ERICSSON

SmartEdge 100 Router Hardware Guide

Release 11.1

INSTALLATION

25/153 30-CRA 119 1170/1 Uen F

Contents

1 Site Preparation

Select the installation site for the SmartEdge® 100 router, considering maintenance, electrical, and ventilation requirements. In addition, consider current and future cabling requirements.

1.1 Agency Compliance Information

Table 1 Agency Compliance Standards

Product Safety	Emissions	Immunity	NEBS Level 3(1)
UL 60950	FCC part 15, Class A	EN61000-3-3	GR-63-CORE
CSA 22.2 No. 60950	ETSI EN300 386-2	EN61000-4-2	GR-1089-CORE
IEC60950	CISPR 22, Class A	EN61000-4-3	
EN60950	ICES-003, Class A	EN61000-4-4	
AS/NZS 60950	VCCI, Class A	EN61000-4-5	
	EN55022, Class A	EN61000-4-6	
	EN61000-3-2	EN61000-4-8	
	EN61000-3-3	EN61000-4-11	
	AS/NZS 3548, Class A	EN300 386-2	

(1) The TX GBIC transceiver does not comply with the Network Equipment Building Standards (NEBS) electrostatic discharge (ESD) requirement.

1.2 Electrical Specifications

Table 2 AC Electrical Specifications

Requirement	Value
Voltage, nominal	90 to 132 VAC, 47 to 63 Hz
Voltage, maximum	170 to 264 VAC, 47 to 63 Hz
Power consumption, nominal	230 watts
Power consumption, maximum	300 watts
Current draw, nominal	2.3A @110 VAC
Current draw, maximum	3.8A @90 VAC

Note: Nominal voltage is recommended to allow brief brownout and over-voltage events.

Table 3 DC Electrical Specifications

Requirement	Value
Voltage range	–40.0 to –57.6 VDC(1)
Power consumption, nominal	230 watts
Power consumption, maximum	300 watts
Current draw, nominal	≤4.8A @–48 VDC
Current draw, maximum	≤7.6A @–40 VDC

(1) The low-voltage alarm on the chassis is raised when the input voltage drops below -33Vdc. The power monitoring circuit has a wide tolerance of -33Vdc to -38Vdc, so input voltage within this range may not raise the low-voltage alarm.

DC power connections require copper wire of a size suitable for the installation (#4 AWG for chassis ground, #12 AWG for DC power cables) in accordance with the National Electrical Code (in the United States) or applicable local jurisdiction (outside the United States) installation requirements. An external fuse panel, either a standalone unit or incorporated in a DC power supply system, or a circuit breaker panel, is required for power on and power off control for DC-powered systems.

Caution!

Risk of equipment damage. Ensure that the fuses in the external fuse panel are suitably rated for the installation in accordance with the National Electrical Code (in the United States) or applicable local jurisdiction (outside the United States) installation requirements. A DC-powered system uses –48 VDC power, is powered from a fuse panel, and can be damaged by overloaded circuits.

AC power connections require a separate circuit with a 15-ampere circuit breaker. Do not connect any other equipment to a circuit to which the SmartEdge 100 chassis is connected.

Table 4 Operating and Inrush Current for AC Chassis and MICs

VAC	Component	Operating Current	Inrush Current(1)
110	Chassis (without MICs, minimum)	2.25A	6.2A
	Chassis (with MICs, maximum)	3.00A	8.4A
240	Chassis (without MICs, minimum)	1.40A	17.6A
	Chassis (with MICs, maximum)	1.70A	17.6A

(1) Inrush current occurs only during power on. Unless noted, maximum duration is 3 µs.

Table 5 Operating and Inrush Current for the DC Chassis and MICs

Component	Operating Current	Inrush Current(1)
Chassis (without MICs, minimum)	2.75A	30.0A @40.0 VDC for 40 µs
Chassis (with MICs, maximum)	3.75A	55.0A @57.6 VDC for 40 µs

(1) Inrush current occurs only during power on.

1.3 Environmental Requirements

The installation area for the SmartEdge 100 hardware must allow a minimum of 20.0 inches (50.8 cm) at the front of the chassis (for maintenance and ventilation).

Caution!

Risk of equipment damage. Never install the chassis in an unventilated area, and always ensure that cooling equipment sufficient to maintain a temperature of less than 104°F (40°C) is available.

Caution!

Risk of equipment damage. Blank cards must be inserted in each empty slot before applying power to ensure proper airflow. SmartEdge router cards can heat quickly and be damaged by the lack of cooling.

Because the cooling air exits at the rear of the chassis, this area must not be blocked; nor must exhaust air from other equipment blow into the front of the SmartEdge 100 chassis.

Table 6 Environmental Requirements

Specification	Value
Cooling	Forced air (fan cooled)
Operating temperature, nominal(1)	41° to 104°F (5° to 40°C)
Operating temperature, short term(2)	23° to 131°F (–5° to 55°C)
Storage temperature	–38° to 150°F (–40° to 70°C)
Operating relative humidity	5 to 95% RH (noncondensing)
Storage relative humidity	5 to 95% RH (noncondensing)
Operating altitude	0 to 10,000 ft (3,048m)

Table 6 Environmental Requirements

Specification	Value
Earthquake	Telcordia 63-CORE Zone 4-compliant
Thermal dissipation, maximum	300 watts (1,024 BTU/hour)

(1) Long term refers to normal operating conditions.
(2) Short term refers to a period of time not more than 96 consecutive hours and a total of not more than 15 days in one year (360 hours in any given year, but no more than 15 occurrences during that year).

1.4 Physical Specifications

Table 7 SmartEdge 100 Physical Specifications

Mechanical Specification	Value
Chassis dimensions	3.5 inches (8.9 cm) height 17.5 inches (44.5 cm) width 19.6 inches (50.0 cm) depth
Chassis weight	20.0 lb (9.1 kg) all MIC slots filled, ready for installation
Chassis mounting	19- or 23-inch rack
Slots	2
MIC slots	2 (carrier card slot 2)
MIC dimensions	1.6 inches (4.0 cm) height 5.3 inches (13.4 cm) width 6.1 inches (15.4 cm) depth

Note: Chassis depth dimension does not include front cable management brackets.

Table 8 SmartEdge 100 Connections

SmartEdge 100 Connections	Connector Type
MIC and Native Port Connections	
ATM OC-3c/STM-1c	SFP (LC), front chassis access
Copper FE	RJ-45, front chassis access
Optical FE	SFP (LC), front chassis access
Optical GE, including native ports	SFP (LC), front chassis access
Copper GE, including native ports	RJ-45, front chassis access
Operations Connections	
Management workstation (LAN)	RJ-45, front chassis access
Craft console (RS-232)	DB-9, front chassis access
Power Connections	

Table 8 SmartEdge 100 Connections

SmartEdge 100 Connections	Connector Type
Power	AC plug, rear chassis access DC plugs, rear chassis access
Chassis ground	M5 screws, rear chassis access

1.5 Select the Rack

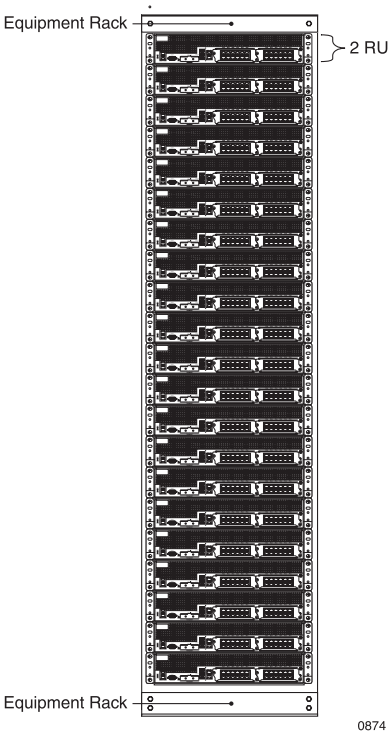

Figure 1 Fully Loaded 45 RU Rack Configuration

The SmartEdge 100 chassis requires two rack units (RUs). An RU is 1.75 inches (4.5 cm). You can mount the SmartEdge 100 chassis in a standard 19- or 23-inch rack. If you use a standard 45 RU rack, you can install up to 22 SmartEdge 100 chassis in a single rack for maximum density. If density is not a consideration, you can mount the chassis in a standard 42 RU rack.

Caution!

Risk of equipment damage. Never install the chassis in a rack that has not been stabilized by being bolted to the floor and to the ceiling and always select a mounting position that is suitable to the type of rack in which the chassis is being installed.

1.6 Equipment and Personal Safety Warnings

Warning!

Risk of electrical shock. Always remove the fuses for both the A- and B-side power sources in the fuse panel before connecting the power cables to the chassis. After the power cables are connected to the chassis and the fuse panel, the system is fully powered on.

Warning!

Risk of electrical shock. Improper grounding can result in an electrical shock. This equipment must be connected to a protective ground in accordance with the instructions provided in this guide.

Warning!

Risk of electrical shock. Only qualified personnel are allowed to service the system. There are mechanical and electrical shock hazards present throughout the system if one or more of the cards is removed.

Warning!

Risk of personal injury. Disconnect the telecommunications network cables before removing the card to which they are connected. This equipment does not provide safety isolation between any port that is connected to a digital network termination point and any other port to which terminal equipment may be connected.

1.7 DC Power Source Warnings

Warning!

Risk of electrical shock. A readily accessible disconnect device, such as a fuse in a fuse panel, must be provided in the fixed wiring for each DC power source. It must be suitable for the rated voltage and current specified. Because a system is fully powered on after all power connections are made, it can cause shock if a power cable is disconnected from the chassis.

Warning!

Risk of electrical shock. Safe operation of this equipment requires connection to a ground point. To prevent possible injury from voltages on the telecommunications network, disconnect all telecommunications network lines before disconnecting the unit from the ground point.

Warning!

Risk of electrical shock. The system uses DC power sources, which can cause severe injury. The DC power sources must be installed only in restricted access areas (dedicated equipment rooms, equipment closets, or the like) in accordance with Articles 110-17, 110-26, and 110-27 of the National Electric Code, ANSI/NFPA 70. Connect the chassis to a –48 VDC source that is reliably connected to earth.

1.8 Access During the Initial Startup and Reload Operations

During the initial startup, only the Craft port (also referred to as the console port) is operable until you have configured the Ethernet port (also referred to as the management port). During a reload operation, the management port is disabled until the initial stage of the reload is complete; all messages displayed during the reload are sent to the Craft port.

You access the SmartEdge 100 router with a console terminal connected to the Craft port, either directly or through a terminal server.

1.9 Access During Normal Operations

After you have configured the management port, you can use one or more of the following options to provide management access:

- A local management workstation, using a connection to the Ethernet management port on the chassis front panel.
- A remote management workstation, using a routed or bridged connection to the Ethernet management port on the chassis front panel.
- A local console terminal with a direct connection to the Craft port on the chassis front panel.
- A remote console terminal with a connection to the Craft port on the chassis front panel, using a terminal server.

For redundancy, Ericsson recommends using two different methods (for example, a remote workstation and a remote console terminal with a connection to a terminal server).

1.10 Management Access Options

Note: The Craft port does not support a modem connection.

Table 9 Options for Management Access

Option	Equipment Requirements
Ethernet port connection to a local management workstation	• A PC-type workstation, running Windows XP, NT, 2000, 98, 95, 3.01, or DOS with Telnet client • Shielded Ethernet crossover cable
Ethernet port connection to a remote management workstation	• A PC-type workstation, running Windows NT, 2000, 98, 95, 3.01, or DOS with Telnet client • Shielded Ethernet straight cable (shipped with the system) • Router or bridge
Craft port connection to a local console terminal	Local terminal—choose one of the following options: • ASCII/VT100 console terminal or equivalent that runs at 9600 baud, 8 data bits, no parity, 1 stop bit • PC-type workstation, running Windows NT, 2000, 98, 95, 3.01, or DOS with terminal emulator, in the same configuration as the ASCII/VT100 terminal • Terminal server • Craft console cable (shipped with the system)
Craft port connection to a remote console terminal	Local terminal—choose one of the following options: • ASCII/VT100 console terminal or equivalent that runs at 9600 baud, 8 data bits, no parity, 1 stop bit • PC-type workstation, running Windows NT, 2000, 98, 95, 3.01, or DOS with terminal emulator, in the same configuration as the ASCII/VT100 terminal • Terminal server cable

1.11 Gathering Cables and Tools

In addition to the equipment shipped with the SmartEdge 100 router and the equipment required for installation, you require cables for the following connections:

- MIC and native port cables:

  Warning!

  The intra-building port(s) of the equipment or subassembly is suitable for connection to intra-building or unexposed wiring or cabling only. The intra-building port(s) of the equipment or subassembly MUST NOT be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 5) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

  - ATM OC ports
  - Copper and optical FE ports
  - Copper and optical GE ports
  - Native ports (FX or TX GE)

- Operations cables:
  - Console terminal (RS-232)
  - Ethernet management workstation (LAN)

- Power cables:
  - Chassis ground (one)
  - AC power cord

Table 10 Tools Needed for SmartEdge 100 Hardware Installation

Tool	Purpose
#1 Phillips screwdriver	Install MICs.
#2 Phillips screwdriver	Attach the mounting brackets and cable management brackets to the chassis.
#2 or #3 Phillips screwdriver(1)	Install the chassis in the rack.

Table 10 Tools Needed for SmartEdge 100 Hardware Installation

Tool	Purpose
3/32-inch slotted screwdriver	Install DC power cables.
Cable crimping tool	Secure barrel, open, or ring lugs to the chassis ground cable; must be compatible with FCI YA4C series of compression lugs (Y2MR or equivalent).

(1) Depending on the screws that you use to install the chassis in a rack, a #3 Phillips screwdriver might be more appropriate than the #2 screwdriver.

1.12 Management Access Cables

A management access cable connects a console terminal, management workstation, or modem to the Ethernet management port or the Craft port on the carrier card. Table 11 lists the cables for these ports.

Table 11 Cable Specifications for Management Access Cables

Name	Description	System Connectors	Cable Connector	Maximum Distance(1)
Craft console cable	RS-232	DB-9 female	DB-9 male	35.0 ft - 10.7 m
Ethernet crossover cable	Category 5 shielded twisted-pair	RJ-45 female	RJ-45 male	328.1 ft - 100.0 m
Ethernet straight cable	Category 5 shielded twisted-pair	RJ-45 female	RJ-45 male	328.1 ft - 100.00 m

(1) The maximum cable length for RS-232 cables is for any baud rate.

1.13 Craft Console Cable

A Craft console cable connects a local Craft console to the Craft port on the front panel. The cable is constructed as a straight-through connection between a standard, DB-9 male connector at the system end and a DB-9 female connector at the computer terminal end.Table 12 lists the pin assignments.

Table 12 Craft Console Cable Pin Assignments

Signal Name(1)	Signal Function	Notes
DCD (input)	Received Line Signal Detector	Not used
TXD (output)	Transmitted Data	SmartEdge router output
RXD (input)	Received Data	SmartEdge router input
DSR (input)	DCE Ready	Not used
–	Signal Ground	–
DTR (output)	DTE Ready	Not used
CTS (input)	Clear to Send	Not used

Table 12 Craft Console Cable Pin Assignments

Signal Name[1]	Signal Function	Notes
RTS (output)	Request to Send	Not used
RI (input)	Ring Indicator	Not used

(1) The direction, input or output, is with respect to the controller card: input describes data flowing into the controller carrier card; output describes data being transmitted by the controller carrier card.

1.14 Ethernet Crossover Cable

An Ethernet crossover cable is a shielded cable that connects the Ethernet port on a PC to the Ethernet management port on the front panel. Both ends of the cable are terminated in standard, RJ-45 eight-pin modular plugs. Table 13 lists the pin assignments.

Table 13 Ethernet Crossover Cable Pin Assignments

Signal Name	Pin	Notes
Tx (+)	3	–
Tx (–)	6	–
Rx (+)	1	–
–	–	No connection
–	–	No connection
Rx (–)	2	–
–	–	No connection
–	–	No connection

1.15 Ethernet Straight Cable

An Ethernet straight cable is a shielded cable that connects the Ethernet management port on the front panel to a LAN hub. Both ends of the cable are terminated in standard, RJ-45 eight-pin modular plugs. Table 14 lists the pin assignments, which are for both ends of the cable.

Table 14 Ethernet Straight Cable Pin Assignments

Signal Name	Notes
Tx (+)	–
Tx (–)	–
Rx (+)	–
–	No connection
–	No connection
Rx (–)	–

Table 14 Ethernet Straight Cable Pin Assignments

Signal Name	Notes
–	No connection
–	No connection

1.16 MIC Cable Specifications

Table 15 Cable Specifications for the MICs

Card Type	Description	Card Connector	Cable Connector	Maximum Distance
ATM OC-3c/STM-1c	Multimode fiber	LC female	LC male	1,640.4 ft - 500.0 m
	Multimode fiber	LC female	LC male	656.2 ft - 200.0 m
ATM OC-3c/STM-1c	Single-mode fiber	LC female	LC male	9.3 mi - 15.0 km
1000Base-SX	Multimode fiber	LC female	LC male	1,640.4 ft - 500m
	Multimode fiber	LC female	LC male	656.2 ft - 200 m
100Base-FX	Multimode fiber	LC female	LC male	1.2 mi - 2.0 km
100Base-LX10	Single-mode fiber	LC female	LC male	6.2 mi - 10.0 km
1000Base-LX	Single-mode fiber	LC female	LC male	6.2 mi - 10.0 km
10/100 Ethernet	Category 5 shielded twisted-pair Ethernet straight or crossover(1)	RJ-45 female	RJ-45 male	328.1 ft - 100 m
FE–GE 100/1000	Category 5 shielded twisted-pair	RJ-45 female	RJ-45 male	328.1 ft - 100 m

(1) See Cable Options for a 10/100 Ethernet Line Card Table to determine which cable, straight or crossover, is suitable; the cable must be grounded at both ends.

1.17 Transceiver-Based Fast Ethernet and Gigabit Ethernet MIC Cables

Table 16 Cable Specifications for Transceiver-Based FE and GE MICs

Tranceiver Type	Description	Card Connector	Cable Connector	Maximum Distance
Copper FE TX transceiver	2-pair category 5 shielded twisted-pair Ethernet straight or crossover(1)	RJ-45 female	RJ-45 male	328.1 ft - 100.0 m
Copper GE TX transceiver	4-pair category 5 shielded twisted-pair	RJ-45 female	RJ-45 male	328.1 ft - 100.0 m
SX SFP transceiver	Multimode fiber 62.5/125 µm	LC female	LC male	1,604.4 ft - 500.0 m
	Multimode fiber 50/125 µm	LC female	LC male	656.2 ft - 200.0 m
FX SFP transceiver	Multimode fiber 62.5/125 µm	LC female	LC male	1.2 mi - 2.0 km

Table 16 Cable Specifications for Transceiver-Based FE and GE MICs

Tranceiver Type	Description	Card Connector	Cable Connector	Maximum Distance
LX10 SFP transceiver	Single-mode fiber 9/125 µm	LC female	LC male	6.2 mi - 10.0 km
LX SFP transceiver	Single-mode fiber 9/125 µm	LC female	LC male	6.2 mi - 10.0 km

(1) See Cable Options for a 10/100 Ethernet Line Card Table to determine which cable, straight or crossover, is suitable; the cable must be grounded at both ends.

The choice of an Ethernet straight or crossover cable for a copper FE port depends on the equipment to which it is being connected; see Table 17.

Table 17 Cable Options for a 10/100 Ethernet Line Card

Configuration	Cable Type
Port is connected to a router.	Straight
Port is connected to a switch.	Crossover
Port is connected to a 10/100 Ethernet port in another SmartEdge router.	Crossover

Note: The wiring for a 10/100 Ethernet MIC in a SmartEdge 100 router is cross-connected like a switch or hub.

1.18 Transceiver-Based SONET/SDH MIC Cables

Table 18 Cable Specifications for Transceiver-Based SONET/SDH MICs

Tranceiver Type	Description	Card Connector	Cable Connector	Maximum Distance
ATM OC-3c/STM-1c MIC	Multimode fiber 62.5/125 µm	LC female	LC male	1,640.4 ft - 500.0 m
Multimode fiber 50/125 µm	LC female	LC male	656.2 ft - 200.0 m	
ATM OC-3c/STM-1c MIC	Single-mode fiber 9/125 µm	LC female	LC male	9.3 mi - 15.0 km

Note: The wiring for a 10/100 Ethernet MIC in a SmartEdge 100 router is cross-connected like a switch or hub.

1.19 Fast Ethernet Gigabit Ethernet MIC Cables

The choice of an Ethernet straight or crossover cable for a copper FE port depends on the equipment to which it is being connected; see Table 19.

Table 19 Cable Options for a 10/100 Ethernet Line Card

Configuration	Cable Type
Port is connected to a router.	Straight
Port is connected to a switch.	Crossover
Port is connected to a 10/100 Ethernet port in another SmartEdge router.	Crossover

Note: The wiring for a 10/100 Ethernet MIC in a SmartEdge 100 router is cross-connected like a switch or hub.

1.19.1 Copper FE Crossover Cable Pin Assignments

A copper FE crossover cable is a shielded and grounded cable; both ends are terminated in standard, RJ-45 eight-pin modular plugs. Table 20 lists the pin assignments.

Table 20 10/100 Ethernet Crossover Cable Pin Assignments

Signal Name	Pin	Notes
Rx (+)	3	–
Rx (–)	6	–
Tx (+)	1	–
–	–	Termination network
–	–	Termination network
Tx (–)	2	–
–	–	Termination network
–	–	Termination network

1.19.2 Copper FE Straight Cable Pin Assignments

A copper FE straight cable is a shielded and grounded cable; both ends are terminated in standard, RJ-45 eight-pin modular plugs. Table 21 lists the pin assignments, which are for both ends of the cable.

Table 21 10/100 Ethernet Straight Cable Pin Assignments

Signal Name	Notes
Rx (+)	–
Rx (–)	–
Tx (+)	–
–	Termination network
–	Termination network
Tx (–)	–
–	Termination network
–	Termination network

2 Installing the Hardware

Stop!

The SmartEdge 100 is to be installed in a restricted access area (dedicated equipment rooms, equipment closets, or other restricted-access area) and in accordance with Articles 110-26 and 110-27 of the National Electric Code, ANSI/NFPA 70, or in accordance with the applicable code in the country of installation.

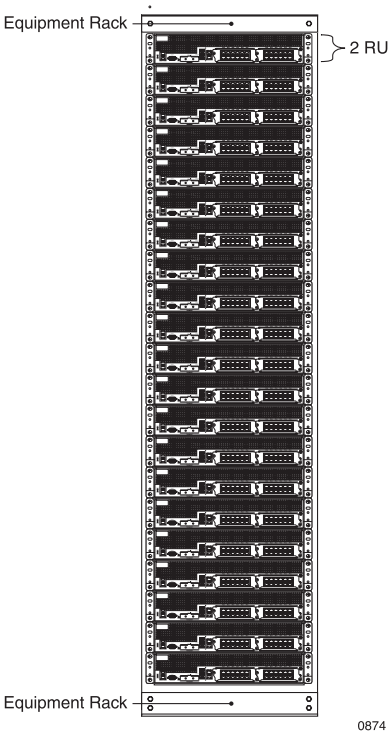

Figure 2 Fully Loaded 45 RU Rack Configuration

To install system hardware:

1. Select the chassis position in the rack.

   SmartEdge 100 chassis requires two rack units (RUs). An RU is 1.75 inches (4.5 cm).

2. Determine alignment and install the chassis mounting brackets:

a Flush mount—Approximately 3.5 inches (8.9 cm) beyond the front of the rack.

b Mid-mount—Approximately 12.7 inches (32.3 cm) beyond the front of the rack.

Because the chassis extends beyond the front of the rack in either mounting position, a rack with a front door might not be suitable for the installation unless the door is removed.

Mounting brackets for 19-inch rack are pre-installed on the chassis in the flush mount position.

The same chassis mounting brackets accommodate both mounting options; the brackets are simply attached to the chassis in different positions.

Either bracket can be attached to either side of the chassis.

When you have finished installing the hardware, you are ready to check the operational status.

The term, GE, applies to any GE native port or MIC that supports a port speed of 1 Gbps or greater; unless explicitly stated, the speed of any GE port is 1 Gbps.

2.1 Install Chassis Mounting Brackets

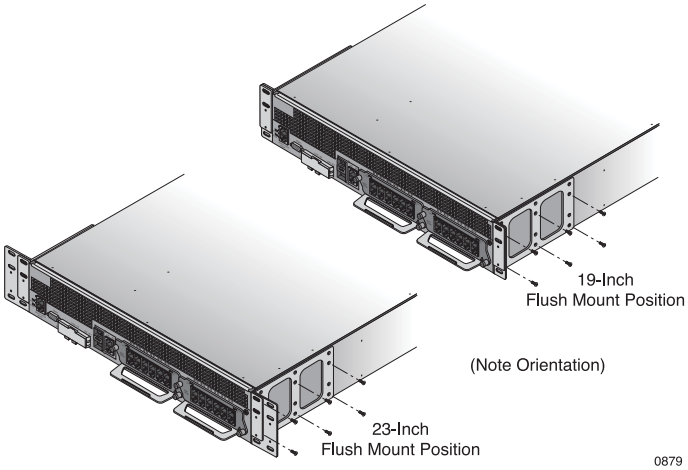

Figure 3 Installing Chassis Brackets for Flush Mount Position

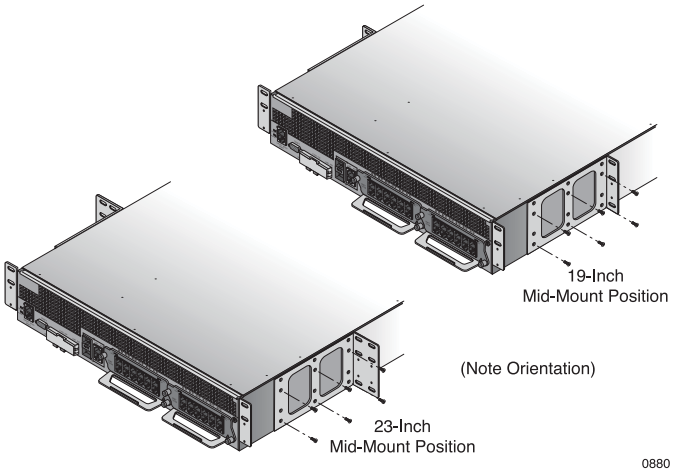

Figure 4 Installing Chassis Brackets for Mid-Mount Position

Two pairs of chassis mounting brackets are shipped with the chassis. Each bracket requires four 10-32 x 0.25-inch screws, which are included with the mounting brackets. One pair of brackets is for mounting the chassis in a 23-inch rack; the other pair of brackets is for mounting in a 19-inch rack.

Caution!

Risk of equipment damage. Always use the number and type of screws specified in the instructions. Failure to use the proper screws to attach the mounting brackets to the SmartEdge chassis and the brackets to the rack can damage the chassis.

Note: If you are mounting the chassis in a 23-inch rack or if you are mounting it in a 19-inch rack in the mid-mount position, remove the 19-inch brackets from the chassis.

To install either type of bracket:

1. Position a mounting bracket against one side of the chassis, lining up the screw holes in the bracket with the screw holes in the side of the chassis, in accordance with the mounting option you have selected.

2. Using a Phillips screwdriver, attach the bracket to the chassis with the screws provided with the mounting bracket; tighten each screw to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).

3. Repeat Step 1 and Step 2 to attach the second bracket to the other side of the chassis.

2.2 Install Chassis

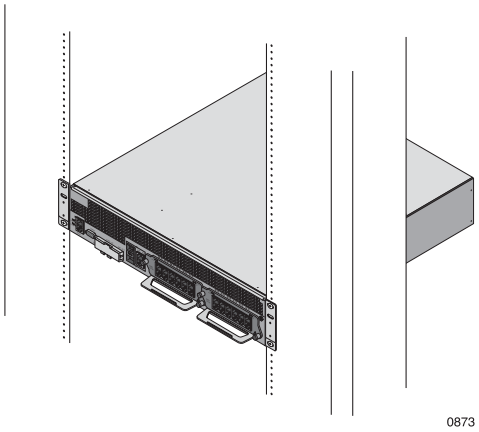

Figure 5 19-Inch Rack Installation

Stop!

Risk of equipment damage. Do not grasp the handle of an installed MIC when lifting or lowering the chassis, because it cannot bear the strain induced by the chassis weight. It can break away from the chassis, thereby causing the chassis to fall. Always grasp the chassis by its underside edges and not by any opening or the handle on any component.

To install the SmartEdge 100 chassis in the rack, you need four 12-24 or equivalent screws:

1. With another installation engineer, lift the chassis to the position selected in the rack.
2. Line up the screw holes in the mounting brackets with the screw holes in the rack.
3. With one engineer holding the chassis in place, use a Phillips screwdriver to secure the chassis to the rack with four 12-24 or equivalent screws; tighten each screw to a maximum torque of 30.0 inch-lbs (3.4 Newton-meters).

2.3 Install Cable Management Brackets

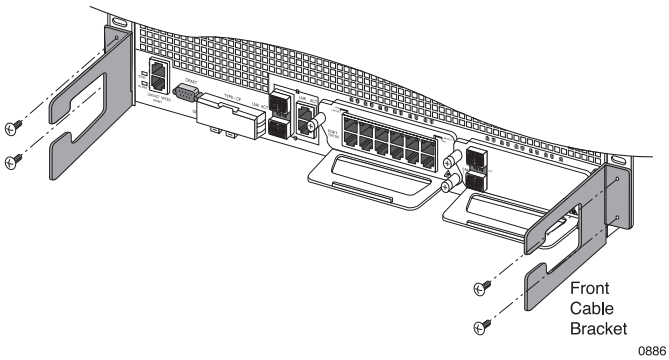

Figure 6 Install the Cable Brackets

The SmartEdge 100 router is shipped with a pair of cable management brackets for the front of the chassis. When installed, each bracket accommodates both fiber-optic and non-fiber cables.

To install a bracket, align it with two unused screw holes in the attached flange; using a Phillips screwdriver, secure it with two 6-32 x 0.25-inch flat-head screws provided with each bracket. Then tighten each screw to a maximum torque of 9.6 inch-lbs (1.1 Newton-meters).

2.4 Connect Chassis Ground Cable

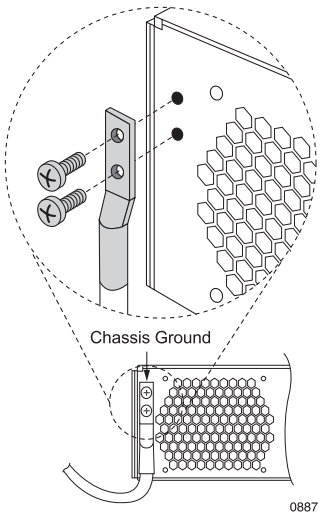

Figure 7 Ground Cable Connection

The back panel of the SmartEdge 100 chassis has a pair of M5 screws, which are used to attach a ground cable, at the upper left corner of the chassis rear panel.

Note: If installed in a Central Office, the ground cable size must be minimum 8 AWG. If the connector cannot handle the current, the ground cable must be the same AWG as the power conductors.

The SmartEdge 100 chassis is suitable for a Common Bonding Network (CBN).

The ground cable must be of a size suitable for the installation (#4 AWG standard copper), and must be installed in accordance with the National Electrical Code (in the United States), or the applicable local jurisdiction (outside the United States) installation requirements.

To connect the chassis ground cable:

1. Using a crimping tool, attach a two-hole lug to one end of the ground cable.

   Note: Bare connectors and all grounding surfaces must be brought to a bright finish and coated with an antioxidant before crimp connections are made.

2. Using a Phillips screwdriver, remove the pair of M5 screws.

3. Place the two-hole lug over the screw holes and insert the screws in the screw holes.

4. Using the Phillips screwdriver, tighten the screws to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).

5. Connect the other end of the cable to an appropriate ground point.

   Note: To properly secure power and ground connections, use star washers for anti-rotation and thread-forming screws with paint-piercing washers, where applicable.

Warning!

Risk of electrical shock. The system uses DC power sources, which can cause severe injury. The DC power sources must be installed only in restricted access areas (dedicated equipment rooms, equipment closets, or the like) in accordance with Articles 110-17, 110-26, and 110-27 of the National Electric Code, ANSI/NFPA 70. Connect the chassis to a –48 VDC source that is reliably connected to earth.

The SmartEdge 100 chassis is suitable for installation in Network Telecommunication Facilities.

Warning!

Risk of electrical shock. A readily accessible disconnect device, such as a fuse in a fuse panel, must be provided in the fixed wiring for each DC power source. It must be suitable for the rated voltage and current specified. Because a system is fully powered on after all power connections are made, it can cause shock if a power cable is disconnected from the chassis.

Warning!

Risk of electrical shock. Safe operation of this equipment requires connection to a ground point. To prevent possible injury from voltages on the telecommunications network, disconnect all telecommunications network lines before disconnecting the unit from the ground point.

Warning!

Risk of electrical shock. This equipment uses –48 VDC power, which can cause shock if inadequate power sources are connected to it. Verify that the power sources for the SmartEdge router meet the power specifications and ensure that DC power cables meet the specifications before connecting the power cables.

Warning!

Risk of electrical shock. Improper grounding can result in an electrical shock. This equipment must be connected to a protective ground in accordance with the instructions provided in this guide.

Caution!

Risk of equipment damage. A DC-powered system uses –48 VDC power, is powered from a fuse panel, and can be damaged by overloaded circuits. Ensure that the fuses in the external fuse panel are suitably rated for the installation in accordance with the National Electrical Code (in the United States) or applicable local jurisdiction (outside the United States) installation requirements.

2.5 Install DC Power Cables

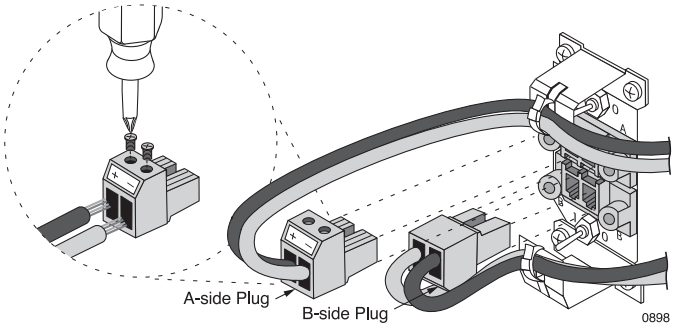

Figure 8 Installing the DC Power Cables

Note: Use only copper American wire gauge (AWG) cables for power and ground connections.

The SmartEdge 100 chassis has connectors for A-side and B-side power cables for power redundancy; these connectors are located on the rear panel of the chassis. The A- and B-side power cables are connected to separate A-side and B-side connectors on the external fuse panel or circuit breaker panel. The chassis requires AWG #12 standard copper wire for the DC power cables.

The SmartEdge 100 Battery Return (BR) is intended to be an Isolated DC Return (DC-I).

To install the DC power cables:

1. Ensure that the circuit breakers are set to the off position, which is marked by a stamped “0” on the chassis rear panel.

2. Attach a DC plug to a pair of DC power cables:

   a Pull the DC power plug from the A-side connector at the rear of the chassis to remove it.

   b Using a slotted screwdriver, loosen the recessed screws in the top of the DC plug and insert the –48 VDC cable in the minus (–) opening and the return cable in the plus (+) opening.

c Tighten the screws to a maximum torque of 0.5 inch-lbs (4.4 Newton-meters)

3. If you are installing redundant DC power sources, attach the second pair of DC power cables to a second plug.

4. Insert the A-side and B-side plugs in the connectors on the rear panel of the chassis, so that they are oriented 180° with respect to each other, as shown in Figure 8. The connectors are polarized so that you cannot insert them incorrectly.

5. Secure the cables to the circuit-breaker shields as shown in Figure 8.

2.6 Install AC Power Cord

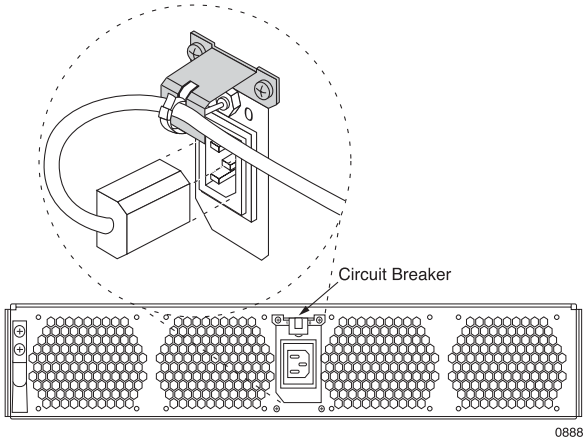

Figure 9 Installing the AC Power Cord

To install the AC power cord:

1. Ensure that the circuit breaker is set to the off position, which is marked by a stamped “0” on the chassis rear panel.

2. Insert the AC power cord in the connector.

3. Secure the AC power cord to the circuit-breaker shield.

4. Plug the other end of the AC power cord to a building outlet that provides a 15A circuit.

2.7 Install MICs

MICs for the SmartEdge 100 router are installed in the chassis when it is shipped.

Caution!

Risk of equipment damage. MICs can heat quickly and be damaged by the lack of cooling. Blank MIC slot covers must be installed in an empty slot before applying power to ensure proper airflow.

2.8 Install CF Card

There is an external slot on the chassis front panel in which you can install a Type I CF card. If a CF card is shipped with the chassis, it is installed in the external slot and no installation procedure is needed.

2.9 Install the Optical Transceivers

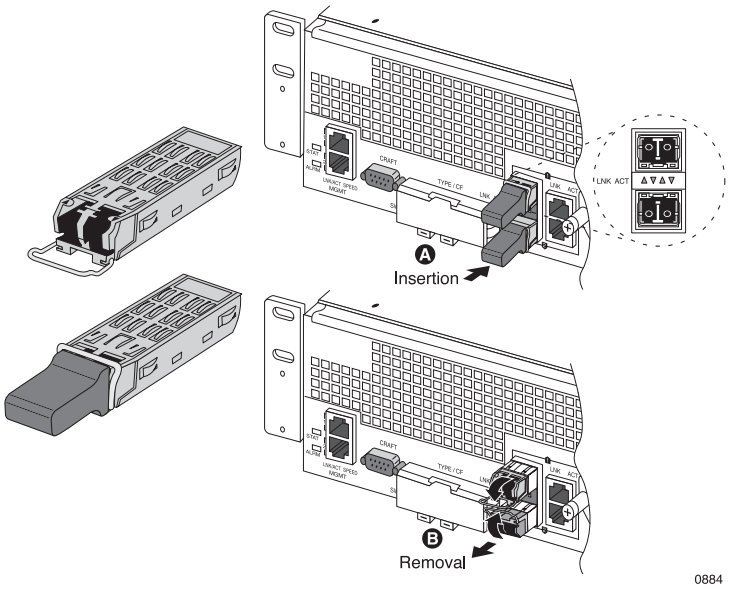

Figure 10 Installing an SFP Transceiver

Optical ports require a small form-factor pluggable (SFP) transceiver in each port. These ports include native ports when configured as optical ports and ports on the ATM, optical GE, and optical FE MICs.

Caution!

Risk of data loss. Install only the transceivers purchased from Ericsson. You can corrupt the system if you attempt to install SFP transceivers that are not purchased from Ericsson and tested with the SmartEdge router.

Stop!

Risk of electrostatic discharge ESD damage. Always use an ESD wrist or ankle strap when handling the SFP. Avoid touching any connector pins. An SFP contains electrostatic-sensitive devices.

To install an optical transceiver of any type:

1. Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; there is an ESD convenience jack located in the lower right corner of the air intake panel on the front of the chassis.
2. Ensure that the SFP latching mechanism is closed.
3. With the transceiver aligned with the connector in the chassis front panel or MIC front panel (as shown in Figure 10), slide the transceiver into the opening for the port until the rear connector is seated and the locking mechanism snaps into place. In Figure 10, the SFP is aligned with an upper port, either native or MIC; to install the SFP in a lower port, rotate the SFP 180°.
4. Leave the dust cover on until you are ready to insert the fiber-optic cables.

2.10 Connections for Management Access

Connecting a console terminal or management workstation to the SmartEdge 100 router is often a two-stage process. Initially the console terminal is connected to the Craft port (also referred to as the console port) to configure the Ethernet port (also referred to as the management port); configuring the management port and modifying the configuration of the console port is described in SmartEdge OS documentation. When the configuration is complete, you might need to alter the connections for normal operations.

2.11 Management Workstation

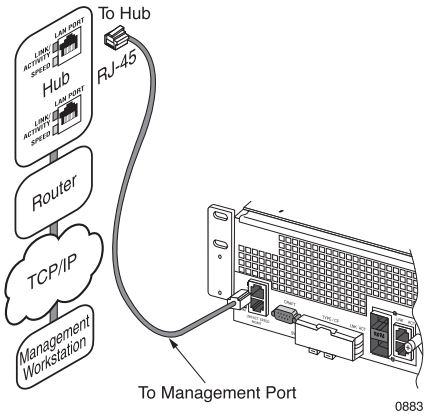

Figure 11 Ground Cable Connection

A management workstation is connected to the SmartEdge 100 router using the upper Ethernet port on the front panel. This type of connection provides access to the SmartEdge OS command-line interface (CLI) after you have configured the port.

Neither type of connection is suitable during a reload operation, because the Ethernet management port is disabled until the reload is complete.

2.12 Local or Remote Console Terminal

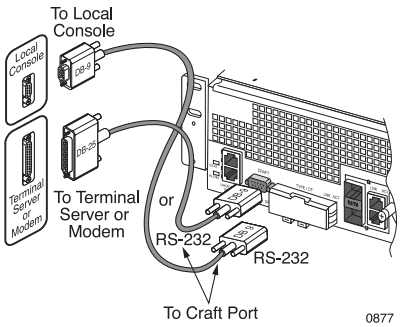

Figure 12 Connections for a Local or Remote Console

A local or remote console terminal is connected to the SmartEdge 100 router using the Craft port on the front panel. This type of connection provides access to the SmartEdge OS CLI, either directly or through a terminal server. This port is always available; all system messages are directed to this port during a reload operation.

Note: The Craft port does not support a modem connection.

2.13 Connect and Route the Cables at the Front of the Chassis

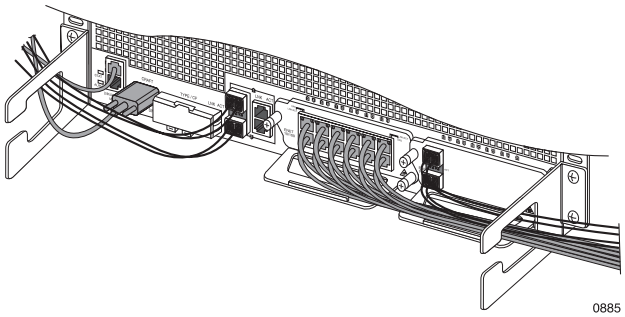

Figure 13 Cable Routing

All MIC cables are connected to the front panels of the MICs.

Caution!

Risk of damage to fiber-optic cables. Never step on a fiber-optic cable or twist one when connecting it to or disconnecting it from a port.

To connect and route the cables at the front of the chassis:

1. Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located in the lower right corner of the air intake panel on the front of the chassis.
2. Connect and route the management access cables, depending on the type of management access you have selected, and the cables for the native ports; see Figure 11 for connecting a management workstation and Figure 12 for connecting a local or remote console:
   a Thread the system ends of the system management and native port cables through the cable management bracket at the left side of the chassis.
   b Insert each cable in the appropriate connector on the front panel.
   c Tie-wrap the cables to form a bundle, and then tie each bundle to the cable bracket.
3. To connect and route the cables for the MIC ports:
   a Thread the system ends of the MIC cables through the cable management bracket at the right side of the chassis.
   b Insert each cable in the appropriate connector on the MIC front panel.

c Tie-wrap the cables from each MIC to form a bundle, and then tie each bundle to the cable bracket.

2.14 Connect the Equipment and Network Ends of the Cables

To connect the equipment and network ends of the cables:

1. Connect the MIC cables to their networks.
2. Ensure that the management access equipment is configured properly.
3. Connect the management access cables to the equipment or their networks.

2.15 Powering On and Powering Off the System

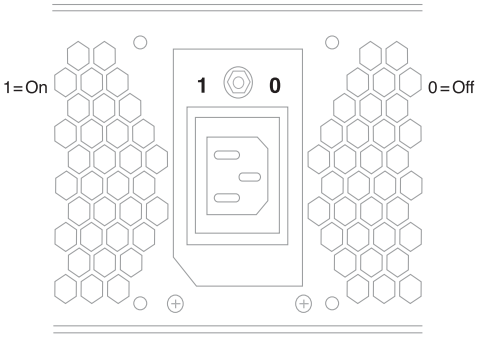

Figure 14 AC Chassis Circuit Breaker

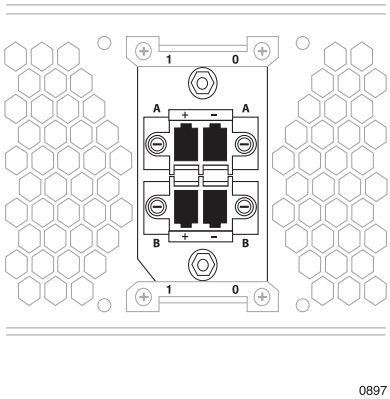

Figure 15 DC Circuit Breakers

You power on the SmartEdge 100 router by moving the circuit breaker on the chassis rear panel to the on position, which is marked by a stamped “1” on the chassis rear panel. You power it off by moving the circuit breaker to the off position, which is marked by a stamped “0”.

Caution!

Risk of equipment damage. Use the circuit breaker only in a lateral direction and only when necessary to power on or power off the system. Do not toggle the circuit breaker on and off repeatedly, which can cause the circuit breaker to not latch properly (it does not remain in the on position). Do not move the circuit breaker in a circular motion. Excessive force applied to the circuit breaker while moving it in a circular motion can cause damage to the internal parts of the circuit breaker.

The AC version of the SmartEdge 100 chassis has a single circuit breaker above the AC power cord connector; see Figure 14. The DC version of the chassis has dual circuit breakers with the A-side circuit breaker above the A-side connector and the B-side circuit breaker below the B-side connector; see Figure 15.

The circuit breaker provides protection against power surges and drops; if a power surge or drop occurs that is outside the range of power supported by the system, the circuit breaker shuts down the system.

During the power-on sequence for a SmartEdge 100 router, the MICs are held in low-power mode until after the controller carrier card is initialized. The SmartEdge OS then performs a power capacity check to ensure that the installed MICs have enough power to be completely operational. Each installed MIC is compared with the MIC configuration for that slot. If they are the same, the MIC is initialized. If the installed and configured MIC types are different, the SmartEdge OS leaves the MIC in low-power mode.

3 Hardware Control and Troubleshooting

The operating system command-line interface (CLI) includes commands that display hardware configuration and status information, allow hardware troubleshooting, and provide hardware control and recovery.

The mode in which you enter a command is as follows:

- Enter **`show`** commands in any mode.
- Enter **`clear`** and **`reload`** commands in exec mode.
- Enter the **`card`** command and the **`port`** command for any type of port in global configuration mode.
- Enter the loopback and **`shutdown`** command in port configuration mode.

3.1 Hardware Status

The CLI commands listed in Table 22 display status information, such as power, temperature, ports, and alarms for the fan tray and individual cards and ports. Required characters and keywords are shown in bold; arguments for which you must supply a value are shown in italics. You can enter **`show`** commands in any mode.

For descriptions of the output for any CLI command, see *Command List* Reference [4].

Table 22 CLI Commands for Hardware Status

Task or Information Needed	CLI Command	Comments
Status of power, temperature for all installed units	**`show hardware`** **`show hardware detail`**	
Status of internal- and external-storage devices	**`show disk`**	
Status for all ports	**`show port`** **`show port detail`** **`show port counters`** **`show port perf-monitor`**	
Status of a specific port, including alarms	**`show port detail`***`slot/port`*	
Status of SFP and XFP transceivers	**`show port transceiver`**	

Table 22 CLI Commands for Hardware Status

Task or Information Needed	CLI Command	Comments
Status of all alarms at system, slot, port, and transceiver level	**show system alarm**	For descriptions of the output for the **show system alarm** command, see the "Troubleshoot with System and Alarm LEDs" section.
Status of alarms for specific slot, port, or transceiver	**show system alarm all**	When reporting alarms and warnings of the transceivers, the SFP transceivers must be compliant to SFF-8472 and the XFP transceivers must be compliant to INF-8077i. The **show system alarm all** command and SNMP traps report the alarms when the corresponding threshold limits preset are exceeded.

3.2 CLI Commands for Hardware Control

Table 23 CLI Commands for Hardware Configuration and Control

Task or Information Needed	CLI Command	Comments
Shut down, restart hardware[1]		
Shut down (disable) a port	**port** ***port-type slot/port*** **shutdown**	The **shutdown** command disables the port, but does not clear counters; use the command to **clear port counters**lear the counters for a specific port.
Restart the system (reload the controller)	**reload**	The **reload** command does not reset the hardware; you must remove and reinstall the MIC to cause a reset.
	For other forms of this command, see *Command List* Reference [4].	
Restart a MIC (reload its software)	**reload mic** ***mic-slot***	
Restart (enable) a port	**port** ***port-type slot/port*** **no shutdown**	
Hardware data—Version, slot number, port number, MIC type, physical layer interface, speed, mode, counters		
Summary information	**show chassis** **show hardware** **show port**	
Detailed information	**show hardware fantray detail** **show hardware card slot** ***slot*** **detail** **show port detail** ***slot/port***	
Configuration data—Slots, ports		
Summary information for each slot	**show chassis**	

Table 23 CLI Commands for Hardware Configuration and Control

Task or Information Needed	CLI Command	Comments
Summary information for each installed MIC	**show port**	
Configuration for a specific port	**show port** ***slot/port*** **detail**	Use the **all** keyword to display data for all ports, including those on MICs that are not installed.

(1) Because the SmartEdge OS software synchronizes all write operations to the file system, you can power down the system without issuing the ***shutdown*** *command.*

3.3 CLI Commands for Hardware Troubleshooting

Required characters and keywords are shown in bold; arguments for which you must supply a value are shown in italics.

Table 24 CLI Commands for Hardware Troubleshooting

Task or Information Needed	CLI Command	Comments
Clear counters for a port	**clear port counters** ***slot/port***	The **clear port counters** command does not disable the port; use the **shutdown** command to disable the port.
Enable loopback on an ATM, an FE, or a GE port	**port** ***port-type slot/port*** **loopback** ***loopback-type***	No loopback type is specified for FE and GE ports.
Disable loopback on an ATM, an FE, or a GE port	**port** ***port-type slot/port*** **no loopback**	

Table 25 Loopback Types

Loopback Type	Description
–	No loopback type is specified for Ethernet and Gigabit Ethernet ports.
internal[1]	Loops transmit line to receive line; ATM OC ports.
line	Loops receive line to transmit line; ATM OC ports.

(1) The ***internal*** *keyword for all FE and GE ports, causes all transmitted traffic to be looped back and not sent to the remote site; instead, the remote site receives a loss of signal (LOS). For a port on a second-generation ATM OC MIC, the port software injects an alarm indication signal-line (AIS-L) and then resumes transmitting traffic.*

3.4 Values for CLI Input Arguments

Table 26 Values for CLI Input Arguments

Argument	Range of Values/Description	Restrictions
loopback-type	See table of loopback types and the ports to which they apply.	
port	1 to 26.	The Ethernet management port is always port 1 in slot 1.
port-type	• **atm**—ATM OC port. • **ethernet**—FE or GE port (any version).	
slot	**1**—Slot in which the Ethernet management port is configured. **2**—Slot for all native and MIC ports.	

3.5 Output Fields for the show chassis Command

The following notes apply to the flags displayed by the **show chassis** command:

- The SmartEdge 100 router does not display the following flags: B, G, N, S, U, W, and X.
- D—The default line card processes packets sent to it from the controller. For a description of the functions of the default line card, see *Command List* Reference [4].
- H—The I/O carrier card is administratively shut down with the **shutdown** command (in card configuration mode).
- O—The I/O carrier card is placed in the ODD state with the **on-demand diagnostic** command (in card configuration mode).
- The I/O carrier card is ready (R flag) when it has been initialized and the code for the PPAs has been downloaded; it is up (U flag) when its PPAs are registered with the requisite NetBSD process.

Table 27 Output Fields for the show chassis Command

Field	Description
Current platform is	SE100—SmartEdge 100 router.
Slot	***slot***—Slot number for this unit.
Configured type	Slot is configured for one of the following card types: • ***traffic-card-type***—line card is configured. • none—Slot is not preconfigured.
Installed type	Slot has card installed: • carrier—I/O carrier card.(1) • ***traffic-card-type***—Line card is installed. • none—Slot is empty. • unknown—Controller carrier card is installed but not initialized.
Initialized	State of card: • No—PPAs have not been initialized for this card. • Yes—PPAs have been initialized for this card.
Flags	Status of card: • A—Active controller. • C—All segmentation and reassembly controllers (SARCs) ready. • D—Card has been assigned as the default line card. • E—Egress Packet Processing ASIC (PPA) is ready.(1) • G—Upgrading field programmable gate array (FPGA).(1) • H—Card is administratively shut down.(1) • I—Ingress PPA is ready.(1) • M—FPGA mismatch.(1) (2) • O—Card is in the ODD state.(1) • R—I/O carrier card is ready.(1)

(1) Reported for slot 2 only.
(2) The version of the FPGA that is installed on this line card and the version that is shipped with this release of the SmartEdge OS do not match; you must update the FPGA on this line card for it to successfully initialize. To upgrade the FPGAs on this line card, see theInstalling Release document for the release that is installed on this SmartEdge router.

Table 28 Line Card Types

Card Type(1)	Description
atm-oc3-2-port	ATM OC MIC
fe-12-port	Copper FE or optical FE MIC
ge-2-port	Copper GE or optical GE MIC

(1) The same card type is also displayed for the low-density version of a line card.

3.6 Output Fields for the show disk Command

Table 29 Output Fields for the show disk Command

Field	Description
Location	Location of the storage device: • internal—Internal-storage device (compact-flash card) typically installed in a slot • external—External-storage device installed in an external slot
512-blocks(1)	Size of the file system in 512-byte blocks: • 362,526—192-MB internal compact-flash card, root file system • 484,079—256-MB internal compact-flash card, root file system • 968,158—512-MB internal compact-flash card, root file system • 1,021,244—1-GB mass-storage device, /md file system(2)
Used	Number of blocks in use
Avail	Number of blocks available
Capacity	Percent of blocks used in the file system, calculated using the number of usable blocks (Used + Avail)(3) (4)
Mounted on	Device on which the file system is mounted: • /—Internal compact-flash card • /md—Mass-storage device in the external slot

(1) The size of the root file system includes the sizes of the /flash file system and the p0 and p1 partitions on the internal-storage device.
(2) The size of the /md file system does not include the partition for SmartEdge OS core dumps on the external-storage device; the partition for core dumps is approximately 500 MB.
(3) The number of usable 512-byte blocks (the sum of the Used and Avail fields) on a storage device is approximately 95% of the number of 512-byte blocks.
(4) The capacity of an external-storage device can decrease slightly over time if sectors are marked as unusable (cannot be read or written).

3.7 Output Fields for the show hardware Command

Table 30 Output Fields for the show hardware Command

Field Name	Field Data Reported and Data Descriptions
Fan(s) Status	• Failed—At least one fan is not working. • Normal—All fans are working.
• AC Power Supply Status • DC Power Supply A Status • DC Power Supply B Status	• No Power—Power has failed, is disconnected, or is not installed. • Unknown—Unknown ATM transceiver.

Table 30 Output Fields for the show hardware Command

Field Name	Field Data Reported and Data Descriptions
Active Alarms	Alarm conditions for this unit: • NONE—No alarm conditions exist. • ***condition***—Alarm condition is in effect. For a complete list of conditions that can cause an alarm, see Section 3.9 on page 51
Slot	• ***slot***—Slot number for this unit. • N/A—No slot number for this unit.
Type	Unit: • backplane—Backplane. • carrier—I/O carrier card (SmartEdge 100 chassis only). • ***MIC-type***—MIC is installed; for a list of MIC types.
Mfg Date	***dd/mm/yyyy***—Date unit was manufactured.
Voltage	• N/A—Voltage is not applicable for this unit. • NOT OK—Voltage for this card is outside its operating range. • OK—Voltage for this card is within its operating range.
Temp	Temperature condition and actual temperature reading in degrees Celsius: • NORMAL/COLD—Normal operating range for this unit. • TEMP_HOT—Hotter than normal. • TEMP_EXTREME—Much hotter than normal. • N/A—Temperature does not apply to this unit. Table 34 lists the temperature ranges for each condition.

Table 31 MIC Types

MIC Type	Description	Port Ranges
atm-oc3-2-port	ATM OC MIC	3 to 4 or 15 to 16
fe-12-port	Copper FE or optical FE MIC	3 to 14 or 15 to 16
ge-2-port	Copper GE or optical GE MIC	3 to 4 or 15 to 16

Table 32 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
Active Alarms[(1)]	Alarm conditions for this unit: • NONE—No alarm conditions exist. • ***condition***—Alarm condition is in effect. For a complete list of conditions that can cause an alarm, see Section 3.9 on page 51
Alarm Card Status	• Present—Alarm card is installed and working (SmartEdge 400 chassis only). • Not Present—Alarm card is not installed (SmartEdge 400 chassis only).

Table 32 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
Card Status	For line cards only: • FPGA mismatch—Card needs an FPGA upgrade. • FPGA upgrade—FPGA upgrade has been started. • HW detected—Card is detected and being initialized. • HW failure—Card has experienced a failure. • HW initialized—Card is initialized and ready.
Chass Entitlement	Type of chassis for which this card is intended: • All—Card is entitled in every chassis. • List of chassis, separated by slashes (/)—Listed chassis only.
Chassis Type	SE100—SmartEdge 100 chassis.
Connector Type	MIC port connector: • Copper—RJ-45 connector. • Optical—SFP optical transceiver (LC) connector.
CPLD Version	*n*—Version of the complex programmable logic device (CPLD) on the MIC.
DimFpga rev DimFpga file rev	Dim FPGA revision and file revision; N/A or not displayed if not applicable for this card.
EEPROM id/ver	*nnnn/n*—Version of the unit EEPROM.
EPPA memory	*nnn* MB—Size of ingress and egress PPA memory.
Fan Tray Status	• Present—Fan and alarm unit (SmartEdge 800 chassis) or fan tray (SmartEdge 400 or SmartEdge 1200 chassis) is installed. • Not Present—Fan and alarm unit (SmartEdge 800 chassis) or fan tray (SmartEdge 400 or SmartEdge 1200 chassis) is not installed or not working.
Fan(s) Status	• Failed—At least one fan is not working. • Normal—All fans are working.
FlipFpga rev	FLIP FPGA revision and file revision; N/A or not displayed if not applicable for this line card.
Hardware Rev	*n*—Hardware revision level for this unit; single digit.
HubFpga rev HubFpga file rev	Hub FPGA revision and file revision; N/A or not displayed if not applicable for this card.
IPPA memory	*nnn* MB—Size of ingress and egress PPA memory.
ITU ch	International Telecommunications Union (ITU) channel number (corresponds to the wavelength displayed in the Wavelength field); not displayed if not applicable for the transceiver installed in this port.
LEDs	State of Fail, Active, Standby, and Sync LEDs: • Blink—ODD test is in progress. • On—LED is illuminated. • Off—LED is not illuminated.
MAC Address	*nn:nn:nn:nn:nn:nn*—Medium access control (MAC) address of the system (stored in the EEPROM); displayed using the backplane keyword only.
Mfg Date	*dd/mm/yyyy*—Date this unit was manufactured.

Table 32 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
MIC ***n***	For each MIC slot ***n:*** • ***MIC-type***—For a list of MIC types. • Not Present—MIC is not installed.
MinnowCPLD Ver	Minnow CPLD revision; applicable to the SmartEdge 100 chassis slot 1 only.
ODD Status	Status of the on-demand diagnostics (ODD) tests: • Aborted—The session was terminated by the user. • Incomplete—At least one of the requested tests could not be run. • In-progress—Session is currently in progress. • Not available—No session of the ODD has been run for this unit. • Passed—All tests have passed. • ***n*** Failure(s)—One or more tests have failed.
POD Status	Status of the power-on diagnostics (POD) tests: • Success—Unit passed all POD tests. • Failure—Unit failed one or more POD tests.
Port	***n***—Port number if hardware data is port specific; not displayed if not applicable for this card.
Ports Configurable	Number of ports on this line card that have been specified as software configurable (ATM DS-3 line card only).
Ports Entitled	All—All physical ports on the line card are entitled.
• AC Power Supply Status • DC Power Supply A Status • DC Power Supply B Status	Status of each power supply: • No Power—Power has failed, is disconnected, or is not installed. • Normal—Power is being supplied by this power supply.
Redback Approved	State of transceiver testing for this SFP optical transceiver in SmartEdge routers: • No—Not Tested. • Yes—Tested.
RxPwrMin[dbm][(2)] RxPwrMax[dbm]	***-nn.nn***—Receiver sensitivity (minimum) and overload level (maximum) for the version of the SFP transceiver installed in this port.
SAR Image Version	***n.n.n.n***—Version of the image.
SARC memory	***nnn*** MB—Size of segmentation and reassembly controller (SARC) memory; applicable to ATM line cards only.
SARC status	Status of the segmentation and reassembly controller (SARC): • OK—SARC is ready. • Not Ready—SARC is not ready. • Unknown—Unable to read SARC status.
Serial No	***nnnnnnnnnnnnnn***—Unique identifier for this unit; 14 alphanumeric characters.

Table 32 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
SFP / MediaType	Optical Carrier Level (*OCn*), transceiver version and cable type for the SFP transceiver installed in this port. For example: `OC3 SR / MM:` • LX / SM—Long range transceiver, single-mode fiber. • SX / MM—Short range transceiver; multimode fiber. • T / Cat5—Copper-based transceiver. • SR / MM—Short reach transceiver, multimode fiber. • IR / SM—Intermediate-reach transceiver, single-mode fiber. • CWDM / SM—Coarse wavelength-division multiplexing (CWDM) transceiver, single-mode fiber. • DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber.
SFP Serial No	nnnnnnnnnn—Unique identifier for this transceiver; 10 alphanumeric characters.
Slot	• *slot*—Slot number for this unit. • N/A—No slot number for this unit.
SlipFpga file rev	SLIP FPGA revision; applicable to the SmartEdge 100 I/O carrier card functions only (slot 1).
SFP Serial No	Small Formfactor Pluggable serial number
SpiFpga file rev	System Packet Interface File revision.
SpiFpga rev	System Packet Interface Fpga.
SysFpga rev	System FPGA revision and file revision; N/A or not displayed if not applicable for this line card.
Temp	Temperature condition and actual temperature reading in degrees Celsius: • NORMAL/COLD—Normal operating range for this unit. • TEMP_HOT—Hotter than normal. • TEMP_EXTREME—Much hotter than normal. • N/A—Temperature does not apply to this unit. Table 34 lists the temperature ranges for each condition.
TxPwrMin[dbm][2] TxPwrMax[dbm]	*-nn.nn*—Transmitter optical output power (minimum and maximum) for the version of the SFP transceiver installed in this port.
Type	Unit: • backplane—Backplane. • carrier—I/O carrier card. • *MIC-type*—MIC is installed.
Voltage	Readings for voltage sources 1.5V, 1.8V, 2.6V, and 3.3V along with the percentage over or under the nominal value.

Table 32 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
Wavelength[2]	Center wavelength for the version of the SFP optical transceiver installed in this port: • 0.00 [nm]—Wavelength is not reported by this transceiver. • ***nnnn.nn*** [nm]—Wavelength for this transceiver version. See *Transceivers for SmartEdge and SM Family Line Cards* Reference [6] for wavelength data for each type of transceiver and its versions.
XFP / Media Type	Transceiver version and cable type for the 10-Gbps SFP (XFP) transceiver installed in this port: • SR / MM—Short reach transceiver, multimode fiber. • LR / SM—Long reach transceiver, single-mode fiber. • ER / MM—Extended long reach transceiver, multimode fiber. • ZR / SM—Extreme reach transceiver, single-mode fiber [3] [4] • DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber
Transceiver version and cable type for the OC-192c/STM-64c XFP transceiver installed in this port: • SR / SM—Short reach transceiver, single-mode fiber. • IR / SM—Intermediate reach transceiver, single-mode fiber. • LR / SM—Long reach transceiver, single-mode fiber.	

(1) Alarm severities conform to the definitions provided in Generic Requirements, GR-474-CORE, Issue 1, December 1997, Network Maintenance: Alarm and Control for Network Elements.
(2) Measured or reported values meet or exceed the transceiver specifications that are documented in Transceivers for SmartEdge and SM Family Line Cards.
(3) The ZR XFP transceiver is a multi-rate device and can be used in the 10GE line card and the SONET/SDH OC-192c/STM-64c LR-2 line card.
(4) Use part number XFP-OC192-LR when ordering the XFP transceivers with 10GE ZR functionality.

Table 33 Transceivers for Each Port Type

Port Type	Transceivers
ATM	• IR / Type I—Intermediate Reach, Type I. • IR / Type II—Intermediate Reach, Type II. • LR / Type I—Long Reach, Type I. • LR / Type II—Long Reach, Type II. • LR / Type III—Long Reach, Type III. • SR / SM—Short Reach transceiver, single-mode fiber. • SR / MM—Short Reach transceiver, multimode fiber. • Unknown—Unknown ATM transceiver.
Ethernet	• FX / MM—Short Reach transceiver, multimode fiber. • LX / SM—Long Reach transceiver, single-mode fiber. • LX10 / SM—Long Reach transceiver, single-mode fiber. • SX / MM—Short Reach transceiver, multimode fiber.

The system displays the actual temperature reading in degrees Celsius with the **`show hardware`** command (in any mode) with the **`detail`** keyword.

Table 34 Definitions of Temperature Conditions

Condition	Definition
COLD	Expected when the system first powers up in a cool or well air-conditioned environment. Typically this temperature is less than: • 30°C for the controller carrier card. • 20°C for the I/O carrier card.
NORMAL	Normal operating temperature. Typically this temperature is between: • 31°C and 78°C for the controller carrier card. • 21°C and 67°C for the I/O carrier card.
HOT	The card is running above normal operating temperature. The lifespan of the card will likely be reduced if this condition persists. The ambient temperature of the room could be too hot, or the fans might need cleaning. Typically this temperature is between: • 79°C and 95° for the controller carrier card. • 68°C and 82°C for the I/O carrier card. When the card temperature is greater than TEMP_HOT for longer than 5 minutes, the system generates a minor alarm; if the condition persists longer than one hour, it generates a major alarm.
EXTREME	The card is running well above normal operating temperature. The lifespan of the card will be reduced if this condition persists. The ambient temperature of the room is likely too hot or the fans might need cleaning. Typically this temperature is over: • 96°C for the controller carrier card. • 83°C for the I/O carrier card. When the card temperature reaches TEMP_EXTREME, the system generates a major alarm.
N/A	Temperature is not applicable for this unit, or this unit does not have a built-in temperature sensor.

3.8 Output Fields for the show port Command

Table 35 Output Fields for the show port Command

Field	Value/Description
Slot/Port:Ch:SubCh	slot/port—Slot and port numbers for this port.
Type	• atm—ATM OC MIC is present or configured in the slot for this port. • ethernet—FE or GE MIC is present or configured in the slot for this port. • unknown—No MIC is configured or present in the slot for this port.
State	Port status (combination of the Admin state and Line state fields): • Down—The port has been configured to be Up, but it is not working. • No card—The I/O carrier card, the MIC, and the port are configured, but the MIC is not installed. • Unavailable—The I/O carrier card is configured, but the MIC is not configured; or the I/O carrier card and MIC are configured, but the MIC does not support this port. • Unconfigured—The I/O carrier card and MIC are configured, but this port is not configured. • Up—The port is working (active).

Table 36 Output Fields for the show port Command with the detail Keyword

Field	Value/Description
Header	
Type	***port-type*** or ***channel-type***.
Slot/Port	***slot***/***port***—Slot and port numbers for this port.
Ch.SubCh	Channel numbers: • ***ds3-chan-num***—DS-3 channel, if appropriate for this port. • ***ds1-chan-num***—DS-1 channel, if appropriate for this DS-3 channel. • ***e1-chan-num***—E1 channel, if appropriate for this port.

Table 36 Output Fields for the show port Command with the detail Keyword

Field	Value/Description
State	Port status (combination of the and fields) for a line card: • Down—Port has been configured to be up, but is not working. • Down—not entitled—Port is on the low-density version of the line card and is not available. • No card—Port has been configured, but the card is not installed. • Unconfigured—Port is not configured and down. • Up—Port is working (active). Port status for a MIC: • Up—Carrier card and associated MIC are configured and physically present. The port is configured and successfully passing traffic. • Down—Carrier card and associated MIC are configured and physically present. The port is configured but is not successfully passing traffic. • No card—Carrier card and associated MIC are configured but not physically present, and the specified port has been configured. • No MIC—Carrier card and associated MIC have been configured, and the specified port has been configured, but the MIC is not physically present. • Unavailable—Carrier card is configured and may or may not be physically present, but either the associated MIC has not been configured or the configured MIC does not support the specified port. • Unconfigured—Carrier card and associated MIC are configured and may or may not be physically present, but the specified port has not been configured.
Port Parameters (in alphabetical order)	
Active Alarms	• getting LOS—Alarm is present. • getting ATM LCD—Alarm is present. • N/A—Not applicable to this type of port. • NONE—No alarms are present. For a complete list of conditions that can cause an alarm, see Section 3.9 on page 51
Admin state	State of the port as a result of an operator command: • Down—Port is not working. • Unconfigured—Port is not configured and down. • Up—Port is working (active).
ATM MTU size	*nnnnn* bytes—Size of the hardware maximum transmission unit (MTU) (not configurable).
ATM Payload Scramble	Condition of scrambling for ATM port (on or off).

Table 36 Output Fields for the show port Command with the detail Keyword

Field	Value/Description
Auto negotiation	Two-part string for the ***setting*** and ***state*** fields. Possible values for the ***setting*** field are: • enabled • disabled
	Possible values for the ***state*** field are: • negotiating—Ethernet drivers are in the process of auto-negotiating with the remote peer. • success—Auto-negotiation was successful. • fail—Auto-negotiation failed. • force—Auto-negotiation failed and the port is in forced mode. • unknown—This is an error state.
	The possible combinations of the ***setting*** and ***state*** fields are: • disabled-unknown • disabled-negotiating • disabled-success • disabled-force • enabled-unknown • enabled-negotiating • enabled-success • enabled-fail
Bandwidth	***nnnnnn*** kbps—Speed of SONET/SDH port. ***nnn.nn*** Mbps—Effective speed of ATM port.
Cable Length	***nnn***—Configured length and type (short or long, depending on configured length).
CCOD Mode	***State of CCOD mode port listening:*** ***on—Port listening mode is enabled.*** off—***Port listening mode is disabled.***
Clock Source	global-reference—Port is using the controller clock for transmitting.
Crc	Configured value of the cyclic redundancy check for a SONET/SDH port (16 or 32).
Dampening Count	***n***—Number of instances this link-dampened port went down and came up within the limits set by the **link-dampening** command. This count is reset only when the port is removed from the configuration with the **no** form of the **port** command (in ATM OC, ATM DS-3, or port configuration mode).
Description	Configured description.
Diag Monitor	• No—SFP cannot monitor its faults nor report power readings • Yes—SFP can monitor its faults and report power readings
DSU Bandwidth	***nn.nn*** Mbps—Bandwidth of configured data service unit (DSU).
DSU Mode	***digital-link***—Configured vendor of DSU.
DSU Scramble	DSU scramble condition (on or off).

Table 36 Output Fields for the show port Command with the detail Keyword

Field	Value/Description
Duplex Mode	• full—Port condition, Ethernet or Gigabit Ethernet (any version). • half—Port condition,10/100 Ethernet only.
Encapsulation	The encapsulation for this port: • 802.1q • atm • cisco-hdlc • ethernet • frame-relay • ppp
Equipment Loopback	Configured equipment loopback: • customer—DS-3 or DS-1 channel responds to remote loopback requests. • network—DS-3 or DS-1 channel ignores remote loopback requests. • NONE—DS-3 or DS-1 channel ignores remote loopback requests.
FEAC code received	Far end alarm condition (of the remote system): • DS3 LOS. • DS3 out of frame (OOF). • DS3 alarm indication signal (AIS) received. • DS3 Idle Received—The far end box is sending the idle pattern and no other data. • Service affecting (SA) equipment failed. • Nonservice affecting (NSA) equipment failed. • Common equipment failed. • N/A or NONE—No alarm condition received.
Flow control	Condition of flow control for Gigabit Ethernet port, any version, (on or off).
Framing	Configured framing for the port: • c-bit • g751 • m23 • ESF • SF • sdh • sonet
Framing Mode	For ATM DS-3 ports only: • ADM—ATM direct mapping mode. • PLCP—Physical layer convergence protocol mode.
Idle Character	Configured idle character (flags or marks).

Table 36 Output Fields for the show port Command with the detail Keyword

Field	Value/Description
Keepalive	State of keepalive timer: • Not Set—Keepalive timer is not configured. • Set (*n* sec)—Keepalive timer is set for *n* seconds.
Line SD BER	10E-4—Signal degrade bit error rate for ATM port. 10E-5 to 10E-9—Signal degrade bit error rate for SONET/SDH port.
Line SF BER	10E-7—Signal fail bit error rate for ATM port. 10E-3 to 10E-5—Signal fail bit error rate for SONET/SDH port.
Line state	Physical state of the line: • Down—Port has been configured to be up, but is not working. • Down— not entitled—Port is on the low-density version of the line card and is not available. • No card—Port has been configured, but the card is not installed. • Unconfigured—Port is not configured and down. • Up—Port is working (active).
Link Dampening	For ATM, Ethernet, and POS ports only. Status of link dampening: • enabled—Link dampening is enabled. • disabled—Link dampening is disabled.
Link up delay	*nnnnn* msec—Configured or default value (in milliseconds) for the delay time for down-to-up transitions.
Link down delay	*nnnnn* msec—Configured or default value (in milliseconds) for the delay time for up-to-down transitions.
Link Distance	For Gigabit Ethernet ports with single-mode fiber (SMF) transceivers (LX or LX70) only. Distance supported by the installed transceiver: • n—Distance supported by the transceiver. • N/A—No transceiver installed or transceiver does not report the distance supported.
Loopback	Type of loopback: • internal—Loops transmit to receive to test the port. • line—Loops receive to transmit to test the connection. • none, off—Loopback is not enabled.
MAC address	*nn:nn:nn:nn:nn:nn*—Medium access control address for this port.

Table 36 Output Fields for the show port Command with the detail Keyword

Field	Value/Description
Media type[1] [2] [3]	Physical interface: • 100Base-TX—10/100 Ethernet or Ethernet management port (at either 10 or 100 Mbps). • ds3—ATM DS-3 port. • 1000Base-LX—Long-reachSFP or Gigabit interface converter (GBIC) transceiver. • 1000Base-LX70—Extended-reach GBIC transceiver. • 1000Base-SX—Short-reach SFP or GBIC transceiver. • 1000Base-T—Copper-based SFP, or GBIC transceiver or GE port on an FE-GE line card. • 1000Base-SR—Short-reach SFP transceiver. • 1000Base-IR—Intermediate-reach SFP transceiver. • 1000Base-CWDM—Coarse wavelength-division multiplexing (CWDM) SFP transceiver. • 1000Base-DWDM—Dense wavelength-division multiplexing (DWDM) SFP transceiver. • 10GE-SR—Short -each OC192 XFP transceiver (10GE or OC-192c/STM-64c port). • 10GE-IR—Intermediate reach OC192 XFP transceiver (OC-192c/STM-64c port). • 10GE-LR—Long-reach OC192 XFP transceiver (10GE or OC-192c/STM-64c port). • 10GE-ER—Extended reach OC192 XFP transceiver (10GE port). • 10GE-ZR—Extreme-reach OC192 XFP transceiver (10GE or OC-192c/STM-64c port). • No GBIC—GBIC transceiver is not installed in this GE port. • No transceiver—OC192 XFP transceiver is not installed in this 10GE or OC-192c/STM-64c port. • Sonet OCn —OC-*n* (OC-3c/STM-1c, OC-12c/STM-4c, OC-48c/STM-16c) port. • unknown—Unknown type of transceiver is installed in this Gigabit Ethernet port.
Mini-RJ21 Connector	Ports n1-n2—Range of port numbers for this connector on an FE-GE line card.
MTU size	*nnnn* Bytes—Configured size of the MTU for the port.
NAS Port Type	• Configured network access server (NAS) port type for an ATM DS-3, ATM OC, Ethernet, Gigabit Ethernet, or POS port only. For a list of NAS port types, see *Configuring ATM, Ethernet, and POS Ports* Reference [2]. • blank—Not configured or not applicable to this port.
Over Subscription Rate	Configured value for over subscription: • *nnnn*% • Unlimited
Path Alarms	• N/A—Not applicable to this type of port. • NONE—No alarms are present. For a complete list of conditions that can cause an alarm, see Section 3.9 on page 51

Table 36 Output Fields for the show port Command with the detail Keyword

Field	Value/Description
Path Trace Length	The maximum size that the TX path trace message can be set to.
PPPoE PADO Delay	State of PADO delay: • Not set—PADO delay is not configured. • Set (***n*** sec)—PADO delay is configured for ***n*** seconds.
Rx path-trace	Received path trace data.
Report Only Alarms	State of alarm reporting for an ATM OC port: • Path alarms (report only): Payload label mismatch (PLM) • Path alarms (report only): Path unequipped (UNEQ) Alarm is reported, but the port is not shut down.
Scramble	Status of X^43 + 1 payload scrambling for a POS port (on or off).
Speed	• ***nnn*** Mbps—Speed of the 10/100 Ethernet port. • ***nn*** Gbps—Speed of the Gigabit Ethernet port (any version). • auto—Speed of the 10/100 Ethernet port has been determined by sensing the line.
Support Lossless Large MTU	Status of this FE port on an FE-GE line card with regard to guaranteed lossless flow control for jumbo frames: • Disabled—Port supports this feature but is not enabled for it. • Enabled—Port is enabled for this feature. • Not Configurable—Port does not support this feature. • Shutdown—Port is a member of a port group that is enabled for this feature and has been shut down because it does not support it.
Temperature	SFP Transceiver temperature
Timeslot	Time slots configured for this channelized DS-3 channel (1 to 24).
Timeslot Speed	Configured speed of DS-0 channels in Kbps (56 or 64).
Tx C2 byte Rx C2 byte	0x13—Value of the C2 byte for this ATM OC port.
Tx Fault Rx Fault	***Fault status for the transmit or receive side of the SFP transceiver installed in this port:*** • ***LowPwrWarning***—Measured power has dropped below the level needed by the transceiver to maintain connectivity without errors. • ***NoFault***—No power fault has occurred. • ***PwrFault***—Measured power is outside the range displayed in the PwrMin and PwrMax fields by the **show hardware** command (in any mode) with the **detail** keyword.
Tx National bit Rx National bit	Value of the national bit (bit 12 of set 1) in the E3 frame: • Enabled • Disabled
Tx path-trace	Transmitted path trace data.
Tx Pwr measured [dbm][4] Rx Pwr measured [dbm]	Current receiver sensitivity and transmitter output power for the SFP transceiver installed in this port.
Undampened line state	• Up—Port is working (active). • Down—Port has been configured to be up, but is not working.

Table 36 Output Fields for the show port Command with the detail Keyword

Field	Value/Description
Vcc Measured	SFP Transceiver Vcc
Wavelength[4]	Center wavelength for the version of the SFP optical transceiver installed in this port: • *0.00* [nm]—Wavelength is not reported by this transceiver. • ***nnnn.nn*** [nm], ITU ch ***nn***—Wavelength and International Telecommunications Union (ITU) channel number (if applicable) for this transceiver version. For wavelength data for each type of transceiver and its versions, see *Transceivers for SmartEdge and SM Family Line Cards* Reference [6].
Yellow Alarm Detection	Yellow alarm detection condition (on or off).
Yellow Alarm Generation	Yellow alarm generation condition (on or off).

(1) Small form-factor pluggable (SFP) transceivers are supported only on the Gigabit Ethernet 3 (GE3) line card, the Gigabit Ethernet 1020 (GE1020) line card, and the 8-port ATM OC-3c/STM-1c IR (atm-oc3e-8-port) line card.
(2) Gigabit interface converter (GBIC) transceivers are supported only on first and second versions of the Gigabit Ethernet line cards. GBIC transceivers are also supported on the 1-port OC-192c/STM-64c (oc192-1-port) card.
(3) 10-Gbps SFP (OC192 XFP) transceivers are supported only on the 10 Gigabit Ethernet (10GE) line card.
(4) Measured or reported values meet or exceed the transceiver specifications that are documented in Transceivers for SmartEdge and SM Family Line Cards.

Table 37 Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data

State	Description
SFP / Media type	Optical Carrier Level (*OCn*), transceiver version and cable type for the SFP transceiver installed in this port. For example: `OC3 SX / MM:` • LX / SM—Long-reach transceiver, single-mode fiber. • SX / MM—Short-reach transceiver, multimode fiber. • T / Cat5—Copper-based transceiver. • SR / MM—Short-reach transceiver, multimode fiber. • IR / SM—Intermediate-reach transceiver, single-mode fiber. • CWDM / SM—Coarse-wavelength-division multiplexing (CWDM) transceiver, single-mode fiber. • DWDM / SM—Dense-wavelength-division multiplexing (DWDM) transceiver, single-mode fiber.
Redback Approved	State of transceiver testing for transceiver in the routers: • No—Not tested. • Yes—Tested.
Diagnostic monitoring	Whether the installed transceiver supports diagnostic monitoring compliant to SFF-8472 for SFPs or INF-8077i for XFPs.
CLEI code	Common Language Equipment Identifier (CLEI) code for this transceiver; blank if not applicable for this transceiver.
Serial number	nnnnnnnnnnnnn—Unique identifier for this transceiver.

Table 37 Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data

State	Description
Wavelength	Center wavelength for the version of the optical transceiver installed in this port: • 0.00 [nm]—Wavelength is not reported by this transceiver. • nnnn.nn [nm]—Wavelength for this transceiver version.
Tx Pwr [dbm](1)	Transmitter optical output power (measured, minimum, and maximum limits) for the version of the transceiver installed in this port.
Rx Pwr [dbm]	Receiver sensitivity (measured, minimum, and maximum limits) for the version of the transceiver installed in this port.
Temperature [oC]	Temperature (measured, minimum, and maximum limits) in degrees Centigrade.
Laser bias current	Magnitude of the laser bias power setting current (measured, minimum and maximum limits), in milliamperes (mA). The laser bias provides direct modulation of laser diodes and allows the user to monitor the “health” of the laser.
Vcc [V]	Magnitude of the supply voltage to the transceiver (measured, minimum, and maximum limits), in Volts (V).
AUX1 (for XFP transceivers only)	Auxiliary measurement 1 for XFP transceivers—defined in Byte 222 Page 01h in INF-8077i.
AUX2 (for XFP transceivers only)	Auxiliary measurement 2 for XFP transceivers—defined in Byte 222 Page 01h in INF-8077i.
Active alarms	Transceiver alarm conditions for specified ***port/slot***: • NONE—No alarm conditions exist • Condition—Alarm condition is in effect.

(1) See Section 3.9 on page 51 for the lists of alarms and warnings supported by the SFP and XFP transceivers.

3.9 Troubleshoot with System Power and Alarm LEDs

Table 38 Definitions of Terms

Term	Definition
ADM	Add-drop multiplexer
AU-n	Administrative unit, level ***n***
BER	Bit error rate
BIP	Bit Interleaved Parity
BTC	Bridging Transmission Convergence (a Ericsson ASIC)
DCC	Data communications channel
FEAC	Far end alarm condition
PLCP	Physical Layer Convergence Protocol
TU-n	Tributary unit, level n
VC-n	Virtual container, level n

Caution!

Risk of equipment damage. Ensure that the fuses in the external fuse panel are suitably rated for the installation in accordance with the National Electrical Code (in the United States) or applicable local jurisdiction (outside the United States) installation requirements.

3.9.1 Chassis Alarms

Table 39 Chassis Alarms

Description	Severity	Probable Cause	Service Affecting
Chassis power failure—Side A	Minor	PowerProblem	No
Fan unit failure	Minor	CoolingFanFailure	No
Local alarm cutoff activated	Minor	OperationNotification	No
Multiple fan failure	Major	ReplaceableUnitProblem	Yes
Power supply output fail	Minor	ReplaceableUnitProblem	Yes
Remote alarm cutoff activated	Minor	OperationNotification	No

3.9.2 Controller Carrier Card Alarms

Table 40 Alarms for the Controller Carrier Card

Description	Severity	Probable Cause	Service Affecting
Controller code mismatch	Major	ReplaceableUnitTypeMismatch	Yes
Controller fail	Critical	ReplaceableUnitProblem	Yes
Controller overheating	Major	ReplaceableUnitProblem	Yes
Controller power-on diagnostic failed	Major	ReplaceableUnitProblem	Yes
Controller temperature critical	Major	ReplaceableUnitProblem	Yes
Controller temperature hot	Minor	ReplaceableUnitProblem	Yes
Diagnostic test fail	Major	ReplaceableUnitProblem	Yes
Local inventory fail	Major	ReplaceableUnitProblem	Yes
Nonvolatile memory fail	Major	CorruptData	Yes
Real-time clock failure	Major	RealTimeClockFailure	Yes

3.9.3 I/O Carrier Card Alarms

Table 41 Alarms for the I/O Carrier Card

Description	Severity	Probable Cause	Service Affecting
Circuit pack card code mismatch	Minor	ReplaceableUnitTypeMismatch	No
Circuit pack failure	Critical	ReplaceableUnitProblem	Yes
Circuit pack mismatch	Critical	ReplaceableUnitTypeMismatch	Yes
Circuit pack missing	Critical	ReplaceableUnitMissing	Yes
Circuit pack overheating	Major	LineCardProblem	Yes
Circuit pack power-on diagnostic failed	Major	ReplaceableUnitProblem	Yes
Circuit pack reset completed	Warning	OperationNotification	Yes
Circuit pack temperature hot	Minor	ReplaceableUnitProblem	Yes
Diagnostic fail	Major	ReplaceableUnitProblem	Yes
Software download completed	Warning	OperationNotification	Yes
Software download failed	Warning	OperationFailure	Yes
Synchronization failure	Critical	TimingProblem	Yes
Voltage failure detected	Major	ReplaceableUnitProblem	Yes

3.9.4 MIC Alarms

The supported alarms for the ATM, FE, and GE MICs. MIC-1 indicates the MIC in the first MIC slot (ports 3 to 14); MIC-2 indicates the MIC in the second MIC slot (ports 15 to 26).

Table 42 MIC Alarms

Description	Severity	Probable Cause	Service Affecting
MIC-1 diagnostic fail	Major	ReplaceableUnitProblem	Yes
MIC-1 failure	Critical	ReplaceableUnitProblem	Yes
MIC-1 MIC type mismatch	Critical	ReplaceableUnitTypeMismatch	Yes
MIC-1 missing	Critical	ReplaceableUnitMissing	Yes
MIC-1 overheat	Major	ReplaceableUnitProblem	Yes
MIC-1 power-on diagnostic failed	Major	ReplaceableUnitProblem	Yes
MIC-1 voltage failed	Major	ReplaceableUnitProblem	Yes
MIC-2 diagnostic fail	Major	ReplaceableUnitProblem	Yes
MIC-2 failure	Critical	ReplaceableUnitProblem	Yes
MIC-2 MIC type mismatch	Critical	ReplaceableUnitTypeMismatch	Yes
MIC-2 missing	Critical	ReplaceableUnitMissing	Yes
MIC-2 overheat	Major	ReplaceableUnitProblem	Yes
MIC-2 power-on diagnostic failed	Major	ReplaceableUnitProblem	Yes
MIC-2 voltage failed	Major	ReplaceableUnitProblem	Yes

3.9.5 ATM Port Alarms

Table 43 Optical Port Alarms—Physical Layer

Description	Severity	Probable Cause	Service Affecting
Port facility loopback enabled	Minor	OperationNotification	No
Port terminal loopback enabled	Minor	OperationNotification	No
Receive laser failure	Critical	DemodulationFailure	Yes

Table 44 Optical Port Alarms—Section/Regenerator Section Layer

Description	Severity	Probable Cause	Service Affecting
Loss of frame	Critical	LossOfFrame	Yes
Loss of signal	Critical	LossOfSignal	Yes

Table 45 Optical Port Alarms—Line/Multiplex Section Layer

Description	Severity	Probable Cause	Service Affecting
Line alarm indication signal (AIS-L)	Minor	AIS	No
Line remote failure indication (RFI-L)	Minor	FarEndReceiverFailure	No
Line signal degrade (BER)	Major	DegradedSignal	Yes
Line signal failure (BER)	Major	ExcessiveBER	Yes
Lockout protection requested	Major	OperationNotification	Yes
Lockout working requested	Major	OperationNotification	Yes
Loss of clock	Major	LossOfTimingSource	Yes
Port auto switch completed	Major	OperationNotification	Yes
Port diagnostic failed	Major	ReplaceableUnitProblem	Yes
Port fault oscillations detected	Critical	DegradedSignal	Yes
Port forced switch requested	Major	OperationNotification	Yes
Port manual switch request	Major	OperationNotification	Yes
Port payload loopback enabled	Minor	OperationNotification	No
Port switch completed	Major	OperationNotification	Yes
Port switch failed	Major	OperationFailure	Yes
Port switch lockout requested	Major	OperationNotification	Yes
Port switch protection path failure	Major	OperationFailure	Yes
Port switch waiting to restore	Minor	OperationNotification	No

3.9.6 FE and GE Port Alarms

Table 46 Ethernet Port Alarms

Description	Severity	Probable Cause	Service Affecting
Excessive collisions detected	Major	LinkFailure	Yes

Table 46 Ethernet Port Alarms

Description	Severity	Probable Cause	Service Affecting
Excessive speed 100M detected	Major	ConfigurationMismatch	Yes
Link down	Major	LinkFailure	Yes
Over subscription detected	Major	ConfigurationMismatch	Yes
Port diagnostic failed	Major	ReplaceableUnitProblem	Yes
Port terminal loopback enabled	Minor	OperatorNotification	No
Under subscription detected	Minor	ConfigurationMismatch	No

3.10 Determine the Status of System Equipment

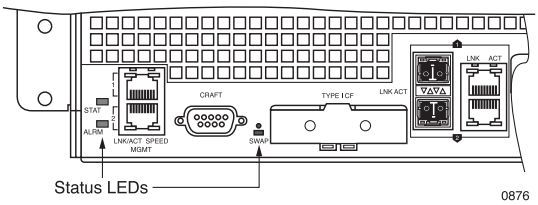

Figure 16 System Equipment LEDs

Table 47 System Equipment LEDs

Label	Activity	Color	Description
ALRM	On	Red	A critical or major system alarm is active.
	On	Yellow	A minor system alarm is active.
	Off	None	No alarm is active.
STAT	On	Red	Power-on diagnostics have failed since the last system initialization.
	On	Green	Power-on diagnostics have passed.
	Blinking	Green	System is initializing.
	Off	None	Power is off or not present.
SWAP	On	Blue	• The slot is empty, and it is safe to insert a CF card. • The file system on the installed CF card is not mounted, and it is safe to remove the CF card.
	Blinking	Blue	A CF card is installed in the slot and the SmartEdge OS is mounting or unmounting the file system.
	Off	None	A CF card is installed, the file system is mounted, and the SmartEdge OS might be transferring data to or from the CF card.

Caution!

Risk of data loss. You can lose data if you remove a CF card while the SWAP LED is blinking or is off.

The change in state of the SWAP LED is as follows:

- When a CF card is installed and you open the door, the SWAP LED state changes from “Off” to “Blinking” until the unmounting process is complete. It then changes state to “On” to indicate that you can safely remove the card.
- If the system cannot unmount the file system on the card, the SWAP LED changes back to “Off” (while the door is still open) and the system displays an error message on the console.
- If you close the door without inserting a CF card in the slot, the LED remains “On”.
- If you insert a formatted CF card in the slot and close the door, the LED changes from “On” to “Blinking” until the mounting process is complete. It then changes state to “Off”.
- If the system is unable to mount the file system on the CF card (for example, because it is unformatted or the file system is damaged), the LED changes from “On” to “Blinking” and then, because the CF card cannot be mounted, changes to “On” and the system displays an error message on the console.

3.11 Determine the Status of ATM MIC Ports

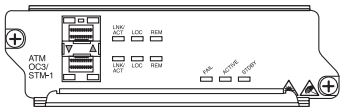

Figure 17 LEDs on ATM Cards

The ATM MIC provides three equipment LEDs to indicate the current status of the MIC and three facility LEDs to indicate the status of each port.

Table 48 Equipment LEDs on ATM MIC

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the MIC.(1)
	Off	None	No failure exists on the MIC.
ACTIVE	On	Green	This MIC is active.
	Off	None	This MIC is either on standby (the STDBY LED is illuminated) or has failed (the FAIL LED is illuminated).
STDBY	On	Yellow	At least one of the ports on this MIC has been configured as a protection port.(2)
	Off	None	None of the ports on this MIC have been configured as a protection port.

(1) A failure can be total, partial, or forced. Failure on any part of the MIC, including failure of any of its ports, results in the FAIL LED being illuminated.
(2) Protection for cards and ports is dependent on the release of the SmartEdge OS.

Table 49 Facility LEDs for ATM MIC Ports

Label	Activity	Color	Description
LINK	On	Green	Signal is present and within specifications.
	Blinking	Green	Signal is present and within specifications; receiving or transmitting packets (not idle cells).
	Off	None	Port is not configured, no signal is present, or signal is not within specifications.
LOC	On	Yellow	Local port is in an alarm state, such as a loss of frame (LOF).
	Off	None	Local port is in a normal state.
REM	On	Yellow	Remote port cannot obtain synchronization, or has a defect or failure, such as an alarm indication signal (AIS).
	Off	None	Remote port is in a normal state.

3.12 Determine Status of Ethernet Management and Copper FE MIC Ports

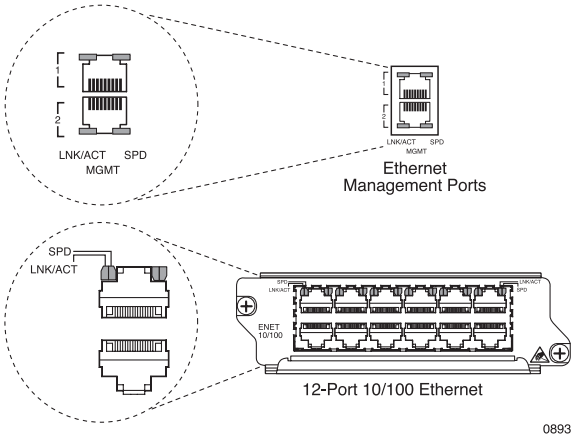

Figure 18 Facility LEDs for Ethernet Management and Copper FE MIC Ports

Table 50 Facility LEDs for Ethernet Management and Copper FE MIC Ports

Label	Activity	Color	Description
LNK/ACT	On	Green	The port is up.
	Blinking	Green	The port is receiving or transmitting frames.
	Off	None	The port is down.
SPD	On	Green	The Ethernet management port is operating at 1000 Mbps.
	On	Yellow	The port is operating at 100 Mbps.
	Off	None	The port is operating at 10 Mbps.

3.13 Determine Status of Native, Optical FE, Optical GE, and Copper GE MIC Ports

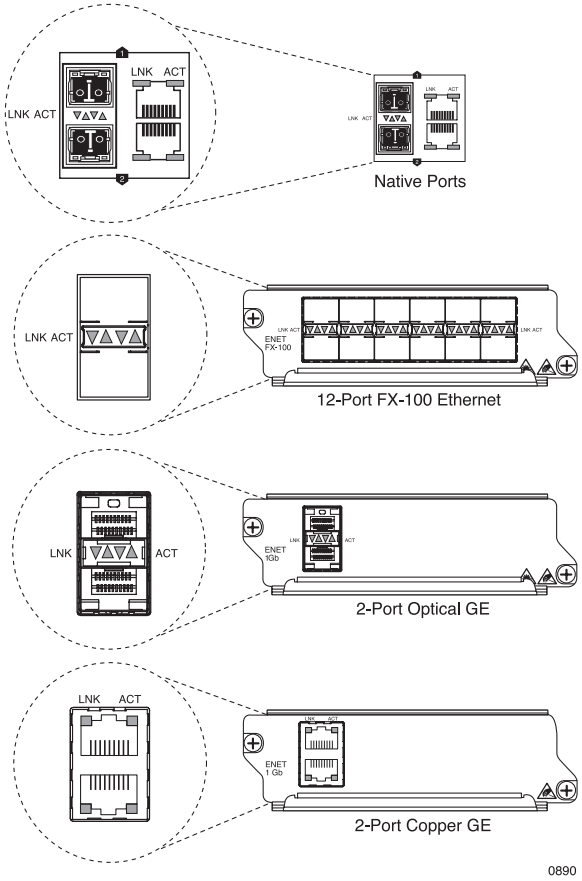

Figure 19 Facility LEDs for Native, Optical FE, Optical GE, and Copper GE MIC Ports

Table 51 Facility LEDs for Native, Optical FE, Optical GE, and Copper GE MIC Ports

Label	Activity	Color	Description
ACT	On	Yellow	The port is receiving or transmitting frames.
	Off	None	The port is inactive.
LNK	On	Green	The port is up.
	Off	None	The port is down.

3.14 Results from Power-On Diagnostics

Power-on diagnostics (POD) verify the correct operation of the carrier card and each installed MIC during a power-on or reload sequence of the SmartEdge 100 router. These tests also run whenever a MIC is installed in a running system. The POD for each component consist of a series of tests, each of which can indicate a component failure.

Note: A description of each test is beyond the scope of this guide.

During each test, the POD display results and status; if an error occurs during the testing, the STAT LED is illuminated; but the error does not stop the loading of the SmartEdge OS.

To display results from the POD, enter one of the following commands in any mode:

show diag pod *component*

show diag pod *component* **detail**

Table 52 Components Tested by the POD

Component	*Component* Argument Values
Carrier card	card 1
MIC	card 2

The **detail** keyword allows you to determine which test the component has failed.

In general, if a component fails to pass its POD, you need to replace it or make arrangements for its replacement. Contact your local technical support representative for more information about the results of a failed test.

The POD are enabled, by default, in the SmartEdge OS; if the POD have been disabled, you can enable them with the following command in global configuration mode:

diag pod

3.15 Troubleshoot Using System Equipment LEDs

To troubleshoot alarm conditions for the system, see Troubleshoot with System Power and Alarm LEDs or consult your local technical representative for information.

3.16 Troubleshoot Using Port LEDs

The facility LEDs for each port on the system display the current port status. For definitions of facility LEDs, see the appropriate section:

- Determine the Status of ATM MIC Ports
- Determine Status of Ethernet Management and Copper FE MIC Ports
- Determine Status of Native, Optical FE, Optical GE, and Copper GE MIC Ports

If you are experiencing hardware problems, check the LEDs to determine the possible problem and solution.

3.17 Troubleshooting with On-Demand Diagnostics

You can use on-demand diagnostics to troubleshoot the controller and I/O carrier cards and MICs. On-demand diagnostic (ODD) tests can isolate a fault up to the field replaceable unit (FRU). Four levels of tests are supported.

Table 53 SmartEdge 100 On-Demand Diagnostic Tests

Level	Devices	Tests
1	All	Duplicates the power-on diagnostics (POD) tests; tests completed in 5 to 10 seconds.
2	Controller carrier card	Includes level 1 tests; tests all onboard active units in the line interface module (LIM) of the board, including memory, registers, Packet Processing ASIC (PPA) Dual Inline Memory Modules (DIMMs) and Static RAM (SRAM), PPA and other onboard processors; tests completed in 5 to 10 minutes.
3	I/O carrier card and MICs	Includes level 2 tests; tests and verifies the data paths for the installed boards with internal loopbacks; tests completed in 10 to 15 minutes.
4	I/O carrier card and MICs	Includes level 3 tests; tests the entire carrier card and MICs using external loopbacks; must be run onsite with external loopback cables installed.

Note: Any MIC, if it is installed, is tested as part of the testing of the I/O carrier card.

The following guidelines apply to the on-demand testing of carrier cards and MICs:

- The cards that you can test depends on the release of the software. In the current release, you can test the following cards:
  - Controller carrier card and I/O carrier card
  - Ethernet management port, native ports, and MIC ports
- Before you can test either carrier card and any MIC, you must take the system out of service.

A session log stores the latest results for each card in main memory and also on the compact-flash card for low-level software; a history file that stores the results for previous sessions (100 sessions) is also stored on that compact-flash card.

You can display partial test results while the tests are in progress; a notification message is displayed when the session is complete. To view test results, enter the **`show diag on-demand`** command (in any mode) at any time. You can display the latest results for the carrier card, the Ethernet management port, the native ports, or MIC ports from the log, or the results for one or more sessions from the history file.

Note: If you are connected to the system using the Ethernet management port, you must enter the **terminal monitor** command (in exec mode) before you start the test session so that the system displays the completion message. For more information about the **terminal monitor** command, see *Command List* Reference [4].

3.18 Initiating ODD Session

Specify slot 1 to test the controller carrier card; specify slot 2 to test the I/O carrier card. Specify slot 1 to test the Ethernet management port; specify slot 2 to test any of the native or MIC ports.

To run ODD tests for the controller carrier card in a SmartEdge 100 chassis, perform the following tasks and enter the command in exec mode. No preparation is needed when testing the controller carrier card.

Table 54 Test the SmartEdge 100 Controller Carrier Card

Task	Command	Notes
Initiate an ODD session for the controller carrier card.	**diag on-demand**	Specify slot 1 for the **card** ***slot*** construct.

To prepare the I/O carrier card for an ODD session.

Table 55 Initiating the SmartEdge 100 I/O Carrier Card for an ODD Session

Task	Command	Notes
Access global configuration mode.	**configure**	Enter this command in exec mode.
Specify the I/O carrier card and access card configuration mode.	**card**	Enter this command in global configuration mode and specify slot 2.
Save the state of the native ports and MIC ports and circuits configured on them and put the ports in the out-of-service state.	**shutdown**	Enter this command in card configuration mode. If there are cross-connected circuits configured on any of the ports, this command disables the cross-connections and saves their state.
Put the I/O carrier card in the ODD state.	**on-demand-diagnostic**	Enter this command in card configuration mode.
Commit the previous commands to the database and return to exec mode.	**end**	You must enter this command (in any mode) to place the I/O carrier card in the ODD state.

To run ODD tests for the I/O carrier card for all native and MIC ports, including the Ethernet management port, in a SmartEdge 100 chassis, perform the following tasks and enter all commands in exec mode.

Table 56 Running ODD Test

Task	Command	Notes
Prepare the I/O carrier card for an ODD session.	See the “Initiating the SmartEdge 100 I/O Carrier Card for an ODD Session” table for a complete list of commands to prepare the I/O carrier card for an ODD session.	

Table 56 Running ODD Test

Task	Command	Notes
Initiate an ODD session.	`diag on-demand`	Specify slot 2 for the `card slot` construct.
Return the I/O carrier card to the in-service state.	See the "Returning a Carrier Card to the In-Service State" table for a complete list of commands to return the I/O carrier card to the in-service state.	

Note: To terminate an ODD session, enter the **no** form of the **diag on-demand** command.

Table 57 lists the affect on these indicators by the **clear diag** command (in exec mode), a reload of the system, the replacement, reload, change of state of the card, or an ODD session that the card successfully passed.

The following guidelines apply to the data and operations listed in Table 57

- You can display alarm and ODD status using the **show hardware** command (in any mode).
- You can clear the ODD log or history using the **clear diag** command (in exec mode).
- Replacing a MIC or reloading the system causes the power-on diagnostics (POD) to run; the LED status reflects the results of the POD tests. You cannot reload a MIC if it is in the ODD state.

Table 57 ODD and LED Conditions for a Card

Status \ After	Clear Log	Clear History	Replace Card	Reload System	Reload Card or Change State—ODD to OSS	Successful ODD Session
LED status	Unchanged	Unchanged	Reflects the results of the POD tests; you cannot reload a MIC if it is in the ODD state.			See Table 59
ODD history	Unchanged	Cleared	Unchanged	Unchanged	Unchanged	History file updated
ODD log	Cleared	Unchanged	Unchanged	Unchanged	Unchanged	Log updated
ODD status	Failed	Failed	Not available	Not available	Failed	Passed

3.19 Returning I/O Carrier Card to In-Service State

After testing the I/O carrier card, you must return the card to the in-service state. To return the card to the in-service state, perform the tasks described in Table 58; you must enter the **no** form of the **on-demand diagnostic** and **shutdown** commands.

Table 58 Returning a Carrier Card to the In-Service State

Task	Command	Notes
Access global configuration mode.	`configure`	Enter this command in exec mode.

Table 58 Returning a Carrier Card to the In-Service State

Task	Command	Notes
Specify the card that was tested and access card configuration mode.	`card`	Enter this command in global configuration mode.
Remove the card from the ODD state and put it in the out-of-service state.	`on-demand-diagnostic`	Enter this command in card configuration mode. Use the `no` form of this command.
Return the card to the in-service state; restore any cross-connections.	`shutdown`	Enter this command in card configuration mode. Use the `no` form of this command. This command restores the cross-connections to their state at the time of the shutdown.
Commit the previous commands to the database and return to exec mode.	`end`	Enter this command in any mode.

Note: To reload the I/O carrier card or MIC, using the **`reload card`** or **`reload mic`** command (in exec mode), respectively, you must first remove the card from the ODD state.

3.20 Administering Results from an ODD Session

Table 59 Administering Results on During ODD Test Session

ODD Test Configuration(1)	STAT LED (Green)	ALRM LED (Red)	SWAP LED (Blue)	Native Port LEDs	MIC Port LEDs
Controller carrier card only; no MICs are inserted or configured and no ports are configured.	Flashes during tests	Off	Off	Off	N/A(2)
Controller carrier card with MICs inserted; MIC and native ports are configured and are UP.	Flashes during tests	Off	Off	Unaffected by ODD(3)	Unaffected by ODD3
I/O carrier card only; no MICs are inserted or configured and no ports are configured.	Unaffected by ODD	Off	Unaffected by ODD	Off	N/A2
I/O carrier card with MICs inserted; MIC and native ports are configured and are UP.	Unaffected by ODD	Unaffected by ODD	Unaffected by ODD	Off	Off

(1) Configuration is lost if not saved before running ODD.

(2) No MICs are installed in the MIC slots.

(3) LEDs are unaffected except for a brief blink during port initialization if they were on before ODD.

3.21 Clearing Results from an ODD Session

To clear or display the results from one or more on-demand diagnostic sessions, perform one or more of the following tasks and enter the **`clear diag`** command in exec mode. Enter the **`show diag`** command, which can display results for up to 20 sessions from the history log, in any mode.

Table 60 Clear Results from On-Demand

Task	Command
Clear the results of on-demand diagnostic tests.	**clear diag on-demand**
Display the results of power-on or on-demand diagnostic tests.	**show diag**

3.22 ODD Examples

To initiate a session on the controller carrier card and display results:

```
[local]Redback#diag on-demand card 1 level 2 loop 4
[local]Redback#show diag on-demand card 1
```

The following example shows how to initiate a session on the Ethernet card in slot 3, display results, and return the card to the in-service state:

```
!Place the I/O carrier card in ODD state
[local]Redback#configure
[local]Redback(config)#card carrier 2
[local]Redback(config-card)#shutdown
[local]Redback(config-card)#on-demand-diagnostic
[local]Redback(config-card)#end

!Run an ODD session
[local]Redback#diag on-demand card 2 level 3 loop 5
!Display results
[local]Redback#show diag on-demand card 2 detail

!Return the I/O carrier card to the in-service state
[local]Redback#configure
[local]Redback(config)#card carrier 2
[local]Redback(config-card)#no on-demand-diagnostic
[local]Redback(config-card)#no shutdown
[local]Redback(config-card)#end
```

The following example shows the output after tests have been run on the I/O carrier card:

```
[local]Redback#show diag on-demand card 2 detail
```

```
Slot Number             : 2
Card Type               : carrier
Detected Card Type      : carrier
Serial Number           : 8L0B6060101352
Detected Serial Number  : 8L0B6060101352
Controller Serial Number: 8N026090100864
Test Level              : 1
Loop Count              : 1
Start Time              : 22:47:35  12/01/2006
Completion Time         : 22:48:11  12/01/2006
Test Summary            : 1 Failure

Test Results Loop 1:

     Card Type Valid                  PASS
     EPPA SCL 3                       PASS
     EPPA SCL 4                       PASS
     IPPA SCL 5                       PASS
     IPPA SCL 6                       PASS
     Controller FPGA Interface Test   PASS
     Controller FPGA Register Test    PASS
     Verify Controller FPGA Revision  PASS
     ADM1026 Register Test            PASS
     ADM1026 Fan Test                 PASS
     ADM1026 Temperature Test         PASS
     ADM1026 Voltage Test             PASS
     D3 Config Test                   PASS
     Controller FPGA Config Test      PASS
     Data Path FPGA Config Test       PASS
     Data Path FPGA Interface Test    PASS
     Data Path FPGA Register Test     PASS
     Verify Data Path FPGA Revision   PASS
     IPPA file load (PPA binary)      PASS
     IPPA Memory                      PASS
     EPPA file load (PPA binary)      PASS
     EPPA Memory                      PASS
     Native Phy 1                     PASS
     Native Phy 2                     PASS
     Native SFP EEPROM Read Test      FAIL

Test Failure Details:
Test Failure Details:
ODD test.  TestName: SFP EEPROM Read Test, slot 2, port 1
 Error: 0x2514 -> SFP_EEPROM_IDENT_ERR
SFP EEPROM Data failure address 0x1, exp 0x03, got 0xdd
```

3.23 Obtaining Assistance

If you cannot determine the nature of the problem by using the information in this chapter, contact your local technical support representative. To help diagnose the problem when you communicate with your representative, ensure that you include the following information in your problem report (if communicating by fax or e-mail):

- Your name and telephone number
- Name of responsible person (if not yourself), e-mail address, and telephone number
- Your system serial number (from the output of the **`show hardware`** command in any mode)
- Brief description of the problem
- List of identifiable symptoms

4 Servicing the Hardware

This chapter describes servicing procedures for the SmartEdge 100 router, including servicing media interface cards (MICs) and transceivers, inserting and removing compact-flash (CF) cards, and how to obtain assistance. The only tool needed to perform the procedures in this chapter is a #1 Phillips screwdriver.

After you replace a line card or change its physical configuration, you must enter SmartEdge OS commands from the command-line interface (CLI) to restore the card to normal operations.

The SmartEdge 100 chassis has an EEPROM that supplies the medium access control (MAC) address for the chassis. If it should ever be necessary to replace the EEPROM, contact your local technical representative for directions.

Stop!

Risk of electrostatic discharge (ESD) damage. Always use an ESD wrist or ankle strap when handling the card. Do not attach the wrist strap to a painted surface. Avoid touching the card, components, or any connector pins.

4.1 Inserting and Extracting a MIC

The term GE applies to any GE native port or MIC that supports a port speed of 1 Gbps or greater; unless explicitly stated, the speed of any GE port is 1 Gbps.

After you replace a MIC or change its physical configuration, you must enter SmartEdge OS commands from the command-line interface (CLI) to restore the MIC ports to normal operations.

Caution!

Risk of equipment damage. Never attempt to repair parts or MICs yourself; always replace any defective MIC with a MIC supplied by your local technical representative. You can damage your SmartEdge router if you install and use MICs that have been repaired in the field.

The design of the SmartEdge 100 router allows you to install and replace all MICs without powering off the system.

Caution!

Risk of equipment malfunction. Before proceeding with the installation or replacement procedure, ensure that you have the CLI prompt on the console or power off the system. If you install or replace a MIC in a running system and the system is not fully operational, you can cause the system to malfunction.

4.1.1 Insert a MIC

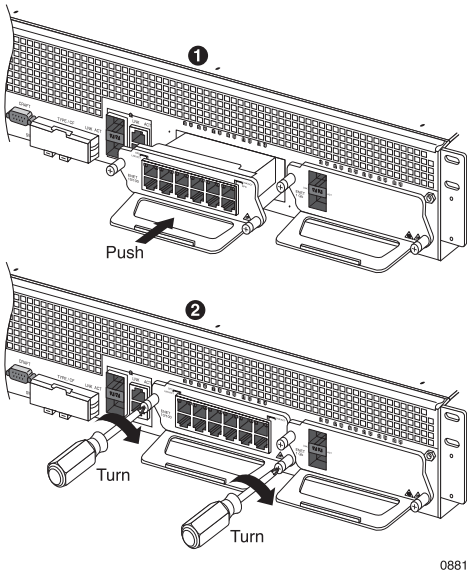

Figure 20 Inserting a MIC

Stop!

Risk of electrostatic discharge (ESD) damage. Any MIC contains electrostatic-sensitive devices. Always use an ESD wrist or ankle strap when handling any MIC. Avoid touching its printed circuit board, components, or any connector pins.

To insert a MIC:

1. Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; there is an ESD convenience jack located on the front of the chassis.

2. Align the MIC with the notched guides and then carefully slide the MIC into the slot.

3. Push the MIC until it is flush with the front panel.
4. Tighten the captive screws alternately.
5. Tighten the captive screws, to a maximum torque of 4.0 inch-lbs (0.5 Newton-meters).

4.1.2 Extract a MIC

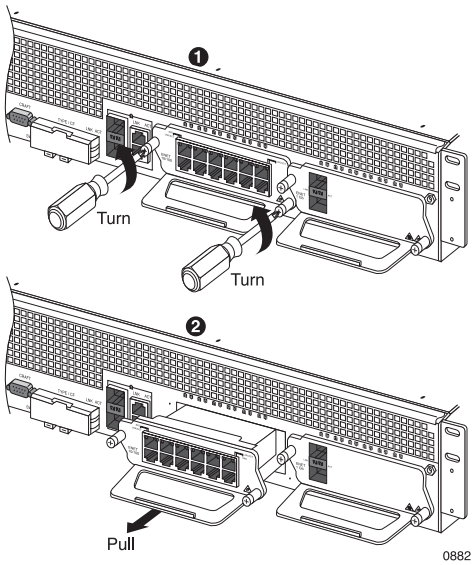

Figure 21 Extracting a MIC

Stop!

Risk of ESD damage. Any MIC contains electrostatic-sensitive devices. Always use an ESD wrist or ankle strap when handling any MIC. Avoid touching its printed circuit board, components, or any connector pins.

To extract a MIC:

1. Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; there is an ESD convenience jack located on the front of the chassis.
2. Using a Phillips screwdriver, loosen the captive screws on the front panel of the MIC being removed.
3. Holding the MIC handle and keeping it perpendicular to the slot, pull gently on the MIC to disengage it from the carrier card.
4. Keeping the MIC horizontally level, carefully slide the MIC out of the chassis, and place it in an antistatic bag.

4.2 Insert a Transceiver

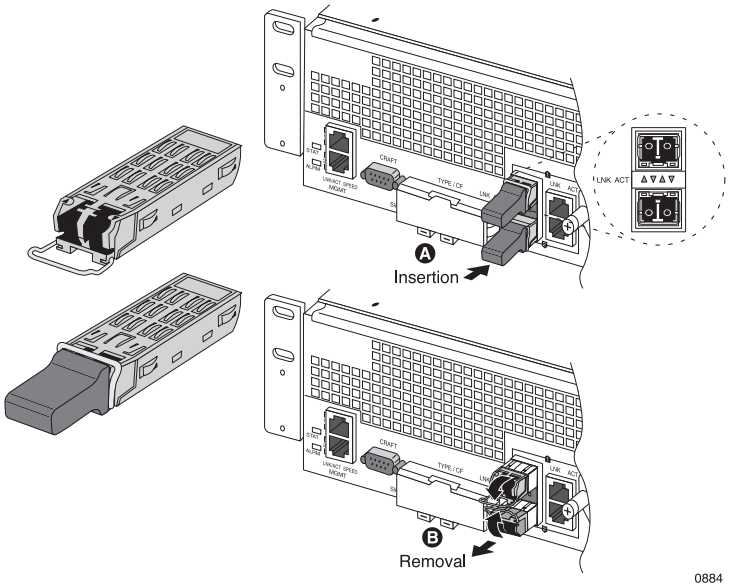

Figure 22 Inserting and Extracting an SFP Transceiver

Caution!

Risk of data loss. Install only the transceivers approved by Ericsson. You can corrupt the system if you attempt to install SFP transceivers that are not approved by Ericsson because these items have not been tested with the SmartEdge router.

Stop!

Risk of ESD damage. An SFP contains electrostatic-sensitive devices. Always use an ESD wrist or ankle strap when handling the SFP. Avoid touching any connector pins.

To insert a transceiver of any type:

1. Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; there is an ESD convenience jack located on the front of the chassis.

2. Ensure that the latching mechanism is closed.

3. With the transceiver connectors as shown in Figure 22, slide the transceiver into the opening for the port until the rear connector is seated and the locking mechanism snaps into place.

4. Remove the dust cover if you are installing an optical transceiver.

4.3 Extract a Transceiver

Stop!

Risk of ESD damage. An SFP contains electrostatic-sensitive devices. Always use an ESD wrist or ankle strap when handling the SFP. Avoid touching any connector pins.

To extract a transceiver of any type:

1. Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; there is an ESD convenience jack located on the front of the chassis.

2. Release the latching mechanism:

   a If the transceiver has a wire handle, unlatch it, and rotate it 90° to 180°.

   b If the transceiver has latching tabs, squeeze and hold the tabs.

3. Withdraw the transceiver from its port and insert a dust cover over the optical connectors.

4.4 Remove a CF Card

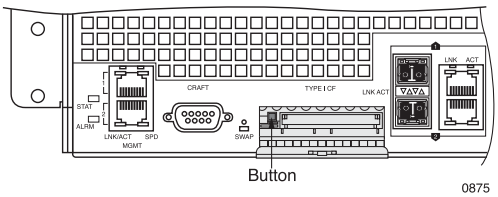

Figure 23 CF Card Ejection Button

Stop!

Risk of data loss. Do not remove a CF card from its slot while SWAP LED is blinking or is off. Remove a CF card from its slot only when the SWAP LED is on.

Caution!

Risk of equipment failure. Always enter the **`unmount /md`** command (in exec mode) before removing a CF card. Removing the CF card from its slot without first entering the **`unmount /md`** command can permanently damage the device and cause the kernel to crash.

Stop!

Risk of ESD damage. A CF card contains electrostatic-sensitive devices. Always use an ESD wrist or ankle strap when handling the card. Avoid touching any connector pins.

To remove a CF card:

1. Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; there is an ESD convenience jack located on the chassis front panel.

2. Open the door that covers the CF Type 1 slot until it “snaps” open. This action begins unmounting the file system on the CF card. The SWAP LED blinks (blue) during the unmounting process.

3. Wait until the SWAP LED is on. It is now safe to remove the CF card.

   If for some reason, the system cannot successfully unmount the file system on the CF card, the SWAP LED stops blinking and changes back to “Off”. You must enter the **`unmount`** command (in exec mode) to unmount the file system on the card. For more information about the **`unmount`** command, see *Command List* Reference [4].

4. Press the ejection button that is inside the CF slot (see Figure 23) twice (first to cause the button to protrude from within its recess and second to disengage the CF card from its carrier card connectors.

5. Grasp the CF card and pull gently and slowly until it is fully outside the slot.

6. Close the door so that it snaps shut; the SWAP LED remains off.

4.5 Install CF Cards

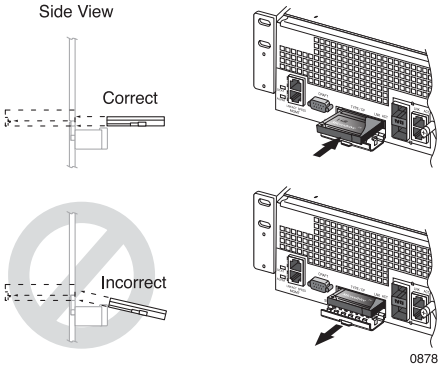

Figure 24 Installing a CF Card

Caution!

Risk of ESD damage. A CF card contains electrostatic-sensitive devices. Always use an ESD wrist or ankle strap when handling the card. Avoid touching any connector pins.

To install a CF card:

1. Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; there is an ESD convenience jack located on the chassis front panel.

2. If a CF card is currently installed, remove the card using the procedure described in the “Remove a CF Card” section.

3. Hold the CF card to be installed so that its pin-hole side faces the slot in the front panel and horizontally align it as close to the bottom edge of the slot as possible and perpendicular to it; see Figure 24.

4. Slowly insert the card in the slot; keep the card perpendicular to the front panel. If the card does not engage the carrier card connectors with approximately 0.50 inches (1.27 cm) of the card outside the slot, do not continue. Remove the card and repeat this step.

   Note: The CF card is polarized; if the card does not engage the connectors, rotate the card 180° and try again.

5. Close the door until it snaps shut. The system automatically recognizes the CF card and begins to mount it. The SWAP LED begins to blink.

6. After the SWAP LED stops blinking (is off), you can begin using it to store data.

If for some reason, the system cannot successfully mount the file system on the CF card (for example, the file system is damaged or the card is unformatted), the SWAP LED stops blinking and changes back to “Off” and the system displays an error message on the console. You must enter the **`format media-device`** command (in exec mode) to format the CF card and the **`mount`** command (in exec mode) to mount it. For more information about the **`format media-device`** and **`mount`** commands, see *Command List* Reference [4].

4.6 Add MIC Cards

Stop!

Risk of ESD damage. Any MIC contains electrostatic-sensitive devices. Always use an ESD wrist or ankle strap when handling the MIC. Avoid touching its printed circuit board, components, or any connector pins.

To add a MIC to an operational system:

1. Prepare for installation:
   a Ensure that the system is fully operational (you have the CLI prompt on the console).
   b Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; there is an ESD convenience jack located in the lower right corner of the air intake panel on the front of the chassis.
2. Loosen the captive screws and remove the MIC slot cover that is installed in the slot for the new MIC.
3. Install the MIC; see the generic procedure in the Insert a MIC.

Caution!

Risk of data loss. Install only the transceivers purchased from Ericsson. You can corrupt the system if you attempt to install SFP transceivers that are not purchased from Ericsson, because these items have not been tested with the SmartEdge router.

4. If the MIC requires transceivers, install the transceivers, using the procedure in the “Insert a Transceiver” section.

5. After the transceivers have been installed, verify the operational status.
6. If you have installed transceivers, remove the dust cover from the connectors.
7. Connect and route the cables.

Caution!

Risk of damage to fiber-optic cables. Never step on a fiber-optic cable or twist one when connecting it to or disconnecting it from a port.

4.7 Replace MIC Cards

Caution!

Risk of ESD damage. Any MIC contains electrostatic-sensitive devices. Always use an ESD wrist or ankle strap when handling the MIC. Avoid touching its printed circuit board, components, or any connector pins.

To remove an existing MIC and replace it with a new MIC:

1. Ensure that you have the CLI prompt on the console.
2. Prepare for replacement:
   a. Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; there is an ESD convenience jack located on the front panel of the chassis.
   b. Label and disconnect any cables from the front of the MIC being removed.
   c. If the MIC has transceivers installed, install a dust cover over each SFP connector.

Caution!

Risk of damage to fiber-optic cables.Never step on a fiber-optic cable or twist one when connecting it to or disconnecting it from a port.

3. Remove the current MIC; see the generic procedure in Extract a MIC.
4. Install the new MIC; see the generic procedure in Insert a MIC.
5. If you are replacing a MIC with the same type of MIC, remove the transceivers from the current MIC and insert them in the ports on the new MIC, using the procedures in the “Extract a Transceiver” and “Insert a Transceiver” sections.
6. Check the LEDs on the new MIC to ensure proper operational status.
7. Remove the dust covers from the connectors.
8. If the MIC is the same type, reconnect the cables you previously disconnected; otherwise connect and route the cables for the ports in the new MIC.
9. Use the SmartEdge OS CLI software to restore the MIC to normal operations.

4.8 Replace Transceivers

Transceivers are hot-swappable; you can replace any transceiver without removing the MIC. However, you must shut down the port before performing the replacement procedure.

Caution!

Risk of data loss. Install only the transceivers purchased from Ericsson. You can corrupt the system if you attempt to install SFP transceivers that are not purchased from Ericsson, because these items have not been tested with the SmartEdge router.

Stop!

Risk of ESD damage. An SFP contains electrostatic-sensitive devices. Always use an ESD wrist or ankle strap when handling the SFP. Avoid touching any connector pins.

To replace a transceiver:

1. Prepare for replacement:

   a From the console terminal or the management workstation (SmartEdge OS CLI software), shut down all activity on the port with the transceiver you want to replace. For commands to shut down the port, see *Command List* Reference [4].

   b Put on an antistatic wrist strap and attach it to an appropriately grounded surface. Do not attach the wrist strap to a painted surface; there is an ESD convenience jack located in the lower right corner of the air intake panel on the front of the chassis.

   c Label and disconnect any cables attached to the transceiver you want to replace.

   d Install a dust cover over the SFP connectors.

   Caution!

   Risk of damage to fiber-optic cables. Never step on a fiber-optic cable or twist one when connecting it to or disconnecting it from a port.

2. Remove the current transceiver, using the procedure in the “Extract a Transceiver” section.

3. Install the new transceiver, using the procedure in the “Insert a Transceiver” section.

4. If the transceiver is the same type as the one you have replaced, reconnect the cables you previously disconnected; otherwise connect and route the cables for this transceiver.

5. Use the SmartEdge OS CLI software to restore the port to normal operations.

4.9 Replace SmartEdge 100 Chassis

Because you cannot open the chassis, certain equipment failures require that you replace the chassis. For example, fans within the SmartEdge 100 chassis are not replaceable.

Although you cannot replace a component, such as a fan, within the chassis, you can perform the following tasks to reduce the risk of damage to your system:

- Notify your local technical representative about the failure.
- If the system reports a minor alarm condition (the ALRM LED is illuminated and is yellow), such as a single fan failure, alleviate any environmental

condition that could cause a second failure, such as increasing the cooling at the site or ensuring that the flow of cooling air and the exhaust air from chassis is not blocked.

- If the system reports a major alarm condition (the ALRM LED is illuminated and is red), such as a multiple fan failure, replace the chassis.

To replace the chassis:

1. If you have a second SmartEdge 100 router at your site and the SmartEdge 100 router with the failure is still operating:

   a Reroute the traffic to the second router.

   b Power off the SmartEdge 100 router.

2. Install a replacement SmartEdge 100 router.

3. Remove the MICs, together with their cables and transceivers, from the original SmartEdge 100 router and install them in the replacement router. See Replace MIC Cards.

4. Remove the CF card, if any, from the SmartEdge 100 router and install it in the replacement router. See the “Remove a CF Card” section.

5. Power on the replacement SmartEdge 100 router; if necessary, update its software configuration to match that on the original SmartEdge 100 router.

6. Reroute the traffic from the SmartEdge 100 router to which you had routed it, to the replacement SmartEdge 100 router.

7. Return the original SmartEdge 100 chassis to your local technical representative for repair.

4.10 Clean Optical Connectors

Clean fiber-optic components are a requirement for quality connections between fiber-optic equipment. Cleaning the fiber-optic equipment is one of the most basic and important procedures for maintaining MICs with fiber-optic connectors. Ericsson produced *Inspection And Cleaning Of Optical Connectors*Reference [7] to provide detailed and comprehensive procedures for your use.

5 System Description

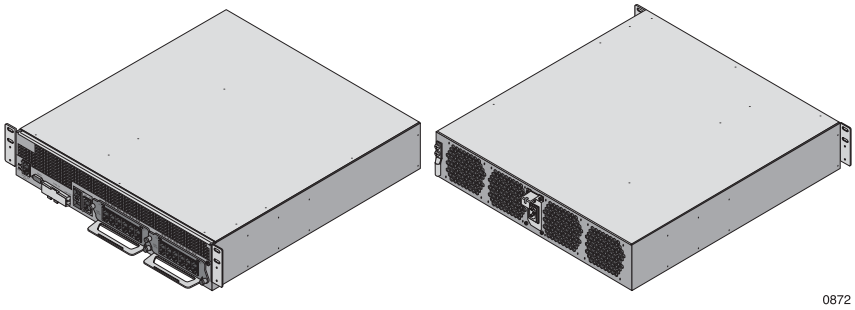

Figure 25 SmartEdge 100 Router

The SmartEdge 100 router is a carrier-class product with an architecture that supports packetized traffic. The SmartEdge 100 router can be used as an edge aggregation router and simultaneously as a broadband remote-access server (BRAS) to directly connect customers to the network. It supports a variety of interfaces and services, such as routing protocols, quality of service (QoS), and inbound and outbound access control lists (ACLs). New services can easily be added with software upgrades.

The SmartEdge 100 router can also be used in the metropolitan core to aggregate traffic from other routers into the long-haul transit core. The SmartEdge 100 router supports a wide variety of interfaces, such as Asynchronous Transfer Mode (ATM), Ethernet 10Base-T, 100Base-TX, 100Base-FX, 1000Base-FX, and 1000Base-T.

The SmartEdge 100 chassis is a rack-mountable unit that includes a single carrier card mounted within it. At the rear of the chassis are five fans for forced-air cooling. A single fan failure does not impact the operation of the system. Air intake is at the front of the chassis and air exhaust at the rear. For this reason, these areas must not be blocked by other equipment.

Two versions of the SmartEdge 100 chassis support either AC or DC power sources. The DC version has connectors for redundant power sources with a separate circuit breaker for each DC source. Because the chassis is fully powered from a single DC source, installing dual DC sources is not required. The power connectors for either the AC or DC power sources are located at the rear of the chassis.

The carrier card implements the functions of a controller card (referred to as the controller carrier card) and the functions of a line card (referred to as the I/O carrier card). The connectors and LEDs for monitoring all functions and components on the carrier card are on the chassis front panel.

The SmartEdge 100 chassis is designed for mounting in a standard 19- or 23-inch rack; it can also be placed in a desktop environment. Cable management brackets are attached to the left and right sides at the front of the

chassis. All maintenance functions are performed at the front of the chassis. An electrostatic discharge (ESD) jack is located on the chassis front panel.

5.1 Controller Carrier Card Functions and Components

The controller carrier card manages the system; it is responsible for the packet routing protocols, the SmartEdge OS command-line interface (CLI), and communications with a network management system running the NetOp Element Management System (EMS) software. The controller card also loads all configuration information necessary for the line cards.

Table 61 lists the controller carrier card features.

Table 61 Controller Carrier Card Features

Feature	Controller Carrier Card
Processors	Dual processors with shared memory that run independently and perform different functions
Control processor functions	• SONET/SDH software • SmartEdge OS software • NetOp EMS software
Main memory (total)	1 GB
NVRAM	512 KB SRAM with battery backup
Internal clock	Local freerunning oscillator (±50.0 ppm)
Real-time clock	Yes, synchronized with NTP server
Internal storage for system images and files	512 MB
External storage for core dumps and system files	1 GB (NEBS certified)
External ports	DB-9 (CRAFT)(1) 2 10/100/1000 Ethernet(2)
Local console	Direct or terminal server connection only

(1) The CRAFT port supports a direct or terminal server connection only.
(2) Support for 1 Gbps depends on the SmartEdge OS release.

A second internal-storage device is also installed on the controller carrier card for low-level software.

5.1.1 Processors

The controller carrier card has two processors: one runs low-level software, including device drivers and equipment management software, and the other runs the routing and broadband remote access server (BRAS) software.

5.1.2 Main Memory

Synchronous Dynamic Random Access Memory (SDRAM) is used by the SmartEdge OS shared databases that are accessed by the I/O carrier card, native ports, and MICs.

5.1.3 NVRAM with Battery

The controller carrier card includes 512 KB of NVRAM, which stores the current state of the system; because it is not affected by power failures or system shutdown, the system can restore operations when power is restored or the system is restarted. Support for NVRAM is dependent on the release of the SmartEdge OS.

5.1.4 System Clock

The internal clock on the controller carrier card is a local free-running oscillator at ±50.0 ppm. The system clock refers to the clock that performs system hardware timing functions; for the SmartEdge 100 router, the system clock source is always the internal clock.

The real-time clock (RTC) on the controller carrier card is initialized before the system is shipped. The clock is not affected by power failures, system shutdown, or reload.

The source for the transmit clock for the native ports or the ports on an Ethernet MIC is always the system clock. For the ATM OC MIC, the transmit clock for a port is its onboard clock (the default), a local free-running oscillator at ±25.0 ppm. However, you can configure the transmit clock for a port to be the receive clock derived from an incoming signal to the port.

The time-of-day clock (TDC) for a SmartEdge router is implemented in software. When the system is powered on, the RTC sets the TDC; otherwise, the TDC is undefined until it is configured and set using the SmartEdge OS. The TDC can be maintained by synchronization with a Network Time Protocol (NTP) server. Periodically, the SmartEdge OS updates the RTC based on the current value of the TDC.

5.1.5 Internal Storage for SmartEdge OS files

The controller carrier card has two internal-storage devices (Type I), one of which is used to store SmartEdge OS images and files. (The other internal-storage device is used to store low-level system software.)

SmartEdge OS storage is organized into three partitions: p0, p1, and /flash. The p0 and p1 partitions each store a system image and its files; the memory on the controller carrier card can be loaded from either partition. The third partition, /flash, stores SmartEdge OS configuration files and other system- and user-created data files.

5.1.6 Optional External Storage Device

The controller carrier card has an external slot on the front panel in which you can install a Type I CF card. When installed, this device is used to capture crash dumps and provide an alternate source for loading SmartEdge OS software, when downloading the software over the network is not possible.

Caution!

Risk of data loss. Use only the CF cards provided by Ericsson. You can corrupt the system if you attempt to install a CF card not obtained from Ericsson because these items have not been tested with the SmartEdge router.

5.1.7 Ports for System Management Access

The CRAFT port has a DB-9 connector that provides an RS-232 connection to a local console terminal or a terminal server. The CRAFT port provides the access to the SmartEdge OS CLI for configuring and monitoring tasks.

Two 10/100/1000 Ethernet ports each have an RJ-45 connector. The upper port provides a connection to an Ethernet device, such as a switch or hub, which allows access to the SmartEdge OS CLI from either a local or remote management workstation for configuring and monitoring tasks. The system can also communicate with a remote workstation that is running the NetOp EMS software.

Note: The upper port is disabled in this release; support for 1 Gbps speed of the lower port is dependent on the release of the SmartEdge OS.

5.1.8 Monitoring Temperature and Voltage

Temperature is monitored at various locations within the chassis; an over-temperature interrupt signals the SmartEdge OS when the temperature rises above or falls below safe operating conditions. Voltages are also monitored and reported to the SmartEdge OS. Administrators can display both temperature and voltage data using commands in the SmartEdge OS CLI. Three levels of temperature conditions are reported: service-affecting, abnormal, and normal.

5.2 I/O Carrier Card

The I/O carrier card is a logical subdivision of the carrier card within the chassis and implements the features and functions of a line card. Like the line cards, the I/O carrier card includes dual-packet processing ASICs, Version 2 (PPA2s). These PPA2s, one for ingress traffic and one for egress traffic, process all data

passing through the SmartEdge 100 router, off-loading the processors on the controller carrier card. Each PPA2 has1 GB of memory.

Unlike previous line cards, the I/O carrier card supports both fixed and removable ports with multiple speeds:

- Ports 1 and 2 are fixed; they are referred to as native ports and have their port connectors on the chassis front panel. Both ports independently support either a copper or optical connection and run at 1 Gbps.
- Ports 3 to 26 are implemented on a pair of removable boards referred to as media interface cards (MICs). The MICs plug into the I/O carrier card through the front panel with a selectable speed of 10 or 100 Mbps or with a speed of 1 Gbps.

  The number of available ports depends on the installed MICs; see Table 62. Ports 3 to 14 are allocated to the MIC in the left MIC slot; ports 15 to 26 are allocated to the MIC in the right MIC slot. Any MIC can be installed in either slot.

5.3 MIC

MICs allow you to install a variety of ATM OC and Ethernet ports in either of two MIC slots in the chassis front panel. You can install any combination of MICs; if only a single MIC is installed, a MIC slot cover is installed to maintain air flow. Table 62 lists the MICs supported on the SmartEdge 100 router.

Table 62 SmartEdge 100 MICs

MIC \ Description	Number of MICs	Number of MIC Ports(1)	Protection Ratios
ATM OC-3c/STM-1c(2) Reference [6].	2	2	None, 1+1
Copper FE	2	12	None
Optical FE(2)	2	12	None
Copper GE	2	2	None
Optical GE(2)	2	2	None

(1) On optical MICs, each port has separate connectors for the transmit (Tx) and receive (Rx) circuits.
(2) For descriptions of the transceivers supported by this MIC, see Transceivers for SmartEdge and SM Family Line Cards.

Protection for ports is dependent on the release of the SmartEdge OS.

5.4 Alarms

System alarms include:

- Critical alarm—Severe, service-affecting condition. It requires immediate corrective action.

- Major alarm—Service-affecting hardware or software condition. It requires immediate corrective attention.
- Minor alarm—A condition that does not have a serious affect on service or on circuits.

Pressing the ACO button silences an audible alarm and lights the ACO LED; pressing the button again turns off the ACO LED. Support for the ACO button depends on the release of the operating system.

6 MIC and Native Port Descriptions

The SmartEdge 100 router supports the following interfaces:

- 2-Port ATM OC-3c/STM-1c MIC
- 12-Port Copper and Optical FE MICs
- 2-Port Copper and Optical GE MICs with Native Ports

The term GE applies to any Gigabit Ethernet native port or MIC that supports a port speed of 1 Gbps or greater; unless explicitly stated, the speed of any GE port is 1 Gbps.

6.1 2-Port ATM OC-3c/STM-1c MIC

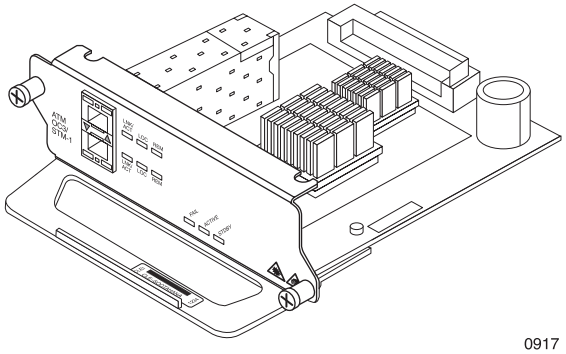

Figure 26 2-Port ATM OC-3c/STM-1c MIC

The ATM OC-3c/STM-1c MIC supports two SONET or SDH ports, each of which operates at 155 Mbps and can be used either as an optical line or optical trunk interface. Each port supports a small form-factor pluggable (SFP) transceiver, either single-mode fiber (SMF) or multimode fiber (MMF); transceiver types are described in Transceivers for SmartEdge 100 Optical Ports.

Note: This 2-port ATM OC-3c/STM-1c MIC is also referred to as a second-generation ATM OC card because it is designed to use the second generation of the Packet Processing ASIC (PPA) and is comparable to the second-generation 4-port ATM OC-3c/STM-1c line card that is supported on the SmartEdge 400 and SmartEdge 800 routers.

The card uses a single segmentation and reassembly (SAR) device, which performs the reassembly function on the incoming ATM cell stream from the physical (PHY) device and the segmentation function to create the corresponding outgoing ATM cell stream.

The hardware provides header error control (HEC) framing for each port; the transmit clock can be derived from either the onboard local oscillator (the default) or the receive clock derived from an incoming signal to the port.

The SAR device supports two, four, or eight distinct class of service queues for each ATM PVC, allowing a mix of priority- and class-based queuing for each ATM PVC. For information about ATM VPs and PVC support, see *Application Traffic Management Command Reference* Reference [5].

Table 63 2-Port ATM OC-3c/STM-1c MIC Specifications

Specification	Value
Number of ports(1)	2
Speed	155.52 Mbps
Interface type	Telcordia IR-1, SDH/STM-1 S-1.1
Connector type(2)	SFP
Protection	None
Compliance	Telcordia GR-253, ANSI T1.102, ITU G.957

(1) Each optical port has separate connectors for the transmit (Tx) and receive (Rx) circuits.
(2) Transceivers are described in the Transceivers for SmartEdge 100 Optical Ports document.

6.1.1 Status LEDs

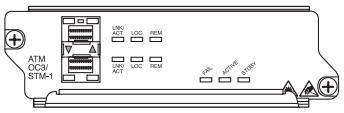

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Figure 27 LEDs on 2-Port ATM OC-3c/STM-1c MIC

Table 64 Equipment LEDs on 2-Port ATM OC-3c/STM-1c MIC

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the MIC.(1)
	Off	None	No failure exists on the MIC.
ACTIVE	On	Green	This MIC is active.
	Off	None	This MIC is either on standby (the STDBY LED is illuminated) or has failed (the FAIL LED is illuminated).
STDBY	On	Yellow	At least one of the ports on this MIC has been configured as a protection port.(2)
	Off	None	None of the ports on this MIC have been configured as a protection port.

(1) A failure can be total, partial, or forced. Failure on any part of the MIC, including failure of any of its ports, results in the FAIL LED being illuminated.
(2) Protection for cards and ports is dependent on the release of the SmartEdge OS.

Table 65 Facility LEDs on 2-Port ATM OC-3c/STM-1c MIC

Label	Activity	Color	Description
LINK	On	Green	Signal is present and within specifications.
	Blinking	Green	Signal is present and within specifications; receiving or transmitting packets (not idle cells).
	Off	None	Port is not configured, no signal is present, or signal is not within specifications.

Table 65 Facility LEDs on 2-Port ATM OC-3c/STM-1c MIC

Label	Activity	Color	Description
LOC	On	Yellow	Local port is in an alarm state, such as a loss of frame (LOF).
	Off	None	Local port is in a normal state.
REM	On	Yellow	Remote port cannot obtain synchronization, or has a defect or failure, such as an alarm indication signal (AIS).
	Off	None	Remote port is in a normal state.

6.2 12-Port Copper and Optical FE MICs

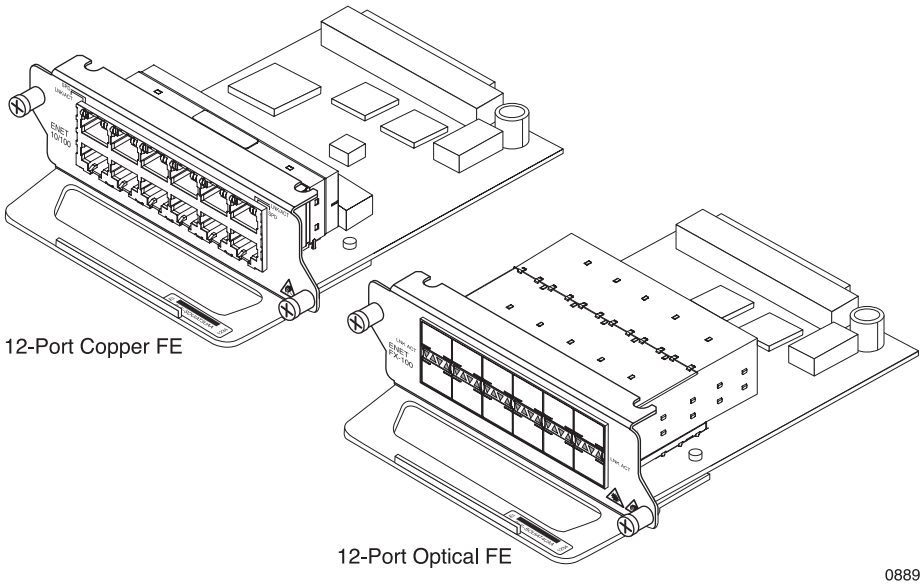

Figure 28 12-Port Copper and Optical FE MICs

The 12-port copper FE MIC (labeled “ENET 10/100”) provides 12 10Base-T or 100Base-TX ports with RJ-45 connectors; the optical FE MIC (labeled “ENET FX-100”) provides 12 100Base-FX ports; each optical port supports a small form-factor pluggable (SFP) transceiver. Transceiver types for the optical FE MIC are described in the Transceivers for SmartEdge 100 Optical Ports document. The speed for each copper FE port is selectable as 10 Mbps or 100 Mbps.

This card is the same size as all the other SmartEdge line cards and occupies a single slot in the chassis. The following types of SFP optical transceivers are supported on any of the ports:

- 100Base-FX—Short reach
- 100Base-LX10—Long reach

Caution!

Risk of data loss. Install only the transceivers purchased from Ericsson. You can corrupt the system if you attempt to install SFP transceivers that are not purchased from Ericsson, because these items have not been tested with the SmartEdge router.

The 12-port copper FE MIC uses RJ-45 connectors instead of copper-based SFP transceivers.

Table 66 12-Port Copper and Optical FE MIC Specifications

Specification	FX	LX10	TX
Number of ports	12	12	12
Protocol	100Base-FX	100Base-LX10	10 Mbps: 10Base-T 100 Mbps: 100Base-TX
Line code	4B/5B	4B/5B	10 Mbps: Manchester coding 100 Mbps: 4B/5B
Speed	100 Mbps	100 Mbps	10 or 100 Mbps
Negotiate flow control(1)	No	No	Yes (including flow-control settings)(2)
Interface type	Optical	Optical	Electrical
Impedance	–	–	100 ohm differential
Connector type(3)	SFP	SFP	RJ-45
Cable type	MMF	SMF	2-pair, category 5 shielded-twisted pair(4)
Protection	None	None	None
Compliance	These versions comply with IEEE 802.3, 802.3u		

(1) These MICs support lossless flow control up to 6.2 mi (10.0 km) for packets with up to 1,500 bytes.

(2) The extent of the support for flow control is dependent on the release of the SmartEdge OS.

(3) Transceivers are described in the Transceivers for SmartEdge 100 Optical Ports document.

(4) The shielded cable must be grounded at both ends.

6.2.1 Status LEDs

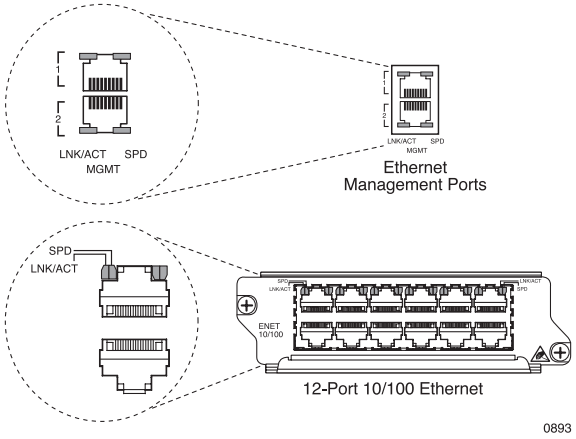

Figure 29 Facility LEDs on 12-Port Copper and Optical FE MICs Ports

Table 67 Facility LEDs for Ethernet Management and Copper FE MIC Ports

Label	Activity	Color	Description
LNK/ACT	On	Green	The port is up.
	Blinking	Green	The port is receiving or transmitting frames.
	Off	None	The port is down.
SPD	On	Green	The Ethernet management port is operating at 1000 Mbps.
	On	Yellow	The port is operating at 100 Mbps.
	Off	None	The port is operating at 10 Mbps.

6.3 2-Port Copper and Optical GE MICs with Native Ports

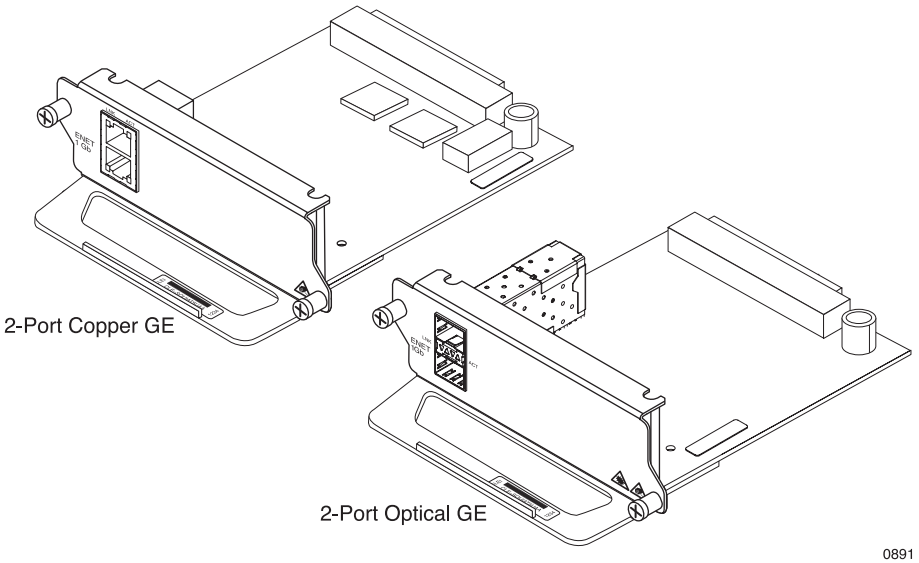

Figure 30 2-Port Copper and Optical GE MICs with Native Ports

The copper GE (labeled “ENET 1 Gb”) MIC provides two ports with RJ-45 connectors. The optical GE (also labeled “ENET 1 Gb”) MIC provides two ports that support SFP transceivers. Transceiver types are described in Transceivers for SmartEdge 100 Optical Ports.

This card is the same size as all the other SmartEdge line cards and occupies a single slot in the chassis. The following types of SFP optical transceivers are supported on any of the ports:

- 1000Base-SX—Short reach
- 1000Base-LX—Long reach

The 2-port copper GE MIC uses RJ-45 connectors instead of copper-based SFP transceivers.

Caution!

Risk of data loss. Install only the transceivers purchased from Ericsson. You can corrupt the system if you attempt to install SFP transceivers that are not purchased from Ericsson, because these items have not been tested with the SmartEdge router.

The SmartEdge 100 I/O carrier card includes two native GE ports, which have RJ-45 and optical SFP-based connectors on the front panel of the chassis. Each port has two connectors, which allows you to configure each port independently for a 1000Base-T, 1000Base-SX, or 1000Base-LX connection.

Table 68 2-Port Copper and Optical GE MIC Specifications

Specification	SX	LX	TX
Number of ports[1]	2	2	2
Protocol	1000Base-SX	1000Base-LX10	10 Mbps: 10Base-T 100 Mbps: 100Base-TX 1000 Mbps: 1000Base-TX
Line code	8B/10B	8B/10B	PAM-5
Speed	1.0 Gbps	1.0 Gbps	10 Mbps 100 Mbps 1000 Mbps
Negotiate flow control[2]	Yes	Yes	Yes
Interface type	Optical	Optical	Electrical
Connector type[3]	SFP	SFP	RJ-45
Cable type	MMF	SMF	4-pair, category 5 shielded-twisted pair[4]

Table 68 2-Port Copper and Optical GE MIC Specifications

Specification	SX	LX	TX
Protection	None	None	None
Compliance	These versions comply with IEEE 802.3, 802.3u		

(1) Each optical port has separate connectors for transmit (Tx) and receive (Rx) circuits.
(2) The extent of the support for flow control is dependent on the release of the SmartEdge OS. These MICs support lossless flow control up to 6.2 mi (10.0 km) for packets with up to 9,600 bytes.
(3) Transceivers are described in Transceivers for SmartEdge and SM Family Line Cards.
(4) The shielded cable must be grounded at both ends.

6.3.1 Status LEDs

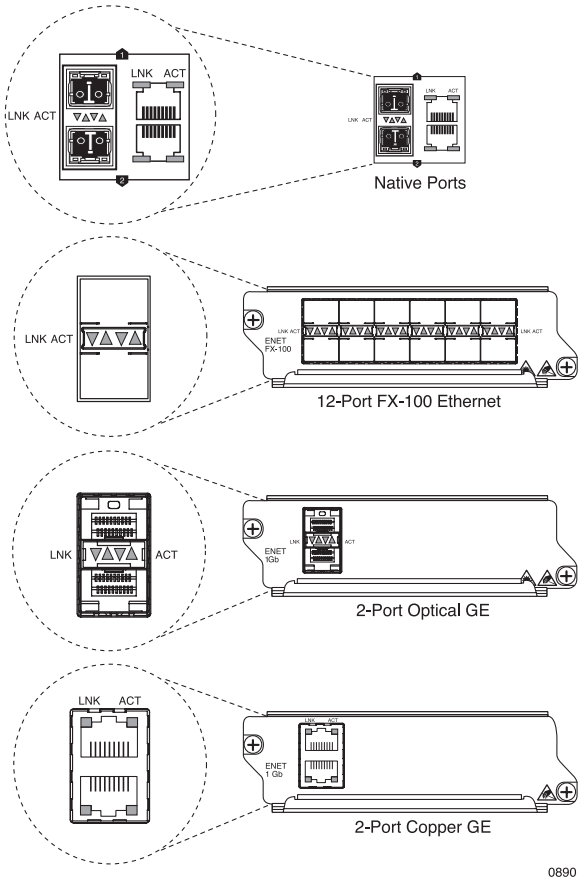

Figure 31 LEDs on 2-Port Copper and Optical GE MICs and Native Ports

Table 69 Facility LEDs on 2-Port Copper and Optical GE MICs and Native Ports

Label	Activity	Color	Description
ACT	On	Yellow	The port is receiving or transmitting frames.
	Off	None	The port is inactive.
LNK	On	Green	The port is up.
	Off	None	The port is down.

Reference List

[1] *Configuring Cards*, 10/1543-CRA 119 1170/1

[2] *Configuring ATM, Ethernet, and POS Ports*, 9/1543-CRA 119 1170/1

[3] *Configuring Circuits*, 12/1543-CRA 119 1170/1

[4] *Command List*, 1/190 77-CRA 119 1170/1

[5] *Application Traffic Management Command Reference*, 190 80-CRA 119 1170/1

[6] *Transceivers for SmartEdge and SM Family Line Cards*, 24/153 30-CRA 119 1170/1

[7] *Inspection And Cleaning Of Optical Connectors*, 1/1020-FEA 206 8203/1