ERICSSON

SmartEdge 400 Router Hardware Guide

Release 11.1

INSTALLATION

26/153 30-CRA 119 1170/1 Uen F

Contents

1 Site Preparation

Select the installation site for the SmartEdge® 400 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	EN61000-4-2	GR-1089-CORE
IEC60950	CISPR 22 Class A	EN61000-4-3	
EN60950	VCCI Class A	EN61000-4-4	
AS/NZS 60950	EN55022, Class A	EN61000-4-5	
	EN61000-3-2	EN61000-4-6	
	AS/NZA 3548 Class A	EN61000-4-11	
		EN50 082-1 (1997)	

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

Caution!

Risk of equipment damage. The intrabuilding ports of the line cards are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding ports of the line cards must not be metallically connected to interfaces that connect to the outside plant (OSP) or its wiring. These interfaces are designed for use with intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring.

Note: The SmartEdge 400 is suitable for installation in Network Telecommunication Facilities and as part of the Common Bonding Network (CBN).

1.2 Electrical Specifications

Table 2 Electrical Specifications

Requirement	Value
Input nominal voltage	–48 VDC
Input voltage range	–40 VDC to –57.5 VDC(1) 85 VAC to 264 VAC 47 to 63 Hz
Input power, maximum	768 watts(2)
Input current rating per feed	16.7 ADC @ –48 VDC
Source DC power requirements	• Sufficient to supply the rated input current • Local codes apply
Number of power of supplies required (non-redundant and redundant)	• 2: 1 from battery plant A • 1 from battery plant B

(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.
(2) The input power for the line cards and fan tray is the same for both AC and DC versions.

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

Each DC power connection must be able to supply a minimum of 20 amperes. DC power connections require copper wire of a size suitable for the installation 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. A DC-powered system uses –48 VDC power, is powered from a fuse panel, and can be damaged by overloaded circuits. To reduce the risk, 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.

AC power connections require one or two separate circuits (the second circuit for power redundancy) with 15-ampere circuit breakers. Do not connect any other equipment to a circuit to which the SmartEdge 400 router is connected.

Table 3 Operating and Inrush Current for Line Cards at –48 VDC

Component	Operating Current	Inrush Current(1)
ATM OC-3c/STM-1c (8-port)	2.98	0.55

Table 3 Operating and Inrush Current for Line Cards at –48 VDC

Component	Operating Current	Inrush Current(1)
ATM OC-12c/STM-4c (2-port)	2.98	0.55
POS OC-3c/STM-1c (8-port)	2.10	1.10
POS OC-12c/STM-4c (4-port)	2.16	1.10
POS OC-48c/STM-16c (4-port)	3.25	1.10
OC-192c/STM-64c (1-port)	1.80	10.52 (max duration is 28 ms)
Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port)	2.80	0.82 (max duration is 52 ms)
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	2.80	0.62 (max duration is 28 ms)
Gigabit Ethernet 1020 (10-port)	2.95	14.20 (max duration is 20 µs)
Gigabit Ethernet 1020 (20-port)	3.70	12.40 (max duration is 20 µs)
Gigabit Ethernet (5-port)	2.30	1.46 (max duration is 25 ms)
Gigabit Ethernet DDR (10-port)	2.65	0.74 (max duration is 28 ms)
10 Gigabit Ethernet (1-port)	2.72	10.52 (max duration is 20 µs)
10 Gigabit Ethernet/OC-192c DDR (1-port)	2.65	0.72 (max duration is 25 ms)

(1) Inrush current occurs during power on or during the installation of a component in a powered-on chassis. Unless noted, maximum duration is 4 ms.

Table 4 Operating and Inrush Current for Chassis Components at –48 VDC

Component	Operating Current	Inrush Current(1)
XCRP4 (active or standby)	2.21	0.52 (max duration is 25 ms)
Advanced Services Engine	2.68	1.20 (max duration is 120 ms)
Alarm card	20 mA	N/A
Fan tray (nominal speed)	0.44	1.46
Fan tray (high speed)	1.76	1.46

(1) Inrush current occurs during power on or during the installation of a component in a powered-on chassis. Unless noted, maximum duration is 4 ms.

1.3 Environmental Requirements

The installation area for the SmartEdge 400 hardware must allow the following clearances:

- A minimum of 6.0 inches (15.2 cm) at the back of the chassis (for cable routing)
- A minimum of 4.5 inches (11.4 cm) at the right side of the chassis (for ventilation)
- A minimum of 20.0 inches (50.8 cm) at the front of the chassis (for maintenance and ventilation)

Caution!

Risk of equipment damage. A SmartEdge router can be damaged by lack of proper cooling and ventilation. To reduce the risk, 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.

Because the cooling air exits on the right side of the chassis, this area to the front and rear of the chassis must not be blocked; nor must exhaust air from other equipment blow into the SmartEdge 400 chassis in this area.

Table 5 Environmental Requirements

Specification	Value
GR-3028-CORE equipment class	(S) F-SR
Cooling	Forced air (fan cooled)
Operating temperature, nominal	41° to 104°F (5° to 40°C)
Operating temperature, short term(1)	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)
Earthquake	Telcordia 63-CORE Zone 4-compliant
Thermal dissipation, maximum	768 watts (2,621 BTU/hour)

(1) 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 6 SmartEdge 400 Physical Specifications

Mechanical Specification	Value
Chassis dimensions	8.75 inches (22.3 cm) height 17.50 inches (44.50 cm) width 13.75 inches (34.9 cm) depth
Chassis weight	28.0 lb (12.7 kg) all line card slots empty 47.0 lb (21.3 kg) all card slots filled, ready for installation
Chassis mounting	19- or 23-inch rack
Total slots	6
Traffic card slots	4

Table 6 SmartEdge 400 Physical Specifications

Mechanical Specification	Value
Common equipment slots	2
Card dimensions	9.75 inches (24.80 cm) height 12.73 inches (32.30 cm) depth

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

Table 7 SmartEdge 400 Connections

Line Card Connections	Connector Type
ATM OC-3c/STM-1c (8-port)	LC, front chassis access
ATM OC-12c/STM-4c (2-port)	LC, front chassis access
POS OC-3c/STM-1c (8-port)	LC, front chassis access
POS OC-12c/STM-4c (4-port)	LC, front chassis access
POS OC-48c/STM-16c (4-port	LC, front chassis access
OC-192c/STM-64c (1-port)	LC, front chassis access
Channelized OC-3/STM-1 (8/4-port) OC-12/STM-4 (2/1-port)	LC, front chassis access
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	MRJ21 (FE ports), RJ-45 (GE ports), front chassis access(1)
Gigabit Ethernet 1020 (10-port)	LC, front chassis access
Gigabit Ethernet 1020 (20-port)(2)	LC, front chassis access
Gigabit Ethernet (5-port	LC, front chassis access
Gigabit Ethernet DDR (10-port)	LC, front chassis access
10 Gigabit Ethernet (1-port)	LC, front chassis access
10 Gigabit Ethernet/OC-192c DDR (1-port)	LC, front chassis access
Operations Connections	**Connector Type**
Management workstation (LAN)	RJ-45, front chassis access
Craft console (RS-232)	DB-9, front chassis access
External Timing, Primary and Secondary (DS-1 or E-1)	DB-9, rear chassis access
Status/Ctl(3)	DB-37, rear chassis access
Power	Terminal block with 8-32 screws, rear chassis access
Chassis ground	1/4-20 terminal studs, rear chassis access

(1) The front panel has 5 MRJ21 connectors, each supporting 12 FE ports; a breakout cable, which uses RJ-45 connectors for the individual ports, is available from Ericsson.
(2) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE1020 line card.
(3) The SmartEdge OS does not support this connection.

1.5 Select the Rack

You can mount the SmartEdge 400 chassis in a standard 19- or 23-inch rack. If you use a standard 7-foot 45 rack unit (RU) rack, you can install up to nine SmartEdge 400 chassis in a single rack for maximum density; see Figure 1. If you install an optional AC power tray with each chassis, you can install up to seven chassis in a single rack. If density is not a consideration, you can mount the chassis in a standard 42 RU rack.

The SmartEdge 400 chassis requires five RUs (an RU is 1.75 inches [4.5 cm]); each AC power tray requires an RU; a standalone external fuse panel requires one RU.

Note: Ericsson does not supply fuse panels.

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.

You must install a lower air ramp below the chassis when you install the chassis at the bottom of the rack or when you install other equipment below the chassis

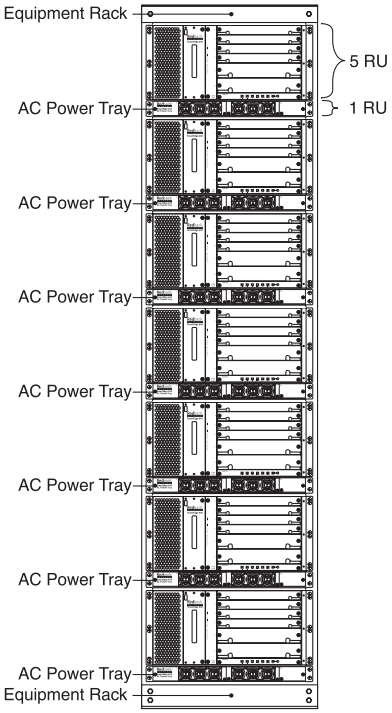


Figure 1 Fully Loaded 45 RU Rack Configuration

1.6 Equipment and Personal Safety Warnings

Warning!

Risk of electrical shock. Always remove the fuses in the fuse panel for all power sources to the chassis power zones (A1 and A2, B1 and B2) 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; there is no power chassis.

Warning!

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

Warning!

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

Caution!

Risk of severe damage to your eyes. Do not stare into the connector or directly view the laser beam emerging from the connector. Keep the connectors covered until you are ready to connect the fiber-optic cables. All versions of the optical cards are Class 1 products, which use lasers to convert electrical signals to optical signals that can damage your eyes.

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 disconnection 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. Disconnect all telecommunications network lines before disconnecting the unit from the ground point. Safe operation of this equipment requires connection to a ground point.

Warning!

Risk of electrical shock. DC power sources 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 console port (labeled “Craft” on the XCRP4 Controller card) is operable until you have configured the Ethernet management port (labeled “ENET MGMT” on the XCRP4 Controller card). 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 console port.

You access the SmartEdge 400 router with a console terminal connected to the Craft 2 port, either directly or through a terminal server.

For more information on configuring the cards, ports, and circuits; see Reference List on page 203.

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 a controller card
- A remote management workstation, using a routed or bridged connection to the Ethernet management port on a controller card
- A local console terminal with a direct connection to the Craft 2 port on a controller card

- A remote console terminal with a connection to the Craft 2 port on a controller card, using a terminal server or modem

For redundancy, we recommend using two different methods (for example, a remote workstation and remote console terminal with a connection to a terminal server). Further, if the configuration of the SmartEdge 400 router includes redundant controller cards, you should use the same means of access to connect each controller card, so that consistent management access, despite a failure, is guaranteed.

1.10 Management Access Options

Table 8 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 2 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 2 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 400 router and the equipment required for installation, you require cables for the following connections:

- Traffic card cables:
  - Optical cards
  - Ethernet and Gigabit Ethernet cards

- Operations cables:
  - Console terminal and management workstation (RS-232, LAN)
  - External timing (one or two, optional)
- Power cables:
  - DC Power (two or four, optional)
  - Chassis ground (one)
  - AC power tray ground (one)

If you intend to build your own cables, see Management Access Cables for cable and connector specifications.

Table 9 Tools Needed for SmartEdge 400 Installation

Tool	Purpose
#1 Phillips screwdriver	Install cards.
#2 Phillips screwdriver	Attach the mounting brackets to the chassis. Install the chassis in the rack.
#2 or #3 Phillips screwdriver(1)	Attach the mounting brackets to the chassis and AC power tray. Install the chassis and AC power tray in the rack. Attach DC power cables.
7/16-inch torque wrench	Connect the ground cables.
Cable crimping tool	Secure barrel, open, or ring lugs to the DC power and ground cables.
Trompeter tool	Remove and install DS-3 and E-3 cables.

(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 a port on a controller card or the chassis.

Table 10 Cable Specifications for Management Access Cables

Name	Description	System Connector	Cable Connector	Maximum Distance
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 - 100.0 m

1.12.1 Craft Console Cable

This cable connects a local Craft console to the Craft 2 port on a controller card. The cable is constructed as a straight-through connection between a

DB-9 male connector at the system end and a DB-9 female connector at the computer terminal end.

Table 11 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
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 card; output describes data being transmitted by the controller card.

1.12.2 Ethernet Crossover Cable

This shielded cable connects the Ethernet port on a PC to the Ethernet port on a controller card. Both ends of the cable are terminated in standard RJ-45 eight-pin modular plugs.

Table 12 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

1.12.3 Ethernet Straight Cable

This shielded cable connects the Ethernet port on a controller card to a LAN hub. Both ends of the cable are terminated in standard RJ-45 eight-pin modular plugs.

Table 13 Ethernet Straight Cable Pin Assignments

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

1.13 External Timing Cables

An external timing cable provides a connection from an external synchronization source, such as a building integrated timing supply (BITS) or synchronization supply unit (SSU), to a SmartEdge router. Using two cables, you can connect a SmartEdge chassis to primary and secondary inputs on the external equipment.

Table 14 Cable Specification for External Timing Cable

Interface	Description	Chassis Connector(1)	Cable Connector	Maximum Distance
External Timing	Shielded twisted-pair	DB-9 female	DB-9 male	None

(1) The chassis connectors are on the rear of the chassis.

A cable consists of two individually shielded, twisted-wire pairs: one pair for the synchronization input and another pair for the synchronization output.

Note: The XCRP4 can receive timing data only. The SmartEdge OS does not support the transmission of timing data to another SmartEdge router or any other external equipment.

The nominal impedance of the DS-1 wire pairs is 100 ohms; that of the E1 wire pairs is 120 ohms.

One end of the cable is terminated with a DB-9 male connector; the other end of the cable is left unterminated for attachment to the wire wrap posts of the external equipment. Both of the DB-9 connectors (PRIMARY and SECONDARY) on the rear panel of a SmartEdge chassis have identical pin assignments.

Note: An adapter, available as an option, provides wire wrap pins to allow you to attach a cable without a connector.

To bring a signal from external equipment into a SmartEdge system:

- For the DS-1 interface (BITS):

You must connect the DS-1 output of the external equipment to pins 2 and 6 of the DB-9 connector on the rear panel of the SmartEdge chassis. The polarity of the signal does not matter. The SmartEdge system accepts a standard BITS source transmitting a framed-all-ones pattern at the DS-1 rate of 1.544 Mbps.

- For the E1 interface (SSU):

  You must connect the E1 output of the external equipment to pins 2 and 6 of the SSU DB-9 connector on the rear panel of a SmartEdge chassis. The polarity of the signal does not matter. A SmartEdge system accepts a standard synchronization source transmitting an HDB3-encoded, framed-all-ones pattern at the E1 rate of 2.048 Mbps.

Table 15 External Timing Cable Pin Assignments

Signal Name(1)	**Color**	**Notes**
Shield	Bare Wire	Frame ground connection
External equipment input (+)	White	Twisted pair with pin 6
–	–	No connection
External equipment output (+)	White	Twisted pair with pin 9
Shield	Bare Wire	Frame ground connection
External equipment input (–)	Blue	Twisted pair with pin 2
–	–	No connection
–	–	No connection
External equipment output (–)	Orange	Twisted pair with pin 4

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

1.14 Line Card Cable Specifications

Table 16 Cable Specifications for Line Cards

Transceiver Type	**Description**	**Card Connector**(1)	**Cable Connector**	**Maximum Distance**
ATM OC-12c/STM-4c (any version)	Single-mode fiber	LC female	LC male	9.3 mi - 15.0 km
ATM OC-3c-STM-1c SR-0	Multimode fiber 62.5/125 µm	LC female	LC male	1.2 mi - 2.0 km
ATM OC-3c-STM-1c IR-1	Single-mode fiber 9/125 µm	LC female	LC male	9.3 mi - 15.0 km
Advanced Services Engine	Category 5 shielded twisted-pair	RJ-45 female	RJ-45 male	328.1ft - 100.0 m
10/100 Ethernet	Category 5 shielded twisted-pair Ethernet straight or crossover(2)	RJ-45 male	RJ-45 male	328.1ft - 100.0 m

Table 16 Cable Specifications for Line Cards

Transceiver Type	Description	Card Connector[1]	Cable Connector	Maximum Distance
FE–GE: 10/100 ports	Category 5 UTP braid shielded #24 AWG solid jacket, with copper braid, tin shielded for each port	MRJ21 female	RJ-45 modular plug, shielded, male	328.1ft - 100.0 m
FE–GE: 100/1000 ports	Category 5 shielded twisted-pair	RJ-45 male	RJ-45 male	328.1ft - 100.0 m

(1) The SC connectors on the card are type SC/PC; cable and card connectors must match.
(2) See Table 19to determine which cable, straight or crossover, is suitable; the cable must be grounded at both ends.

1.15 Transceiver-Based Gigabit Ethernet Line Card Cables

Table 17 Cable Specifications for Transceiver-Based Gigabit Ethernet Line Cards

Line Card	Description	Card Connector[1]	Cable Connector	Maximum Distance
SX GBIC transceiver	Multimode fiber 62.5/125 µm	SC female	SC male	1,804.4 ft - 550.0 m
	Multimode fiber 50/125 µm	SC female	SC male	656.2 ft - 200.0 m
TX transceiver	4-pair, Category 5 shielded twisted-pair[2]	RJ-45	RJ-45	328.1 ft - 100.0 m
LX GBIC transceiver	Single-mode fiber 9/125 µm	SC female	SC male	6.2 mi - 10.0 km
LX70 GBIC transceiver	Single-mode fiber 9/125 µm	SC female	SC male	43.5 mi - 70.0 km
SX SFP transceiver	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
LX SFP transceiver	Single-mode fiber 9/125 µm	LC female	LC male	6.2 mi - 10.0 km
ZX SFP transceiver	Single-mode fiber 9/125 µm	LC female	LC male	49.7 mi - 80.0 km[3]
SR/SW XFP transceiver	Multimode fiber 50/125 µm	LC female	LC male	984.4 ft - 300.0 m
LR/LW XFP transceiver	Single-mode fiber 9/125 µm	LC female	LC male	6.2 mi - 10.0 km
ER XFP transceiver	Single-mode fiber 9/125 µm	LC female	LC male	24.9 mi - 40.0 km
ZR XFP transceiver[4] [5]	Single-mode fiber 9/125 µm	LC female	LC male	49.7 mi - 80.0 km
DWDM transceiver[6][7]	SMF fiber 9/125 µm	LC female	LC male	49.7 mi - 80.0 km

(1) The SC connectors on the card are type SC/PC; cable and card connectors must match.
(2) To comply with GR-1089 intrabuilding lightning surge requirements, intrabuilding wiring must be shielded, and the shield for the wiring must be grounded at both ends.
(3) When the port level lossless flow control is enabled, the distance reach is limited to 43.5 mi (70.0 km).
(4) The ZR XFP transceiver is a multi-rate device and can be used in the 10GE line card and the SONET OC-192c/STM-64c LR line card.
(5) Use part number XFP-OC192-LR2 when ordering the XFP transceivers with 10GE ZR functionality.
(6) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(7) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35, 36, 37, 53, and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

1.16 Transceiver-Based SONET/SDH Line Card Cables

Table 18 Cable Specifications for the SONET/SDH Line Cards

Transceiver Type	Description	Card Connector[1]	Cable Connector	Maximum Distance
SR / SM[2]	Single-mode fiber 9/125 µm	LC, FC, or SC female	LC, FC, or SC male	1.2 mi - 2.0 km
IR / SM[2]	Single-mode fiber 9/125 µm	LC female	LC male	9.3 mi - 15.0 km
IR-2 / SM (with XFP transceiver)	Single-mode fiber 9/125 µm	LC female	LC male	24.9 mi - 40.0 km
LR-1 / SM	Single-mode fiber 9/125 µm	LC female	LC male	24.9 mi - 40.0 km
LR-2 / SM	Single-mode fiber 9/125 µm	LC female	LC male	49.7 mi - 80.0 km

(1) The SC connectors on the card are type SC/PC; cable and card connectors must match.
(2) Use part number RDH90159/1 (SFP-ATM-OC3-SR-IR) when ordering SFP transceivers with OC-3 SR-0 or OC-3 IR-1 functionality.

1.17 10/100 Ethernet and Fast Ethernet–Gigabit Ethernet Cables

The choice of an Ethernet straight or crossover cable for a port on the 10/100 Ethernet card depends on the equipment to which it is being connected.

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 10/100 Ethernet line card wiring is cross-connected like a switch or hub; this condition is denoted with the label “X” by each port.

1.17.1 10/100 Ethernet Crossover Cable Pin Assignments

Both ends of this shielded and grounded cable are terminated in standard RJ-45 eight-pin modular plugs.

Table 20 10/100 Ethernet Crossover Cable Pin Assignments

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

Table 20 10/100 Ethernet Crossover Cable Pin Assignments

Signal Name	Pin	Notes
Tx (–)	2	–
–	–	Termination network
–	–	Termination network

1.17.2 10/100 Ethernet Straight Cable Pin Assignments

Both ends of this shielded and grounded cable are terminated in standard RJ-45 eight-pin modular plugs.

Table 21 10/100 Ethernet Straight Cable Pin Assignments

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

1.17.3 Fast Ethernet Breakout Cable Pin Assignments

Table 22 Fast Ethernet Breakout Cable Pin Assignments

Port	MRJ21 Pins	RJ-45 Pins	Colors		Port	MRJ21 Pins	RJ-45 Pins	Colors
1	1 2 13 14	1 2 3 6	White/Blue Blue/White White/Orange Orange/White		7	29 30 41 42	1 2 3 6	Black/Green Green/Black Black/Brown Brown/Black
2	3 4 15 16	1 2 3 6	White/Green Green/White White/Brown Brown/White		8	31 32 43 44	1 2 3 6	Black/Gray Gray/Black Yellow/Blue Blue/Yellow
3	25 26 37 28	1 2 3 6	White/Gray Gray/White Red/Blue Blue/Red		9	9 10 21 22	1 2 3 6	Yellow/Orange Orange/Yellow Yellow/Green Green/Yellow
4	27 28 39 40	1 2 3 6	Red/Orange Orange/Red Red/Green Green/Red		10	11 12 23 24	1 2 3 6	Yellow/Brown Brown/Yellow Yellow/Gray Gray/Yellow

Table 22 Fast Ethernet Breakout Cable Pin Assignments

Port	MRJ21 Pins	RJ-45 Pins	Colors		Port	MRJ21 Pins	RJ-45 Pins	Colors
5	5 6 17 18	1 2 3 6	Red/Brown Brown/Red Red/Gray Gray/Red		11	33 34 45 46	1 2 3 6	Violet/Blue2 Blue/Violet Violet/Orange Orange/Violet
6	7 8 19 20	1 2 3 6	Black/Blue Blue/Black Black/Orange Orange/Black		12	35 36 47 48	1 2 3 6	Violet/Green Green/Violet Violet/Brown Brown/Violet

2 Installing the Hardware

Stop!

The SmartEdge 400 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.

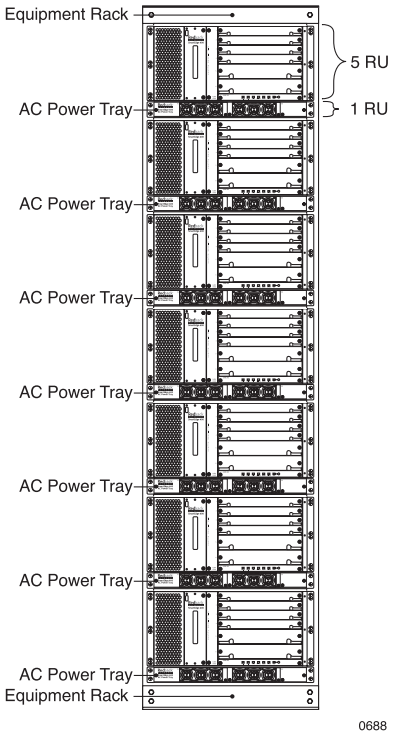


Figure 2 Fully Loaded 45 RU Rack Configuration

To install system hardware:

1. Install an external fuse panel.

   Use either a stand-alone unit or one incorporated in a DC power supply system, or use a circuit breaker panel. We recommend that the panel provide separate connectors for all power zones (A1, A2, B1, B2.)

2. Select the chassis position in the rack:

a The SmartEdge 400 chassis requires five rack units (RUs). (An RU is 1.75 inches [4.5 cm].) If you install the optional AC power tray, it must be installed immediately below the chassis. An AC power tray requires one RU.

b A standalone external fuse panel requires one RU.

Caution!

Risk of equipment damage. In a rack that has not been stabilized, the chassis can cause a rack to overbalance. To reduce the risk, 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.

Determine alignment and install the chassis mounting brackets:

a Flush mount—The front of the chassis (the cable management bracket) extends approximately 2.5 inches (6.4 cm) beyond the front of the rack. Extended mount—The chassis with the cable management bracket extends approximately 5.8 inches (14.7 cm) beyond the front of the rack.

b Because the fan tray and cable tray extend beyond the front of the rack in any of the four mounting positions, a rack with a front door might not suit the installation unless the door is removed.

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

d The chassis can be mounted front- or rear-facing in any of the mounting positions.

e Brackets for the 23-inch rack are not shipped with the chassis but are available in the bracket spares kit (SXK 109 8786/1).

2.1 Installing the Chassis Mounting Brackets

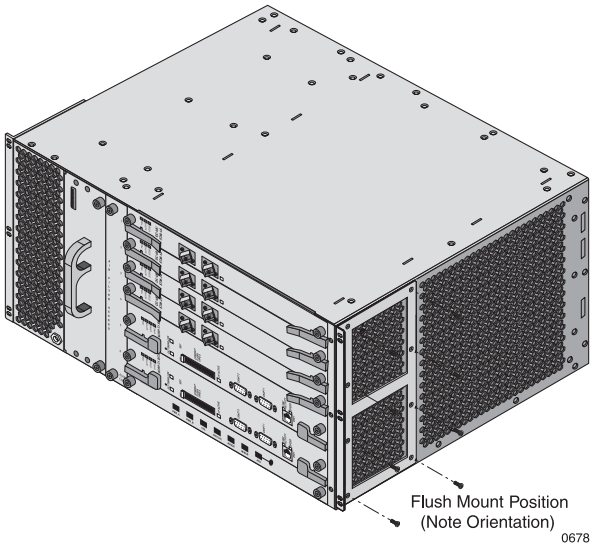


Figure 3 Installing Chassis Brackets for Flush Mount Position

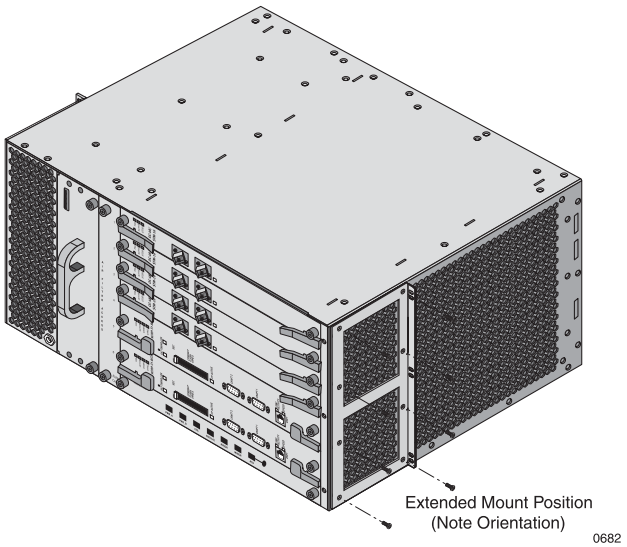


Figure 4 Installing Chassis Brackets for Extended Mount Position

A pair of chassis mounting brackets, for 19-inch and 23-inch racks, are shipped with the chassis. Each bracket requires eight 10-32 x 0.25-inch screws, which are shipped with the brackets.

Note: Brackets for the 23-inch rack are not shipped with the chassis but are available in the bracket spare kit.

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 400 chassis and the brackets to the rack can damage 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, according to the mounting option you have selected. Refer to the proper orientation for installing the brackets in Figure 3 and Figure 4.
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 Installing the Chassis

Warning!

Risk of personal injury. A fully loaded chassis weighs almost 50 lb (23 kg) and can cause injury if one person attempts to lift or move it. To reduce the risk, do not lift or move the chassis without the aid of another trained person; always follow the procedures at this installation site for safely lifting heavy objects.

Caution!

Risk of equipment damage. Do not grasp the power safety cover, the cable tray, the opening for the fan tray, or any slot opening as a handhold when lifting or lowering the chassis. None of these components nor any opening can bear the strain induced by the chassis weight. Always grasp the chassis by its underside edges and not by the covers or the interior partition.

Perform the following steps when only two installers are available to install the chassis. In this scenario, the two installers lift the chassis into the rack; then

one installer steadies it from the rear while the second installer inserts and tightens the rack mounting screws.

To install the SmartEdge 400 chassis in the rack:

1. Before you begin, you need six 12-24 or equivalent screws.
2. Move the heavy-duty cart so that the rear of the chassis is closest to the rack.
3. Remove the fan tray:
4. Using a Phillips screwdriver, loosen the captive screw on the front of the unit.
5. Gently slide it from the chassis and set it aside.
6. With one engineer holding the chassis in place, use a Phillips screwdriver to secure the chassis to the rack with six 12-24 or equivalent screws; tighten each screw to a maximum torque of 30.0 inch-lbs (3.4 Newton-meters).

2.3 Installing the Cable Management Brackets

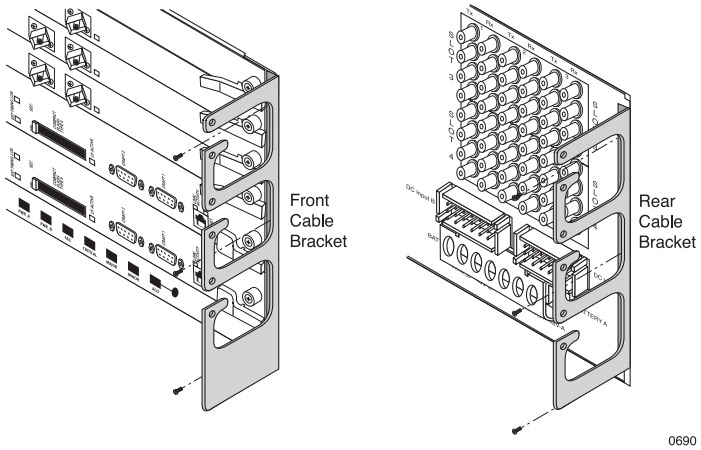


Figure 5 Installing the Cable Management Brackets

The SmartEdge 400 router is shipped with a pair of cable management brackets; the bracket for the front of the chassis is approximately 1.0 in (2.54 cm) longer than the bracket for the rear of the chassis. When installed at the front of the chassis, a single bracket accommodates both fiber-optic and nonfiber cables.

To install the bracket for the front of the chassis, align it with the three screw holes at the right side of the chassis and secure it with three 10-32 x 0.25-inch screws provided with the bracket; tighten each screw to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters); see Figure 5.

The cable management bracket for the rear of the chassis routes the DC power cables and the DS-3 and E3 cables attached to the BNC connectors; you can install the bracket on either side of the chassis.

To install the bracket, align it with the three screw holes at the right or left side of the rear of the chassis and secure it with three 10-32 x 0.25-inch screws provided with the bracket; tighten each screw to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters); see Figure 5, which illustrates the installation on the right side of the chassis.

2.4 Mounting the AC Power Tray

The AC power tray provides slots for two AC power supplies; it allows a SmartEdge 400 router to be installed at a site for which DC power sources are not available. An AC power supply connects to the SmartEdge 400 chassis with a pair of AC power tray jumper cables using connectors on the rear of the AC power tray.

If you do not install the optional AC power tray, you must install or have available an external fuse panel, either a standalone unit or incorporated in a DC power supply system, or circuit breaker panel, to be used with the SmartEdge 400 router. We recommend that the panel provide separate A-side and B-side power connectors, so that the power redundancy provided by the SmartEdge 400 architecture can be used.

2.4.1 Install AC Power Tray Mounting Brackets

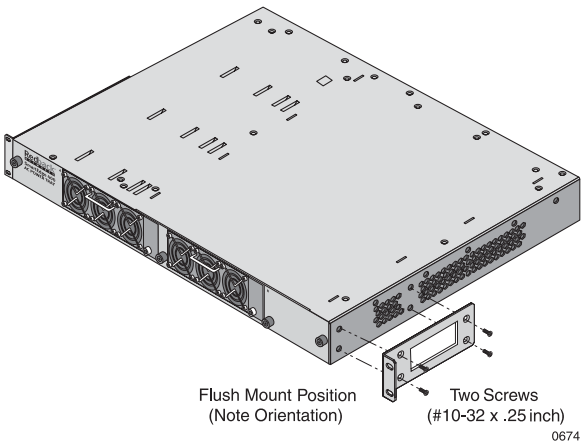


Figure 6 Installing AC Power Tray Brackets for Flush Mount Position

Two pairs of mounting brackets, for 19-inch and 23-inch racks, are shipped with the AC power tray. Each bracket requires two 10-32 x 0.25-inch screws, which are shipped with the brackets.

To install either version of the mounting brackets for the AC power tray:

1. Position a mounting bracket against one side of the AC power tray, lining up the screw holes in the bracket with the screw holes in the side of the AC power tray. Ensure that the bracket position corresponds to the position of the chassis mounting brackets. Figure 6 and Figure 7 illustrate the proper orientation for installing the brackets.

2. Using a Phillips screwdriver, secure the bracket to the AC power tray with the 10-32 x 0.25-inch screws provided with the brackets; tighten each screw to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).

3. Repeat Step 1 and Step 2 to install the second bracket on the other side of the AC power tray.

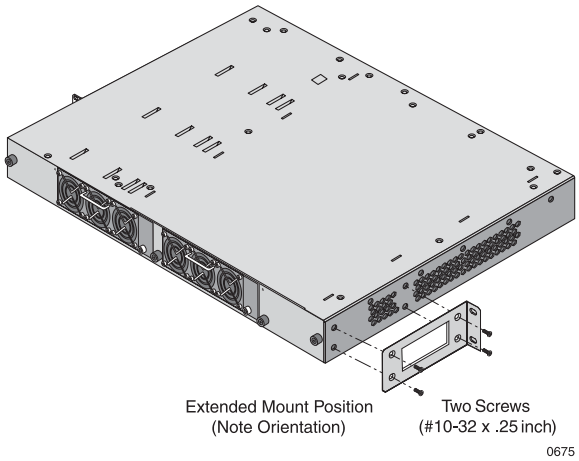


Figure 7 Installing AC Power Tray Brackets for Extended Mount Position

2.4.2 Install the AC Power Tray

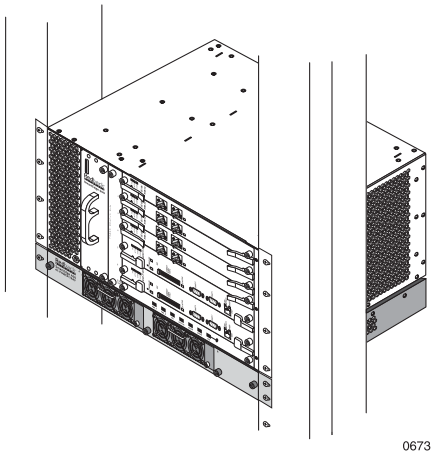


Figure 8 Positioning an AC Power Tray

You mount the AC power tray directly below the chassis. To install the AC power tray in the rack, you need four 12-24 or equivalent screws. Perform the following steps; see Figure 8

1. Position the AC power tray directly below the SmartEdge 400 chassis so that the screw holes in the AC power tray mounting brackets are aligned with the screw holes in the rack just below the chassis.

2. Using a Phillips screwdriver, secure the AC power tray 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).

2.5 Connecting Ground Cables and C-Brackets

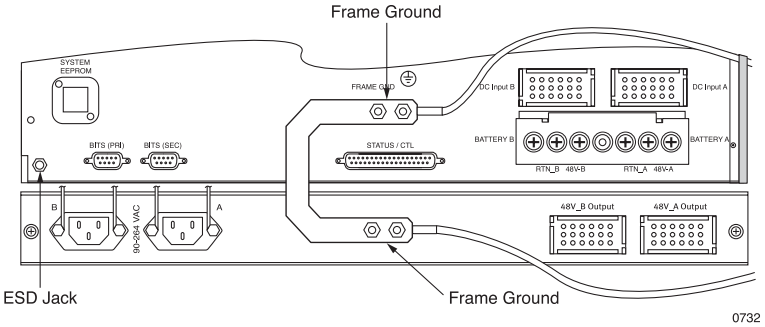


Figure 9 C-Bracket and Ground Cable Connections

The back panels of the SmartEdge 400 chassis and the AC power tray each have a pair of 10-32 studs, which are used to attach a ground cable to each unit; if the AC power tray is installed, the studs are also used to attach a C-bracket that provides additional stability for the AC power tray in the event of an earthquake. The C-bracket installation is required only if the chassis and AC power tray are installed in a 23-inch rack.

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

The ground cables must be of a size suitable for the installation, 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.

Note: The size of the ground cable, if installed in a Central Office, must be 6 - 8 AWG, or greater. If the connector cannot handle this, the ground cable must be the same AWG as the power conductors.

To connect a 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. Place the connector over the studs at the rear of the chassis or AC power tray.

3. Secure the connection with a pair of lug nuts; with a 7/16-inch torque wrench, tighten the lug nuts to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).

4. 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.

Caution!

Risk of equipment damage. Effective grounding of the chassis or AC power tray depends on the ground cable connector being in full contact with the chassis or AC power tray. To reduce the risk of ineffective grounding, always install the ground cables first and secure them with lugs before installing the C-bracket.

To install the C-bracket:

1. Place the bracket over the studs on both back panels with the open end of the bracket on the right; slide the bracket over the studs until it is in full contact with the ground cable lug nuts on both back panels.

2. Secure the connection with a pair of lug nuts on each back panel; with the torque wrench, tighten the lug nuts to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters), see Figure 9.

2.6 Connect DC Power Sources

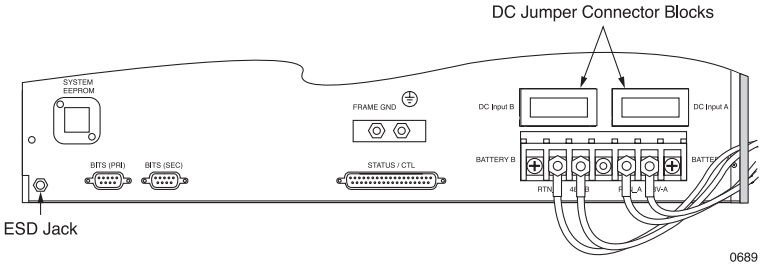


Figure 10 DC Power Connections

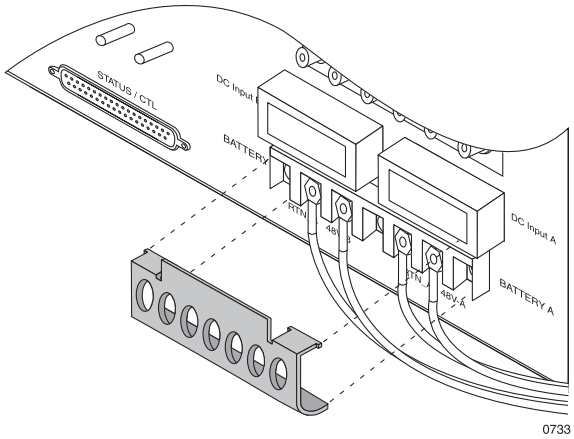


Figure 11 Installing the Plastic Safety Cover

The SmartEdge 400 chassis has four #8 terminal screws on the rear of the chassis for A-side and B-side DC power cables for full power redundancy. 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 terminal screws are labeled “RTN_A”, “48V-A”, “RTN_B”, and “48V-B”. Each power cable must be of a size suitable for the installation and installed in accordance with the National Electrical Code (in the United States) or applicable local jurisdiction (outside the United States) installation requirements.

The following DC power source warnings and cautions apply when connecting DC power sources:

Warning!

Risk of electrical shock. The system uses DC power sources, which can cause severe injury. To reduce the risk, 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.

Warning!

Risk of electrical shock. 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. To reduce the risk, 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.

Warning!

Risk of electrical shock. Safe operation of this equipment requires connection to a ground point. To reduce the risk of 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. To reduce the risk, verify that the power sources for the SmartEdge router meet the power specifications, and ensure that DC power cables meet the specifications provided in the “Physical Specifications” section in the same chapter before connecting the power cables.

Warning!

Risk of electrical shock. After the power cables are connected to the chassis and the fuse panel, the system is fully powered on; there is no power switch. To reduce the risk, always remove the fuses for both the A-side and B-side power sources in the fuse panel before connecting the power cables to the chassis.

Warning!

Risk of electrical shock. Improper grounding can result in an electrical shock. To reduce the risk, 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. To reduce the risk, 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.

Caution!

Risk of equipment damage. You can permanently damage the chassis if you attempt to apply DC power to it and the DC power plugs are not installed in the connectors on the rear of the chassis. To reduce the risk, ensure that the plugs are installed as described in the following procedure.

Note: In Figure 10, the SmartEdge 400 has isolated DC return (DC-I). The –48V return terminal for each power source is not connected to the frame ground.

To connect the DC power cables; see Figure 10

1. Ensure that the DC jumper connector blocks are installed.

   To enable either or both DC power connections, a DC jumper connector block are installed in the connectors labeled “DC Input A” and “DC Input B”. Both blocks are installed even if you are connecting only one DC power source. The chassis is shipped with these blocks installed.

2. Connect the negative power cable as follows:

   a Using a crimping tool, attach a ring or open lug to one end of a power cable. This step is optional.

   b If you have attached a ring lug to the DC power cable, remove the plastic safety cover over the terminal block; the cover is attached by tension only.

   c Using a Phillips screwdriver, loosen the terminal screw labeled “–48V” on the left side (the A-side) of the power tray.

   d Thread the power cable through the cable guide at the side of the chassis.

e Connect the cable; perform one of the following actions, depending on the type of lug:

a Ring lug—Remove the terminal screw and place the ring lug over the terminal screw hole; then insert and partially tighten the screw to hold the cable in place.

b Open lug or bare wire—Loosen the terminal screw and slide the ring lug or bare wire under the screw; then partially tighten the screw to hold the cable in place.

3. With the Phillips screwdriver, tighten the screw to a maximum torque of 10.0 inch-lbs (1.1 Newton-meters).

4. Repeat Step 2 to connect the positive power cable to the connector labeled “RTN”.

5. If you are connecting dual power sources, repeat Steps 2 and 3 to connect the power cables to the terminal screws labeled “RTN_B” and “48V-B”.

6. If you removed the plastic safety cover, install it over the DC terminal block; see Figure 11.

2.7 Connect AC Power Sources

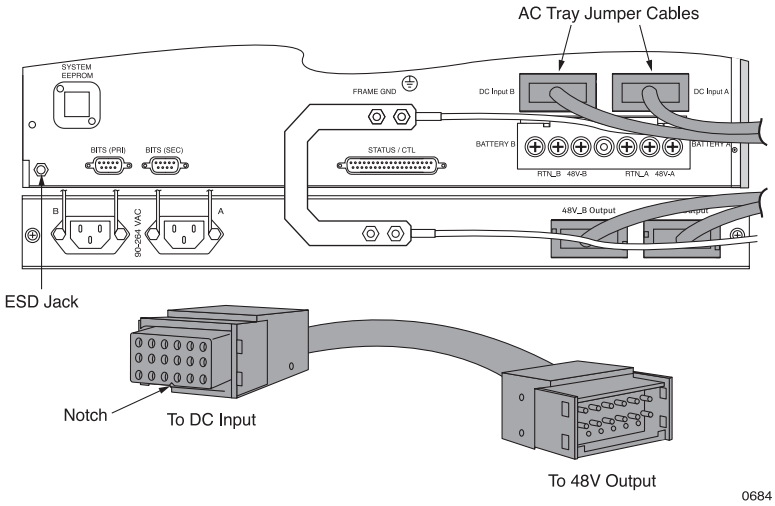


Figure 12 AC Power Connections

To connect the SmartEdge 400 router to AC power sources; see Figure 12

1. Connect the AC power tray to the chassis:

a Remove the DC jumper connector blocks from the connectors labeled “DC Input A” and “DC Input B”.

b Insert one end of an AC tray jumper cable in each of the “DC Input A” and “DC Input B” connectors. The plugs are keyed so that you cannot install them incorrectly; install the plug with the notched side down.

Install both cables, even if the AC power tray contains a single power supply.

c Insert the plug at the other end of each cable in the AC power tray connectors labeled “48V_A Output” and “48V_B Output”, respectively.

2. Install the AC power cords :

a Insert the ends of the retention clips in the openings provided on each side of the AC power cord connectors on the rear of the AC power tray.

b Insert an AC power cord in the connector for an installed power supply on the rear of the AC power tray and pull down the retention clip to secure the plug. (Match the label by the power cord connector with the label by the power supply slot.)

c If the tray includes dual power supplies, repeat steps a and b for the second AC power cord.

Note: If you connect the other end of the AC power cord to a building outlet, you will power on the system; there is no ON/OFF switch on the AC power tray. Do not connect the AC power cords to the building outlets until you have completed the installation.

2.8 Completing the Installation

After the chassis ground and power cables are connected to the chassis, you are ready to install the controller and line cards. If you need help identifying the cards, see the card illustrations provided in Card Descriptions. You then install blank cards in any remaining empty slots.

2.8.1 Select the Slots

Card slots in the SmartEdge 400 chassis are numbered sequentially from left to right as you face the front of the chassis.

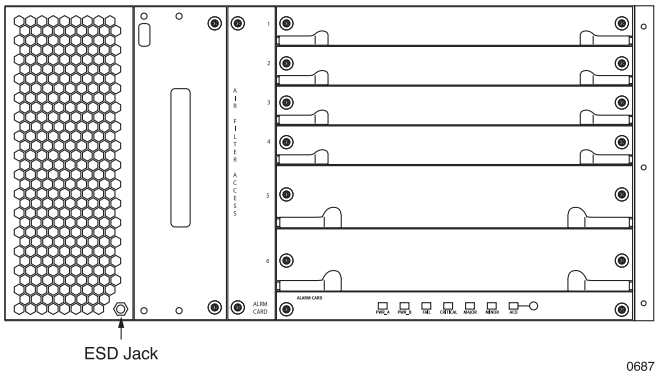


Figure 13 SmartEdge 400 Card Slots

Note: When you first power on the system, the active controller card is in slot 6. Thereafter, the slot changes whenever a switchover occurs.

2.8.2 Install Cards

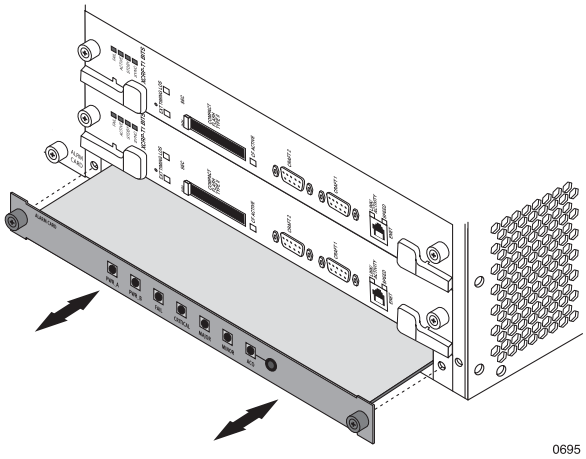


Figure 14 Installing a Line Card

To install a card:

1. Select an available slot for the card:

Table 23 Available Slots

Chassis	Controller Card Slots	Line Card Slots
SmartEdge 400	5 or 6	1 to 4

Caution!

Risk of electrostatic discharge (ESD) damage. To reduce the risk of 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.

---

2. Put on an ESD wrist strap and attach it to an appropriate grounded surface.

3. Loosen the captive screws and remove the current traffic or blank card that is installed in the slot for the new card.

4. Align the new card with the card guides; these are located at the top and bottom of the card slot in the chassis.

Caution!

Risk of equipment damage. When you insert the card, the underside of the card might rub against the electromagnetic interference (EMI) gasket of the adjacent card and potentially damage the card. If the card does not slide smoothly without effort, or if the card touches the components on the adjacent card, do not force the card into the slot. Shift the left edges of the front panel slightly to the right until the card slides easily into the slot.

5. Position the ejector levers away from the front panel and then carefully slide the card into the slot. The ejector levers rotate as the latching mechanisms engage the walls of the slot and the connectors on the card are inserted into the connectors on the backplane.
6. Fully seat the connectors with the backplane by pushing on the ejector levers until they are parallel with the front panel.
7. Tighten the screws on the front panel. Then with the Phillips screwdriver, tighten each screw to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters).
8. Verify the operational status as described in Hardware Control and Troubleshooting
9. Connect and route the cables using the procedures in Cable Management.

Repeat Step 1 to Step 9 for each card to be installed.

2.8.3 Install Blank Cards

When all cards have been installed, insert a blank card into every empty slot, and tighten the captive screws at the top and bottom of the front panel.

Caution!

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

2.8.4 Install Transceivers

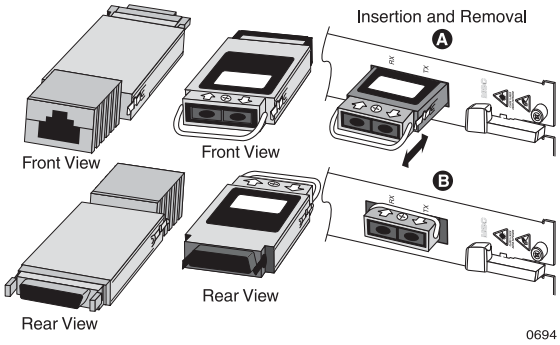


Figure 15 Installing a GBIC Transceiver

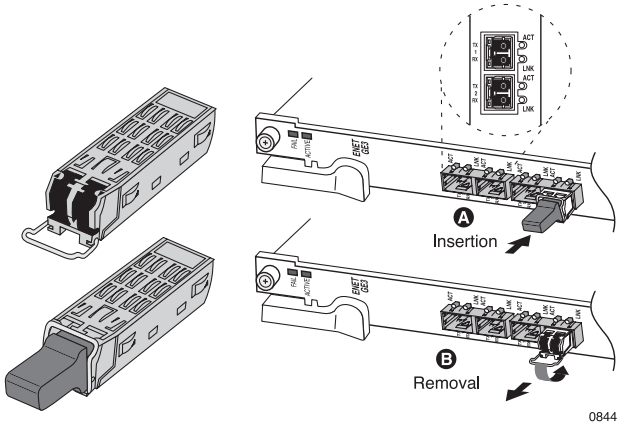


Figure 16 Installing an SFP Transceiver

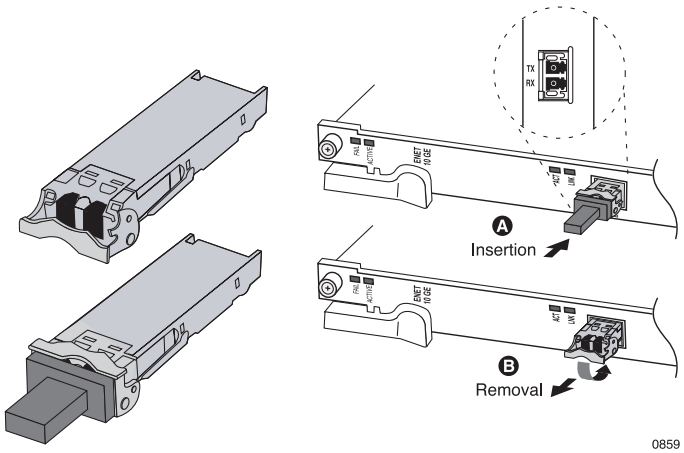


Figure 17 Installing an XFP Transceiver

Gigabit Ethernet ports require a gigabit interface converter (GBIC), a small form-factor pluggable (SFP), or a 10-Gbps SFP (XFP) transceiver in each port; the port on an OC-192c/STM-64c card also requires an XFP transceiver.

Table 24 Transceiver Types for SmartEdge Line Cards

Line Card	Transceiver[1]	Supported Versions
ATM OC-3c/STM-1c (8-port)	SFP	SR-0, IR-1
ATM OC-12c/STM-1c (2-port)	SFP	SR-0, IR-1
POS OC-3c/STM-1c (8-port)	SFP	SR-0, IR-1
POS OC-12c/STM-4c (4-port)	SFP	SR-0, IR-1
POS OC-48c/STM-16c (4-port)	SFP	SR-1, IR-1, LR-2
Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port)	SFP	IR-1
Gigabit Ethernet 1020 (10-port)	SFP	SX, LX, ZX, TX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn[2]
Gigabit Ethernet 1020 (20-port)[3]	SFP	SX, LX, ZX, TX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn[2]
Gigabit Ethernet (5-port)	SFP	SX, LX, ZX, TX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn[2]
Gigabit Ethernet DDR (10-port)	SFP	SX, LX, ZX, TX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn[2]
10 Gigabit Ethernet (1-port)	XFP	SR, LR, ER, ZR, DWDMnn[4]
10 Gigabit Ethernet/OC-192c DDR (1-port)	XFP	SR-1, IR-2, LR-2, SR/SW, LR/LW, ER/EW, ZR/ZW, DWDMnn[4], OTN-DWDMITUnn[4]
SONET OC-192c/STM-64c (1-port)	XFP	SR-1, IR-2, LR-2

(1) If the transceiver has not been qualified for use in the line card, the system displays a warning message.
(2) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(3) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE1020 line card.
(4) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35,36,37,53,and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

Caution!

Risk of data loss. You can corrupt the system if you attempt to install transceivers (GBICs, SFPs, or XFPs) that have not been tested with the SmartEdge line cards. To reduce the risk, install only the transceivers approved by Ericsson.

To install a transceiver of any type:

1. Put on an antistatic wrist strap and attach it to an appropriate 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.

Caution!

Risk of ESD damage. Transceivers contain electrostatic sensitive devices. To reduce the risk of ESD damage, always use an ESD wrist or ankle strap when handling a transceiver. Avoid touching its connector pins.

2. Ensure that the latching mechanism is closed.

3. With the transceiver connectors aligned with the RX and TX labels on the front panel of the line card (as shown in Figure 15, Figure 16, or Figure 17), slide the transceiver into the opening for the port until the rear connector is seated and the locking mechanism snaps into place.

   The labels for the TX and RX connectors vary by vendor. An arrow, which can be incised on the case, usually indicates the traffic direction.

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

2.8.5 Install Compact Flash (CF) Cards

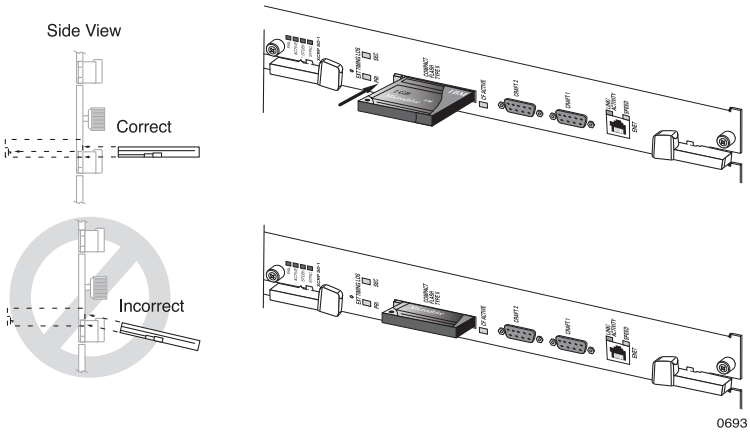


Figure 18 Installing a CF Card

Each controller card has an external slot on the front panel in which you can install an optional Type I or Type II external storage device.

If you install an external storage device in the active controller card, the standby controller card, if installed, must also have an external storage device installed; however, the device types (Type I or Type II) need not match.

Note: The XCRP4 Controller card supports Type I CF cards only.

Caution!

Risk of equipment damage. Do not force the device into its slot. If the device does not slide in easily, one of the following conditions is possible:

The device does not engage the connectors because it is mispositioned. Check the position and alignment as described in step 3. The device does not engage the connectors because it is upside down. Remove the device and rotate it 180°; then try again. The device has been previously damaged so that it cannot align correctly with the slot connectors; remove the device and discard it. Do not use it in any other equipment. The slot connectors have been bent or otherwise damaged by a previous device insertion; you must replace the controller card.

To install a CF card:

1. If you are installing the device in an XCRP4 Controller card, open the door that covers the CF Type 1 slot until it “snaps” open.

2. Hold the device so that its pin-hole side faces the slot in the controller front panel.

3. Horizontally align the device as close to the bottom edge of the slot as possible and perpendicular to it; see Figure 18.

4. Slowly insert the device in the slot. If the device does not engage the connectors with approximately 0.5 inches (1.27 cm) of the device outside the slot, do not continue. Remove the device and repeat this step.

5. If you are installing the device in an XCRP4 Controller card, close the door.

After replacing the CF card, re-seat the XCRP4 Controller card so the Power-on Diagnostic (POD) can run on the XCRP card. For information on the POD, see Section 2.14.1 on page 49.

For more information about the **`format media-device`** and **`mount`** commands, see *Command List* Reference [5].

2.9 Cable Management

Cable management is implemented at the front of the chassis to accommodate both fiber-optic and copper cables. You route cables using the underside of the fan tray for the copper cables and the cable tray for fiber-optic cables. At the rear of the chassis, you route the external timing cables (if they are present) using fixed brackets at the top of the chassis.

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

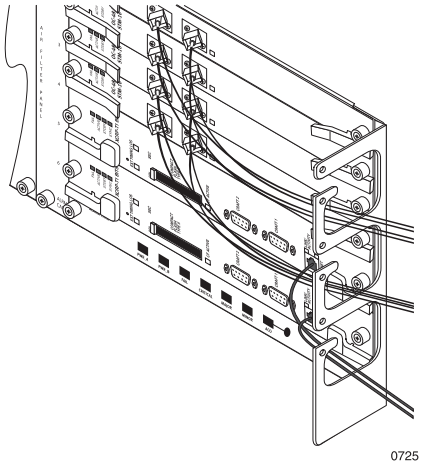


Figure 19 Cable Routing at the Front of the SmartEdge 400 Chassis

Cable connections are made with standard cables.

Caution!

Risk of severe damage to your eyes. All versions of the optical cards are Class 1 products, which use lasers to convert electrical signals to optical signals that can damage your eyes. To reduce the risk when handling these optical cards, keep the connectors covered until you are ready to connect the fiber-optic cables. When you remove a cover, do not stare into the connector or directly view the laser beam emerging from the connector.

Caution!

Risk of damage to fiber-optic cables. These cables are fragile and are easily damaged when bent. To reduce the risk, never step on a cable; never twist it when connecting it to or disconnecting it from a line card.

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

1. Put on an antistatic wrist strap and attach it to an appropriate 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. See Figure 24 for connecting a

management workstation and Figure 25 for connecting a local or remote console. To connect and route the cables:

a Thread the system ends of the cables through the lowest opening in the cable management bracket at the right side of the card slot.

b Insert each cable in the appropriate connector on the card.

c Tie-wrap the cables from each controller card to form a bundle, and then tie each bundle to the rack.

3. Starting with the line card installed in slot 4, connect and route the line card cables; see Figure 19

   a Thread the system ends of the cables through an opening in the cable management bracket at the right side of the card slot. Select an opening that provides space for all cables to be connected to this card.

   b Insert each cable in the appropriate connector on the card.

   c Tie-wrap the cables to form a bundle, and then tie each bundle to the rack.

4. Connect and route the breakout cables for the FE–GE line cards:

   a Thread the MRJ21 connector end of a breakout cable through the cable management bracket at the right side of the card slot.

   b Attach the breakout cable to the right-most connector to be cabled on an FE–GE line card. Position the connector so that the incised label “KEY” on the connector is on the bottom side of the connector as you face the chassis; see Figure 20.

Caution!

Risk of equipment damage. The cable connector is keyed to ensure that you insert it with the correct orientation into the front panel connector. However, it is possible to force an incorrectly positioned cable connector into the connector on the front panel. To reduce the risk of overriding the key, ensure that the incised “KEY” label is on the left side of the connector.

---

   c Tighten the captive screws without letting the front panel support the weight of the cable.

Caution!

Risk of equipment damage. A breakout cable for the 60 10/100 ports on the FE–GE line cards is made of AWG #24 wire and includes individual cables for 12 ports; when connected to the FE–GE front panel, the cable weight can cause the front panel to be separated from the FE–GE printed circuit board. To reduce the risk, never allow the front panel to support the weight of the cable; support the cable and immediately route it before you connect another cable.

d Tie-wrap the breakout cable to the rack so that it supports the weight of the cable.

e Continue to connect and route the breakout cables for the other MRJ21 connectors on the card; see Figure 21.

f Connect and route the cables for the GE ports on the FE–GE card as described in step 3.

Caution!

Risk of equipment damage. You can damage the GE port cables if you thread them through the same opening in the cable management bracket that contains the breakout cables. To reduce the risk, use a different opening in the cable management bracket for the GE port cables.

2.9.2 Connect and Route the Cables at the Rear of the Chassis

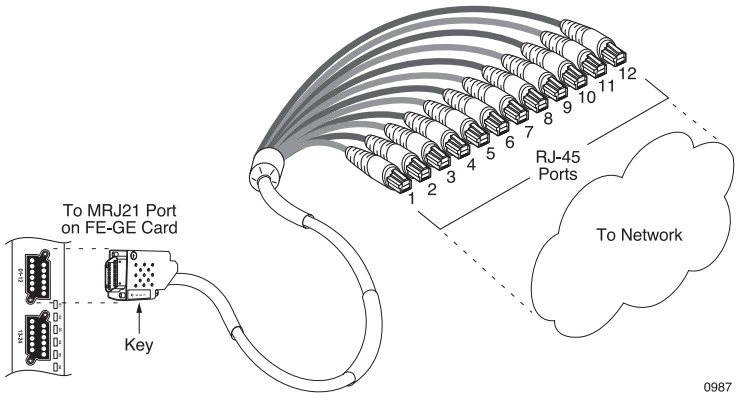


Figure 20 Connecting an FE–GE Breakout Cable

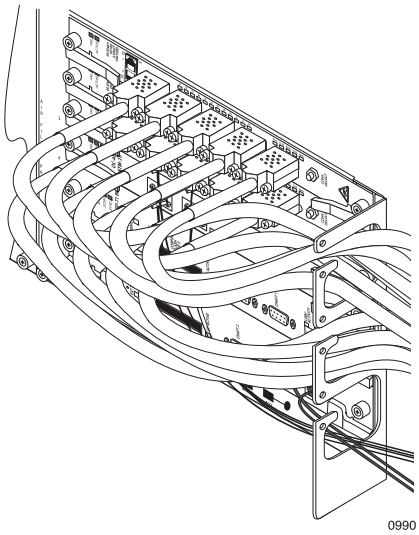


Figure 21 Routing an FE–GE Breakout Cable

Cable connections for the ATM DS-3, DS-3, and E3 ports and to external timing equipment are made with standard cables. Slots and ports for the ATM DS-3, DS-3, and E3 cards are labeled on the rear panel of the chassis.

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

1. Put on an antistatic wrist strap and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located in the lower left corner of the on the rear of the chassis.

2. For ATM DS-3, DS-3, and E3 cards installed in slots 3 and 4, attach the cables to the BNC connectors at the rear of the chassis:

   a Thread the system ends of the cables through the cable management bracket at the left or right side of the chassis.

   b Connect the cables to the BNC connectors; because of the close proximity of the connectors, a Trompeter tool (to insert or extract BNC cables) can help you make the connections; see Figure 22.

   c Gather the BNC cables and tie-wrap them so that each bundle contains both the transmit and receive cables for each port on a single card; then attach the bundles to the cable management bracket.

3. Optional. Connect and route the external timing cables; see Figure 23:

   Attach the DB-9 ends of the external timing cables to the primary and secondary connectors, labeled “Primary” and “Secondary”, at the left rear of the SmartEdge 400 chassis; tie the cables to the rack.

   Note: Support for the status and control port depends on the release of the SmartEdge OS.

4. Tie and route the chassis ground cable and the A-side and B-side DC power cables, if installed, to convenient locations on the rack.

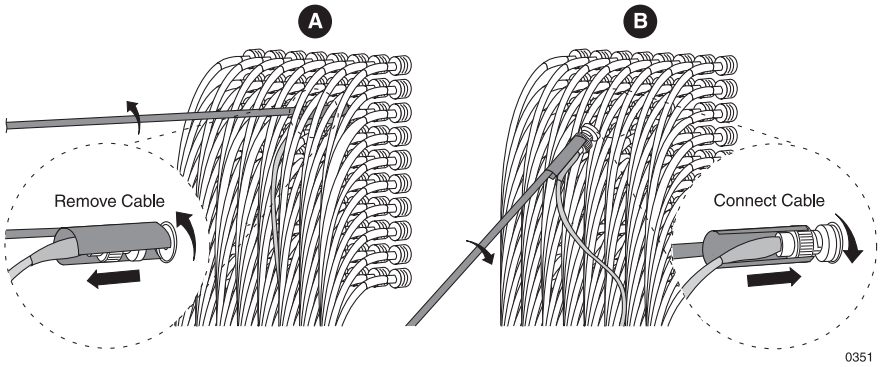


Figure 22 Using a Trompeter Tool

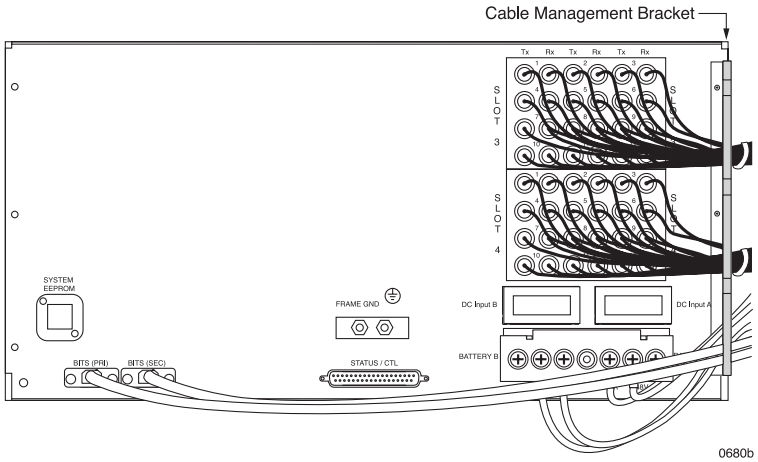


Figure 23 Cable Routing at the Rear of the SmartEdge 400 Chassis

2.9.3 Connect the Cables from the Front of the Chassis

To connect the cables from the front of the chassis:

1. Connect the line card cables to their networks.

2. Ensure that the management access equipment is configured properly according to the specifications given in the “Management Access Options”.

3. Connect the management access cables to the equipment or their networks; perform this step for one or more of these options, depending on the cables you have connected to the system:

   a Management workstation; see Figure 24.

   b Console terminal; see Figure 25.

2.9.4 Connect the Cables from the Rear of the Chassis

To connect the cables from the rear of the chassis:

1. If you have installed any ATM DS-3, DS-3 or E3 cables, connect the female end of each BNC cable to its network.

2. If you have installed external timing cables, attach the unterminated ends of the cables to the wire wrap posts of the external equipment.

3. If you are using AC power, connect the system to its AC power source: insert the AC power cords into the AC power plugs at the rear of the chassis and into the building outlets.

Warning!

Risk of electrical shock. After the power cables are connected to the chassis and the fuse panel, the system is fully powered on; there is no power switch. To reduce the risk, always remove the fuses from the fuse panel or if there is a circuit breaker, switch the circuit breaker to the OFF position, before connecting or disconnecting a power cable.

---

4. If you are using DC power, complete the power connections to the external fuse panel or circuit breaker panel. The procedure for the circuit breaker panel is beyond the scope of this book; to complete the connections to a fuse panel:

   a Remove the fuses for the A-side and B-side connectors on the external fuse panel.

   b Connect the A-side power cables to the A-side –48V and RTN connectors on the external fuse panel.

   c If you are installing redundant power, connect the B-side power cables to the B-side –48V and RTN connectors on the external fuse panel.

You are now ready to power on the system and check the operating status; continue with Hardware Control and Troubleshooting

2.10 Connections for Management Access

Connecting a console terminal or management workstation to the SmartEdge 400 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). When the configuration is complete, you might need to alter the connections for normal operations.

2.10.1 Management Workstation

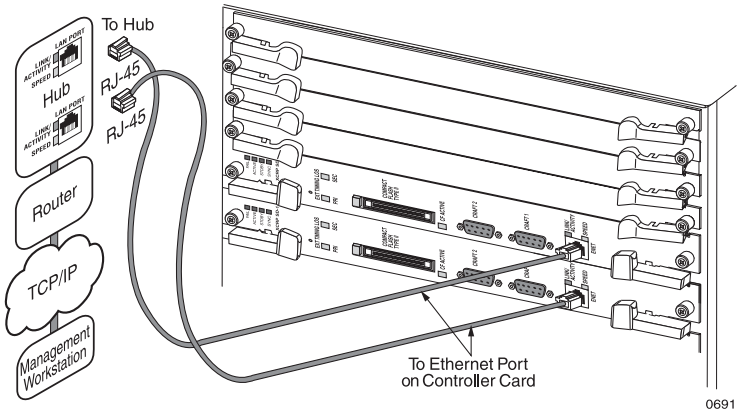


Figure 24 Connections for a Management Workstation

A management workstation is connected to the SmartEdge 400 router using the Ethernet port on the front of a controller card. This type of connection provides access to the SmartEdge OS command-line interface (CLI) after you have configured the port. Figure 24 shows the connections to the Ethernet ports on a pair of controller cards.

Two types of connections are supported:

- Local connection using a shielded Ethernet crossover cable
- Remote connection using a shielded Ethernet straight cable

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

2.10.2 Local or Remote Console Terminal

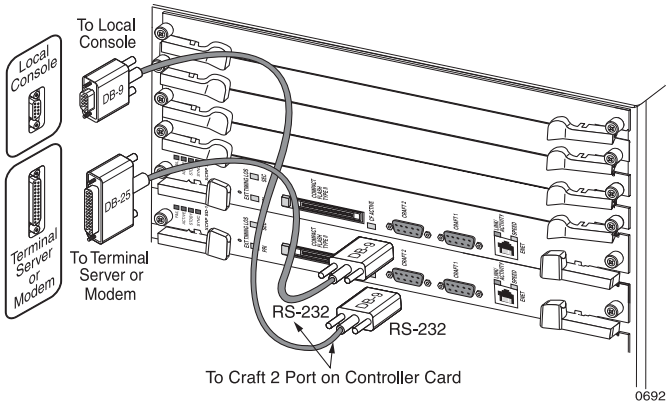


Figure 25 Connections for a Local or Remote Console

A local or remote console terminal is connected to the SmartEdge 400 router using the Craft port on the front of a controller card. This type of connection

provides access to the SmartEdge OS CLI, either directly or through a terminal server. Figure 25 shows the connection to the Craft port.

A null modem is needed when connecting this cable to a modem; it is not needed when connecting it to a PC or terminal server.

This port is always available; all system messages are directed to this port during a power on or reload operation.

Note: When you first power on the system, the active controller card is in slot 6. Thereafter, the slot changes whenever a switchover occurs.

2.11 Connections for Line Card Cables

You connect all line card cables are connected to the front panels of the cards.

Not all ports are enabled on a low-density version of a line card; low density line cards are identified by the label on the lower ejector lever.

Table 25 Port Data for SmartEdge Line Cards

Type of Line Card and Card Description	Physical Ports	Low-Density Version[1]	Low-Density Port Numbers
ATM OC-3c/STM-1c (8-port)	8	No	–
ATM OC-12c/STM-4c (2-port)	2	No	–
POS OC-3c/STM-1c (8-port)	8	No	–
POS OC-12c/STM-4c (4-port)	4	No	–
POS OC-48c/STM-16c (4-port)	4	No	–
OC-192c/STM-64c (1-port)	1	No	–
Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port)	8, 2 4, 1	No	–
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	60, 2	No	–
Gigabit Ethernet 1020 (10-port)	10	No	1, 3
Gigabit Ethernet 1020 (20-port)[2]	20	No	–
Gigabit Ethernet (5-port)	5	No	–
10 Gigabit Ethernet DDR (10-port)	10	No	–
10 Gigabit Ethernet (1-port)	1	No	–
10 Gigabit Ethernet/OC-192c DDR (1-port)	1	No	–

(1) Support for the low-density version of a line card depends on the release of the SmartEdge OS.
(2) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE1020 line card.

2.12 Connections for Advanced Services Card Cables

Table 26 Port Data for Advanced Services Cards

Type of Line Card/Description	Physical Ports[1]	Low-Density Version	Low-Density Port Numbers
Advanced Services Engine	4 (2 for each ASP)[2]	No	–

(1) The SmartEdge OS does not support these ports directly.
(2) These ports are not used for control or data traffic.

2.13 Connections for External Timing Cables

An external timing cable provides a connection from an external synchronization source, such as a building integrated timing supply (BITS) or synchronization supply unit (SSU), to a SmartEdge 400 router. Each cable consists of two individually shielded, twisted wire pairs: one pair for the synchronization input and another pair for the synchronization output.

The XCRP4 can receive timing data only. However, the SmartEdge OS does not support the transmission of timing data to another SmartEdge router or any other external equipment.

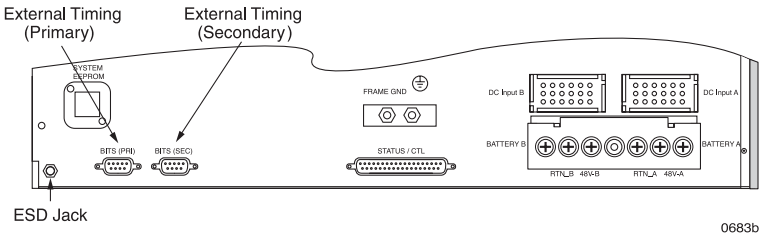


Figure 26 Connections for System Management Cables

Two connections are possible: one from a primary source and one from a secondary source. Either connection can provide timing for the entire chassis (input), regardless of the configuration of the controller cards. See Figure 26 for the location of the connectors for these cables.

An adapter, available as an option, provides wire wrap pins to allow you to attach a cable without a connector.

Note: The SmartEdge OS does not support the status and control port.

2.14 Powering On and Off the System

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. To reduce the risk, 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.

Power on a SmartEdge 400 router by inserting the fuses in the external fuse panel or, if the SmartEdge 400 router is powered by AC power, by connecting each AC power cord to a separate building outlet for a circuit rated at 15A with a 15A circuit breaker. The PWR A and PWR B LEDs on the front of the chassis should light, depending on the power connections you have made, to signify that power is being supplied; see Figure 27.

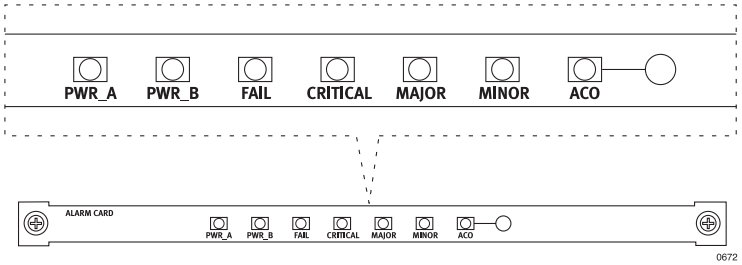


Figure 27 SmartEdge 400 Status LEDs

Table 27 SmartEdge 400 Status LEDs

Label	Activity	Color	Description
PWR A	On	Green	The A-side –48 VDC power source is present.
	Off	None	The A-side –48 VDC power source is absent or outside the under and over voltage limits.
PWR B	On	Green	The B-side –48 VDC power source is present.
	Off	None	The B-side –48 VDC power source is absent or outside the under and over voltage limits.
FAIL	On	Red	A failure exists on the fan tray.
	Off	None	All cards and the fan tray are functional.

The status of the SmartEdge 400 router is indicated by the LEDs that are located on the front of the alarm card.

During the power-on sequence for a SmartEdge router, the line cards are held in low-power mode until the SmartEdge OS determines which slot has the active controller card. After the active controller card (and the standby

controller card, if it is installed) are initialized, the SmartEdge OS initializes the configured line cards starting with the lowest-numbered slot. If a line card is not configured, no power is allocated to it.

If the chassis power capacity is exceeded before all configured cards are initialized, the remaining cards are left in low-power mode. You must manually unconfigure one of the initialized line cards (using the **no** form of the **card** command in global configuration mode) before the SmartEdge OS can initialize these power-denied cards. Because the power capacity check is always performed when line cards are configured from the CLI (using the **card** command or the **port** command in global configuration mode), no cards are denied power during the power-on sequence unless mismatched controller cards are installed.

If the active and standby controller versions are different, the SmartEdge OS allocates power for both controller cards, initializes them, and issues a controller mismatch alarm.

The SmartEdge OS always reserves enough power during system configuration so that if the system has only a single controller card installed, a standby controller card of the same type can be installed at a later time.

To power off the system, remove the fuses on both the A- and B-sides in the fuse panel.

2.14.1 Power-On Diagnostics

Power-on diagnostics verify the correct operation of the controller cards, the backplane, fan tray, alarm card, and each installed line card during a power-on or reload sequence of the SmartEdge router. These tests also run whenever a controller or line card is installed in a running system. The power-on diagnostics for each component consist of a series of tests, each of which can indicate a component failure.

During each test, the power-on diagnostics display results and status; if an error occurs during the testing of a card, the test lights the FAIL LED on the failing card, but does not stop the loading of the SmartEdge OS. A failure on the backplane, fan tray, or alarm card causes the FAIL LED on the alarm card to light.

The maximum test time is 90 seconds: 60 seconds for a controller card, 10 seconds for the backplane and fan tray, and 5 seconds for each installed line card. If the system has two controller cards, the controller tests run in parallel.

To display results from power-on diagnostics, enter one of the following commands in any mode:

show diag pod *component*

show diag pod *component* **detail**

Table 28 Components Tested by POD

Component	Component Argument Values
Alarm card	**alarm-card**
Backplane	**backplane**
controller card	**card 5** **card 6**
Fan tray	**fantray**
Traffic card	**card** ***n*** (slot number 1 to 4)

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

In general, if a component fails to pass its power-on diagnostic tests, 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.

Power-on diagnostics are enabled by default in the operating system. If they have been disabled, you can enable them with the **diag pod** command in global configuration mode:

3 Hardware Control and Troubleshooting

The operating system command-line interface (CLI) includes commands that display hardware configuration and status information, allows hardware troubleshooting, and provide hardware control and recovery. You enter all commands through the management port or the console port on the active controller card. When the system is powered on or reloaded, the active controller card is in slot 5 or slot 6.

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

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

3.1 Hardware Status

The CLI commands that display status information, such as power, temperature, ports, alarms, and bit error rate tests (BERTs), for the fan and alarm unit 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 [5].

Table 29 CLI Commands for Hardware Status

Task or Information Needed	CLI Command	Comments
BERT status	**`show bert`**	
Status of internal- and external storage devices	**`show disk`**	
Fan and alarm unit, power, temperature for all installed units	**`show hardware`** **`show hardware detail`**	
Show software licenses for all ports	**`show licenses`**	
Status for all ports	**`show port`** **`show port`** **`show port detail`** **`show port counters`** **`show port perf-monitor`**	

Table 29 CLI Commands for Hardware Status

Task or Information Needed	CLI Command	Comments
Status of a specific port, including alarms	***slot/port*detail**	
Status of the SmartEdge Service Engine (SSE) group[1]	**show administrators** **show chassis** **show chassis power** **show configuration** **show configuration sse** **show disk sse** **show disk sse counters** **show hardware** **show sse {group | partition}** **show sse group** counters **show system alarm sse**	These show commands display a variety of information about the SSE group. The information contains software version information, system uptime, task information, configuration information, and current state of the card.
Status of SFP and XFP transceivers	**show port transceiver**	
Status of standby controller	**show redundancy**	
Status of all alarms at system, slot, port, transceiver, sse group, sse partition, and sse disk level	**show system alarm all**	
Status of alarms for specific card, port, or channel	**show system alarm**	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 alarm system alarm** command and SNMP traps report the alarms when the corresponding threshold limits preset are exceeded.
Status of alarms for specific transceiver or SNMP trap	**system alarm**	The transceiver alarm reporting (including corresponding SNMP traps) is disabled by default.
Status of the ASE card	**show tech-support ase**	Helps your technical support representative resolve issues on the ASE card. The command shows software version information, system uptime, task information, configuration information, and current state of each line card.

(1) This command is not supported on the SmartEdge 400 and 800 chassis.

3.2 CLI Commands for Hardware Control

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

Table 30 CLI Commands for Hardware Configuration and Control

Task or Information Needed	CLI Command	Comments
Reload the SSE disk[1]	**reload disk slot_number_disk_num**	

Table 30 CLI Commands for Hardware Configuration and Control

Task or Information Needed	CLI Command	Comments
Restart the system (reload both controller cards)[2]	`reload`	The `reload` command does not reset the hardware; you must remove and reinstall the card to cause a reset.
Restart a line card (reload its software)	`reload card` *`slot`*	
Restart (enable) a port	`port` *`port-typeslot/port`* `no shutdown`	
Shut down (disable) a port	`port` *`port-typeslot/port`* `shutdown`	The `shutdown` command disables the port, but does not clear counters; use the`clear port counters` command to clear the counters for a specific port.
Shut down, restart hardware[3]		
Shut down (disable) a card		
Unshut (no shutdown)[4]		
Hardware data—Version, slot number, port number, physical layer interface, speed, mode, counters		

Summary information	`show chassis`
	`show chassis power`
	`show hardware`
	`show port`	

Detailed information	`show chassis powerinventory`
	`show hardware fantraydetail`
	`show hardware card slot` *`slot`* `detail`
	`show port detail`*`slot/port`*	

Configuration data—Slots, ports		
Summary information for each slot	`show chassis`	
Current configuration information for all SSE groups[1]	`show configuration sse`	
Summary information for each SSE hard disk drive[1]	`show disk sse slot`	
Summary information for all SSE hard disk drive counters[1]	`show disk sse counters slot disk_num`	
Summary information for each installed line card	`show port`	
Summary information for each installed transceiver	`show port transceiver`	
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.
Configuration for a channel	`show port` *`slot/port:chan-num`*`detail`	
Summary information for each installed SSE group[1]	`show sse { group [ group_name ] | partition [ partition_name ] }`	
Summary information for all SSE group counters[1]	`show sse group` counters	

Table 30 CLI Commands for Hardware Configuration and Control

Task or Information Needed	CLI Command	Comments
Summary information for all SSE group and partition alarms(1)	**show system** alarm sse{ **group** [*group_id*] | **partition** [*partition_id*] }	
Disable/enable all the transceiver alarms reporting	**[no] system alarm transceiver suppress**	

(1) This command is not supported on the SmartEdge 400 and 800 chassis.
(2) For other forms of this command, see Command List Reference [5].
(3) Because the SmartEdge OS software synchronizes all write operations to the file system, you can power down the system without issuing the ***shutdown*** *command.*
(4) Use this command to enable the card after using the ***shutdown*** *command to stop the normal operation and halt the traffic.*

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 31 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.
Run a BERT on a channel or port	**bert** *slot/port* **:** *<port-type>* **pattern** *pattern* **interval** *minutes* **error** *error*	• The **error** *error* construct is supported for DS-3, DS-1, DS-0s, and E-1 channels and ports only. • **port** *keepalive*must be disabled (**port** *keepalive*is only supported with the encapsulation cisco-hdlc) • When **bert** exercises on DS-0s under channelized DS-1, DS-0s must be configured with the full timeslots range of 1-24. • When **bert** exercises on DS–0s under channelized E–1, DS–0s must be configured with the full timeslots range of 1-31 (channelized E–1 only framed) .
Enable loopback on a channel or port.	**port** *port-type slot/port;[ch];[subch];[subsubch]* **loopback** *loopback-type*	
Disable loopback on a channel or port	**port** *port-type slot/port;[ch];[subch];[subsubch]* **no loopback**	

Table 32 Loopback Types

Loopback Type	Description
–	No loopback type is specified for Ethernet and Gigabit Ethernet ports.
internal(1)	Loops the transmit line to the receive line.

Table 32 Loopback Types

Loopback Type	Description
line	Loops the receive line to the transmit line.
local	Loops the transmit line to the receive line to test internal functions.
network line	Full loopback from the receive line to the transmit line; channels with all timeslots configured as follows: • 1 to 24 – DS-0s under channelized DS-1. • 1 to 31 – DS-0s under channelized E-1.
network payload	Payload loopback from the receive line to the transmit line: channels with all timeslots configured as follows: • 1 to 24 – DS-0s under channelized DS-1. • 1 to 31 – DS-0s under channelized E-1.
remote	Verifies remote link connectivity and quality: channels with C-bit framing; the admin state must be Up.
remote line fdl ansi	Facility data link (FDL) ANSI loopback: channels with Extended Superframe Format (ESF) framing.
remote line fdl bellcore	FDL Telcordia loopback: channels with ESF framing.
remote line inband	Inband loopback: channels with either ESF or Superframe Format (SF) framing; the Admin state must be Up.
remote payload	Payload loopback: channels with ESF framing.

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

3.4 Values for CLI Input Arguments

Values for input arguments that are shown in bold must be entered in the specified format.

Table 33 Values for CLI Input Arguments

Argument	Range of Values/Description	Restrictions
card-type	Line card type	
chan-num	Channel number	
error	Number of injected bit errors for a BERT: • **10^3** to **10^10**(1) • **10^3** to **10^7**(2) • **none**	

Table 33 Values for CLI Input Arguments

Argument	Range of Values/Description	Restrictions
loopback-type	Type of loopback: • internal—Loops the transmit line to receive line. • line—Loops the receive line to the transmit line. • local—Loops the transmit line to the receive line to test internal functions. • network line—Full loopback from the receive line to the transmit line; channels with all timeslots configured as follows: * 1 to 24 – DS-0s under channelized DS-1. * 1 to 31 – DS-0s under channelized E-1. • network payload—Payload loopback from the receive line to the transmit line: channels with all timeslots configured as follows: * 1 to 24 – DS-0s under channelized DS-1. * 1 to 31 – DS-0s under channelized E-1. • remote—Verifies remote link connectivity and quality: channels with C-bit framing; the admin state must be Up. • remote line fdl ansi—Facility data link (FDL) ANSI loopback: channels with Extended Superframe Format (ESF) framing. • remote line fdl bellcore—FDL Telcordia loopback: channels with ESF framing. • remote line inband—Inband loopback: channels with either ESF or Superframe Format (SF) framing; the Admin state must be Up. • remote payload—Payload loopback: channels with ESF framing. See Table 32 for a list of loopback types and the ports and channels to which they apply.	
pattern	Pattern to use to exercise the line or channel during a BERT: • **0s**,**1s**, **1100** • **1-in-2**, **1-in-8**, **1-in-12**, **1-in-32** • **2^15**, **2^20**, **2^23**, **10^3~10^7** • **qrss**, **user-defined**	
port	1 to 62, depending on line card type.	The Ethernet management port on a controller card is always port 1.
port-type	SeeTable 35 andTable 36 for the types of ports and channels.	
slot	The slot in which a line card or primary controller card is installed. • SmartEdge 400: 1 to 4 • SmartEdge 600: 1 to 4 • SmartEdge 800: 1 to 6, 9 to 14 • SmartEdge 1200: 1 to 6, 9 to 14 • SmartEdge 1200H: 1 to 6, 9 to 14	

(1) DS-0s, DS-1, DS-3, and E-1 channels support this number.

(2) The 8/4-Port Channelized OC-3-STM-1 and 2/1-Port OC-12./STM-4 line card only supports this number.

Table 34 Card Types

Card Type	Description
atm-oc3e-8-port	ATM OC-3c/STM-1c (8-port)
atm-oc12e-2-port	ATM OC-12c/STM-4c (2-port)
oc3e-8-port	POS OC-3c/STM-1c (8-port)
oc12e-4-port	POS OC-12c/STM-4c (4-port)
oc48e-4-port	POS OC-48c/STM-16c (4-port)
oc192-1-port	OC-192c/STM-64c (1-port)
ch-oc3oc12-8or2-port(1)	Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port)
fege-60-2-port	Fast Ethernet–Gigabit Ethernet (FE–GE) (60-port FE, 2-port GE)
ge-10-port	Gigabit Ethernet 1020 (GE1020) (10-port)
ge-20-port (2)	Gigabit Ethernet 1020 (GE1020) (20-port)
ge-5-port	Gigabit Ethernet (5-port)
ge2-10-port	Gigabit Ethernet DDR (10-port)
ge4-20-port(3)(2)	Gigabit Ethernet DDR (20-port)
10ge-1-port	10 Gigabit Ethernet (1-port)
10ge-4-port(3)	10 Gigabit Ethernet (10GE) DDR (4-port)
10ge-oc192-1-port	10 Gigabit Ethernet/OC-192c DDR (1-port)
ase	Advanced Services Engine
sse(3)	SmartEdge Storage Engine
xcrp4-base	XCRP4 controller card with a software-configurable interface to external timing equipment (BITS or SSU) and 8 GB of memory

(1) To use ports 5 through 8 on a Channelized 8-port OC-3/STM-1 or 2–port OC-12/STM-4 line card (ROA1283420/1), an all-ports software license (FAL1241079/1) is needed. A separate software license (FAL1240782/1) is required for the Channelized 4-port OC-3/STM-1 or 1-port OC-12/STM-4 line card (ROA1283420/2).
(2) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE and 20-port GE1020 line cards.
(3) This card is not supported in the SmartEdge 400 and SmartEdge 800 chassis.

Table 35 Port Types

Port Type	Description
`atm`	ATM ports
`pos`	POS ports
`ethernet`	Ethernet or Gigabit Ethernet ports (any version)
`channelized-oc3`	Channelized OC-3 port
`channelized-oc12`	Channelized OC-12 port
`channelized-stm1`	Channelized STM-1 port
`channelized-stm4`	Channelized STM-4 port

Table 36 Channel Types

Channel Type	Subchannel/ Service Type	Framing	SONET Channel Mapping	SDH AUG Mapping
channelized-ds1	NxDS0	SF ESF	VT1.5	au3/tu11 au4/tu11
channelized-ds3	DS1 E1	C-Bit Parity M23	STS1	au3/no-tugs au4/tu3
channelized-e1	NxDS0	CRC-4 NO-CRC-4	N/A	au3/tu12 au4/tu12
ds1	POS	C-Bit Parity M23	STS1	au3/no-tugs au4/tu3
ds3	NxDS0	SF ESF unframed	VT1.5	au3/tu11 au4/tu11
e1	POS	CRC-4 NO-CRC-4	N/A	au3/tu12 au4/tu12

Note: Because the SDH and SONET mappings are applied on a per-port basis, channels that required different SDH or SONET mappings are not supported on the same port.

Table 37 Supported Subchannel Types

Subchannel Type	Subsubchannel/ Service Type	Framing	Upper-Level Channel Type
ds1	POS	SF ESF	Channelized DS3 channel
channelized-ds1	NxDS0	SF ESF	Channelized DS3 channel
e1	POS	CRC-4 NO-CRC-4 unframed	Channelized DS3 channel
channelized-e1	NxDS0	CRC-4 NO-CRC-4	Channelized DS3 channel
nxds0	POS	N/A	Channelized T1 channel Channelized T1 subchannel Channelized E1 channel Channelized E1 subchannel
nxds0	POS CESoPSN	N/A	Channelized T1 channel Channelized T1 subchannel Channelized E1 channel Channelized E1 subchannel

3.5 Output Fields for the show licenses all Command

This command displays the per-slot software license information of all the ports on the selected line card.

Table 38 Output Fields for the show licences all Command with the all-ports detail Keyword

Field Name	Field Data Reported and Data Descriptions
License Type	Software license information applied on this line card.
Card Type	ch-oc3oc12–8or2-port
Additional Ports Entitled	Additional slots entitled on this line card. Slots 5 to 8.
Slot Entitled	Slots that are entitled on this line card.

3.6 Output Fields for the show chassis Command

Table 39 Output Fields for the show chassis Command

Field Name	Description
Current platform is	Chassis type: • SE400—SmartEdge 400 router. • SE600 • SE800 • SE1200 • SE1200H—NEBS-compliant
Slot	Slot number for this unit.
Configured type	Slot is configured for one of the following card types: • ***line-card-type***—Line card is configured.(1) • xcrp—Controller card of any type or controller card is configured. • ase—Advanced Services Engine is configured. • sse—SmartEdge Storage Engine is configured. (2) • none—Slot is not preconfigured.
Installed type	Slot has card installed: • ***line-card-type***—Line card is installed. • xcrp—Controller card of any type or controller card is installed. • ase—Advanced Services Engine is installed. • sse—SmartEdge Storage Engine is installed.(2) • none—Slot is empty. • unknown—Controller card is installed but not initialized.

Table 39 Output Fields for the show chassis Command

Field Name	Description
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(3)(4) • A — Active Crossconnect • B — Standby Crossconnect • C — SARCs (Segmentation And Reassembly Controllers) • D — Default Traffic Card(5) • E — EPPA (Egress Packet Processing ASIC) Ready • G — Upgrading FPGA (Field Programmable Gate Array) • H — Card Admin State SHUT(6) • I — IPPA (Ingress PPA) Ready • M — FPGA Upgrade Required(7)(8) • N — SONET EU Enabled • O — Card Admin State ODD(9) • P — Coprocessor Ready (SSE card) • P1 — ASP1 Ready (ASE card) • P2 — ASP2 Ready (ASE card) • R — Traffic Card Ready • S — SPPA (Segmented PPA) Ready • U — Card PPAs/ASP UP (All cards: PPAs are up; ASE card: at least one APS is up; SSE card: coprocessor is up.) • W—Warm Reboot (Card has not been reloaded since the last switchover.) • X—XCRP Mismatch. (The standby and active controller cards are not identical.)

*(1) A line card is configured with the **card** command (in global configuration mode); it might not be installed.*
(2) The SSE card is not supported on the SmartEdge 400 and 800 chassis
(3) A line card cannot be up (U flag) without being ready (R flag), but it can be ready without being up.
(4) A line card is ready (R flag) when the card has been initialized and the code for the PPAs has been downloaded; it is up (U flag) when the PPAs on the card are registered with the requisite NetBSD process
(5) The default line card processes packets sent to it from the active controller card.
*(6) A line card is administratively shut down with the **shutdown** command (in card configuration mode).*
(7) 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 Installing the SmartEdge OS Reference [9].
*(8) This flag only appears when an FPGA version on the selected line card is available for an upgrade. Otherwise, it is not displayed even when the installed and file versions are different in the **show hardware card <slot> detail** command.*
*(9) A line card is placed in the ODD state with the **on-demand diagnostic** command (in card configuration mode).*

3.7 Output Fields for the show disk Command

Table 40 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	Percentage 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).

3.8 Output Fields for the show hardware Command

This command displays information only for those units that are installed in the chassis.

Table 41 Output Fields for the show hardware Command

Field Name	Field Data Reported and Data Descriptions
Fan Tray Status	• Present—Fan and alarm unit is installed. • Not Present—Fan and alarm unit is not installed or not working.
Fan(s) Status	• Failed—At least one fan is not working. • Normal—All fans are working.
SmartEdge • Power Supply A Status • Power Supply B Status	Status of the power supply modules: • No Power—Power has failed, is disconnected, or is not installed. • Normal—Power is being supplied by this power supply.

Table 41 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 the Troubleshoot with System Power and Alarm LEDs section.
Slot	• ***slot***—Slot number for this unit. • N/A—No slot number for this unit.
Type	Unit: • backplane—Backplane. • ***controller-card-type***—Controller card is installed. • fan tray—Fan and alarm unit is installed. • ***traffic-card-type***—Line card is installed. • unknown—Controller card is inserted but not initialized.
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.
Temperature	Temperature condition and actual temperature reading in degrees Celsius: • Cold—Temperature is colder than normal. • Normal—Temperature is within normal operating range for this unit. • Hot—Temperature is hotter than normal. • Extreme—Temperature is much hotter than normal. • N/A—Temperature does not apply to this unit.

Table 42 Product Codes for SmartEdge Chassis Types

Chassis Type	Chassis Model	Product Code
SmartEdge 400	SmartEdge 400 AC chassis	44
	SmartEdge 400 DC chassis	0A
SmartEdge 600	SmartEdge 600 chassis	H1
SmartEdge 800	SmartEdge 800 chassis	8Y
SmartEdge 800e	SmartEdge 800 enhanced chassis	9C
SmartEdge 1200	SmartEdge 1200 chassis(1)	D9
SmartEdge 1200H	SmartEdge 1200H chassis	H1

(1) SmartEdge 1200 chassis comes with NEBS-compliant air ramp.

This command displays information only for those units that are installed in the chassis, and in most cases, displays only the fields that are applicable to the type of card.

Table 43 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 the Troubleshoot with System Power and Alarm LEDs section.
Air filter date	***yyyy-mm***—Date the air filter is due to be replaced.
Alarm Card Status[2]	• Present—Alarm card is installed and working (SmartEdge 400 chassis only). • Not Present—Alarm card is not installed (SmartEdge 400 chassis only).
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	Type of chassis in which the backplane is installed.
DimFpga rev DimFpga file rev	Dim FPGA revision and file revision; N/A or not displayed if not applicable for this card.
Disk	SSE disk number; 1 or 2.[3]
EEPROM id/ver	***nnnn/n***—Version of the unit EEPROM.
EPPA memory	***nnn*** MB—Size of ingress and egress PPA memory.
Ericsson Approved	State of transceiver testing for this SFP optical transceiver in SmartEdge routers: • No—Not tested. • Yes—Tested.
Fan Tray Status	• Present—Fan and alarm unit (SmartEdge 800 chassis) or fan tray (SmartEdge 400, SmartEdge 600, SmartEdge 1200, or SmartEdge 1200H chassis) is installed. • Not Present—Fan and alarm unit (SmartEdge 800 chassis) or fan tray (SmartEdge 400, SmartEdge 600, SmartEdge 1200, or SmartEdge 1200H 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.
ForteFpga rev	Forte FPGA revision and file revision; applicable to XCRP only. This FPGA controls power on/reset for all devices.
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.

Table 43 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
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 lit. • Off—LED is not lit. Sync LED is for controller cards only.
LimFpga rev	LIM FPGA revision and file revision; N/A or not displayed if not applicable for this line card.
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.
MaxFpga rev	Max FPGA revision and file revision; applicable to XCRP controller card only. This FPGA controls access to the CPU bus.
Memory	Memory for which this controller card is entitled: • Max—All memory on the controller card is enabled. • ***nnnn*** MB—Size in MB of enabled memory.
Mfg Date	***dd/mm/yyyy***—Date this unit was manufactured.
MinnowCPLD Ver	Minnow CPLD revision; applicable to the SmartEdge 100 chassis slot 1 only.
Model	SSE disk model; vendor in parentheses.
ODD Status	Status of the on-demand diagnostics (ODD) tests: • Aborted—The session was terminated by the user or by the standby controller card being removed. • 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.
OpusFpga rev	Opus FPGA revision and file revision; applicable to XCRP only. This FPGA manages peripherals such as the front panel LEDs and the CRAFT ports.
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	List of ports that are entitled on this line card: • ***n1, n2, n3,...***—Entitled ports. • All—All physical ports on the line card are entitled.

Table 43 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
SmartEdge 400 chassis: • Power Supply A Status • Power Supply B Status	SmartEdge 400 with AC Power Supply: • AC Unit No Power—The AC power supply is not installed or is not fully inserted. • AC Unit High Temp—High temperature has been detected at the AC source. • AC Unit Failure—AC power source has failed. • AC Unit Normal—Power is being supplied by the AC source. SmartEdge 400 with DC Power Supply: • DC Unit Normal—Power is being supplied by the DC source. • No Power—DC Power has failed, is disconnected, or is not installed.
SmartEdge 800 chassis: • Power Supply A Status • Power Supply B Status	SmartEdge 800 chassis: • No Power—Power has failed, is disconnected, or is not installed. • Normal—Power is being supplied by this power supply.
SmartEdge 1200 chassis: • Power Supply A1 Status • Power Supply A2 Status • Power Supply B1 Status • Power Supply B2 Status	SmartEdge 1200 chassis: • No Power—Power has failed, is disconnected, or is not installed. • Normal—Power is being supplied by this power supply.
RxPwrMin[dbm][4] RxPwrMax[dbm]	*-nn.nn*—Receiver sensitivity (minimum) and overload level (maximum) for the version of the SFP transceiver installed in this port.
S3Fpga rev	S3 FPGA revision and file revision; applicable to XCRP only. This FPGA manages the control and phase alignment of the Stratum-3 PLL.
SAR Image Type	ATM mode currently loaded on the applicable ATM OC line cards:[5] • atm priority—ATM priority mode. • ip-priority—IP priority mode. • vc-fair—Virtual circuit (VC) fairness mode. • hsvc-fair—Hierarchical shaping virtual circuit (HSVC) fairness mode.
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.
SCC id	ID for the system communication controller (SCC) ASIC on a controller card; the SCC controls and communicates with the line cards.
Serial No	*nnnnnnnnnnnnnn*—Unique identifier for this unit; 14 alphanumeric characters.

Table 43 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
SFP / Media type	SFP Transceivers—Ethernet line cards: • FX / MM—Short reach transceiver, multimode fiber. • LX10 / SM—Long reach transceiver, single-mode fiber. • SX / MM—Short reach transceiver, multimode fiber. • LX / SM—Long reach transceiver, single-mode fiber. • ZX / SM—Extended long reach transceiver, single-mode fiber. • BX / SM—Bidirectional transceiver, single-mode fiber. • T / Cat5—Copper-based transceiver. • CWDM / SM—Coarse wavelength-division multiplexing (CWDM) transceiver, single-mode fiber. • DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber.(6)
	SFP transceivers—SONET/SDH OC-n (OC-48c/STM-16c, OC-12c/STM-4c, and OC-3c/STM-1c) cards: • SR / MM—Short reach transceiver, multimode fiber. • SR / SM—Short reach transceiver, single-mode fiber. • IR / SM—Intermediate reach transceiver, single-mode fiber. • LR / SM—Long reach 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).
SpiFpga file rev	System Packet Interface File revision.
SpiFpga rev	System Packet Interface Fpga.
SXC id	ID of the SONET cross-connect (SXC) ASIC on a controller card; the SXC cross-connects traffic between some line cards.
SysFpga rev	System FPGA revision and file revision; N/A or not displayed if not applicable for this line card.
Temperature	Temperature condition and actual temperature reading in degrees Celsius: • Cold—Temperature is colder than normal. • Normal—Temperature is within normal operating range for this unit. • Hot—Temperature is hotter than normal. • Extreme—Temperature is much hotter than normal. • N/A—Temperature does not apply to this unit. Table 44 lists descriptions of each temperature condition. Table 45 lists temperature ranges for card types.
TxPwrMin[dbm](4) TxPwrMax[dbm]	*-nn.nn*—Transmitter optical output power (minimum and maximum) for the version of the SFP transceiver installed in this port.

Table 43 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
Type	Unit: • backplane—Backplane. • ***controller-card-type***—Controller card is installed. • fan tray—Fan and alarm unit is installed. • ***traffic-card-type***—Line card 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.
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]—Wavelength for this transceiver version. See *Transceivers for SmartEdge and SM Family Line Cards* for wavelength data for each type of transceiver and its versions.
XFP / Media type	10-Gbps SFP (XFP) transceivers—10-GE and SONET/SDH OC-192 line cards: • SR / SM—Short reach transceiver, single-mode fiber. • SW / SM—Short reach transceiver, single-mode fiber. • SR / MM—Short reach transceiver, multimode fiber. • IR / SM—Intermediate reach transceiver, single-mode fiber. • LR / SM—Long reach transceiver, single-mode fiber. • LW / SM—Long reach transceiver, single-mode fiber. • ER / SM—Extended long reach transceiver, single-mode fiber. • EW / SM—Extended long reach transceiver, single-mode fiber. • ZR / SM—Extreme reach transceiver, single-mode fiber.(7) • ZW / SM—Extreme reach transceiver, single-mode fiber.(7) • 10GE-DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber. (8) • OTN-DWDM—OTN-DWDMITU XFP transceiver, single-mode fiber. (8)

(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) Applies to SmartEdge 400 chassis only.
(3) The Converged Packet Gateway (CPG) supports a single hard disk for each SmartEdge Storage Engine (SSE) card
(4) Measured or reported values meet or exceed the transceiver specifications that are documented in Transceivers for SmartEdge and SM Family Line Cards.
(5) The 8-port ATM OC-3c/STM-1c (atm-oc3e-8-port) line card only supports the “vc-fair" and "hsvc-fair" atm modes.
(6) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(7) Use part number XFP-OC192-LR2 when ordering the XFP transceivers with 10GE ZR functionality.
(8) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35,36,37,53,and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

Table 44 Definitions of Temperature Conditions

Condition	Description
COLD	Expected when the system first powers up in a cool or well air-conditioned environment.
NORMAL	Normal operating temperature.
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 chassis air filter or fans might need cleaning or replacing. 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. When the card is an active-controller card and the peer controller temperature is NORMAL, the auto reload-switch-over is triggered, the system generates an OVERHEAT 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 chassis air filter or fans might need cleaning or replacing. When the card's TEMP_EXTREME persists for 10 minutes or more, the line card will be shutdown automatically, and the system generates a CIRCUIT_PACK_FAIL major alarm.
N/A	Temperature does not apply to this unit, or this unit does not have a built-in temperature sensor.

Table 45 Temperature Ranges for Card Types

Card Type	Temperature Ranges
atm-oc3e-8-port atm-oc12e-2-port atm-oc12e-1-port oc3e-8-port oc12e-4-port oc48e-4-port	COLD ≤ 20°C NORMAL = 21 - 71°C HOT = 72 - 93°C EXTREME ≥ 94°C
oc192-1-port ge-10-port ge-20-port[(1)] ge-5-port ge2-10-port 10ge-1-port 10ge-oc192-1-port	COLD ≤ 20°C NORMAL = 21 - 84°C HOT = 85 - 94°C EXTREME ≥ 95°C
fege-60-2-port	COLD ≤ 20°C NORMAL = 21 - 89°C HOT = 90 - 103°C EXTREME ≥ 104°C
ch-oc3oc12-8or2-port	COLD ≤ 20°C NORMAL = 21 - 89°C HOT = 90 - 105°C EXTREME ≥ 105°C

Table 45 Temperature Ranges for Card Types

Card Type	Temperature Ranges
ge4-20-port[2][1] 10ge-4-port	COLD ≤ 20°C NORMAL = 21 - 85°C HOT = 86 - 103°C EXTREME ≥ 104°C
ase	COLD ≤ 20°C NORMAL = 21 - 70°C HOT = 71- 76°C EXTREME ≥ 77°C
sse[2]	COLD ≤ 20°C NORMAL = 21 - 75°C HOT = 76- 80°C EXTREME ≥ 81°C
xc4	COLD ≤ 20°C NORMAL = 21 - 90°C HOT = 91- 100°C EXTREME ≥ 100°C

(1) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE1020 and 20-port GE line cards.
(2) This card is not supported in the SmartEdge 400 and SmartEdge 800 chassis.

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

3.9 Output Fields for the show port Command

Table 46 Output Fields for the show port Command

Field Name	Value/Description
Slot/Port	slot/port—Slot and port numbers for this port.
Ch:SubCh:SubSubCh	Channel numbers, if appropriate for this port:
Type	port-type or channel-type.
State	Port status (combination of the Admin state and Line state fields): • 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).

Table 47 Port Types

Port Type	Description
atm	ATM port
pos	POS port
ethernet	Ethernet or GE port (any version)
transceiver	SFP or XFP transceivers port
channelized-oc3	Channelized OC-3 port
channelized-oc12	Channelized OC-12 port
channelized-stm1	Channelized STM-1 port
channelized-stm4	Channelized STM-4 port

Table 48 Port/Channel Types

Port/Channel Type	Description
Port types	Type of ports: • atm • pos • ethernet • transceiver • channelized-oc3 • channelized-oc12 • channelized-stm1 • channelized-stm4
Channel types	Type of channels: • channelized-ds1 • channelized-ds3 • channelized-e1 • ds0s • ds1 • ds3 • e1

Table 49 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Header	
Type	***port-type*** or ***channel-type***.
Slot/Port	***slot***/***port***—Slot and port numbers for this port.

Table 49 Output Fields for the show port Command with the detail Keyword

Field Name	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 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 the Troubleshoot with System Power and Alarm LEDs section.
Admin state	State of the port as a result of an operator command: • Down—Port is not working. • Up—Port is working (active).
APS Group Name	Automatic Protection Switching group name. If the port is bound to an APS group, the details are displayed as follows: • APS Group Name: atm1 • Group ID: 1 • Port Type: Working or Protect • Tx Traffic: Active or Standby • Rx Traffic: Active or Standby
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 49 Output Fields for the show port Command with the detail Keyword

Field Name	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[1]	***State of source of the transmit clock:*** ***global-reference—system clock on the active controller card.***[2] local—local clock located on the line card (onboard clock).[3] loop—receive clock derived from the incoming signal on the port. card-reference—clock source that has been specified for the line cards.
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
Distant Alarm Detection	Distant alarm (RAI) detection condition (on or off) on E1 channel.
Distant Alarm Generation	Distant alarm (RAI) generation condition (on or off) on E1 channel.

Table 49 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
DSU Bandwidth(4)	***nn.nn*** Mbps—Bandwidth of configured data service unit (DSU).
DSU Mode(4)	***digital-link***—Configured vendor of DSU.
DSU Scramble(4)	DSU scramble condition (on or off).
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 • 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 • crc4 • esf • g751 • m23 • no-crc4 • sf • sdh (an option of ATM OC, POS, and WAN-PHY ports) • sonet (an option of ATM OC, POS, and WAN-PHY ports) • unframed
Idle Character	Configured idle character (flags or marks).

Table 49 Output Fields for the show port Command with the detail Keyword

Field Name	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-5 to 10E-9—Signal degrade bit error rate for SONET/SDH port.
Line SF BER	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. • Unconfigured - not licensed—Port is configured without the “all-port” license. (5) • 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 LX10) 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 the transmit line to receive line. • line—Loops the receive line to the transmit line. • local—Loops the transmit line to the receive line to test internal functions. • network line—Full loopback from the receive line to the transmit line; channels with all timeslots configured (1 to 24). • network payload—Payload loopback from the receive line to the transmit line: channels with all timeslots configured (1 to 24). • remote—Verifies remote link connectivity and quality: channels with C-bit framing; the admin state must be Up. • remote line fdl ansi—Facility data link (FDL) ANSI loopback: channels with Extended Superframe Format (ESF) framing. • remote line fdl bellcore—FDL Telcordia loopback: channels with ESF framing. • remote line inband—Inband loopback: channels with either ESF or Superframe Format (SF) framing; the Admin state must be Up. • remote payload—Payload loopback: channels with ESF framing.
MAC address	*nn:nn:nn:nn:nn:nn*—Medium access control address for this port.

Table 49 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Media type	Physical interface: • 100Base-TX—10/100 Ethernet or Ethernet management port (at either 10 or 100 Mbps). • 1000Base-LX—Long reach SFP or Gigabit interface converter (GBIC) transceiver. • 1000Base-LX10—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-LR—Long reach SFP transceiver. • 1000Base-CWDM—Coarse wavelength-division multiplexing (CWDM) SFP transceiver. • 1000Base-DWDM—Dense wavelength-division multiplexing (DWDM) SFP transceiver.(6) • 10GE-SR (Displays 10000Base-SR)—Short reach XFP transceiver (10GE or OC-192c/STM-64c port). • 10GE-SW (Displays 10000Base-SW). • 10GE-SR+10GE-SW (Displays 10000Base-SR for LAN-PHY) or 10000Base-SW for WAN-PHY.) • 10GE-IR—Intermediate reach XFP transceiver (OC-192c/STM-64c port). • 10GE-LR (Displays 10000Base-LR.)—Long reach XFP transceiver (10GE or OC-192c/STM-64c port). • 10GE-LW (Displays 10000Base-LW).* • 10GE-LR+10GE-LW (Displays 10000Base-LR for LAN-PHY) or 10000Base-LW for WAN-PHY.) • 10GE-ER (Displays 10000Base-ER.)—Extended reach XFP transceiver (10GE port). • 10GE-EW (Displays 10000Base-EW). • 10GE-ER+10GE-EW (Displays 10000Base-ER for LAN-PHY) or 10000Base-EW for WAN-PHY.) • 10GE-ZR (Displays 10000Base-ZR for LAN-PHY) or 10000Base-ZW for WAN-PHY.)—Extreme reach XFP transceiver (10GE or OC-192c/STM-64c port). • 10GE-DWDM (Displays 10000Base-DWDM)—Dense-wavelength-division-multiplexing (DWDM) XFP transceiver. (7) • OTN-DWDM—OTN-DWDMITU XFP transceiver, single-mode fiber. (7) • No GBIC—GBIC transceiver is not installed in this GE port. • No transceiver—XFP transceiver is not installed in this 10GE or OC-192c/STM-64c port. • Sonet OCn —SONET/SDH OC-*n* (OC-3c/STM-1c, OC-12c/STM-4c, or 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.
Optical Transport(8)	• otu2e—An OTN XFP is inserted. • NONE—No optical transport

Table 49 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Over Subscription Rate	Configured value for over subscription: • ***nnnn***% • Unlimited
QoS Rate Maximum[9]	QoS port-rate limiting value:[10] • ***50 to 149 Mbps***. • Payload line-rate (150 Mbps).
Path Alarms	• N/A—Not applicable to this type of port. • NONE—No alarms are present. CH-OC3/CH-OC12: • STS Path • VT Path CH-STM1/CH-STM4: • AU Path— based on SDH aug-mapping and port type as follows: * au3-xxx: stm1 = x3; stm4 = x12 * au4-xxx: stm1 = x1; stm4 = x4 • VT Path For a complete list of conditions that can cause an alarm, see the Troubleshoot with System Power and Alarm LEDs section.
Path Trace Length	The maximum size that the TX path trace message can be set to.
Physical Layer[11]	• lan-phy • wan-phy
PPPoE PADO Delay	State of PADO delay: • Not set—PADO delay is not configured. • Set (***n*** sec)—PADO delay is configured for ***n*** seconds.
Restart link up delay	The configured delay before declaring a port is up after a restart of the system.
Rx path-trace	Received path trace data.
Report Only Alarms	State of alarm reporting for an ATM or POS OC port: • Path alarms (report only): Payload label mismatch (PLM) • Path alarms (report only): Path unequipped (UNEQ) • Path Alarm Indication Signal (AIS-P) • Path Loss Of Pointer (LOP-P) • Path Payload Label Mismatch (PLM-P) • Path Remote Defect Indication (RDI-P) • Path Unequipped (UNEQ-P) 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).

Table 49 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
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 DS-0 channels.
Tx C2 byte Rx C2 byte	Value of the C2 byte: • ATM OC ports—0x13 • POS OC ports—0x16 • WANPHY port—0x1a • Ch-OC3/CH-OC12 (depends channel-mapping): * VT1.5—0x16 * STS-1—0x04 • CH-STM1/CH-STM4 (depends aug-mapping): * AU3-NO-TUG/AU4-TU3—0x04 * AU3-TU12/AU3-TU11/AU4-TU12/AU4-TU11—0x02
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][12] 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.
Vcc Measured	SFP Transceiver Vcc

Table 49 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Wavelength[12]	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 [7].
Yellow Alarm Detection	Yellow alarm (RAI) detection condition (on or off) on T1(Ds-1) channel.
Yellow Alarm Generation	Yellow alarm (RAI) generation condition (on or off) on T1(DS-1) channel.

(1) Changes to the clock source setting will not cause LOF on the 8-port ATM OC-3c/STM-1c.
(2) This is the default card clock source on the 8-port ATM OC-3c/STM-1c card.
(3) This is the default card clock source on previous ATM cards, except for the 8-port OC-3c/STM-1c card.
(4) This field is not supported on the Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port) card.
*(5) At the **show port all** command output on the Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 line card.*
(6) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(7) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35,36,37,53,and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(8) This field is only applicable for the 10G LAN-PHY port type.
(9) Only supported in hsvc-fair mode on the 8-port ATM OC-3c/STM-1c (atm-oc3e-8-port) line card. When executed in vc-fair mode, an error message occurs if executed with any value other than 150 Mbps.
(10) When Payload line-rate (150 Mbps) is selected, the actual line-rate received is 149.76 Mbps.
(11) This field is only applicable for the line cards that support WAN-PHY mode.
(12) Measured or reported values meet or exceed the transceiver specifications that are documented in Transceivers for SmartEdge and SM Family Line Cards.

Table 50 XFP Auxiliary Measurement Displayed by the show port Command with the detail Keyword

Field Name	Description
Auxiliary monitoring not implemented	0000b
APD bias voltage (16-bit value is Voltage in units of 10 mV)	0001b
Reserved	0010b
TEC current (mA) (16-bit value is Current in units of 100 uA)	0011b
Laser temperature (same encoding as module temperature)	0100b
Laser wavelength	0101b
+5V Supply voltage	0110b
+3.3V Supply voltage	0111b
+1.8V Supply voltage	1000b
-5.2V Supply voltage (absolute value encoded as primary voltage monitor)	1001b
+5V Supply current (16-bit Value is Current in 100 uA)	1010b
+3.3V Supply current (16-bit Value is Current in 100 uA)	1101b

Table 50 XFP Auxiliary Measurement Displayed by the show port Command with the detail Keyword

Field Name	Description
+1.8V Supply current (16-bit Value is Current in 100 uA)	1110b
-5.2V Supply current (16-bit Value is Current in 100 uA)	1111b

Not all fields apply to all types of ports; in most cases this command displays only the fields that are applicable to the type of port. The “Type” and “Slot/Port” field names are not displayed in the output.

3.10 Output Fields for the show port transceiver Command

Not all fields apply to all types of ports; in most cases this command displays only the fields that are applicable to the type of port. The “Type” and “Slot/Port” field names are not displayed in the output.

Table 51 Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data

State	Description
SFP / Media type	SFP Transceivers—Ethernet line cards: • FX / MM—Short reach transceiver, multimode fiber. • LX10 / SM—Long reach transceiver, single-mode fiber. • SX / MM—Short reach transceiver, multimode fiber. • LX / SM—Long reach transceiver, single-mode fiber. • ZX / SM—Extended long reach transceiver, single-mode fiber. • BX / SM—Bidirectional transceiver, single-mode fiber. • T / Cat5—Copper-based transceiver. • CWDM / SM—Coarse wavelength-division multiplexing (CWDM) transceiver, single-mode fiber. • DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber.(1)
	SFP transceivers—SONET/SDH OC-n (OC-48c/STM-16c, OC-12c/STM-4c, and OC-3c/STM-1c) cards: • SR / MM—Short reach transceiver, multimode fiber. • SR / SM—Short reach transceiver, single-mode fiber. • IR / SM—Intermediate reach transceiver, single-mode fiber. • LR / SM—Long reach transceiver, single-mode fiber.

Table 51 Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data

State	Description
SFP / Media type	SFP Transceivers—Ethernet line cards: • FX / MM—Short reach transceiver, multimode fiber. • LX10 / SM—Long reach transceiver, single-mode fiber. • SX / MM—Short reach transceiver, multimode fiber. • LX / SM—Long reach transceiver, single-mode fiber. • ZX / SM—Extended long 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.(2)
	SFP transceivers—SONET OC-n (OC-3c/STM-1c, OC-12c/STM-4c, and OC-48c/STM-16c) cards: • SR / SM—Short reach transceiver, single-mode fiber. • SR / MM—Short reach transceiver, multimode fiber. • IR / SM—Intermediate reach transceiver, single-mode fiber. • LR / SM—Long reach transceiver, single-mode fiber.
XFP / Media type	10-Gbps SFP (XFP) transceivers—OC-192 and 10-Gig Ethernet line cards: • SR or SW / SM—Short reach transceiver, single-mode fiber. • SR / MM—Short reach transceiver, multimode fiber. • IR / SM—Intermediate reach transceiver, single-mode fiber. • LR or LW / SM—Long reach transceiver, single-mode fiber. • ER or EW / SM—Extended long reach transceiver, single-mode fiber. • ZR or ZW / SM—Extreme reach transceiver, single-mode fiber.(3) • 10GE-DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber. (4) • OTN-DWDM—OTN-DWDMITU transceiver, single-mode fiber. (4)
Ericsson Approved	State of transceiver testing for transceiver in SmartEdge 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.
Serial number	nnnnnnnnnnnnnn—Unique identifier for this transceiver.
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]	Transmitter optical output power (measured, minimum, and maximum limits) for the version of the transceiver installed in this port. For a complete list of alarms and warnings supported by the SFP and XFP transceivers, see the Troubleshoot with System Power and Alarm LEDs section.
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.

Table 51 Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data

State	Description
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(5) (for XFP transceivers only)	Auxiliary measurement 1 for XFP transceivers—defined in Byte 222 Page 01h in INF-8077i.
AUX2(5) (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) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(2) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(3) Use part number XFP-OC192-LR2 when ordering the XFP transceivers with 10GE ZR functionality.
(4) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35,36,37,53,and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(5) See Table 52 for a list of auxiliary input types monitored by each auxiliary A/D channel of the XFP transceivers.

Table 52 XFP Transceivers Measurements and Threshold Values

Field Name	Range
Auxiliary monitoring not implemented	0000b
APD bias voltage (16-bit value is Voltage in units of 10 mV)	0001b
Reserved	0010b
TEC current (mA) (16-bit value is Current in units of 100 uA)	0011b
Laser temperature (same encoding as module temperature)	0100b
Laser wavelength	0101b
+5V Supply voltage	0110b
+3.3V Supply voltage	0111b
+1.8V Supply voltage	1000b
-5.2V Supply voltage (absolute value encoded as primary voltage monitor)	1001b
+5V Supply current (16-bit Value is Current in 100 uA)	1010b
+3.3V Supply current (16-bit Value is Current in 100 uA)	1101b
+1.8V Supply current (16-bit Value is Current in 100 uA)	1110b
-5.2V Supply current (16-bit Value is Current in 100 uA)	1111b

3.11 Troubleshoot with System and Card LEDs

To ensure that the system LEDs are working, press the alarm cutoff (ACO) button for more than three seconds to light all working LEDs on the fan tray. The LEDs remain lit as long as the ACO button is pressed.

3.12 Troubleshoot with System Power and Alarm LEDs

In most cases, the overall status of a SmartEdge system is indicated by the two sets of LEDs located on the front of the fan and alarm unit. If you are experiencing hardware problems, check the LEDs to determine the possible cause and solution.

Note: The SSE card is not supported on the SmartEdge 400 and 800 chassis.

Table 53 Problems Indicated by Power and Alarm LEDs

Problem	Solution
FAN (red) is on; one or more fans are not operating.	Replace the fan and alarm unit.
PWR A or PWR B (green) is off.	No power is present at the A-side or B-side power input; perform the following checks or actions: • Remove and check the fuse for the A-side or B-side DC power source at the external fuse panel. Replace the fuse, if necessary. • Remove the fuse for the A-side or B-side power source at the external fuse panel; then check the connections for the A-side or B-side power source at the external fuse panel. Correct any loose connections, and replace the fuse. • Remove the fuses for both power sources at the external fuse panel; then remove the cover that shields the power filters and check the connections for the power cables at the A- or B-side power filter. Correct any loose connections, replace the cover, and then replace the fuses.
MAJOR (red) is on; one or more line cards are not operable (in low-power mode), resulting from a mismatched pair of controller cards (the standby controller card is not the same version as the active controller card).	Remove the standby controller card; if available, install a standby controller card of the same version as the active controller card.

3.12.1 Chassis Alarms

Table 54 Chassis Alarms

Description	Severity	Probable Cause	Service Affecting
Chassis power capacity exceeded	Major	MisMatchedControllerCard	Yes
AC power failure—side A	Minor	ReplaceableUnitProblem	No
AC power failure—side B	Minor	ReplaceableUnitProblem	No
AC power missing—side A	Minor	ReplaceableUnitMissing	No
AC power missing—side B	Minor	ReplaceableUnitMissing	No
AC power overheat—side A	Minor	ReplaceableUnitProblem	No
AC power overheat—side B	Minor	ReplaceableUnitProblem	No
Alarm card missing	Major	ReplaceableUnitMissing	Yes

Table 54 Chassis Alarms

Description	Severity	Probable Cause	Service Affecting
Backplane power-on-diagnostic failed	Minor	ReplaceableUnitProblem	No
Chassis power failure—Side A1	Minor	PowerProblem	No
Chassis power failure—Side A2	Minor	PowerProblem	No
Chassis power failure—Side B1	Minor	PowerProblem	No
Chassis power failure—Side B2	Minor	PowerProblem	No
Chassis power failure—side A	Minor	PowerProblem	No
Chassis power failure—side B	Minor	PowerProblem	No
Fan tray comm failure—side A	Minor	CoolingFanFailure	No
Fan tray comm failure—side B	Minor	CoolingFanFailure	No
Fan tray communication failure	Major	CoolingFanFailure	Yes
Fan tray controller (card) failure	Major	ReplaceableUnitProblem	Yes
Fan tray controller (card) overheat	Major	ReplaceableUnitProblem	Yes
Fan tray failure detected	Minor	ReplaceableUnitProblem	No
Fan tray filter replacement	Major	ReplaceableUnitProblem	Yes
Fan tray fuse failure	Major	ReplaceableUnitProblem	Yes
Fan tray missing	Major	ReplaceableUnitMissing	Yes
Fan tray reset occurred	Warning	Reinitialized	Yes
Fan unit failure	Minor	CoolingFanFailure	No
Local alarm cutoff activated	Minor	OperationNotification	No
Mesh diagnostic failure	Major	ReplaceableUnitFailure	Yes
Multiple fan failure	Major	ReplaceableUnitProblem	Yes
Remote alarm cutoff activated	Minor	OperationNotification	No

3.12.2 Line Card Alarms

Table 55 Line Card Alarms

Description	Severity	Probable Cause	Service Affecting
Bridging Transmission Convergence (BTC) interface error detected	Major	ReplaceableUnitProblem	Yes
BTC not ready	Major	ReplaceableUnitProblem	Yes
Circuit pack backplane RX error[(1)(2)]	Major	BackplaneFailure	Yes
Circuit pack backplane TX error[(1)(2)]	Major	BackplaneFailure	Yes
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

Table 55 Line Card Alarms

Description	Severity	Probable Cause	Service Affecting
Circuit pack power-on diagnostic failed	Major	ReplaceableUnitProblem	Yes
Circuit pack reset completed	Warning	OperationNotification	Yes
Diagnostic fail	Major	ReplaceableUnitProblem	Yes
Loss of backplane clock	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

(1) Applies to SSE and PPA3-based line cards only.
(2) For additional information, refer to SW-WHP-0129 White Paper on PMA3 Line Card Silent Traffic Halt Faults Detection and Alarms Reporting".

3.12.3 Controller Card Alarms

Table 56 Controller Card Alarms

Description	Severity	Probable Cause	Service Affecting
Backup fail: peer dead(1)	Major	ReplaceableUnitProblem	Yes
Controller (card) auto switch completed(1)	Major	OperationNotification	Yes
Controller (card) code mismatch	Major	ReplaceableUnitTypeMismatch	Yes
Controller (card) exerciser switch failed(1)	Major	OperationFailure	Yes
Controller (card) fail	Critical	ReplaceableUnitProblem	Yes
Controller (card) forced switch requested(1)	Major	OperationNotification	Yes
Controller (card) manual switch requested(1)	Major	OperationNotification	Yes
Controller (card) missing(1)	Critical	ReplaceableUnitMissing	Yes
Controller (card) overheating	Major	ReplaceableUnitProblem	Yes
Controller (card) power-on diagnostic failed	Major	ReplaceableUnitProblem	Yes
Controller (card) software not supported	Major	SoftwareError	Yes
Controller (card) switch completed(1)	Major	OperationNotification	Yes
Controller (card) switch failed(1)	Major	OperationFailure	Yes
Controller (card) temperature critical	Major	ReplaceableUnitProblem	Yes
Controller (card) temperature hot	Minor	ReplaceableUnitProblem	Yes
Controller (card) type mismatch	Major	ReplaceableUnitTypeMismatch	Yes
Diagnostic test fail	Major	ReplaceableUnitProblem	Yes
Local backplane inventory fail	Major	ReplaceableUnitProblem	Yes
Local fan tray inventory fail	Major	ReplaceableUnitProblem	Yes
Local inventory fail	Major	ReplaceableUnitProblem	Yes
Nonvolatile memory fail	Major	CorruptData	Yes

Table 56 Controller Card Alarms

Description	Severity	Probable Cause	Service Affecting
Peer controller card (PCC) type incompatible(1)	Major	ReplaceableUnitProblem	Yes
PCC0 BSD L2 Cache Parity Error	Critical	ReplaceableUnitProblem	Yes
PCC1 VXW L2 Cache Parity Error	Critical	ReplaceableUnitProblem	Yes
Peer inventory fail(1)	Major	ReplaceableUnitProblem	Yes
Peer shared format mismatch(1)	Major	ReplaceableUnitProblem	Yes
Peer Sonet/Sdh mode incompatible(1)	Major	ReplaceableUnitProblem	Yes
Real-time clock battery failure	Major	BatteryFailure	Yes
Real-time clock failure	Major	RealTimeClockFailure	Yes
Redundancy link fail	Major	OperationFail	Yes

*(1) This alarm is suppressed if the system has a single controller card and has been configured using the **system alarm** command (in global configuration mode) with the **redundancy suppress** construct.*

3.12.4 SSE Card Alarms

Table 57 SSE Card Alarms

Description	Severity	Probable Cause	Service Affecting
ASE ASP 1 down	Critical	processorProblem	Yes
ASE ASP 2 down	Critical	processorProblem	Yes
NFS server service down	Major	reinitialized	Yes
Disk type mismatch	Warning	replaceableUnitTypeMismatch	No
CPU Crash	Critical	processorProblem	Yes

3.12.5 SSE Disk Alarms

Table 58 SSE Disk Alarms

Description	Severity	Probable Cause	Service Affecting
Hard disk health degraded	Minor	replaceableUnitProblem	No
Hard disk failed	Major	diskFailure	Yes
Hard disk missing(1)	Major	replaceableUnitMissing	Yes
Hard disk not supported	Major	replaceableUnitTypeMismatch	Yes
Hard disk out of service	Minor	diskFailure	No
Hard disk voltage failure	Major	diskFailure	Yes
Hard disk overheating: extremely hot	Major	diskFailure	Yes
Hard disk overheating: temperature hot	Minor	diskFailure	No
Hard disk reading test failur	Major	diskFailure	Yes
Hard disk power-on diagnostic failed	Major	diskFailure	Yes

(1) This alarm only reports when both disks are missing, single disk missing will be suppressed.

3.12.6 SSE Group Alarms

Table 59 SSE Group Alarms

Description	Severity	Probable Cause	Service Affecting
SSE group manual switch in progress	Major	operationNotification	Yes
SSE group auto switch in progress	Major	configurationOrCustomisationError	Yes
SSE group switch completed	Warning	configurationOrCustomisationError	No
SSE group switch failed	Major	operationNotification	Yes
SSE group auto switch waiting to restore	Minor	configurationOrCustomisationError	No
SSE group not operational	Major	databaseInconsistency	Yes
SSE group block device failed	Major	operationFailure	Yes

3.12.7 SSE Group Partition Alarms

Table 60 SSE Group Partition Alarms

Description	Severity	Probable Cause	Service Affecting
SSE group partition not operational[1]	Major	operationFailure	Yes
SSE group partition sync in progress	Minor	operationNotification	No
SSE group partition data sync failed	Major	operationFailure	Yes
SSE group partition full	Major	operationNotification	Yes
SSE group partition low space	Minor	operationNotification	No
SSE group partition not operational at standby[2]	Major	databaseInconsistency	Yes

(1) Probable causes: a) The disk does not have enough space to create the partition; b) Another partition of the same name but with a different size already exists on the disk from a previous configuration. Solution: Use the `delete partition` *command to free up disk space or remove the existing partition, or use the* `format sse` *command to remove all user-configured partitions on the disk. The* `format sse` *command can only be run on an SSE card that is not bound to any SSE group.*
(2) Probable causes: a) The disk does not have enough space to create the partition; b) Another partition of the same name but with a different size already exists on the disk from a previous configuration. Solution: Use the `delete partition` *command to free up disk space or remove the existing partition, or use the* `format sse` *command to remove all user-configured partitions on the disk. The* `format sse` *command can only be run on an SSE card that is not bound to any SSE group.*

3.12.8 Optical Port Alarms

The tables in this section apply to ports on the ATM OC and Packet over SONET/SDH (POS) line cards.

Note: If a major or critical alarm occurs on an ATM or a POS port and that port is a member of an Automatic Protection Switching (APS) group, either as a protected or a working port, the alarm is downgraded to a minor alarm because the service is protected by the redundant port. For configuration and management information for APS ports and groups, see *Configuring ATM, Ethernet, and POS Ports* Reference [2]. The severity levels in the table are the default levels, not the degraded levels.

Table 61 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 62 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
Section DCC (data communications channel) link down	Major	ExternalIFDeviceProblem	Yes
Section signal degrade (BER [bit error rate])	Major	DegradedSignal	Yes
Section signal failure (BER)	Major	ExcessiveBER	Yes

Table 63 Optical Port Alarms—Line/Multiplex Section Layer

Description	Severity	Probable Cause	Service Affecting
Line alarm indication signal (AIS-L)	Minor	AIS	No
Line DCC (data communications channel) link down	Major	ExternalIFDeviceProblem	Yes
Line remote defect indication (RDI-L)	Minor	FarEndReceiverFailure	No
Line signal degrade (BER [bit error rate])	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 channel mismatch	Major	ApsChannelMatchFailure	Yes
Port diagnostic failed	Major	ReplaceableUnitProblem	Yes
Port far-end protection line failure	Major	ApsChannelProcessingFailure	Yes
Port fault oscillations detected	Critical	DegradedSignal	Yes
Port forced switch requested	Major	OperationNotification	Yes
Port manual switch request	Major	OperationNotification	Yes

Table 63 Optical Port Alarms—Line/Multiplex Section Layer

Description	Severity	Probable Cause	Service Affecting
Port mode mismatch	Major	ApsModeMismatch	Yes
Port protection switch byte failure	Major	ApsByteFailure	Yes
Port switch completed	Major	OperationNotification	Yes
Port switch lockout requested	Major	OperationNotification	Yes
Port payload loopback enabled	Minor	OperationNotification	No
Port switch failed	Major	OperationFailure	Yes
Port switch protection path failure	Major	OperationFailure	Yes
Port switch waiting to restore	Minor	OperationNotification	No
Severely errored frames (SEF)	Major	ErroredFrame	No

Table 64 SFP Transceiver Alarms

Description	Severity	Probable Cause	Service Affecting
Transceiver access failure	Major	Replaceable Unit Problem	Yes
Transceiver bias current–high	Major	Replaceable Unit Problem	Yes
Transceiver bias current–high warning	Minor	Replaceable Unit Problem	No
Transceiver bias current–low	Major	Replaceable Unit Problem	Yes
Transceiver bias current–low warning	Minor	Replaceable Unit Problem	No
Transceiver mismatch	Minor	Replaceable Unit Problem	No
Transceiver missing	Major	Replaceable Unit Problem	Yes
Transceiver receive power–high	Major	Replaceable Unit Problem	Yes
Transceiver receive power–high warning	Minor	Replaceable Unit Problem	No
Transceiver receive power–low	Major	Replaceable Unit Problem	Yes
Transceiver receive power–low warning	Minor	Replaceable Unit Problem	No
Transceiver temperature–high	Major	Replaceable Unit Problem	Yes
Transceiver temperature–high warning	Minor	Replaceable Unit Problem	No
Transceiver temperature–low	Major	Replaceable Unit Problem	Yes
Transceiver temperature–low warning	Minor	Replaceable Unit Problem	No
Transceiver TX power–high	Major	Replaceable Unit Problem	Yes
Transceiver TX power–high warning	Minor	Replaceable Unit Problem	No
Transceiver TX power–low	Major	Replaceable Unit Problem	Yes
Transceiver TX power–low warning	Minor	Replaceable Unit Problem	No
Transceiver voltage–high	Major	Replaceable Unit Problem	Yes
Transceiver voltage–high warning	Minor	Replaceable Unit Problem	No
Transceiver voltage–low	Major	Replaceable Unit Problem	Yes
Transceiver voltage–low warning	Minor	Replaceable Unit Problem	No

Table 65 XFP Transceiver Alarms

Description	Severity	Probable Cause	Service Affecting
Transceiver AUX1–high	Major	Replaceable Unit Problem	Yes
Transceiver AUX1–high warning	Minor	Replaceable Unit Problem	No
Transceiver AUX1–low	Major	Replaceable Unit Problem	Yes
Transceiver AUX1–low warning	Minor	Replaceable Unit Problem	No
Transceiver AUX2–high	Major	Replaceable Unit Problem	Yes
Transceiver AUX2–high warning	Minor	Replaceable Unit Problem	No
Transceiver AUX2–low	Major	Replaceable Unit Problem	Yes
Transceiver AUX2–low warning	Minor	Replaceable Unit Problem	No
Transceiver bias current–high	Major	Replaceable Unit Problem	Yes
Transceiver bias current–high warning	Minor	Replaceable Unit Problem	No
Transceiver bias current–low	Major	Replaceable Unit Problem	Yes
Transceiver bias current–low warning	Minor	Replaceable Unit Problem	No
Transceiver L-VCC2–high	Major	Replaceable Unit Problem	Yes
Transceiver L-VCC2–high warning	Minor	Replaceable Unit Problem	No
Transceiver L-VCC2–low	Major	Replaceable Unit Problem	Yes
Transceiver L-VCC2–low warning	Minor	Replaceable Unit Problem	No
Transceiver L-VCC3–high	Major	Replaceable Unit Problem	Yes
Transceiver L-VCC3–high warning	Minor	Replaceable Unit Problem	No
Transceiver L-VCC53–low	Major	Replaceable Unit Problem	Yes
Transceiver L-VCC3–low warning	Minor	Replaceable Unit Problem	No
Transceiver L-VCC5–high	Major	Replaceable Unit Problem	Yes
Transceiver L-VCC5–high warning	Minor	Replaceable Unit Problem	No
Transceiver L-VCC5–low	Major	Replaceable Unit Problem	Yes
Transceiver L-VCC5–low warning	Minor	Replaceable Unit Problem	No
Transceiver receive power–high	Major	Replaceable Unit Problem	Yes
Transceiver receive power–high warning	Minor	Replaceable Unit Problem	No
Transceiver receive power–low	Major	Replaceable Unit Problem	Yes
Transceiver receive power–low warning	Minor	Replaceable Unit Problem	No
Transceiver TX power–high	Major	Replaceable Unit Problem	Yes
Transceiver TX power–high warning	Minor	Replaceable Unit Problem	No
Transceiver TX power–low	Major	Replaceable Unit Problem	Yes
Transceiver TX power–low warning	Minor	Replaceable Unit Problem	No
Transceiver temperature–high	Major	Replaceable Unit Problem	Yes
Transceiver temperature–high warning	Minor	Replaceable Unit Problem	No
Transceiver temperature–low	Major	Replaceable Unit Problem	Yes
Transceiver temperature–low warning	Minor	Replaceable Unit Problem	No

3.12.9 DS-3 Channel or Port and E3 Port Alarms

Not all alarms apply to all DS-3 channel or port types; the card type determines the applicable alarms.

Table 66 DS-3 Channel or Port and E3 Port Alarms

Description	Severity	Probable Cause	Service Affecting
Bit error rate exceeded threshold	Major	ExcessiveBER	Yes
Facility loopback enabled	Minor	OperationNotification	No
Far-end alarm indication signal (AIS)	Minor	AIS	No
Far-end common equipment failure	Minor	ReplaceableUnitProblem	No
Far-end equipment failure (non-service-affecting)	Minor	ReplaceableUnitProblem	No
Far-end equipment failure (service-affecting)	Major	ReplaceableUnitProblem	Yes
Far-end idle signal	Minor	FarEndReceiverFailure	No
Far-end loss of signal	Minor	LossOfSignal	No
Far-end out of frame	Minor	LossOfFrame	No
Payload loopback enabled	Minor	OperationNotification	No
Port diagnostic failure	Major	ReplaceableUnitProblem	Yes
Receive alarm indication signal (AIS)	Minor	AIS	No
Receive Bit Interleaved Parity (BIP) violation	Major	ReceiveFailure	Yes
Receive framing mismatch	Critical	PayloadTypeMismatch	Yes
Receive frequency out of range	Major	ReceiveFailure	Yes
Receive IDLE signal	Major	FarEndReceiverFailure	Yes
Receive loss of frame (LOF)	Critical	LossOfFrame	Yes
Receive loss of signal (LOS)	Critical	LossOfSignal	Yes
Receive parity error exceeded threshold	Major	ExcessiveBER	Yes
Receive remote alarm indication (RAI)	Minor	FarEndReceiverFailure	No
Remote Line Loopback	Minor	OperationNotification	No
Transmit frequency out of range	Major	TransmitFailure	Yes
Transmit path alarm indication signal (AIS-P)	Major	TransmitFailure	Yes
Transmit path loss of pointer (LOP-P)	Major	LossOfPointer	Yes
Transmit path trace mismatch	Major	TransmitFailure	Yes
Transmit path unequipped (UNEQ-P)	Major	TransmitFailure	Yes
Transmit remote failure indication (RFI-P)	Minor	TransmitFailure	No
Transmit signal label mismatch (PLM-P)	Major	SignalLabelMismatch	Yes
Terminal loopback enabled	Minor	OperationNotification	No

3.12.10 DS-1 Channel and Path Alarms

Table 67 DS-1 Channel and Path Alarms

Description	Severity	Probable Cause	Service Affecting
DS-1 packet link down	Minor	LinkFailure	No
DS-1 payload loopback enabled	Minor	OperationNotification	No
Port diagnostic failed	Minor	ReplaceableUnitProblem	No
Port facility loopback enabled	Minor	OperationNotification	No
Port terminal loopback enabled	Minor	OperationNotification	No
Receive alarm indication signal (AIS)	Minor	AIS	No
Receive loss of frame (LOF)	Major	LossOfFrame	Yes
Receive loss of multi-frame alignment	Major	ReceiveFailure	Yes
Receive loss of signal (LOS)	Major	LossOfSignal	Yes
Receive remote alarm indication (RAI)	Minor	ReceiveFailure	No
Remote loopback activated	Minor	OperationNotification	No
Remote loopback requested through DS-3 FEAC (far-end alarm condition)	Minor	OperationNotification	No
Transmit alarm indication signal (AIS)	Minor	AIS	No
Transmit loss of frame (LOF)	Minor	LossOfFrame	No
Transmit remote alarm indication (RAI)	Minor	TransmitFailure	No

3.12.11 E1 Channel or Port Alarms

Table 68 E1 Channel or Port Alarms

Description	Severity	Probable Cause	Service Affecting
Port diagnostic failed	Minor	ReplaceableUnitProblem	No
Port facility loopback enabled	Minor	OperationNotification	No
Port terminal loopback enabled	Minor	OperationNotification	No
Receive alarm indication signal (AIS)	Minor	AIS	No
Receive loss of frame (LOF)	Major	LossOfFrame	Yes
Receive loss of multi-frame alignment	Major	ReceiveFailure	Yes
Receive loss of signal (LOS)	Major	LossOfSignal	Yes
Receive RAI indication	Minor	ReceiveFailure	No

3.12.12 Ethernet Port Alarms

Table 69 Ethernet Port Alarms

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

Table 69 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

3.12.13 Gigabit Ethernet Port Alarms

Table 70 Gigabit Ethernet Port Alarms

Description	Severity	Probable Cause	Service Affecting
Link down	Major	LinkFailure	Yes
Link flooded	Major	LinkFailure	Yes
Port diagnostic failed	Major	ReplaceableUnitProblem	Yes
Port terminal loopback enabled	Minor	OperatorNotification	No
Receive loss of signal (LOS)	Critical	LossOfSignal	Yes

3.12.14 VT Path Alarms

Table 71 VT Path Alarms

Description	Severity	Probable Cause	Service Affecting
VT loss of pointer (LOP-V)	Major	LossOfPointer	Yes
VT path alarm indication signal (AIS-V)	Minor	AIS	No
VT path remote failure indication (RFI-V)	Minor	FarEndReceiverFailure	No
VT payload label mismatch (PLM-V)	Major	SignalLabelMismatch	Yes
VT unequipped (UNEQ-V)	Major	SignalLabelMismatch	Yes

3.12.15 TU-12 Path Alarms

Table 72 TU-12 Path Alarms

Description	Severity	Probable Cause	Service Affecting
TU-12 (tributary unit-12) alarm indication signal (AIS)	Minor	AIS	No
TU-12 loss of pointer (LOP)	Major	LossOfPointer	Yes
VC-12 (virtual container-12) payload label mismatch (PLM)	Major	SignalLabelMismatch	Yes

Table 72 TU-12 Path Alarms

Description	Severity	Probable Cause	Service Affecting
VC-12 remote failure indication (RFI)	Minor	FarEndReceiverFailure	No
VC-12 unequipped (UNEQ)	Major	SignalLabelMismatch	Yes

3.12.16 VC-3 Path Alarms—Low-Order Path Layer

Table 73 VC-3 Path Alarms—Low-Order Path Layer

Description	Severity	Probable Cause	Service Affecting
TU-3 (tributary unit-3) alarm indication signal (AIS)	Minor	AIS	No
TU-3 loss of pointer (LOP)	Major	LossOfPointer	Yes
VC-3 (virtual container-3) payload label mismatch (PLM)	Major	SignalLabelMismatch	Yes
VC-3 remote failure indication (RFI)	Minor	FarEndReceiverFailure	No
VC-3 unequipped (UNEQ)	Major	SignalLabelMismatch	Yes

3.12.17 VC-3 Path Alarms—High-Order Path Layer

Table 74 VC-3 Path Alarms—High-Order Path Layer

Description	Severity	Probable Cause	Service Affecting
AU-3 (administrative unit-3) path alarm indication signal (AIS)	Major	AIS	Yes
AU-3 loss of pointer (LOP)	Major	Loss OfPointer	Yes
VC-3 path trace failure	Minor	PathTraceMismatch	No
VC-3 path unequipped (UNEQ)	Major	SignalLabelMismatch	Yes
VC-3 payload label mismatch (PLM)	Major	SignalLabelMismatch	Yes
VC-3 remote failure indication (RFI)	Minor	FarEndReceiverFailure	No

3.12.18 VC-4 Path Alarms

Table 75 VC-4 Path Alarms

Description	Severity	Probable Cause	Service Affecting
AU-4 (administrative unit-4) path alarm indication signal (AIS)	Major	AIS	Yes
AU-4 loss of pointer (LOP)	Major	Loss OfPointer	Yes
VC-4 path trace failure	Minor	PathTraceMismatch	No
VC-4 path unequipped (UNEQ)	Major	SignalLabelMismatch	Yes
VC-4 payload label mismatch (PLM)	Major	SignalLabelMismatch	Yes
VC-4 remote failure indication (RFI)	Minor	FarEndReceiverFailure	No

3.12.19 STS and STM Path Alarms

Table 76 STS and STM Path Alarms

Description	Severity	Probable Cause	Service Affecting
ATM loss of cell delineation	Major	DegradedSignal	Yes
Concatenation mismatch	Minor	PayloadTypeMismatch	No
Path alarm indication signal (AIS-P)	Minor	AIS	No
Path loss of pointer (LOP-P)	Major	LossOfPointer	Yes
Path remote defect indication (RDI-P)	Minor	FarEndReceiverFailure	No
Path identifier mismatch (PIM-P)	Minor	PathTraceMismatch	No
Path signal degrade (BER [bit error rate])	Major	DegradedSignal	Yes
Path signal failure (BER)	Major	ExcessiveBER	Yes
Path trace failure	Minor	PathTraceMismatch	No
Path unequipped (UNEQ-P)	Major	SignalLabelMismatch	Yes
Payload label mismatch (PLM)	Major	SignalLabelMismatch	Yes

3.13 Troubleshooting with Card Status LEDs

The equipment and facility LEDs on each card display the status of individual cards and their ports. See the Card Descriptions section for definitions of equipment and facility LEDs.

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

Table 77 Problems Indicated by Card Status LEDs

Problem	Solution
FAIL (red) is on.	The card has failed. Replace the card.
ACTIVE (green) is off.	Perform the following checks or actions: Check the STDBY LED: • If the STDBY LED is on, this is a normal condition. • If the STDBY LED is off, check the FAIL LED.
	Check the FAIL LED: • If the FAIL LED is on, replace the card. • If the FAIL LED is off, check the FAIL LED.
LOS (yellow) is on.	The port is experiencing a loss of signal. Check the cable connections and correct them if necessary.
SYNC (green) is off.	This condition is normal if no external timing cable is installed. Otherwise, all external timing signals have failed; the system is running with the onboard controller clock. Check the cable connections and correct them if necessary.

Table 77 Problems Indicated by Card Status LEDs

Problem	Solution
EXTERNAL TIMING LOS PRI (yellow) is on.	The signal is not present or an external timing source has not been configured. Check the cable connection and configuration.
EXTERNAL TIMING LOS SEC (yellow) is on.	The signal is not present or an external timing source has not been configured. Check the cable connection and configuration.

Note: Ethernet and Gigabit Ethernet cards do not have STDBY LEDs.

3.14 Troubleshoot with On-Demand Diagnostics

You initiate an on-demand diagnostic (ODD) session (one or more tests) from the SmartEdge OS command-line interface (CLI). These tests diagnose the standby controller card and line cards. You can also run tests on more than one card simultaneously. The following guidelines apply to the on-demand testing of traffic and controller cards:

- ODD testing requires version 2.0.2.9 or later of the system bootrom. To view the currently installed version, enter the **`show version`** command in any mode. To upgrade the bootrom, enter the **`upgrade bootrom`** command in exec mode. For more information about these commands, see *Command List* Reference [5].
- To test a line card, you must put it in the ODD state; see Initiate ODD Session for instructions.
- The cards that can be tested depend on the release of the software. In the current release, you can test the following cards:
  - Controller cards (any version), when they are functioning as standby controllers
  - ATM OC cards
  - POS OC cards
  - 10/100 Ethernet and Fast Ethernet–Gigabit Ethernet (FE–GE) cards
  - Transceiver-based Gigabit Ethernet cards (all versions)
  - Channelized cards (all versions)
  - Advanced Services Engine
  - SmartEdge Storage Engine

  Note: You cannot run ODD tests on the active controller card.
- Low-density versions of line cards are also supported, but only the enabled ports are tested.

Four levels of tests are supported; not all cards support all levels of tests.

Table 78 ODD Tests

Level	Components	Tests
1	All	Duplicates the tests of the power-on diagnostics; runs in 5 to 10 seconds.
2	Standby controller card, line cards only	Includes level 1 tests; tests a8,0.ll onboard active components in the line interface module (LIM) of the board, including memory, registers, PPA DIMMs and SRAM, PPA and other onboard processors; runs in 5 to 10 minutes.
3	Line cards only	Includes level 2 tests; tests and verifies the card data paths for the entire card with internal loopbacks; runs in 10 to 15 minutes.
4	Line cards only	Includes level 3 tests; tests the entire card using external loopbacks; must be run on site with external loopback cables installed; runs in 10 to 15 minutes.(1)(2)(3)

(1) To run external loopback tests on the Fast Ethernet-Gigabit Ethernet line card, install external loopback plugs on the FE and GE ports. Alternatively, the GE ports can be connected back to back.
(2) To run external loopback tests on the BiDirectional SFPs, require both left and right hand BiDi SFPs. Also BiDi SFPs require explicit cabling between left and right hand ports. The 5-port GE line card is an exception for this ODD test, as it has an extra port. One way to test this extra port is by having two 5-port GE cards in the system.
(3) To run external loopback tests on the Copper SFPs, install external loopback cables between the neighboring ports.

A session log stores the latest results for each card in main memory and also on the internal-storage device for low-level software; a history file stores the results for each session for the last 100 sessions on that internal-storage device.

You can display partial test results while the tests are in progress; a notification message is displayed when the session is completed. To view the results, use the **`show diag`** command with the **`on-demand`** keyword in any mode. You can display the latest results for a card from the log or the results for one or more sessions from the history file.

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 [5].

3.14.1 Initiate ODD Session

Table 79 Parameters for an ODD Session

Parameter	Description
`card` ***`slot`***	Line card in the specified slot to be tested.
`standby`	Tests the standby controller card.
`level` ***`level`***	Level at which the test is to be initiated. The levels are 1 to 4.
`loop` ***`loop-num`***	Number of times to repeat the diagnostic test.

Table 80 Card Types and Slots for the card Command

Type of Line Card/Description	***`card-type`*** **Keyword**	***`slot`*** **Argument Range**
ATM OC-3c/STM-1c (8-port)	`atm-oc3e-8-port`	1 to 6 and 9 to 14
ATM OC-12c/STM-4c (2-port)	`atm-oc12e-2-port`	1 to 6 and 9 to 14

Table 80 Card Types and Slots for the card Command

Type of Line Card/Description	*card-type* Keyword	*slot* Argument Range
POS OC-3c/STM-1c (8-port)	oc3e-8-port	1 to 6 and 9 to 14
POS OC-12c/STM-4c (4-port)	oc12e-4-port	1 to 6 and 9 to 14
POS OC-48c/STM-16c (4-port)	oc48e-4-port	1 to 6 and 9 to 14
OC-192c/STM-64c (1-port)	oc192-1-port	1 to 6 and 9 to 14
Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port)(1)	ch-oc3oc12-8or2-port	1 to 6 and 9 to 14
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	fege-60-2-port	1 to 6 and 9 to 14
Gigabit Ethernet 1020 (10-port)	ge-10-port	1 to 6 and 9 to 14
Gigabit Ethernet 1020 (20-port)(2)	ge-20-port	1 to 5 and 9 to 13
Gigabit Ethernet (5-port)	ge-5-port	1 to 6 and 9 to 14
Gigabit Ethernet DDR (10-port)	ge2-10-port	1 to 6 and 9 to 14
Gigabit Ethernet DDR (20-port)(3)(2)	ge4-20-port	1 to 6 and 9 to 14
10 Gigabit Ethernet (1-port)	10ge-1-port	1 to 6 and 9 to 14
10 Gigabit Ethernet DDR (4-port)(3)	10ge-4-port	1 to 6 and 9 to 14
10 Gigabit Ethernet/OC-192c DDR (1-port)	10ge-oc192-1-port	1 to 6 and 9 to 14
Advanced Services Engine	ase	1 to 4
SmartEdge Storage Engine(3)	sse	1 to 6 and 9 to 14

(1) To use ports 5 through 8 on a Channelized 8-port OC-3/STM-1 or 2–port OC-12/STM-4 line card (ROA1283420/1), an all-ports software license (FAL1241079/1) is needed. A separate software license (FAL1240782/1) is required for the Channelized 4-port OC-3/STM-1 or 1-port OC-12/STM-4 line card (ROA1283420/2).
(2) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE1020 line card.
(3) This card is not supported in the SmartEdge 400 and SmartEdge 800 chassis.

To initiate an ODD session:

1. If you are testing a line card, change its state to ODD; otherwise, proceed to step 2.

2. To prepare a line card for an ODD session, perform the tasks listed in Table 81; Table 80 lists values for the ***card-type*** and ***slot*** arguments.

Table 81 Prepare a Line Card for an ODD Session

Task	Command	Notes
Access global configuration mode.	configure	Enter this command in exec mode.
Specify the card to be tested and access card configuration mode.	card	Specify the card type and slot number.
Save the state of the ports and circuits on the card and put it in the out-of-service state.	shutdown	If there are cross-connected circuits configured on any of the ports on an ATM or Ethernet card, this command disables the cross-connections and saves their state.

Table 81 Prepare a Line Card for an ODD Session

Task	Command	Notes
Put the card in the ODD state.	`on-demand-diagnostic`	
Commit the previous commands to the database and return to exec mode.	`end`	You must enter this command to place the card in the ODD state.

3. To test one or more components, enter one of the commands listed in Table 82; all commands are entered in exec mode.Table 79 lists the values for the ***level-num*** and ***loop-num*** arguments. The arguments ***slot***, ***slot1***, ***slot2***, and ***slotn*** are chassis slot numbers for the line cards to be tested.

Table 82 Test Components

Task	Command
Test a line card.	**diag on-demand card** ***slot*** **level** ***level*** **loop** ***loop-num***
Test the standby controller card.	**diag on-demand standby level** ***level*** **loop** ***loop-num***

Table 83 ODD and LED Conditions for a Card

State of Indicator After	Clear Log(1)	Clear History	Replace Card(2)	Reload System	Reload Card or Change State—ODD to OSS	Successful ODD Session
Alarm conditions	On	On	Cleared	Cleared	On	Cleared
Alarm status	On	On	Cleared	Cleared	On	Cleared
FAIL LED	On	On	Cleared	Cleared	On	Cleared
LED status	Unchanged	Unchanged	N/A(2)	N/A(2)	N/A(2)	See Table 85
ODD history	Unchanged	Cleared	Unchanged	Unchanged	Unchanged	History file is updated
ODD log	Cleared	Unchanged	Unchanged	Unchanged	Unchanged	Log is updated
ODD status	Failed	Failed	Not available	Not available	Failed	No failures were detected

*(1) You can clear the ODD log or history using the **clear diag** command (in exec mode).*
(2) Replacing a card or reloading the system causes the power-on diagnostics to run; the LED status reflects the results of the power-on diagnostic tests. You cannot reload a card if it is in the ODD state.

To view the results, see Results from an ODD Session.

3.14.2 Return Line Card to the In-Service State

After testing a line card, you must return it to the in-service state. To return the line card to the in-service state from the ODD state, you must enter the **no** form of the **on-demand diagnostic** and **shutdown** commands.

Table 84 Return a Line Card to the In-Service State

Task	Command	Notes
Access global configuration mode.	`configure`	Enter this command in exec mode.
Specify the card that was tested and access card configuration mode.	`card`	Specify the card type and slot number.

Table 84 Return a Line Card to the In-Service State

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

Note: If you intend to reload the card, using the **`reload card`** in exec mode, you must first remove the card from the ODD state.

3.14.3 Results from an ODD Session

Table 85 LED States During and After an ODD Session

Card State	State of LEDs
Out of service (**`shutdown`** command)	FAIL, ACTIVE, and STDBY LEDs are off.
ODD (**`on-demand-diagnostic`** command)	FAIL, ACTIVE, and STDBY LEDs are off.
Session in progress	FAIL, ACTIVE, and STDBY LEDs blink.
End of session with one or more failures	FAIL LED is on; ACTIVE, and STDBY LEDs are turned off until card is returned to the in-service state.
End of terminated session	FAIL, ACTIVE, and STDBY LEDs are turned off until the card is returned to the in-service state.
End of successful session	FAIL, ACTIVE, and STDBY LEDs are turned off until the card is returned to the in-service state.

To display the results from one or more ODD sessions, perform one of the tasks listed in Table 86; all commands are entered in any mode.

Table 86 Display Results from ODD Sessions

Task	Command
Display results for all components from the last initiated session.	`show diag on-demand`
Display results for a line card.	`show diag on-demand card` ***`slot`***
Display results for the standby controller card.	`show diag on-demand standby`
Display results for the last ***`n`*** sessions. The latest session is displayed first. Up to 100 sessions can be listed.	`show diag on-demandhistory` ***`n`***

Table 87 Status Descriptions for an ODD Session

Session Status	Description
Aborted	Session was terminated by the user or by the standby controller card being removed.
Incomplete	At least one of the requested tests could not be run.
In-Progress	Session is currently in progress.

Table 87 Status Descriptions for an ODD Session

Session Status	Description
n Failures	Session was completed with a number of test failures.
Passed	All tests passed.

Table 88 Status Descriptions for a Test

Test Status	Description
Aborted	Test was started but terminated by the standby controller card being removed.
Failed	Test ran and failed.
Not Run	Test has not yet run (initial state).
Passed	Test ran successfully.
Running	Test is currently in progress.
Skipped	Test could not be run; for example, the part revision is earlier than the required minimum version or no file found.

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

If the version of the Sys FPGA on a line card is not 0x7 or later, the voltage check, temperature check, and bus tests cannot be run; they are skipped, and the session status is reported as “Incomplete”. To resolve the problem, enter the **`show hardware`** command (in any mode) with the **`card`** and **`detail`** keywords to display the FPGA version in the SysFpga field.

3.14.4 Clear Results from ODD Sessions

To clear the results from one or more ODD sessions, perform one of the tasks listed in Table 89; enter all commands in exec mode.

Table 89 Clear Results from ODD Sessions

Task	Command
Clear the results from the last initiated session.	**`clear diag on-demand`**
Clear the latest results for all components tested.	**`clear diag on-demandall`**
Clear the latest results for a line card.	**`clear diag on-demandcard`** ***`slot`***
Clear the latest results for the standby controller card.	**`clear diag on-demandstandby`**

3.14.5 ODD Examples

The following example shows how to initiate a session on the standby controller card and display results:

```
[local]Ericsson#diag on-demand standby level 2 loop 4
[local]Ericsson#show diag on-demand standby
```

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 card in ODD state
[local]Ericsson#configure
[local]Ericsson(config)#card fege-60-2-port 3
[local]Ericsson(config-card)#shutdown
[local]Ericsson(config-card)#on-demand-diagnostic
[local]Ericsson(config-card)#end

!Run an ODD session
[local]Ericsson#diag on-demand card 3 level 3 loop 5
!Display results
[local]Ericsson#show diag on-demand card 3
!Return the card to the in-service state
[local]Ericsson#configure
[local]Ericsson(config)#card fege-60-2-port 3
[local]Ericsson(config-card)#no on-demand-diagnostic
[local]Ericsson(config-card)#no shutdown
[local]Ericsson(config-card)#end
```

3.15 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 Hardware

The SmartEdge 400 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 or the Ericsson Technical Assistance Center (TAC) for directions.

Table 90 Slot Assignments for SmartEdge 400 Cards

Card	Slots Available
Controller	5, 6
ATM OC-3c/STM-1c (8-port) ATM OC-12c/STM-4c (2-port) POS OC-3c/STM-1c (8-port POS OC-12c/STM-4c (4-port) POS OC-48c/STM-16c (4-port) OC-192c/STM-64c (1-port) Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port) Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE) Gigabit Ethernet 1020 (10-port) Gigabit Ethernet (5-port) Gigabit Ethernet DDR (10-port) 10 Gigabit Ethernet (1-port) 10 Gigabit Ethernet/OC-192c DDR (1-port)	1 to 4
Gigabit Ethernet 1020(1)	2 to 4
Advanced Services Engine	1 to 4

(1) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE1020 line card.

Caution!

Risk of equipment malfunction. If you install or replace a card in a running system and the system is not fully operational, you can cause the system to malfunction.

Table 91 Tools Needed for Installation and Replacement Procedures

Tool	Purpose
#1 Phillips screwdriver	Remove and install the fan tray and cards.

Table 91 Tools Needed for Installation and Replacement Procedures

Tool	Purpose
3/16-inch Allen wrench	Remove and install an AC power supply in an AC power tray.
Trompeter tool	Remove and install DS-3 or E-3 cables.

4.1 Servicing Line Cards

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.

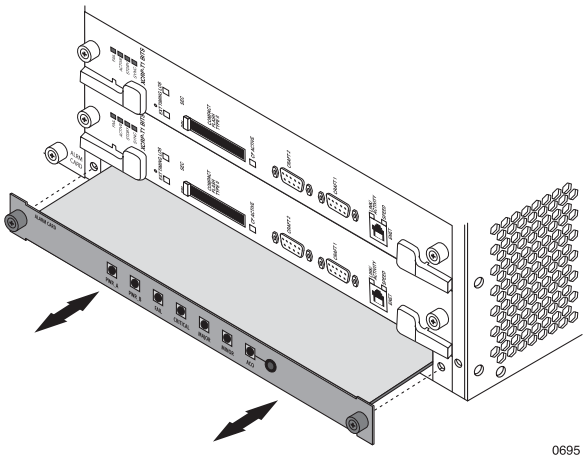


Figure 28 Removing and Replacing a Line Card

Stop!

Risk of equipment malfunction. If you install or replace a card in a running system and the system is not fully operational, you can cause the system to malfunction.

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.

Make sure the system is fully operational before proceeding with the installation or replacement procedure:

- In a system with dual controller cards, ensure that the standby controller is fully synchronized with the active controller card. Use the **`show redundancy`** command (in any mode) to display the status of the standby controller.
- In a system with a single controller card, ensure that you have the CLI prompt on the console.
- If the system is not currently in an operational state, you need to power off the system. To power off the system, remove all fuses for both power zones (primary and backup for each zone) in the fuse panel.

4.2 Servicing Controller Cards

The second controller card must be the same type and have the same memory size as the current controller card; you can check the Common Language Equipment Identifier (CLEI) codes to ensure that they are identical.

Stop!

Risk of ESD damage. A controller card contains electrostatic-sensitive devices. To reduce the risk of ESD damage, always use an ESD wrist or ankle strap when handling any card. Avoid touching its printed circuit board, components, or any connector pins.

4.2.1 Adding a Second Controller Card

To add a second controller card to a configuration:

1. Prepare for the addition:
   a. Optional. Upgrade the active controller to run the latest release of the system software.

      For instructions to display the release information, see *Technical Product Description* Reference [8].

      For instructions to upgrade the active controller to a new software release, see the release notes for that release.

   b. Put on an antistatic wrist strap and attach it to an appropriate 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.

c Loosen the captive screws and remove the blank card that is installed in slot 5 or 6.

Caution!

Risk of ESD damage. A controller card contains electrostatic sensitive devices. To reduce the risk of ESD damage, always use an ESD wrist or ankle strap when handling any card. Avoid touching its printed circuit board, components, or any connector pins.

2. Install the card.

   The second controller card must have the same memory size as the current controller card; check the Common Language Equipment Identifier (CLEI) codes to ensure that they are identical.

   If the software release on the controller card that you are installing is different from the release on the active controller, the active controller overwrites the release on the second controller card after you complete the installation procedure.

Caution!

Risk of data loss. If the controller cards are not the same type with the same main memory configuration, the system might need to shut down one or more line cards to free enough available power for the standby controller card. The SmartEdge OS always reserves enough power during system configuration so that if the system has only a single controller card installed, a standby controller card of the same type can be installed at a later time. If the controller cards are mismatched, the system issues an alarm for mismatched controllers, allocates power for the second controller card, and recalculates available power. If the available power is not sufficient to power all the installed line cards, the SmartEdge OS begins putting installed line cards into low-power mode, starting with the highest-numbered slot, until enough power is available to initialize the standby controller card.

To reduce the risk of line card shutdown, always ensure that the controller cards are identical before you install a second controller card.

3. If the first controller card includes an external storage device, install an external storage device in the controller card you have just installed.

4. Verify the operational status: the FAIL LED must not be on.

5. Generally, duplicate the cable connections of the active controller card on the standby controller card and route the cables accordingly.

After you have installed the card, the system ensures that both controller cards are running the same release of the system software, and downloads the release on the active controller card to the new standby controller card, if necessary.

4.2.2 Replacing a Controller Card

If the system configuration includes a single controller card, traffic is disrupted when you remove the card.

If the software release on the controller card that you are installing is different from the release on the active controller, the active controller overwrites the release on the replacement controller card after you complete the replacement procedure.

Caution!

Risk of data loss. Controller cards are hot swappable, but if the system configuration includes redundant controller cards, you can disrupt traffic if you remove the active controller card. To reduce the risk, verify that the card being removed is not the active controller (that is, the STDBY LED is on).

Perform the following steps to replace a controller card:

1. Prepare for replacement:

   a Optional. If you are replacing one of a pair of controller cards, upgrade the active controller to run the latest release of the system software.

   For procedures to display the release information and to upgrade the active controller to a new software release, see *Upgrading the Boot ROM or Minikernel* Reference [9].

   b If possible, in a system with dual controller cards, ensure that the system is fully operational: the standby controller must be fully synchronized with the active controller card. Use the **`show redundancy`** command in any mode to display the status of the standby controller.

   c If an external storage device is installed in the controller card, dismount the device; enter the following command in exec mode:

   ```
   unmount /md
   ```

   d Put on an antistatic wrist strap and attach it to an appropriate 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.

e Label and disconnect any cables from the front of the controller card being removed.

Caution!

Risk of equipment failure. Removing the controller card with its external storage device without first entering the **`unmount /md`** command (in exec mode) can permanently damage the device and cause the kernel to crash. To reduce the risk, always enter the unmount /md command before removing an external storage device.

Caution!

Risk of data loss. You can lose data that is being transferred to the external storage device if you enter the **`unmount /md`** command (in exec mode) before the data transfer operation is complete. To reduce the risk, do not enter the **`unmount /md`** command while the CF ACTIVE LED is blinking. When the operation is complete, the LED is turned off.

Caution!

Risk of ESD damage. A controller card contains electrostatic sensitive devices. To reduce the risk of ESD damage, always use an ESD wrist or ankle strap when handling any card. Avoid touching its printed circuit board, components, or any connector pins.

---

2. Remove the current card.
3. Install the new card.

   If you are replacing one of a pair of controller cards, the replacement controller card must have the same memory size as the current controller card; you can check the CLEI codes to ensure that they are identical.

Caution!

Risk of data loss. If the controller cards are not the same type with the same main memory configuration, the system might need to shut down one or more line cards to free enough available power for the standby controller card. The SmartEdge OS always reserves enough power during system configuration so that if the system has only a single controller card installed, a standby controller card of the same type can be installed at a later time. If the controller cards are mismatched, the system issues an alarm for mismatched controllers, allocates power for the second controller card, and recalculates available power. If the available power is not sufficient to power all the installed line cards, the SmartEdge OS begins putting installed line cards into low-power mode, starting with the highest-numbered slot, until enough power is available to initialize the standby controller card.

To reduce the risk of line card shutdown, always ensure that the controller cards are identical before you install a second controller card.

4. If an external storage device was installed in the previous controller card, remove the device from its slot and install it in the new controller card.

5. Verify the operational status: the FAIL LED must not be on.

6. Reconnect the cables you previously disconnected.

   If you have replaced one of a pair of controller cards, the system ensures that both controller cards are running the same release of the system software and downloads the release on the active controller to the new standby controller, if necessary.

4.2.3 Upgrading a Controller Card

Later versions of the controller card (XCRP4) provide more processing power and more memory than earlier version of the controller card.

In a dual-controller system, you must upgrade both controller cards. You cannot mix controller types in the same chassis.

To upgrade any controller card in a system to a later version:

1. Power down the SmartEdge router. You cannot upgrade the controller cards in a running system.

2. Replace each controller card currently installed in the chassis. In a dual-controller system, you must replace both controller cards.

Note: Both replacement controller cards must be the same version with the same amount of memory. You cannot mix controller types or memory configurations in the same chassis.

3. Power on the SmartEdge router.

4. Verify the operational status of both controller cards: the FAIL LED must not be on.

5. Reconnect the cables you previously disconnected.

6. Determine if you need to upgrade the SmartEdge OS that is shipped on the card.

   Enter the **`show version`** command in exec mode. If the displayed release version is not 2.5.3 or later, you must upgrade the SmartEdge OS to Release 2.5.3 or later before upgrading to the XCRP4 Controller card. If the displayed release version is not 6.1.3 or later, you must upgrade the SmartEdge OS to Release 6.1.3 or later before upgrading to the XCRP4 Controller card. The procedure to upgrade the SmartEdge OS to a later release is described in the release notes for that release.

4.2.4 Replacing a CF Card

Each controller card has an external slot on the front panel in which you can install an optional Type I or Type II CF card. Type I CF cards are 3.3 mm thick and Type II are 5 mm thick.

If a CF card is installed in the active controller card, the standby controller card, if installed, must also have a CF card installed; however, the CF card types (Type I or Type II) need not match.

Note: The XCRP4 Controller card supports Type I CF card only.

Removing the CF card without entering the **`unmount /md`** command can permanently damage the CF card and cause the kernel to crash. To reduce the risk, always enter the **`unmount /md`** command before removing the CF card.

For more information about the **`unmount`** command, see *Command List* Reference [5].

Caution!

Risk of data loss. You can lose data that is being transferred to the CF card if you enter the **`unmount /md`** command (in exec mode) before the data transfer operation is complete. To reduce the risk, do not enter the **`unmount /md`** command while the CF ACTIVE LED is blinking. When the operation is complete, the LED is turned off.

To replace a CF card:

1. Enter the following command in exec mode: **`unmount /md`**.

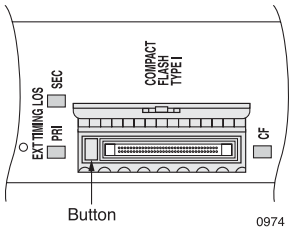
2. If you are removing the CF card in an XCRP4 Controller card, perform the following steps:

   a 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 CF Active LED blinks during the unmounting process.

   b Wait until the CF Active LED stops blinking. It is now safe to remove the CF card.

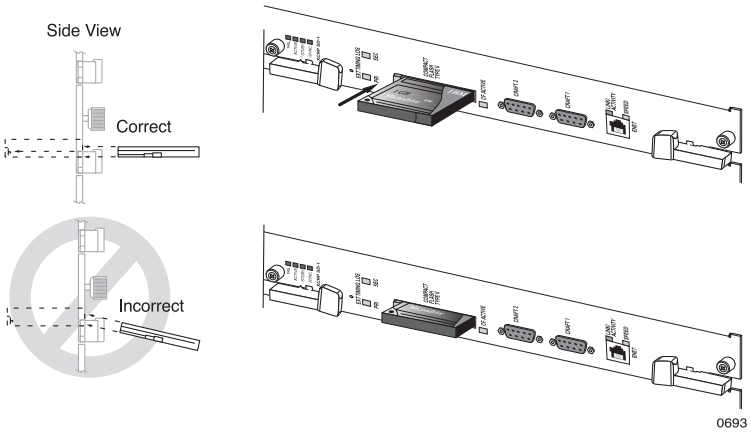
   Note: If the system cannot successfully unmount the file system on the CF card, the CF Active LED stops blinking and is off. You must enter the **`unmount`** command (in exec mode) to unmount the file system on the card.

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



4. Grasp the CF card and pull gently and slowly until the CF card is disengaged from the internal pins.

5. Insert a new CF card.



6. Close the door.

After replacing the CF card, re-seat the XCRP4 Controller card so the Power-on Diagnostic (POD) can run on the XCRP card. For information on the POD, see Section 2.14.1 on page 49.

For detailed instructions on how to install a CF card, see Install Compact Flash (CF) Cards.

4.3 Replacing a Transceiver

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

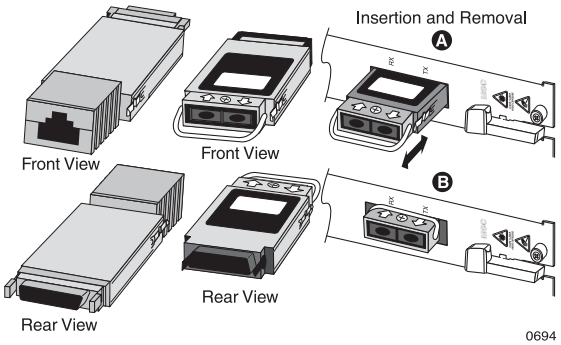


Figure 29 GBIC Transceivers

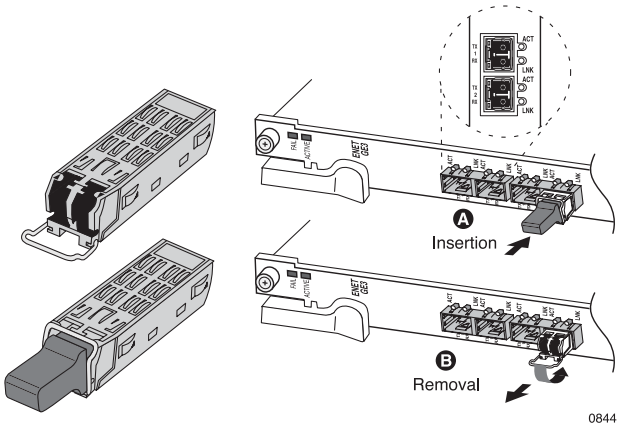


Figure 30 SFP Transceivers

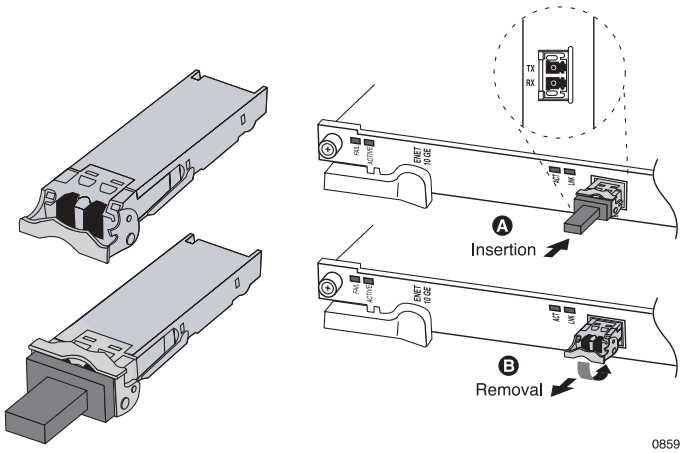


Figure 31 XFP Transceivers

To remove a transceiver of any type:

1. Shut down all activities on the port with the transceiver you want to replace. See *Configuring ATM, Ethernet, and POS Ports* Reference [2].

2. Put on an antistatic wrist strap and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located on the front of the fan tray.

Caution!

Risk of damage to fiber-optic cables. Never stop on a cable; never twist it when connecting it to or disconnecting it from a line card.

---

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

   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.

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

4.4 Cleaning Optical Connectors

Clean fiber-optic components are a requirement for quality connections between fiber-optic equipment. For more information, see *Inspection And Cleaning Of Optical Connectors* Reference [10].

4.5 Servicing the Advanced Services Engine

Caution!

Risk of ESD damage. A services card contains electrostatic-sensitive devices. To reduce the risk of ESD damage, always use an ESD wrist or ankle strap when handling any card. Avoid touching its printed circuit board, components, or any connector pins.

4.5.1 Adding an ASE Card

To add an ASE card to an operational system:

1. Ensure that the system is fully operational:
   a. In a system with dual controller cards, the standby controller must be fully synchronized with the active controller card. Use the **`show redundancy`** command (in any mode) to display the status of the standby controller.
   b. In a system with a single controller card, ensure that you have the CLI prompt on the console.
2. Select the proper slot for a services card.
3. Put on an antistatic wrist strap and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located on the front of the fan tray.
4. Loosen the captive screws and remove the blank card that is installed in the slot for the new card.
5. Install the card.
6. After the card has been installed, verify the operational status.
7. Connect and route the cables.

   If you are having difficulty installing a new card, perform the following checks or actions:

   a. Ensure that you are not attempting to install a controller card in any slot other than slot 7 or 8.
   b. If you are attempting to install a services card in slot 7 or 8, select a different slot; services cards can be installed in slots 1 to 6 and 9 to 14 only.
   c. Ensure that the card is properly aligned with the slot guides.

Note: If you have already configured the slot by using the **`card`** command (in global configuration mode) and the services card is not the same type as the services card that you configured for the slot, the system does not initialize the new services card; instead, it is held in low-power mode with its components in reset mode. If the type of services card is the same as the slot configuration, the system initializes the card.

4.5.2 Replacing an ASE Card

Perform the following steps to remove an existing services card and replace it with a new card:

1. Ensure that the system is fully operational:
   a. In a system with dual controller cards, the standby controller must be fully synchronized with the active controller card. Use the **`show redundancy`** command to display the status of the standby controller.
   b. In a system with a single controller card, 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 appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located on the front of the fan tray.
   b. Label and disconnect any cables from the front of the card being removed.
   c. If the card has optical ports, install rubber covers over the connectors.

Caution!

Risk of ESD damage. A services card contains electrostatic-sensitive devices. To reduce the risk of ESD damage, always use an ESD wrist or ankle strap when handling any card. Avoid touching its printed circuit board, components, or any connector pins.

3. Remove the current card.
4. Install the new card.
5. Check the LEDs on the new card to ensure proper operational status.
6. Reconnect the cables you previously disconnected.
7. Use the SmartEdge OS CLI software to restore the card to normal operations.

4.6 Replacing the Fan Tray

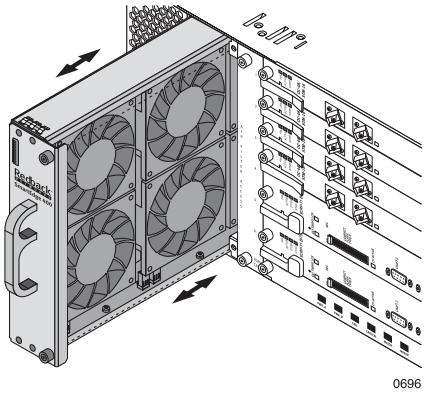


Figure 32 Replacing the Fan Tray

The chassis is cooled with six fans contained in the fan tray, which is located at the front of the chassis. You do not have to power off the system to remove the fan tray, because the SmartEdge 400 router can operate without the fans for a short period of time.

Caution!

Risk of equipment damage. A working fan tray and air filter are required by the SmartEdge 400 chassis for it to operate without causing an over temperature condition that can damage the system components. To reduce the risk, always replace the fan tray or air filter within two minutes of its removal.

To replace the fan tray:

1. Put on an antistatic wrist strap and attach it to an appropriate 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. Remove the fan tray; see Figure 32
   a Using a Phillips screwdriver, loosen the captive screws on the front of the fan tray.
   b Gently slide it out of the chassis and set it aside.
3. Install the new fan tray:
   a Insert the fan tray into the chassis.
   b With a Phillips screwdriver, tighten the screws on the front of the unit to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters).

4. Check the LEDs on the front of the fan tray, the FAN LED must not be on.
5. Replace the air filter and update the service date.

   If you do not replace the air filter and then update the service date, the service date stored in the fan tray will not be valid for the air filter.

Note: If you do not replace the air filter and then update the service date, the service date stored in the fan tray will not be valid for the air filter.

4.7 Replacing the Alarm Unit

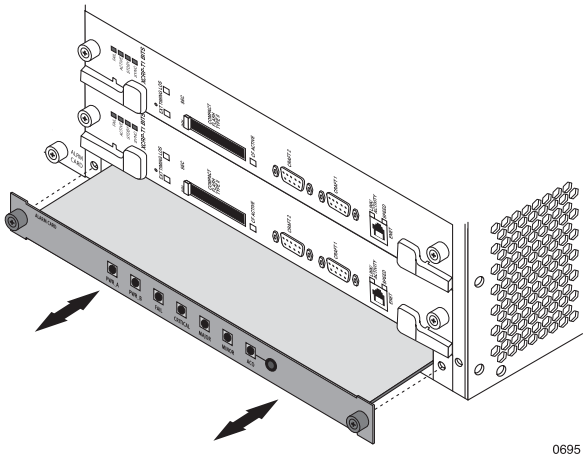


Figure 33 Replacing the Alarm Card

You do not have to power off the system to remove the alarm card.

To replace the alarm card; see Figure 33

1. Put on an antistatic wrist strap and attach it to an appropriate 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.

Caution!

Risk of ESD damage. An alarm card contains electrostatic sensitive devices. To reduce the risk of ESD damage, always use an ESD wrist or ankle strap when handling any card. Avoid touching its printed circuit board, components, or any connector pins.

2. Remove the alarm card:

   a Using a Phillips screwdriver, loosen the captive screws on the front panel of the alarm card.

b Hold the card by the captive screws and support the card with your fingers on the under edge of the front panel.

c Keeping the card horizontally level so that it is perpendicular to the slot, carefully slide the card out of the chassis, and place it in an antistatic bag.

3. Install the new alarm card:

a Horizontally align the card with the slot, so that the card is perpendicular to it; then carefully slide the card into the slot.

b Secure the card in the chassis by tightening the captive screws on the left and right side of the front panel. With a Phillips screwdriver, tighten each screw to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters).

4.8 Replacing the Air Filter

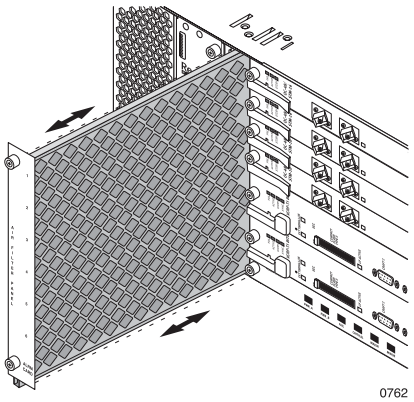


Figure 34 Replacing the Air Filter with Attached Panel

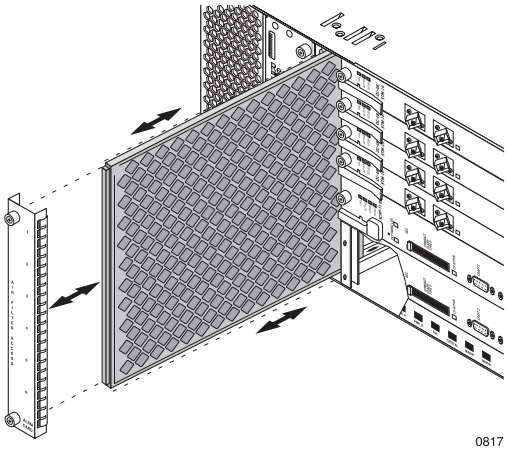


Figure 35 Replacing the Air Filter with Separate Panel

The SmartEdge 400 chassis has a built-in air filter that is used in conjunction with the fan tray to cool the system. In the initial version of the SmartEdge 400

chassis, the filter is permanently attached to a panel next to the fan tray; in later versions of the chassis the filter is separate from its panel. Because the filter with the attached panel is no longer available, when you replace it, you replace it with a filter with the separate panel.

We recommend that you change the filter every three to six months (or more often, if required) to ensure the correct airflow through the chassis. The system can be configured to generate an alarm condition if the service interval selected by the system administrator expires without the air filter being replaced.

You do not have to power off the system to remove the air filter, because the SmartEdge 400 router can operate without the air filter for a short period of time.

Caution!

Risk of equipment damage. A working fan tray and air filter are required by the SmartEdge 400 chassis for it to operate without causing an over temperature condition that can damage the system components. To reduce the risk, always replace the fan tray or air filter within two minutes of its removal.

If you prefer, you can clean the air filter instead of installing a new one. To clean the filter, you can blow it with slightly compressed air, vacuum it, or wash it with water beneath a faucet or with a moderate pressure nozzle. Do not expose the filter to any harsh cleaning chemicals or solvents. If necessary, use a mild detergent similar to dishwashing liquid. For electronic equipment, vacuuming is probably the most practical method, considering logistics and the reduced risk of introducing moisture into the system.

To replace the air filter:

1. Remove the current filter. Using a Phillips screwdriver, loosen the captive screws on the front panel and pull gently on the captive screws to remove the panel from the chassis:

   a If the filter is attached to the panel, this step also removes the filter.

   b If the filter is separate from the panel, slide it out of the opening.

2. Install the new filter. Insert the replacement filter into the opening with the lattice side of the filter next to the card slots (on the right side of the opening). The filter slides between the pair of flanges on the bottom of the opening:

   a If the filter is attached to the panel, this step also inserts the panel into the opening; see Figure 34.

   b If you are installing a filter with a separate panel, insert the panel into the opening; see Figure 35.

Push gently on the panel until it is flush with the front of the chassis; the resistance of the panel ensures a snug fit that maintains the correct airflow.

3. Secure the panel in the chassis by tightening the captive screws. With the Phillips screwdriver, tighten each screw to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters).

4. Update the service date for the air filter; either enter the following command in exec mode, or ask the system administrator to do so:

   `service air-filter`

   The system updates the service date in the EEPROM of the fan tray, according to the service interval configured by the system administrator.

Caution!

Risk of equipment damage. You can corrupt the EEPROM for the fan tray in which the service date is stored, if you remove the fan tray from the chassis while the **`service air-filter`** command is running. To reduce the risk, do not attempt to remove the fan tray until after the command is completed.

4.9 Servicing External Storage Device

Caution!

Risk of ESD damage. An external storage device contains electrostatic sensitive devices. To reduce the risk of ESD damage, always use an ESD wrist or ankle strap when handling any external storage device. Avoid touching its connector pins.

4.9.1 Installing an External Storage Device

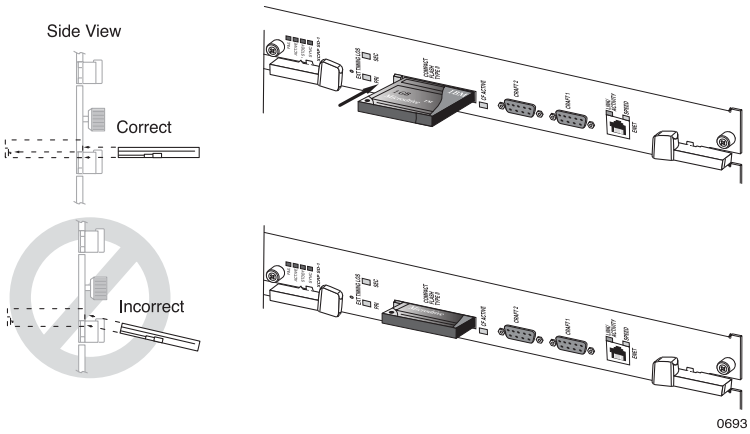


Figure 36 Installing an External Storage Device

Each controller card has an external slot on the front panel in which you can install an optional Type I or Type II external storage device.

If an external storage device is installed in the active controller card, the standby controller card, if installed, must also have an external storage device installed; however, the device types (Type I or Type II) need not match.

To install an external storage device:

1. Put on an antistatic wrist strap and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located on the front of the fan and alarm unit.

2. If you are installing the device in an XCRP4 Controller card, open the door that covers the CF Type 1 slot until it “snaps” open.

3. Hold the device so that its pin-hole side faces the slot in the controller front panel. (The arrow on the device points toward the front panel.)

4. Horizontally align the device as close to the bottom edge of the slot as possible and perpendicular to it; see Figure 36.

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

Caution!

Risk of equipment damage. Do not force the device into its slot. If the device does not slide in easily, one of the following conditions is possible:

The device does not engage the internal pins because it is mispositioned. Check the position and alignment as described in step 4. The device does not engage the connectors because it is upside down. Remove the device and rotate it 180°; then try again. The device has been previously damaged so that it cannot align correctly with the internal pins; remove the card and discard it. Do not use it in any other equipment. The internal pins have been bent or otherwise damaged by a previous device insertion; you must replace the controller card.

6. If you are installing the device in an XCRP4 Controller card, close the door.

After insertion, the system automatically recognizes the external storage device and you can use it to store data.

If the system cannot successfully mount the file system on the device (for example, the file system is damaged or the device is unformatted), the CF Active LED stops blinking, becomes off, and the system displays an error message on the console. You must enter the **`formatmedia-device`** command (in exec mode) to format the device and the **`mount`** command (in exec mode) to mount it.

For more information about the **`formatmedia-device`** and **`mount`** commands, see *Command List* Reference [5].

4.9.2 Removing an External Storage Device

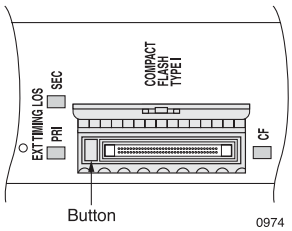


Figure 37 Ejector for External Storage-Device in XCRP4 Controller Card

To remove an external storage device:

1. Prepare the device for removal: enter the following command in exec mode:

   `unmount /md`

Caution!

Risk of equipment failure. Removing the external storage device without first entering the **`unmount /md`** command (in exec mode) can permanently damage the device and cause the kernel to crash. To reduce the risk, always enter the unmount /md command before removing an external storage device.

Caution!

Risk of data loss. You can lose data that is being transferred to the external storage device if you enter the **`unmount /md`** command (in exec mode) before the data transfer operation is complete. To reduce the risk, do not enter the **`unmount /md`** command while the CF ACTIVE LED is blinking. When the operation is complete, the LED is turned off.

2. If you are removing the device in an XCRP4 Controller card:

   a Open the door that covers the CF Type 1 slot until it “snaps” open. This action begins unmounting the file system on the device. The CF Active LED blinks during the unmounting process.

   b Wait until the CF Active LED stops blinking. It is now safe to remove the device.

   If the system cannot successfully unmount the file system on the device, the CF Active LED stops blinking and is 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 [5].

3. If you are removing the device in an XCRP4 Controller card, press the ejection button that is inside the CF slot (see Figure 37) twice (first to cause the button to protrude from within its recess and second to disengage the device from its connectors).

4. Grasp the device and pull gently and slowly until the device is disengaged from the internal pins.

5. If you are removing the device in an XCRP4 Controller card, close the door.

4.10 Servicing AC Power Supply

Caution!

Risk of ESD damage. An AC power supply contains electrostatic sensitive devices. To reduce the risk of ESD damage, always use an ESD wrist or ankle strap when handling it. Avoid touching its printed circuit board, components, or any connector pins.

4.10.1 Adding an AC Power Supply

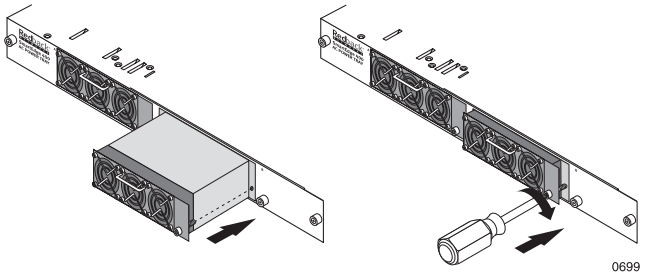


Figure 38 Installing an AC Power Supply

To install an AC power supply, you need a 3/16-inch Allen wrench. Perform the following steps:

1. Put on an antistatic wrist strap and attach it to an appropriate 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. Use the Allen wrench to remove the blank panel that covers the empty slot.
3. Insert the AC power supply into the empty slot in the AC power tray until the captive bolt can engage the AC power tray; see Figure 38.
4. With a 3/16-inch Allen wrench, tighten the bolt to a maximum torque of 25.0 inch-lbs (2.8 Newton-meters); as you screw the bolt, the AC power supply moves into the AC power tray.
5. Insert the AC power cord for the supply in the connector for that supply on the rear of the AC power tray and pull down the retention clip to secure the plug. (Match the label by the power cord connector with the label by the power supply slot.)
6. Insert the AC power cord for the power supply you have added in a building outlet for a 15A circuit that has a 15A circuit breaker.
7. Verify the status of the new power supply.

4.10.2 Replace an AC Power Supply

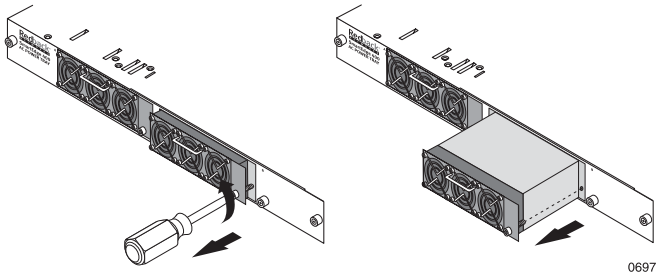


Figure 39 Removing an AC Power Supply

To replace an AC power supply, you need a 3/16-inch Allen wrench. Perform the following steps:

1. Put on an antistatic wrist strap and attach it to an appropriate 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.

Caution!

Risk of ESD damage. An AC power supply contains electrostatic sensitive devices. To reduce the risk of ESD damage, always use an ESD wrist or ankle strap when handling it. Avoid touching its printed circuit board, components, or any connector pins.

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2. Disconnect the AC power cord for the power supply that you are replacing from the building outlet.
3. Remove the AC power supply; see Figure 39
   a Using a 3/16-inch Allen wrench, loosen and unscrew the captive screw on the front of the AC power supply; as you loosen the screw, the AC power supply moves forward out of the AC power tray.
   b After the screw is disengaged from the AC power tray, gently slide the AC power supply out of the AC power tray and set it aside.
4. Install the new AC power supply; see Figure 38
   a Insert the AC power supply into the AC power tray until the captive screw can engage the AC power tray.
   b With a 3/16-inch Allen wrench, tighten the screw to a maximum torque of 25.0 inch-lbs (2.8 Newton-meters); as you tighten the screw, the AC power supply moves into the AC power tray.

5. Insert the AC power cord for the power supply you have replaced in the building outlet from which you disconnected it.

6. Verify the status of the new power supply.

5 System Descriptions

The SmartEdge 400 router is a carrier-class product with an architecture that supports packetized traffic. The SmartEdge 400 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 vital 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.

Because of the optimized packet forwarding capabilities and support of high-bandwidth uplink interfaces, the SmartEdge 400 router can also be used in the metropolitan core to aggregate traffic from other routers into the long-haul transit core.

5.1 Specification Summary

Table 92 General Specifications

Specification	Value
Synchronization	• Line timing mode (various line cards) • Internal timing mode • External timing mode
Protection type	• Power: independent dual-feed • XCRP4 Controller card: 1:1 • External timing: 1:1
Operations connections	• Management workstation (ENET): 10/100Base-T • Console terminal (Craft): RS-232 • Alarms audible and visual: critical, major, minor, ACO

Note: Protection for cards and ports depends on the release of the SmartEdge OS.

5.2 Controller Card

A controller 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.

5.3 Line Cards Interfaces

Table 93 SmartEdge 400 Line Cards

Type of Line Card/Description	Number of Cards	Number of Ports[1]	Low-Density Version	Low-Density Ports[2]	Protection Ratios[3]
ATM OC-3c/STM-1c (8-port)	4	8	No	–	None,1+1 APS
ATM OC-12c/STM-4c (2-port)	4	2	No	–	None, 1+1 APS
POS OC-3c/STM-1c (8-port)	4	8	No	–	None, 1+1 APS
POS OC-12c/STM-4c (4-port)	4	4	No	–	None, 1+1 APS
POS OC-48c/STM-16c (4-port)	4	4	No	–	None, 1+1 APS
OC-192c/STM-64c (1-port)	4	1	No	–	None, 1+1 APS
Channelized OC3c-STM-1c (8/4-port) / OC-12/STM-4 (2/1-port)	4	8, 2 4, 1	No	–	None, 1+1 APS
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	4	60, 2	No	–	None
Gigabit Ethernet 1020 (10-port)	4	10	No	–	None
Gigabit Ethernet 1020 (20-port)[4]	2 [5]	20	No	–	None
Gigabit Ethernet (5-port)	4	5	No	–	None
Gigabit Ethernet DDR (10-port)	4	10	No	–	None
10 Gigabit Ethernet (1-port)	4	1	No	–	None
10 Gigabit Ethernet/OC-192c DDR (1-port)	4	1	No	–	None

(1) On optical cards, each port has separate connectors for the transmit (Tx) and receive (Rx) circuits.
(2) The low-density version of a card provides a limited number of ports that are enabled through software entitlement.
(3) Protection features for various types of cards and ports are dependent on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.
(4) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE1020 line card.
(5) The 20-port GigabitEthernet 1020 line card requires two adjacent slots.

5.4 Advanced Services Engine Card

Table 94 Advanced Services Engine Card

Type of Card	Number of Cards	Number of Ports[1]	Low-Density Version	Low-Density Ports	Protection Ratios
Advanced Services Engine (4-port)	12	4[2]	No	–	None

(1) The SmartEdge OS does not support these ports directly.
(2) These ports are not used for control or data traffic.

5.5 Packet Mesh Architecture

The SmartEdge 400 router implements a grid of cross connections in its backplane that allows any line card to communicate directly to any other line

card in the chassis. The feature allows incoming packets to be directly routed from the receiving line card to the line card that will transmit them to the network. Each line card uses a combination of a Packet Mesh ASIC (PMA) and Packet Processing ASICs (PPAs) to perform this function.

5.6 Redundancy

The architecture of the system is fully redundant for all traffic-affecting components. Redundancy features include:

- Separate A-side and B-side power connections
- 1+1 Automatic Protection Switching (APS) protection for ATM second-generation line cards: ATM OC-3c/STM-1c and ATM OC-12c/STM-4c
- 1+1 APS protection for Packet over SONET/SDH (POS) line cards: OC-48c/STM-16c, OC-12c/STM-4c, and OC-3c/STM-1c

  Note: Protection for cards and ports is configurable on a port basis; a mix of unprotected ports is supported. Protection features and the types of ports that support APS are dependent on the release of the software.

- Redundant controller cards and redundant file systems
- Redundant external timing sources, such as building integrated timing supply (BITS) or synchronization supply unit (SSU), with internal timing if both sources should fail

5.7 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.

5.8 System Status

The system status LEDs are located on the fan tray:

- Power sources (A1, A2, B1, and B2)
- Fan
- Alarm cutoff (ACO)

5.9 SmartEdge 400 Router

The SmartEdge 400 router has two versions: AC and DC.

Table 95 SmartEdge 400 Chassis Versions

Chassis	Product Code	Description
SmartEdge 400 AC	44	SmartEdge 400 chassis that supports AC power source with an AC power tray.
SmartEdge 400 DC	0A	SmartEdge 400 chassis that supports DC power.

In the descriptions that follow, the term, SmartEdge 400, applies to any version of the chassis, unless otherwise noted. Figures for the SmartEdge 400 chassis illustrate the SmartEdge 400 chassis without the AC power tray.

5.9.1 Chassis Card Cage

The SmartEdge 400 chassis has six slots with two slots dedicated to the controller cards and four slots available for a flexible combination of line cards. A separate area of the chassis has fans for forced-air cooling. The SmartEdge 400 chassis is designed for mounting in a standard 19- or 23-inch rack.

All cards are installed at the front of the chassis. With the exception of the line cards that use the BNC connectors on the rear of the chassis, the cards have their port connectors on their front panels.

Note: Traffic cards with BNC connectors are limited to slots 3 and 4, which are the only slots that support BNC connectors.

Cable management brackets are attached to the right side of the front of the chassis and to the left side of the rear of the chassis.

Caution!

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

5.9.2 Chassis Cooling

The fan tray is also mounted at the front of the chassis. An alarm card, inserted below the slots for the controller cards, has the system LEDs mounted on it; system LEDs include power status (A and B sources), alarm status (critical, major, minor), and a failure LED for the fan tray or the system itself, and an alarm cutoff (ACO) button and its associated LED.

The ACO button provides one means of silencing an audible alarm; pressing the ACO button silences an audible alarm and lights the ACO LED; pressing the button again turns off the ACO LED and, if the alarm condition has not been corrected, sounds the alarm.

Note: Support for the ACO button depends on the release of the SmartEdge OS.

The chassis is cooled with six fans contained in the fan tray. A single fan failure does not impact the operation of the system; however, the unit must be replaced as soon as possible to provide the full protection of the redundant fans. To maintain the airflow through the chassis, empty slots must have blank cards installed.

5.9.3 Chassis Power

The rear of the chassis has connectors for power (A and B sides), DS-3 and E3 cards installed in slots 3 and 4, alarm outputs and status inputs, and dual external-timing inputs for synchronization.

Note: The SmartEdge OS does not support the status and control port.

Electrostatic discharge (ESD) jacks are conveniently located on both the front and the rear of the chassis.

5.9.4 AC Power Tray

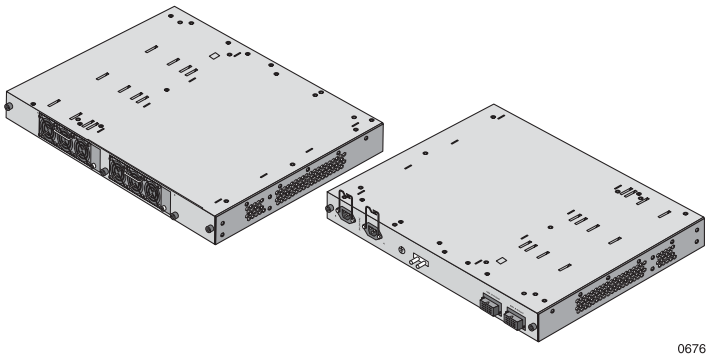

Figure 40 AC Power Tray

An optional AC power tray, which is installed directly below the chassis, allows the SmartEdge 400 router to be installed at sites for which no DC power is available; see Figure 40. The AC power tray has slots for two power supplies and connectors to allow dual AC-power cords to connect to separate AC power circuits. A pair of LEDs on the front panel of each installed power supply indicate the status of the AC-input and DC-output power to and from the AC power tray. Each AC power supply connects to the SmartEdge 400 chassis with an AC power tray jumper cable using connectors on the rear of the AC power tray and provides sufficient power for a fully loaded chassis.

6 Card Descriptions

6.1 Line Cards

The SmartEdge router supports the XCRP4 Controller card and the following line and service cards.

Table 96 Line Card Order Numbers

Order Numbers	Description	Front Panel Label	Earliest Release
ATM			
ROA1283243/1 AIM-SE8-L3-8OC3	8-port OC-3c/STM-1c ATM, SFP transceivers	ATM OC3/ STM-1	SmartEdge 400—6.1.5 SmartEdge 600—6.2.1 SmartEdge 800—6.1.5 SmartEdge 1200—6.1.5 SmartEdge 1200H—6.3.1
ROA1283281/1	2-port OC-12c/STM-4c ATM Enhanced, SFP transceivers	ATM OC12 STM-4	SmartEdge 400—6.4.1 SmartEdge 600—6.4.1 SmartEdge 800—6.4.1 SmartEdge 1200—6.4.1 SmartEdge 1200H—6.4.1
POS			
ROA1283250/1	8-port OC-3c/STM-1c POS using SFP Transceivers	POS OC3/ STM-1	SmartEdge 400—6.3.1 SmartEdge 600—6.3.1 SmartEdge 800—6.3.1 SmartEdge 1200—6.3.1 SmartEdge 1200H—6.3.1
ROA1283249/1	4-port OC-12c/STM-4c POS using SFP Transceivers	POS OC12/ STM-4	SmartEdge 400—6.3.1 SmartEdge 600—6.3.1 SmartEdge 800—6.3.1 SmartEdge 1200—6.3.1 SmartEdge 1200H—6.3.1
ROA1283251/1 OIM-SE8-4OC48	4-port OC-48c/STM-16c POS using SFP Transceivers	POS OC48/ STM-16	SmartEdge 400—6.2.1 SmartEdge 600—6.2.1 SmartEdge 800—6.2.1 SmartEdge 1200—6.2.1 SmartEdge 1200H—6.3.1

Table 96 Line Card Order Numbers

Order Numbers	Description	Front Panel Label	Earliest Release
ROA1283202/1 OIM-SE8-1OC192	1-port OC-192c/STM-64c POS using XFP Transceiver[1]	POS OC-192c STM-64c	SmartEdge 400—6.1.3 SmartEdge 600—6.2.1 SmartEdge 800—6.1.3 SmartEdge 1200—6.1.3 SmartEdge 1200H—6.3.1
Channelized OC			
ROA1283420/2[2] or ROA1283420/2[3]	Channelized 8-port OC-3/STM-1 or 2–port OC-12/STM-4 or Channelized 4-port OC-3/STM-1 or 1-port OC-12/STM-4	CHOC3/12 STM1/4	SmartEdge 400—11.1.1 SmartEdge 600—11.1.1 SmartEdge 800—11.1.1 SmartEdge 1200—11.1.1 SmartEdge 1200H—11.1.1
FE–GE			
ROA1283186/1 EIM-SE12-60FE-TX	60-port FE–GE card using RJ-45 connectors[4]	60 ENET 10/100 2 ENET 100/1000	SmartEdge 400—6.1.3 SmartEdge 600—6.2.1 SmartEdge 800—6.1.3 SmartEdge 1200—6.1.3 SmartEdge 1200H—6.3.1
ROA1283184/1 EIM-SE8-1020GE	10-port GE 1020 card using SFP transceivers	GE1020 Enet 1Gb	SmartEdge 400—4.0.5.2 SmartEdge 600—6.2.1 SmartEdge 800—4.0.5.2 SmartEdge 1200—6.1.1 SmartEdge 1200H—6.3.1
ROA1283185/1 EIM-SE8-1020GEXP-COM	20-port GE 1020 card using SFP transceivers	GE1020 20 Port Gigabit Ethernet	SmartEdge 400—4.0.5 SmartEdge 600—6.2.1 SmartEdge 800—4.0.5 SmartEdge 1200—6.1.1 SmartEdge 1200H—6.3.1
ROA1283241/1 EIM-SE8-5GE	5-port GE card using SFP transceivers	ENET 1Gb	SmartEdge 400—6.1.4 SmartEdge 600—6.2.1 SmartEdge 800—6.1.4 SmartEdge 1200—6.1.4 SmartEdge 1200H—6.3.1
ROA1283411/1	10-port GE DDR-based card using SFP transceivers	ENET SD 1Gb	SmartEdge 400—6.4.1 SmartEdge 600—6.4.1 SmartEdge 800—6.4.1 SmartEdge 1200—6.4.1 SmartEdge 1200H—6.4.1

Table 96 Line Card Order Numbers

Order Numbers	Description	Front Panel Label	Earliest Release
ROA1283240/1 EIM-SE12-20GE(5)	20-port GE DDR card using SFP transceivers	ENET 100/1000	SmartEdge 600—6.2.1 SmartEdge 1200—6.1.5 SmartEdge 1200H—6.3.1
ROA1283183/1 EIM10GE-SE8-L3	1-port 10 GE card using XFP transceiver	ENET 10GE	SmartEdge 400—4.0.5 SmartEdge 600—6.2.1 SmartEdge 800—4.0.5 SmartEdge 1200—6.1.1 SmartEdge 1200H—6.3.1
ROA1283242/1 EIM10GE-SE12-4(5)(6)	4-port 10 GE DDR card using XFP transceivers	ENET 4X 10GE	SmartEdge 600—6.2.1 SmartEdge 1200—6.1.5 SmartEdge 1200H—6.3.1
ROA1283409/1(7)	1-port 10 GE/OC-192c DDR-based card using XFP Transceiver	ENET 10Gb POS OC-192c/ STM-64c	SmartEdge 400—6.4.1 SmartEdge 600—6.4.1 SmartEdge 800—6.4.1 SmartEdge 1200—6.4.1 SmartEdge 1200H—6.4.1

(1) This line card accepts XFP transceivers, including SR, IR, and LR types.
(2) Use Software License FAL1241079/1 number.
(3) Use Software License FAL1240782/1 with this part number.
(4) The front panel has 5 MRJ21 connectors, each supporting 12 FE ports; a breakout cable, which uses RJ-45 connectors for the individual ports, is available from Ericsson (CBL-FE-RJ21-2M).
(5) This card is not supported on the SmartEdge 400 and 800 chassis.
(6) The OTN-DWDM XFP transceivers can only be installed in ports 1 and 4 of this line card.
(7) The 1-port 10GE-OC192 line card supports 10GE and OC-192c/STM-64c functionalities.

Note: For further information and a full list of supported transceivers, see *Transceivers for SmartEdge and SM Family Line Cards* Reference [7].

Table 97 SmartEdge Line Cards

Line Card Type and Card Description	Physical Ports	Low-Density Version	Low-Density Port Numbers
ATM OC-3c/STM-1c (8-port)	8	No	–
ATM OC-12c/STM-4c (2-port)	2	No	–
POS OC-3c/STM-1c (8-port)(1)	8	No	–
POS OC-12c/STM-4c (4-port)	4	No	–
POS OC-48c/STM-16c (4-port)	4	No	–
OC-192c/STM-64c (1-port)	1	No	–
Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port)(2)	8, 2 4, 1	No	–
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	60, 2	No	–

Table 97 SmartEdge Line Cards

Line Card Type and Card Description	Physical Ports	Low-Density Version	Low-Density Port Numbers
Gigabit Ethernet 3 (4-port)	4	No	–
Gigabit Ethernet 1020 (10-port)	10	No	–
Gigabit Ethernet 1020 (20-port)(3)	20	No	–
Gigabit Ethernet (5-port)	5	No	–
Gigabit Ethernet DDR (10-port)	10	No	–
Gigabit Ethernet DDR (20-port)(3)(4)	20	No	–
10 Gigabit Ethernet (1-port)	1	No	–
10 Gigabit Ethernet DDR (4-port)(4)(5)	4	No	–
10 Gigabit Ethernet/OC-192c DDR (1-port)(6)	1	No	–
ase	4(7) (2 for each ASP)(8)	N/A	N/A
ase ase2	4 4	N/A	N/A
sse(4)	4	N/A	N/A

(1) Use part number RDH90159/1 (SFP-ATM-OC3-SR-IR) when ordering SFP transceivers with OC-3 SR-0 or OC-3 IR-1 functionality.
(2) To use ports 5 through 8 on a Channelized 8-port OC-3/STM-1 or 2–port OC-12/STM-4 line card (ROA1283420/1), an all-ports software license (FAL1241079/1) is needed. A separate software license (FAL1240782/1) is required for the Channelized 4-port OC-3/STM-1 or 1-port OC-12/STM-4 line card (ROA1283420/2).
(3) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE DDR and 20-port GE1020 line cards.
(4) This card is not supported on the SmartEdge 400 and 800 chassis.
(5) The OTN-DWDM XFP transceivers can only be installed in ports 1 and 4 of this line card.
(6) The 1-port 10GE-OC192 line card supports 10GE and OC-192c/STM-64c functionalities.
(7) The SmartEdge OS does not support these ports directly.
(8) These ports are not used for control or data traffic.

Gigabit Ethernet applies to any Ethernet line card that supports a port speed of 1 Gbps or greater; unless explicitly stated, the speed of any Gigabit Ethernet port is 1 Gbps.

Each pair of facility LEDs on the transceiver-based Gigabit Ethernet cards indicates status for its associated port.

These transceivers are described in *Transceivers for SmartEdge and SM Family Line Cards*.

6.2 Controller Card

The SmartEdge: 400 router supports the XCRP4 Controller card. This controller card supports applications that require high volumes of traffic; it also supports more subscribers than the other controller cards. The interface to

BITS or SSU equipment does not support the transmission of timing data to the external equipment.

The controller card is responsible for:

- Packet routing protocols.
- Operating system command-line interface (CLI).
- Communication with a network management system running the NetOp Element Management System (EMS) software.
- Loading of all configuration information necessary for the line cards.

Table 98 XCRP4 Controller Card Features

Feature	XCRP4
Processors	Four processors with shared memory that run independently and perform different functions
Control processor functions	• SONET/SDH software • SmartEdge OS software • NetOp EMS software • External timing (synchronization) software
Main memory (total)	Up to 8 GB DDR-II SDRAM
NVRAM	512 KB DRAM with battery backup
Internal timing	SONET minimum clock (±20.0 ppm in freerun mode, normal mode only)
Real-time clock	Yes, synchronized with NTP server
External timing implementation(1)	Software selectable(2)
Internal storage for system images and files	2 GB
External storage for core dumps and system files	1 GB (NEBS certified)
External ports	1 DB-9 (CRAFT) 1 10/100/1000 Ethernet(3)

(1) The SmartEdge OS does not support the transmission of data to the external equipment.
(2) The XCRP4 can receive data only.
(3) Support for 1 Gbps depends on the release of the SmartEdge OS.

6.2.1 Controller Card LEDs

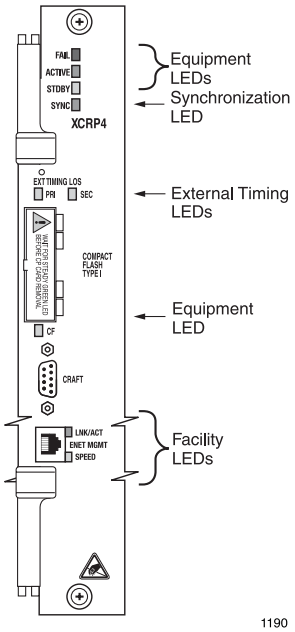

Figure 41 LEDs on Controller Cards

A controller card has:

- Four equipment LEDs—Indicate current card status
- One synchronization and two external timing LEDs—Indicate the status of any connected external timing source
- Two facility LEDs—Indicate status of the Ethernet port

Table 99 Equipment LEDs on Controller Cards

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the controller card.(1)
	Blinking	Red	Standby controller is being synchronized with the active controller.(2)
	Off	None	No failure exists on the controller card.
ACTIVE	On	Green	This controller card is the active controller.
	Off	None	This controller card is either on standby (the STDBY LED is on) or has failed (the FAIL LED is on).
STDBY	On	Yellow	This controller card is the standby controller for the system.
	Off	None	This controller card is either the active controller for the system (the ACTIVE LED is on) or has failed (the FAIL LED is on).

Table 99 Equipment LEDs on Controller Cards

Label	Activity	Color	Description
CF	On	Green	• 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	Green	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.

(1) A failure can be total, partial, or forced. Failure on any part of the card, including failure of any of its ports, results in the FAIL LED being on.
(2) The synchronization process is not affected by line card installation and removal; the active controller, and hence the system, continues to be responsive to traffic forwarding and continues to detect and notify the administrator of any faults that occur while the standby controller is being synchronized.

Table 100 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.

Table 101 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.

Table 101 System Equipment LEDs

Label	Activity	Color	Description
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.

When you first power on the system, the active controller card is in slot 7. Thereafter, the slot changes whenever a switchover occurs. Check the status of the ACTIVE LED or use the **`show chassis`** command (in any mode) to determine the slot number.

Caution!

Risk of data loss. Do not remove a CF card from its slot while the CF ACTIVE LED is blinking; you can lose data that is being transferred to the device if you enter the **`unmount /md`** command (in exec mode) before the data transfer operation is complete. To reduce the risk, you must wait until the CF ACTIVE LED is off; then enter the **`unmount /md`** command to prepare the device for removal.

Caution!

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

Table 102 Synchronization and External Timing LEDs on Controller Cards

Label	Activity	Color	Description
SYNC	On	Green	At least one of the selected synchronization references is in good condition and is providing reference.
	Off	None	The selected synchronization reference is external, and all external references have failed. The timing is being internally generated.
EXTERNAL TIMING LOS PRI	On	Yellow	The primary input signal from the external equipment has been configured (provisioned), but is not present.
	Off	None	The primary input signal has not yet been configured or has been configured and is present.

Table 102 Synchronization and External Timing LEDs on Controller Cards

Label	Activity	Color	Description
EXTERNAL TIMING LOS SEC	On	Yellow	The secondary input signal from the external equipment has been configured (provisioned), but is not present.
	Off	None	The secondary input signal has not yet been configured or has been configured and is present.

Table 103 Facility LEDs on Controller Cards

Label	Activity	Color	Description
LINK/ACTIVITY LINK/ACT	On	Green	The link is present and active.
	Blinking	Green	The link is transmitting or receiving frames.
	Off	None	The link has no active frame.
SPEED	On	Green	The link is operating at 1 Gbps (XCRP4 only)
	On	Yellow	The link is operating at 100 Mbps.
	Off	None	The link is operating at 10 Mbps.

6.2.2 Supporting Information

The following sections provide information about functional components of the XCRP4 Controller card.

6.2.2.1 Processors

The XCRP4 Controller card has four processors: one processor runs the low-level software and the other three processors run the BRAS and routing software.

Support for more than one processor to run the BRAS and routing software depends on the release of the SmartEdge OS.

6.2.2.2 Main Memory

Main memory Synchronous dynamic RAM (SDRAM) is used by the operating system shared databases that are accessed by the line cards. In a chassis with two controller cards, both cards must have the same memory configuration.

6.2.2.3 NVRAM with Battery

The internal clock on an XCRP4 Controller card is a SONET minimum clock (SMC) at ±20.0 ppm in free-run and normal modes only.

Support for NVRAM depends on the release of the SmartEdge OS.

Support for an external timing connection of the ports:

- All controller cards support a BITS (DS-1) or SSU (E1) interface as a source for the system clock. For the XCRP4 Controller cards, the type of interface is software selectable.
- The SmartEdge OS does not support transmission of data to external equipment.
- The external timing interfaces allow operation of the system clock to be independent of the type of external equipment and the framing of the external line.

6.2.2.4 System Clocks

The internal clock on an XCRP4 Controller card is a SONET minimum clock (SMC) at ±20.0 ppm in free-run and normal modes only.

The system clock performs timing functions for system hardware, regardless of the source of its timing data. Using the SmartEdge OS, you can specify external equipment (external timing mode), the received clock of a line card (line timing mode), or the internal clock on the controller card (internal mode) as the source for the system clock.

The real-time clock (RTC) on the XCRP4 Controller card is initialized before the system is shipped. It is not affected by power failures, system shutdown, or reload. The RTC uses the NVRAM battery.

By default, the source of the transmit clock for the ports on a line card is its onboard clock. Depending on the type of line card, the transmit clock for a port on a line card can use instead the receive clock derived from an incoming signal to the port or system clock. Because a port does not interface to the source of the system clock directly, line card synchronization is independent of the type of external timing equipment and the version of the controller card installed in the chassis.

The time-of-day clock (TDC) for a SmartEdge router is implemented in software. When a system with an XCRP4 Controller card 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.

6.2.2.5 External Timing Connection

Note: The SmartEdge OS does not support the status and control port.

All controller cards support a BITS (DS-1) or SSU (E1) interface as a source for the system clock. For the XCRP4 Controller card, the type of interface is software selectable.

The SmartEdge OS does not support transmission of data to external equipment.

The external timing interfaces allow operation of the system clock to be independent of the type of external equipment and the framing of the external line.

6.2.2.6 Internal Storage for Operating System Files

A controller card has one or two CF cards (Type I), which store operating system images and files.

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 a controller card can be loaded from either partition. The third partition, /flash, stores SmartEdge OS configuration files and other system- and user-created data files.

The capacity of the CF cards can vary; the CF cards installed in the active and standby controller cards need not have the same capacity.

6.2.2.7 Optional CF Card

Caution!

Risk of data loss. 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. To reduce the risk, use only the CF cards provided by Ericsson.

A controller card has an external slot on the front panel in which you can install an optional Type I or Type II CF card. The XCRP4 Controller card supports Type I CF cards only. When installed (the system is shipped with the slot empty), the CF card captures crash dumps and provides an alternate source for loading SmartEdge OS software, if it is not possible to download it over the network.

If a CF card is installed in the active controller card, the standby controller card, if installed, must also have a CF card installed.

6.2.2.8 Ports for System Management Access

The XCRP4 Controller card has a single Craft port, labeled CRAFT. Each port has a DB-9 connector and provides an RS-232 connection to a local console terminal, a terminal server, or a modem. The Craft port provides access to the SmartEdge OS CLI for configuring and monitoring tasks; it is enabled on both the active and standby controller cards.

All controller cards have a single Ethernet port with an RJ-45 connector that runs at 100 Mbps and provides a connection to an Ethernet device such as a switch or hub. This port provides access to the SmartEdge OS CLI from either a local or remote management workstation for configuring and monitoring tasks. Using this port, the system can also communicate with a remote workstation that is running the NetOp EMS software.

Support for 1-Gbps speed of the port on the XCRP4 Controller card depends on the release of the SmartEdge OS.

The Ethernet management port on the standby controller card is disabled unless the card becomes the active controller card.

6.2.2.9 Monitoring Temperature and Voltage

Temperature is monitored at both air inlet and air outlet locations on a controller card; an over-temperature interrupt signals the SmartEdge OS when the temperature rises above 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.

6.2.2.10 Fully Redundant Configuration

When two controller cards are installed in the SmartEdge 400 chassis, one functions as the active controller and the other card functions as the standby controller, providing full redundancy for high-reliability networking requirements. If a controller card fails, the redundant card automatically becomes the active controller, thereby avoiding any unnecessary service disruption in the network

If you upgrade the active controller card with a new software release, the active controller upgrades the standby controller.

Redundancy extends to the console connections on the controller cards: the console ports can each be connected to a terminal server, and the Ethernet management ports can be connected to the same Ethernet hub with individual cables.

The software automatically switches to the external timing secondary source should the primary source fail. If both sources fail, the active controller card uses an internal timing source.

6.3 8-Port ATM OC-3c/STM-1c Card

The 8-port ATM OC-3c/STM-1c card is designed as a subscriber-facing module and a network uplink module.

This PPA2-based, third-generation ATM OC-3c/STM-1c card has an increased minimum memory capacity of 1 GB. It also has increased circuit density of 24K with eight CoS queues, or 32K with two or four CoS queues. The 2-port

card provides improved performance and supports more ATM VPs and PVCs than the 4-port card.

This card uses the vc-fair and hsvc-fair SAR images. The hsvc-fair image supports hierarchical and nonhierarchical shaping, port rate limiting, and VC fairness under congestion. Both vc-fair and hsvc-fair SAR images support statistics.

The SAR devices support two, four, or eight distinct CoS queues for each ATM PVC, allowing a mix of priority- and class-based queuing for each ATM PVC.

When configuring the EPD threshold in hsvc-fair mode, the value used should not exceed 500.

Note: The number configured for the threshold has an acceptable range of 2 to 10000; however, in the case of hsvc-fair mode, it should not be configured greater than 500. If it is configured above 500, poor performance can result.

This card occupies a single slot in the chassis and requires a separate SFP transceiver for each port.

The following SFP optical transceivers are supported on any of the ports:

- SONET OC-3/STM-1 SR-0—Short Reach
- SONET OC-3/STM-1 IR-1—Intermediate Reach

Note: Use part number RDH90159/1 (SFP-OC3-SR-IR) when ordering the SFP transceivers with OC-3- IR-1 or OC-3 SR-1 (single mode, up to 2 km) functionality.

Table 104 8-Port ATM OC-3c/STM-1c Card Specifications

Specification	**SR-0**	**IR-1**(1)
Number of ports(2)	8	8
Speed	155.52 Mbps	155.52 Mbps
Protection (facility)(3)	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching
Interface	SR-0	SONET OC-3 IR-1 / SDH STM I-1
Link power budget(4)	.0 dB	12.0 dB
Nominal wavelength	1310 nm	1310 nm
Connector type	LC	LC
Cable type	MMF	SMF
Transceiver type	SFP	SFP

Table 104 8-Port ATM OC-3c/STM-1c Card Specifications

Specification	SR-0	IR-1[1]
Compliance	SFF-8472 and INF-8074i ANSI-T1.105.06 SR-0	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957
Transmitter		
Optical output power	–14.0 dBm (max) –20.0 dBm (min)	–8.0 dBm (max) –15.0 dBm (min)
Center wavelength range	1270 to 1360 nm	1270 to 1360 nm
Extinction ratio	10.0 dB (min)	8.2 dB (min)
Spectral width	7.7 nm (max) (RMS)	4.0 nm (max) (RMS)
Receiver		
Wavelength range	1260 to 1360 nm	1270 to 1580 nm
Sensitivity (min)	–29.0 dBm	–28.0 dBm
Overload level (max)	–14.0 dBm	–8.0 dBm

(1) Use part number RDH90159/1 (SFP-OC3-SR-IR) when ordering the SFP transceivers with OC-3- IR-1 or OC-3 SR-1 (single mode, up to 2 km) functionality.
(2) Each optical port has separate connectors for the transmit (Tx) and receive (Rx) circuits.
(3) Protection features for various types of cards and ports depend on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.
(4) The link power budget is calculated using (minimum output power) – (minimum sensitivity).

6.3.1 Status LEDs

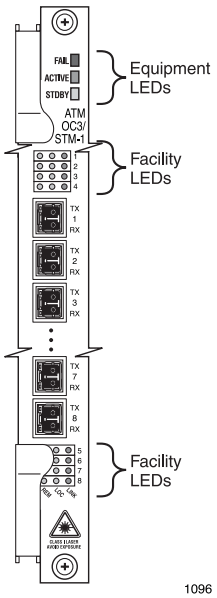

Figure 42 Status LEDs on 8-Port ATM OC-3c/STM-1c Card

Table 105 Equipment LEDs on 8-Port ATM OC-3c/STM-1c Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This port is in one of the following states: • This card is in service when no other port is configured. • At least one non-APS port carries active traffic. • At least one APS port carries active traffic.
	Off	None	This port is in one of the following states: • This card has failed (when the FAIL LED is On). • All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).
STDBY	On	Yellow	At least one of the ports on this card configured as a protection port.(2)
	Off	None	None of the ports on this card configured as a protection port.

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

Table 106 Facility LEDs on 8-Port ATM OC-3c/STM-1c Card

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.

6.4 2-Port ATM OC-12c/STM-4c Card

The 2-port ATM OC-12c/STM-4c card is designed as a subscriber-facing module and a network uplink module.

This PPA2-based, third-generation ATM OC-12c/STM-4c card has an increased minimum memory capacity of 1 GB. It also has increased circuit density of 24K with eight CoS queues, or 32K with two or four CoS queues. The 2-port card provides improved performance and supports more ATM VPs and PVCs than the 1-port card.

This card uses the vc-fair and hsvc-fair SAR images. The hsvc-fair image supports hierarchical and nonhierarchical shaping, port rate limiting, and VC

fairness under congestion. Both vc-fair and hsvc-fair SAR images support statistics.

The SAR devices support two, four, or eight distinct CoS queues for each ATM PVC, allowing a mix of priority- and class-based queuing for each PVC.

When configuring the EPD threshold in hsvc-fair mode, the value used should not exceed 500.

Note: The number configured for the threshold has an acceptable range of 2 to 10000; however, in the case of hsvc-fair mode, it should not be configured greater than 500. If it is configured above 500, poor performance can result.

This card occupies a single slot in the chassis and requires a separate SFP transceiver for each port.

The following SFP transceivers are supported on the card ports:

- SONET OC-12c/STM-4c SR-0—Multimode Short Reach
- SONET OC-12c/STM-4c IR-1—Single-mode Intermediate Reach
- SONET OC-12c/STM-4c LR-1—Single-mode Long Reach

Note: Use part number RDH90174/1 (SFP-OC12-IR) when ordering the SFP transceivers with OC-12 SR-1 (single mode, up to 2 km) or OC-12-IR-1 functionality.

Table 107 2–Port ATM OC-12c/STM-4c Line Card Specifications

Specification	**SR-0**	**IR-1**(1)	**LR-1**
Number of ports	2	2	2
Speed	622.08 Mbps	622.08 Mbps	622.08 Mbps
Protection (facility)	• None • 1+1 APS: Bidirectional; reverstive or nonrevertive switching	• None • 1+1 APS: Bidirectional; reverstive or nonrevertive switching	• None • 1+1 APS: Bidirectional; reverstive or nonrevertive switching
Interface	SR -0	SONET OC-12 IR-1 / SDH STM I-4	SONET OC-12 LR-1 / SDH STM L-4.1
Link power budget	6.0 dB(2)	13.0 dB(2)	24.0 dB(3)
Nominal wavelength	1310 nm	1310 nm	1310 nm
Connector type	LC	LC	LC
Cable type	MMF	SMF	SMF
Transceiver type	SFP	SFP	SFP
Compliance	SFF-8472 and INF-8074i ANSI-T1.105.06 SR-0	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957
Transmitter			

Table 107 2–Port ATM OC-12c/STM-4c Line Card Specifications

Specification	**SR-0**	**IR-1**(1)	**LR-1**
Optical output power	–14.0 dBm (max) –20.0 dBm (min)	–8.0 dBm (max) –15.0 dBm (min)	+2.0 dBm (max) -3.0 dBm (min)
Path penalty	–	–	1 dB (max)
Center wavelength range	1270 to 1380 nm	1270 to 1360 nm	1280to 1335 nm
Extinction ratio	10.0 dB (min)	8.2 dB (min)	10.0 dB (min)
Side-mode suppression ratio	–	N/A	30.0 dB (min)
Spectral width	200.0 nm (max) (RMS)	4.0 nm (max) (RMS)	1.0 nm (max) (4)
Receiver			
Wavelength range	1270 to 1580 nm	1270 to 1580 nm	1260 to 1580 nm
Sensitivity	–26.0 dBm	–28.0 dBm	-28.0 dBm (max)
Overload level	–14.0 dBm	0.0 dBm	-8.0 dBm (min)

(1) Use part number RDH90174/1 (SFP-OC12-IR) when ordering the SFP transceivers with OC-12 SR-1 (single mode, up to 2 km) or OC-12- IR-1 functionality.
(2) The link power budget is calculated using (minimum output power) – (minimum sensitivity).
(3) The link power budget is calculated using (minimum output power) – (minimum sensitivity) – (optical path power penalty); power penalty is 1.0 dB.
(4) Measured 20 dB down from center wavelength.

6.4.1 Status LEDs

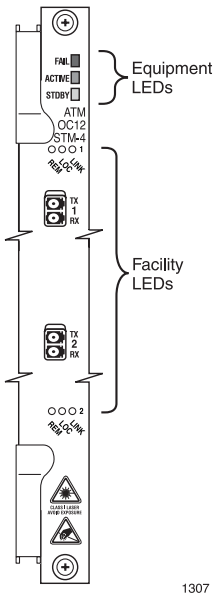

Figure 43 LEDs on 2-Port ATM OC-12c/STM-4c Line Card

Table 108 Equipment LEDs on 2-Port ATM OC-12c/STM-4c Line Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This port is in one of the following states: • This card is in service when no other port is configured. • At least one non-APS port carries active traffic. • At least one APS port carries active traffic.
	Off	None	This port is in one of the following states: • This card has failed (when the FAIL LED is On). • All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).
STDBY	On	Yellow	At least one of the ports on this card configured as a protection port.(2)
	Off	None	None of the ports on this card configured as a protection port.

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

Table 109 Facility LEDs on 2-Port ATM OC-12c/STM-4c Line Card

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.

6.5 8-Port POS OC-3c/STM-1c Card

The 8-port POS OC-3c/STM-1c card is designed to be used as a subscriber-facing module and as well as a network uplink module. This card is a PPA2-based card and has a minimum memory capacity of 1 GB.

This POS OC-3c/STM-1c card supports the Point-to-Point Protocol (PPP), high-level data-link control (HDLC), Frame Relay (FR) encapsulations, Modified Deficit Round Robin (MDRR), and POS Link Aggregation Group (LAG) features.

This card occupies a single slot in the chassis and requires a separate SFP transceiver for each port.

The following SFP transceivers are supported on any of the ports:

- SONET OC-3/STM-1 SR-0—Multimode Short Reach
- SONET OC-3/STM-1 IR-1—Intermediate Reach

Note: Use part number RDH90159/1 (SFP-OC3-SR-IR) when ordering the SFP transceivers with OC-3- IR-1 or OC-3 SR-1 (single mode, up to 2 km) functionality.

Table 110 8-Port POS OC-3c/STM-1c Card Specifications

Specification	**SR-0**	**IR-1**(1)
Interface	SR-0	SONET OC-3 IR-1 / SDH STM I-1
Speed	155.52 Mbps	155.52 Mbps
Protection (facility)(2)	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching
Link power budget(3)	.0 dB	12.0 dB
Nominal wavelength	1310 nm	1310 nm
Connector type	LC	LC
Cable type	MMF	SMF
Transceiver type	SFP	SFP
Compliance	SFF-8472 and INF-8074i ANSI-T1.105.06 SR-0	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957
Transmitter		
Optical output power	–14.0 dBm (max) –20.0 dBm (min)	–8.0 dBm (max) –15.0 dBm (min)
Center wavelength range	1270 to 1360 nm	1270 to 1360 nm
Extinction ratio	10.0 dB (min)	8.2 dB (min)
Spectral width	7.7 nm (max) (RMS)	4.0 nm (max) (RMS)
Receiver		
Wavelength range	1260 to 1360 nm	1270 to 1580 nm
Sensitivity (min)	–29.0 dBm	–28.0 dBm
Overload level (max)	–14.0 dBm	–8.0 dBm

(1) Use part number RDH90159/1 (SFP-OC3-SR-IR) when ordering the SFP transceivers with OC-3- IR-1 or OC-3 SR-1 (single mode, up to 2 km) functionality.
(2) Protection features for various types of cards and ports depend on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.
(3) The link power budget is calculated using (minimum output power) – (minimum sensitivity).

6.5.1 Status LEDs

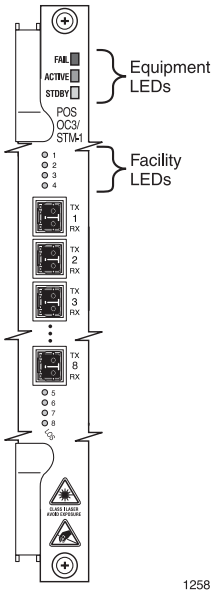

Figure 44 Status LEDs on 8-Port POS OC-3c/STM-1c Card

Table 111 Equipment LEDs on 8-Port POS OC-3c/STM-1c Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This port is in one of the following states: • This card is in service when no other port is configured. • At least one non-APS port carries active traffic. • At least one APS port carries active traffic.
	Off	None	This port is in one of the following states: • This card has failed (when the FAIL LED is On). • All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).
STDBY	On	Yellow	At least one of the ports on this card has been configured as a protection port.(2)
	Off	None	None of the ports on this card has been configured as a protection port.

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

Table 112 Facility LED on 8-Port POS OC-3c/STM-1c Card

Label	Activity	Color	Description
LOS	On	Yellow	This port has been configured and enabled, but is experiencing an LOS.
	Off	None	This port is in one of the following states: • Has been configured (provisioned) and enabled, and is receiving or transmitting traffic. • Has been configured, but is currently disabled. • Has not yet been configured.

6.6 4-Port POS OC-12c/STM-4c Card

The 4-port POS OC-12c/STM-4c card functions as a network uplink module in edge routing and BRAS applications. This PPA2-based card has an increased minimum memory capacity of 1 GB and supports PPP, HDLC, FR encapsulations, MDRR, and POS LAG features.

This card occupies a single slot in the chassis and requires a separate SFP transceiver for each port.

The following SFP transceivers are supported on the card ports:

- SONET OC-12c/STM-4 SR-0—Short Reach
- SONET OC-12/STM-4 IR-1—Intermediate Reach
- SONET OC-12/STM-4 LR-1—Long Reach

Note: Use part number RDH90174/1 (SFP-OC12-IR) when ordering the SFP transceivers with OC-12 SR-1 (single mode, up to 2 km) or OC-12-IR-1 functionality.

Table 113 4-Port POS OC-12c/STM-4c Card Specifications

Specification	SR-0	IR-1[1]	LR-1
Number of ports	4	4	4
Speed	622.08 Mbps	622.08 Mbps	622.08 Mbps
Protection (facility)[2]	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching
Interface	SR -0	SONET OC-12 IR-1 / SDH STM I-4	SONET OC-12 LR-1 / SDH STM L-4.1
Link power budget	6.0 dB[3]	13.0 dB[3]	24.0 dB[4]
Nominal wavelength	1310 nm	1310 nm	1310 nm
Connector type	LC	LC	LC
Cable type	MMF	SMF	SMF

Table 113 4-Port POS OC-12c/STM-4c Card Specifications

Specification	**SR-0**	**IR-1**[1]	**LR-1**
Transceiver type	SFP	SFP	SFP
Compliance	SFF-8472 and INF-8074i ANSI-T1.105.06 SR-0	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957
Transmitter			
Optical output power	–14.0 dBm (max) –20.0 dBm (min)	–8.0 dBm (max) –15.0 dBm (min)	+2.0 dBm (max) -3.0 dBm (min)
Path penalty	–	–	1 dB (max)
Center wavelength range	1270 to 1380 nm	1270 to 1360 nm	1280to 1335 nm
Extinction ratio	10.0 dB (min)	8.2 dB (min)	10.0 dB (min)
Side-mode suppression ratio	–	N/A	30.0 dB (min)
Spectral width	200.0 nm (max) (RMS)	4.0 nm (max) (RMS)	1.0 nm (max) [5]
Receiver			
Wavelength range	1270 to 1580 nm	1270 to 1580 nm	1260 to 1580 nm
Sensitivity	–26.0 dBm	–28.0 dBm	-28.0 dBm (max)
Overload level	–14.0 dBm	0.0 dBm	-8.0 dBm (min)

(1) Use part number RDH90174/1 (SFP-OC12-IR) when ordering the SFP transceivers with OC-12 SR-1 (single mode, up to 2 km) or OC-12- IR-1 functionality.
(2) Protection features for various types of cards and ports depend on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.
(3) The link power budget is calculated using (minimum output power) – (minimum sensitivity).
(4) The link power budget is calculated using (minimum output power) – (minimum sensitivity) – (optical path power penalty); power penalty is 1.0 dB.
(5) Measured 20 dB down from center wavelength.

6.6.1 Status LEDs

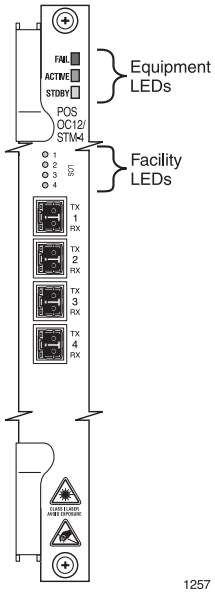

Figure 45 Status LEDs on 4-Port POS OC-12c/STM-4c Card

Table 114 Equipment LEDs on 4-Port POS OC-12c/STM-4c Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This port is in one of the following states: • This card is in service when no other port is configured. • At least one non-APS port carries active traffic. • At least one APS port carries active traffic.
	Off	None	This port is in one of the following states: • This card has failed (when the FAIL LED is On). • All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).
STDBY	On	Yellow	At least one of the ports on this card has been configured as a protection port.(2)
	Off	None	None of the ports on this card has been configured as a protection port.

(1) A failure can be total, partial, or forced. Failure on any part of the card, including failure of any of its ports, results in the FAIL LED being on.

(2) Protection for cards and ports depends on the release of the SmartEdge OS.

Table 115 Facility LED on 4-Port POS OC-12c/STM-4c Card

Label	Activity	Color	Description
LOS	On	Yellow	This port has been configured and enabled, but is experiencing an LOS.
	Off	None	This port is in one of the following states: • Has been configured (provisioned) and enabled, and is receiving or transmitting traffic. • Has been configured, but is currently disabled. • Has not yet been configured.

6.7 4-Port POS OC-48c/STM-16c Card

The 4-port POS OC-48c/STM-16c card functions as a network uplink module in edge routing and BRAS applications. This PPA2-based card has an increased minimum memory capacity of 1 GB.

This POS OC-48c/STM-16c card supports PPP, HDLC, FR encapsulations, MDRR, and POS LAG features.

This card occupies a single slot in the chassis and requires a separate SFP transceiver for each port.

The following SFP transceivers are supported on the card ports:

- SONET OC-48/STM-16 SR-1—Short Reach
- SONET OC-48/STM-16 IR-1—Intermediate Reach
- SONET OC-48/STM-16 LR-2—Long Reach

Table 116 4-Port POS OC-48c/STM-16c Card Specifications

Specification	SR-1	IR-1	LR-2
Number of ports	4	4	4
Speed	2488.32 Mpbs	2488.32 Mpbs	2488.32 Mpbs
Protection (facility)[1][2]	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching
Interface	SONET OC-48 SR-1 / SDH STM I-16	SONET OC-48 IR-1 / SDH STM S-16	SONET OC-48 LR-2 / SDH STM L-16.2
Link power budget	8.0 dB[3]	13 dB[3]	24.0 dB[4]
Nominal wavelength	1310 nm	1310 nm	1550 nm
Connector type	LC	LC	LC
Cable type	SMF	SMF	SMF
Transceiver type	SFP	SFP	SFP

Table 116 4-Port POS OC-48c/STM-16c Card Specifications

Specification	**SR-1**	**IR-1**	**LR-2**
Compliance	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957
Transmitter			
Optical output power	–3.0 dBm (max) –10.0 dBm (min)	0.0 dBm (max) –5.0 dBm (min)	3.0 dBm (max) –2.0 dBm (min)
Path penalty	–	–	2.0 dB (max)
Center wavelength range	1270 to 1360 nm	1270 to 1360 nm	1500 to 1580 nm
Extinction ratio	8.2 dB (min)	8.2 dB (min)	8.2 dB (min)
Side-mode suppression ratio	–	30.0 dB (min)	30.0 dB (min)
Spectral width	4.0 nm (max) (RMS)(5)	1.0 nm (max)(6)	1.0 nm (max)(6)
Receiver			
Wavelength range	1270 to 1580 nm	1270 to 1580 nm	1500 to 1580 nm
Sensitivity	–18.0 dBm	–18.0 dBm	–28.0 dBm
Overload level	–3.0 dBm	0.0 dBm	–9.0 dBm
Optical reflectance	–14.0 dB (max)	–27.0 dB (max)	–27.0 dB (max)

(1) Protection features for various types of cards and ports depend on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.
(2) POS APS is not supported on the 4-port POS OC-48c/STM-16c card.
(3) The link power budget is calculated using (minimum output power) – (minimum sensitivity).
(4) The link power budget is calculated using (minimum output power) – (minimum sensitivity) – (optical path power penalty); power penalty is 2.0 dB.
(5) Root mean square (RMS) value.
(6) Measured 20 dB down from center wavelength.

6.7.1 Status LEDs

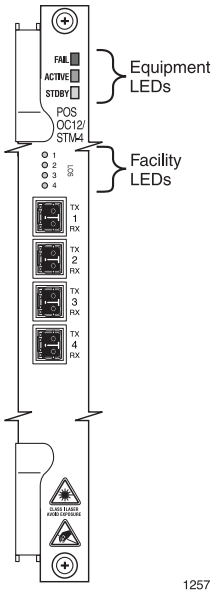

Figure 46 Status LEDs on 4-Port POS OC-48c/STM-16c Card

Table 117 Equipment LEDs on 4-Port POS OC-48c/STM-16c Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This port is in one of the following states: • This card is in service when no other port is configured. • At least one non-APS port carries active traffic. • At least one APS port carries active traffic.
	Off	None	This port is in one of the following states: • This card has failed (when the FAIL LED is On). • All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).
STDBY	On	Yellow	At least one of the ports on this card has been configured as a protection port.(2)
	Off	None	None of the ports on this card has been configured as a protection port.

(1) A failure can be total, partial, or forced. Failure on any part of the card, including failure of any of its ports, results in the FAIL LED being on.

(2) Protection for cards and ports depends on the release of the SmartEdge OS.

Table 118 Facility LED on 4-Port POS OC-48c/STM-16c Card

Label	Activity	Color	Description
LOS	On	Yellow	This port has been configured and enabled, but is experiencing an LOS.
	Off	None	This port is in one of the following states: • Has been configured (provisioned) and enabled, and is receiving or transmitting traffic. • Has been configured, but is currently disabled. • Has not yet been configured.

6.8 1-Port OC-192c/STM-64c Card

The 1-port OC-192c/STM-64c card provides a single 9.953-Gbps SONET/SDH port and can be used as either an optical line or optical trunk interface.

The OC-192c/STM-64c card supports PPP, HDLC, and FR encapsulations. It also supports a frame size of up to 9,600 bytes.

This card occupies a single slot in the chassis and requires an XFP transceiver for the port.

The following 10-Gbps XFP transceivers are supported on the card port:

- SONET OC-192/STM-64 SR-1—Short Reach
- SONET OC-192/STM-64 IR-2—Intermediate Reach
- SONET OC-192/STM-64 LR-2—Long Reach

Caution!

Risk of data loss. You can corrupt the system if you attempt to install transceivers (GBICs, SFPs, or XFPs) not purchased from Ericsson; these transceivers have not been tested with the SmartEdge router. To reduce the risk, install only approved transceivers.

Note: Use part number RDH90168/2 (XFP-OC192-LR2) when ordering the XFP transceivers with 10GE ZR functionality.

Table 119 1-Port OC-192c/STM-64c Card Specifications

Specification[1]	SR-1	IR-2	LR-2[2]
Number of port	1	1	1
Speed	9.953 Gbps	9.953 Gbps	9.953 Gbps
Interface	SR-1/I-64.1	IR-2/S-64.2b	LR-2/P1L1-2D2

Table 119 1-Port OC-192c/STM-64c Card Specifications

Specification[1]	**SR-1**	**IR-2**	**LR-2**[2]
Link power budget[3]	5.0 dB	13.0 dB	24.0 dB
Nominal wavelength	1310 nm	1550 nm	1550 nm
Connector type	LC	LC	LC
Cable type	SMF	SMF	SMF
Transceiver type	XFP	XFP	XFP
Compliance	Telcordia GR-253 SR-1 GR-1377-CORE ITU G.691 I-64.1	Telcordia GR-253 IR-2 GR-1377-CORE ITU G.691 S-64.2b	Telcordia GR-253 LR-2 GR-1377-CORE ITU G.691 P1L1-2D2
Transmitter			
Optical output power	–6.0 dBm (min) –1.0 dBm (max)	–1.5 dBm (min) 2.0 dBm (max)	0.0 dBm (min) 4.0 dBm (max)
Path penalty	1.0 dB	2.0 dB	2.0 dB
Center wavelength range	1270 to 1565 nm	1270 to 1565 nm	1270 to 1565 nm
Extinction ratio	6.0 dB (min)	8.2 dB (min)	8.2 dB (min)
Center wavelength	1310 nm	1310 nm	1550 nm
Spectral width[4]	1.0 nm (max)	1.0 nm (max)	1.0 nm (max)
Side-mode suppression ratio	30.0 dB (min)	30.0 dB (min)	30.0 dB (min)
Receiver			
Wavelength range	1270 to 1565 nm	1270 to 1565 nm	1270 to 1565 nm
Sensitivity (min)	–11.0 dBm	–14.0 dBm	–24.0 dBm
Overload level (max)	0.5 dBm[5]	–1.0 dBm	–7.0 dBm
Optical reflectance	–14.0 dB	–27.0 dB	–27.0 dB

*(1) To display static transceiver data, enter the show hardware command (in any mode) with the **card** and **detail** keywords, or, for dynamic data, enter the show port command (in any mode) with the detail keyword. Measured or reported values may meet or exceed performance parameters that are specified in this table.*
(2) Use part number RDH90168/2 (XFP-OC192-LR2) when ordering the XFP transceivers with 10GE ZR functionality.
(3) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(4) Measured 20 dB down from the central wavelength peak.
(5) The receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 1.0 dB, unless otherwise noted.

6.8.1 Status LEDs

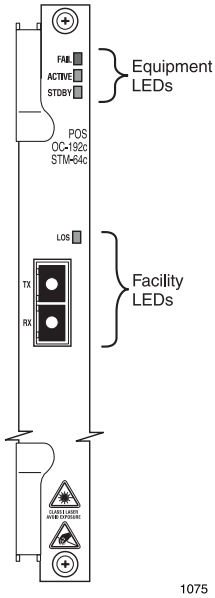

Figure 47 Status LEDs on 1-Port OC-192c/STM-64c Card

Table 120 Equipment LEDs on 1-Port OC-192c/STM-64c Card

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

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

Table 121 Facility LED on 1-Port OC-192c/STM-64c Card

Label	Activity	Color	Description
LOS	On	Yellow	This port has been configured and enabled, but is experiencing a LOS.
	Off	None	This port is in one of the following states: • Has been configured (provisioned) and enabled, and is receiving or transmitting traffic. • Has been configured, but is currently disabled. • Has not yet been configured.

6.9 Channelized OC-3/STM-1 or OC-12/STM-4 Card

There are two Channelized OC-3/STM-1 or OC-12/STM-4 cards available:

- ROA1283420/1 – 8 ports of OC-3/STM-1 with two ports configurable as OC-12/STM-4 (Software License – FAL1241079/1)
- ROA1283420/2 – 4 ports of OC-3/STM-1 with one port configurable as OC-12/STM-4 (Software License – FAL1240782/1)

The Channelized 8-port OC-3/STM-1 or 2–port OC-12/STM-4 line card (ROA1283420/1) is equipped with a license (FAL1241079/1) that must be loaded against a slot in the SmartEdge router to enable all ports. The license is granted through the ELIS licensing system by your local Ericsson market unit contact.

The Channelized 4-port OC-3/STM-1 or 1-port OC-12/STM-4 line card (ROA1283420/2) can be upgraded in the future to enable the remaining four OC-3OC-3/STM-1 or OC-12/STM-4 ports by purchasing a separate license (FAL1240782/1).

All ports on a Channelized OC-3/STM-1 or OC-12/STM-4 line card must be configured for either SONET framing (OC-3/OC-12) or SDH framing (STM-1/STM-4). That is, all ports on a card must be SONET or SDH; a combination of SONET and SDH is not supported. The first port configured on the card limits the configuration of the remaining ports on that card to the same framing type.

Ports 1 and 5 on the Channelized cards are multirate ports, configurable as Channelized OC-3/STM-1 or OC-12/STM-4. The adjacent three Channelized OC-3/STM-1 ports in a port group cannot be used when ports 1 and 5 are operating as Channelized OC-12/STM-4 ports. For example: On the Channelized 8-port OC-3/STM-1 or 2–port OC-12/STM-4 line card, if port 1 is used as a Channelized OC-12/STM-4 port, ports 2 to 4 are not available and ports 5 to 8 can be used as Channelized OC-3/STM-1 ports.

The Channelized OC-3/STM-1 card supports eight or four SONET SMF ports; each operates at 155.52 Mbps. The Channelized OC-12/STM-4 card supports two or one SONET SMF ports; each operates at 622.08 Mbps. Both OC-3/12 and STM-1/4 ports can be channelized to DS0.

This card does not support concatenated STN-n/STM-n signals, such as STS-3c and OC-3c.

For more information on how to configure the channelized ports, see *Configuring Channelized Ports* Reference [3].

There are two 4-port groups on this channelized card:

- Group 1 contains ports 1 through 4, where port 1 has the OC-3/12 or STM-1/4 dual-rate capability.

- Group 2 contains ports 5 through 8, where port 5 has the OC-3/12 or STM-1/4 dual-rate capability.
- When ports 1 and 5 are in use as OC-12/SMT-4, the other six ports are not available.
- A total of 1000 unchannelized channels of Packet Over SONET (POS) are supported on each 4-port group.

Hardware features, most of which are software configurable, include:

- SONET and SDH mappings
- Channelized Point-to-Point Protocol (PPP)
- Cisco HDLC (C-HDLC)
- Single Hop Bidiretional Forwarding Detection (BFD)
- Multi-Link Point-to-Point Protocol (MLPPP)
- Priority Weighted-Fair Queuing (PWFQ) for PPP, C-HDLC, and MLPPP
- Automatic Protection Switching (APS) for PPP, C-HDLC, and MLPPP
- Circuit Emulation Services (CES)
- CES over Packet Switched Networks (CESoPSN)
- APS for CES
- DS3, T1, E1, VT1.5, C11, C12, DS0, nx64K, channelization for all POS services
- T1, E1, VT1.5, C11, C12, DS0, nx64K, channelization for CES services

This card is the same size as all other SmartEdge line cards and occupies a single slot in the chassis.

Table 122 Port-Type Configuration

Port Type	Mode 1	Mode 2	Mode 3	Mode 4
Port 1	OC-3/STM-1	OC-12/STM-4	OC-12/STM-4	OC-3/STM-1
Port 2	OC-3/STM-1			OC-3/STM-1
Port 3	OC-3/STM-1			OC-3/STM-1
Port 4	OC-3/STM-1			OC-3/STM-1
Port 5	OC-3/STM-1	OC-12/STM-4	OC-3/STM-1	OC-12/STM-4
Port 6	OC-3/STM-1		OC-3/STM-1	
Port 7	OC-3/STM-1		OC-3/STM-1	
Port 8	OC-3/STM-1		OC-3/STM-1	

Note: Use part number RDH90159/1 (SFP-OC3-SR-IR) when ordering the SFP transceivers with OC-3 SR-1 (single mode, up to 2 km) or OC-3 IR-1 functionality.

Table 123 8/4-Port Channelized OC-3/STM-1 Card SFP Specifications — SR-0 and IR-1

Specification	**SR-0**	**IR-1**(1)
Number of ports	8/4	8/4
Speed	155.52 Mbps	155.52 Mbps
Protection (facility)(2)	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching
Interface	SR-0	SONET OC-3 IR-1 / SDH STM I-1
Link power budget(3)	9.0 dB	13.0 dB
Nominal wavelength	1310 nm	1310 nm
Connector type	LC	LC
Cable type	MMF	SMF
Transceiver type	SFP	SFP
Compliance	SFF-8472 and INF-8074i ANSI-T1.105.06 SR-0	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957
Transmitter		
Optical output power	–14.0 dBm (max) –20.0 dBm (min)	–8.0 dBm (max) –15.0 dBm (min)
Center wavelength range	1270 to 1360 nm	1270 to 1360 nm
Extinction ratio	10.0 dB (min)	8.2 dB (min)
Spectral width	7.7 nm (max) (RMS)	4.0 nm (max) (RMS)
Receiver		
Wavelength range	1260 to 1360 nm	1270 to 1580 nm
Sensitivity (min)	–29.0 dBm	–28.0 dBm
Overload level (max)	–14.0 dBm	–8.0 dBm

(1) Use part number RDH90159/1 (SFP-OC3-SR-IR) when ordering the SFP transceivers with OC-3 SR-1 (single mode, up to 2 km) or OC-3 IR-1 functionality.
(2) Protection features for various types of cards and ports depend on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.
(3) The link power budget is calculated using (minimum output power) – (minimum sensitivity).

Note: Use part number RDH90174/1 (SFP-OC12-IR) when ordering the SFP transceivers with OC-12 SR-1 (single mode, up to 2 km) or OC-12 IR-1 functionality.

Table 124 2/1-Port Channelized OC-12/STM-4 Card SFP Specifications — SR-0, IR-1, and LR-1

Specification	**SR-0**	**IR-1**(1)	**LR-1**
Number of ports	2/1	2/1	2/1
Speed	622.08 Mbps	622.08 Mbps	622.08 Mbps
Protection (facility)(2)	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching	• None • 1+1 APS: Bidirectional; revertive or nonrevertive switching
Interface	SR -0	SONET OC-12 IR-1 / SDH STM I-4	SONET OC-12 LR-1 / SDH STM L-4.1
Link power budget	6.0 dB(3)	13.0 dB(3)	24.0 dB(4)
Nominal wavelength	1310 nm	1310 nm	1310 nm
Connector type	LC	LC	LC
Cable type	MMF	SMF	SMF
Transceiver type	SFP	SFP	SFP
Compliance	SFF-8472 and INF-8074i ANSI-T1.105.06 SR-0	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957
Transmitter			
Optical output power	–14.0 dBm (max) –20.0 dBm (min)	–8.0 dBm (max) –15.0 dBm (min)	+2.0 dBm (max) -3.0 dBm (min)
Path penalty	–	–	1 dB (max)
Center wavelength range	1270 to 1380 nm	1270 to 1360 nm	1280to 1335 nm
Extinction ratio	10.0 dB (min)	8.2 dB (min)	10.0 dB (min)
Side-mode suppression ratio	–	30.0 dB (min)	30.0 dB (min)
Spectral width	200.0 nm (max) (RMS)	4.0 nm (max) (RMS)	1.0 nm (max) (5)
Receiver			
Wavelength range	1270 to 1580 nm	1270 to 1580 nm	1260 to 1580 nm
Sensitivity (min)	–26.0 dBm	–28.0 dBm	-28.0 dBm
Overload level (max)	–14.0 dBm	0.0 dBm	-8.0 dBm

(1) Use part number RDH90174/1 (SFP-OC12-IR) when ordering the SFP transceivers with OC-12 SR-1 (single mode, up to 2 km) or OC-12 IR-1 functionality.
(2) Protection features for various types of cards and ports depend on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.
(3) The link power budget is calculated using (minimum output power) – (minimum sensitivity).
(4) The link power budget is calculated using (minimum output power) – (minimum sensitivity) – (optical path power penalty); power penalty is 1.0 dB.
(5) Measured 20 dB down from center wavelength.

6.9.1 LEDs on 8/4-Port Channelized OC-3/STM-1 or 2/1-Port Channelized OC-12/STM-4 Card

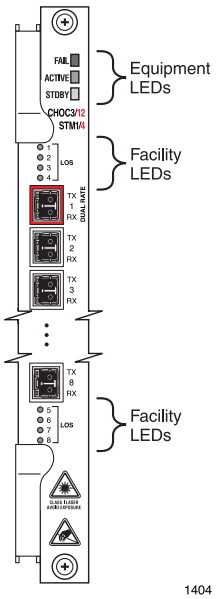

Figure 48 LEDs on 8/4-Port Channelized OC-3/STM-1 or 2/1-Port Channelized OC-12/STM-4 Card

Table 125 Equipment LEDs on 8/4-Port Channelized OC-3/STM-1 or 2/1-Port Channelized OC-12/STM-4 Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This port is in one of the following states: • This card is in service when no other port is configured. • At least one non-APS port carries active traffic. • At least one APS port carries active traffic.
	Off	None	This port is in one of the following states: • This card has failed (when the FAIL LED is On). • All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).
STDBY	On	Yellow	At least one of the ports on this card has been configured as a protection port.(2)
	Off	None	None of the ports on this card has been configured as a protection port.

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

Table 126 Facility LEDs on 8/4-Port Channelized OC-3/STM-1 or 2/1-Port Channelized OC-12/STM-4 Card

Label	Activity	Color	Description
LOS	On	Yellow	This port has been configured and enabled, but is experiencing an LOS.
	Off	None	This port is in one of the following states: • Has been configured and enabled, and is receiving or transmitting traffic. • Has been configured, but is currently disabled. • Has not yet been configured.

6.10 60-Port Fast Ethernet Card

The 60-port Fast Ethernet (FE) card, which provides 60 FE ports and two Gigabit Ethernet (GE) ports, is also referred to as the FE–GE card. The FE ports are copper-based 10Base-T or 100Base-TX with selectable speeds of 10 Mbps or 100 Mbps, and the GE ports are copper-based 1000Base-TX with selectable speeds of 100 or 1000 Mbps.

This card is the same size as all other SmartEdge line cards and occupies a single slot in the chassis.

Table 127 60-Port Fast Ethernet Card Specifications

Specification	Value
Number of ports	60 - 10/100 Mbps 2 - 10/1000
Speed	10, 100, or 1000 Mbps (user selectable, 100 Mbps is auto-sensing)
Protection	None
Protocol	10 Mbps: 10Base-T 100 Mbps: 100Base-TX 1000 Mbps: 1000Base-TX
Line code	10 Mbps: Manchester coding 100 Mbps: MLT-3 1000 Mbps: PAM-5
Flow control negotiation	Yes
Interface	Electrical
Impedance	100 ohms
Connector type	MRJ21(1), RJ-45
Cable type(2)	2 pair, Category 5 shielded-twisted pair
Compliance	IEEE 802.3, 802.3u

(1) In addition to RJ-45 connectors for the GE ports, the FE–GE card has 5 MRJ21 connectors, each of which supports 12 FE ports; the MRJ21 breakout cable has RJ-45 connectors for the individual ports.
(2) The shielded cable must be grounded at both ends.

6.10.1 Status LEDs

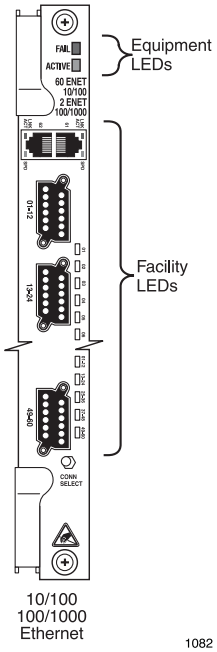

Figure 49 Status LEDs on 60-Port Fast Ethernet Card

Table 128 Equipment LEDs on 60-Port Fast Ethernet Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This card is in service.
	Off	None	This card has failed (the FAIL LED is on).

(1) A failure can be total, partial, or forced. Failure on any part of the card, including failure of any of its ports, results in the FAIL LED being on.

Table 129 Facility LEDs for 10/100 Ports on 60-Port Fast Ethernet Card

Label	Activity	Color	Description
01 – 12	On	Yellow	This port is operating at 10 Mbps; the link is up.
	Blinking	Yellow	This port is operating at 10 Mbps; the link is up and active.
	On	Green	This port is operating at 100 Mbps; the link is up.
	Blinking	Green	This port is operating at 100 Mbps; the link is up and active.
	Off	None	This port is not configured (no link), no activity exists, or the link is down.
01 – 12 13 – 24 25 – 36 37 – 48 49 – 60	On	Green	The connector for these ports is selected (using the push button at the bottom of the front panel).
	Off	None	The connector for these ports is not selected.

Because of the number of 10/100 ports on the 60-port Fast Ethernet card, facility LEDs on those ports are organized differently. Each 10/100 port is identified by two LEDs:

- A connector LED identifies which connector has been selected using the push button (labeled CONN SELECT) at the bottom of the front panel.
- A port LED identifies the operating speed of the port and its status.

Table 130 Facility LEDs for 100/1000 Ports on 60-Port Fast Ethernet Card

Label	Activity	Color	Description
LNK ACT	On	Green	The link is present and active.
	On	Blinking	The link is transmitting and receiving frames.
	Off	None	The link has no active frame.
SPD	On	Yellow	The link is operating at 100 Mbps.
	On	Green	The link is operating at 1000 Mbps.
	Off	None	The link is operating at 10 Mbps.

6.11 10-Port Gigabit Ethernet 1020 Card

The 10-port Gigabit Ethernet 1020 (GE1020) card is designed for traffic management. This PPA2-based card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the ports.

This card occupies a single slot in the chassis and requires a separate SFP transceiver for each port.

The following SFP optical transceivers are supported on the card ports:

- 1000Base-SX—Short Reach
- 1000Base-LX—Long Reach
- 1000Base-ZX—Extended Reach
- 1000Base-TX—Copper
- 1000Base-BX-D-20—20 km Bidirectional
- 1000Base-BX-U-20—20 km Bidirectional
- 1000Base-CWDM—Coarse Wavelength Division Multiplexing
- 1000Base-DWDM—Dense Wavelength Division Multiplexing

Caution!

Risk of data loss. You can corrupt the system if you attempt to install transceivers (GBICs, SFPs, or XFPs) not purchased from Ericsson; these transceivers have not been tested with the SmartEdge router. To reduce the risk, install only approved transceivers.

Table 131 10-Port Gigabit Ethernet 1020 Card Specifications — 1000Base SX, LX, ZX, and TX

Specification	SX	LX	ZX	TX(1)
Number of ports	10	10	10	10
Speed	1 Gbps	1 Gbps	1 Gbps	1 Gbps
Interface	1000Base-SX	1000Base-LX	1000Base-ZX	1000Base-TX
Link power budget(2)	7.5 dB	8.0 dB	21.0 dB	–
Nominal wavelength	850 nm	1310 nm	1550 nm	–
Connector type	LC	LC	LC	RJ-45
Cable type	MMF	SMF	SMF	Copper
Transceiver type	SFP	SFP	SFP	–
Compliance	IEEE 802.3 and 802.3z	IEEE 802.3 and 802.3z	–	IEEE 802.3, 802.3ab, and 802.3z
Transmitter				
Optical output power	–9.5 dBm (min) 0.0 dBm (max)	–11.0 dBm (min) –3.0 dBm (max)	–3.0 dBm (min) 5.0 dBm (max)	–
Center wavelength range	830 to 860 nm	1270 to 1355 nm	1540 to 1560 nm	–
Extinction ratio	9.0 dB (min)	9.0 dB (min)	9.0 dB (min)	–
Center wavelength	850 nm	1310 nm	1550 nm	–
Spectral width	0.85 nm (max) (RMS)	4.00 nm (max) (RMS)	1.00 nm (max)(3)	–
Receiver				
Wavelength range(4)	770 to 860 nm	1265 to 1600 nm	1260 to 1620 nm	–
Sensitivity (min)	–17.0 dBm	–19.0 dBm	–23.0 dBm	–
Overload level (max)	–3.0 dBm	–3.0 dBm	–3.0 dBm	–

(1) When this 1000Base-TX SFP transceiver is used in the 20x1GE card, a maximum of 10 transceivers can be inserted into the card. These transceivers are inserted into the card such that only one port from each of the following slot pairs is populated: 1-11, 2-12, 3-13, 4-14, 5-15, 6-16, 7-17, 8-18, 9-19, and 10-20. If both ports in a slot pair are populated, the SFP cages of the line card can be damaged.

(2) Link power budget is calculated using (minimum output power) – (minimum sensitivity).

(3) Measured 20 dB down from the center wavelength peak.

(4) Receiver sensitivity is degraded 1.0 dB for wavelengths ≥ 1570 nm.

Table 132 10-Port Gigabit Ethernet 1020 Card Specifications — 1000Base BX-D-20 and BX-U-20

Specification[1]	**BX-D-20**	**BX-U-20**
Number of ports	10	10
Speed	1 Gbps	1 Gbps
Interface	1000Base-BX-D-20	1000Base-BX-U-20
Link power budget[2]	13.0 dB	13.0 dB
Nominal wavelength	1490 nm	1310 nm
Connector type	LC	LC
Cable type	SMF	SMF
Transceiver type	SFP	SFP
Compliance	IEEE 802.3 and 802.3ah	IEEE 802.3 and 802.3ah
Transmitter		
Optical output power	–7.0 dBm (min) 0.0 dBm (max)	–7.0 dBm (min) 0.0 dBm (max)
Extinction ratio	6.0 dB (min)	6.0 dB (min)
Center wavelength	1490 nm	1310 nm
Spectral width	1.00 nm (max)[3]	3.50 nm (max) (RMS)
Receiver		
Center wavelength	1310 nm	1490 nm
Sensitivity (min)	–18.7 dBm	–18.7 dBm
Overload level (max)	0.0 dBm	0.0 dBm

(1) The Bidirectional SFP transceivers must be used in pairs, one BX-D-20 and one BX-U-20; otherwise, the links will not work.
(2) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(3) Measured 20 dB down from the center wavelength peak.

Table 133 10-Port Gigabit Ethernet 1020 Card Specifications — 1000Base CWDM and DWDM

Specification	**CWDM**	**DWDM**[1]
Number of ports	10	10
Speed	1 Gbps	1 Gbps
Interface	1000Base-CWDMnnnn[2]	1000Base-DWDMITUnn[3]
Link power budget[4]	21.0 dB	24.0 dB
Nominal wavelength	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data.
Connector type	LC	LC
Cable type	SMF	SMF
Transceiver type	SFP	SFP
Compliance	ITU G.694.2	ITU G.694.1

Table 133 10-Port Gigabit Ethernet 1020 Card Specifications — 1000Base CWDM and DWDM

Specification	CWDM	DWDM[1]
Transmitter		
Optical output power	–2.0 dBm (min) 5.0 dBm (max)	0.0 dBm (min) 4.0 dBm (max)
Center wavelength range	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data.
Extinction ratio	9.0 dB (min)	8.2 dB (min)
Center wavelength	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data.
Spectral width	1.00 nm (max)[5]	0.30 nm (max)
Receiver		
Wavelength range[6]	1260 to 1620 nm	1260 to 1620 nm
Sensitivity (min)	–23.0 dBm	–24.0 dBm
Overload level (max)	–7.0 dBm	–9.0 dBm

(1) The ranges of DWDM ITU channels are application specific.
(2) The nominal wavelengths of CWDM SFP transceivers are 1471, 1491, 1511, 1531, 1551, 1571, 1591, and 1611; specified in ITU G.694.2.
(3) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(4) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(5) Measured 20 dB down from the center wavelength peak.
(6) Receiver sensitivity is degraded 1.0 dB for wavelengths ≥ 1570 nm.

Table 134 ITU DWDM Frequencies and Wavelengths

ITU[1][2][3]	Frequency (THz)	Wavelength (nm)		ITU	Frequency (THz)	Wavelength (nm)
17	191.7	1563.86		40	194.0	1545.32
18	191.8	1563.05		41	194.1	1544.53
19	191.9	1562.23		42	194.2	1543.73
20	192.0	1561.42		43	194.3	1542.94
21	192.1	1560.61		44	194.4	1542.14
22	192.2	1559.79		45	194.5	1541.35
23	192.3	1558.98		46	194.6	1540.56
24	192.4	1558.17		47	194.7	1539.77
25	192.5	1557.36		48	194.8	1538.98
26	192.6	1556.55		49	194.9	1538.19
27	192.7	1555.75		50	195.0	1537.40
28	192.8	1554.94		51	195.1	1536.61
29	192.9	1554.13		52	195.2	1535.82
30	193.0	1553.33		53	195.3	1535.04

Table 134 ITU DWDM Frequencies and Wavelengths

ITU[(1)(2)(3)]	Frequency (THz)	Wavelength (nm)		ITU	Frequency (THz)	Wavelength (nm)
31	193.1	1552.52		54	195.4	1534.25
32	193.2	1551.72		55	195.5	1533.47
33	193.3	1550.92		56	195.6	1532.68
34	193.4	1550.12		57	195.7	1531.90
35	193.5	1549.32		58	195.8	1531.12
36	193.6	1548.51		59	195.9	1530.33
37	193.7	1547.72		60	196.0	1529.55
38	193.8	1546.92		61	196.1	1528.77
39	193.9	1546.12				

(1) The ranges of DWDM ITU channels are application specific.
(2) The range of GE-DWDM ITU channels is 17 to 60.
(3) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35, 36, 37, 53, and 55.

6.11.1 Status LEDs

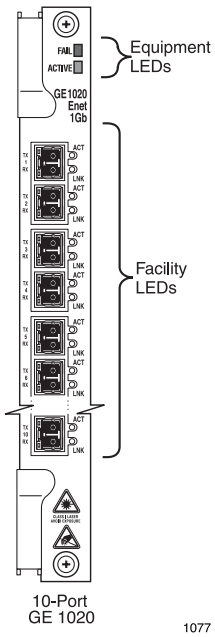

Figure 50 Status LEDs on 10-Port Gigabit Ethernet 1020 Card

Table 135 Equipment LEDs on 10-Port Gigabit Ethernet 1020 Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.[(1)]
	Off	None	No failure exists on the card.

Table 135 Equipment LEDs on 10-Port Gigabit Ethernet 1020 Card

Label	Activity	Color	Description
ACTIVE	On	Green	This card is in service.
	Off	None	This card has failed (the FAIL LED is on).

(1) A failure can be total, partial, or forced. Failure on any part of the card, including failure of any of its ports, results in the FAIL LED being on.

Table 136 Facility LEDs on 10-Port Gigabit Ethernet 1020 Card

Label	Activity	Color	Description
ACT	On	Yellow	The link is transmitting or receiving frames.
	Off	None	The link has no active frame.
LNK	On	Green	The link is up.
	Off	None	The link is down.

6.12 20-Port Gigabit Ethernet 1020 Card

The 20-port Gigabit Ethernet 1020 (GE1020) card is designed for traffic management. This PPA2-based card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the ports.

This card is bigger than all other SmartEdge line cards and occupies two adjacent slots in the chassis.

The following SFP optical transceivers are supported on the card ports:

- 1000Base-SX—Short Reach
- 1000Base-LX—Long Reach
- 1000Base-ZX—Extended Reach
- 1000Base-TX—Copper
- 1000Base-BX-D-20—20 km Bidirectional
- 1000Base-BX-U-20—20 km Bidirectional
- 1000Base-CWDM—Coarse Wavelength Division Multiplexing
- 1000Base-DWDM—Dense Wavelength Division Multiplexing

Caution!

Risk of data loss. You can corrupt the system if you attempt to install transceivers (GBICs, SFPs, or XFPs) not purchased from Ericsson; these transceivers have not been tested with the SmartEdge router. To reduce the risk, install only approved transceivers.

Table 137 20-Port Gigabit Ethernet 1020 Card Specifications — 1000Base SX, LX, ZX, and TX

Specification	**SX**	**LX**	**ZX**	**TX**(1)
Number of ports	20	20	20	20
Speed	1 Gbps	1 Gbps	1 Gbps	1 Gbps
Interface	1000Base-SX	1000Base-LX	1000Base-ZX	1000Base-TX
Link power budget(2)	7.5 dB	8.0 dB	21.0 dB	–
Nominal wavelength	850 nm	1310 nm	1550 nm	–
Connector type	LC	LC	LC	RJ-45
Cable type	MMF	SMF	SMF	Copper
Transceiver type	SFP	SFP	SFP	–
Compliance	IEEE 802.3 and 802.3z	IEEE 802.3 and 802.3z	–	IEEE 802.3, 802.3ab, and 802.3z
Transmitter				
Optical output power	–9.5 dBm (min) 0.0 dBm (max)	–11.0 dBm (min) –3.0 dBm (max)	–3.0 dBm (min) 5.0 dBm (max)	–
Center wavelength range	830 to 860 nm	1270 to 1355 nm	1540 to 1560 nm	–
Extinction ratio	9.0 dB (min)	9.0 dB (min)	9.0 dB (min)	–
Center wavelength	850 nm	1310 nm	1550 nm	–
Spectral width	0.85 nm (max) (RMS)	4.00 nm (max) (RMS)	1.00 nm (max)(3)	–
Receiver				
Wavelength range(4)	770 to 860 nm	1265 to 1600 nm	1260 to 1620 nm	–
Sensitivity (min)	–17.0 dBm	–19.0 dBm	–23.0 dBm	–
Overload level (max)	–3.0 dBm	–3.0 dBm	–3.0 dBm	–

(1) When this 1000Base-TX SFP transceiver is used in the 20x1GE card, a maximum of 10 transceivers can be inserted into the card. These transceivers are inserted into the card such that only one port from each of the following slot pairs is populated: 1-11, 2-12, 3-13, 4-14, 5-15, 6-16, 7-17, 8-18, 9-19, and 10-20. If both ports in a slot pair are populated, the SFP cages of the line card can be damaged.

(2) Link power budget is calculated using (minimum output power) – (minimum sensitivity).

(3) Measured 20 dB down from the center wavelength peak.

(4) Receiver sensitivity is degraded 1.0 dB for wavelengths ≥ 1570 nm.

Table 138 20-Port Gigabit Ethernet 1020 Card Specifications — 1000Base BX-D-20 and BX-U-20

Specification[1]	**BX-D-20**	**BX-U-20**
Number of ports	20	20
Speed	1 Gbps	1 Gbps
Interface	1000Base-BX-D-20	1000Base-BX-U-20
Link power budget[2]	13.0 dB	13.0 dB
Nominal wavelength	1490 nm	1310 nm
Connector type	LC	LC
Cable type	SMF	SMF
Transceiver type	SFP	SFP
Compliance	IEEE 802.3 and 802.3ah	IEEE 802.3 and 802.3ah
Transmitter		
Optical output power	–7.0 dBm (min) 0.0 dBm (max)	–7.0 dBm (min) 0.0 dBm (max)
Extinction ratio	6.0 dB (min)	6.0 dB (min)
Center wavelength	1490 nm	1310 nm
Spectral width	1.00 nm (max)[3]	3.50 nm (max) (RMS)
Receiver		
Center wavelength	1310 nm	1490 nm
Sensitivity (min)	–18.7 dBm	–18.7 dBm
Overload level (max)	0.0 dBm	0.0 dBm

(1) The Bidirectional SFP transceivers must be used in pairs, one BX-D-20 and one BX-U-20; otherwise, the links will not work.
(2) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(3) Measured 20 dB down from the center wavelength peak.

Table 139 20-Port Gigabit Ethernet 1020 Card Specifications — 1000Base CWDM and DWDM

Specification	**CWDM**	**DWDM**[1]
Number of ports	20	20
Speed	1 Gbps	1 Gbps
Interface	1000Base-CWDMnnnn[2]	1000Base-DWDMITUnn[3]
Link power budget[4]	21.0 dB	24.0 dB
Nominal wavelength	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Connector type	LC	LC
Cable type	SMF	SMF
Transceiver type	SFP	SFP
Compliance	ITU G.694.2	ITU G.694.1

Table 139 20-Port Gigabit Ethernet 1020 Card Specifications — 1000Base CWDM and DWDM

Specification	CWDM	DWDM[1]
Transmitter		
Optical output power	–2.0 dBm (min) 5.0 dBm (max)	0.0 dBm (min) 4.0 dBm (max)
Center wavelength range	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Extinction ratio	9.0 dB (min)	8.2 dB (min)
Center wavelength	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Spectral width	1.00 nm (max)[5]	0.30 nm (max)
Receiver		
Wavelength range[6]	1260 to 1620 nm	1260 to 1620 nm
Sensitivity (min)	–23.0 dBm	–24.0 dBm
Overload level (max)	–7.0 dBm	–9.0 dBm

(1) The ranges of DWDM ITU channels are application specific.
(2) The nominal wavelengths of CWDM SFP transceivers are 1471, 1491, 1511, 1531, 1551, 1571, 1591, and 1611; specified in ITU G.694.2.
(3) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(4) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(5) Measured 20 dB down from the center wavelength peak.
(6) Receiver sensitivity is degraded 1.0 dB for wavelengths ≥ 1570 nm.

6.12.1 Status LEDs

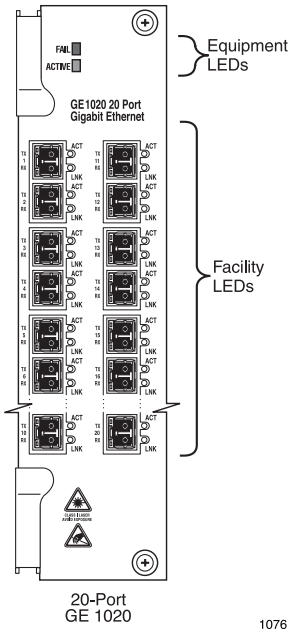

Figure 51 Status LEDs on 20-Port Gigabit Ethernet 1020 Card

Table 140 Equipment LEDs on 20-Port Gigabit Ethernet 1020 Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This card is in service.
	Off	None	This card has failed (the FAIL LED is on).

(1) A failure can be total, partial, or forced. Failure on any part of the card, including failure of any of its ports, results in the FAIL LED being on.

Table 141 Facility LEDs on 20-Port Gigabit Ethernet 1020 Card

Label	Activity	Color	Description
ACT	On	Yellow	The link is transmitting or receiving frames.
	Off	None	The link has no active frame.
LNK	On	Green	The link is up.
	Off	None	The link is down.

6.13 5-Port Gigabit Ethernet Card

The 5-port Gigabit Ethernet card is designed for traffic management. This PPA2-based, third-generation GE card has an increased minimum memory capacity of 1 GB. It can also process data internally at a much higher rate than the PPAs on the first and second generations of the GE card.

This card occupies a single slot in the chassis and requires a separate SFP transceiver for each port.

The following SFP optical transceivers are supported on the card ports:

- 1000Base-SX—Short Reach
- 1000Base-LX—Long Reach
- 1000Base-ZX—Extended Reach
- 1000Base-TX—Copper
- 1000Base-BX-D-20—20 km Bidirectional
- 1000Base-BX-U-20—20 km Bidirectional
- 1000Base-CWDM—Coarse Wavelength Division Multiplexing
- 1000Base-DWDM—Dense Wavelength Division Multiplexing

Caution!

Risk of data loss. You can corrupt the system if you attempt to install transceivers (GBICs, SFPs, or XFPs) not purchased from Ericsson; these transceivers have not been tested with the SmartEdge router. To reduce the risk, install only approved transceivers.

Table 142 5-Port Gigabit Ethernet Card Specifications — 1000Base SX, LX, ZX, and TX

Specification	**SX**	**LX**	**ZX**	**TX**[1]
Number of ports	5	5	5	5
Speed	1 Gbps	1 Gbps	1 Gbps	1 Gbps
Interface	1000Base-SX	1000Base-LX	1000Base-ZX	1000Base-TX
Link power budget[2]	7.5 dB	8.0 dB	21.0 dB	–
Nominal wavelength	850 nm	1310 nm	1550 nm	–
Connector type	LC	LC	LC	RJ-45
Cable type	MMF	SMF	SMF	Copper
Transceiver type	SFP	SFP	SFP	–
Compliance	IEEE 802.3 and 802.3z	IEEE 802.3 and 802.3z	–	IEEE 802.3, 802.3ab, and 802.3z
Transmitter				
Optical output power	–9.5 dBm (min) 0.0 dBm (max)	–11.0 dBm (min) –3.0 dBm (max)	–3.0 dBm (min) 5.0 dBm (max)	–
Center wavelength range	830 to 860 nm	1270 to 1355 nm	1540 to 1560 nm	–

Table 142 5-Port Gigabit Ethernet Card Specifications — 1000Base SX, LX, ZX, and TX

Specification	**SX**	**LX**	**ZX**	**TX**(1)
Extinction ratio	9.0 dB (min)	9.0 dB (min)	9.0 dB (min)	–
Center wavelength	850 nm	1310 nm	1550 nm	–
Spectral width	0.85 nm (max) (RMS)	4.00 nm (max) (RMS)	1.00 nm (max)(3)	–
Receiver				
Wavelength range(4)	770 to 860 nm	1265 to 1600 nm	1260 to 1620 nm	–
Sensitivity (min)	–17.0 dBm	–19.0 dBm	–23.0 dBm	–
Overload level (max)	–3.0 dBm	–3.0 dBm	–3.0 dBm	–

(1) When this 1000Base-TX SFP transceiver is used in the 20x1GE card, a maximum of 10 transceivers can be inserted into the card. These transceivers are inserted into the card such that only one port from each of the following slot pairs is populated: 1-11, 2-12, 3-13, 4-14, 5-15, 6-16, 7-17, 8-18, 9-19, and 10-20. If both ports in a slot pair are populated, the SFP cages of the line card can be damaged.
(2) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(3) Measured 20 dB down from the center wavelength peak.
(4) Receiver sensitivity is degraded 1.0 dB for wavelengths ≥ 1570 nm.

Table 143 5-Port Gigabit Ethernet Card Specifications — 1000Base BX-D-20 and -BX-U-20

Specification(1)	**BX-D-20**	**BX-U-20**
Number of ports	5	5
Speed	1 Gbps	1 Gbps
Interface	1000Base-BX-D-20	1000Base-BX-U-20
Link power budget(2)	13.0 dB	13.0 dB
Nominal wavelength	1490 nm	1310 nm
Connector type	LC	LC
Cable type	SMF	SMF
Transceiver type	SFP	SFP
Compliance	IEEE 802.3 and 802.3ah	IEEE 802.3 and 802.3ah
Transmitter		
Optical output power	–7.0 dBm (min) 0.0 dBm (max)	–7.0 dBm (min) 0.0 dBm (max)
Extinction ratio	6.0 dB (min)	6.0 dB (min)
Center wavelength	1490 nm	1310 nm
Spectral width	1.00 nm (max)(3)	3.50 nm (max) (RMS)
Receiver		
Center wavelength	1310 nm	1490 nm

Table 143 5-Port Gigabit Ethernet Card Specifications — 1000Base BX-D-20 and -BX-U-20

Specification[1]	**BX-D-20**	**BX-U-20**
Sensitivity (min)	–18.7 dBm	–18.7 dBm
Overload level (max)	0.0 dBm	0.0 dBm

(1) The Bidirectional SFP transceivers must be used in pairs, one BX-D-20 and one BX-U-20; otherwise, the links will not work.
(2) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(3) Measured 20 dB down from the center wavelength peak.

Table 144 5-Port Gigabit Ethernet Card Specifications — 1000Base CWDM and DWDM

Specification	**CWDM**	**DWDM**[1]
Number of ports	5	5
Speed	1 Gbps	1 Gbps
Interface	1000Base-CWDMnnnn[2]	1000Base-DWDMITUnn[3]
Link power budget[4]	21.0 dB	24.0 dB
Nominal wavelength	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Connector type	LC	LC
Cable type	SMF	SMF
Transceiver type	SFP	SFP
Compliance	ITU G.694.2	ITU G.694.1
Transmitter		
Optical output power	–2.0 dBm (min) 5.0 dBm (max)	0.0 dBm (min) 4.0 dBm (max)
Center wavelength range	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Extinction ratio	9.0 dB (min)	8.2 dB (min)
Center wavelength	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Spectral width	1.00 nm (max)[5]	0.30 nm (max)
Receiver		
Wavelength range[6]	1260 to 1620 nm	1260 to 1620 nm

Table 144 5-Port Gigabit Ethernet Card Specifications — 1000Base CWDM and DWDM

Specification	CWDM	DWDM(1)
Sensitivity (min)	–23.0 dBm	–24.0 dBm
Overload level (max)	–7.0 dBm	–9.0 dBm

(1) The ranges of DWDM ITU channels are application specific.
(2) The nominal wavelengths of CWDM SFP transceivers are 1471, 1491, 1511, 1531, 1551, 1571, 1591, and 1611; specified in ITU G.694.2.
(3) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(4) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(5) Measured 20 dB down from the center wavelength peak.
(6) Receiver sensitivity is degraded 1.0 dB for wavelengths ≥ 1570 nm.

6.13.1 Status LEDs

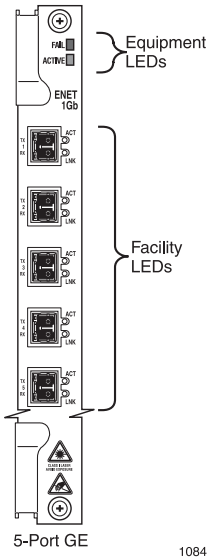

Figure 52 LEDs on 5-Port Gigabit Ethernet Card

Table 145 Equipment LEDs on 5-Port Gigabit Ethernet Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This card is in service.
	Off	None	This card has failed (the FAIL LED is on).

(1) A failure can be total, partial, or forced. Failure on any part of the card, including failure of any of its ports, results in the FAIL LED being on.

Table 146 Facility LEDs on 5-Port Gigabit Ethernet Card

Label	Activity	Color	Description
ACT	On	Yellow	The link is transmitting or receiving frames.
	Off	None	The link has no active frame.
LNK	On	Green	The link is up.
	Off	None	The link is down.

6.14 10-Port Gigabit Ethernet DDR Card

The 10-port Gigabit Ethernet DDR-based card is designed for traffic management using second-generation PPAs. This card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the ports. It also has increased circuit density of 32K with a minimum of 24K with eight CoS queues.

This card occupies a single slot in the chassis and requires a separate SFP transceiver for each port.

The following SFP optical transceivers are supported on the card ports:

- 1000Base-SX—Short Reach
- 1000Base-LX—Long Reach
- 1000Base-ZX—Extended Reach
- 1000Base-TX—Copper
- 1000Base-BX-D-20—20 km Bidirectional
- 1000Base-BX-U-20—20 km Bidirectional
- 1000Base-CWDM—Coarse Wavelength Division Multiplexing
- 1000Base-DWDM—Dense Wavelength Division Multiplexing

Caution!

Risk of data loss. You can corrupt the system if you attempt to install transceivers (GBICs, SFPs, or XFPs) not purchased from Ericsson; these transceivers have not been tested with the SmartEdge router. To reduce the risk, install only approved transceivers.

Table 147 10-Port GE DDR Card Specifications (1000Base SX, LX, ZX, and TX)

Specification	SX	LX	ZX	TX[1]
Number of ports	10	10	10	10
Speed	1 Gbps	1 Gbps	1 Gbps	1 Gbps
Interface	1000Base-SX	1000Base-LX	1000Base-ZX	1000Base-TX
Link power budget[2]	7.5 dB	8.0 dB	21.0 dB	–
Nominal wavelength	850 nm	1310 nm	1550 nm	–
Connector type	LC	LC	LC	RJ-45
Cable type	MMF	SMF	SMF	Copper
Transceiver type	SFP	SFP	SFP	–
Compliance	IEEE 802.3 and 802.3z	IEEE 802.3 and 802.3z	–	IEEE 802.3, 802.3ab, and 802.3z
Transmitter				
Optical output power	–9.5 dBm (min) 0.0 dBm (max)	–11.0 dBm (min) –3.0 dBm (max)	–3.0 dBm (min) 5.0 dBm (max)	–
Center wavelength range	830 to 860 nm	1270 to 1355 nm	1540 to 1560 nm	–
Extinction ratio	9.0 dB (min)	9.0 dB (min)	9.0 dB (min)	–
Center wavelength	850 nm	1310 nm	1550 nm	–
Spectral width	0.85 nm (max) (RMS)	4.00 nm (max) (RMS)	1.00 nm (max)[3]	–
Receiver				
Wavelength range[4]	770 to 860 nm	1265 to 1600 nm	1260 to 1620 nm	–
Sensitivity (min)	–17.0 dBm	–19.0 dBm	–23.0 dBm	–
Overload level (max)	–3.0 dBm	–3.0 dBm	–3.0 dBm	–

(1) When this 1000Base-TX SFP transceiver is used in the 20x1GE card, a maximum of 10 transceivers can be inserted into the card. These transceivers are inserted into the card such that only one port from each of the following slot pairs is populated: 1-11, 2-12, 3-13, 4-14, 5-15, 6-16, 7-17, 8-18, 9-19, and 10-20. If both ports in a slot pair are populated, the SFP cages of the line card can be damaged.
(2) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(3) Measured 20 dB down from the center wavelength peak.
(4) Receiver sensitivity is degraded 1.0 dB for wavelengths ≥ 1570 nm.

Table 148 10-Port GE DDR Card Specifications (1000Base BX-D-20 and BX-U-20)

Specification[1]	BX-D-20	BX-U-20
Number of ports	10	10
Speed	1 Gbps	1 Gbps
Interface	1000Base-BX-D-20	1000Base-BX-U-20
Link power budget[2]	13.0 dB	13.0 dB
Nominal wavelength	1490 nm	1310 nm
Connector type	LC	LC
Cable type	SMF	SMF
Transceiver type	SFP	SFP

Table 148 10-Port GE DDR Card Specifications (1000Base BX-D-20 and BX-U-20)

Specification[1]	**BX-D-20**	**BX-U-20**
Compliance	IEEE 802.3 and 802.3ah	IEEE 802.3 and 802.3ah
Transmitter		
Optical output power	–7.0 dBm (min) 0.0 dBm (max)	–7.0 dBm (min) 0.0 dBm (max)
Extinction ratio	6.0 dB (min)	6.0 dB (min)
Center wavelength	1490 nm	1310 nm
Spectral width	1.00 nm (max)[3]	3.50 nm (max) (RMS)
Receiver		
Center wavelength	1310 nm	1490 nm
Sensitivity (min)	–18.7 dBm	–18.7 dBm
Overload level (max)	0.0 dBm	0.0 dBm

(1) The Bidirectional SFP transceivers must be used in pairs, one BX-D-20 and one BX-U-20; otherwise, the links will not work.
(2) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(3) Measured 20 dB down from the center wavelength peak.

Table 149 10-Port GE DDR Card Specifications (1000Base CWDM and DWDM)

Specification	**CWDM**	**DWDM**[1]
Number of ports	10	10
Speed	1 Gbps	1 Gbps
Interface	1000Base-CWDMnnnn[2]	1000Base-DWDMITUnn[3]
Link power budget[4]	21.0 dB	24.0 dB
Nominal wavelength	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Connector type	LC	LC
Cable type	SMF	SMF
Transceiver type	SFP	SFP
Compliance	ITU G.694.2	ITU G.694.1
Transmitter		
Optical output power	–2.0 dBm (min) 5.0 dBm (max)	0.0 dBm (min) 4.0 dBm (max)
Center wavelength range	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Extinction ratio	9.0 dB (min)	8.2 dB (min)
Center wavelength	1471 to 1611 nm	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data

Table 149 10-Port GE DDR Card Specifications (1000Base CWDM and DWDM)

Specification	CWDM	DWDM(1)
Spectral width	1.00 nm (max)(5)	0.30 nm (max)
Receiver		
Wavelength range(6)	1260 to 1620 nm	1260 to 1620 nm
Sensitivity (min)	–23.0 dBm	–24.0 dBm
Overload level (max)	–7.0 dBm	–9.0 dBm

(1) The ranges of DWDM ITU channels are application specific.
(2) The nominal wavelengths of CWDM SFP transceivers are 1471, 1491, 1511, 1531, 1551, 1571, 1591, and 1611; specified in ITU G.694.2.
(3) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(4) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(5) Measured 20 dB down from the center wavelength peak.
(6) Receiver sensitivity is degraded 1.0 dB for wavelengths ≥ 1570 nm.

6.14.1 Status LEDs

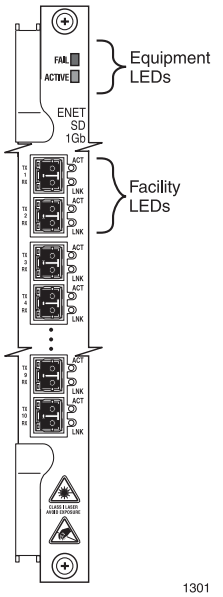

Figure 53 LEDs on 10-Port Gigabit Ethernet DDR Card

Table 150 Equipment LEDs on 10-Port GE DDR Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.

Table 150 Equipment LEDs on 10-Port GE DDR Card

Label	Activity	Color	Description
ACTIVE	On	Green	This card is in service.
	Off	None	This card has failed (the FAIL LED is On).

(1) When the card is first plugged in to the chassis, both the FAIL and ACTIVE LEDs stay on until the card is initialized by the Smartedge OS. FAIL - On does not necessarily indicate a card failure.

Table 151 Facility LEDs on 10-Port GE DDR Card

Label	Activity	Color	Description
ACT	On	Yellow	The link is transmitting or receiving frames.
	Off	None	The link has no active frame.
LNK	On	Green	The link is up.
	Off	None	The link is down.

6.15 1-Port 10 Gigabit Ethernet Card

The 1-port 10 Gigabit Ethernet (1x10GE) card is designed for traffic management using the second-generation PPAs. This card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the port, which runs at 10 Gbps.

The port on this line card can be configured as LAN-PHY at 10320 Mbits/s, or WAN-PHY at 9953.25 Mbits/s.

This card occupies a single slot in the chassis and requires an XFP transceiver for the port.

The following 10-Gbps XFP transceivers are supported on the card port:

- 10GE-SR—Short Reach
- 10GE-LR—Long Reach
- 10GE-ER—Extended Reach
- 10GE-ZR—Extreme Reach
- 10GE-DWDM—Dense wavelength-division multiplexing

Caution!

Risk of data loss. You can corrupt the system if you attempt to install transceivers (GBICs, SFPs, or XFPs) not purchased from Ericsson; these transceivers have not been tested with the SmartEdge router. To reduce the risk, install only approved transceivers.

Note: Use part number RDH90168/2 (XFP-OC192-LR2) when ordering the XFP transceivers with 10GE ZR functionality.

Table 152 1-Port 10 Gigabit Ethernet Card Specifications

Specification	SR	LR	ER	ZR[1]
Number of port	1	1	1	1
Speed	10 Gbps	10 Gbps	10 Gbps	10 Gbps
Interface	10GE-SR	10GE-LR	10GE-ER	10GE-ZR
Link power budget[2]	7.3 dB (OMA = –3.8 dBm)	9.4 dB (OMA = –5.2 dBm)	15.0 dB (OMA = –1.7 dBm)	24.0 dB
Nominal wavelength	850 nm	1310 nm	1550 nm	1550 nm
Connector type	LC	LC	LC	LC
Cable type	MMF	SMF	SMF	SMF
Transceiver type	XFP	XFP	XFP	XFP
Compliance	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae	–
Transmitter				
Optical output power	–7.3 dBm (min) –1.0 dBm (max)	–8.2 dBm (min) 0.5 dBm (max)	–4.7 dBm (min) 4.0 dBm (max)	0.0 dBm (min) 4.0 dBm (max)
Transmitter dispersion penalty	3.9 dB	3.2 dB	3.0 dB	3.0 dB
Center wavelength range	840 to 860 nm	1260 to 1355 nm	1530 to 1565 nm	1530 to 1565 nm
Extinction ratio	3.0 dB (min)	3.5 dB (min)	3.0 dB (min)	9.0 dB (min)
Center wavelength	850 nm	1310 nm	1550 nm	1550 nm
Spectral width	802.3ae-2002	–	–	–
Receiver				
Wavelength range	840 to 860 nm	1270 to 1565 nm	1270 to 1565 nm	1270 to 1565 nm
Sensitivity (min)	–11.1 dBm	–12.6 dBm	–14.1 dBm	–22.1 dBm
Overload level (max)	–1.0 dBm[3]	0.5 dBm	–1.0 dBm[4]	–7.0 dBm

(1) Use part number RDH90168/2 (XFP-OC192-LR2) when ordering the XFP transceivers with 10GE ZR functionality.
(2) Informative value only. This estimate is a worst case with the OMA as specified and extinction ratio as specified for the transmitter.
(3) The SR receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 1.0 dB, unless otherwise noted.
(4) The ER receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 5.0 dB.

Table 153 1-Port 10 Gigabit Ethernet Card Specifications — DWDM

Specification	DWDM[1]
Number of port	1
Speed	10.3125 Gbps
Interface	DWDMnn[2]
Link power budget[3]	24 dB

Table 153 1-Port 10 Gigabit Ethernet Card Specifications — DWDM

Specification	**DWDM**(1)
Nominal wavelength	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Connector type	LC
Cable type	SMF
Transceiver type	XFP
Compliance	ITU G.959.1 P1L1-2D2, ITU-T G698.1, and ITU 694.1 GR-253 LR-2b
Transmitter	
Optical output power	–1.0 dBm (min) +3.0 dBm (max)
Center wavelength range	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Extinction ratio	8.2 dB (min)
Spectral width	0.3 nm (max)(4)
Receiver	
Wavelength range	1270 nm to 1600 nm
Sensitivity (min)	–24.0 dBm
Overload level (max)	–7.0 dBm

(1) The ranges of DWDM ITU channels are application specific.
(2) The 10GE-DWDM XFP transceivers support ITU channels 20, 33, 35,36,37,53,and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(3) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(4) Measured 20 dB down from the center wavelength peak.

6.15.1 Status LEDs

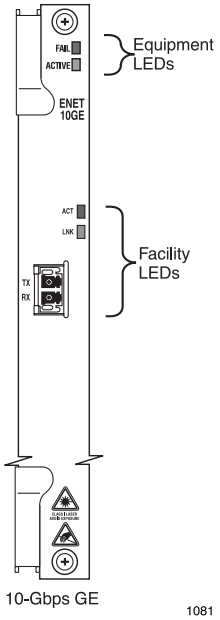

Figure 54 LEDs on 1-Port 10 Gigabit Ethernet Card

Table 154 Equipment LEDs on 1-Port 10 Gigabit Ethernet Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This card is in service.
	Off	None	This card has failed (the FAIL LED is on).

(1) A failure can be total, partial, or forced. Failure on any part of the card, including failure of any of its ports, results in the FAIL LED being on.

Table 155 Facility LEDs on 1-Port 10 Gigabit Ethernet Card

Label	Activity	Color	Description
ACT	On	Yellow	The link is transmitting or receiving frames.
	Off	None	The link has no active frame.
LNK	On	Green	The link is up.
	Off	None	The link is down.

6.16 1-Port 10 Gigabit Ethernet/OC-192c DDR Card

The 1-port 10GE/OC-192c DDR-based card designed for traffic management using second-generation PPAs. This multimode DDR card supports the 10GE LAN-PHY, 10GE WAN-PHY, 10GE-DWDM, POS OC-192c, OC-192c DWDM, or OTN-DWDM modes for the SmartEdge routers.

This card supports a minimum of 1 GB of memory capacity and can process data internally to match the speed of the port — 10.3125 Gbps in 10GE LAN-PHY or 10GE-DWDM mode; 9.953 Gbps in 10GE WAN-PHY, POS OC-192c, or OC-192c DWDM mode; and 11.0957 Gbps in OTN-DWDM mode.

For Ethernet LAN-PHY and WAN-PHY modes, this card supports dot1q, PPPoE, and plain Ethernet encapsulations. For POS mode, it supports PPP, HDLC, and FR encapsulations.

For 10GE LAN-PHY, 10GE WAN-PHY, 10GE-DWDM, or OTN-DWDM mode, the maximum MTU is 9,198 bytes; for POS OC–192c or OC–192c DWDM mode, 12,800 bytes.

This card occupies a single slot in the chassis and requires an XFP transceiver for the port.

The following XFP transceivers are supported on the card port:

- 10GE-SR/SW—Short Reach
- 10GE-LR/LW—Long Reach
- 10GE-ER/EW—Extended Reach
- 10GE-ZR/ZW—Extreme Reach
- 10GE-DWDM—Dense Wavelength Division Multiplexing
- OTN-DWDM—80 km OTU2e Transport
- SONET OC-192/STM-64-SR-1—Short Reach
- SONET OC-192/STM-64-IR-2—Intermediate Reach
- SONET OC-192/STM-64-LR-2—Long Reach

Caution!

Risk of data loss. You can corrupt the system if you attempt to install transceivers (GBICs, SFPs, or XFPs) not purchased from Ericsson; these transceivers have not been tested with the SmartEdge router. To reduce the risk, install only approved transceivers.

Note: When ordering the XFP transceivers with 10GE ZR/ZW functionality, use part number XFP-OC192-LR2.

Table 156 1-Port 10GE/OC-192c DDR Card Specifications — 10GE LAN-PHY

Specification	SR	LR	ER	ZR[1]
Number of port	1	1	1	1
Speed	10.3125 Gbps	10.3125 Gbps	10.3125 Gbps	10.3125 Gbps
Interface	10GE-SR	10GE-LR	10GE-ER	10GE-ZR
Link power budget[2]	7.3 dB (OMA = –3.8 dBm)	9.4 dB (OMA = –5.2 dBm)	15.0 dB (OMA = –1.7 dBm)	24.0 dB
Nominal wavelength	850 nm	1310 nm	1550 nm	1550 nm
Connector type	LC	LC	LC	LC
Cable type	MMF	SMF	SMF	SMF
Transceiver type	XFP	XFP	XFP	XFP
Compliance	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae	–
Transmitter				
Optical output power	–7.3 dBm (min) –1.0 dBm (max)	–8.2 dBm (min) 0.5 dBm (max)	–4.7 dBm (min) 4.0 dBm (max)	0.0 dBm (min) 4.0 dBm (max)
Transmitter dispersion penalty	3.9 dB	3.2 dB	3.0 dB	3.0 dB
Center wavelength range	840 to 860 nm	1260 to 1355 nm	1530 to 1565 nm	1530 to 1565 nm
Extinction ratio	3.0 dB (min)	3.5 dB (min)	3.0 dB (min)	9.0 dB (min)
Center wavelength	850 nm	1310 nm	1550 nm	1550 nm
Spectral width	802.3ae-2002	–	–	–
Receiver				
Wavelength range	840 to 860 nm	1270 to 1565 nm	1270 to 1565 nm	1270 to 1565 nm
Sensitivity (min)	–11.1 dBm	–12.6 dBm	–14.1 dBm	–22.1 dBm
Overload level (max)	–1.0 dBm[3]	0.5 dBm	–1.0 dBm[4]	–7.0 dBm

(1) Use part number RDH90168/2 (XFP-OC192-LR2) when ordering the XFP transceivers with 10GE ZR functionality.
(2) Informative value only. This estimate is a worst case with the OMA as specified and extinction ratio as specified for the transmitter.
(3) The SR receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 1.0 dB, unless otherwise noted.
(4) The ER receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 5.0 dB.

Table 157 1-Port 10GE/OC-192c DDR Card Specifications — 10GE WAN-PHY

Specification	SW	LW	EW	ZW[1]
Number of port	1	1	1	1
Speed	9.953 Gbps	9.953 Gbps	9.953 Gbps	9.953 Gbps
Interface	10GE-SW	10GE-LW	10GE-EW	10GE-ZW
Link power budget[2]	7.3 dB (OMA = –3.8 dBm)	9.4 dB (OMA = –5.2 dBm)	15.0 dB (OMA = –1.7 dBm)	24.0 dB
Nominal wavelength	850 nm	1310 nm	1550 nm	1550 nm
Connector type	LC	LC	LC	LC

Table 157 1-Port 10GE/OC-192c DDR Card Specifications — 10GE WAN-PHY

Specification	**SW**	**LW**	**EW**	**ZW**(1)
Cable type	MMF	SMF	SMF	SMF
Transceiver type	XFP	XFP	XFP	XFP
Compliance	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae	–
Transmitter				
Optical output power	–7.3 dBm (min) –1.0 dBm (max)	–8.2 dBm (min) 0.5 dBm (max)	–4.7 dBm (min) 4.0 dBm (max)	0.0 dBm (min) 4.0 dBm (max)
Transmitter dispersion penalty	3.9 dB	3.2 dB	3.0 dB	3.0 dB
Center wavelength range	840 to 860 nm	1260 to 1355 nm	1530 to 1565 nm	1530 to 1565 nm
Extinction ratio	3.0 dB (min)	3.5 dB (min)	3.0 dB (min)	9.0 dB (min)
Center wavelength	850 nm	1310 nm	1550 nm	1550 nm
Spectral width	802.3ae-2002	–	–	–
Receiver				
Wavelength range	840 to 860 nm	1270 to 1565 nm	1270 to 1565 nm	1270 to 1565 nm
Sensitivity (min)	–11.1 dBm	–12.6 dBm	–14.1 dBm	–22.1 dBm
Overload level (max)	–1.0 dBm(3)	0.5 dBm	–1.0 dBm(4)	–7.0 dBm

(1) Use part number RDH90168/2 (XFP-OC192-LR2) when ordering the XFP transceivers with 10GE ZR functionality.
(2) Informative value only. This estimate is a worst case with the OMA as specified and extinction ratio as specified for the transmitter.
(3) The SR receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 1.0 dB, unless otherwise noted.
(4) The ER receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 5.0 dB.

Table 158 1-Port 10GE/OC-192c DDR Card Specifications — DWDM

Specification	**DWDM**(1)
Number of port	1
Speed	10GE: 10.3125 Gbps OC-192c: 9.953 Gbps
Interface	DWDMnn(2)
Link power budget(3)	24 dB
Nominal wavelength	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Connector type	LC
Cable type	SMF
Transceiver type	XFP
Compliance	ITU G.959.1 P1L1-2D2, ITU-T G698.1, and ITU 694.1 GR-253 LR-2b
Transmitter	

Table 158 1-Port 10GE/OC-192c DDR Card Specifications — DWDM

Specification	**DWDM**(1)
Optical output power	–1.0 dBm (min) +3.0 dBm (max)
Center wavelength range	See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data
Extinction ratio	8.2 dB (min)
Spectral width	0.3 nm (max)(4)
Receiver	
Wavelength range	1270 nm to 1600 nm
Sensitivity (min)	–24.0 dBm
Overload level (max)	–7.0 dBm

(1) The ranges of DWDM ITU channels are application specific.
(2) The 10GE-DWDM XFP transceivers support ITU channels 20, 33, 35, 36, 37, 53, and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(3) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(4) Measured 20 dB down from the center wavelength peak.

Table 159 1-Port 10GE/OC-192c DDR Card Specifications — OTN-DWDM

Specification	**OTN-DWDM**(1)(2)(3)
Number of port	1
Speed	11.0957 Gbps
Interface	OTN-DWDMnn(4)
Link power budget(5)	25 dB
Nominal wavelength	See the ITU DWDM Transmit Frequencies and Wavelengths table for ITU frequency and wavelength data
Connector type	LC
Cable type	SMF
Transceiver type	XFP
Compliance	ITU G.707, ITU G.709, ITU G.798, ITU G.8251, and ITU G959.1 SFF INF-8077i, SFF 8477 IEEE 802.3ae-2004
Transmitter	
Optical output power	0.0 dBm (min) +3.0 dBm (max)
Center wavelength range	See the ITU DWDM Transmit Frequencies and Wavelengths table for ITU frequency and wavelength data
Extinction ratio	9.0 dB (min)
Spectral width	1.0 nm (max)(6)
Receiver	
Wavelength range	1527 nm to 1567 nm

Table 159 1-Port 10GE/OC-192c DDR Card Specifications — OTN-DWDM

Specification	**OTN-DWDM**[(1)(2)(3)]
Sensitivity (min)	-28.0 dBm
Overload level (max)	+5.0 dBm

(1) The OTN-DWDM XFP transceivers can vary slightly, depending on the manufacturer.
(2) The OTN-DWDM XFP transceiver is an 80km device by default.
(3) The OTN-DWDM XFP transceiver has FEC (Forward Error Correction) enabled by default.
(4) The OTN-DWDM XFP transceivers support ITU channels 20, 33, 35, 36, 37, 53, and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
(5) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(6) Measured 20 dB down from the center wavelength peak.

Caution!

Risk of data loss. Because the 10 Gigabit Ethernet/OC-192c DDR (1-port) line card has multi-rate capability, it is important that you choose the proper XFP transceiver for the intended application.

Table 160 1-Port 10GE/OC-192c DDR Card Specifications — POS OC-192c/STM-64c

Specification[(1)]	**SR-1**	**IR-2**	**LR-2**[(2)]
Number of port	1	1	1
Speed	9.953 Gbps	9.953 Gbps	9.953 Gbps
Interface	SR-1/I-64.1	IR-2/S-64.2b	LR-2/P1L1-2D2
Link power budget[(3)]	5.0 dB	13.0 dB	24.0 dB
Nominal wavelength	1310 nm	1550 nm	1550 nm
Connector type	LC	LC	LC
Cable type	SMF	SMF	SMF
Transceiver type	XFP	XFP	XFP
Compliance	Telcordia GR-253 SR-1 GR-1377-CORE ITU G.691 I-64.1	Telcordia GR-253 IR-2 GR-1377-CORE ITU G.691 S-64.2b	Telcordia GR-253 LR-2 GR-1377-CORE ITU G.691 P1L1-2D2
Transmitter			
Optical output power	–6.0 dBm (min) –1.0 dBm (max)	–1.5 dBm (min) 2.0 dBm (max)	0.0 dBm (min) 4.0 dBm (max)
Path penalty	1.0 dB	2.0 dB	2.0 dB
Center wavelength range	1270 to 1565 nm	1270 to 1565 nm	1270 to 1565 nm
Extinction ratio	6.0 dB (min)	8.2 dB (min)	8.2 dB (min)
Center wavelength	1310 nm	1310 nm	1550 nm
Spectral width[(4)]	1.0 nm (max)	1.0 nm (max)	1.0 nm (max)

Table 160 1-Port 10GE/OC-192c DDR Card Specifications — POS OC-192c/STM-64c

Specification(1)	**SR-1**	**IR-2**	**LR-2**(2)
Side-mode suppression ratio	30.0 dB (min)	30.0 dB (min)	30.0 dB (min)
Receiver			
Wavelength range	1270 to 1565 nm	1270 to 1565 nm	1270 to 1565 nm
Sensitivity (min)	–11.0 dBm	–14.0 dBm	–24.0 dBm
Overload level (max)	0.5 dBm(5)	–1.0 dBm	–7.0 dBm
Optical reflectance	–14.0 dB	–27.0 dB	–27.0 dB

*(1) To display static transceiver data, enter the show hardware command (in any mode) with the **card** and **detail** keywords, or, for dynamic data, enter the show port command (in any mode) with the detail keyword. Measured or reported values may meet or exceed performance parameters that are specified in this table.*
(2) Use part number RDH90168/2 (XFP-OC192-LR2) when ordering the XFP transceivers with 10GE ZR functionality.
(3) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
(4) Measured 20 dB down from the central wavelength peak.
(5) The receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 1.0 dB, unless otherwise noted.

6.16.1 Status LEDs

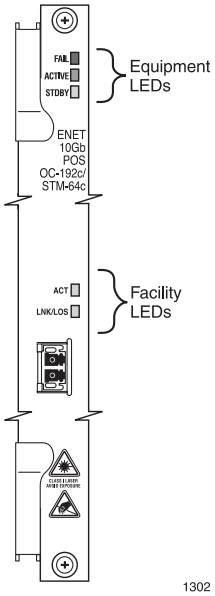

Figure 55 LEDs on 1-Port 10GE/OC-192c DDR Card

Table 161 Equipment LEDs on 1-Port 10GE/OC-192c DDR Card

Label	**Activity**	**Color**	**Description**
FAIL(1)	On	Red	The card is configured, but a failure exists.(2)
	Off	None	No failure exists on the card.

Table 161 Equipment LEDs on 1-Port 10GE/OC-192c DDR Card

Label	Activity	Color	Description
ACTIVE(1)	On	Green	This card is in service.
	Off	None	This card is either on standby (the STDBY LED is On) or has failed (the FAIL LED is On).
STDBY(1)(3)	On	Yellow	The POS OC–192 c/STM-64c port works as APS standby.
	Off	None	The port is not configured as a protection port.

(1) APS protection is only supported on the POS OC-192c/STM-64c port, and not the 10 Gigabit Ethernet port.
(2) When the card is first powered up, both the FAIL and ACTIVE LEDs stay on until the card is initialized by the SmartEdge OS. FAIL - On does not necessarily indicate a card failure.
(3) Applies to the POS OC-192c/STM-64c port only.

Table 162 Facility LEDs on 1-Port 10GE/OC-192c DDR Card

Label	Activity	Color	Description
In 10GE LAN-PHY or WAN-PHY Mode			
ACT	On	Green Blinking	The link is transmitting or receiving frames.
	Off	None	The link has no active frame.
LNK/LOS(1)	On	Green	The port is configured and the link is Up.
	Off	None	The port is not configured or the link is Down.
In POS OC-192c/STM-64c Mode			
ACT	On	Green Blinking	The link is transmitting or receiving frames.
	Off	None	The link has no active frame.
LNK/LOS(1)	On	Yellow	The port is configured and a LOS condition exists.
	Off	None	The port is not configured or no LOS condition occurred.

(1) LNK LED concept applied in both Ethernet LAN-PHY and WAN-PHY modes; LOS LED concept is applied in POS OC-192c/STM-64c mode only.

7 Advanced Services Engine

The Advanced Services Engine (ASE) card provides advanced security functions to protect the network at its edge. Using Deep Packet Inspection (DPI), the ASE card can identify and process point-to-point (P2P) applications, and provide a more efficient and secured network operation.

Security features on the ASE card ensure minimal network disruption and provide secure tunnels for end-user applications. You perform IP Security (IPSec) configuration, management, and reporting with NetOp Element Manager System.

Table 163 ASE Card Specifications

Specification	Value
Number of ports	Two for each ASP
Speed	10/100/1000 Mbps
Protection	None
Interface	Ethernet BaseT
Connection type	RJ-45
Compliance	IEEE 802.3, 802.3u, 802.3ab

Table 164 ASE Card Port Data

Type of Card and Card Description	Physical Ports(1)	Low-Density Version	Low-Density Port Numbers
Advanced Services Engine	4 (2 for each ASP)(2)	No	–

(1) The SmartEdge OS does not support these ports directly.

(2) These ports are not used for control or data traffic. They are used for netboot only in a development environment.

7.1 LEDs

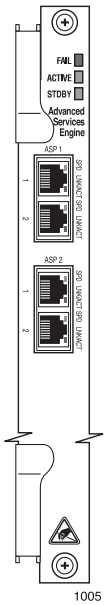

Figure 56 LEDs on ASE Card

Table 165 Equipment LEDs on the ASE Card

Label	Activity	Color	Description
FAIL	On	Red	A failure exists on the card.(1)
	Off	None	No failure exists on the card.
ACTIVE	On	Green	This card is in service.
	Off	None	This card is on standby (the STDBY LED is on) or has failed (the FAIL LED is on).
STDBY	On	Yellow	This card is on standby.
	Off	None	This card is in service (the ACTIVE LED is on) or has failed (the FAIL LED is on).

(1) A failure can be total, partial, or forced. Failure on any part of the card, including failure of any of its ports, results in the FAIL LED being on.

Table 166 Facility LEDs for the ASE Card

Label	Activity	Color	Description
LNK ACT	On	Green	The link is present and active.
	On	Blinking	The link is transmitting or receiving frames.
	Off	None	The link has no active frame.
SPD	On	Yellow(1)	The link is operating at 100 Mbps.
	On	Green	The link is operating at 1000 Mbps.
	On	Green	The link is operating at 10 Mbps.(2)

(1) The default condition for no link or cable attached is yellow.
(2) The LED shows green for both 10 and 1000 Mbps.

7.2 Provisioning and Configuring the ASE Card

Stop!

The Advanced Services Engine (ASE) card must be running the correct version of the boot ROM and so must the SmartEdge OS system. To avoid a serious equipment outage in the field, if you are running SmartEdge OS Release 6.4.1.2 or later on either the ASE or the SmartEdge OS system, DO NOT DOWNGRADE to 6.4.1.1 or earlier. If you must downgrade, contact your support representative for an equipment-safe procedure. Downgrading from these releases can cause permanent damage to the ASE.

The following steps give a brief overview of how to provision and configure applicable SmartEdge chassis for the ASE card:

1. To provision a chassis for the ASE card, use either the NetOp Element Management System (EMS) or the **card ase** ***slot*** CLI command.

   Note: The ASPs of the ASE card must be configured under an ASP pool before the processor can be brought up.

   For more information about ASE-related CLI commands, see *Advanced Services Configuration and Operation Using the SmartEdge OS CLI* Reference [11].

2. To monitor the progress of provisioning the chassis for the ASE card, use the **show chassis** command.

   Automatic processing copies the ASE software to the ASPs during provisioning. Reissue the command until it shows you that the ASPs are up and running.

3. To configure the ASE card for IPSec VPNs, you must use the NetOp EMS Security Services software.

   For more information about Security Services using NetOp EMS Security Services software, see *Advanced Services Configuration and Operation Using the NetOp EMS Software* Reference [11].

7.3 ASE Operational Commands

The following are ASE operational commands:

- **show asp**—Shows the status of the ASPs after the ASE card has been configured.

  Note: ASP status will show only if the ASE card has been provisioned in the chassis and the XCRP is correctly configured.

- **reload card** ***slot***—Shuts down and reloads ASE software to the ASPs.

  Note: This operation can take several minutes to complete.

- **show tech-support ase**—Displays information that helps your technical support representative resolve issues on the ASE card. The information contains software version information, system uptime, task information, configuration information, and current state of each line card

- **show chassis**—Shows slots that ASE cards are installed in and the state of the cards:

```
[local]Egle6#sh chassis
Current platform is SE1200
Flags:
A-Active Crossconnect      B-Standby Crossconnect     C-SARC Ready
D-Default Traffic Card     E-EPPA Ready               G-Upgrading FPGA
H-Card Admin State SHUT    I-IPPA Ready               M-FPGA Upgrade Required
N-SONET EU Enabled         O-Card Admin State ODD     P-Coprocessor Ready
P1-ASP1 Ready              P2-ASP2 Ready              R-Traffic Card Ready
S-SPPA Ready               U-Card PPAs/ASP UP         W-Warm Reboot
X-XCRP mismatch)
Slot: Configured-type    Slot: Installed-type    Initialized    Flags
2 : ase                  2 : ase                 Yes            P1P2UR
7 : xcrp                 7 : xcrp                Yes

[local]Egle6#
```

Note: Look for P1P2UR to verify that the ASE card is up.

For more information about ASE-related CLI commands, see *Advanced Services Configuration and Operation Using the SmartEdge OS CLI* Reference [11].

7.4 Operating Status

The ASE card has equipment LEDs at the top of each card to indicate the current status of the card, and facility LEDs to indicate the status of the ports.

Note: The ASE card is not NEBS compliant; therefore, when installed in the SmartEdge 400 chassis, it is not capable of operating at 104°F (40°C.)

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 Channelized Ports*, 93/1543-CRA 119 1170/1

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

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

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

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

[8] *Technical Product Description*, 4/221 02-CRA 119 1170/1

[9] *Installing the SmartEdge OS*, 1/190 47-CRA 119 1170/1

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

[11] *Advanced Services Configuration and Operation Using the SmartEdge OS CLI*, 1/1543-CRA 119 1170/1