Port 49
- Port 50

Fiber Optic Modules

This section lists the types of fiber optic modules supported on Foundry's X-Series devices.

Fiber Optic Media for EFM Applications

Support for the following fiber optic media was added in release 02.2.00. These optics are in accordance with the IEEE 802.3ah standard, Ethernet in the First Mile (EFM):

- **EFM-U** – 1000Base-BX10-U fiber (uplink) transceiver, Wavelength = 1310 nm (Foundry part number E1MG-BXU)
- **EFM-D** – 1000Base-BX10-D fiber (downlink) transceiver, Wavelength = 1490 nm (Foundry part number E1MG-BXD)

The output of the **show media** command displays the type of media installed in the ports.

Fiber Optic Media for Ethernet over Fiber Applications

Support for the following fiber optic media for Ethernet over fiber applications, was added in release 02.3.01:

- **100BaseBX** – 100BaseBX uses single mode fiber for bidirectional ethernet applications and supports Ethernet in the First Mile (EFM) applications. Its maximum distance is 10 kilometers.

100BaseBX is supported only on the FESX424HF.

- **100BaseFX** – Also known as the "fiber version" of 100BaseTX, the 100BaseFX uses two strands of multi-mode fiber (MMF) for receive and transmit. Its maximum distance is 2000 meters (2 kilometers).

100BaseFX is supported only on the FESX424HF.

NOTE: You must enter a CLI command to enable and disable support for 100BaseFX on a fiber port. See "Enabling and Disabling Support for 100BaseFX" on page 2-20.

- **1000BaseSX 2** – 1000BaseSX uses short wavelength (SX) laser over multimode fiber, as opposed to 1000BaseLX, which uses long wavelength (LX) laser over multimode and single-mode fiber. Whereas

previous releases of 1000BaseSX support a maximum distance of 550 meters, the 1000BaseSX 2 supports a maximum distance of 2000 meters (2 kilometers).

1000BaseSX 2 is supported on all FastIron X-Series devices.

Enabling and Disabling Support for 100BaseFX

Foundry's FESX424HF device supports the following types of SFPs for 100BaseFX:

- Multimode SFP – maximum distance is 2 kilometers
- Bidirectional singlemode SFP – maximum distance is 10 kilometers

To enable support for 100BaseFX on a fiber port, enter the following command at the Global CONFIG level of the CLI:

```
FESX424HF(config)# link-config gig fiber 100base-fx e 16
```

The above command enables 100BaseFX on port 16.

The following command enables 100BaseFX on ports 23 and 24

```
FESX424HF(config)# link-config gig fiber 100base-fx e 23 e 24
```

Syntax: [no] link-config gig fiber 100base-fx ethernet <portnum> ethernet <portnum>

You can specify one or two ethernet ports at a time, as shown in the above examples.

To disable 100BaseFX support on a fiber port, enter the **no** form of the command. Note that you must disable 100BaseFX support before inserting a different type of module in the same port. Otherwise, the device will not recognize traffic traversing the port.

Viewing the Media Types Installed in the Ports

The output of the **show media** command displays the type of media (copper or fiber) installed in the ports. The following shows an example output.

```
FastIron SuperX Switch(config)# show media
1/1:C1550 1/2:M-SX 1/3:EFM-U 1/4:EFM-D 1/5:M-TX 1/6:M-TX 1/7:M-LX
...
```

The **show media** command output can indicate the following media types installed in a port:

- **C1550** – CWDM transceiver with 1550 nm wavelength
- **EFM-U** – 1000Base-BX10-U fiber (uplink) transceiver
- **EFM-D** – 1000Base-BX10-D fiber (downlink) transceiver
- **M-FX** – 100BaseFX fiber mini-GBIC
- **M-FXB1** or **M-FXB2** – 100BaseFX fiber mini-GBIC
- **M-LX** – 1000BaseLX fiber mini-GBIC
- **M-SX** – 1000BaseSX fiber mini-GBIC
- **M-TX** – 1000BaseTX copper mini-GBIC
- **M-XR** – 1000BaseSX 2 fiber mini-GBIC
- **FXB1** or **FXB2** – 1000BaseBX fiber mini-GBIC
- **M-LHA** 1000BaseLHA fiber mini-GBIC

NOTE: Some older SFP modules (mini-GBICs for Gigabit Ethernet ports) have latching mechanisms which are larger than the newer parts. These latches could interfere with one another when inserted side by side into a SuperX module. Avoid using these mini-GBICs side by side in the same module. These older modules are identified by the number PL-XPL-00-S13-22 or PL-XPL-00-L13-23 above the Serial Number. All newer mini-GBICs do not have this limitation.

Power Supplies

Each FastIron stackable switch comes with one alternating-current (AC) or direct-current (DC) power supply, depending on how it was ordered from the factory. All models have two power supply slots, enabling you to install a second power supply for redundancy. Direct-current (DC) supplies are available for some devices, in which you can use any combination of AC and DC supplies in the same device. The following table lists the power supplies that may be installed in a FastIron stackable switch.

Device	Supported Power Supplies
FES2402	RPS5-AC and RPS5-DC
FES4802	RPS5-AC and RPS5-DC
FES9604	RPS5-AC and RPS5-DC
FES12GCF	RPS5-AC and RPS5-DC
FESX424, FESX424HF, and FWSX424	RPS-X424-AC and RPS-X424-DC
FESX448 and FWSX448	RPS-X448-AC
FES2402-POE	RPS8-AC
FES4802-POE	RPS8-AC

The power supplies can be swapped in or out of the device while the device is running. You can remove and insert a power supply without opening the chassis. If the device contains redundant power supplies, you can remove one of the supplies without interrupting operation. The remaining supply provides enough power for all the ports.

The following sections provide further details about the power supplies for the FastIron family of switches.

For hardware specifications for the power supplies, see the chapter "Hardware Specifications" on page A-1.

RPS5-AC and RPS5-DC Power Supplies

The RPS5-AC and RPS5-DC power supplies are supported in the following devices:

- FES2402
- FES4802
- FES9604
- FES12GCF

The RPS5-AC and RPS5-DC power supplies are 100VAC @ 3.5A, 240 VAC @ 1.5A, 50-60Hz, and are auto-sensing and auto-switching.

Figure 3.14 shows a rear view of a FastIron Stackable device containing one AC power supply. Figure 3.15 shows a rear view of a FastIron Stackable device containing one DC power supply. The supplies are standard for all four models. In addition, the supplies are the same as the ones used in the FastIron 4802, so you can exchange supplies with the FastIron 4802 as well.

Figure 3.14 RPS5-AC power supply

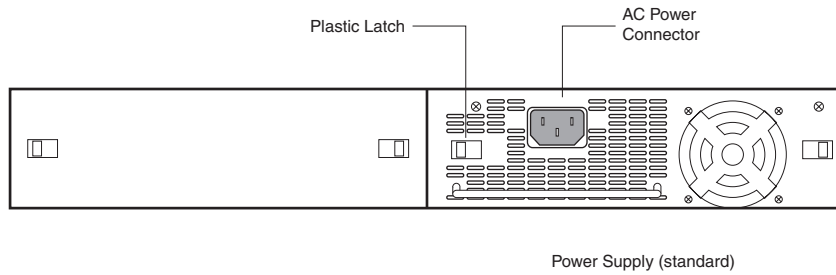
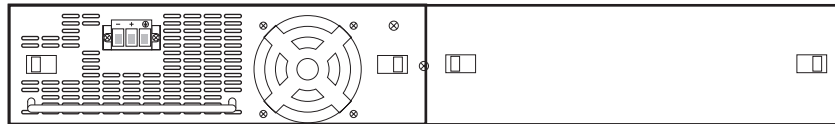


Figure 3.15 RPS5-DC power supply



RPSX-424-AC and RPS-X424-DC Power Supplies

The RPSX-424-AC and RPS-X424-DC power supplies are supported in the following devices:

- FESX424
- FWSX424
- FESX424HF

The power supplies are 100VAC @ 3.5A, 240 VAC @ 1.5A, 50-60Hz, and are auto-sensing and auto-switching.

Figure 3.16 shows a rear view of a FastIron Stackable device containing one AC power supply. Figure 3.17 shows a rear view of a FastIron Stackable device containing one DC power supply.

Figure 3.16 RPSX-242-AC power supply

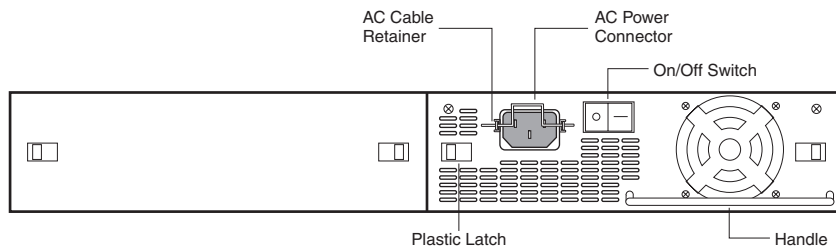
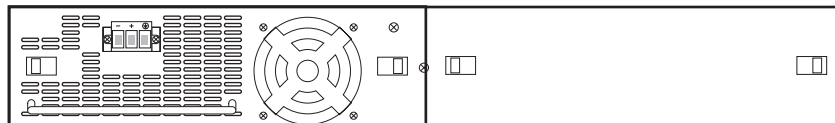


Figure 3.17 RPS-X424-DC power supply



RPS8-AC and RPSX-448-AC Power Supplies

The RPS8-AC power supplies are supported in the following devices:

- FES2402-POE
- FES4802-POE

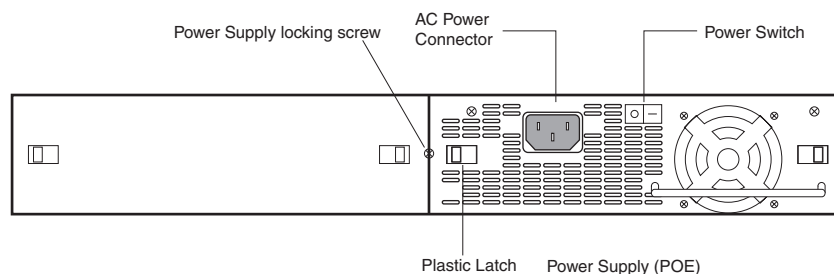
The RPSX-448-AC power supplies are supported in the following devices:

- FESX448
- FWSX448

The RPS8-AC and RPSX-448-AC power supplies are auto-sensing and auto-switching. The supplies provide 600 watts of total output power, including +12VDC @ 10A to the system and -48VDC @ 10 A for Power over Ethernet applications. The supplies provide 100-240 VAC input, 50-60Hz @ 9A to 3.2A.

Figure 3.18 shows a rear view of a FastIron Stackable device containing one AC power supply.

Figure 3.18 RPS8-AC and RPSX-448-AC power supplies



Cooling System and Fans

This section describes the fans in the FES, FESX, and FWSX chassis.

FES Fans

The FES cooling fans cool the CPU, main memory, and voltage regulators. The fans use either a push or pull configuration to move the air from the left side of the device to the right side of the device.

The fans in the FES operate at a steady speed, and do not support multiple fan speeds as do the fans in the FESX and FWSX.

FESX and FWSX Fans

The FastIron Edge Switch X-Series and FastIron Workgroup Switch X-Series include two three-speed fans that operate at low speed, then adjust based on the ambient temperature and configured or default temperature thresholds. Both fans operate simultaneously at the same speed. If one fan fails, it does not affect the operation of the other fan.

The fans can operate at speeds of low, medium, and high. The system uses a **fan speed switch** and a default or configured temperature threshold associated with it to determine at which speed the fan should operate. Fan speed switches are as follows:

- slow-to-medium
- medium-to-slow
- medium-to-fast
- fast-to-medium

If desired, you can change the settings of the temperature thresholds associated with fan speed switches. For more information, see “Managing the FESX and FWSX Fan Settings and Temperature Sensors” on page 6-3.

Layer 3 Routing Protocol Table Sizes

Use the **show default values** command to display Layer 3 routing protocol table sizes. The command output shows the default, maximum, and currently configured values. The following shows an example output.

FESX Router# show default values

```

sys log buffers:50          mac age time:300 sec      telnet sessions:5
ip arp age:10 min         bootp relay max hops:4    ip ttl:64 hops
ip addr per intf:24

```

when multicast enabled :

```
igmp group memb.:140 sec  igmp query:60 sec
```

when ospf enabled :

```

when ospf enabled :
ospf dead:40 sec          ospf hello:10 sec        ospf retrans:5 sec
ospf transit delay:1 sec

```

when bgp enabled :

```

bgp local pref.:100       bgp keep alive:60 sec    bgp hold:180 sec
bgp metric:10             bgp local as:1          bgp cluster id:0
bgp ext. distance:20      bgp int. distance:200   bgp local distance:200

```

System Parameters	Default	Maximum	Current
ip-arp	4000	64000	4000
ip-static-arp	512	1024	512
atalk-route	1024	1536	1024
atalk-zone-port	64	255	64
atalk-zone-sys	768	2048	768
multicast-route	16	8192	16
dvmrp-route	2048	32000	2048
dvmrp-mcache	512	2048	512
pim-mcache	1024	4096	1024
igmp-max-group-addr	256	1024	256
ip-cache	256000	400000	256000
ip-filter-port	32	128	32
ip-filter-sys	64	4096	64
ipx-forward-filter	32	128	32
ipx-rip-entry	2048	8192	2048
ipx-rip-filter	32	128	32
ipx-sap-entry	4096	8192	4096
ipx-sap-filter	32	128	32
l3-vlan	32	1024	32
ip-qos-session	1024	16000	1024
l4-real-server	1024	2048	1024
l4-virtual-server	256	512	256
l4-server-port	2048	4096	2048
mac	64000	64000	64000
ip-route	80000	200000	80000
ip-static-route	64	1024	64
vlan	64	4061	64
spanning-tree	32	128	32
mac-filter-port	16	256	16
mac-filter-sys	32	512	32
ip-subnet-port	24	128	24
session-limit	65536	160000	65536
view	10	65535	10
virtual-interface	255	512	255

Chapter 4

Installing a FastIron X-Series Stackable Switch

WARNING: The procedures in this manual are for qualified service personnel.

This chapter describes how to physically install the FES, FESX, and FWSX devices.

This chapter contains the following topics:

Table 4.1: Chapter Contents

Description	See Page
Unpacking the hardware	4-1
Summary of installation tasks	4-3
Installation precautions	4-4
Site preparation	4-5
Installing a redundant power supply	4-6
Mounting the device	4-8
Powering ON the device	4-9
Verifying proper operation	4-9
Attaching a PC or terminal to the Foundry device	4-10

Information about configuring IP addresses and connecting network devices is in the chapter “Connecting Network Devices and Checking Connectivity”.

Unpacking a System

The Foundry systems ship with all of the following items. Please review the list below and verify the contents. If any items are missing, please contact the place of purchase.

Package Contents

- Foundry Networks FastIron Edge Switch, FastIron Edge Switch X-Series, or FastIron Workgroup Switch X-Series
- 115V AC power cable (for AC sourced devices)
- Rack mount brackets and mounting screws
- CD-ROM containing software images and the user documentation (including this guide)
- Warranty card

General Requirements

To manage the system, you need the following items for serial connection to the switch or router:

- A management station, such as a PC running a terminal emulation application.
- A straight-through EIA/TIA DB-9 serial cable (F/F). The serial cable can be ordered separately from Foundry Networks. If you prefer to build your own cable, see the pinout information in “Attaching a PC or Terminal” on page 4-10.

You use the serial connection to perform basic configuration tasks including assigning an IP address and network mask to the system. This information is required for managing the system using the Web management interface or IronView Network Manager or using the CLI through Telnet.

WARNING: Do not use the handles on the power supply units to lift or carry a Foundry device.

Summary of Installation Tasks

Follow the steps listed below to install your FES, FESX, or FWSX device. Details for each of the steps highlighted below are provided in this chapter and in the following chapter.

Table 4.2: Summary of Installation Tasks

Task Number	Task	Where to Find More Information
1	Ensure that the physical environment that will host the device has the proper cabling and ventilation.	"Preparing the Installation Site" on page 4-5
2	<p>Optionally insert redundant power supplies. If you need to install a power supply, it may be easier to install it before mounting the device, although the power supplies are "hot swappable", and can be installed or removed after the device is mounted and powered-on.</p> <hr/> <p>CAUTION: Remove the power cord from a power supply before you install it in or remove it from the device. Otherwise, the power supply or the device could be damaged as a result. (The device can be running while a power supply is being installed or removed, but the power supply itself should not be connected to a power source.)</p> <hr/>	"Installing a Redundant Power Supply" on page 4-6
4	Install the Foundry device on a desktop, in an equipment rack, or on the wall.	"Installing the Device" on page 4-8
5	Once the device is physically installed, plug the device into a nearby power source that adheres to the regulatory requirements outlined in this manual.	"Powering On the System" on page 4-9
6	Verify that the system LEDs are registering the proper LED state after power-on of the system.	"Verifying Proper Operation" on page 4-9
7	Attach a terminal or PC to the Foundry device. This will enable you to configure the device via the <i>Command Line Interface (CLI)</i> .	"Attaching a PC or Terminal" on page 4-10
8	No default password is assigned to the CLI. For additional access security, assign a password.	"Assigning Permanent Passwords" on page 5-1
9	Before attaching equipment to the device, you need to configure an interface IP address to the subnet on which it will be located. Initial IP address configuration is performed using the CLI with a direct serial connection. Subsequent IP address configuration can be performed using the Web management interface.	"Configuring IP Addresses" on page 5-3
10	Once you power on the device and assign IP addresses, the system is ready to accept network equipment.	"Connecting Network Devices" on page 5-5
11	Test IP connectivity to other devices by pinging them and tracing routes.	"Testing Connectivity" on page 5-7

Table 4.2: Summary of Installation Tasks

Task Number	Task	Where to Find More Information
12	Continue configuring the device using the CLI or the Web management interface. You also can use IronView Network Manager to manage the device. See the <i>Foundry IronView Network Management User's Guide</i> for information.	<i>Foundry FastIron X-Series Configuration Guide</i> or <i>Foundry Switch and Router Installation and Basic Configuration Guide</i> and <i>Foundry Enterprise Configuration and Management Guide</i>
13	Secure access to the device.	<i>Foundry Security Guide</i> .

Installation Precautions

Follow these precautions when installing a Foundry device.

General Precautions

WARNING: All fiber-optic interfaces use Class 1 lasers.

CAUTION: Do not install the device in an environment where the operating ambient temperature might exceed 40° C (104° F).

CAUTION: Make sure the air flow around the front, sides, and back of the device is not restricted.

CAUTION: Never leave tools inside the chassis.

Lifting Precautions

WARNING: Make sure the rack or cabinet housing the device is adequately secured to prevent it from becoming unstable or falling over.

WARNING: Do not use the handles on the power supply units to lift or carry a Foundry device.

WARNING: Mount the devices you install in a rack or cabinet as low as possible. Place the heaviest device at the bottom and progressively place lighter devices above.

Power Precautions

CAUTION: Use a separate branch circuit for each AC power cord, which provides redundancy in case one of the circuits fails.

CAUTION: Ensure that the device does not overload the power circuits, wiring, and over-current protection. To determine the possibility of overloading the supply circuits, add the ampere (amp) ratings of all devices installed on the same circuit as the device. Compare this total with the rating limit for the circuit. The maximum ampere ratings are usually printed on the devices near the input power connectors.

CAUTION: All devices with DC power supplies are intended for installation in restricted access areas only. A restricted access area is where access can be gained only by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.

CAUTION: For the DC input circuit to a FES, FESX, or FWSX (DC power supply part number RPS5DC and RPS-X424-DC), make sure there is a 10-amp listed circuit breaker, minimum -48VDC, double pole, on the input to the terminal block. The input wiring for connection to the product should be Listed copper wire, 14 AWG, marked VW-1, and rated 90 degrees Celsius.

CAUTION: Make sure you insert the power supply right-side up. It is possible to insert the supply upside down, although the supply will not engage with the power backplane when upside down. The power supply is right-side up when the power connector is on the left and the fan vent is on the right.

CAUTION: Remove the power cord from a power supply before you install it in or remove it from the device. Otherwise, the power supply or the device could be damaged as a result. (The device can be running while a power supply is being installed or removed, but the power supply itself should not be connected to a power source.)

CAUTION: The RPS8-AC power supply is designed exclusively for use with the FES2402-POE and FES4802-POE devices. The power supply produces extensive power to support 802.3af applications. Installing the power supply in a device other than the FES2402-POE or FES4802-POE will cause extensive damage to your equipment.

WARNING: Disconnect the power cord from all power sources to completely remove power from the device.

WARNING: Make sure to choose the appropriate circuit device depending on the number of AC power supplies installed in the chassis. The minimum current draw for the system is one AC power supply.

WARNING: Power supplies are hot swappable. However, Foundry Networks recommends that you disconnect the power supply from AC power before installing or removing the supply. The device can be running while a power supply is being installed or removed, but the power supply itself should not be connected to a power source. Otherwise, you could be injured or the power supply or other parts of the device could be damaged.

WARNING: Make sure that the power source circuits are properly grounded, then use the power cord supplied with the device to connect it to the power source.

WARNING: If the installation requires a different power cord than the one supplied with the device, make sure you use a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.

Preparing the Installation Site

Cabling Infrastructure

Ensure that the proper cabling is installed in the site. See “Hardware Specifications” on page A-1 or www.foundrynetworks.com for a summary of supported cabling types and their specifications.

Installation Location

Before installing the device, plan its location and orientation relative to other devices and equipment. Allow at least 3" of space at the front of the device for the twisted-pair, fiber-optic, and power cabling. Also, allow a minimum of 3" of space between the sides and the back of the device and walls or other obstructions.

Installing a Redundant Power Supply

The FastIron Stackable device ships with one AC or DC power supply. If desired, you can install a second supply for redundancy.

If you need to install a redundant power supply, it may be easier to install it before mounting the device, although the power supplies are "hot swappable" and can be installed or removed after the device is mounted and powered on.

This section provides the following procedures:

- Installing a redundant AC power supply – "Installing an AC Power Supply" on page 4-6
- Installing a redundant DC power supply – "Installing a DC Power Supply" on page 4-7

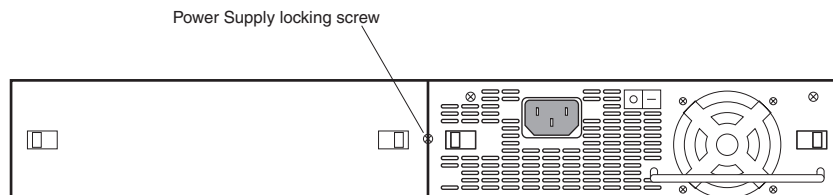
Installing an AC Power Supply

WARNING: Before beginning the installation, see the precautions in "Power Precautions" on page 4-4.

Use the following procedures for AC power supplies in FastIron stackable devices. See "Power Supplies" on page 2-21 for a list of which power supplies are supported in which devices, and for illustrations showing power supply placement in the Foundry devices.

To install an AC power supply, do the following:

1. If necessary, remove the power supply locking screw located in the center rear of the device (illustrated below).



2. If the empty power supply bay has a cover plate, press inward on the two latches near the edges of the cover plate to unlock the plate, then remove the plate.
3. Remove the power supply from its packaging.
4. With one hand, hold the bar on the front panel of the power supply. With the other hand, support the underside of the power supply, and insert the power supply into the empty power supply slot. Press until the supply is completely in the slot, so that the connectors on the back of the supply are fully engaged with the pins on the power backplane.

CAUTION: Make sure you insert the power supply right-side up. It is possible to insert the supply upside down, although the supply will not engage with the power backplane when upside down. The power supply is right-side up when the power connector is on the left and the fan vent is on the right.

5. Press the two latches near the edges of the supply outward to lock the supply in place.
6. Connect the power cord to the power supply.

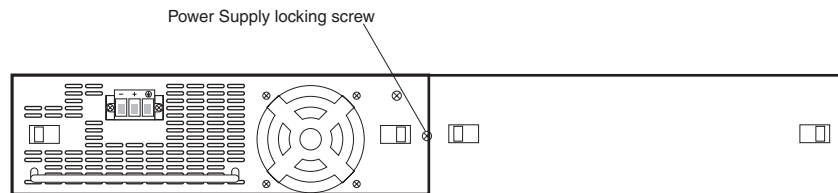
7. Connect the plug end of the power cord into an outlet.

Installing a DC Power Supply

Use the following procedures for DC power supplies in FastIron stackable devices. See "Power Supplies" on page 2-21 for a list of which power supplies are supported in which devices, and for illustrations of power supply placement in the Foundry devices.

WARNING: Before beginning the installation, see the precautions in "Power Precautions" on page 4-4.

1. If necessary, before installing a power supply, remove the power supply locking screw located in the center rear of the device (illustrated below).



2. If the empty power supply bay has a cover plate, press inward on the two latches near the edges of the cover plate to unlock the plate, then remove the plate.
3. Remove the power supply from its packaging.
4. Prepare the positive, negative, and ground wires by stripping about 1/4" of insulation off the end of each one. (Use 14 AWG wire.)
5. Loosen the three screws used to hold the wires in the connector. These are the wires under the following markings:

— + ⊕
6. Slip the ground wire into the opening under the ⊕ marking until the wire is fully in place, then tighten the screw to hold the wire in place.
7. Repeat for the negative (—) and positive (+) wires.
8. Pull gently on each wire to make sure they are securely fastened in the connector.
9. With one hand, hold the bar on the front panel of the power supply. With the other hand, support the underside of the power supply, and insert the power supply into the empty power supply slot. Press until the supply is completely in the slot, so that the connectors on the back of the supply are fully engaged with the pins on the power backplane.

CAUTION: Make sure you insert the power supply right-side up. It is possible to insert the supply upside down, although the supply will not engage with the power backplane when upside down. The power supply is right-side up when the power connector is on the left and the fan vent is on the right.

10. Press the two latches near the edges of the supply outward to lock the supply in place.
11. If necessary, replace the power supply locking screw.
12. After the power supply is properly inserted, connect the power source to the wires to activate the circuit.

Installing the Device

You can install Foundry systems on a desktop, in an equipment rack, or on the wall.

WARNING: Make sure the rack or cabinet housing the device is adequately secured to prevent it from becoming unstable or falling over.

WARNING: Mount the devices you install in a rack or cabinet as low as possible. Place the heaviest device at the bottom and progressively place lighter devices above.

Desktop Installation

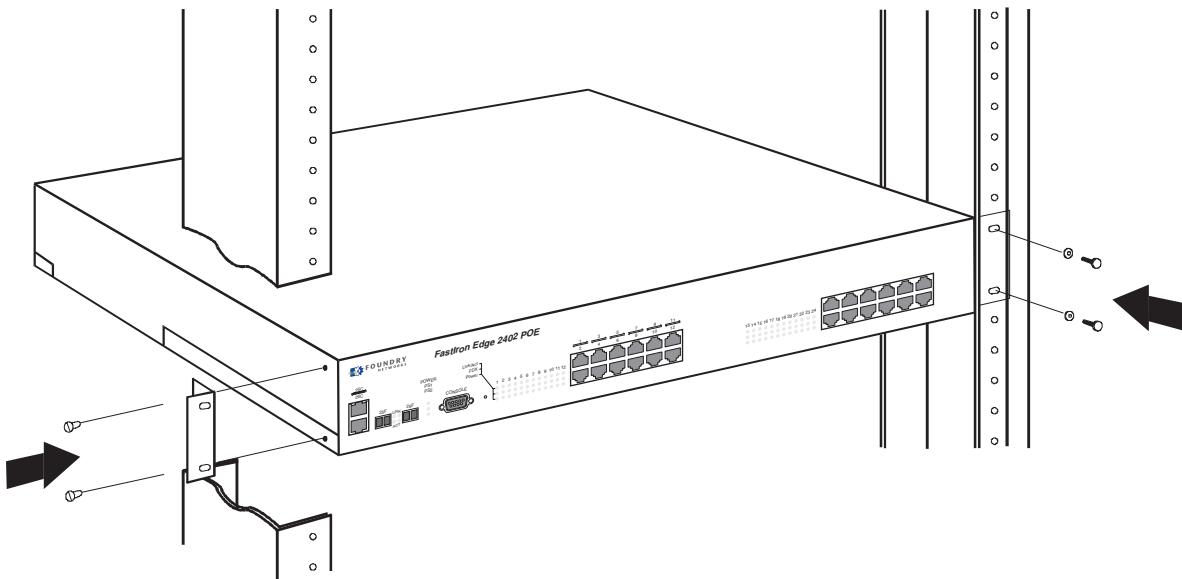
1. Set the device on a flat desktop, table, or shelf. Make sure that adequate ventilation is provided for the system – a 3-inch clearance is recommended on each side.
2. Go to “Powering On the System” on page 4-9.

Rack Mount Installation

NOTE: You need a #2 Phillips-head screwdriver for installation.

1. Remove the rack mount kit from the shipping carton. The kit contains two L-shaped mounting brackets and mounting screws.
2. Attach the mounting brackets to the sides of the device as illustrated in Figure 4.1.
3. Attach the device in the rack as illustrated in Figure 4.1.
4. Proceed to “Powering On the System” on page 4-9.

Figure 4.1 Installing the Device in a rack mount



Wall Mount Installation

1. To mount the device on a wall, you must order and install the Wall Mount Bracket kit (part number 70076-000). Follow the instructions included in the kit to mount the device on a wall.
2. Proceed to “Powering On the System” on page 4-9.

Powering On the System

After you complete the physical installation of the system, you can power on the system.

1. Ensure that all power supplies are fully and properly inserted and no power supply slots are uncovered.

CAUTION: Never leave tools inside the device.

2. Remove the power cord from the shipping package.
3. Attach the AC power cable to the AC connector on the rear panel.
4. Insert the power cable plug into a 115V/120V outlet.

NOTE: To turn the system off, simply unplug the power cord(s).

NOTE: The socket should be installed near the equipment and should be easily accessible.

NOTE: If the outlet is not rated 115/120V, stop and get the appropriate cable for the outlet.

Verifying Proper Operation

After you have installed any redundant power supplies, verify that the device is working properly by plugging it into a power source and verifying that it passes its self test.

If your device has more than one power supply installed, repeat this procedure for each power supply.

1. Connect the power cord supplied with the device to the power connector on the power supply on the rear of the device.
2. Insert the other end into a properly grounded electrical outlet.
3. For the FES2402-POE and FES4802-POE with power supply model RPS8, turn the power switch to the ON position.

NOTE: The non-POE devices use power supply model RPS5, which do not have power switches. They power on when you connect a power cord to the device and to a power source.

If your installation requires a different power cord than that supplied with the device, make sure you obtain a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.

4. Verify that the LED for each power supply is a solid green.
5. Verify proper operation by observing the LEDs:

All the port LEDs should flash momentarily, usually in sequence, while the device performs diagnostics. After the diagnostics are complete, the LEDs will be dark except for the ones that are attached by cables to other devices. If the links on these cables are good and the connected device is powered on, the link LEDs will light.

For more details on specific LED conditions after system start-up, see the section below, "Observing the Power Status LEDs" on page 4-10 and "Hardware Specifications" on page A-1.

Observing the Power Status LEDs

Table 4.3 lists the LEDs that show power status. The power supplies themselves do not have LEDs.

Table 4.3: LEDs for Power

LED	Position	State	Meaning
Power	Left side of front panel	On	The device is powered on and has enough power to operate.
		Off	The device is not powered on, or has been powered on but does not have sufficient power to operate.
PS1	Left side of front panel	On	Power supply 1 is installed and is functioning normally. Power supply 1 is located in the right-hand bay (when you are facing the rear of the device).
		Off	Power supply 1 is not installed or is not providing power.
PS2	Left side of front panel	On	Power supply 2 is installed and is functioning normally. Power supply 2 is located in the left-hand bay (when you are facing the rear of the device).
		Off	Power supply 2 is not installed or is not providing power.

The software regularly polls the hardware for power status information. You can display the status information from any management session. In addition, the software automatically generates a Syslog message and SNMP trap if a status change occurs.

Attaching a PC or Terminal

To assign an IP address, you must have access to the **Command Line Interface (CLI)**. The CLI is a text-based interface that can be accessed through a direct serial connection to the device and through Telnet connections. The CLI is described in detail in the *Foundry Switch and Router Command Line Interface Reference*.

You need to assign an IP address using the CLI. You can access the CLI by attaching a serial cable to the Console port. After you assign an IP address, you can access the system through Telnet, the Web management interface, or IronView Network Manager.

To attach a management station using the serial port:

1. Connect a PC or terminal to the serial port of the system using a straight-through cable. The serial port has a male DB-9 connector.

NOTE: You need to run a terminal emulation program on the PC.

2. Open the terminal emulation program and set the session parameters as follows:
 - Baud: 9600 bps
 - Data bits: 8
 - Parity: None

- Stop bits: 1
- Flow control: None

When you establish the serial connection to the system, press Enter to display the CLI prompt in the terminal emulation window. For example:

- FESX Switch>
- FESX Switch-PREM>

If you see one of these prompts, you are now connected to the system and can proceed to “Assigning Permanent Passwords” on page 5-1.

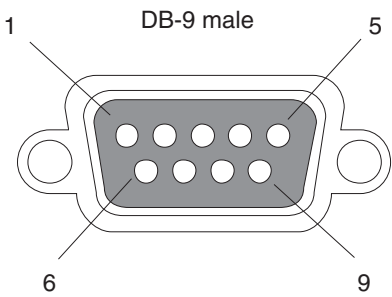
You can customize the prompt by changing the system name. See the *Foundry FastIron X-Series Configuration Guide* or the *Foundry Switch and Router Installation and Basic Configuration Guide*.

If you do not see one of these prompts:

1. Make sure the cable is securely connected to your PC and to the Foundry system.
2. Check the settings in your terminal emulation program. In addition to the session settings listed above, make sure the terminal emulation session is running on the same serial port you attached to the Foundry system.

The EIA/TIA 232 serial communication port serves as a connection point for management by a PC or SNMP workstation. Foundry switches and Layer 3 Switches come with a standard male DB-9 connector, shown in Figure 4.2.

Figure 4.2 Serial port pin and signalling details

Pin Assignment	Pin Number	Switch Signal
	1	Reserved
	2	TXD (output)
	3	RXD (input)
	4	Reserved
	5	GND
	6	Reserved
	7	CTS (input)
	8	RTS (output)
	9	Reserved

Most PC serial ports also require a cable with a female DB-9 connector.

Terminal connections will vary, requiring either a DB-9 or DB-25 connector, male or female.

Serial cable options between a Foundry switch or router and a PC or terminal are shown in Figure 4.3.

NOTE: As indicated in Figure 4.2 and Figure 4.3, some of the wires should not be connected. If you do connect the wires that are labeled “Reserved”, you might get unexpected results with some terminals.

Figure 4.3 Serial port pin assignments showing cable connection options to a terminal or PC

DB-9 to DB-9 Female Switch			Terminal or PC	DB-9 to DB-25 Female Switch			Terminal or PC
1	Reserved		1	1	Reserved		8
2	→		2	2	→		3
3	←		3	3	←		2
4	Reserved		4	4	Reserved		20
5	→		5	5	→		7
6	Reserved		6	6	Reserved		6
7	←		7	7	←		4
8	→		8	8	→		5
9	Reserved		9	9	Reserved		22

Chapter 5

Connecting Network Devices and Checking Connectivity

This chapter provides the details for connecting network devices and checking network connectivity.

WARNING: The procedures in this manual are for qualified service personnel.

Table 5.1 lists the tasks you must perform to connect your Foundry device, and shows where to get troubleshooting information for any problems that can arise.

Table 5.1: Network Connectivity Tasks

Step	Task	Page
1	Secure access to the CLI by assigning passwords.	5-1
2	Configure IP addresses for the management, Ethernet, virtual, and loopback interfaces.	5-3
3	Connect your device to another networking device.	5-5
4	Test a port for connectivity to other networking devices using the ping and traceroute commands.	5-7
5	Troubleshoot any problems that can arise.	5-10

Assigning Permanent Passwords

By default, the CLI is not protected by passwords. To secure CLI access, Foundry strongly recommends assigning passwords. See the *Foundry Security Guide*.

NOTE: You cannot assign a password using the Web management interface. You can assign passwords using IronView Network Manager if an enable password for a Super User has been configured on the device.

The CLI contains the following access levels:

- User EXEC – The level you enter when you first start a CLI session. At this level, you can view some system information but you cannot configure system or port parameters.

- Privileged EXEC – This level is also called the Enable level and can be secured by a password. You can perform tasks such as manage files on the flash module, save the system configuration to flash, and clear caches at this level.
- CONFIG – The configuration level. This level lets you configure the system's IP address and configure switching and routing features. To access the CONFIG mode, you must already be logged into the Privileged level of the EXEC mode.

You can set the following levels of Enable passwords:

- Super User – Allows complete read-and-write access to the system. This is generally for system administrators and is the only password level that allows you to configure passwords.

NOTE: You must set a super user password before you can set other types of passwords.

- Port Configuration – Allows read-and-write access for specific ports but not for global (system-wide) parameters.
- Read Only – Allows access to the Privileged EXEC mode and CONFIG mode but only with read access.

To set passwords:

1. At the opening CLI prompt, enter the following command to change to the Privileged level of the EXEC mode:

```
FESX Switch> enable
```

2. Access the CONFIG level of the CLI by entering the following command:

```
FESX Switch# configure terminal
```

```
FESX Switch(config)#
```

3. Enter the following command to set the super-user password:

```
FESX Switch(config)# enable super-user-password <text>
```

NOTE: You must set the super-user password before you can set other types of passwords.

4. Enter the following commands to set the port configuration and read-only passwords:

```
FESX Switch(config)# enable port-config-password <text>
```

```
FESX Switch(config)# enable read-only-password <text>
```

NOTE: If you forget your super-user password, see "Recovering from a Lost Password" on page 5-2.

Syntax: enable super-user-password | read-only-password | port-config-password <text>

Passwords can be up to 32 characters long.

Recovering from a Lost Password

By default, the CLI does not require passwords. However, if someone has configured a password for the device but the password has been lost, you can regain super-user access to the device using the following procedure.

NOTE: Recovery from a lost password requires direct access to the serial port and a system reset.

To recover from a lost password:

1. Start a CLI session over the serial interface to the Foundry device.
2. Reboot the device.
3. While the system is booting, before the initial system prompt appears, enter **b** to enter the boot monitor mode.
4. Enter **no password** at the prompt. (You cannot abbreviate this command.)

5. Enter **boot system flash primary** at the prompt. This command causes the device to bypass the system password check.
6. After the console prompt reappears, assign a new password.

Configuring IP Addresses

You must configure at least one IP address using the serial connection to the CLI before you can manage the system using the other management interfaces. In addition, Foundry routers require an IP subnet address for the subnet in which you plan to place them in your network.

Foundry devices support both classical IP network masks (Class A, B, and C subnet masks, and so on) and Classless Interdomain Routing (CIDR) network prefix masks.

- To enter a classical network mask, enter the mask in IP address format. For example, enter "209.157.22.99 255.255.255.0" for an IP address with a Class-C subnet mask.
- To enter a prefix number for a network mask, enter a forward slash (/) and the number of bits in the mask immediately after the IP address. For example, enter "209.157.22.99/24" for an IP address that has a network mask with 24 significant ("mask") bits.

By default, the CLI displays network masks in classical IP address format (example: 255.255.255.0). You can change the display to the prefix format. See the *Foundry FastIron X-Series Configuration Guide* or the *Foundry Enterprise Configuration and Management Guide*.

NOTE: If your network uses a BootStrap Protocol (BootP) server or a Dynamic Host Configuration Protocol (DHCP) server, you can allow the Foundry device to obtain IP addresses for the hosts on the network.

Devices Running Layer 3 Software

Before attaching equipment to a Foundry Layer 3 Switch, you must assign an interface IP address to the subnet on which the router will be located. You must use the serial connection to assign the first IP address. For subsequent addresses, you also can use the CLI through Telnet or the Web management interface.

By default, you can configure up to 24 IP interfaces on each port, virtual interface, and loopback interface. You can increase this amount to up to 64 IP subnet addresses per port by increasing the size of the subnet-per-interface table. See the *Foundry FastIron X-Series Configuration Guide* or the *Foundry Switch and Router Installation and Basic Configuration Guide*.

The following procedure shows how to add an IP address and mask to a router port.

1. At the opening CLI prompt, enter **enable**.
2. Enter the following command at the CLI Privileged EXEC level prompt, then press Enter. This command erases the factory test configuration if still present:

```
FESX Router> enable
```

```
FESX Router# erase startup-config
```

CAUTION: Use the **erase startup-config** command only for new systems. If you enter this command on a system you have already configured, the command erases the configuration. If you accidentally do erase the configuration on a configured system, enter the **write memory** command to save the running configuration to the startup-config file.

3. Access the configuration level of the CLI by entering the following command:

```
FESX Router# configure terminal          Privileged EXEC Level
FESX Router(config)#                    Global CONFIG Level
```

4. Configure the IP addresses and mask addresses for the interfaces on the router.

```
FESX Router(config)# int e 2
```

```
FESX Router(config-if-e1000-2)# ip address 192.22.3.44 255.255.255.0
```

NOTE: You can use the syntax **ip address** <ip-addr>/<mask-bits> if you know the subnet mask length. In the above example, you could enter **ip address 192.22.3.44/24**.

Syntax: enable [<password>]

Syntax: configure terminal

Syntax: [no] ip address <ip-addr> <ip-mask> [secondary]

or

Syntax: [no] ip address <ip-addr>/<mask-bits> [secondary]

Use the **secondary** parameter if you have already configured an IP address within the same subnet on the interface.

Devices Running Layer 2 Software

To configure an IP Address on a device running Layer 2 software:

1. At the opening CLI prompt, enter **enable**.

```
FESX Switch> enable
```

2. Enter the following command at the Privileged EXEC level prompt (for example, FESX Switch#), then press Enter. This command erases the factory test configuration if still present:

```
FESX Switch# erase startup-config
```

CAUTION: Use the **erase startup-config** command only for new systems. If you enter this command on a system you have already configured, the command erases the configuration. If you accidentally do erase the configuration on a configured system, enter the **write memory** command to save the running configuration to the startup-config file.

3. Access the configuration level of the CLI by entering the following command:

```
FESX Switch# configure terminal          Privileged EXEC Level
FESX Switch(config)#                    Global CONFIG Level
```

4. Configure the IP address and mask for the switch.

```
FESX Switch(config)# ip address 192.22.3.44 255.255.255.0
```

5. Set a default gateway address for the switch.

```
FESX Switch(config)# ip default-gateway 192.22.3.1
```

NOTE: You do not need to assign a default gateway address for single subnet networks.

Syntax: enable [<password>]

Syntax: configure terminal

Syntax: [no] ip address <ip-addr> <ip-mask>

or

Syntax: [no] ip address <ip-addr>/<mask-bits>

Syntax: ip default-gateway <ip-addr>

Connecting Network Devices

Foundry devices support connections to other vendors' routers, switches, and hubs, as well other Foundry devices.

Connectors

- 10Base-T/100Base-TX ports come with RJ-45 jacks for standard unshielded twisted pair (UTP/Category 5) cable connections.
- 1000Base-T ports come equipped with RJ-45 connectors.
- 1000Base-SX ports come equipped with SC connectors for SFP transceivers.
- 1000Base-LX ports come equipped with SC connectors for SFP transceivers.
- 1000Base-LH ports come equipped with SC connectors for SFP transceivers.
- 10GBase-ER ports come equipped with LC connectors for XFP transceivers.
- 10GBase-LR ports come equipped with LC connectors for XFP transceivers.
- 10GBase-SR ports come equipped with LC connectors for XFP transceivers.

For port pinouts, see the section "10/100 and Gigabit Port Pinouts" on page A-4.

Cable Specifications

See "Cable Specifications" on page A-5 for cable lengths and types.

Connecting to Ethernet or Fast Ethernet Hubs

For copper connections to Ethernet hubs, a 10/100BaseTX or 1000BaseT switch, or another Foundry device, a crossover cable is required (Figure 5.1 and Figure 5.2). If the hub is equipped with an uplink port, it will require a straight-through cable instead of a crossover cable.

NOTE: The 802.3ab standard (automatic MDI/MDIX detection) calls for automatic negotiation of the connection between two 1000Base-T ports. Therefore, a crossover cable may not be required; a straight-through cable may work as well. For more information about this feature, see the *Foundry FastIron X-Series Configuration Guide* or the *Foundry Switch and Router Installation and Basic Configuration Guide*.

Figure 5.1 UTP crossover cable

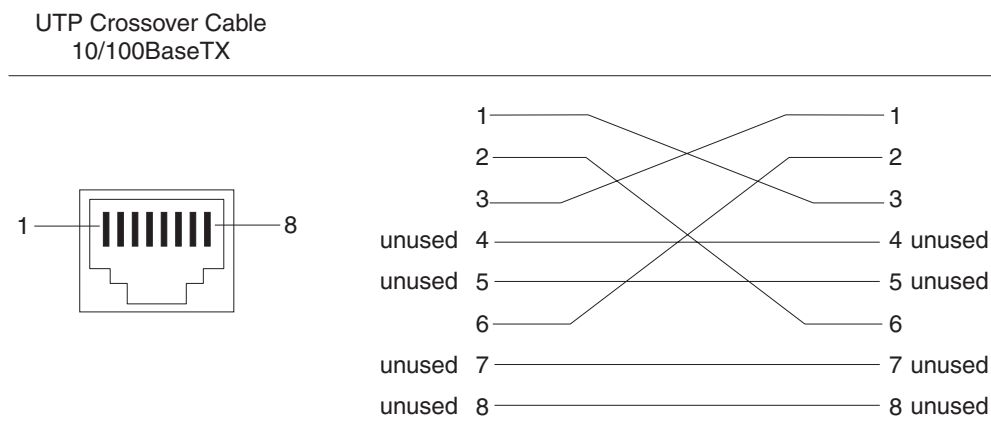
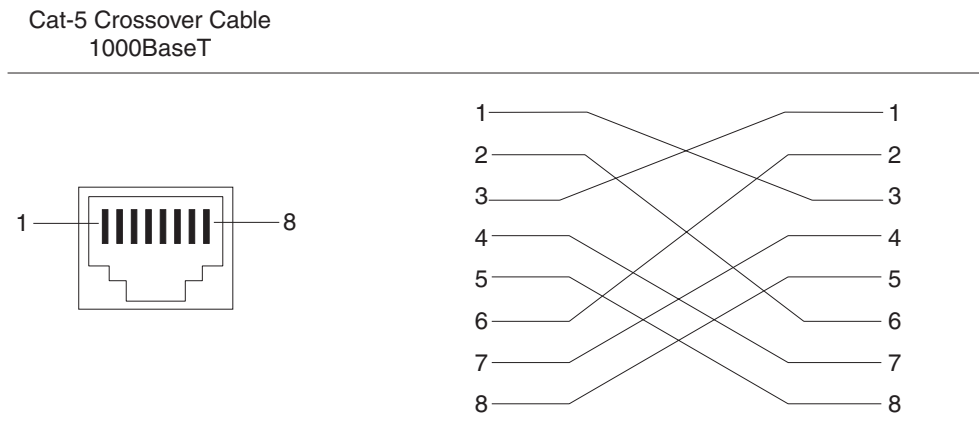


Figure 5.2 Cat-5 crossover cable for 1000BaseT



NOTE: The 802.3ab standard calls for automatic negotiation of the connection between two 1000BaseT ports. Consequently, a crossover cable may not be required; a straight-through cable may work as well.

Connecting to Workstations, Servers, or Routers

Straight-through UTP cabling is required for direct UTP attachment to workstations, servers, or routers using network interface cards (NICs).

Fiber cabling is required for direct attachment to Gigabit NICs or switches and routers via fiber ports. See “Connecting a Network Device to a Fiber Port” on page 5-6.

Automatic MDI/MDIX Detection

All 10/100 and Gigabit Ethernet Copper ports on the Foundry FastIron devices support automatic Media Dependent Interface (MDI) and Media Dependent Interface Crossover (MDIX) detection. This feature is enabled on all 10/100 and Gigabit copper ports by default. For each port, you can disable auto MDI/MDIX, designate the port as an MDI port, or designate the port as an MDIX port.

For more information about this feature and how to configure it, see the *Foundry FastIron X-Series Configuration Guide* or the *Foundry Switch and Router Installation and Basic Configuration Guide*.

Connecting a Network Device to a Fiber Port

For direct attachment from the Foundry device to a Gigabit NIC, switch, or router, fiber cabling with an LC connector is required.

To connect the Foundry device to another network device using a fiber port, you must do the following:

- Install a fiber optic module (SFP transceiver or mini-GBIC for Gigabit Ethernet ports, or XFP-MSA transceiver for 10-Gigabit Ethernet ports)
- Cable the fiber optic module

The following sections provide information about performing these tasks.

Installing a Fiber Optic Module

You must install a fiber optic module (SFP or XFP transceiver) in each Gigabit Ethernet and 10-Gigabit Ethernet fiber port you want to use.

You can install a new fiber optic module in a port while the FastIron Stackable device is powered on and running.

Before installing one of these modules into the port, have the following on hand:

- An ESD wrist strap with a plug for connection to a metal surface.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

To install a fiber optic module, do the following:

1. Put on the ESD wrist strap and ground yourself by attaching the clip end to a metal surface (such as an equipment rack) to act as ground.
2. Remove the new module from its protective packaging.
3. Gently insert the fiber optic module into the port until the module clicks into place. The module is keyed to prevent incorrect insertion.

Cabling a Fiber Optic Module

To cable a fiber optic module, do the following:

1. Remove the protective covering from the fiber-optic port connectors and store the covering for future use.
2. Before cabling a fiber optic module, Foundry strongly recommends cleaning the cable connectors and the port connectors. For more information, see "Cleaning the Fiber-Optic Connectors" on page 5-7.
3. Gently insert the cable connector(s) (a tab on each connector should face upward) into the port connector(s) until the tabs lock into place.
4. Observe the link and active LEDs to determine if the network connections are functioning properly. For more information about the LED indicators, see Table 5.2 on page 5-9.

Cleaning the Fiber-Optic Connectors

To avoid problems with the connection between the fiber optic module (SFP (mini-GBIC) or XFP) and the fiber cable connectors, Foundry strongly recommends cleaning both connectors each time you disconnect and reconnect them. In particular, dust can accumulate in the connectors and cause problems such as reducing the optic launch power.

To clean the fiber cable connectors, Foundry recommends using the fiber-optic reel-type cleaner that shipped with your FastIron chassis. You can also purchase this type of cleaner from the following Website:

http://www.fisfiber.com/Home_Page.asp

When not using an SFP or XFP connector, make sure to keep the protective covering on.

Testing Connectivity

After you install the network cables, you can test network connectivity to other devices by pinging those devices. You also can observe the LEDs related to network connection and perform trace routes.

Pinging an IP Address

To verify that a Foundry device can reach another device through the network, enter a command such as the following at any level of the CLI on the Foundry device:

```
FESX Switch> ping 192.33.4.7
```

Syntax: ping <ip addr> | <hostname> [source <ip addr>] [count <num>] [timeout <msec>] [ttl <num>] [size <byte>] [quiet] [numeric] [no-fragment] [verify] [data <1-to-4 byte hex>] [brief]

See the *Foundry Switch and Router Command Line Interface Reference* for information about the parameters.

NOTE: If you address the ping to the IP broadcast address, the device lists the first four responses to the ping.

Observing LEDs

After you install the network cables, you can observe certain LEDs to determine if the network connections are functioning properly. Table 5.2 outlines the LEDs related to the network connections, the desired state of each LED, possible abnormal states of each LED, and what to do if an LED indicates an abnormal state.

Table 5.2: Network Connection-Related LED States

LED	Desired State	Meaning	Abnormal State	Meaning/Action
Link (Lnk)	On (Green)	A link is established with the remote port.	Off	<p>A link is not established with the remote port. You can do the following:</p> <ul style="list-style-type: none"> Verify that the connection to the other network device has been properly made. Also, make certain that the other network device is powered on and operating correctly. Verify that the transmit port on the Foundry device is connected to the receive port on the other network device, and that the receive port on the Foundry device is connected to the transmit port on the other network device. If you are not certain, remove the two cable connectors from the port connector and reinsert them in the port connector, reversing their order. Dust may have accumulated in the cable connector or port connector. For information about cleaning the connectors, see "Cleaning the Fiber-Optic Connectors" on page 5-7. If the other actions don't resolve the problem, try using a different port or a different cable.
Active (Act)	On or blinking (Yellow)	The port is transmitting and receiving user packets.	Off for an extended period.	<p>The port is not transmitting or receiving user packets. You can do the following:</p> <ul style="list-style-type: none"> Check the Link LED to make sure the link is still established with the remote port. If not, take the actions described in the Meaning/Action column for the Link LED. Verify that the port has not been disabled through a configuration change. You can use the CLI. If you have configured an IP address on the device, you also can use the Web management interface or IronView Network Manager.

If a problem persists after taking these actions, contact Foundry's technical support.

Tracing a Route

To determine the path through which a Foundry device can reach another device, enter a command such as the following at any level of the CLI on the Foundry device:

```
FESX Switch> traceroute 192.33.4.7
```

Syntax: traceroute <host-ip-addr> [maxttl <value>] [minttl <value>] [numeric] [timeout <value>]
[source-ip <ip addr>]

The CLI displays trace route information for each hop as soon as the information is received. Traceroute requests display all responses to a given TTL. In addition, if there are multiple equal-cost routes to the destination, the Foundry device displays up to three responses by default.

See the *Foundry Switch and Router Command Line Interface Reference* for information about the command syntax.

Troubleshooting Network Connections

- For the indicated port, verify that both ends of the cabling (at the Foundry device and the connected device) are snug.
- Verify that the Foundry device and the connected device are both powered on and operating correctly.
- Verify that you have used the correct cable type for the connection:
 - For twisted-pair connections to an end node, use straight-through cabling.
 - For fiber-optic connections, verify that the transmit port on the device is connected to the receive port on the connected device, and that the receive port on the device is connected to the transmit port on the connected device.
- Verify that the port has not been disabled through a configuration change. You can use the CLI. If you have configured an IP address on the device, you also can use the Web management interface or IronView Network Manager.
- For copper ports, you can test the cable using Virtual Cable Testing. See “Using Virtual Cable Testing to Diagnose a Cable” on page 5-10.
- If the other procedures don’t resolve the problem, try using a different port or a different cable.

Using Virtual Cable Testing to Diagnose a Cable

FESX and FWSX devices provide support for **Virtual Cable Test** (VCT) technology. VCT technology enables you to diagnose a conductor (wire or cable) by sending a pulsed signal into the conductor, then examining the reflection of that pulse. This method of cable analysis is referred to as Time Domain Reflectometry (TDR). By examining the reflection, the Foundry device can detect and report cable statistics such as; local and remote link pair, cable length, and link status.

Configuration Notes

- This feature is supported in the following configurations:
 - FESX devices running software release 01.1.00 or later
 - FWSX devices and all associated software releases
- This feature is supported on copper ports only. It is not supported on fiber ports.
- The port to which the cable is connected must be enabled when you issue the command to diagnose the cable. If the port is disabled, the command is rejected.
- If the port is operating at 100 Mbps half-duplex, the TDR test on one pair will fail.
- If the remote pair is set to forced 100 Mbps, any change in MDI/MDIX may cause the device to interpret the Multilevel Threshold-3 (MLT-3) as a reflected pulse, in which case, the device will report a faulty condition. In this scenario, it is recommended that you run the TDR test a few times for accurate results.

Command Syntax

To diagnose a cable using TDR, enter commands such as the following at the Privileged EXEC level of the CLI:

```
FESX Switch# phy cable-diag tdr 1
```

The above command diagnoses the cable attached to port 1.

Syntax: phy cable-diag tdr <port-num>

Viewing the Results of the Cable Analysis

To display the results of the cable analysis, enter a command such as the following at the Privileged EXEC level of the CLI:

```
FESX Switch#sh cable-diag tdr 1
Port      Speed Local pair Pair Length Remote pair Pair status
-----
01        1000M Pair A    <50M      Pair B    Terminated
          Pair B    <50M      Pair A    Terminated
          Pair C    <50M      Pair D    Terminated
          Pair D    <50M      Pair C    Terminated
```

Syntax: show cable-diag tdr <port-num>

Table 5.3 defines the fields shown in the command output.

Table 5.3: Cable Statistics

This Line...	Displays...
Port	The interface that was tested.
Speed	The port's current line speed.
Local pair	The local link name.
Pair Length	The cable length when terminated, or the distance to the point of fault when the line is not up.
Remote pair	The remote link name.
Pair status	The status of the link. This field displays one of the following: <ul style="list-style-type: none"> Terminated: The link is up. Shorted: A short is detected in the cable. Open: An opening is detected in the cable. ImpedMis: The impedance is mismatched. Failed: The TDR test failed.

Chapter 6

Managing the FastIron Stackable Chassis

This chapter contains information about refining the configuration of, monitoring, and managing the hardware components listed in Table 6.1.

Table 6.1: Chapter Contents

Description	See Page
Managing the FES temperature settings	6-1
Managing the FESX and FWSX temperature settings and fan settings	6-3
Displaying management module CPU usage	6-5
Removing MAC address entries	6-5

Managing FES Temperature Settings

This section describes how to display temperature settings on the FES chassis and how to change the temperature warning and shutdown levels.

Using the Temperature Sensor on the FES

The FES chassis comes with a built-in temperature sensor. The temperature sensor causes the device to generate a Syslog message and SNMP trap if the temperature exceeds a specified warning level or shutdown level. If the device's temperature exceeds the safe threshold (shutdown level), the device will shut itself down.

The software reads the temperature sensor according to the chassis poll time, which is 60 seconds by default. If the temperature equals or exceeds the shutdown temperature for five consecutive polls of the temperature by the software, the software will shut down the device to prevent damage.

You can use the CLI or Web management interface to do the following:

- Display the temperature of the device
- Change the warning and shutdown temperature levels
- Change the chassis poll time

Displaying the Temperature on the FES

By default, the software polls the temperature sensor every 60 seconds to get the current temperature. This poll rate is controlled by the chassis poll time, which also controls how often the software polls other system components.

To display the temperature of a device, enter the following command at any level of the CLI:

```
FES Switch> show chassis
power supply 1 ok
power supply 2 not present
power supply 1 to 2 from left to right
fan ok
Current temperature : 41.0 C degrees
Warning level : 64 C degrees, shutdown level : 80 C degrees
```

Syntax: show chassis

Displaying Temperature Messages on the FES

The software sends a Syslog message and an SNMP trap if the temperature crosses the warning or shutdown thresholds. The following methods describe how to view the system log on the device. If you have configured the device to use a Syslog server or SNMP trap receiver, see the documentation for the server or receiver.

To display the system log, enter the following command at any CLI level:

```
FES Switch# show log

Syslog logging: enabled (0 messages dropped, 0 flushes, 0 overruns)
Buffer logging: level ACDMEINW, 8 messages logged
level code: A=alert C=critical D=debugging M=emergency E=error
I=informational N=notification W=warning

Static Log Buffer:

Dynamic Log Buffer (50 entries):

at 0 days 0 hours 2 minutes 0 seconds, level alert
Temperature 48.0 C degrees, warning level 45.0 C degrees, shutdown level 55.0 C
degrees

at 0 days 0 hours 1 minutes 0 seconds, level alert
Temperature 50.0 C degrees, warning level 45.0 C degrees, shutdown level 55.0 C
degrees
```

Changing the Temperature Warning and Shutdown Levels on the FES

The default warning temperature is 45.0 C degrees. The default shutdown temperature is 55.0 C degrees. You can change the warning and shutdown temperatures using the following commands. The valid range for each value is 0 – 125 C degrees.

NOTE: You cannot set the warning temperature to a value higher than the shutdown temperature.

To change the temperature at which the device sends a warning, enter a command such as the following at the Privileged EXEC level of the CLI:

```
FES Switch# temperature warning 47
```

Syntax: temperature warning <value>

The <value> can be 0 – 125.

To change the shutdown temperature, enter a command such as the following at Privileged EXEC level of the CLI:

```
FES Switch# temperature shutdown 57
```

Syntax: temperature shutdown <value>

The <value> can be 0 – 125.

Changing the Chassis Temperature Polling Interval

The software reads the temperature sensor and polls other hardware sensors according to the value set for the chassis poll time, which is 60 seconds by default. You can change the chassis poll time using the CLI.

To change the chassis poll time, enter a command such as the following at the global CONFIG level of the CLI:

```
FES Switch(config)# chassis poll-time 200
```

Syntax: chassis poll-time <value>

The <value> can be 0 – 65535.

Managing the FESX and FWSX Fan Settings and Temperature Sensors

The FESX and FWSX devices have two three-speed fans that operate at low speed, then adjust based on the ambient temperature and configured or default temperature thresholds. Both fans operate simultaneously at the same speed. If one fan fails, it does not affect the operation of the other fan.

The fans can operate at speeds of low, medium, and high. The system uses a *fan speed switch* and a default or configured temperature threshold associated with it to determine at which speed a fan should operate. Fan speed switches are as follows:

- slow-to-medium
- medium-to-slow
- medium-to-fast
- fast-to-medium

If desired, you can change the settings of the temperature thresholds associated with fan speed switches. See “Changing the Temperature Threshold for a Fan Speed Switch” on page 6-4.

About the Temperature Sensors for Fan Speed Switches

The FESX and FWSX devices include two temperature sensors; one at the air intake, and the other at the exhaust. The FESX and FWSX devices use the exhaust-side temperature sensor against the configured or default temperature threshold to determine at which speed the fans should operate.

By default, the system polls the temperature sensor on the system every 60 seconds to get a temperature reading. Depending on the temperature readings for the system, the system can do the following:

- Leave the fan speed as is
- Increase the fan speed
- Decrease the fan speed
- Shut down a module to prevent damage

If desired, you can change the chassis polling interval for temperature sensors. See “Changing the Chassis Temperature Polling Interval” on page 6-3.

Changing the Chassis Polling Interval

The procedure for changing the chassis polling interval on the FESX and FWSX is the same as that on the FES device. See “Changing the Chassis Temperature Polling Interval” on page 6-3.

Adjusting Temperature Thresholds

The FESX and FWSX devices provide default settings for temperature thresholds associated with fan speed switches. Therefore, no initial configuration is necessary. If desired, you can change the settings.

By default, the system uses the temperature thresholds shown in Table 6.2.

Table 6.2: Default Temperature Thresholds for Fan Speed Switching

Fan Speed Switch	Default Temperature Threshold
Fast-to-Medium	35
Medium-to-Fast	40
Medium-to-Slow	25
Slow-to-Medium	30

Changing the Temperature Threshold for a Fan Speed Switch

To change the temperature threshold for a fan speed switch, enter a command such as the following:

```
FESX Switch# temp fan-speed slow-to-medium 30
```

This command causes the system to switch the fan speed from slow to medium if the system's temperature reading exceeds 30° C.

Syntax: temp fan-speed <speed-switch> <threshold-value>

where:

<speed-switch> can be one of the following:

- fast-to-medium
- medium-to-fast
- medium-to-slow
- slow-to-medium

<threshold-value> is a temperature in Centigrade. Table 6.2 shows the default and recommended temperature thresholds. When changing the temperature threshold for a fan speed switch, remember that the temperature threshold of a higher fan switching speed must be higher than the temperature threshold of a lower fan switching speed.

Viewing Fan Speed Switches and Temperature Thresholds

To view the speed at which the fans are currently operating and the configured temperature thresholds for fan speed switching, enter the **show chassis** command. As shown in the following example, the brackets [] delineate the current fan speeds.

```
FESX Switch>show chassis
power supply 1 present, status ok
power supply 2 not present
fan 1 ok
Fan 1 speed: slow<->[medium]<->fast
fan 2 ok
Fan 2 speed: slow<->[medium]<->fast
fan speed switching temperature thresholds:
    slow -> medium @ 30 degrees Celsius
    slow <- medium @ 25 degrees Celsius
    medium -> fast @ 40 degrees Celsius
    medium <- fast @ 35 degrees Celsius
Exhaust Side Temperature Readings:
    Current temperature : 35.5 degrees Celsius
    Warning level.....: 64.0 degrees Celsius
    Shutdown level.....: 80.0 degrees Celsius
Intake Side Temperature Readings:
    Current temperature : 29.0 degrees Celsius
Boot Prom MAC: 00e0.5200.0100
```

Displaying Management Module CPU Usage

You can display the amount of the management module's CPU in use. To do so, enter the following command at any level of the CLI:

```
FESX Switch# show cpu

31 percent busy, from 3248 sec ago
1   sec avg:  31 percent busy
5   sec avg:  31 percent busy
60  sec avg:  31 percent busy
300 sec avg:  31 percent busy
```

Syntax: show cpu

Removing MAC Address Entries

You can remove learned MAC address entries from the Foundry system's MAC address table. You can remove the following:

- All MAC address entries.
- All MAC address entries for a specified Ethernet port.
- All MAC address entries for a specified VLAN.
- A specified MAC address entry in all VLANs.

For example, to remove entries for the MAC address 000d.cb80.00d in all VLANs, enter the following command at the Privileged EXEC level of the CLI:

```
FESX Switch# clear mac-address 000d.cb80.00d0
```

Syntax: clear mac-address <mac-address> | ethernet <port-num> | vlan <number>

If you enter the **clear mac-address** command without any parameters, the software removes all MAC entries.

Use the <mac-address> parameter to remove a specified MAC address from all VLANs. Specify the MAC address in the following format: HHHH.HHHH.HHHH.

Use the **ethernet** <port-num> parameter to remove all MAC addresses for a specified Ethernet port.

Use the **vlan** <number> parameter to remove all MAC addresses for a specified VLAN.

Chapter 7

Maintaining the FastIron Stackable Switch Hardware

This chapter provides instructions for maintaining the FastIron stackable hardware.

WARNING: The procedures in this manual are for qualified service personnel.

This chapter contains the following information:

Table 7.1: Chapter Contents

Description	See Page
Recommended hardware maintenance schedule	7-1
Installing or replacing a power supply	7-2
Installing or replacing a 10-GbE module	7-7
Replacing a fiber optic module (SFP (mini-GBIC) or XFP)	7-9
Cleaning the fiber-optic connectors	7-10

Hardware Maintenance Schedule

The FastIron stackable switch requires minimal maintenance for its hardware components. Foundry recommends cleaning the fiber-optic connectors on a fiber-optic port and the connected fiber cable each time you disconnect the cable.

Otherwise, you can replace the following hardware components as needed:

- Copper and fiber optic modules (SFPs (mini-GBICs) and XFP transceivers)
- Power supplies
- 10-Gigabit Ethernet module

Installing or Replacing a Power Supply

You can install or replace a power supply while the FastIron chassis is powered on and running. The power supplies are located in slots at the rear of the FastIron chassis.

This section provides information about the following topics:

- Installation precautions and warnings
- Determining which AC power supply has failed, if necessary.
- Replacing an AC power supply.

WARNING: Power supplies are hot swappable. However, Foundry Networks recommends that you disconnect the power supply from AC power before installing or removing the supply. The device can be running while a power supply is being installed or removed, but the power supply itself should not be connected to a power source. Otherwise, you could be injured or the power supply or other parts of the device could be damaged.

Installation Precautions and Warnings

Follow these precautions when installing a power supply in the FastIron chassis.

General Precautions

WARNING: Before beginning the installation, see the precautions in “Power Precautions” on page 7-2.

CAUTION: Do not install the device in an environment where the operating ambient temperature might exceed 40° C (104° F).

CAUTION: Never leave tools inside the chassis.

Power Precautions

CAUTION: Use a separate branch circuit for each AC power cord, which provides redundancy in case one of the circuits fails.

CAUTION: Ensure that the device does not overload the power circuits, wiring, and over-current protection. To determine the possibility of overloading the supply circuits, add the ampere (amp) ratings of all devices installed on the same circuit as the device. Compare this total with the rating limit for the circuit. The maximum ampere ratings are usually printed on the devices near the input power connectors.

CAUTION: All devices with DC power supplies are intended for installation in restricted access areas only. A restricted access area is where access can be gained only by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.

CAUTION: For the DC input circuit to a FES, FESX, or FWSX (DC power supply part number RPS5DC and RPS-X424-DC), make sure there is a 10-amp listed circuit breaker, minimum -48VDC, double pole, on the input to the terminal block. The input wiring for connection to the product should be Listed copper wire, 14 AWG, marked VW-1, and rated 90 degrees Celsius.

CAUTION: Make sure you insert the power supply right-side up. It is possible to insert the supply upside down, although the supply will not engage with the power backplane when upside down. The power supply is right-side up when the power connector is on the left and the fan vent is on the right.

CAUTION: Remove the power cord from a power supply before you install it in or remove it from the device. Otherwise, the power supply or the device could be damaged as a result. (The device can be running while a power supply is being installed or removed, but the power supply itself should not be connected to a power source.)

CAUTION: The RPS8-AC power supply is designed exclusively for use with the FES2402-POE and FES4802-POE devices. The power supply produces extensive power to support 802.3af applications. Installing the power supply in a device other than the FES2402-POE or FES4802-POE will cause extensive damage to your equipment.

WARNING: Disconnect the power cord from all power sources to completely remove power from the device.

WARNING: Make sure to choose the appropriate circuit device depending on the number of AC power supplies installed in the chassis. The minimum current draw for the system is one AC power supply.

WARNING: Power supplies are hot swappable. However, Foundry Networks recommends that you disconnect the power supply from AC power before installing or removing the supply. The device can be running while a power supply is being installed or removed, but the power supply itself should not be connected to a power source. Otherwise, you could be injured or the power supply or other parts of the device could be damaged.

WARNING: Make sure that the power source circuits are properly grounded, then use the power cord supplied with the device to connect it to the power source.

WARNING: If the installation requires a different power cord than the one supplied with the device, make sure you use a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.

CAUTION:

Determining Which Power Supply Failed

If you are replacing a power supply that has failed and you are not sure which supply has failed, enter the following command at any CLI command prompt:

```
FESX Switch> show chassis
power supply 1 ok
power supply 2 not present
power supply 1 to 2 from left to right
fan ok
Current temperature : 41.0 C degrees
Warning level : 64 C degrees, shutdown level : 80 C degrees
```

This command displays status information for the power supplies and the fans. The power supplies are numbered from left to right. These numbers assume you are facing the front of the device, not the rear.

If the display indicates “Installed (Failed)” for any of the slots, the power supply installed in that particular slot has failed.

AC Power Supplies

Use the following procedures for AC power supplies in FastIron stackable devices. See “Power Supplies” on page 2-21 for a list of which power supplies are supported in which devices, and for illustrations showing power supply placement in the Foundry devices.

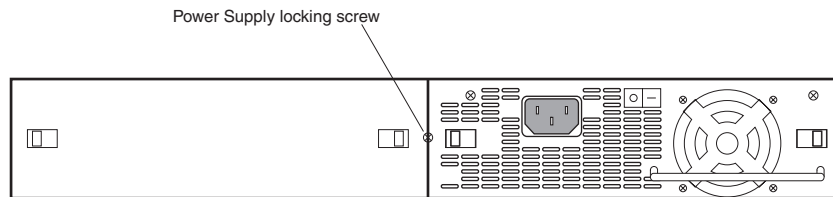
Removing an AC Power Supply

1. Unplug the power supply from the power source.
2. Disconnect the power cord from the power supply.
3. If necessary, remove the power supply locking screw located in the center rear of the device.
4. Press inward on the two latches near the edges of the power supply to unlock the supply.
5. Hold the bar on the front panel of the power supply and pull outward. This will disconnect the power supply from the backplane.
6. Continue to pull the power supply until it is removed from the device.
7. Place the power supply in an anti-static bag for storage.
8. Insert a new supply, or place the cover plate over the empty power supply bay and press the two latches near the edges of the supply outward to lock the plate into place.
9. If necessary, replace the power supply locking screw.

Installing an AC Power Supply

To install an AC power supply, do the following:

1. If necessary, remove the power supply locking screw located in the center rear of the device (illustrated below).



2. If the empty power supply bay has a cover plate, press inward on the two latches near the edges of the cover plate to unlock the plate, then remove the plate.
3. Remove the power supply from its packaging.
4. With one hand, hold the bar on the front panel of the power supply. With the other hand, support the underside of the power supply, and insert the power supply into the empty power supply slot. Press until the supply is completely in the slot, so that the connectors on the back of the supply are fully engaged with the pins on the power backplane.

CAUTION: Make sure you insert the power supply right-side up. It is possible to insert the supply upside down, although the supply will not engage with the power backplane when upside down. The power supply is right-side up when the power connector is on the left and the fan vent is on the right.

5. Press the two latches near the edges of the supply outward to lock the supply in place.
6. Connect the power cord to the power supply.
7. Connect the plug end of the power cord into an outlet.

DC Power Supplies

Use the following procedures for DC power supplies in FastIron stackable devices. See "Power Supplies" on page 2-21 for a list of which power supplies are supported in which devices, and for illustrations of power supply placement in the Foundry devices.

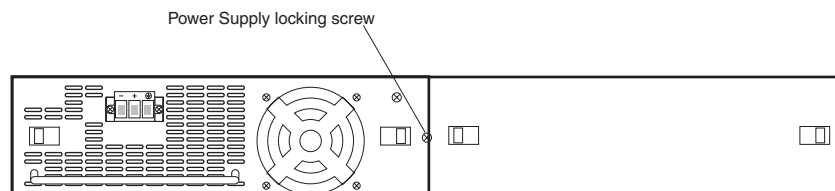
WARNING: Before beginning the installation, see the precautions in "Power Precautions" on page 7-2.

Removing a DC Power Supply

1. Turn off the DC power source or disconnect it from the power supply.
2. Loosen the three screws used to hold the wires in the connector, then pull out the wires.
3. If necessary, remove the power supply locking screw located in the center rear of the device.
4. Press the two latches near the edges of the supply inward to unlock the supply.
5. Hold the bar on the front panel of the power supply and pull outward. This will disconnect the power supply from the backplane.
6. Continue to pull the power supply until it is removed from the device.
7. Place the power supply in an anti-static bag for storage.
8. Insert a new supply, or place the cover plate over the empty power supply bay and press the two latches near the edges of the supply outward to lock the plate into place.
9. If necessary, replace the power supply locking screw.

Installing a DC Power Supply

1. If necessary, before installing a power supply, remove the power supply locking screw located in the center rear of the device (illustrated below).



2. If the empty power supply bay has a cover plate, press inward on the two latches near the edges of the cover plate to unlock the plate, then remove the plate.
3. Remove the power supply from its packaging.
4. Prepare the positive, negative, and ground wires by stripping about 1/4" of insulation off the end of each one. (Use 14 AWG wire.)
5. Loosen the three screws used to hold the wires in the connector. These are the wires under the following markings:
 — + ⊕
6. Slip the ground wire into the opening under the ⊕ marking until the wire is fully in place, then tighten the screw to hold the wire in place.
7. Repeat for the negative (—) and positive (+) wires.
8. Pull gently on each wire to make sure they are securely fastened in the connector.

9. With one hand, hold the bar on the front panel of the power supply. With the other hand, support the underside of the power supply, and insert the power supply into the empty power supply slot. Press until the supply is completely in the slot, so that the connectors on the back of the supply are fully engaged with the pins on the power backplane.

CAUTION: Make sure you insert the power supply right-side up. It is possible to insert the supply upside down, although the supply will not engage with the power backplane when upside down. The power supply is right-side up when the power connector is on the left and the fan vent is on the right.

10. Press the two latches near the edges of the supply outward to lock the supply in place.
11. If necessary, replace the power supply locking screw.
12. After the power supply is properly inserted, connect the power source to the wires to activate the circuit.

Verifying Proper Operation

To verify the proper operation of the power supply after power on, you can observe the LEDs on the power supply.

After the FastIron device powers on, you can observe the LEDs on the front of the device to verify that it initialized successfully. Table 7.2 outlines the LEDs, the desired state of each LED, possible abnormal states of each LED, and what to do if an LED indicates an abnormal state.

Table 7.2 lists the LEDs that show power status. The power supplies themselves do not have LEDs.

Table 7.2: LEDs for Power

LED	Desired State	Desired State Meaning	Abnormal State	Abnormal State Meaning
Power	ON – Green (steady)	The device is powered on and has enough power to operate.	OFF	The device is not powered on, or has been powered on but does not have sufficient power to operate.
PS1	ON – Green (steady)	Power supply 1 is installed and is functioning normally. Power supply 1 is located in the right-hand bay (when you are facing the rear of the device).	OFF	Power supply 1 is not installed or is not providing power.
PS2	ON – Green (steady)	Power supply 2 is installed and is functioning normally. Power supply 2 is located in the left-hand bay (when you are facing the rear of the device).	OFF	Power supply 2 is not installed or is not providing power.

The software regularly polls the hardware for power status information. You can display the status information from any management session. In addition, the software automatically generates a Syslog message and SNMP trap if a status change occurs.

Displaying the Status of the AC Power Supplies

You can display the status of the AC power supplies by entering the **show chassis** command at any level of the CLI. The display shows whether an AC power supply is installed in the specified power supply slot and the status of the power supply, which can be one of the following:

- OK – The power supply is functioning properly and supplying power to the chassis and installed modules.
- Failed – The power supply is not functioning and is not supplying power to the chassis and installed modules.

Installing or Replacing a 10-Gigabit Ethernet Module

NOTE: This section applies to the FESX and FWSX devices only.

The 1-port and 2-port 10-Gigabit Ethernet modules are optional. You can order the FESX and FWSX with a 10-Gigabit module installed at the factory, or you can later upgrade your device.

This section provides the steps for installing, removing, and replacing the 10-Gigabit Ethernet module. You will need the following tools to perform these procedures:

- #2 Phillips-head screwdriver
- Electrostatic Discharge (ESD) kit

Disassembling the Chassis

This section provides instructions for disassembling the FastIron chassis so that you can install, remove, or replace a 10-Gigabit Ethernet module.

1. Put on an Electrostatic Discharge (ESD) wrist strap and attach the clip end to a metal surface (such as an equipment rack) to act as ground.
2. Use a #2 Phillips-head screwdriver to remove the screw that secures the power supplies, or power supply and blank faceplate, in place. The screw is located on the rear of the device, in between the two power supply slots.
3. Remove the power supply and blank faceplate, or dual power supplies, as instructed in the section “Removing an AC Power Supply” on page 7-4 or “Removing a DC Power Supply” on page 7-5. Use the appropriate procedures according to the type of supply or supplies installed in the device.
4. Remove the device’s cover and faceplate:
 - Use a #2 Phillips-head screwdriver to remove the two screws on each side of the cover. (There are four screws altogether.) If the device was mounted on a rack, remove the two mounting brackets as well. Figure 4.1 on page 4-8 shows the location of the mounting brackets and screws.
 - Gently slide the cover approximately one inch towards the rear of the unit, then lift the cover off of the chassis.
 - Remove the faceplate located in the upper left-hand corner of the front panel. Use a #2 Phillips-head screwdriver to remove the two screws that secure it in place. Place the blank faceplate in a safe place for future use.
5. Proceed to the section “Removing a 10-Gigabit Ethernet Module” on page 7-7 or “Installing a 10-Gigabit Ethernet Module” on page 7-8.

Removing a 10-Gigabit Ethernet Module

1. Disassemble the FastIron chassis as instructed in the section “Disassembling the Chassis” on page 7-7.
2. Remove the 10-Gigabit module:
 - Unplug the power cable from the rear of the 10-Gigabit module.
 - Use a #2 Phillips-head screwdriver to loosen and remove the three screws on the 10-Gigabit module.

- Gently lift the module up and out of the chassis.
3. Place the 10-Gigabit module in an anti-static bag for storage.
4. Unplug the power cable for the 10-Gigabit module from the main board and remove it from the chassis.
5. Do one of the following:
 - Insert the new 10-Gigabit module as instructed in the section “Installing a 10-Gigabit Ethernet Module” on page 7-8.
 - If you are removing the module without replacing it, install the blank face plate in the upper left-hand corner or the front panel.
6. Re-assemble the device as instructed in the section “Re-assembling the Chassis” on page 7-8.

Installing a 10-Gigabit Ethernet Module

Follow these procedures when installing a 10-Gigabit Ethernet Module:

1. Disassemble the FastIron chassis as instructed in the section “Disassembling the Chassis” on page 7-7.
2. Remove the 10-Gigabit Ethernet module, power cable, and faceplate from the protective packaging.
3. Install the 10-Gigabit module’s power cable (supplied with the 10-Gigabit module):
 - Plug one end of the cable into the power connector on the main board of the device. The connector is located on the rear of the main board towards the rear of the device.
 - Plug the other end of the cable into the power connector located on the rear of the 10-Gigabit module (the side opposite the port connectors).
4. Install the 10-Gigabit module in the chassis:
 - Use the two guide links (mounting posts) located towards the rear of the main board to properly place and align the 10-Gigabit Ethernet module inside the chassis and on top of the main board.
 - Use a #2 Phillips-head screwdriver to fasten the three screws on the 10-Gigabit module. Affix the screws loosely at first, then tighten them once you are sure the board is properly positioned.
5. Mount the faceplate (provided with the 10-Gigabit module) on the upper left-hand corner of the front panel. Use a #2 Phillips-head screwdriver to fasten the two screws in place.
6. Re-assemble the device as described in the following section.

Re-assembling the Chassis

This section provides instructions for re-assembling the FastIron device after removing, installing, or replacing a 10-GbE module.

1. Replace the device’s cover by gently guiding the cover into place, taking care not to bump the connectors for the 10-Gigabit port(s). To seat the cover, lift up slightly on the rear of the cover while affixing the front of the cover, then carefully seat the back of the cover into place.
2. Replace the power supplies or power supply and blank faceplate.
3. Once the cover and power supplies are properly positioned, re-fasten the screws on each side of the cover.
4. If the device is rack-mounted, replace the mounting brackets.
5. Replace the screw that secures the power supplies in place.

Replacing a Fiber Optic Module

You can remove an SFP or XFP from a port and replace it with a new one while the FastIron Stackable device is powered on and running.

This section provides information about the following tasks:

- Removing a fiber optic module
- Installing a new fiber optic module
- Cabling a fiber optic module

Removing a Fiber Optic Module

You can remove a fiber SFP (also called a mini-GBIC) or an XFP from a port while the FastIron Stackable device is powered on and running.

Before removing a fiber optic module, have the following on hand:

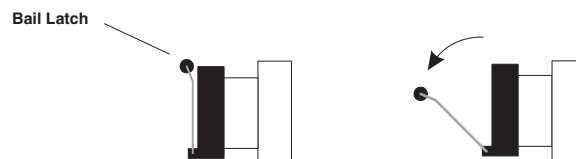
- An ESD wrist strap with a plug for connection to the ESD connector on the FastIron Stackable device.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

- The protective covering that you removed from the fiber optic module when you initially installed the module.

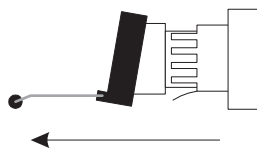
To remove a fiber optic module from a Gigabit Ethernet or 10-Gigabit Ethernet port, do the following:

1. Put on the ESD wrist strap and ground yourself by attaching the clip end to a metal surface (such as an equipment rack).
2. Disconnect the fiber cable connector from the port connector.
3. Insert the protective covering into the port connectors.
4. Pull the fiber optic module out of the port by pulling the bail latch forward, away from the front panel of the module. This unlocks the module from the front panel.



NOTE: The bail latch may be attached to either the top or the bottom of the mini-GBIC.

5. Grasping the bail latch, pull the fiber optic module out of the port.



6. Store the fiber optic module in a safe, static-free place or in an anti-static bag.
7. Install a new fiber optic module in the port. For information about performing this task, see "Installing a New Fiber Optic Module".

Installing a New Fiber Optic Module

You must install a fiber optic module (SFP or XFP transceiver) in each Gigabit Ethernet and 10-Gigabit Ethernet fiber port you want to use.

You can install a new fiber optic module in a port while the FastIron Stackable device is powered on and running.

Before installing one of these modules into the port, have the following on hand:

- An ESD wrist strap with a plug for connection to a metal surface.

WARNING: For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.

To install a fiber optic module, do the following:

1. Put on the ESD wrist strap and ground yourself by attaching the clip end to a metal surface (such as an equipment rack) to act as ground.
2. Remove the new module from its protective packaging.
3. Gently insert the fiber optic module into the port until the module clicks into place. The module is keyed to prevent incorrect insertion.

Cabling a Fiber Optic Module

To cable a fiber optic module, do the following:

1. Remove the protective covering from the fiber-optic port connectors and store the covering for future use.
2. Before cabling a fiber optic module, Foundry strongly recommends cleaning the cable connectors and the port connectors. See “Cleaning the Fiber-Optic Connectors” on page 7-10.
3. Gently insert the cable connector(s) (a tab on each connector should face upward) into the port connector(s) until the tabs lock into place.
4. Observe the link and active LEDs to determine if the network connections are functioning properly. For more information about the LED indicators, see Table 5.2 on page 5-9.

Cleaning the Fiber-Optic Connectors

To avoid problems with the connection between the fiber optic module (SFP (mini-GBIC) or XFP) and the fiber cable connectors, Foundry strongly recommends cleaning both connectors each time you disconnect and reconnect them. In particular, dust can accumulate in the connectors and cause problems such as reducing the optic launch power.

To clean the fiber cable connectors, Foundry recommends using the fiber-optic reel-type cleaner that shipped with your FastIron chassis. You can also purchase this type of cleaner from the following Website:

http://www.fisfiber.com/Home_Page.asp

When not using an SFP or XFP connector, make sure to keep the protective covering on.

Appendix A

Hardware Specifications

This chapter contains hardware specifications for the Foundry Networks FastIron Stackable devices.

This chapter contains the following information:

Table A.1: Chapter Contents

Description	See Page
Chassis specifications	
Physical dimensions and weight	A-2
Environmental considerations	A-2
Cooling system	A-3
Regulatory compliance	A-3
Warranty	A-3
Pinouts and Signaling	A-3
Cable lengths	A-5
Power cords	A-6
Power supply specifications	
Overview	A-6
Key features	A-7
Physical dimensions and weight	A-8
Input connector	A-8
Regulatory compliance	A-9
Environmental considerations	A-11
Electrical specifications	A-11

Chassis Specifications

The following sections present the hardware specifications for the FastIron Stackable devices.

Physical Dimensions

Table A.2 lists the physical dimensions and weight for the FastIron family of switches.

Table A.2: Physical Dimensions and Weight of the FES, FESX, and FWSX

Platform	Height	Width	Depth	Weight
FES2402 FES4802 FES12GCF FESX424 FWSX424	2.63 in 6.68 cm	17.5 in 44.45 cm	19.6 in 49.78 cm	<ul style="list-style-type: none"> 25 lbs (11.36 kg) fully loaded, including dual redundant power supplies 17.5 lbs (7.94 kg) empty
FESX448 FWSX448	2.63 in 6.68 cm	17.5 in 44.45 cm	19.6 in 49.78 cm	<ul style="list-style-type: none"> 25 lbs (11.36 kg) fully loaded, including dual redundant power supplies 17.5 lbs (7.94 kg) empty
FES9604	4.38 in 11.12 cm	17.5 in 44.45 cm	19.6 in 49.78 cm	<ul style="list-style-type: none"> 31 lbs (14.06 kg) fully loaded, including dual redundant power supplies 23.5 lbs (10.66 kg) empty
FES2402-POE FES4802-POE	2.63 in 6.68 cm	17.5 in 44.45 cm	19.6 in 49.78 cm	<ul style="list-style-type: none"> 29 lbs (13.15 kg) fully loaded, including dual redundant power supplies 17.5 lbs (7.94 kg) empty

Environmental Considerations

For optimal performance, operate or store your Foundry device in compliance with the following environmental conditions.

Operating Environment

Table A.3 provides the operating environment specifications for the FastIron family of switches.

Table A.3: Operating Environment

Operating Temperature	Relative Humidity	Operating Altitude
32° – 104° F (0° – 40° C)	5 to 90%, @ 104°F (40° C), non-condensing or 20 to 90% non-condensing for DC power supply	0 – 6,600 ft (0 – 2000 meters)

- Maximum BTUs:
 - FES2402, FES4802, FES9604, FES12GCF, and FESX424: 340 BTU/Hr (100 watts) per power supply
 - FES2402-POE: 316 BTU/Hr (580 watts) per power supply

- FES4802-POE: 462 BTU/Hr (580 watts) per power supply

Storage Environment

Table A.4 provides the storage environment specifications for the FastIron family of switches.

Table A.4: Storage Environment

Storage Temperature	Storage Humidity	Storage Altitude
-40° to 158° F, -40° to 70° C	95% maximum, non-condensing	10,000 feet (3,000 meter) maximum

Cooling

The cooling fans cool the CPU, main memory, and voltage regulators. The fans use either a push or pull configuration to move the air from the left side of the device to the right side of the device.

- Total cooling capacity: 80 to 100 watts
- Total air flow: 200 LFM
- Operating noise: < 43 dB-A

Regulatory Compliance

Table A.5 lists the Electromagnetic Compatibility (EMC), Immunity standards, and safety agency approvals for the FastIron family of switches.

Table A.5: Regulatory Compliance

Certifications
Emissions:
<ul style="list-style-type: none"> • CISPR-22 Class A • EN 55022 • FCC Class A • VCCI Class A
Electromagnetic:
<ul style="list-style-type: none"> • Generic: EN 50082-1

Warranty

The FastIron family of switches come with a 5-year limited lifetime warranty.

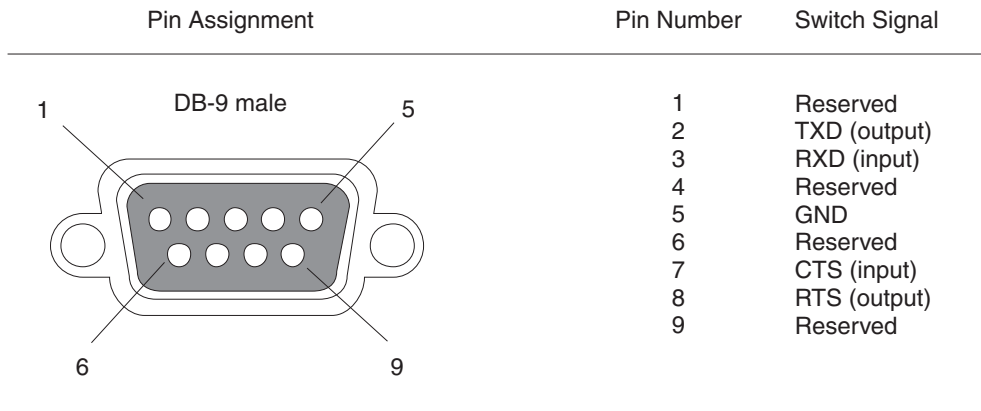
Pinouts and Signaling

This section lists the pinouts for the DB-9 connector and RJ-45 port jacks.

Serial (Console) Port Pinouts

The Console port is a standard male DB-9 connector, as shown in Figure A.1.

Figure A.1 Serial port pin and signalling details

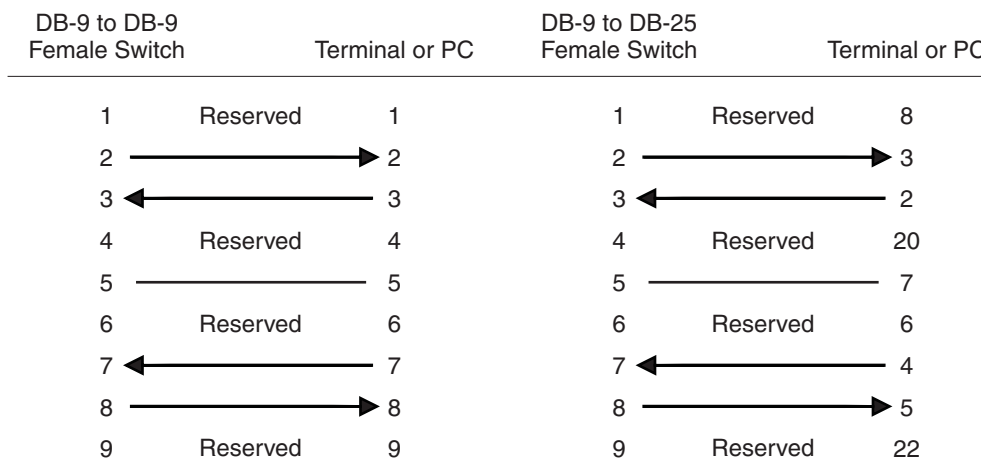


Most PC serial ports require a cable with a female DB-9 connector. However, terminal connections will vary, requiring a cable with either a DB-9 or DB-25 connector, male or female.

Serial cable options between the FSX chassis and a PC or terminal are shown in Figure A.2.

NOTE: As indicated in Figure A.1 and Figure A.2, some of the wires should not be connected. If you do connect the wires that are labeled “Reserved”, you might get unexpected results with some terminals.

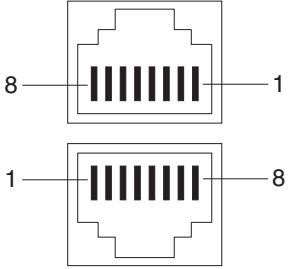
Figure A.2 Console Port Pin Assignments Showing Cable Connection Options to a Terminal or PC



10/100 and Gigabit Port Pinouts

- 10Base-T/100Base-TX ports come with RJ45 jacks for standard unshielded twisted pair (UTP/Category 5) cable connections.
- 1000Base-SX ports come equipped with SC connectors.
- 1000Base-LX ports come equipped with SC connectors.
- 1000Base-LH ports come equipped with SC connectors.
- 1000Base-T ports come equipped with RJ-45 connectors.
- 10GBase-LR and SR ports come equipped with XFP MSA connectors.

Figure A.3 Pin assignment and signalling for 10/100BaseTX and 1000BaseT ports

Pin Assignment	10BaseT		100BaseTX and 1000BaseT	
	Pin Number	MDI-X ports	Pin Number	MDI-X ports
	1	RD+	1	RD+
	2	RD-	2	RD-
	3	TD+	3	TD+
	4	Not used	4	CMT
	5	Not used	5	CMT
	6	TD-	6	TD-
	7	Not used	7	CMT
	8	Not used	8	CMT

Cable Specifications

Table A.6: Cable length summary table

	Fiber Type	Core Diameter (microns)	Modal Bandwidth (MHz*km)	Range (meters)
10Base-T/ 100Base-TX	n/a	n/a	n/a	100 meters
1000Base-BX10	SMF	9	n/a	2 – 10000 (10km)
1000Base-LHA	SMF	9	n/a	2 – 70000 (70km)
1000Base-LHB	SMF	9	n/a	2 – 150000 (150km)
1000Base-LX	MMF	62.5	500	2 – 550
	MMF	50	400	2 – 550
	MMF	50	500	2 – 550
	SMF	9	n/a	2 – 5000
1000Base-SX	MMF	62.5	160	2 – 200 ^a
	MMF	62.5	200	2 – 275 ^b
	MMF	50	400	2 – 500
	MMF	50	500	2 – 550 ^c
1000Base-T	N/A	n/a	n/a	100
10GBase-LR	SMF	9	n/a	2 – 10000 (10km)
10GBase-SR	MMF	62.5	n/a	2 – 85

Table A.6: Cable length summary table (Continued)

	Fiber Type	Core Diameter (microns)	Modal Bandwidth (MHz*km)	Range (meters)
1000Base-ZX	SMF	9	n/a	2 – 70000 (70km)

- a. The TIA 568 building wiring standard specifies 160/500 MHz*km MMF (Multi-mode Fiber).
- b. The international ISO/IEC 11801 building wiring standard specifies 200/500 MHz*km MMF.
- c. The ANSI Fibre Channel specification specifies 500/500 MHz*km 50 micron MMF and 500/500 MHz*km fiber has been proposed for addition to ISO/IEC 11801.

NOTE: Cable installation and network configuration will affect overall transmission capability. The numbers provided above represent the accepted recommendations of the various standards. For network-specific recommendations, consult your local Foundry reseller or system engineer.

Power Cords

All of the FastIron devices ship with US-compatible power cords unless otherwise specified at the time of order. United Kingdom- and European-compatible power cords are also available.

Power Supply Specifications

This section contains the following information for the power supplies that ship with the FastIron family of switches.

- “Overview” on page A-6
- “Key features” on page A-7
- “Physical Dimensions and Weight” on page A-8
- “Input Connector” on page A-8
- “Regulatory Compliance” on page A-9
- “Environmental Considerations” on page A-11
- “Electrical Specifications” on page A-11

Overview

Each FastIron stackable switch comes with one alternating-current (AC) or direct-current (DC) power supply, depending on how it was ordered from the factory. All models have two power supply slots, enabling you to install a second power supply for redundancy. Direct-current (DC) supplies are available for some devices, in which you

can use any combination of AC and DC supplies in the same device. The following table lists the power supplies that may be installed in a FastIron stackable switch.

Device	Supported Power Supplies
FES2402	RPS5-AC and RPS5-DC
FES4802	RPS5-AC and RPS5-DC
FES9604	RPS5-AC and RPS5-DC
FES12GCF	RPS5-AC and RPS5-DC
FESX424 and FWSX424	RPS-X424-AC and RPS-X424-DC
FESX448 and FWSX448	RPS-X448-AC
FES2402-POE	RPS8-AC
FES4802-POE	RPS8-AC

WARNING: The power supplies used with POE devices produce extensive power to support 802.3af applications. Installing the power supply in a device other than a POE device will cause extensive damage to your equipment.

The power supplies can be swapped in or out of the device while the device is running. You can remove and insert a power supply without opening the chassis. If the device contains two power supplies, you can remove one of the power supplies without interrupting operation. The remaining power supply provides enough power for all the ports. For more information, see “Installing a Redundant Power Supply” on page 4-6.

All power supplies are auto-sensing and auto-switching.

Key features

Key features of the FES, FESX, and FWSX power supplies are as follows:

- **RPS5-AC**
 - operating 85 VAC to 254 VAC input, universal/wide input
 - rated 100 to 240 V ~ 50/60 Hz @ 3.5 a to 1.5 a
 - 220 watts of total output power
 - interoperative with RPS5-AC and RPS5-DC power supplies
- **RPS5-DC**
 - -40 VDC to -60 VDC input
 - interoperative with RPS5-AC and RPS5-DC power supplies
- **RPS8-AC**
 - operating 85 VAC to 264 VAC input, universal/wide input
 - rated 100 to 240V ~ 50/60 Hz @ 8a to 3.2 a
 - 600 watts of total output power
- **RPS-X424-AC**
 - operating 85 VAC to 254 VAC input, universal/wide input

- rated 100 to 240 V ~ 50/60 Hz @ 3.5 a to 1.5 a
- 220 watts of total output power
- interoperative with RPS-X424-AC and RPS-X424-DC power supplies
- **RPS-X424-DC**
 - -40 VDC to -60 VDC input
 - interoperative with RPS-X424-AC and RPS-X424-DC power supplies

Physical Dimensions and Weight

Table A.7: Physical Dimensions and Weight of Power Supplies

Power Supply	Dimensions	Weight
RPS5-AC and RPS-X424-AC	2.46 in (H) x 8.67 in (W) x 7.6 in (D) 6.25 cm (H) x 22.03 cm (W) x 19.30 cm (D)	4.25 lbs (1.93 kg)
RPS5-DC and RPS-X424-DC	2.36 in (H) x 8.04 in (W) x 6.45 in (D) 5.99 cm (H) x 20.42 cm (W) x 16.38 cm (D)	4.25 lbs (1.93 kg)
RPS8-AC	2.46 in (H) x 8.67 in (W) x 7.6 in (D) 6.25 cm (H) x 22.03 cm (W) x 19.30 cm (D)	6 lbs (2.72 kg)

Input Connector

Table A.8: Input Connector for Power Supplies

Power Supply	Input Connector Properties
RPS5-AC and RPS-X424-AC	Standard IEC type (IEC320) C14 type: UL/CSA 15A/250V, VDE 10A/250V Orientation: Ground pin down
RPS5-DC and RPS-X424-DC	3-position Phoenix Contact The power supply is connected to Earth Ground using wire attached to the ground stud on the power supply rear panel.
RPS8-AC	Standard IEC type (IEC320) C14 type: UL/CSA 15A/250V, VDE 10A/250V Orientation: Ground pin down

Regulatory Compliance

This section contains regulatory standards for the power supplies, including the following:

- Electromagnetic Compatibility (EMC) compliance
- Immunity regulations
- Safety certifications
- Safety warning labels
- Environmental standards

Electromagnetic Compatibility (EMC) and Immunity Standards

The power supplies comply with the conducted and radiated test and immunity standards as listed in Table A.9. EMC standards are within a 6 dB minimum margin.

Table A.9: EMC and Immunity Standards for Power Supplies

Power Supply	EMC Standards	Immunity Standards
RPS5-AC and RPS-X424-AC	CISPR 22 Class A FCC Class A VCCI Class A IC ICES-003 Class A (Canada) EN55022 Class A Harmonic Current Emissions (Class A) - EN61000-3-2, with Amendment 14 (1999) Voltage Fluctuations and Flicker - EN61000-3-3	EN 55024 EN 61000-4-5. The power supply is tested to level 2 (differential mode) and level 3 (common mode)
RPC5-DC and RPS-X424-DC	CISPR 22 Class A FCC Class A VCCI Class A IC ICES-003 Class A (Canada) EN55022 Class A Harmonic Current Emissions (Class A) - EN61000-3-2, with Amendment 14 (1999) Voltage Fluctuations and Flicker - EN61000-3-3	EN 55024 EN 61000-4-5. The power supply is tested to level 2 (differential mode) and level 3 (common mode)
RPC8-AC	CISPR 22 Class A FCC Class A VCCI Class A EN55022 Class A Harmonic Current Emissions (Class A) - EN61000-3-2, with Amendment 14 (1999) Voltage Fluctuations and Flicker - EN61000-3-3	EN 55024 EN 61000-4-5. The power supply is tested to level 2 (differential mode) and level 3 (common mode)

Safety Agency Approvals and Certifications

The FES, FESX, and FWSX power supplies comply with the following safety standards:

- CSA/cUL
- UL
- CE
- TUV

Safety Warnings

The power supplies are marked with an electrical hazard label and with the safety warnings shown in Table A.10.

Table A.10: Safety Warning Labels on Power Supplies

CAUTION: No operator serviceable parts inside. Refer servicing to qualified personnel.	
ATTENZIONE	Non aprire. Rivolgersi a personale qualificado.
CUIDADO:	Partes adentro no reparables por el operador. Refiera reparo a personal autorizado.
ATTENTION:	Entretien et réparations internes ne sont autorisés qu'au personnel technique qualifié.
ACHTUNG:	Zugang zur Bedienung nicht erforderlich. Wartung nur durch qualifiziertes Personal.

Environmental Considerations

Table A.11: Environmental Considerations for Power Supplies

Property	RPS5-AC, RPS5-DC, RPS-X424-AC, and RPS-X424-DC	RPS8-AC
Operating temperature	32° to 104° F, 0° to 40° C	32° to 104° F, 0° to 40° C
Operating relative humidity	0 – 95%, non-condensing	0 – 95%, non-condensing
Operating altitude	up to 6,600 feet above sea level	up to 10,000 feet above sea level
Operating noise	< 43 dB-A	< 43 dB-A
Storage temperature	-40° to 185° F, -40° to +85° C	-40° to 185° F, -40° to +85° C
Storage altitude	up to 15,000 feet above sea level	up to 15,000 feet above sea level
Cooling	AC: internal fan, 50 mm DC: internal fan, 60 mm	internal fans, 50mm

Electrical Specifications

This section lists the electrical specifications for the power supplies. Note that output specifications for the RPS5-AC, RPS-X424-AC, RPS5-DC, and RPS-X424-DC differ from the output specifications for the RPS8-AC power supply.

Input specifications

Table A.12: Input Specifications for Power Supplies

Property	RPS5-AC and RPS-X424-AC	RPS5-DC and RPS-X424-DC	RPS8-AC
Input voltage range	100 - 240 VAC	-40 to -60 VDC	100 - 240 VAC
Input current	< 3.5 Amps	< 9 Amps	< 9 Amps
Inrush current	< 4.2 Amps peak maximum	10 Amps peak maximum < 150 ms (0.15 seconds)	<11.25 Amps peak maximum

Output Specifications for RPS8-AC

The power supplies that ship with the POE devices provide 600 watts of total output power, including +12VDC @ 10A to the system and -48VDC @ 10 A for Power over Ethernet applications.

WARNING: The RPS8-AC power supply is designed exclusively for use with the FES2402-POE and FES4802-POE devices. The power supply produces extensive power to support 802.3af applications. Installing the power supply in a device other than the FES2402-POE or FES4802-POE will cause extensive damage to your equipment.

Appendix B

Cautions and Warnings

The cautions and warnings that appear in this manual are listed below in English, German, French, and Spanish.

Cautions

A caution calls your attention to a possible hazard that can damage equipment.

"Vorsicht" weist auf eine mögliche Beschädigung des Geräts hin. Sie finden die folgenden Vorsichtshinweise in diesem Handbuch.

Une mise en garde attire votre attention sur un risque possible d'endommagement de l'équipement. Ci-dessous, vous trouverez les mises en garde utilisées dans ce manuel.

Un mensaje de precaución le advierte sobre un posible peligro que pueda dañar el equipo. Las siguientes son precauciones utilizadas en este manual.

CAUTION:	The RPS8-AC power supply is designed exclusively for use with the FES2402-POE and FES4802-POE devices. The power supply produces extensive power to support 802.3af applications. Installing the power supply in a device other than the FES2402-POE or FES4802-POE will cause extensive damage to your equipment.
VORSICHT:	Das RPS8-AC Stromnetz hat für die FES2402-POE und FES4802-POE Geräte ausschließlich aufgezeichnet. Dieses Stromnetz erzeugt umfassend Starkstrom zur Bestätigung von 802.3af Anwendungen. Ihr Anlage beschädigt wird, wenn das Stromnetz in Geräte anders als FES2402-POE oder FES4802-POE einbauen wird.
MISE EN GARDE:	Le bloc d'alimentation RPS8-AC est conçu exclusivement pour être utilisé avec les dispositifs FES2402-POE et FES4802- POE. Le bloc d'alimentation produit une alimentation très importante pour prendre en charge les applications 802.3af. Si vous l'installez dans un dispositif autre que les FES2402-POE ou FES4802-POE, il endommagera gravement votre équipement.
PRECAUCIÓN	El suministro de corriente alterna del RPS8 está diseñado exclusivamente para uso con los dispositivos FES2402-POE y FES4802- POE. El suministro de corriente produce suficiente energía para abastecer a las aplicaciones 802.3af. Si se instala el suministro de corriente en un dispositivo que no sea el FES2402-POE o el FES4802-POE, se producirán daños de consideración al equipo.

- CAUTION:** Remove the power cord from a power supply before you install it in or remove it from the device. Otherwise, the power supply or the device could be damaged as a result. (The device can be running while a power supply is being installed or removed, but the power supply itself should not be connected to a power source.)
- VORSICHT:** Nehmen Sie vor dem Anschließen oder Abtrennen des Geräts das Stromkabel vom Netzteil ab. Ansonsten könnten das Netzteil oder das Gerät beschädigt werden. (Das Gerät kann während des Anschließens oder Annehmens des Netzteils laufen. Nur das Netzteil sollte nicht an eine Stromquelle angeschlossen sein.)
- MISE EN GARDE:** Enlevez le cordon d'alimentation d'un bloc d'alimentation avant de l'installer ou de l'enlever du dispositif. Sinon, le bloc d'alimentation ou le dispositif risque d'être endommagé. (Le dispositif peut être en train de fonctionner lorsque vous installez ou enlevez un bloc d'alimentation, mais le bloc d'alimentation lui-même ne doit pas être connecté à une source d'alimentation.)
- PRECAUCIÓN:** Retire el cordón de corriente del suministro de corriente antes de instalarlo o retirarlo del instrumento. De no hacerse así, el suministro de corriente o el instrumento podrían resultar dañados. (El instrumento puede estar encendido mientras se instala o retira un suministro de corriente, pero el suministro de corriente en sí no deberá conectado a la corriente).
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- CAUTION:** Do not install the device in an environment where the operating ambient temperature might exceed 40o C (104o F).
- VORSICHT:** Das Gerät darf nicht in einer Umgebung mit einer Umgebungsbetriebstemperatur von über 40° C (104° F) installiert werden.
- MISE EN GARDE:** N'installez pas le dispositif dans un environnement où la température d'exploitation ambiante risque de dépasser 40° C (104° F).
- PRECAUCIÓN:** No instale el instrumento en un entorno en el que la temperatura ambiente de operación pueda exceder los 40oC (104oF).
-

- CAUTION:** Make sure the air flow around the front, sides, and back of the device is not restricted.
- VORSICHT:** Stellen Sie sicher, dass an der Vorderseite, den Seiten und an der Rückseite der Luftstrom nicht behindert wird.
- MISE EN GARDE:** Vérifiez que rien ne restreint la circulation d'air devant, derrière et sur les côtés du dispositif et qu'elle peut se faire librement.
- PRECAUCIÓN:** Asegúrese de que el flujo de aire en las inmediaciones de las partes anterior, laterales y posterior del instrumento no esté restringido.
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- CAUTION:** Use a separate branch circuit for each AC power cord, which provides redundancy in case one of the circuits fails.
- VORSICHT:** Es empfiehlt sich die Installation eines separaten Stromkreisweiges für jede Wechselstrom-Elektroschnur als Redundanz im Fall des Ausfalls eines Stromkreises.
- MISE EN GARDE:** Utilisez un circuit de dérivation différent pour chaque cordon d'alimentation C.A. Ainsi, il y aura un circuit redondant en cas de panne d'un des circuits.
- PRECAUCIÓN:** Use un circuito derivado separado para cada cordón de alimentación de CA, con lo que se proporcionará redundancia en caso de que uno de los circuitos falle.
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- CAUTION:** Ensure that the device does not overload the power circuits, wiring, and over-current protection. To determine the possibility of overloading the supply circuits, add the ampere (amp) ratings of all devices installed on the same circuit as the device. Compare this total with the rating limit for the circuit. The maximum ampere ratings are usually printed on the devices near the input power connectors.
- VORSICHT:** Stromkreise, Verdrahtung und Überlastschutz dürfen nicht durch das Gerät überbelastet werden. Addieren Sie die Nennstromleistung (in Ampere) aller Geräte, die am selben Stromkreis wie das Gerät installiert sind. Somit können Sie feststellen, ob die Gefahr einer Überbelastung der Versorgungsstromkreise vorliegt. Vergleichen Sie diese Summe mit der Nennstromgrenze des Stromkreises. Die Höchstnennströme (in Ampere) stehen normalerweise auf der Geräterückseite neben den Eingangsstromanschlüssen.
- MISE EN GARDE:** Assurez-vous que le dispositif ne risque pas de surcharger les circuits d'alimentation, le câblage et la protection de surintensité. Pour déterminer le risque de surcharge des circuits d'alimentation, additionnez l'intensité nominale (ampères) de tous les dispositifs installés sur le même circuit que le dispositif en question. Comparez alors ce total avec la limite de charge du circuit. L'intensité nominale maximum en ampères est généralement imprimée sur chaque dispositif près des connecteurs d'entrée d'alimentation.
- PRECAUCIÓN:** Verifique que el instrumento no sobrecargue los circuitos de corriente, el cableado y la protección para sobrecargas. Para determinar la posibilidad de sobrecarga en los circuitos de suministros, añada las capacidades nominales de corriente (amp) de todos los instrumentos instalados en el mismo circuito que el instrumento. Compare esta suma con el límite nominal para el circuito. Las capacidades nominales de corriente máximas están generalmente impresas en los instrumentos, cerca de los conectores de corriente de entrada.
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- CAUTION:** All devices with DC power supplies are intended for installation in restricted access areas only. A restricted access area is where access can be gained only by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.
- VORSICHT:** Alle Geräte mit DC-Netzteil sind nur für die Installation in Bereichen mit beschränktem Zugang gedacht. Ein Bereich mit beschränktem Zugang ist ein Bereich, zu dem nur Wartungspersonal mit Spezialwerkzeug, Schlüssel oder anderen Sicherheitsvorrichtungen Zugang hat. Dieser Zugang wird von für den Bereich zuständigen Personen überwacht.
- MISE EN GARDE:** Tous les dispositifs avec bloc d'alimentation C.C. sont conçus pour l'installation dans des zones à accès réglementé uniquement. Une zone à accès réglementé est une zone dont l'accès n'est possible qu'au personnel de service utilisant un verrou, une clé ou un outil spécial, ou d'autres moyens de sécurité, et qui est contrôlée par les autorités responsables du site.
- PRECAUCIÓN:** Todos los instrumentos con suministros de corriente continua han sido diseñados únicamente para instalación en áreas restringidas. Se entiende como área de acceso restringido un lugar al que solo puede acceder personal de servicio mediante el uso de una herramienta especial, llave y cerrojo u otro medio de seguridad similar, y que esté controlado por la autoridad responsable de esa ubicación.
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- CAUTION:** For the DC input circuit to an FES, FESX, or FWSX (DC power supply part number RPS5DC and RPS-X424-DC), make sure there is a 10-amp listed circuit breaker, minimum -48VDC, double pole, on the input to the terminal block. The input wiring for connection to the product should be Listed copper wire, 14 AWG, marked VW-1, and rated 90 degrees Celsius.
- VORSICHT:** Für den Eingangs-Gleichstromkreis an ein FES- oder FESX-Netzteil (Gleichstromnetzteile mit der Teilernr. RPS5DC und RPS-X424-DC) muss gewährleistet werden, dass ein zweipoliger 10 A-Leistungsschalter (min. -48VDC) am Eingang zur Reihenklemme installiert wird. Beim Eingangsdraht für den Anschluss am Produkt muss es sich um einen zulässigen
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Kupferdraht (14 AWG gekennzeichnet mit VW-1), der für mindestens 90° C ausgelegt ist, handeln.

MISE EN GARDE: Pour le circuit d'alimentation C.C. d'un FES ou FESX (références du bloc d'alimentation C.C. RPS5DC et RPS-X424-DC), assurez-vous de la présence d'un disjoncteur de 10 ampères, minimum -48 V C.C., double coupure, sur l'entrée vers le bloc d'alimentation. Les câbles d'alimentation pour le produit doivent être en fils de cuivre, 14 AWG (American Wire Gauge), marqués VW-1 et classés 90 degrés Celsius.

PRECAUCIÓN: Para el circuito de entrada de CC a un modelo FES o FESX (suministro de corriente continua con No. de referencia RPS5DC y RPS-X424-DC), verifique que haya un cortacircuitos catalogado para 10 amperios, mínimo de -48 VCC, bipolar, en la entrada al bloque terminal. El cableado de entrada para la conexión al producto deberá ser catalogado de cobre, 14 AWG, marcado VW-1, y nominal para 90 grados Celsius.

CAUTION: Make sure you insert the power supply right-side up. It is possible to insert the supply upside down, although the supply will not engage with the power backplane when upside down. The power supply is right-side up when the power connector is on the left and the fan vent is on the right.

VORSICHT: Sicher Sie sicher, dass Sie das Netzteil mit der richtigen Seite nach oben weisend einstecken. Man kann die Karte auch umgekehrt einstecken. Allerdings rastet das umgekehrte Netzteil nicht in die Netzstrom-Rückwandplatine ein. Die rechte Seite des Netzteils weist nach oben, wenn sich der Stromanschlussstecker links und der Ventilatorschlitz rechts befindet.

MISE EN GARDE: Assurez-vous d'insérer le bloc d'alimentation dans le bon sens. Il est possible de l'insérer " la tête en bas ", mais le bloc d'alimentation ne s'enclenchera pas dans la face arrière d'alimentation s'il est inséré à l'envers. Le bloc d'alimentation est dans le bon sens lorsque le connecteur se trouve sur le côté gauche et le ventilateur sur la droite.

PRECAUCIÓN: Verifique que inserta el suministro de corriente con la cara correcta hacia arriba. Es posible insertar el suministro hacia abajo, pese a que este no se conectará con el enchufe posterior de esta forma. El suministro de potencia estará con la cara correcta hacia arriba cuando el conector de corriente quede a la izquierda y la abertura del ventilador queda a la derecha.

CAUTION: Use the erase startup-config command only for new systems. If you enter this command on a system you have already configured, the command erases the configuration. If you accidentally do erase the configuration on a configured system, enter the write memory command to save the running configuration to the startup-config file.

VORSICHT: Verwenden Sie den Befehl "Erase startup-config" (Löschen Startup-Konfig) nur für neue Systeme. Wenn Sie diesen Befehl in ein bereits konfiguriertes System eingeben, löscht der Befehl die Konfiguration. Falls Sie aus Versehen die Konfiguration eines bereits konfigurierten Systems löschen, geben Sie den Befehl "Write Memory" (Speicher schreiben) ein, um die laufende Konfiguration in der Startup-Konfig-Datei zu speichern.

MISE EN GARDE: N'utilisez la commande erase startup-config que pour les nouveaux systèmes. Si vous entrez cette commande sur un système que vous avez déjà configuré, elle efface la configuration. Si vous effacez la configuration par accident sur un système configuré, entrez la commande write memory pour enregistrer la configuration actuelle dans le fichier startup-config.

PRECAUCIÓN: Use el comando erase startup-config (borrar configuración de inicio) para sistemas nuevos solamente. Si usted introduce este comando en un sistema que ya ha configurado, el comando borrará la configuración. Si usted borra accidentalmente la configuración en un sistema ya configurado, introduzca el comando write memory (escribir memoria) para guardar la configuración en ejecución en el archivo startup-config.

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- CAUTION:** Never leave tools inside the chassis.
- VORSICHT:** Lassen Sie keine Werkzeuge im Chassis zurück.
- MISE EN GARDE:** Ne laissez jamais d'outils à l'intérieur du châssis.
- PRECAUCIÓN:** No deje nunca herramientas en el interior del chasis.
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- CAUTION:** If you do not install a module in a slot, you must keep the slot panel in place. If you run the chassis with an uncovered slot, the system will overheat.
- VORSICHT:** Falls kein Modul im Steckplatz installiert wird, muss die Steckplatztafel angebracht werden. Wenn ein Steckplatz nicht abgedeckt wird, läuft das System heiß.
- MISE EN GARDE:** Si vous n'installez pas de module dans un slot, vous devez laisser le panneau du slot en place. Si vous faites fonctionner le châssis avec un slot découvert, le système surchauffera.
- PRECAUCIÓN:** Si no instala un módulo en la ranura, deberá mantener el panel de ranuras en su lugar. Si pone en funcionamiento el chasis con una ranura descubierta, el sistema sufrirá sobrecalentamiento.
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Warnings

A warning calls your attention to a possible hazard that can cause injury or death. The following are the warnings used in this manual.

"Achtung" weist auf eine mögliche Gefährdung hin, die zu Verletzungen oder Tod führen können. Sie finden die folgenden Warnhinweise in diesem Handbuch:

Un avertissement attire votre attention sur un risque possible de blessure ou de décès. Ci-dessous, vous trouverez les avertissements utilisés dans ce manuel.

Una advertencia le llama la atención sobre cualquier posible peligro que pueda ocasionar daños personales o la muerte. A continuación se dan las advertencias utilizadas en este manual.

WARNING:	The procedures in this manual are for qualified service personnel.
ACHTUNG:	Die Verfahren in diesem Handbuch sind nur für qualifiziertes Wartungspersonal gedacht.
AVERTISSEMENT:	Les procédures décrites dans ce manuel doivent être effectuées par le personnel de service qualifié uniquement.
ADVERTENCIA:	Los procedimientos de este manual se han hecho para personal de servicio cualificado.

WARNING:	All fiber optic interfaces use Class 1 lasers.
ACHTUNG:	Alle Glasfaser-Schnittstellen verwenden Laser der Klasse 1.
AVERTISSEMENT:	Toutes les interfaces en fibres optiques utilisent des lasers de classe 1.
ADVERTENCIA:	Todas las interfaces de fibra óptica utilizan láser de clase 1.

WARNING:	Make sure the rack or cabinet housing the device is adequately secured to prevent it from becoming unstable or falling over.
ACHTUNG:	Stellen Sie sicher, dass das Gestell oder der Schrank für die Unterbringung des Geräts auf angemessene Weise gesichert ist, so dass das Gestell oder der Schrank nicht wackeln oder umfallen kann.
AVERTISSEMENT:	Vérifiez que le bâti ou le support abritant le dispositif est bien fixé afin qu'il ne devienne pas instable ou qu'il ne risque pas de tomber.
ADVERTENCIA:	Verifique que el bastidor o armario que alberga el instrumento está asegurado correctamente para evitar que pueda hacerse inestable o que caiga.

WARNING:	Mount the devices you install in a rack or cabinet as low as possible. Place the heaviest device at the bottom and progressively place lighter devices above.
ACHTUNG:	Montieren Sie die Geräte im Gestell oder Schrank so tief wie möglich. Platzieren Sie das schwerste Gerät ganz unten, während leichtere Geräte je nach Gewicht (je schwerer desto tiefer) darüber untergebracht werden.
AVERTISSEMENT:	Montez les dispositifs que vous installez dans un bâti ou support aussi bas que possible. Placez le dispositif le plus lourd en bas et le plus léger en haut, en plaçant tous les dispositifs progressivement de bas en haut du plus lourd au plus léger.
ADVERTENCIA:	Monte los instrumentos que instale en un bastidor o armario lo más bajos posible. Ponga el instrumento más pesado en la parte inferior y los instrumentos progresivamente más livianos más arriba.

WARNING:	Disconnect the power cord from all power sources to completely remove power from the device.
ACHTUNG:	Ziehen Sie das Stromkabel aus allen Stromquellen, um sicherzustellen, dass dem Gerät kein Strom zugeführt wird.
AVERTISSEMENT:	Débranchez le cordon d'alimentation de toutes les sources d'alimentation pour couper complètement l'alimentation du dispositif.
ADVERTENCIA:	Para desconectar completamente la corriente del instrumento, desconecte el cordón de corriente de todas las fuentes de corriente.

WARNING:	Make sure that the power source circuits are properly grounded, then use the power cord supplied with the device to connect it to the power source.
ACHTUNG:	Stellen Sie sicher, dass die Stromkreise ordnungsgemäß geerdet sind. Benutzen Sie dann das mit dem Gerät gelieferte Stromkabel, um es an die Stromquelle anzuschließen.
AVERTISSEMENT:	Vérifiez que les circuits de sources d'alimentation sont bien mis à la terre, puis utilisez le cordon d'alimentation fourni avec le dispositif pour le connecter à la source d'alimentation.
ADVERTENCIA:	Verifique que circuitos de la fuente de corriente están conectados a tierra correctamente; luego use el cordón de potencia suministrado con el instrumento para conectarlo a la fuente de corriente.

WARNING:	Do not use the handles on the power supply units to lift or carry a Foundry device.
ACHTUNG:	Die Griffe an den Netzteilen dürfen nicht zum Anheben oder Tragen eines Foundrygeräte verwendet werden.
AVERTISSEMENT:	N'utilisez pas les poignées des unités de bloc d'alimentation pour soulever ou porter un dispositif en châssis.
ADVERTENCIA:	No use las asas de las unidades de suministro de corriente para alzar o transportar un instrumento de Foundry.

WARNING:	If the installation requires a different power cord than the one supplied with the device, make sure you use a power cord displaying the mark of the safety agency that defines the regulations for power cords in your country. The mark is your assurance that the power cord can be used safely with the device.
ACHTUNG:	Falls für die Installation ein anderes Stromkabel erforderlich ist (wenn das mit dem Gerät gelieferte Kabel nicht passt), müssen Sie sicherstellen, dass Sie ein Stromkabel mit dem Siegel einer Sicherheitsbehörde verwenden, die für die Zertifizierung von Stromkabeln in Ihrem Land zuständig ist. Das Siegel ist Ihre Garantie, dass das Stromkabel sicher mit Ihrem Gerät verwendet werden kann.
AVERTISSEMENT:	Si l'installation nécessite un cordon d'alimentation autre que celui fourni avec le dispositif, assurez-vous d'utiliser un cordon d'alimentation portant la marque de l'organisation responsable de la sécurité qui définit les normes et réglementations pour les cordons d'alimentation dans votre pays. Cette marque vous assure que vous pouvez utiliser le cordon d'alimentation avec le dispositif en toute sécurité.
ADVERTENCIA:	Si la instalación requiere un cordón de corriente distinto al que se ha suministrado con el instrumento, verifique que usa un cordón de corriente que venga con la marca de la agencia de seguridad que defina las regulaciones para cordones de corriente en su país. Esta marca será su garantía de que el cordón de corriente puede ser utilizado con seguridad con el instrumento.

- WARNING:** Power supplies are hot swappable. However, Foundry Networks recommends that you disconnect the power supply from AC power before installing or removing the supply. The device can be running while a power supply is being installed or removed, but the power supply itself should not be connected to a power source. Otherwise, you could be injured or the power supply or other parts of the device could be damaged.
- ACHTUNG:** Netzteile können unter Strom stehend ausgetauscht werden. Allerdings empfiehlt Foundry Networks, dass Sie das Netzteil vom Netzstrom abtrennen, bevor Sie das Netzteil anschließen oder abtrennen. Das Gerät kann während des Anschließens oder Abnehmens des Netzteils laufen. Nur das Netzteil sollte nicht an eine Stromquelle angeschlossen sein. Ansonsten können Sie verletzt oder das Netzteil bzw. andere Geräteteile beschädigt werden.
- AVERTISSEMENT:** Les blocs d'alimentation peuvent être changés à chaud. Cependant, Foundry Networks vous conseille de débrancher le bloc d'alimentation de l'alimentation C.A. avant d'installer ou d'enlever le bloc d'alimentation. Le dispositif peut être en cours de fonctionnement pendant que vous installez ou enlevez un bloc d'alimentation, mais le bloc d'alimentation lui-même ne doit pas être connecté à une source d'alimentation. Sinon, vous risquez d'être blessé ou le bloc d'alimentation ou d'autres pièces du dispositif risquent d'être endommagés.
- ADVERTENCIA:** Los suministros de corriente pueden intercambiarse sin necesidad de ajustes. No obstante, Foundry Networks recomienda que desconecte el suministro de corriente de la toma de corriente alterna antes de instalar o retirar el suministro. El instrumento puede estar activado cuando se esté instalando o retirando un suministro de corriente, pero el suministro de corriente en sí no deberá estar conectado a la fuente de corriente. De no hacerlo así, podría sufrir daños personales o el suministro de corriente u otras piezas podrían resultar dañadas.
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- WARNING:** Before beginning the installation, see the precautions in "Power Precautions" on page 2-4.
- ACHTUNG:** Vor der Installation siehe Vorsichtsmaßnahmen unter " Power Precautions " (Vorsichtsmaßnahmen in Bezug auf elektrische Ablagen) auf den Seiten 2 - 4.
- AVERTISSEMENT:** Avant de commencer l'installation, consultez les précautions décrites dans " Power Precautions " (Précautions quant à l'alimentation), pages 2-4.
- ADVERTENCIA:** Antes de comenzar la instalación, consulte las precauciones en la sección " Power Precautions" (Precauciones sobre corriente) que se encuentra en las páginas 2-4.
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- WARNING:** For safety reasons, the ESD wrist strap should contain a series 1 meg ohm resistor.
- ACHTUNG:** Aus Sicherheitsgründen sollte ein EGB-Armband zum Schutz von elektronischen gefährdeten Bauelementen mit einem 1 Megaohm-Reihenwiderstand ausgestattet sein.
- AVERTISSEMENT:** Pour des raisons de sécurité, la dragonne ESD doit contenir une résistance de série 1 méga ohm.
- ADVERTENCIA:** Por razones de seguridad, la correa de muñeca ESD deberá contener un resistor en serie de 1 mega ohmio.
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- WARNING:** A fully populated chassis is heavy. TWO OR MORE PEOPLE ARE REQUIRED WHEN LIFTING, HANDLING, OR MOUNTING THESE DEVICES.
- ACHTUNG:** Ein voll bestücktes Gehäuse ist schwer. ZUM ANHEBEN, HANDHABEN ODER MONTIEREN DIESER GERÄTE SIND MINDESTENS ZWEI PERSONEN ERFORDERLICH.
- AVERTISSEMENT:** Les châssis sont lourds quand ils sont entièrement remplis. POUR SOULEVER, MANIPULER OU MONTER CES DISPOSITIFS, DEUX PERSONNES MINIMUM SONT NÉCESSAIRES.
- ADVERTENCIA:** Un chasis muy concurrido es muy pesado. SE REQUIEREN DOS O MÁS PERSONAS CUANDO SE VAYA A ALZAR, MANEJAR O MONTAR ESTE DISPOSITIVO.
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- WARNING:** Be careful not to accidently insert your fingers into the fan tray while removing it from the chassis. The fan may still be spinning at a high speed.
- ACHTUNG:** Die Finger dürfen nicht versehentlich in das Ventilatorblech gesteckt werden, wenn dieses vom Gehäuse abgenommen wird. Der Ventilator kann sich unter Umständen noch mit hoher Geschwindigkeit drehen.
- AVERTISSEMENT:** Faites attention de ne pas accidentellement insérer vos doigts dans le boîtier du ventilateur lorsque vous l'enlevez du châssis. Il est possible que le ventilateur tourne encore à grande vitesse.
- ADVERTENCIA:** Procure no insertar los dedos accidentalmente en la bandeja del ventilador cuando esté desmontando el chasis. El ventilador podría estar girando a gran velocidad.
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