

SmartEdge 600 Router Hardware Guide

Release 11.1

INSTALLATION

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1 Site Preparation

Select the installation site for the SmartEdge® 600 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
UL 60950	FCC part 15, Class A	EN61000-4-2	GR-63-CORE
CSA 22.2 No. 60950	ETSI EN300 386	EN61000-4-3	GR-1089-CORE
IEC60950	CISPR 22 Class A	EN61000-4-4	
EN60950	VCCI Class A	EN61000-4-5	
AS/NZS 60950	EN55022, Class A	EN61000-4-6	
	AS/NZA 3548 Class A	ETSI EN300 386	

Caution!

Risk of equipment damage. The intrabuilding ports of the line cards are suitable for connection to intrabuilding or unexposed wiring or cabling only. These ports must not be metallically connected to interfaces that connect to the outside plant (OSP) or its wiring. These interfaces are designed for use in 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 600 router is suitable for installation in Network Telecommunications Facilities and as part of the Common Bonding Network (CBN).

1.2 Electrical Specifications

Table 2 DC Electrical Specifications

Requirement	Value
Input voltage, nominal	–48.0 VDC
Input voltage range	–40.0 VDC to –57.5 VDC ⁽¹⁾

**Table 2 DC Electrical Specifications**

Requirement	Value
Total input power, maximum	2736 VA
Input current rating per feed	57 ADC@-48 VDC
Source DC power requirement	Sufficient to supply the rated input current Local codes apply
Number of input feeds	Two: One from battery plant A and one 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.

Table 3 AC (Optional) Electrical Specifications

Requirement	Value
Input voltage, nominal	200 to 240 VAC
Input voltage range	175 VAC to 275 VAC
Input power, maximum	3120 VA
Input current rating	15.6A maximum @ 200 to 240 VAC
Input line frequency, nominal	50 to 60 Hz
Input line frequency, range	47 to 63 Hz
Source AC power requirement	20A, IEC-320
Number of input feeds	Two independent branch circuits

Table 4 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
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)
Gigabit Ethernet DDR (20-port)	6.25	1.50
10 Gigabit Ethernet (1-port)	2.72	10.52 (max duration is 20 μs)



Table 4 Operating and Inrush Current for Line Cards at –48 VDC

Component	Operating Current	Inrush Current ⁽¹⁾
10 Gigabit Ethernet DDR (4-port)	6.25	1.50
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 5 Operating and Inrush Current for Chassis Components at –48 VDC

Component	Operating Current	Inrush Current
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)
SmartEdge Storage Engine	2.80	0.86 (max duration is 48 ms)
Fan tray (nominal speed)	2.20	7.42
Fan tray (high speed)	6.04	7.42

1.3 Electrical Power Connections

Note: The SmartEdge 600 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.

The SmartEdge 600 chassis power architecture has connectors for a single power zone.

Primary sources are designated as A sources; backup sources are B sources. For a fully redundant power configuration, both sources must be connected.

Each power connection must be able to supply a minimum of 75 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 stand-alone unit or incorporated in a DC power supply system, or a circuit breaker panel is required for power-on and power-off control. A DC-powered system uses –48 VDC power and is powered from a fuse panel, which can be damaged by overloaded circuits.



Caution!

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

1.3.1 AC Power Option

You can supply power to the SmartEdge 600 by means of an optional AC Power Shelf (BMK 907 058/1). It requires a 200-240VAC power source. It has two power modules (BMK 905 76/1) and a split power bus for redundancy. Each power module is capable of delivering 2725 Watts.

The AC Power Shelf has a status port for use in monitoring warnings and errors.

1.4 Environmental Requirements

The installation area for the SmartEdge 600 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 20.0 inches (50.8 cm) at the front of the chassis (for maintenance)

Caution!

Risk of equipment damage. The SmartEdge 600 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.

Table 6 Environmental Requirements

Specification	Value
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)



Table 6 Environmental Requirements

Specification	Value
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	2,736 watts (9,336 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).

1.5 Physical Specifications

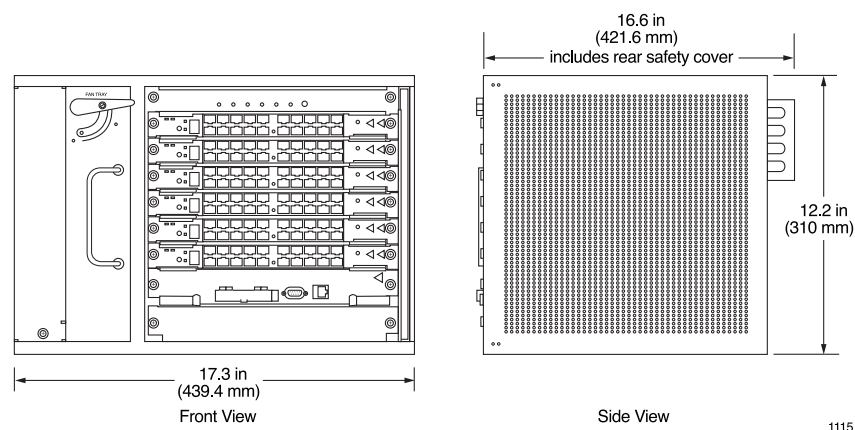


Figure 1 SmartEdge 600 Chassis Dimensions

Chassis depth dimension includes the front cable tray and the power safety cover.

Table 7 SmartEdge 600 Chassis Physical Specifications

Mechanical Specification	Value
SmartEdge 600 chassis dimensions	12.2 inches (310.0 mm) height 17.3 inches (439.4 mm) width 16.6 inches (421.6 mm) depth ⁽¹⁾
Chassis weight ⁽²⁾	48.8 lbs (22.1 kg) all card slots empty, ready for installation 94 lb (42.6 kg) with all slots filled
Chassis mounting	19- or 23-inch rack
Total slots	8
Line card slots	6
Common equipment slots	2
Card dimensions	9.75 inches (247.7 mm) height 12.73 inches (323.3 mm) depth

(1) Includes rear safety cover.

(2) Included the fan tray weight of 10.1 lbs (4.54 kg).

**Table 8 SmartEdge 600 Connections**

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
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
Gigabit Ethernet DDR (20-port) ⁽²⁾	LC, front chassis access
10 Gigabit Ethernet (1-port)	LC, front chassis access
10 Gigabit Ethernet DDR (4-port)	LC, front chassis access
10 Gigabit Ethernet/OC-192c DDR (1-port)	LC, front chassis access
Operations Connections	
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 E1)	DB-9, rear chassis access
Modem, SL7 and SL8 (RS-232) ⁽³⁾	DB-25, rear chassis access
Alarm ⁽³⁾	DB-25, rear chassis access
Status/Ctl ⁽³⁾	DB-37, rear chassis access
Power and chassis ground	1/4-20 threaded holes on 0.625-inch (1.59 cm) centers, rear chassis access
Advanced Services Engine	RJ-45, front 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 and 20-port GE line cards.

(3) The SmartEdge OS does not support this connection.

1.6 Select the Rack

You can mount the SmartEdge 600 chassis in a standard 19- or 23-inch rack. Brackets for the 23-inch rack are not shipped with the chassis but are available in the bracket spares kit (NTM 101 1517/1).



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.

The SmartEdge 600 chassis requires 7 RUs—1.75 inches (4.50 cm). The optional AC shelf at the bottom of the rack requires 1 RU; a stand-alone external fuse panel requires 1 RU.

Note: Ericsson does not supply fuse panels.

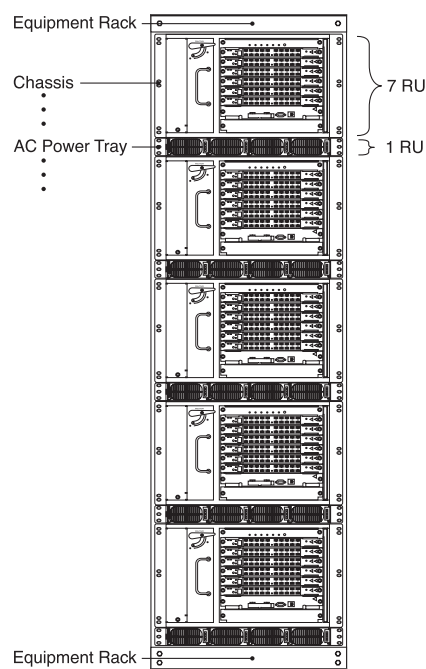


Figure 2 SmartEdge 600 Chassis in 42-RU Rack

Regardless of rack width and height, the SmartEdge 600 chassis can be mounted only in the flush position.

1.7

Select the Installation Method

The SmartEdge 600 chassis is heavy, as much as 48.7 lb (22.1 kg) when all slots have cards installed, and somewhat unwieldy. When planning the installation, consideration must be given to how the chassis can best be installed at the site you have chosen.



Two possible installation scenarios are to:

- Install the chassis as shipped.

Two people can perform the installation without additional aid if the chassis is empty with no removable components installed. The effective weight of the chassis without removable components is 48.7 lb (22.1 kg).

- Install the chassis with all components already installed.

Use a power lifting device to position the chassis in the rack if you intend to install the fan tray, cable tray, and controller and line cards before installing the system in a rack.

1.8 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 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 switch.

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 present 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.

1.9

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.

1.10 Access During Initial Startup and Reload Operations

During the initial startup, only the operable console port is the one 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 600 router with a terminal connected to the console port, either directly or through a terminal server.

For information about configuring cards, ports, and circuits, see *Configuring ATM, Ethernet, and POS Ports* Reference [2].

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

For redundancy, we recommend using two different methods (for example, a remote workstation and a remote console terminal with a connection to a terminal server). Further, if the configuration of the SmartEdge 600 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.



1.12 Management Access Options

Table 9 Options for Management Access

Option	Equipment Requirements
Ethernet port connection to a local management workstation	A PC or workstation with support for SSH and Telnet. Shielded Ethernet crossover cable.
Ethernet port connection to a remote management workstation	A PC or workstation with support for SSH and Telnet. 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: <ul style="list-style-type: none"> • ASCII/VT100 console terminal or equivalent that runs at 9600 bits per second, 8 data bits, no parity, 1 stop bit. • PC or workstation 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: <ul style="list-style-type: none"> • ASCII/VT100 console terminal or equivalent that runs at 9600 bits per second, 8 data bits, no parity, 1 stop bit. • PC or workstation in the same configuration as the ASCII/VT100 terminal. A modem that runs at 56 kbps (maximum), 8 data bits, no parity, 1 stop bit, or terminal server. Modem or terminal server cable.

1.13 Gathering Cables and Tools

You need cables for the following connections:

- Line card cables:
 - Ethernet cards
 - Gigabit Ethernet cards
- Operations cables:
 - Console terminal and management workstation (RS-232, LAN)
 - External timing (one or two, optional)
- Power cables:
 - DC power (four or eight)
 - Chassis ground (two)

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

**Table 10 Tools Needed for SmartEdge 600 Hardware Installation**

Tool	Purpose
Heavy-duty cart	Transport chassis and system equipment from the receiving area to the installation site.
Power lifter	Optional (depending on installation scenario). Position the chassis in the rack.
#1 Phillips screwdriver	Remove and install the fan tray and cable tray; remove and install the cards. The screwdriver needs a 0.1875-inch barrel that is 5 to 6 inches long to install and remove the cable tray.
#2 or #3 Phillips screwdriver ⁽¹⁾	Attach the mounting brackets to the chassis and air ramp. Install the chassis and air ramp in the rack.
7/16-inch torque wrench	Connect the chassis ground cables.
Cable crimping tool ⁽²⁾	Secure barrel or open lugs to the DC power and chassis ground cables. ⁽³⁾

(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.

(2) The OUR840 manufactured by Burndy Tooling (recommended) or equivalent.

(3) When barrel lugs are not provided, other options are available to secure the conductors.

1.14 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 11 Cable Specifications for Management Access Cables

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

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

1.14.1 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 12 Craft Console Cable Pin Assignments

Signal Name ⁽¹⁾	Signal Function	Notes
DCD (input)	Received Line Signal Detector	Not used
TXD (output)	Transmitted Data	SmartEdge 600 output
RXD (input)	Received Data	SmartEdge 600 input
DSR (input)	DCE Ready	Not used
—	Signal Ground	—



Table 12 *Craft Console Cable Pin Assignments*

Signal Name ⁽¹⁾	Signal Function	Notes
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.

1.14.2 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 13 *Ethernet Crossover Cable Pin Assignments*

Other End		
Signal Name	Pin	Notes
Tx (+)	3	—
Tx (—)	6	—
Rx (+)	1	—
—	—	No connection
—	—	No connection
Rx (—)	2	—
—	—	No connection
—	—	No connection

1.14.3 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 14 *Ethernet Straight Cable Pin Assignments*

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

*Table 14 Ethernet Straight Cable Pin Assignments*

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

1.15 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 the SmartEdge 600 router. Using two cables you can connect the SmartEdge 600 router to primary and secondary inputs on the external equipment.

Table 15 Cable Specification for External Timing Cable

Interface	Description	Chassis Connectors ⁽¹⁾	Cable Connector
External Timing	Shielded twisted-pair	DB-9 female	DB-9 male

(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 Controller card can receive timing data only.

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 the SmartEdge 600 router 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 the SmartEdge 600 router:

- For the DS-1 interface (BITS)—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 router. The polarity of the signal does not matter. The router 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)—Connect the E1 output of the external equipment to pins 2 and 6 of the SSU DB-9 connector on the rear panel of the router. The polarity of the signal does not matter. The router



accepts a standard synchronization source transmitting an HDB3-encoded, framed-all-ones pattern at the E1 rate of 2.048 Mbps.

Table 16 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.

1.16 Line Card Cable Specifications

Table 17 Cable Specifications for Line Cards

Card Type	Description	Card End	Cable End	Maximum Distance
ATM OC-12c/STM-4c	Single-mode fiber	LC female	LC male	9.3mi - 15.0km
ATM OC-3c/STM-1c SR-0	Multimode fiber	LC female	LC male	1.2mi - 2.0km
ATM OC-3c/STM-1c IR-1	Single-mode fiber	LC female	LC male	9.3mi - 15.0km
Advanced Services Engine	Category 5 shielded twisted-pair	RJ-45 female	RJ-45 male	328.1ft - 100.0m
10/100 Ethernet	Category 5 shielded twisted-pair Ethernet straight or crossover ⁽¹⁾	RJ-45 female	RJ-45 male	328.1ft - 100.0m
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 - 100.0m
FE–GE: 100/1000 ports	Category 5 shielded twisted-pair	RJ-45 female	RJ-45 male	328.1ft - 100.0m

(1) See Table 20 to determine which cable, straight or crossover, is suitable; the cable must be grounded at both ends.

1.16.1 Transceiver-Based Gigabit Ethernet Line Card Cables

Table 18 Cable Specifications for Transceiver-Based Gigabit Ethernet Line Cards

Transceiver	Description	Card End ⁽¹⁾	Cable End	Maximum Distance
SX GBIC transceiver	Multimode fiber 62.5/125 µm	SC female	SC male	1,804.4ft - 550.0m
Multimode fiber 50/125 µm	SC female	SC male	656.2ft - 200.0m	

**Table 18** Cable Specifications for Transceiver-Based Gigabit Ethernet Line Cards

Transceiver	Description	Card End ⁽¹⁾	Cable End	Maximum Distance
TX transceiver	4-pair, Category 5 shielded twisted-pair ⁽²⁾	RJ-45	RJ-45	328.1ft - 100.0m
LX GBIC transceiver	Single-mode fiber 9/125 μ m	SC female	SC male	6.2mi - 10.0km
LX70 GBIC transceiver	Single-mode fiber 9/125 μ m	SC female	SC male	43.5mi - 70.0km
SX SFP transceiver	Multimode fiber 62.5/125 μ m	LC female	LC male	1,640.4ft - 500.0m
Multimode fiber 50/125 μ m	LC female	LC male	656.2ft - 200.0m	
LX SFP transceiver	Single-mode fiber 9/125 μ m	LC female	LC male	6.2mi - 10.0km
ZX SFP transceiver	Single-mode fiber 9/125 μ m	LC female	LC male	49.7mi - 80.0km ⁽³⁾
SR/SW XFP transceiver	Multimode fiber 50/125 μ m	LC female	LC male	984.4ft - 300.0m
LR/LW XFP transceiver	Single-mode fiber 9/125 μ m	LC female	LC male	6.2mi - 10.0km
ER XFP transceiver	Single-mode fiber 9/125 μ m	LC female	LC male	24.9mi - 40.0km
ZR XFP transceiver ^{(4) (5)}	Single-mode fiber 9/125 μ m	LC female	LC male	49.7mi - 80.0km
DWDM transceiver ⁽⁶⁾⁽⁷⁾	Single-mode fiber 9/125 μ m	LC female	LC male	49.7mi - 80.0km

(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.

1.17 Transceiver-Based SONET/SDH Line Card Cables

Table 19 Cable Specifications for the SONET/SDH Line Cards

Transceiver Type	Description	Card Connector ⁽¹⁾	Cable Connector	Maximum Distance
SR / MM	Multimode fiber 62.5/125 μ m	LC female	LC male	1,640.4 ft - 500.0 m ⁽²⁾ 1.2 mi - 2.0 km
SR / SM ⁽³⁾	Single-mode fiber 9/125 μ m	LC, FC, or SC female	LC, FC, or SC male	1.2 mi - 2.0 km
IR / SM ⁽³⁾	Single-mode fiber 9/125 μ m	LC female	LC male	9.3 mi - 15.0 km
IR-2 / SM (with XFP transceiver)	Single-mode fiber 9/125 μ m	LC female	LC male	24.9 mi - 40.0 km



Table 19 Cable Specifications for the SONET/SDH Line Cards

Transceiver Type	Description	Card Connector ⁽¹⁾	Cable Connector	Maximum Distance
LR-1 / SM	Single-mode fiber 9/125 μ m	LC female	LC male	24.9 mi - 40.0 km
LR-2 / SM	Single-mode fiber 9/125 μ m	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) For SFP-OC12-MM transceiver, the maximum distance is 500 meters.

(3) Use part number RDH90159/1 (SFP-ATM-OC3-SR-IR) when ordering the SFP transceivers with OC-3 SR-0 or OC-3 IR-1 functionality.

1.18 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 20 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.

1.18.1 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 21 10/100 Ethernet Crossover Cable Pin Assignments

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



1.18.2 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 22 10/100 Ethernet Straight Cable Pin Assignments

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

1.18.3 Fast Ethernet Breakout Cable Pin Assignments

Table 23 Fast Ethernet Breakout Cable Pin Assignments

Port	MRJ21 Pins	RJ-45 Pins	Colors
1	1 2 13 14	1 2 3 6	White/Blue Blue/White White/Orange Orange/White
2	3 4 15 16	1 2 3 6	White/Green Green/White White/Brown Brown/White
3	25 26 37 28	1 2 3 6	White/Gray Gray/White Red/Blue Blue/Red
4	27 28 39 40	1 2 3 6	Red/Orange Orange/Red Red/Green Green/Red
5	5 6 17 18	1 2 3 6	Red/Brown Brown/Red Red/Gray Gray/Red
6	7 8 19 20	1 2 3 6	Black/Blue Blue/Black Black/Orange Orange/Black
7	29 30 41 42	1 2 3 6	Black/Green Green/Black Black/Brown Brown/Black
8	31 32 43 44	1 2 3 6	Black/Gray Gray/Black Yellow/Blue Blue/Yellow
9	9 10 21 22	1 2 3 6	Yellow/Orange Orange/Yellow Yellow/Green Green/Yellow
10	11 12 23 24	1 2 3 6	Yellow/Brown Brown/Yellow Yellow/Gray Gray/Yellow
11	33 34 45 46	1 2 3 6	Violet/Blue2 Blue/Violet Violet/Orange Orange/Violet
12	35 36 47 48	1 2 3 6	Violet/Green2 Green/Violet Violet/Brown Brown/Violet



2 Installing the Hardware

Stop!

The SmartEdge 600 router 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.

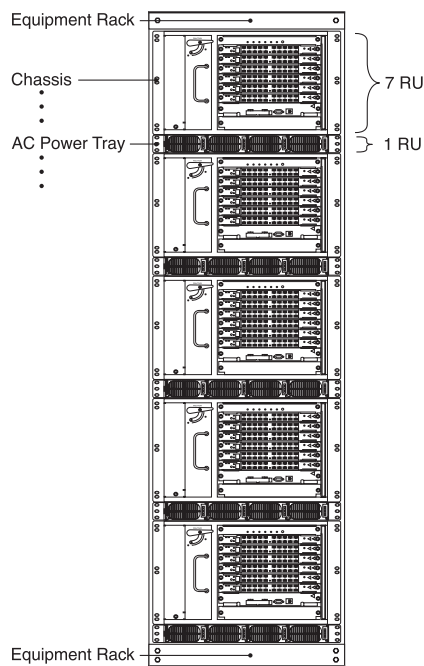


Figure 3 Fully Loaded 42 RU Rack Configuration

Decide where in the rack to position the chassis based on component stackup:

- The chassis requires seven rack units (RUs). An RU is 1.75 inches (4.5 cm).
- The optional AC power shelf requires one RU. It must be installed immediately below the chassis.
- A standalone external fuse panel requires one RU.

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.

2.1 Install the Chassis Mounting Brackets

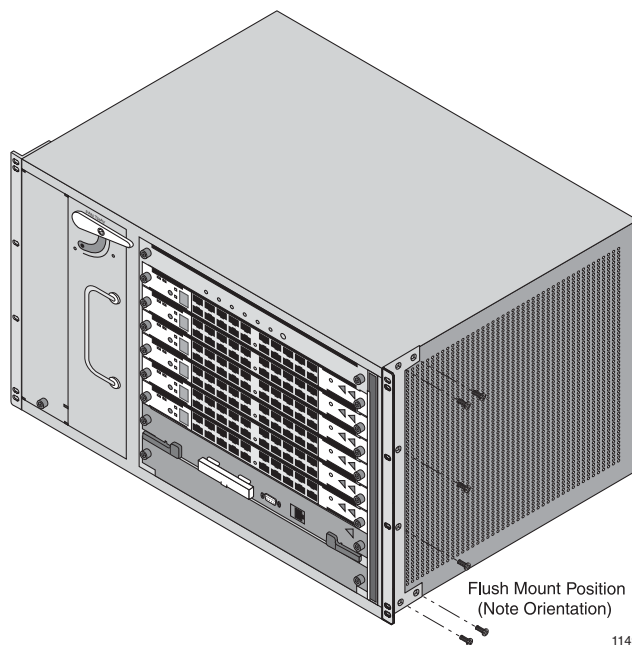


Figure 4 Installing Chassis Brackets for Flush Mount Position

Caution!

Risk of equipment damage. Always use the number and type of screws specified in the instructions.

To install brackets:

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.



2. Using a Phillips screwdriver, attach the bracket to the chassis with the screws provided with the mounting bracket; tighten to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).
3. Repeat steps 1 and 2 to attach the second bracket to the other side of the chassis.

2.2

Install the Chassis

Warning!

Risk of personal injury. Do not lift or move the chassis without the aid of another trained person. A fully loaded chassis can weigh as much as 94 lb (42.6 kg) and can cause injury if one person attempts to lift or move it. Always follow the procedures at this installation site for safely lifting heavy objects.

Install the chassis in the rack:

1. With another installation engineer, lift the chassis to the position selected in the rack.
2. Line up the screw holes in the mounting brackets with the screw holes in the rack.
3. With one engineer holding the chassis in place, use the Phillips screwdriver to secure the shelf to the rack using fasteners of the type compatible with the rack. Tighten the fasteners to the vendor recommended torque level.

2.3 Install the Cable Management Brackets

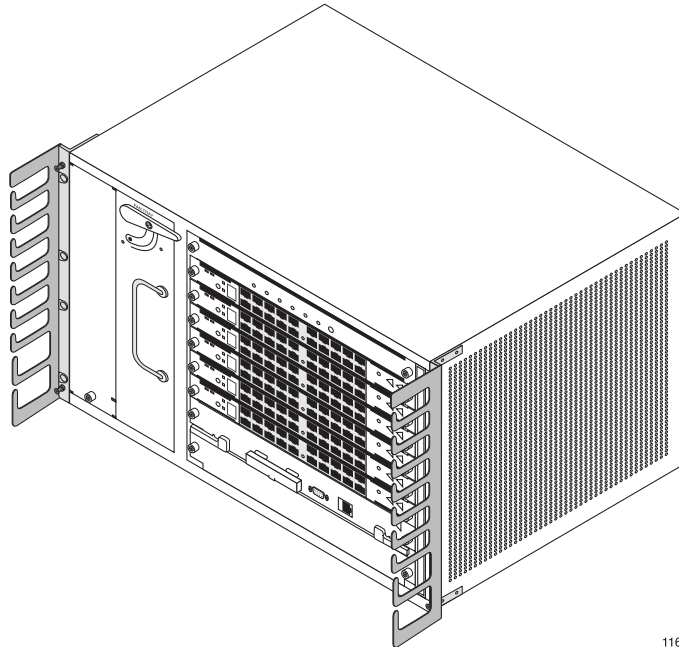


Figure 5 Installing the Cable Management Brackets

To install the left-side bracket, align it with the screw holes at the left side of the rack and secure it to the rack with the two captive fasteners; tighten to a maximum torque of 8.0 inch-lbs (0.9 Newton-meters).

For additional cable management, you can install another cable management bracket at the right side of the chassis.

Note: When you install a right-side cable management bracket, the air filter access will be limited only to removal from the rear of the chassis.

2.4 Connect Power and Ground Cables

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

The chassis ground terminal is located at the bottom-right corner of the back panel. 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.

Connect a chassis ground cable:

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



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

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.

2. Secure the connection with a pair of bolts and split washers, which are supplied in the Installation Kit. Tighten the bolts to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).

3. 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.

2.4.1

Connect DC Power Sources

The SmartEdge 600 chassis has two terminal blocks on the rear of the chassis labeled BATTERY A and BATTERY B for A-side and B-side DC power cables, which provides full power redundancy. Each terminal block has a pair of 1/4-20 studs.

The A- and B-side power cables connect to separate A-side and B-side connectors on the external fuse panel or circuit breaker panel.

The terminal studs are labeled RETURN and -48V. 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.

Note: The SmartEdge 600 chassis has an isolated DC return (DC-I). The -48V return terminal for each power source is not connected to either frame ground (primary or backup).

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

Warning!

Risk of electrical shock. 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. 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. The 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. This equipment uses –48 VDC power, which can cause shock if inadequate power sources are connected to it. Verify that the power sources for the system and DC power cables meet the specifications provided in Chapter 1.

Warning!

Risk of electrical shock. 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. After the power cables are connected to the chassis and the fuse panel, the system is fully powered on; there is no power switch.



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.

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.

2.4.1.1

Connect Power Cables

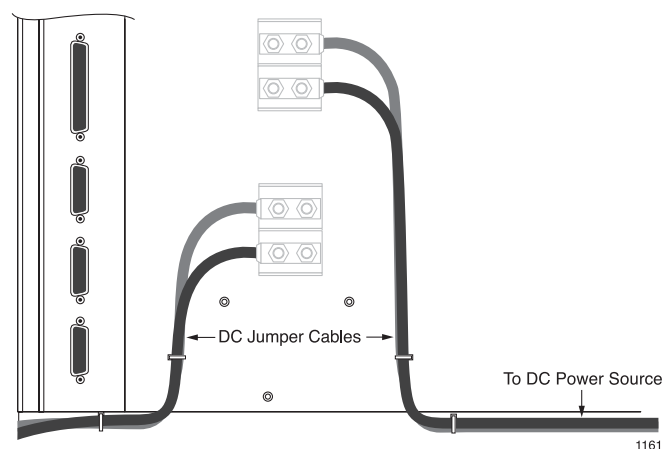


Figure 6 DC Power Connections



Connect the power cables:

1. Using a crimping tool, attach a two-hole lug to one end of each power cable.
2. For the BATTERY A connection, secure the connection of the red cable to RETURN with a pair of lug nuts and the black cable to -48V; tighten to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).
3. For the BATTERY B connection, secure the connection of the red cable to RETURN with a pair of lug nuts and the black cable to -48V; tighten to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).
4. Use the provided metal loops in the chassis to dress the cables with tie wraps.
5.
Note: The dressing of the DC jumper cables must allow for servicing the push-through air filter and the fan tray from the rear of the chassis.
6. Install the safety cover.

2.5 Optional AC Power Shelf

The optional AC power shelf provides slots for two AC power modules, which allows a SmartEdge 600 router to be installed at a site for which DC power sources are not available. AC power shelf connects to the SmartEdge 600 chassis with two pairs of DC jumper cables using connectors on the rear of the AC power shelf.

Warning!

Risk of personal injury. Do not attempt to access any component inside the AC power shelf; there are no user-serviceable components inside it.

Table 24 Order Numbers

BMG907058/1	Four-slot, one rack unit (RU) AC power shelf
BMK90576/1	2725 Watt AC power module unit with AC power cord
NTM1011728/1	Spare cable kit—Includes one interconnect data cable, one set of DC jumper cables, and two AC power cords with North American plugs.



Warning!

Risk of electrical shock. Do not disconnect the power cables to the chassis until you have first de-energized the DC power supplies, and then removed the fuses for both the A- and B-side power sources in the fuse panel. With the power cables connected to the chassis and the fuse panel, the system is fully powered on, and you can incur electrical shock when you remove the cables from the chassis connectors.

2.5.1 Install the AC Power Shelf

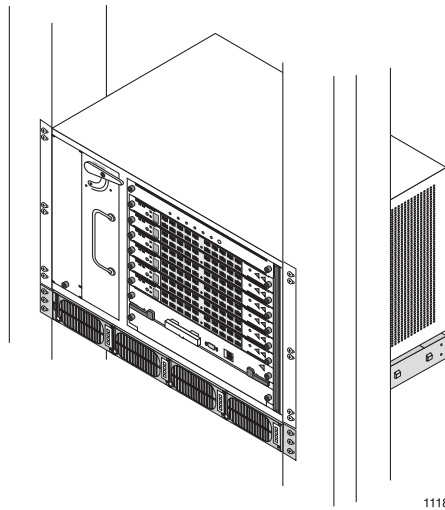


Figure 7 Positioning an AC Power Shelf

Install the AC power shelf:

1. Position the shelf directly below the chassis so the screw holes in the shelf mounting brackets align with the screw holes in the rack just below the chassis.
2. On a 19" wide rack, use the Phillips screwdriver to secure the shelf to the rack using the fasteners of the type compatible with the rack. Tighten the fasteners to the vendor recommended torque level.

2.5.1.1 Install the Ground Bracket

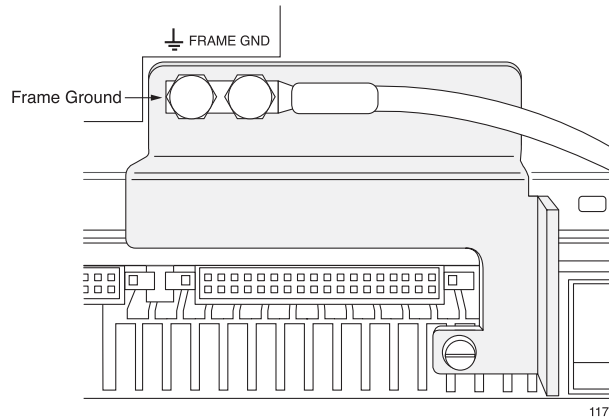


Figure 8 Ground Bracket

Install the ground bracket between the shelf and the chassis:

1. On the chassis, remove the chassis ground lug at the lower-center rear of the chassis.
2. Stack the ground bracket under the chassis ground lug and reattach it using the existing hardware; tighten to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).
3. On the AC power shelf, use the Phillips screwdriver to secure the bracket to the available mounting position using the hardware provided.

2.5.1.2 Install AC Power Modules

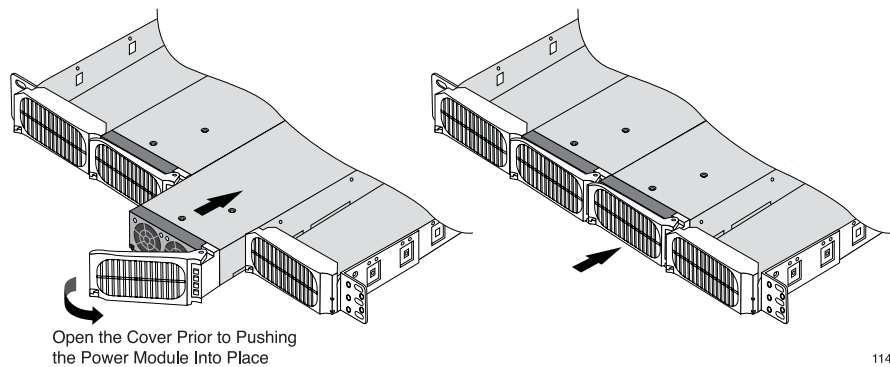


Figure 9 AC Power Modules

Install AC power modules in the shelf:

1. Open the front ejector (fan cover) of the power module by squeezing the latch spring and pulling open the ejector.
2. Insert a module into one of the two center slots (2 and 3) in the shelf.



Note: AC power modules operate only from the two center slots of the AC power shelf.

3. Push the module in until the right side of the ejector engages the receptacle slot in the shelf wall.
4. Push closed the ejector lever until the module spring latch locks on the ejector to seat the module.
5. Insert the second module into the other center slot and repeat steps 3 and 4.

2.5.1.3

Connect the AC Power Shelf to the Chassis

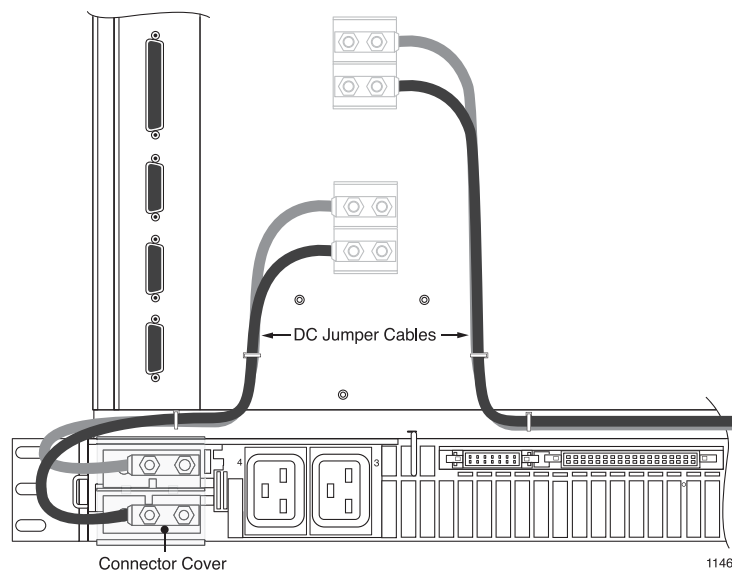


Figure 10 AC Power Connections

Warning!

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

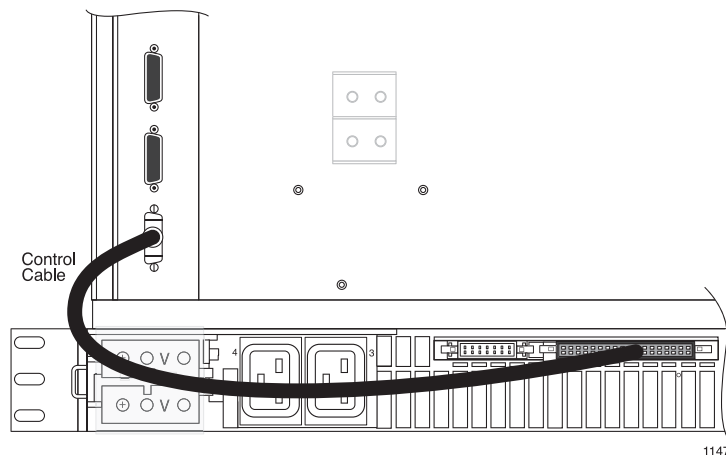
Connect the shelf to the chassis:

1. Unpack the two 6AWG red and two black DC jumper cables.
2. Flip open the touch-safe lug landing cover on the left-side terminal block.
3. Attach the short pair of red and black DC jumper cables to the left-side terminals—red cable to the top terminal (+) and black cable to the bottom one (-).

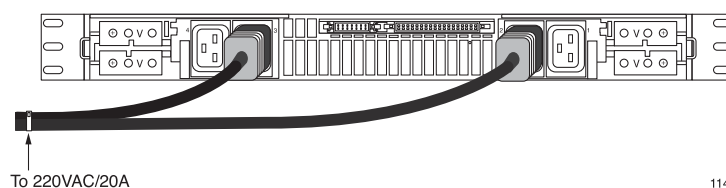


4. Secure each connection with a pair of 1/4-20 lug nuts; tighten to a maximum torque of 62.0 inch-lbs (7 Newton-meters).
 5. Snap the cover shut.
 6. Attach the remaining ends to the bottom (BATTERY B) terminal block of the chassis—red cable to the top terminal (RETURN) and black to bottom one (-48V).
 7. Secure the connections with pairs of lock washers and lug nuts; tighten to a maximum torque of 62.0 inch-lbs (7 Newton-meters).
 8. Use the provided metal loops on the chassis to dress the cables with tie wraps.
- Note:** Dress the DC jumper cables so the push-through air filter and fan tray can be serviced from the rear of the chassis.
9. Repeat this procedure for the right-side self connections using the long pair of DC jumper cables.
 10. Install the safety cover.

11. Connect the control cable from J1 (right-side flat connector) on the shelf to the chassis connector labeled AC STATUS/CTL.



12. Insert the AC power cords for each power module into connectors 2 and 3 on the shelf.



- Power on the chassis by connecting the AC power cords to separate 220 VAC building outlets, each of which must be for a circuit rated at 20A with a 20A circuit breaker.

Note: The AC power cords ship with North American plugs installed. If you are connecting to another type of service, simply remove the plugs and replace them with the appropriate plugs.

- Check the status LEDs located on the alarm card at the front of the chassis and the AC input power and DC output power LEDs on the front of each installed power module.

If you encounter problems installing the AC power shelf, contact your local technical support representative.

2.6 Card Slots

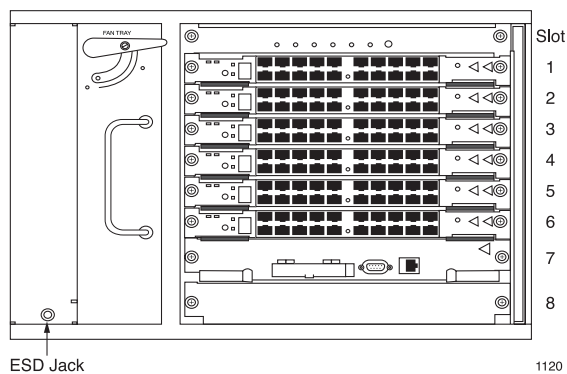


Figure 11 SmartEdge 600 Card Slots

Table 25 Slot Assignments for SmartEdge 600 Cards

Card	Slots Available
Controller	7, 8

**Table 25 Slot Assignments for SmartEdge 600 Cards**

Card	Slots Available
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 6
Gigabit Ethernet 1020 (20-port) Gigabit Ethernet DDR (20-port)	1 to 5 ⁽¹⁾
Advanced Services Engine	1 to 6
SmartEdge Storage Engine	1 to 6

(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.



2.7 Install Cards

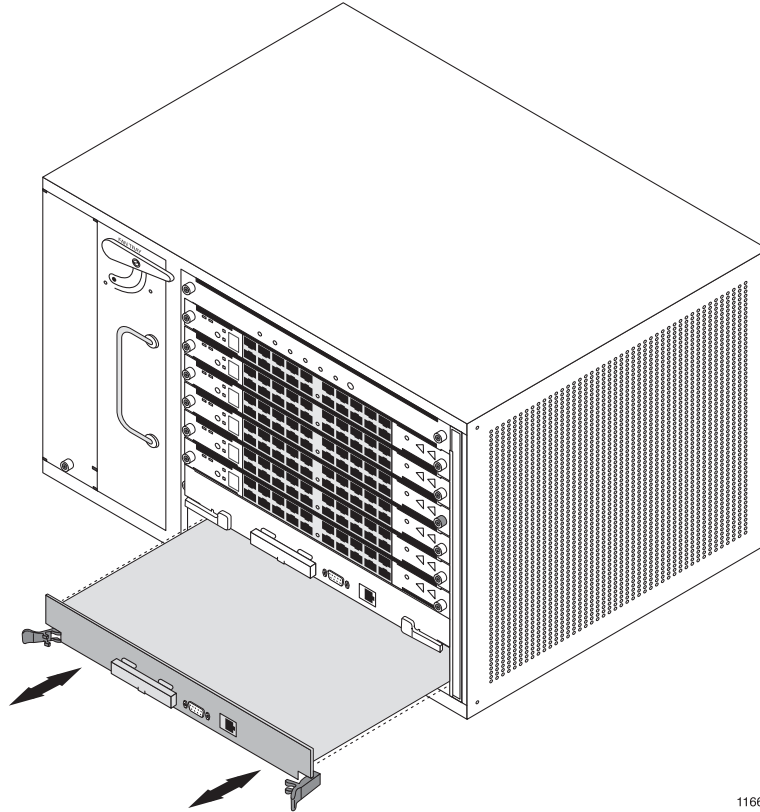


Figure 12 Installing Cards

1166

Warning!

Risk of personal injury. Only qualified personnel must install and service the system and its components. To avoid injury, do not attempt to access any component inside the chassis.

Caution!

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.



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.

Install cards:

1. Put on an ESD 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. Select the slot for the card.
3. Remove the card from its antistatic bag. Save the bag for later use.
4. Align the card with the card guides at the right and left sides of the slot.

Caution!

Risk of equipment damage. If you feel any resistance, or hear the card touching the components on the card installed in the adjacent slot at the left, do not force the card into the slot. Ensure that the card is perpendicular to the slot. If you feel any resistance, slightly lift the bottom edge of the front panel until it can slide 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. Push on the ejector levers until they are parallel with the front panel; this action fully seats the connectors with the backplane.
7. Secure the card in the chassis by tightening the screw at the top and bottom of the front panel. Use a Phillips screwdriver to tighten each screw to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters).
8. Repeat steps 2 to 7 for each card to be installed.



2.7.1

Install Blank Cards

Caution!

Risk of equipment damage. High temperature can damage router cards. Insert a blank card in each empty slot.

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.

2.7.2

Install Transceivers

Caution!

Risk of severe damage to your eyes. Do not stare into the connector or directly view the laser beam emerging from the connector. 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. Keep the connectors covered until you are ready to connect the fiber-optic cables.

Install Transceivers

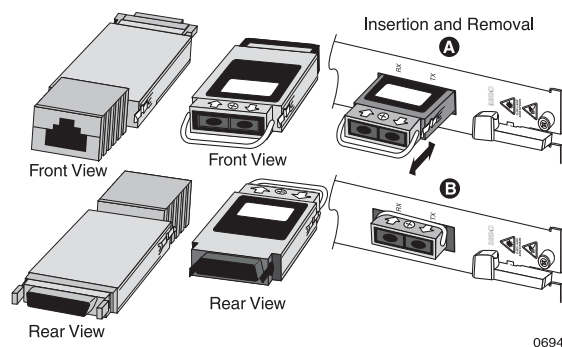


Figure 13 Installing a GBIC Transceiver

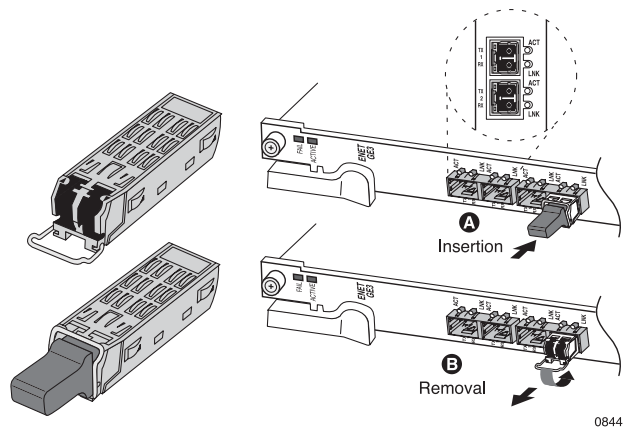


Figure 14 Installing an SFP Transceiver

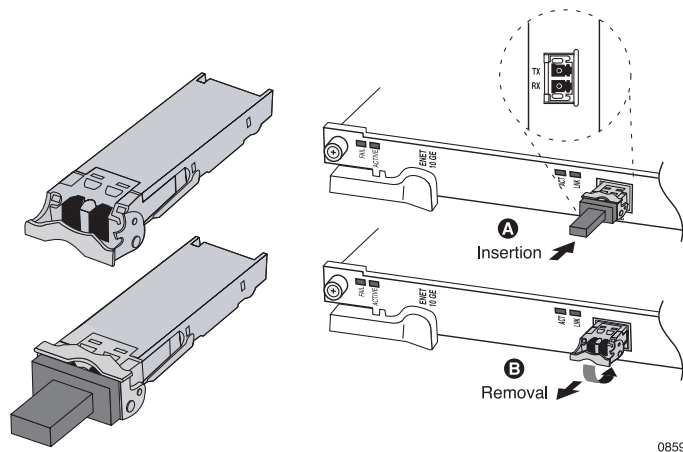


Figure 15 Installing an XFP Transceiver

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 26 Transceiver Types for 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, R-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, TX, ZX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn ⁽²⁾
Gigabit Ethernet 1020 (20-port) ⁽³⁾	SFP	SX, LX, TX, ZX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn ⁽²⁾



Table 26 Transceiver Types for Line Cards

Line Card	Transceiver ⁽¹⁾	Supported Versions
Gigabit Ethernet (5-port)	SFP	SX, LX, TX, ZX, 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⁾
Gigabit Ethernet DDR (20-port) ⁽³⁾	SFP	SX, LX, TX, ZX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn ⁽²⁾
10 Gigabit Ethernet (1-port)	XFP	SR, LR, ER, ZR, DWDMnn ⁽⁴⁾
10 Gigabit Ethernet DDR (4-port)	XFP	SR, LR, ER, ZR, DWDMnn ⁽⁴⁾ , OTN-DWDMITUnn ⁽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⁾
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 and 20-port GE line cards.

(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.

Stop!

Risk of data loss. Install only transceivers approved by Ericsson. Transceivers that have not been properly tested with SmartEdge line cards can corrupt the system.

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 on the front of the fan tray.

Stop!

Risk of ESD damage. Always use an ESD wrist or ankle strap when handling any 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 14 or Figure 15), 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.

GBIC transceivers are supported only on ports the first and second versions of the Gigabit Ethernet line cards. SFP transceivers are supported only on ports on GE1020 line cards. XFP transceivers are supported only on ports on 10GE line cards.

Note: 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.

To remove a transceiver of any type:

1. Shut down all activities on the port with the transceiver you want to replace. See *Command List Reference* [5].
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.

Stop!

Risk of damage to fiber-optic cables. Never step 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.

Stop!

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

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

2.7.3

Install Compact Flash (CF) Cards

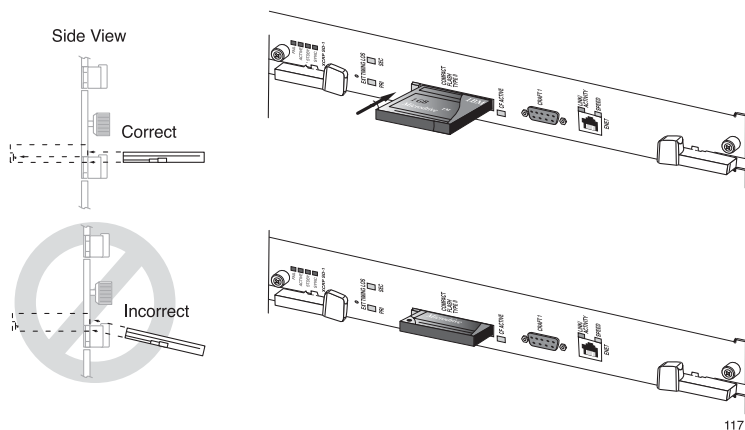


Figure 16 Installing a CF Card

Each controller card has an external slot on the front panel in which you can install an optional Type I 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 need not match. The XCRP4 controller card supports Type I devices only.

To install an external storage device:

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.
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. Do not force the device into its slot. Check for one of the following conditions:

Misaligned—Check the position and alignment as described in Step 3.

Upside down—Remove the device and rotate it 180° and try again.

Damaged—Remove the device and discard it. Do not use it in any other equipment.

Damaged slot connectors—Replace the controller card.

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

After insertion, the system automatically recognizes the CF card and begins to mount it. The CF Active LED begins to blink. When the CF Active LED is off, you can begin using the CF card.

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 2.12.1 Power-On Diagnostics on page 47.

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

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

2.8 Connections for Management Access

Connecting a console terminal or management workstation to the SmartEdge 600 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).

2.8.1 Management Workstation

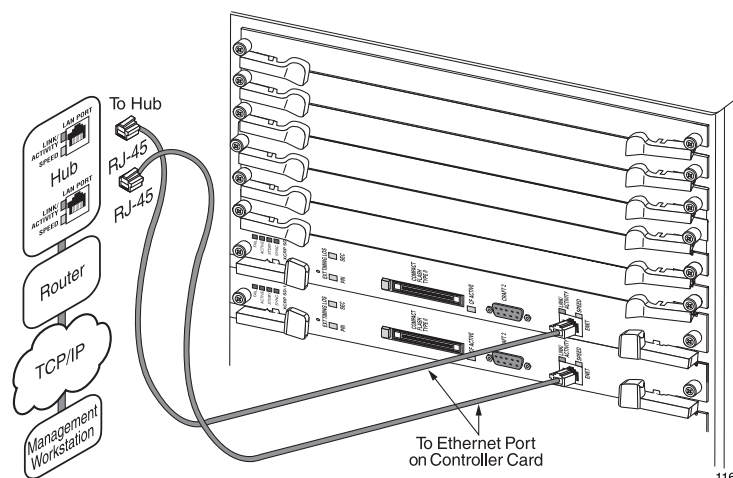


Figure 17 Connections for a Management Workstation



A management workstation is connected to the SmartEdge 600 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.

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.

2.8.2

Local or Remote Console Terminal

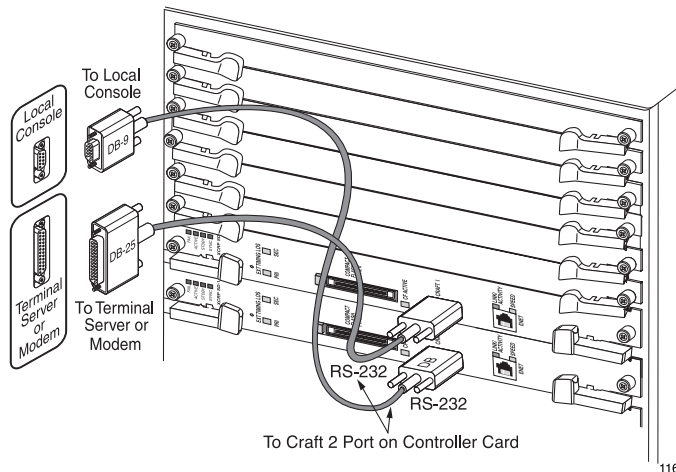


Figure 18 Connections for a Local or Remote Console

A local or remote console terminal is connected to the SmartEdge 600 router using the Craft port on the front of a controller card. This type of connection provides access to the operating system CLI, either directly or through a terminal server.

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.



2.9 Connections for External Timing Cables

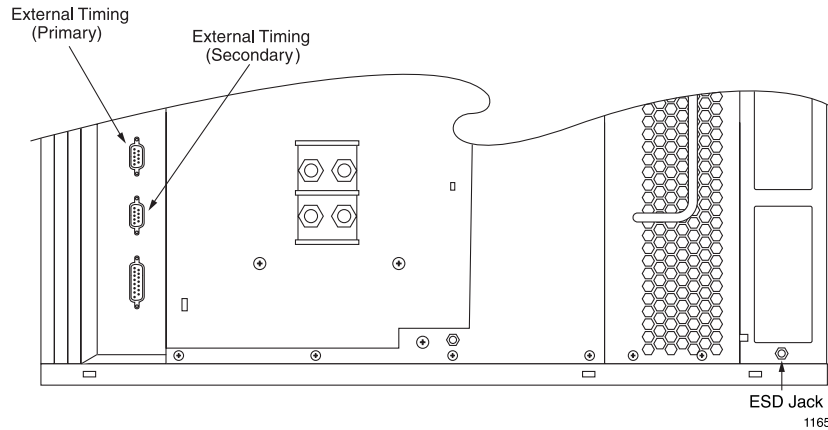


Figure 19 Connections for External Timing Cables

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

The controller cards can receive timing data only.

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.

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

Note: The operating system does not support the status and control port.

2.10 Connections for Line Card Cables

All line card cables are connected to the front panels of the cards.

Table 27 Port Data for 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 IR (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	No	—



Table 27 Port Data for Line Cards

Line Card Type and Card Description	Physical Ports	Low-Density Version	Low-Density Port Numbers
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	60, 2	No	–
Gigabit Ethernet 1020 (10-port)	10	No	–
Gigabit Ethernet 1020 (20-port) ⁽¹⁾	20	No	–
Gigabit Ethernet (5-port)	5	No	–
Gigabit Ethernet DDR (10-port)	10	No	–
Gigabit Ethernet DDR (20-port) ⁽⁴⁾	20	No	–
10 Gigabit Ethernet (1-port)	1	No	–
10 Gigabit Ethernet DDR (4-port)	4	No	–
10 Gigabit Ethernet/OC-192c DDR (1-port)	1	No	–

(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.

2.11 Connect and Route Cables

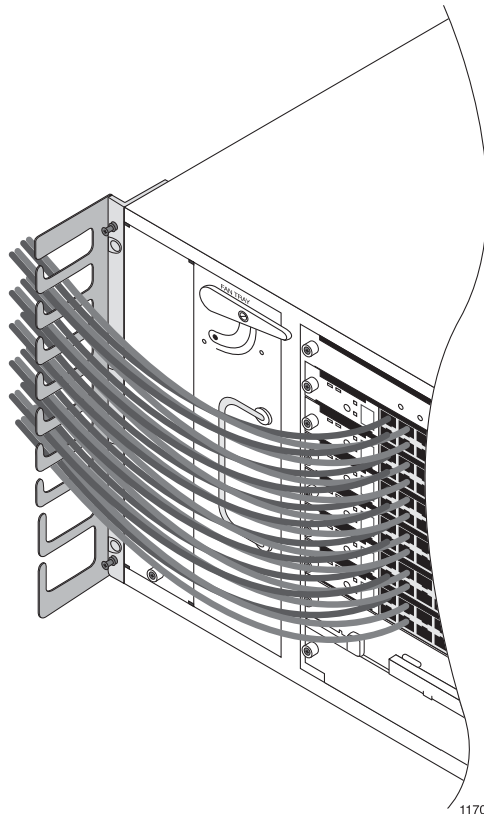


Figure 20 Cable Routing

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. 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. Never step on a cable. Never twist it when connecting it to or disconnecting it from a line card.

Connect and route the cables:

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. 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 6, connect and route the line card cables:
 - 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 21.

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.
 - 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.

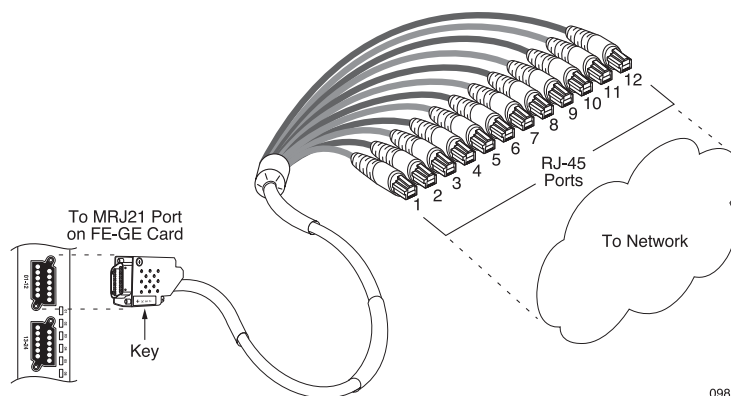


Figure 21 Connecting an FE-GE Breakout Cable

2.12

Power On and Off the System

Caution!

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

Power on a SmartEdge 600 router by inserting the fuses in the external fuse panel. The power LEDs on the front of the chassis light, depending on the power connections you have made, to signify that power is being supplied.

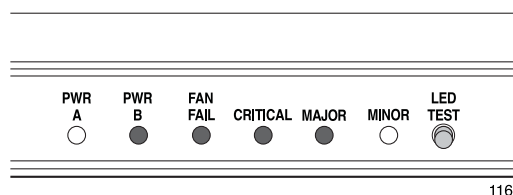


Figure 22 SmartEdge 600 Status LEDs



Table 28 SmartEdge 600 Status LEDs

Label	Activity	Color	Description
A, B	On	Green	The –48 VDC power source (primary or backup) is present: <ul style="list-style-type: none"> • A—Primary source • B—Backup source
Off	None	The –48 VDC power source (primary or backup) is absent.	
FAN	On	Red	A failure condition exists in the fan tray. ⁽¹⁾
Off	None	The fan tray is fully functional.	

(1) The failure can be the result of either a nonfunctional fan or malfunctioning fan controller card; the failure condition can be detected by the power-on or ODD tests.

During the power-on sequence for a SmartEdge 600 router, the line cards are held in low-power mode until the operating system 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 operating system 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 operating system 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 operating system allocates power for both controller cards, initializes them, and issues a controller mismatch alarm.

The operating system always reserves enough power during system configuration so that if the system has only a single controller card installed, it is always possible to install a standby controller card of the same type at a later time.

To power off the system, remove all fuses in the fuse panel.

2.12.1 Power-On Diagnostics

Power-on diagnostics verify the correct operation of the controller cards, backplane, fan tray, and each installed line card during a power-on or reload sequence of the SmartEdge 600 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 operating system. A failure on the backplane or fan tray causes the FAN LED on the fan tray to light.

The maximum test time is 130 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 29 Components Tested by POD

Component	Component Argument Values
Backplane	<code>backplane</code>
Controller card	<code>card 7</code> <code>card 8</code>
Fan tray	<code>fan tray</code>
Line card	<code>card n</code> (slot number 1 to 6)

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 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, allow 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 7.

The modes in which you enter commands are as follows:

- Enter **show** commands in any mode.
- Enter **clear** and **reload** commands in exec mode.
- Enter the **card** command and the **port** command for any type of port 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 30 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 30 CLI Commands for Hardware Status

Task or Information Needed	CLI Command	Comments
Status of a specific port, including alarms	<code>slot/portdetail</code>	
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	<p>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.</p> <p>The show alarm system alarm command and SNMP traps report the alarms when the corresponding threshold limits preset are exceeded.</p>
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 or ASE2 card. The command shows software version information, system uptime, task information, configuration information, and current state of each line card.
Status of the ASE2 card ⁽¹⁾	show tech-support ase2	

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

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 31 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 31 CLI Commands for Hardware Configuration and Control

Task or Information Needed	CLI Command	Comments
Restart the system (reload both controller cards) ⁽²⁾	<code>reload</code>	The <code>reload</code> command does not reset the hardware; you must remove and reinstall the card to cause a reset.
Restart a line card (reload its software)	<code>reload card slot</code>	
Restart (enable) a port	<code>port port-type slot/port</code> <code>no shutdown</code>	
Shut down (disable) a port	<code>port port-type slot/port</code> <code>shutdown</code>	The <code>shutdown</code> command disables the port, but does not clear counters; use the <code>clear port counters</code> 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	<code>show chassis</code> <code>show chassis power</code> <code>show hardware</code> <code>show port</code>	
Detailed information	<code>show chassis power inventory</code> <code>show hardware fan tray detail</code> <code>show hardware card slot</code> <code>slot detail</code> <code>show port details slot/port</code>	
Configuration data—Slots, ports		
Summary information for each slot	<code>show chassis</code>	
Current configuration information for all SSE groups ⁽¹⁾	<code>show configuration sse</code>	
Summary information for each SSE hard disk drive ⁽¹⁾	<code>show disk sse slot</code>	
Summary information for all SSE hard disk drive counters ⁽¹⁾	<code>show disk sse counters slot</code> <code>disk_num</code>	
Summary information for each installed line card	<code>show port</code>	
Summary information for each installed transceiver	<code>show port transceiver</code>	
Configuration for a specific port	<code>show ports slot/port detail</code>	Use the <code>all</code> keyword to display data for all ports, including those on MICs that are not installed.
Configuration for a channel	<code>show port slot/port:chan-num detail</code>	
Summary information for each installed SSE group ⁽¹⁾	<code>show sse { group [group_name] partition [partition_name] }</code>	
Summary information for all SSE group counters ⁽¹⁾	<code>show sse group counters</code>	

**Table 31** CLI Commands for Hardware Configuration and Control

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

(1) The SSE card is not supported on the SmartEdge 400 and 800 routers.

(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 32 CLI Commands for Hardware Troubleshooting

Task or Information Needed	CLI Command	Comments
Clear counters for a port	<code>clear port counters slot/port</code>	The <code>clear port counters</code> command does not disable the port; use the shutdown command to disable the port.
Run a BERT on a channel or port	<code>bert slot/port : <port-type> pattern pattern interval minutes error error</code>	<ul style="list-style-type: none"> The <code>error error</code> construct is supported for DS-3, DS-1, DS-0s, and E-1 channels and ports only. <code>port keepalive</code> must be disabled (<code>port keepalive</code> is only supported with the encapsulation <code>cisco-hdlc</code>) When <code>bert</code> exercises on DS-0s under channelized DS-1, DS-0s must be configured with the full timeslots range of 1-24. When <code>bert</code> 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.	<code>port port-type slot/port; [ch] ; [subch] ; [subsubch]</code> <code>loopback loopback-type</code>	
Disable loopback on a channel or port	<code>port port-type slot/port; [ch] ; [subch] ; [subsubch]</code> <code>no loopback</code>	

Table 33 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 33 Loopback Types

Loopback Type	Description
<code>line</code>	Loops the receive line to the transmit line.
<code>local</code>	Loops the transmit line to the receive line to test internal functions.
<code>network line</code>	Full loopback from the receive line to the transmit line; channels with all timeslots configured as follows: <ul style="list-style-type: none"> • 1 to 24 – DS-0s under channelized DS-1. • 1 to 31 – DS-0s under channelized E-1.
<code>network payload</code>	Payload loopback from the receive line to the transmit line; channels with all timeslots configured as follows: <ul style="list-style-type: none"> • 1 to 24 – DS-0s under channelized DS-1. • 1 to 31 – DS-0s under channelized E-1.
<code>remote</code>	Verifies remote link connectivity and quality: channels with C-bit framing; the admin state must be Up.
<code>remote line fdl ansi</code>	Facility data link (FDL) ANSI loopback: channels with Extended Superframe Format (ESF) framing.
<code>remote line fdl bellcore</code>	FDL Telcordia loopback: channels with ESF framing.
<code>remote line inband</code>	Inband loopback: channels with either ESF or Superframe Format (SF) framing; the Admin state must be Up.
<code>remote payload</code>	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 34 Values for CLI Input Arguments

Argument	Range of Values/Description	Restrictions
<code>card-type</code>	Line card type	
<code>chan-num</code>	Channel number	
<code>error</code>	Number of injected bit errors for a BERT: <ul style="list-style-type: none"> • 10^3 to 10^{10}⁽¹⁾ • 10^3 to 10^7⁽²⁾ • none 	



Table 34 Values for CLI Input Arguments

Argument	Range of Values/Description	Restrictions
<i>loopback-type</i>	<p>Type of loopback:</p> <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> * 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: <ul style="list-style-type: none"> * 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. <p>See Table 33 for a list of loopback types and the ports and channels to which they apply.</p>	
<i>pattern</i>	<p>Pattern to use to exercise the line or channel during a BERT:</p> <ul style="list-style-type: none"> • 0s,1s, 1100 • 1-in-2, 1-in-8, 1-in-12, 1-in-32 • 2¹⁵, 2²⁰, 2²³, 10³~10⁷ • qrss, user-defined 	
<i>port</i>	1 to 62, depending on line card type.	The Ethernet management port on a controller card is always port 1.
<i>port-type</i>	See Table 36 and Table 37 for the types of ports and channels.	
<i>slot</i>	<p>The slot in which a line card or primary controller card is installed.</p> <ul style="list-style-type: none"> • 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 35 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 ⁽²⁾⁽³⁾	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
ase2 ⁽³⁾	Advanced Services Engine 2
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 GE1020 and 20-port GE DDR cards.

(3) This card is not supported in the SmartEdge 400 and SmartEdge 800 routers.

Table 36 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 37** *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 38 *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 39 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 40 Output Fields for the show chassis Command

Field Name	Description
Current platform is	Chassis type: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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. ase2—Advanced Services Engine 2 is configured.⁽²⁾ sse—SmartEdge Storage Engine is configured.⁽³⁾ none—Slot is not preconfigured.
Installed type	Slot has card installed: <ul style="list-style-type: none"> line-card-type—Line card is installed. xcrp—Controller card of any type or controller card is installed. ase—Advanced Services Engine is installed. ase2—Advanced Services Engine 2 is installed.⁽²⁾ sse—SmartEdge Storage Engine is installed.⁽³⁾ none—Slot is empty. unknown—Controller card is installed but not initialized.



Table 40 Output Fields for the show chassis Command

Field Name	Description
Initialized	State of card: <ul style="list-style-type: none"> No—PPAs have not been initialized for this card. Yes—PPAs have been initialized for this card.
Flags	Status of card ⁽⁴⁾⁽⁵⁾ <ul style="list-style-type: none"> A — Active Crossconnect B — Standby Crossconnect C — SARCs (Segmentation And Reassembly Controllers) D — Default Traffic Card⁽⁶⁾ E — EPPA (Egress Packet Processing ASIC) Ready G — Upgrading FPGA (Field Programmable Gate Array) H — Card Admin State SHUT⁽⁷⁾ I — IPPA (Ingress PPA) Ready M — FPGA Upgrade Required⁽⁸⁾⁽⁹⁾ N — SONET EU Enabled O — Card Admin State ODD⁽¹⁰⁾ P — Coprocessor Ready (SSE card) P1 — ASP1 Ready (ASE or ASE2 card)⁽²⁾ P2 — ASP2 Ready (ASE or ASE2 card)⁽²⁾ R — Traffic Card Ready S — SPPA (Segmented PPA) Ready U — Card PPAs/ASP UP (All cards: PPAs are up; ASE or ASE2 card: at least one APS is up; SSE card: coprocessor is up.)⁽²⁾ 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 ASE2 card is not supported on the SmartEdge 400 and 800 routers.

(3) The SSE card is not supported on the SmartEdge 400 and 800 routers.

(4) A line card cannot be up (U flag) without being ready (R flag), but it can be ready without being up.

(5) 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

(6) The default line card processes packets sent to it from the active controller card.

(7) A line card is administratively shut down with the **shutdown** command (in card configuration mode).

(8) 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* [11].

(9) 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.

(10) 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 41 Output Fields for the show disk Command

Field	Description
Location	Location of the storage device: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • /—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 42 Output Fields for the show hardware Command

Field Name	Field Data Reported and Data Descriptions
Fan Tray Status	<ul style="list-style-type: none"> • Present—Fan and alarm unit is installed. • Not Present—Fan and alarm unit is not installed or not working.
Fan(s) Status	<ul style="list-style-type: none"> • Failed—At least one fan is not working. • Normal—All fans are working.
SmartEdge <ul style="list-style-type: none"> • Power Supply A Status • Power Supply B Status 	Status of the power supply modules: <ul style="list-style-type: none"> • No Power—Power has failed, is disconnected, or is not installed. • Normal—Power is being supplied by this power supply.

**Table 42** *Output Fields for the show hardware Command*

Field Name	Field Data Reported and Data Descriptions
Active Alarms	Alarm conditions for this unit: <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • slot—Slot number for this unit. • N/A—No slot number for this unit.
Type	Unit: <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 43 *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 44 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: <ul style="list-style-type: none"> • NONE—No alarm conditions exist. • <i>condition</i>—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	<i>yyyy-mm</i> —Date the air filter is due to be replaced.
Alarm Card Status ⁽²⁾	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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	<i>nnnn/n</i> —Version of the unit EEPROM.
EPPA memory	<i>nnn</i> MB—Size of ingress and egress PPA memory.
Redback Approved	State of transceiver testing for this SFP optical transceiver in SmartEdge routers: <ul style="list-style-type: none"> • No—Not tested. • Yes—Tested.
Fan Tray Status	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<i>n</i> —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	<i>nnn</i> MB—Size of ingress and egress PPA memory.

**Table 44** *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: <ul style="list-style-type: none"> • 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	<i>nn:nn:nn:nn:nn:nn</i> —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: <ul style="list-style-type: none"> • Max—All memory on the controller card is enabled. • <i>nnnn</i> MB—Size in MB of enabled memory.
Mfg Date	<i>dd/mm/yyyy</i> —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: <ul style="list-style-type: none"> • 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. • <i>n</i> 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: <ul style="list-style-type: none"> • Success—Unit passed all POD tests. • Failure—Unit failed one or more POD tests.
Port	<i>n</i> —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: <ul style="list-style-type: none"> • <i>n1, n2, n3, . . .</i>—Entitled ports. • All—All physical ports on the line card are entitled.



Table 44 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
SmartEdge 400 chassis: <ul style="list-style-type: none"> Power Supply A Status Power Supply B Status 	SmartEdge 400 with AC Power Supply: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> Power Supply A Status Power Supply B Status 	SmartEdge 800 chassis: <ul style="list-style-type: none"> No Power—Power has failed, is disconnected, or is not installed. Normal—Power is being supplied by this power supply.
SmartEdge 1200 chassis: <ul style="list-style-type: none"> Power Supply A1 Status Power Supply A2 Status Power Supply B1 Status Power Supply B2 Status 	SmartEdge 1200 chassis: <ul style="list-style-type: none"> 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⁾ <ul style="list-style-type: none"> 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): <ul style="list-style-type: none"> 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	nnnnnnnnnnnnnnnn—Unique identifier for this unit; 14 alphanumeric characters.

**Table 44** *Output Fields for the show hardware Command with the detail Keyword*

Field Name	Field Data Reported and Data Descriptions
SFP / Media type	<p>SFP Transceivers—Ethernet line cards:</p> <ul style="list-style-type: none"> 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⁾ <p>SFP transceivers—SONET/SDH OC-n (OC-48c/STM-16c, OC-12c/STM-4c, and OC-3c/STM-1c) cards:</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> <i>slot</i>—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	<p>Temperature condition and actual temperature reading in degrees Celsius:</p> <ul style="list-style-type: none"> 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. <p>Table 45 lists descriptions of each temperature condition.</p> <p>Table 46 lists temperature ranges for card types.</p>
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 44 Output Fields for the show hardware Command with the detail Keyword

Field Name	Field Data Reported and Data Descriptions
Type	Unit: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 0.00 [nm]—Wavelength is not reported by this transceiver. nnnn.nn [nm]—Wavelength for this transceiver version. See <i>Transceivers for SmartEdge and SM Family Line Cards</i> 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: <ul style="list-style-type: none"> 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-DWDM ITU 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 45** *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	<p>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.</p> <p>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.</p> <p>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.</p>
EXTREME	<p>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.</p> <p>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.</p>
N/A	Temperature does not apply to this unit, or this unit does not have a built-in temperature sensor.

Table 46 *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	<p>COLD $\leq 20^{\circ}\text{C}$</p> <p>NORMAL = 21 - 71$^{\circ}\text{C}$</p> <p>HOT = 72 - 93$^{\circ}\text{C}$</p> <p>EXTREME $\geq 94^{\circ}\text{C}$</p>
oc192-1-port ge-10-port ge-20-port ⁽¹⁾ ge-5-port ge2-10-port 10ge-1-port 10ge-oc192-1-port	<p>COLD $\leq 20^{\circ}\text{C}$</p> <p>NORMAL = 21 - 84$^{\circ}\text{C}$</p> <p>HOT = 85 - 94$^{\circ}\text{C}$</p> <p>EXTREME $\geq 95^{\circ}\text{C}$</p>
fege-60-2-port	<p>COLD $\leq 20^{\circ}\text{C}$</p> <p>NORMAL = 21 - 89$^{\circ}\text{C}$</p> <p>HOT = 90 - 103$^{\circ}\text{C}$</p> <p>EXTREME $\geq 104^{\circ}\text{C}$</p>
ch-oc3oc12-8or2-port	<p>COLD $\leq 20^{\circ}\text{C}$</p> <p>NORMAL = 21 - 89$^{\circ}\text{C}$</p> <p>HOT = 90 - 105$^{\circ}\text{C}$</p> <p>EXTREME $\geq 105^{\circ}\text{C}$</p>



Table 46 *Temperature Ranges for Card Types*

Card Type	Temperature Ranges
ge4-20-port ⁽²⁾⁽¹⁾ 10ge-4-port ⁽²⁾	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
ase2 ⁽²⁾	COLD ≤ 20°C NORMAL = 21 - 75°C HOT = 76 - 85°C EXTREME ≥ 86°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 DDR cards.

(2) This card is not supported in the SmartEdge 400 and SmartEdge 800 routers.

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 47 *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:

*Table 47 Output Fields for the show port Command*

Field Name	Value/Description
Type	port-type or channel-type.
State	Port status (combination of the Admin state and Line state fields): <ul style="list-style-type: none">• 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 48 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 49 Port/Channel Types

Port/Channel Type	Description
Port types	Type of ports: <ul style="list-style-type: none"> • atm • pos • ethernet • transceiver • channelized-oc3 • channelized-oc12 • channelized-stm1 • channelized-stm4
Channel types	Type of channels: <ul style="list-style-type: none"> • channelized-ds1 • channelized-ds3 • channelized-e1 • ds0s • ds1 • ds3 • e1

Table 50 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Header	
Type	<i>port-type</i> or <i>channel-type</i> .
Slot/Port	<i>slot/port</i> —Slot and port numbers for this port.
State	Port status (combination of the and fields) for a line card: <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.



Table 50 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Admin state	State of the port as a result of an operator command: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• 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	<i>nnnnn</i> bytes—Size of the hardware maximum transmission unit (MTU) (not configurable).
ATM Payload Scramble	Condition of scrambling for ATM port (on or off).
Auto negotiation	Two-part string for the <i>setting</i> and <i>state</i> fields. Possible values for the <i>setting</i> field are: <ul style="list-style-type: none">• enabled• disabled Possible values for the <i>state</i> field are: <ul style="list-style-type: none">• 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 <i>setting</i> and <i>state</i> fields are: <ul style="list-style-type: none">• disabled-unknown• disabled-negotiating• disabled-success• disabled-force• enabled-unknown• enabled-negotiating• enabled-success• enabled-fail
Bandwidth	<i>nnnnnn</i> kbps—Speed of SONET/SDH port. <i>nnn.nn</i> Mbps—Effective speed of ATM port.
Cable Length	<i>nnn</i> —Configured length and type (short or long, depending on configured length).
CCOD Mode	<i>State of CCOD mode port listening:</i> <i>on—Port listening mode is enabled.</i> <i>off—Port listening mode is disabled.</i>



Table 50 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Clock Source ⁽¹⁾	<p><i>State of source of the transmit clock:</i></p> <p><i>global-reference-system clock on the active controller card.</i>⁽²⁾</p> <p>local—local clock located on the line card (onboard clock).⁽³⁾</p> <p>loop—receive clock derived from the incoming signal on the port.</p> <p>card-reference—clock source that has been specified for the line cards.</p>
Crc	Configured value of the cyclic redundancy check for a SONET/SDH port (16 or 32).
Dampening Count	<i>n</i> —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	<ul style="list-style-type: none"> 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.
DSU Bandwidth ⁽⁴⁾	<i>nn.nn</i> Mbps—Bandwidth of configured data service unit (DSU).
DSU Mode ⁽⁴⁾	<i>digital-link</i> —Configured vendor of DSU.
DSU Scramble ⁽⁴⁾	DSU scramble condition (on or off).
Duplex Mode	<ul style="list-style-type: none"> full—Port condition, Ethernet or Gigabit Ethernet (any version). half—Port condition, 10/100 Ethernet only.
Encapsulation	<p>The encapsulation for this port:</p> <ul style="list-style-type: none"> 802.1q atm cisco-hdlc ethernet ppp
Equipment Loopback	<p>Configured equipment loopback:</p> <ul style="list-style-type: none"> 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	<p>Far end alarm condition (of the remote system):</p> <ul style="list-style-type: none"> 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.

**Table 50** *Output Fields for the show port Command with the detail Keyword*

Field Name	Value/Description
Flow control	Condition of flow control for Gigabit Ethernet port, any version, (on or off).
Framing	Configured framing for the port: <ul style="list-style-type: none"> • 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).
Keepalive	State of keepalive timer: <ul style="list-style-type: none"> • Not Set—Keepalive timer is not configured. • Set (<i>n</i> sec)—Keepalive timer is set for <i>n</i> 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • enabled—Link dampening is enabled. • disabled—Link dampening is disabled.
Link up delay	<i>nnnnn</i> msec—Configured or default value (in milliseconds) for the delay time for down-to-up transitions.
Link down delay	<i>nnnnn</i> 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: <ul style="list-style-type: none"> • <i>n</i>—Distance supported by the transceiver. • N/A—No transceiver installed or transceiver does not report the distance supported.



Table 50 *Output Fields for the show port Command with the detail Keyword*

Field Name	Value/Description
Loopback	<p>Type of loopback:</p> <ul style="list-style-type: none"> • 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 50 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Media type	<p>Physical interface:</p> <ul style="list-style-type: none"> • 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.⁽⁹⁾ • 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-<i>n</i> (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	<i>nnnn</i> Bytes—Configured size of the MTU for the port.
NAS Port Type	<ul style="list-style-type: none"> • 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 <i>Configuring ATM, Ethernet, and POS Ports</i> Reference [2]. • blank—Not configured or not applicable to this port.
Optical Transport ⁽⁸⁾	<ul style="list-style-type: none"> • otu2e—An OTN XFP is inserted. • NONE—No optical transport



Table 50 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Over Subscription Rate	Configured value for over subscription: <ul style="list-style-type: none"> • <i>nnnn</i>% • Unlimited
QoS Rate Maximum ⁽⁹⁾	QoS port-rate limiting value: ⁽¹⁰⁾ <ul style="list-style-type: none"> • <i>50 to 149 Mbps</i>. • Payload line-rate (150 Mbps).
Path Alarms	<ul style="list-style-type: none"> • N/A—Not applicable to this type of port. • NONE—No alarms are present. <p>CH-OC3/CH-OC12:</p> <ul style="list-style-type: none"> • STS Path • VT Path <p>CH-STM1/CH-STM4:</p> <ul style="list-style-type: none"> • AU Path— based on SDH aug-mapping and port type as follows: <ul style="list-style-type: none"> * au3-xxx: stm1 = x3; stm4 = x12 * au4-xxx: stm1 = x1; stm4 = x4 • VT Path <p>For a complete list of conditions that can cause an alarm, see the Troubleshoot with System Power and Alarm LEDs section.</p>
Path Trace Length	The maximum size that the TX path trace message can be set to.
Physical Layer ⁽¹¹⁾	<ul style="list-style-type: none"> • lan-phy • wan-phy
PPPoE PADO Delay	State of PADO delay: <ul style="list-style-type: none"> • Not set—PADO delay is not configured. • Set (<i>n</i> sec)—PADO delay is configured for <i>n</i> 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: <ul style="list-style-type: none"> • 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) <p>Alarm is reported, but the port is not shut down.</p>
Scramble	Status of X ⁴³ + 1 payload scrambling for a POS port (on or off).



Table 50 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Speed	<ul style="list-style-type: none"> <i>nnn</i> Mbps—Speed of the 10/100 Ethernet port. <i>nn</i> 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	<p>Status of this FE port on an FE-GE line card with regard to guaranteed lossless flow control for jumbo frames:</p> <ul style="list-style-type: none"> 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	<p>Value of the C2 byte:</p> <ul style="list-style-type: none"> ATM OC ports—0x13 POS OC ports—0x16 WANPHY port—0x1a Ch-OC3/CH-OC12 (depends channel-mapping): <ul style="list-style-type: none"> * VT1.5—0x16 * STS-1—0x04 CH-STM1/CH-STM4 (depends aug-mapping): <ul style="list-style-type: none"> * AU3-NO-TUG/AU4-TU3—0x04 * AU3-TU12/AU3-TU11/AU4-TU12/AU4-TU11—0x02
Tx Fault Rx Fault	<p><i>Fault status for the transmit or receive side of the SFP transceiver installed in this port:</i></p> <ul style="list-style-type: none"> <i>LowPwrWarning</i>—Measured power has dropped below the level needed by the transceiver to maintain connectivity without errors. <i>NoFault</i>—No power fault has occurred. <i>PwrFault</i>—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	<p>Value of the national bit (bit 12 of set 1) in the E3 frame:</p> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Up—Port is working (active). Down—Port has been configured to be up, but is not working.
Vcc Measured	SFP Transceiver Vcc



Table 50 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: <ul style="list-style-type: none"> • 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 <i>Transceivers for SmartEdge and SM Family Line Cards</i> 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 51 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 51 *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 52 *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: <ul style="list-style-type: none">• 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: <ul style="list-style-type: none">• 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 52 Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data

State	Description
SFP / Media type	<p>SFP Transceivers—Ethernet line cards:</p> <ul style="list-style-type: none"> 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⁾ <p>SFP transceivers—SONET OC-n (OC-3c/STM-1c, OC-12c/STM-4c, and OC-48c/STM-16c) cards:</p> <ul style="list-style-type: none"> 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	<p>10-Gbps SFP (XFP) transceivers—OC-192 and 10-Gig Ethernet line cards:</p> <ul style="list-style-type: none"> 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⁾
Redback Approved	<p>State of transceiver testing for transceiver in SmartEdge routers:</p> <ul style="list-style-type: none"> 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	<p>Center wavelength for the version of the optical transceiver installed in this port:</p> <ul style="list-style-type: none"> 0.00 [nm]—Wavelength is not reported by this transceiver. nnnn.nn [nm]—Wavelength for this transceiver version.
Tx Pwr [dbm]	<p>Transmitter optical output power (measured, minimum, and maximum limits) for the version of the transceiver installed in this port.</p> <p>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.</p>
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 52** 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 <i>port/slot</i> : <ul style="list-style-type: none"> 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 53 for a list of auxiliary input types monitored by each auxiliary A/D channel of the XFP transceivers.

Table 53 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 ASE2 and SSE cards are not supported on the SmartEdge 400 and 800 routers.

Table 54 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.	<p>No power is present at the A-side or B-side power input; perform the following checks or actions:</p> <ul style="list-style-type: none"> 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 55 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

**Table 55 Chassis Alarms**

Description	Severity	Probable Cause	Service Affecting
Alarm card missing	Major	ReplaceableUnitMissing	Yes
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 56 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



Table 56 Line Card Alarms

Description	Severity	Probable Cause	Service Affecting
Circuit pack overheating	Major	LineCardProblem	Yes
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 57 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



Table 57 Controller Card Alarms

Description	Severity	Probable Cause	Service Affecting
Nonvolatile memory fail	Major	CorruptData	Yes
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 58 SSE Card Alarms

Description	Severity	Probable Cause	Service Affecting
ASE and ASE2 ASP 1 down	Critical	processorProblem	Yes
ASE and ASE2 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 59 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



Table 59 SSE Disk Alarms

Description	Severity	Probable Cause	Service Affecting
Hard disk reading test failure	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 60 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 61 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 62 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 63 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 64 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

**Table 64** *Optical Port Alarms—Line/Multiplex Section Layer*

Description	Severity	Probable Cause	Service Affecting
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
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 65 *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

**Table 65 SFP Transceiver Alarms**

Description	Severity	Probable Cause	Service Affecting
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 66 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



Table 66 XFP Transceiver Alarms

Description	Severity	Probable Cause	Service Affecting
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 67 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

**Table 67 DS-3 Channel or Port and E3 Port Alarms**

Description	Severity	Probable Cause	Service Affecting
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 68 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 69 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

**Table 69** *E1 Channel or Port Alarms*

Description	Severity	Probable Cause	Service Affecting
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 70 *Ethernet Port Alarms*

Description	Severity	Probable Cause	Service Affecting
Excessive collisions detected	Major	LinkFailure	Yes
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 71 *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 72 *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

**Table 72** VT Path Alarms

Description	Severity	Probable Cause	Service Affecting
VT payload label mismatch (PLM-V)	Major	SignalLabelMismatch	Yes
VT unequipped (UNEQ-V)	Major	SignalLabelMismatch	Yes

3.12.15 TU-12 Path Alarms

Table 73 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
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 74 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 75 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 76 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	LossOfPointer	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 77 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 78 Problems Indicated by Card Status LEDs

Problem	Solution
FAIL (red) is on.	The card has failed. Replace the card.



Table 78 Problems Indicated by Card Status LEDs

Problem	Solution
ACTIVE (green) is off.	Perform the following checks or actions: Check the STDBY LED: <ul style="list-style-type: none">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: <ul style="list-style-type: none">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.
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 (ASE)
- Advanced Services Engine 2 (ASE2)
- SmartEdge Storage Engine (SSE)

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 79 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, ASE, SSE, and line cards only	Includes level 1 tests; tests a8,0.11 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	ASE, SSE, and 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	ASE cards and 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⁾⁽⁴⁾

(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.

(4) To run external loopback tests on ASE or ASE2 cards, install external loopback crossover cables between ASP 1 Port1 and ASP 2 Port1, and between ASP 1 Port2 and ASP 2 Port2.

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 80 Parameters for an ODD Session

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

Table 81 Card Types and Slots for the `card` Command

Type of Line Card/Description	<code>card-type</code> Keyword	<code>slot</code> Argument Range
ATM OC-3c/STM-1c (8-port)	<code>atm-oc3e-8-port</code>	1 to 6 and 9 to 14
ATM OC-12c/STM-4c (2-port)	<code>atm-oc12e-2-port</code>	1 to 6 and 9 to 14
POS OC-3c/STM-1c (8-port)	<code>oc3e-8-port</code>	1 to 6 and 9 to 14
POS OC-12c/STM-4c (4-port)	<code>oc12e-4-port</code>	1 to 6 and 9 to 14
POS OC-48c/STM-16c (4-port)	<code>oc48e-4-port</code>	1 to 6 and 9 to 14
OC-192c/STM-64c (1-port)	<code>oc192-1-port</code>	1 to 6 and 9 to 14
Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port) ⁽¹⁾	<code>ch-oc3oc12-8or2-port</code>	1 to 6 and 9 to 14
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	<code>fege-60-2-port</code>	1 to 6 and 9 to 14
Gigabit Ethernet 1020 (10-port)	<code>ge-10-port</code>	1 to 6 and 9 to 14
Gigabit Ethernet 1020 (20-port) ⁽²⁾	<code>ge-20-port</code>	1 to 5 and 9 to 13
Gigabit Ethernet (5-port)	<code>ge-5-port</code>	1 to 6 and 9 to 14
Gigabit Ethernet DDR (10-port)	<code>ge2-10-port</code>	1 to 6 and 9 to 14
Gigabit Ethernet DDR (20-port) ⁽³⁾⁽²⁾	<code>ge4-20-port</code>	1 to 5 and 9 to 13
10 Gigabit Ethernet (1-port)	<code>10ge-1-port</code>	1 to 6 and 9 to 14
10 Gigabit Ethernet DDR (4-port) ⁽³⁾	<code>10ge-4-port</code>	1 to 6 and 9 to 14
10 Gigabit Ethernet/OC-192c DDR (1-port)	<code>10ge-oc192-1-port</code>	1 to 6 and 9 to 14
Advanced Services Engine	<code>ase</code>	1 to 6 and 9 to 14
Advanced Services Engine 2 ⁽³⁾	<code>ase2</code>	1 to 6 and 9 to 14
SmartEdge Storage Engine ⁽³⁾	<code>sse</code>	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 and 20-port GE DDR cards.

(3) This card is not supported in the SmartEdge 400 and SmartEdge 800 routers.

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 82; Table 81 lists values for the *card-type* and *slot* arguments.

Table 82 Prepare a Line Card for an ODD Session

Task	Command	Notes
Access global configuration mode.	<code>configure</code>	Enter this command in exec mode.
Specify the card to be tested and access card configuration mode.	<code>card</code>	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.	<code>shutdown</code>	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.
Put the card in the ODD state.	<code>on-demand-diagnostic</code>	
Commit the previous commands to the database and return to exec mode.	<code>end</code>	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 83; all commands are entered in exec mode. Table 80 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 83 Test Components

Task	Command
Test a line card.	<code>diag on-demand card slot level level loop loop-num</code>
Test the standby controller card.	<code>diag on-demand standby level level loop loop-num</code>

Table 84 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 86
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 85 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.
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 86 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 87; all commands are entered in any mode.

Table 87 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 <i>n</i> sessions. The latest session is displayed first. Up to 100 sessions can be listed.	show diag on-demandhistory n



Table 88 *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.
n Failures	Session was completed with a number of test failures.
Passed	All tests passed.

Table 89 *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 90; enter all commands in exec mode.

Table 90 *Clear Results from ODD Sessions*

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



3.14.5 ODD Examples

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

```
[local]Redback#diag on-demand standby level 2 loop 4
[local]Redback#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]Redback#configure
[local]Redback(config)#card fege-60-2-port 3
[local]Redback(config-card)#shutdown
[local]Redback(config-card)#on-demand-diagnostic
[local]Redback(config-card)#end

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

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

The design of the SmartEdge 600 router permits you to install and replace all cards without powering off the system.

Caution!

Risk of equipment damage. Never attempt to repair parts or cards yourself; always replace any defective card with a card supplied by your technical representative.

Table 91 Tools Needed for Installation and Replacement Procedures

Tool	Purpose
#1 Phillips screwdriver	Remove and install the fan tray, cards. The screwdriver needs a 4.5-inch (11.5-cm) shaft to reach the screws that secure the fan tray in the chassis.
Trompeter tool	Remove and install DS-3 or E3 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.

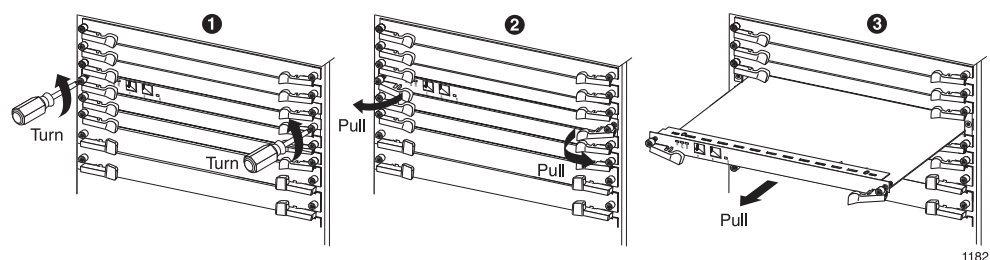


Figure 23 Removing a Card from the SmartEdge 600 Chassis

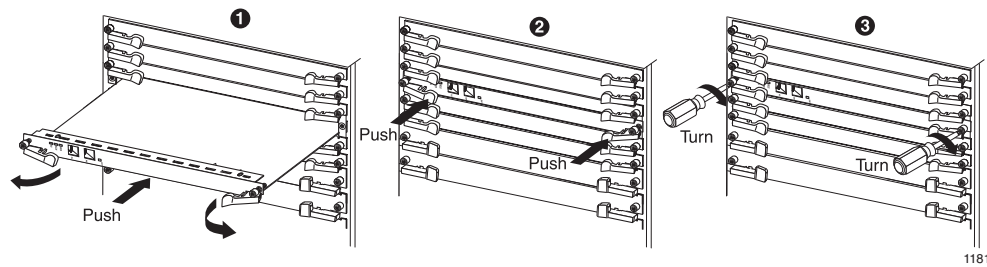


Figure 24 Replacing a Card in the SmartEdge 600 Chassis

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.

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

- 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 in the fuse panel.
- The SmartEdge 600 router has an EEPROM that supplies the medium access control (MAC) address for the chassis. If it should ever be necessary to replace the EEPROM, consult your local technical representative.
- If the controller cards are not the same type with same main memory configuration, the system might need to shut down one or more line cards to free up enough available power for the standby controller card. The operating system 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 operating system 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.



- 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.

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:

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 tray.
2. Loosen the captive screws and remove the blank card that is installed in slot 7 or 8.
3. Install the card.
4. If the first controller card includes a CF card, install a CF card in the controller card you have just installed. To install the CF card, see [Install Compact Flash \(CF\) Cards](#).
5. Verify the operational status: the FAIL LED must not be lit.
6. 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, you will disrupt traffic when you remove the card.

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

Stop!

Risk of data loss. Verify that the card being removed is not the active controller (that is, the STDBY LED is lit). 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 replace a controller card:

1. For 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 to display the status of the standby controller.
2. For dual controller cards, upgrade the active controller to run the latest release of the system software.
3. For a controller card with a CF card installed, dismount the device by entering the following command in exec mode:

```
unmount /md
```

Removing the controller card with its CF card without first entering the `unmount /md` command can permanently damage the device and cause the kernel to crash.

Stop!

Risk of data loss. Do not enter the `unmount /md` command while the CF ACTIVE LED is blinking. You can lose data that is being transferred to the CF card if you enter the `unmount /md` command before the data transfer operation is complete. When the operation is complete, the LED is turned off.



4. 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.
5. Label and disconnect any cables from the front of the controller card being removed.
6. Remove the current card.
7. Install the card.
8. If a CF card was installed in the previous controller card, remove the device from its slot and install it in the new controller card; perform the procedure in Replacing a CF Card.
9. Verify the operational status: the FAIL LED must not be lit.
10. 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 CF card.

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

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

Removing the CF card without first 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 a CF card.

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

Stop!

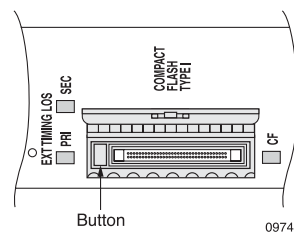
Risk of data loss. Do not enter the `unmount /md` command while the CF ACTIVE LED is blinking. You can lose data that is being transferred to the CF card if you enter the `unmount /md` command before the data transfer operation is complete. When the operation is complete, the LED is turned off.

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:
 - 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.

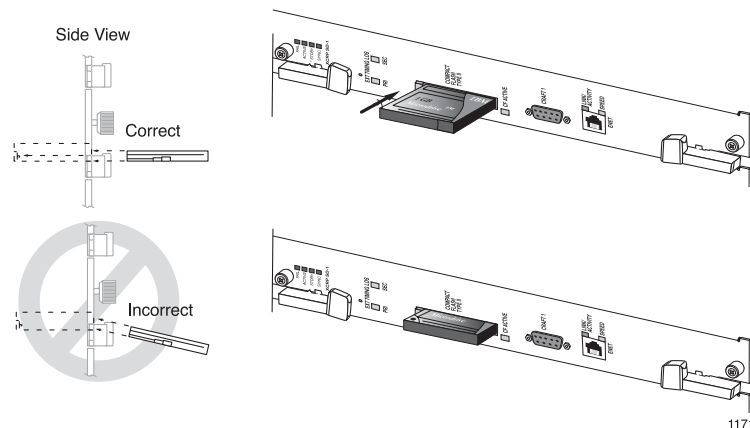
Note: If the system cannot successfully unmount the file system on the CF card, the CF Active LED stops blinking and is unlit. You must enter the **unmount** command (in exec mode) to unmount the file system on the card.

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. Installing a 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 2.12.1 Power-On Diagnostics on page 47.

For detailed instructions on how to install a CF card, see Section 2.7.3 on page 39.

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.

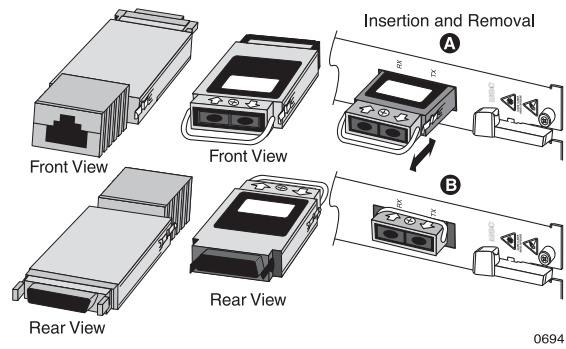


Figure 25 GBIC Transceiver

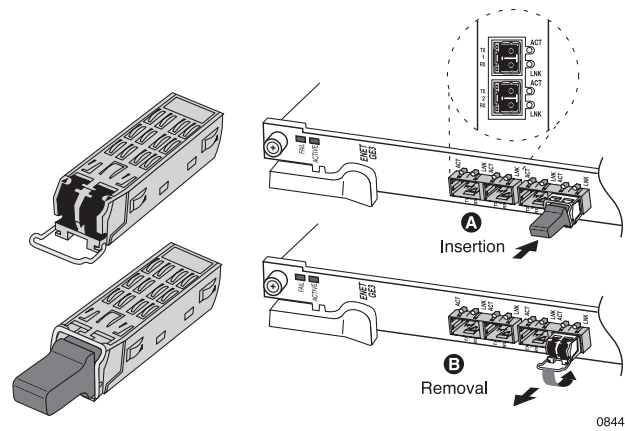


Figure 26 SFP Transceiver

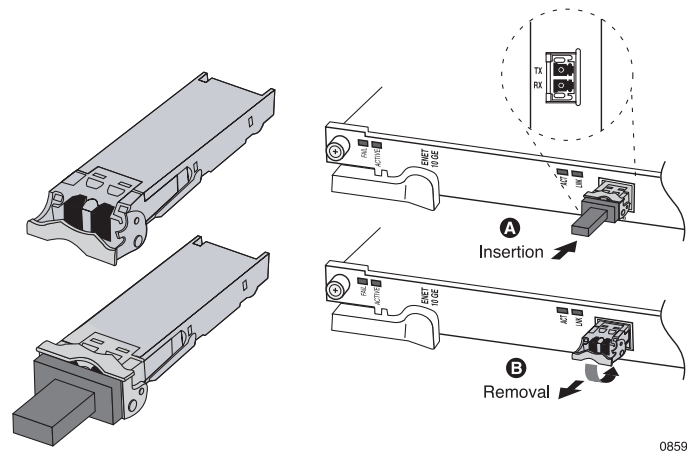


Figure 27 XFP Transceiver



Caution!

Risk of severe damage to your eyes. Do not stare into the connector or directly view the laser beam emerging from the connector. 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. Keep the connectors covered until you are ready to connect the fiber-optic cables.

Stop!

Risk of data loss. Install only the transceivers approved by Ericsson. You can corrupt the system if you attempt to install transceivers have not been tested with supported line cards.

Stop!

Risk of ESD damage. Always use an ESD wrist or ankle strap when handling a transceiver. Transceivers contain electrostatic sensitive devices. Avoid touching its connector pins.

To remove a transceiver of any type:

1. Shut down all activity on the port with the transceiver you want to replace. See *Command List* Reference [5].
 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 step on a cable or twist it when connecting it to or disconnecting it from an line card.

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



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

To install a transceiver of any type:

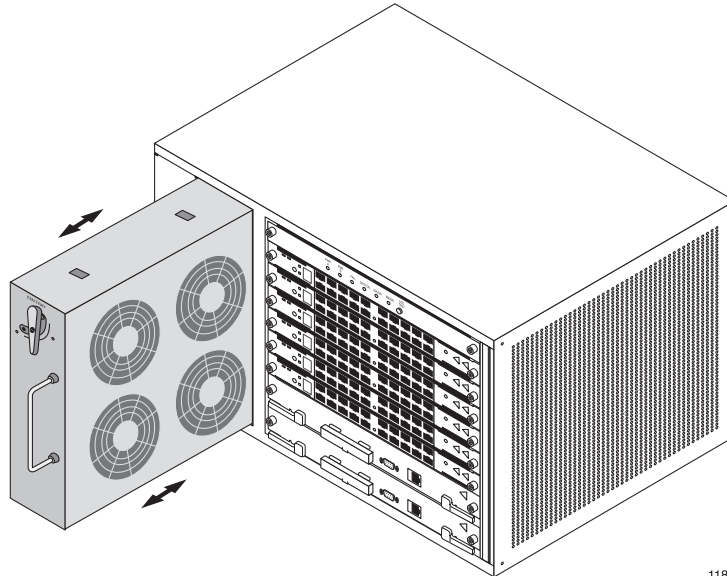
1. Put on an antistatic wrist strap, and attach it to an appropriate grounded surface; an ESD convenience jack. Do not attach the wrist strap to a painted surface.
2. Ensure that the latching mechanism is closed.
3. With the transceiver connectors aligned with the RX and TX labels on the front panel of the line card 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.

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 Replacing the Fan Tray



1185

Figure 28 Replacing the Fan Tray

You do not have to power off the system to remove the fan tray. The SmartEdge 600 router can operate without the fans for up to three minutes.

Caution!

Risk of equipment damage. Always replace the fan tray or air filter within three minutes of its removal. A working fan tray and air filter are required by the SmartEdge 600 chassis for it to operate without overheating system components.

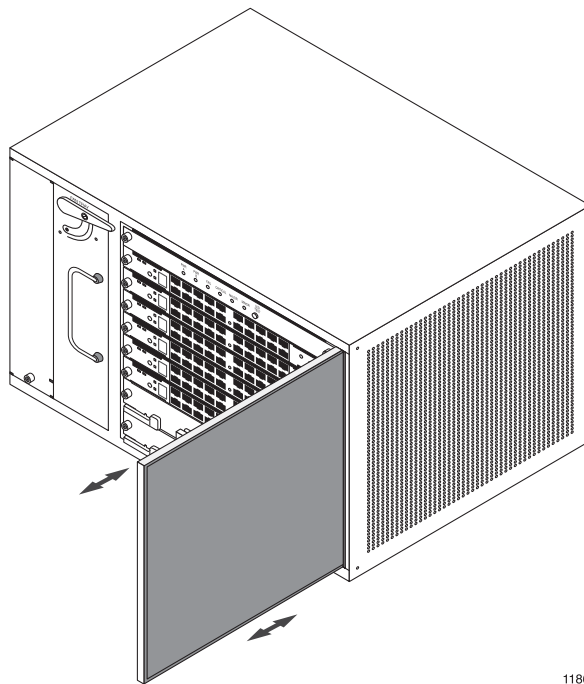
To replace the fan tray:

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.
2. Rotate the locking lever down to the unlocked position.
3. Remove the fan tray.
4. Install the new fan tray from the front or rear of the chassis.
5. Rotate the locking lever up to the locked position.
6. Check the LED on the front of the fan tray; the ENGAGED LED should be lit.
7. Check the LEDs on the alarm card; the FAN FAIL LED should not be lit.

8. Replace the air filter and update the service date; see Replacing 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.

4.6 Replacing the Air Filter



1186

Figure 29 Air Filter

The SmartEdge 600 router has a built-in air filter that is used with the fan tray to cool the system. The filter is mounted at the right side of the chassis. We recommend that you change this filter every six months (or more often, if required) to ensure the correct airflow through the chassis.

Caution!

Risk of equipment damage. Always replace the fan tray or air filter within three minutes of its removal. A working fan tray and air filter are required by the SmartEdge 600 chassis for it to operate without overheating system components.

To replace the air filter:



1. Remove the current filter by attaching the correct hook or loop side of the new filter to the old one and then pushing it out, toward front or rear. Hook and loop fasteners along the edges of the filter will keep the old filter suspended until you remove it.

Caution!

Risk of equipment damage. During air filter replacement avoid contamination entering the chassis.

2. For single-sided access (front or rear), attach the correct hook or loop side of the new filter to the old one and then use the new filter to pull out the old one.
- Note:** If a cable management bracket is stalled on the right side of the chassis, you must remove the air filter from the rear.
3. Insert the replacement filter by pushing it into place.
 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.

4.7 Remove and Replace an AC Power Module

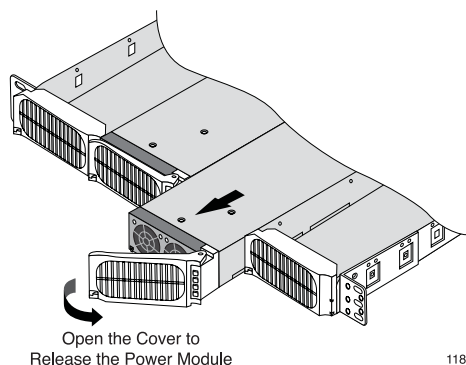


Figure 30 Removing an AC Power Module

To remove an AC power module:

1. Open the front ejector (fan cover) of the power module by squeezing the latch spring and pulling open the ejector.

2. Slide the module from the shelf.

To replace the AC power module:

1. Open the front ejector (fan cover) of the power module by squeezing the latch spring and pulling open the ejector.

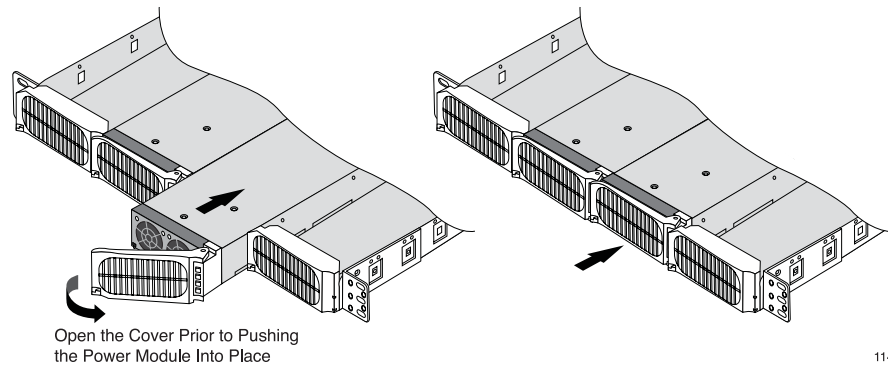


Figure 31 *Inserting an AC Power Module*

2. Insert a module into one of the two center slots (2 and 3) in the shelf.
3. Push the module in until the right side of the ejector engages the receptacle slot in the shelf wall.
4. Push closed the ejector lever until the module spring latch locks on the ejector to seat the module.



5 System Description

The SmartEdge 600 router is a carrier-class product with an architecture that supports packetized traffic. It 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).

5.1 Specification Summary

Table 92 General Specifications

Specification	Value
Synchronization	<ul style="list-style-type: none"> Line timing mode (various line cards) Internal timing mode External timing mode
Protection type	<ul style="list-style-type: none"> Power: independent dual-feed XCRP4 Controller: 1:1 External timing: 1:1
Operations connections	<ul style="list-style-type: none"> Management workstation (ENET): 10/100Base-T Console terminal (Craft): RS-232 Alarms: audible and visual: critical, major, minor, ACO

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 Card Interfaces

Table 93 SmartEdge 400 Line Cards

Type of Card	Number of Cards	Number of Ports ⁽¹⁾	Low-Density Version	Low-Density Ports ⁽²⁾	Protection Ratios ⁽³⁾
ATM OC-3c/STM-1c (8-port)	6	8	No	—	None, 1+1 APS
ATM OC-12c/STM-4c (2-port)	6	2	No	—	None, 1+1 APS
POS OC-3c/STM-1c (8-port)	6	8	No	—	None, 1+1 APS

**Table 93 SmartEdge 400 Line Cards**

Type of Card	Number of Cards	Number of Ports ⁽¹⁾	Low-Density Version	Low-Density Ports ⁽²⁾	Protection Ratios ⁽³⁾
POS OC-12c/STM-4c (4-port)	6	4	No	—	None, 1+1 APS
POS OC-48c/STM-16c (4-port)	6	4	No	—	None, 1+1 APS
OC-192c/STM-64c (1-port)	6	1	No	—	None, 1+1 APS
Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port)	6	8, 2 4, 1	No	—	None, 1+1 APS
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	6	60, 2	No	—	None
Gigabit Ethernet 1020 (10-port)	6	10	No	—	None
Gigabit Ethernet 1020 (20-port) ⁽⁴⁾	3 ⁽⁵⁾	20	No	—	None
Gigabit Ethernet (5-port)	6	5	No	—	None
Gigabit Ethernet DDR (10-port)	6	10	No	—	None
Gigabit Ethernet DDR (20-port) ⁽⁴⁾	6	20	No	—	None
10 Gigabit Ethernet (1-port)	6	1	No	—	None
10 Gigabit Ethernet/OC-192-c DDR (1-port)	6	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 and 20-port GE DDR cards.

(5) The 20-port GE1020 card requires two adjacent slots.

5.4 Advanced Services Engine Card

Table 94 Advanced Services Engine Card

Type of Card	Number of Cards	Protection Ratios
Advanced Services Engine	6	None

5.5 SmartEdge Storage Engine Card

Table 95 SmartEdge Storage Engine Card

Type of Card	Number of Cards	Number of Hard Disk Drives
SmartEdge Storage Engine	6	2



5.6 Packet Mesh Architecture

The SmartEdge 600 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. Each line card uses a combination of a Packet Mesh ASIC (PMA) and Packet Processing ASICs (PPAs) to perform this function.

5.7 Redundancy

Redundancy features include:

- Dual power connections, each with separate A-side and B-side power connections
- 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.

5.8 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.

5.9 System Status

The system status LEDs are located on the fan tray:

- Power sources (A and B)
- Fan
- Alarm cutoff (ACO)



5.10 SmartEdge 600 Router

The SmartEdge 600 router is NEBS compliant and designed for mounting in a standard 19- or 23-inch rack.

5.10.1 Chassis Card Cage

The SmartEdge 600 router has a card cage with eight slots. Two slots are dedicated to the controller cards and six slots are available for a flexible combination of line cards.

All cards are installed at the front of the chassis. A cable tray provides the means to route the cables from the front of the chassis to the external equipment.

The rear of the chassis has connectors for alarm outputs, status inputs, dual external timing inputs for synchronization, and dual RS-232 ports for local connections.

Note: The operating system does not support the alarm, status, and RS-232 dial-up modem ports.

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

5.10.2 Chassis Cooling

Cooling for the chassis is provided by the fan tray installed directly above the card slots. Six fans provide the needed airflow from the bottom of the chassis to the top with exhaust at the rear of the chassis. An air filter is installed below the card cage.

A single fan failure does not impact the operation of the system; however, to prevent overheating, the unit must be replaced as soon as possible.

Caution!

Risk of equipment damage. Every slot must have a controller, line, or blank card installed in it. SmartEdge 600 cards can be damaged by lack of cooling when the chassis has empty slots.

5.10.3 Chassis Power

The SmartEdge 600 router power architecture has one power zone with primary (A) and backup (B) sources. For a fully redundant power configuration, both sources must be connected.



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	8-port OC-3c/STM-1c ATM, SFP transceivers	ATM OC3/ STM-1	SmartEdge 400/800/1200—6.1.5 SmartEdge 600—6.2.1 SmartEdge 1200H—6.3.1
ROA1283243/2	8-port OC-3c/STM-1c ATM, SFP transceivers	ATM OC3/ STM-1	SmartEdge 400/600/800/1200/1200H —6.2.1.10, 6.4.1.4, 6.5.1.5, and 11.1.2
ROA1283281/1	2-port OC-12c/STM-4c ATM Enhanced, SFP transceivers	ATM OC12 STM-4	SmartEdge 400/600/800/1200/1200H —6.4.1
ROA1283281/2	2-port OC-12c/STM-4c ATM Enhanced, SFP transceivers	ATM OC12 STM-4	SmartEdge 400/600/800/1200/1200H —6.5.1.5 and 11.1.2
POS			
ROA1283250/1	8-port OC-3c/STM-1c POS using SFP Transceivers	POS OC3/ STM-1	SmartEdge 400/600/800/1200/1200H —6.3.1
ROA1283249/1	4-port OC-12c/STM-4c POS using SFP Transceivers	POS OC12/ STM-4	SmartEdge 400/600/800/1200/1200H —6.3.1
ROA1283251/1	4-port OC-48c/STM-16c POS using SFP Transceivers	POS OC48/ STM-16	SmartEdge 400/600/800/1200—6.2.1 SmartEdge 1200H—6.3.1
ROA1283202/1	1-port OC-192c/STM-64c POS using XFP Transceiver ⁽¹⁾	POS OC-192c STM-64c	SmartEdge 400/800/1200—6.1.3 SmartEdge 600—6.2.1 SmartEdge 1200H—6.3.1
Channelized OC			



Table 96 Line Card Order Numbers

Order Numbers	Description	Front Panel Label	Earliest Release
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 400/600/800/1200/1200H —11.1.1
FE-GE			
ROA1283186/1	60-port FE-GE card using RJ-45 connectors ⁽⁴⁾	60 ENET 10/100 2 ENET 100/1000	SmartEdge 400/800/1200—6.1.3 SmartEdge 600—6.2.1 SmartEdge 1200H—6.3.1
ROA1283184/1	10-port GE 1020 card using SFP transceivers	GE1020 Enet 1Gb	SmartEdge 400/800—4.0.5 SmartEdge 600—6.2.1 SmartEdge 1200—6.1.1 SmartEdge 1200H—6.3.1
ROA1283185/1	20-port GE 1020 card using SFP transceivers ⁽⁵⁾	GE1020 20 Port Gigabit Ethernet	SmartEdge 400/800—4.0.5 SmartEdge 600—6.2.1 SmartEdge 1200—6.1.1 SmartEdge 1200H—6.3.1
ROA1283241/1	5-port GE card using SFP transceivers	ENET 1Gb	SmartEdge 400/800/1200—6.1.4 SmartEdge 600—6.2.1 SmartEdge 1200H—6.3.1
ROA1283411/1	10-port GE DDR-based card using SFP transceivers	ENET SD 1Gb	SmartEdge 400/600/800/1200/1200H —6.4.1
ROA1283240/1	20-port GE DDR card using SFP transceivers ⁽⁵⁾⁽⁶⁾	ENET 100/1000	SmartEdge 600—6.2.1 SmartEdge 1200—6.1.5 SmartEdge 1200H—6.3.1
ROA1283183/1	1-port 10 GE card using XFP transceiver	ENET 10GE	SmartEdge 400/800—4.0.5 SmartEdge 600—6.2.1 SmartEdge 1200—6.1.1 SmartEdge 1200H—6.3.1



Table 96 Line Card Order Numbers

Order Numbers	Description	Front Panel Label	Earliest Release
ROA1283242/1 ⁽⁶⁾⁽⁷⁾	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 ⁽⁸⁾	1-port 10 GE/OC-192c DDR-based card using XFP Transceiver	ENET 10Gb POS OC-192c/ STM-64c	SmartEdge 400/600/800/1200/1200H—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) 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 DDR cards.

(6) This card is not supported on the SmartEdge 400 and 800 routers.

(7) The OTN-DWDM XFP transceivers can only be installed in ports 1 and 4 of this line card.

(8) 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	—
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	—



Table 97 SmartEdge Line Cards

Line Card Type and Card Description	Physical Ports	Low-Density Version	Low-Density Port Numbers
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 ase2 ⁽⁴⁾	4 ⁽⁷⁾ (2 for each ASP) ⁽⁸⁾	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 GE1020 and 20-port GE DDR cards.

(4) This card is not supported on the SmartEdge 400 and 800 routers.

(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 Cards

The controller card type designation for the SmartEdge 600 router is XCRP4. Controller cards are installed in slots 7 and 8 in the router

The XCRP4 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	<ul style="list-style-type: none"> • SONET/SDH software • SmartEdge OS software • NetOp EMS software • External timing (synchronization) software
Main memory (total)	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
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 ⁽²⁾

(1) The SmartEdge OS does not support the transmission of data to the external equipment.

(2) Support for 1 Gbps depends on the release of the SmartEdge OS.

6.2.1 Controller Card LEDs

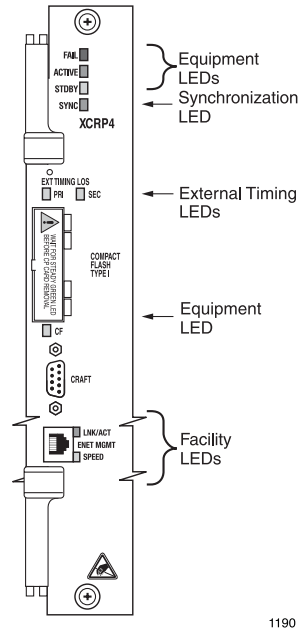


Figure 32 LEDs on Controller Cards

Each 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	<ul style="list-style-type: none"> 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.
	Off	None	No read or write operation on the external storage device is in progress.

(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.

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.

Stop!

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.

Stop!

Risk of equipment failure. Always enter the `unmount /md` command before removing a CF card. 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.

**Table 100 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.

Table 101 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.
EXTERNAL TIMING LOS SEC	On	Yellow	The secondary input signal from the external equipment has been configured but is not present.
	Off	None	The secondary input signal has not yet been configured or has been configured and is present.

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

Synchronous Dynamic Random Access Memory (SDRAM) is used by the SmartEdge OS 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 NVRAM battery on the XCRP4 Controller card is rechargeable; it is recharged from the power supplied to the SmartEdge router during normal operations. The battery typically lasts more than two years when fully charged and without benefit of being recharged by being powered on.

6.2.2.4 System Clock

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 cards 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.

6.2.2.5 External Timing Connection

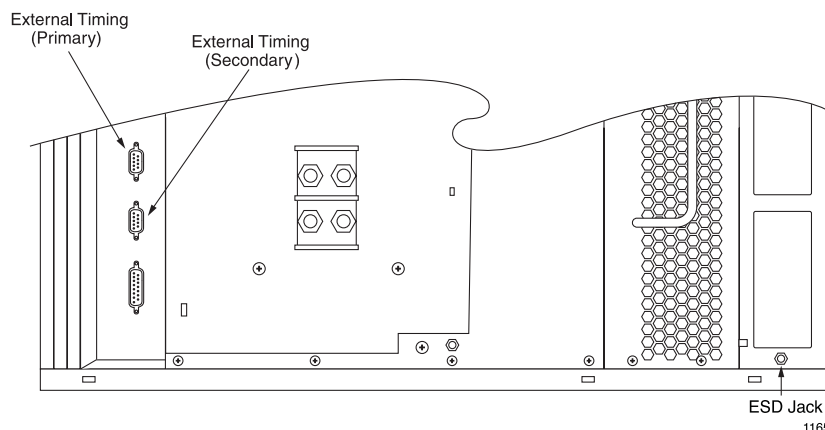


Figure 33 External Timing Cables Connections

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

Note: For the XCRP4 Controller card, the type of interface is software selectable. The SmartEdge OS does not support transmission of data to another SmartEdge router or any other 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.

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 33 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. Support for the other ports depends on the release of the operating system.

6.2.2.6 Internal Storage for SmartEdge OS files

A controller card has one or two CF cards (Type I), which store SmartEdge OS 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. Use only the CF cards provided by Ericsson. You can corrupt the system if you attempt to install a CF card not obtained from Ericsson because these items have not been tested with the SmartEdge router.

A controller card has an external slot on the front panel in which you can install an optional Type I 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. The CRAFT 2 port is the only enabled 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 600 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 (ROA1283243/1) 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.

The new version 8-port ATM OC-3c/STM-1c card (ROA1283243/2) is designed to support new log messages for memory errors. For this new card to work properly with 6.2.1.10, 6.4.1.4, 6.5.1.5, and 11.1.2 software releases, a manual upgrade of the Field-Programmable Gate Array (FPGA) image version is required. For information on how to upgrade the FPGA on this card, see “Upgrade the Line Card FPGAs” in *Installing the SmartEdge OS* for your platform.

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 102 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⁾	<ul style="list-style-type: none">• None• 1+1 APS: Bidirectional; revertive or nonrevertive switching	<ul style="list-style-type: none">• 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 102 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

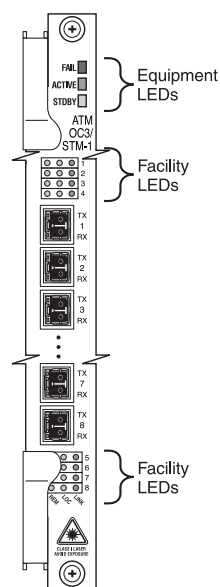


Figure 34 Status LEDs on 8-Port ATM OC-3c/STM-1c Card

**Table 103 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	At least on port on the card carries: <ul style="list-style-type: none"> • Normal traffic on a configured non-APS protection port. • Either TX or RX active traffic on a configured APS working or protection port. • No port configuration (special case).
	Off	None	All ports are configured as APS working or protection ports but carry no traffic. All traffic channels are in Standby mode.
STDBY	On	Yellow	At least one of the ports on this card has been configured as an APS protection port. ⁽²⁾
	Off	None	None of the ports on this card has been configured as an APS 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 104 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.

The new version 2-port ATM OC-12c/STM-4c card (ROA1283281/2) is designed to support new log messages for error-correcting code (ECC) errors. For this new card to work properly with 6.5.1.5 and 11.1.2 software releases, a manual upgrade of the Field-Programmable Gate Array (FPGA) image version is required. For information on how to upgrade the FPGA on this card, see “Upgrade the Line Card FPGAs” in *Installing the SmartEdge OS* for your platform.

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 105 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)	<ul style="list-style-type: none"> • None • 1+1 APS: Bidirectional; reverstive or nonrevertive switching 	<ul style="list-style-type: none"> • None • 1+1 APS: Bidirectional; reverstive or nonrevertive switching 	<ul style="list-style-type: none"> • 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

**Table 105 2-Port ATM OC-12c/STM-4c Line Card Specifications**

Specification	SR-0	IR-1 ⁽¹⁾	LR-1
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	1280 to 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

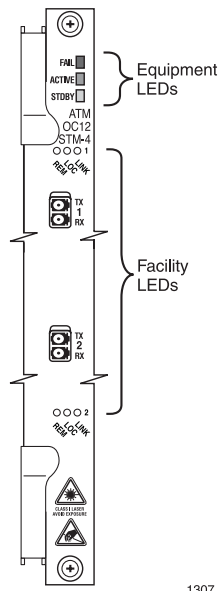


Figure 35 LEDs on 2-Port ATM OC-12c/STM-4c Line Card

Table 106 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	At least on port on the card carries: <ul style="list-style-type: none"> Normal traffic on a configured non-APS protection port. Either TX or RX active traffic on a configured APS working or protection port. No port configuration (special case).
	Off	None	All ports are configured as APS working or protection ports but carry no traffic. All traffic channels are in Standby mode.
STDBY	On	Yellow	At least one of the ports on this card has been configured as an APS protection port. ⁽²⁾
	Off	None	None of the ports on this card has been configured as an APS 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 107 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.

**Table 107 Facility LEDs on 2-Port ATM OC-12c/STM-4c Line Card**

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

6.5 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 108 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⁾	<ul style="list-style-type: none"> • None • 1+1 APS: Bidirectional; revertive or nonrevertive switching 	<ul style="list-style-type: none"> • 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



Table 108 8-Port POS 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) 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

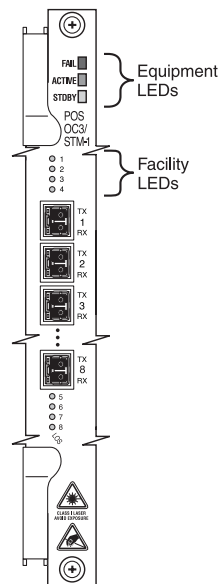


Figure 36 Status LEDs on 8-Port POS OC-3c/STM-1c Card

**Table 109** 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	At least on port on the card carries: <ul style="list-style-type: none"> • Normal traffic on a configured non-APS protection port. • Either TX or RX active traffic on a configured APS working or protection port. • No port configuration (special case).
	Off	None	All ports are configured as APS working or protection ports but carry no traffic. All traffic channels are in Standby mode.
STDBY	On	Yellow	At least one of the ports on this card has been configured as an APS protection port. ⁽²⁾
	Off	None	None of the ports on this card has been configured as an APS 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 110 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: <ul style="list-style-type: none"> • 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 111 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⁾	<ul style="list-style-type: none"> None 1+1 APS: Bidirectional; revertive or nonrevertive switching 	<ul style="list-style-type: none"> None 1+1 APS: Bidirectional; revertive or nonrevertive switching 	<ul style="list-style-type: none"> 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	1280 to 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).

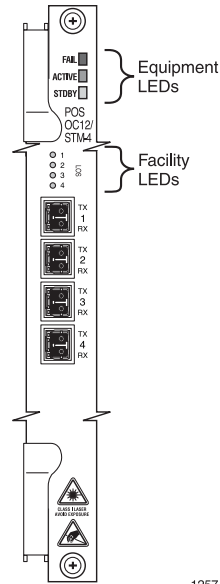
(4) The link power budget is calculated using (minimum output power) – (minimum sensitivity) – (optical path power penalty); power penalty is 1.0 dB.

(5) Measured 20 dB down from center wavelength.



6.6.1

Status LEDs



1257

Figure 37 Status LEDs on 4-Port POS OC-12c/STM-4c Card

Table 112 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	At least on port on the card carries: <ul style="list-style-type: none">• Normal traffic on a configured non-APS protection port.• Either TX or RX active traffic on a configured APS working or protection port.• No port configuration (special case).
	Off	None	All ports are configured as APS working or protection ports but carry no traffic. All traffic channels are in Standby mode.
STDBY	On	Yellow	At least one of the ports on this card has been configured as an APS protection port. ⁽²⁾
	Off	None	None of the ports on this card has been configured as an APS 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 113 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: <ul style="list-style-type: none"> • 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 114 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 Mbps	2488.32 Mbps	2488.32 Mbps
Protection (facility) ⁽¹⁾⁽²⁾	<ul style="list-style-type: none"> • None • 1+1 APS: Bidirectional; revertive or nonrevertive switching 	<ul style="list-style-type: none"> • None • 1+1 APS: Bidirectional; revertive or nonrevertive switching 	<ul style="list-style-type: none"> • 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 114 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.

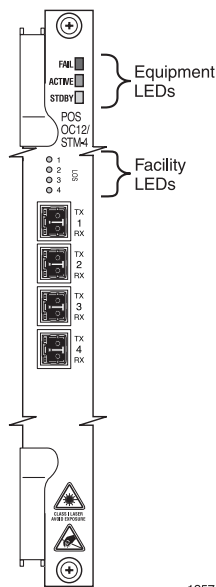
(3) The link power budget is calculated using (minimum output power) – (minimum sensitivity).

(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**



1257
Figure 38 Status LEDs on 4-Port POS OC-48c/STM-16c Card

Table 115 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	At least on port on the card carries: <ul style="list-style-type: none">• Normal traffic on a configured non-APS protection port.• Either TX or RX active traffic on a configured APS working or protection port.• No port configuration (special case).
	Off	None	All ports are configured as APS working or protection ports but carry no traffic. All traffic channels are in Standby mode.
STDBY	On	Yellow	At least one of the ports on this card has been configured as an APS protection port. ⁽²⁾
	Off	None	None of the ports on this card has been configured as an APS 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 116** 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: <ul style="list-style-type: none">• 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 117 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 117 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

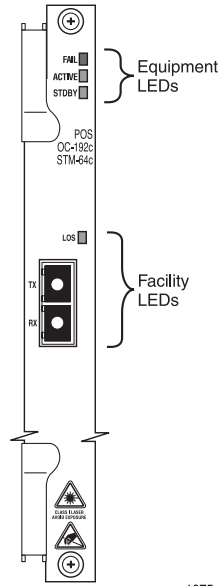


Figure 39 Status LEDs on 1-Port OC-192c/STM-64c Card

Table 118 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 119 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: <ul style="list-style-type: none">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-3/OC-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/STM-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 Bidirectional 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 120 *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 121 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⁾	<ul style="list-style-type: none"> None 1+1 APS: Bidirectional; revertive or nonrevertive switching 	<ul style="list-style-type: none"> 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 122 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⁾	<ul style="list-style-type: none"> None 1+1 APS: Bidirectional; revertive or nonrevertive switching 	<ul style="list-style-type: none"> None 1+1 APS: Bidirectional; revertive or nonrevertive switching 	<ul style="list-style-type: none"> 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).

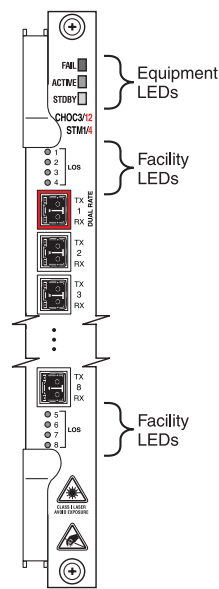
(4) The link power budget is calculated using (minimum output power) – (minimum sensitivity) – (optical path power penalty); power penalty is 1.0 dB.

(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



1404

Figure 40 LEDs on 8/4-Port Channelized OC-3/STM-1 or 2/1-Port Channelized OC-12/STM-4 Card

Table 123 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	At least on port on the card carries: <ul style="list-style-type: none"> Normal traffic on a configured non-APS protection port. Either TX or RX active traffic on a configured APS working or protection port. No port configuration (special case).
	Off	None	All ports are configured as APS working or protection ports but carry no traffic. All traffic channels are in Standby mode.
STDBY	On	Yellow	At least one of the ports on this card has been configured as an APS protection port. ⁽²⁾
	Off	None	None of the ports on this card has been configured as an APS 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 124 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: <ul style="list-style-type: none">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 125 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**

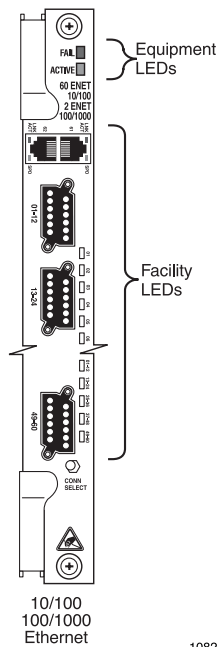


Figure 41 Status LEDs on 60-Port Fast Ethernet Card

Table 126 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 127 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 128 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 129 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 130 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 131 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 131 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 132 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 132** 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				

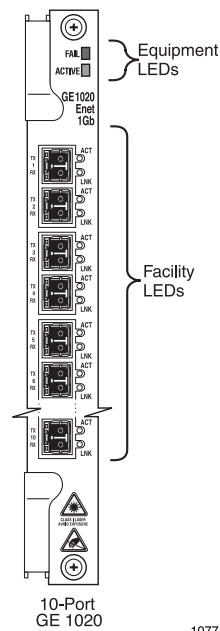
(1) The ranges of DWDM ITU channels are application specific.

(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 42** Status LEDs on 10-Port Gigabit Ethernet 1020 Card**Table 133** 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 133 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 134 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 135 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 136 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 137 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 137 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

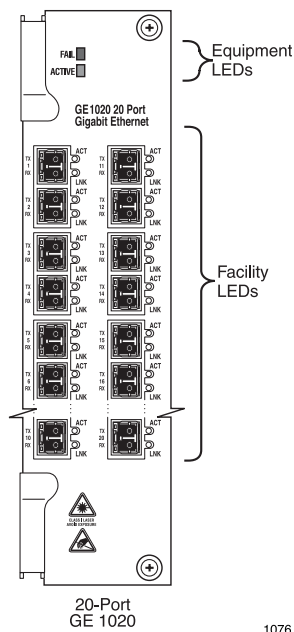


Figure 43 Status LEDs on 20-Port Gigabit Ethernet 1020 Card

Table 138 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 139 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 140 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 140 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 141 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 141 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 142 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 142 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

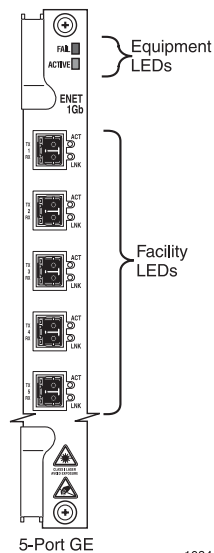


Figure 44 LEDs on 5-Port Gigabit Ethernet Card

Table 143 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 144** 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 145 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 146 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 146 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 147 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 147 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

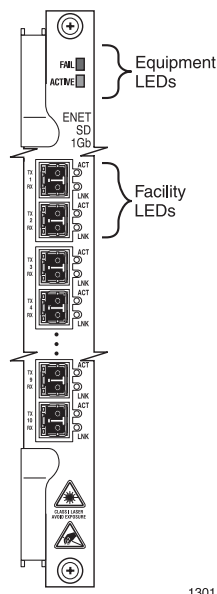


Figure 45 LEDs on 10-Port Gigabit Ethernet DDR Card

Table 148 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 148** 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 149 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 20-Port Gigabit Ethernet DDR Card

The 20-port Gigabit Ethernet (GE) DDR card is designed as a subscriber-facing module and as well as a network uplink module. This third-generation PPA card has an increased minimum memory capacity of 20 Gbps. It also has increased port density compared with previous GE cards. It supports up to 48K circuits per card.

Note: The 20-Port Gigabit Ethernet DDR card is not supported on the SmartEdge 400 and SmartEdge 800 routers.

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:

- 100Base-FX—Short Reach
- 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



Note: When this 1000Base-TX SFP transceiver is used in the 20-port GE DDR 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.

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 150 20-Port Gigabit Ethernet DDR Card Specifications — 100Base-FX

Specification ⁽¹⁾	FX
Number of ports	20
Speed	100 Mbps
Interface	100Base-FX
Link power budget ⁽²⁾	13.5 dB
Nominal wavelength	1310 nm
Connector type	LC
Cable type	MMF
Transceiver type	SFP
Compliance	SFF-8472 and INF-8074i
Transmitter	
Optical output power	–19.0 dBm (min) –14.0 dBm (max)
Center wavelength range	1270 to 1380 nm
Extinction ratio	10.0 dB (min)
Center wavelength	1310 nm
Spectral width	140.0 nm (max) (RMS)
Receiver	
Wavelength range ⁽³⁾	1270 to 1380 nm

**Table 150 20-Port Gigabit Ethernet DDR Card Specifications — 100Base-FX**

Specification ⁽¹⁾	FX
Sensitivity	–32.5 dBm (min) –14.0 dBm (max)
Overload level (max)	0.0 dBm

(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) Link power budget is calculated using (minimum output power) – (minimum sensitivity).

(3) Receiver sensitivity is degraded 1.0 dB for wavelengths \leq 1570 nm.

Table 151 20-Port Gigabit Ethernet Card DDR 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 20-port GE DDR 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 \geq 1570 nm.



Table 152 20-Port Gigabit Ethernet DDR 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 153 20-Port Gigabit Ethernet Card DDR 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 153 20-Port Gigabit Ethernet Card DDR 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 154 20-Port Gigabit Ethernet Card DDR Specifications — 1000Base CWDM and DWDM

Specification ⁽¹⁾	CWDM	DWDM
Number of ports ⁽²⁾	20	20
Speed	1 Gbps	1 Gbps
Protection	None	None
Interface	1000Base-CWDMnnnn ⁽³⁾	1000Base-DWDMITUnn ⁽⁴⁾
Line code	8B/10B	8B/10B
Flow control negotiation ⁽⁵⁾	Yes	Yes
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)



Table 154 20-Port Gigabit Ethernet Card DDR Specifications — 1000Base CWDM and DWDM

Specification ⁽¹⁾	CWDM	DWDM
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) ⁽⁶⁾	0.30 nm (max)
Receiver		
Wavelength range ⁽⁷⁾	1260 to 1620 nm	1260 to 1620 nm
Sensitivity	−23.0 dBm (min)	−24.0 dBm (min)
Overload level	−7.0 dBm (max)	−9.0 dBm (max)

(1) Data for coarse wavelength-division multiplexing (CWDM) and dense wavelength-division multiplexing (DWDM) transceivers can vary slightly, depending on the manufacturer.

(2) Each optical port has separate connectors for the transmit (Tx) and receive (Rx) circuits.

(3) CWDM nominal wavelengths are 1471, 1491, 1511, 1531, 1551, 1571, 1591, and 1611; specified in ITU G.694.2.

(4) The range of 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.

(5) The extent of the support for flow control depends on the release of the SmartEdge OS.

(6) Measured 20 dB down from the center wavelength peak.

(7) Receiver sensitivity is degraded 1.0 dB for wavelengths ≥ 1570 nm.

6.15.1

Status LEDs

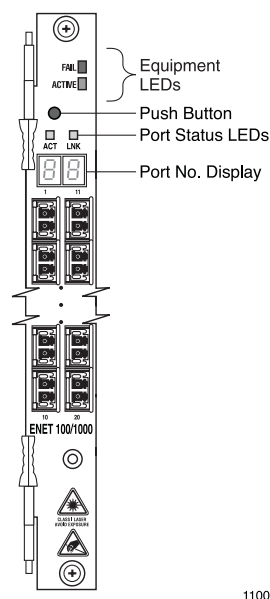


Figure 46 LEDs on 20-Port Gigabit Ethernet DDR Card



In addition to the LEDs, the 20-port GE DDR card also has a push button and a 2-digit port number display on its faceplate:

- The push button allows the users to cycle through the ports and select the one which status is displayed in the port no. display.
- The port no. display indicates which of the 20 ports status is being displayed in the port status LEDs.

The equipment LEDs indicate the current status of the card and port status LEDs indicate the state of a port.

Table 155 LINK LEDs on 20-Port Gigabit Ethernet DDR 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 156 Facility LEDs on 20-Port Gigabit Ethernet 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.

6.16 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 157 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

**Table 157 1-Port 10 Gigabit Ethernet Card Specifications**

Specification	SR	LR	ER	ZR ⁽¹⁾
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 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
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.

6.16.1

Status LEDs

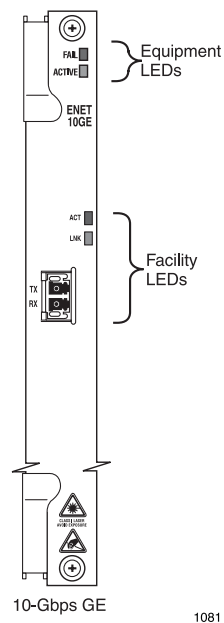


Figure 47 LEDs on 1-Port 10 Gigabit Ethernet Card

Table 159 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 160 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.

6.17

4-Port 10 Gigabit Ethernet DDR Card

The 4-port 10GE is a DDR-based card designed to address the requirements for applications and services with large volumes of network traffic. Each 4-port 10GE DDR card is optimized to deliver Ethernet services, operates as an uplink



to other switches and routers in the network or for interconnectivity between two SmartEdge routers.

This PPA3-based card has an increased port density compared with previous 10GE cards. It supports up to 48K circuits per card. This 4-port 10GE DDR card is capable of a maximum throughput of 20 Gbps. It can be used in ingress oversubscription mode at a maximum of 2 to 1 (40 Gbps over four 10GE faceplate ports; 20 Gbps within the card and across the backplane). Ports on this card can be configured in one of two ingress oversubscription modes for incoming traffic: priority-based packet discard for traffic from trusted networks and random-based packet discard from unfiltered nontrusted networks.

To allow for optimal operation in cases of ingress oversubscription, generation of Ethernet PAUSE frames for receive flow control purposes is automatically disabled for all ports on a 4-port 10GE DDR card whenever three or more ports on the same card are placed in operation using the `no shutdown` command.

Note: The 4-Port 10 Gigabit Ethernet DDR card is not supported on the SmartEdge 400 and SmartEdge 800 routers.

For more information on the `flow-control` CLI configuration command description, see *Command List* Reference [5].

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

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

- 10GE-SR—Short Reach
- 10GE-LR—Long Reach
- 10GE-ER—Extended Reach
- 10G-ZR—Extreme Reach
- 10GE-DWDM—Dense Wavelength Division Multiplexing
- OTN-DWDM—80 km OTU2e Transport

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 161 4-Port 10 Gigabit Ethernet XFP Specifications (10GE-Base SR, LR, ER, and ZR)

Specification	SR	LR	ER	ZR ⁽¹⁾
Number of ports	4	4	4	4
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 162 4-Port 10 Gigabit Ethernet Card Specifications — DWDM

Specification	DWDM ⁽¹⁾
Number of ports	4
Speed	10.3125 Gbps
Interface	DWDMnn ⁽²⁾
Link power budget ⁽³⁾	24 dB
Nominal wavelength	See the ITU DWDM Transmit Frequencies and Wavelengths table for ITU frequency and wavelength data
Connector type	LC

**Table 162 4-Port 10 Gigabit Ethernet Card Specifications — DWDM**

Specification	DWDM ⁽¹⁾
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 the ITU DWDM Transmit Frequencies and Wavelengths table 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 163 4-Port 10 Gigabit Ethernet Card Specifications — OTN-DWDM

Specification	OTN-DWDM ⁽¹⁾⁽²⁾⁽³⁾
Number of ports	4
Speed	11.0957 Mbps
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)



Table 163 4-Port 10 Gigabit Ethernet Card Specifications — OTN-DWDM

Specification	OTN-DWDM ⁽¹⁾⁽²⁾⁽³⁾
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
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.

6.17.1

Status LEDs

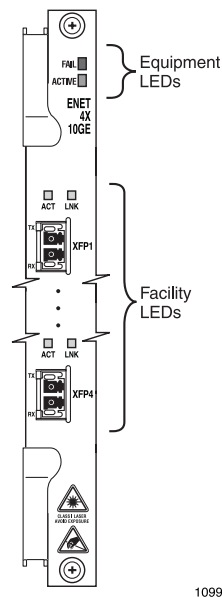


Figure 48 LEDs on 4-Port 10 Gigabit Ethernet DDR Card

Table 164 Equipment LEDs on 4-Port 10 Gigabit Ethernet 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 164** Equipment LEDs on 4-Port 10 Gigabit Ethernet 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) 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 165 Facility LEDs on 4-Port 10 Gigabit Ethernet 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.

6.18 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 166 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				

**Table 166 1-Port 10GE/OC-192c DDR Card Specifications — 10GE LAN-PHY**

Specification	SR	LR	ER	ZR ⁽¹⁾
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 167 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
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


Table 167 1-Port 10GE/OC-192c DDR Card Specifications — 10GE WAN-PHY

Specification	SW	LW	EW	ZW ⁽¹⁾
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 168 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	
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 169 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
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 170 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)
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.

6.18.1 Status LEDs

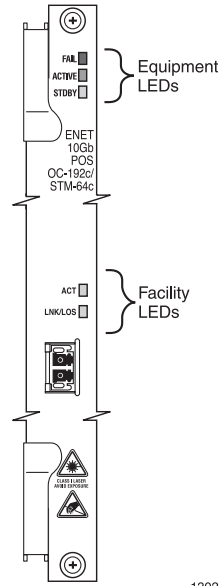


Figure 49 LEDs on 1-Port 10GE/OC-192c DDR Card

Table 171 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.
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 172 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			



Table 172 Facility LEDs on 1-Port 10GE/OC-192c DDR Card

Label	Activity	Color	Description
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) and Advanced Services Engine 2 (ASE2) cards provide advanced services beyond the terminating and forwarding capabilities provided by line cards. ASE-based services available in this release include Security Services, which provide support for IP Security (IPsec), Virtual Private Networks (VPNs), Application Traffic Management, and Distributed Control Plane (DCP).

Security features on the ASE and ASE2 cards protect the network at its edge, ensure minimal network disruption, and provide secure tunnels for end-user applications. Using Deep Packet Inspection (DPI), the ASE and ASE2 cards can identify and process point-to-point (P2P) applications, and provide a more efficient and secured network operation. You perform IP Security (IPsec) configuration, management, and reporting with NetOp Element Manager System (EMS).

The Distributed Control Plane solution on the ASE and ASE2 cards extends the functionality of the XCRP4 Controller card across the backplane mesh to support high signaling loads in CPG deployments. The ASE2 card utilizes a higher-performance processor and more memory to support multiple Evolved Packet Systems (EPS-C) process instances.

Note: The ASE2 card is not supported on the SmartEdge 400 and SmartEdge 800 routers.

Table 173 Order Numbers

Order Number	Description	Front Panel Label	Platform Supported
ROA1283239/1	Advanced Services Engine	Advanced Services Engine	SmartEdge 400, 600, 800, 1200, or 1200H
ROA1283753/1	Advanced Services Engine 2	Advanced Services Engine 2	SmartEdge 600, 1200, and 1200H

Table 174 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 175 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	—
Advanced Services Engine 2			

(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

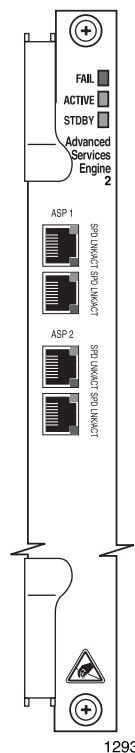


Figure 50 LEDs on ASE and ASE2 Cards

Table 176 Equipment LEDs

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 177 Facility LEDs

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 ASE and ASE2 Cards

Stop!

The Advanced Services Engine (ASE) card and the SmartEdge OS must be running the correct version of the boot ROM. 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, **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 card.

The following steps provide a general overview of how to configure a SmartEdge router for ASE and ASE2 cards:

1. Provision the router using either the NetOp Element Management System (EMS) or the `card card_type slot` CLI command.
2. To monitor the progress of provisioning the chassis, use the `show chassis` command.

Automatic processing copies the ASE and ASE2 software to the ASPs during provisioning. Reissue the command until it shows that the ASPs are up and running.

Note: The ASPs of both ASE and ASE2 cards must be configured under an ASP pool before the processor can be brought up.

For more information about ASE- and ASE2-related CLI commands, see *Advanced Services Configuration and Operation Using the SmartEdge OS CLI* (1/1543-CRA 119 1170/1).



3. To configure the ASE or ASE2 card for IPsec VPNs, you must use the NetOp EMS Security Services software.

For more information about using NetOp EMS Security Services software, see *Advanced Services Configuration and Operation Using the NetOp EMS Software* (1553-CRA 119 1170/1).

7.3 Operational Commands

- **show asp**—Shows the status of the ASPs after the card has been configured.

Note: ASP status is shown only if the card has been provisioned in the chassis and the XCRP is correctly configured.

- **reload card slot**—Shuts down and reloads ASE and ASE2 software to the ASPs.

Note: This operation can take several minutes to complete.

- **show tech-support card_type**—Displays information that helps your technical support representative resolve issues on the ASE or ASE2 card. The information contains software version information, system uptime, task information, configuration information, and the current state of each line card.
- **show chassis**—Shows slots that ASE and ASE2 cards are installed in and the state of the cards:

```
[local]Egle6#show 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 : ase2                   2 : ase2                    Yes              P1P2UR
7 : xcrp                   7 : xcrp                    Yes
```

[local]Egle6#

Note: Look for P1P2UR to verify that the card is up.

7.4 Operating Status

The ASE and ASE2 cards have 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.



8 SmartEdge Storage Engine

The SmartEdge Storage Engine (SSE) card is an internal services card designed to provide fault-tolerant file storage services for clients and various applications internal to the SmartEdge 600, SmartEdge1200, or SmartEdge 1200H router. This highly available services card provides Network File System (NFS) services to store large amounts of data.

The SSE card supports up to two one SCSI Attached Storage (SAS) hard disk drives drive (HDD) with an onboard SAS controller, Network Processor (NP), Packet Mesh ASIC (PMA), and other components. This card operates with the XCRP4 Controller cards and in any I/O card slot in the SmartEdge 600, SmartEdge1200, or SmartEdge 1200H router.

8.1 Hard Disk Drive Description

The SSE card houses one or two standard SAS 2.5" drives,drive, which areis a hot-swappable field-replaceable unitsunit that can be mounted in a the HDD slot on the SSE without removing the card. You can insert and remove an HDD without affecting the operation of the other HDD. These HDDs are separate devices and can be used to perform Redundant Array of Independent Disks (RAID1) redundancy to provide a highly fault tolerant system.

The HDDs have HDD has a storage capacity of 300 147 GB and are is controlled by CLI commands received from the Network Processor (NP) through the SAS controller.

The SAS controller is used by the NP to communicate to the SAS drives.drive. The controller handles all HDD communications and start-up procedures.

8.2 Specifications and LEDs

Table 178 SSE Card Specifications

Specification	Value
Number of HDD slots	Two ⁽¹⁾
Interface	Two SAS HDD modules ⁽²⁾
Connection type	Two 29-pin right angle SAS connectors
Compliance	IEEE 802.3, 802.3u, 802.3ab
Operating temperature	Table 45 lists descriptions of each temperature condition. Table 46 lists temperature ranges for card types.

**Table 178 SSE Card Specifications**

Specification	Value
Operating altitude (max)	0 to 10,000 ft (3,048m)
Operating relative humidity	5 to 90% RH (noncondensing)

(1) CPG supports a single hard disk for each SSE card

(2) CPG supports a single hard disk for each SSE card

Table 179 SAS Connector Pin Assignments

Pin #	Signal Name	Signal Type		Pin #	Signal Name	Signal Type
S1	Ground for SAS Primary	Ground		S8	Ground for SAS Secondary	Ground
S2	SAS Primary TP+	Output		S9	SAS Secondary TS+	Output
S3	SAS Primary TP-	Output		S10	SAS Secondary TS-	Output
S4	Ground for SAS Primary	Ground		S11	Ground for SAS Secondary	Ground
S5	SAS Primary RP-	Input		S12	SAS Secondary RS-	Input
S6	SAS Primary RP+	Input		S13	SAS Secondary RS+	Input
S7	Ground for SAS Primary	Ground		S14	Ground for SAS Secondary	Ground
P1	+3.3V	Power		P8	+5.0V	Power
P2	+3.3V	Power		P9	+5.0V	Power
P3	+3.3V Pre-charge	Power		P10	Ground	Ground
P4	Ground	Ground		P11	Ready LED, O.C. Output, LOL = 15 mA	Output
P5	Ground	Ground		P12	Ground	Power
P6	Ground	Ground		P13	+12.0V Pre-charge	Power
P7	+5.0V Pre-charge	Power		P14	+12.0V	Power
				P15	+12V	Power

Table 180 SSE Card Slot Data

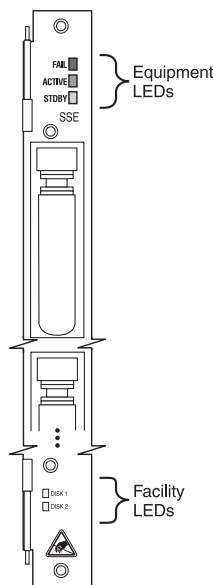
Type of Card and Card Description	Physical Slots ⁽¹⁾
SmartEdge Storage Engine	2 ⁽²⁾ HDD slots ⁽³⁾

(1) The SmartEdge OS does not support these ports directly.

(2) CPG supports a single hard disk for each SSE card

(3) Supported by the CLI commands received from the Network Processor (NP) through the SAS controller.

The SSE card provides 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 HDDs.



1144

Figure 51 LEDs on SSE Cards

Table 181 Equipment LEDs on the SSE 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 lit.

Table 182 Facility LEDs for the HDD on the SSE Card

Label	Color	Activity	Description
Disk 1 or Disk 2 Hard Disk	Green	On	The HDD is powered on.
	Green	Blinking	The HDD is in active mode.
	None	Off	The HDD is powered off.
	Yellow	On	The HDD can be removed for servicing.
	Yellow	Blinking	The HDD data is being synchronized to another HDD.
	None	Off	The HDD is in normal operation mode.



8.3 Provision and Configure the SSE Card

Configuring an SSE card involves provisioning the SSE card, and partitioning the disk, and setting up a redundancy scheme. For detailed information about how to configure and operate an SSE card, see *SSE Configuration and Operation Reference* [13].

8.4 SSE Operational Commands

The following are SSE operational commands:

- **clear disk sse counters**—Clears counters on the SSE in the specified slot or on the specified disk of the SSE card.
- **clear sse group counters**—Clears counters on the specified SSE group. This command does not persist over the following events:
 - SSE group switchover
 - XCRP switchover
 - card reload
 - system reload
 - disk removal
 - disk insertion
- **debug fsm group**—For field and development debugging of SSE group-specific operations.
- **debug fsm partition**—For field and development debugging of SSE partition-specific operations.
- **delete partition**—Removes the specified partition on an SSE disk. All data in the partition is deleted.

Note: This delete partition command cannot be executed if the partition is mounted on the XCRP or Advanced Services Engine (ASE) card.

- **diag on-demand**—Runs diagnostics on the SSE card in the specified slot. Before running diagnostics on the SSE card, make sure to disable the SSE card or the specified disk on the SSE card by using the shutdown command.
- **format sse**—Formats the specified disk on the SSE card, removing all user-configured partition and data.

Note: The SSE card cannot be bound to an SSE group when issuing **format sse** command.



- **reload card**—Shuts down the card for removal and reinsertion.
- **reload disk**—Shuts down the specified SSE disk and reloads the disk. This command is equivalent to removing and reinserting the disk.

Note: If you issue this reload disk command on the active card during data synchronization on any partition, a warning message appears.
- **show administrators**—Displays administrator sessions on a system.
- **show chassis**—Displays installed and configured cards and their status.
- **show chassis power**—Displays power allocation for the current SmartEdge chassis configuration.
- **show configuration**—Displays current configuration of the SmartEdge router or the contents of the previously saved configuration file on the local file system.
- **show configuration sse**—Displays current configuration of all SSE cards on the system.
- **show disk**—Displays disk info for the SSE card.
- **show disk sse counters**—Displays disk counters for the SSE card.
- **show hardware**—Displays information about the system hardware.
- **show sse group | partition**—Displays SSE group or SSE partition counters.
- **show sse group | partition counters**—Displays SSE group or SSE partition information.
- **show system alarm**—Displays system-level alarms.
- **show version**—Displays current version of the software running on the system.
- **sse group switch-over**—Performs a manual switchover on an SSE group configured with redundancy to the standby SSE card or disk. The standby SSE card or disk must be available.
- **telnet to SSE**—Accesses the SSE Linux shell via telnet from the XCRP's management interface for development and debugging purposes only.
- **UNIX/DOS Commands**—Allows you to utilize the UNIX/DOS commands supported on the CLI. For users with CLI admin privileges only.

For more information on SSE-related commands, see *SSE Configuration and Operation Reference* [13].



8.5 Operating Status

Equipment LEDs indicate the current status of the SSE card, and facility LEDs indicate the status of the HDDsHDD.



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] *Installing the SmartEdge OS*, 1/190 47-CRA 119 1170/1-V1
- [12] *Advanced Services Configuration and Operation Using the SmartEdge OS CLI*, 1/1543-CRA 119 1170/1
- [13] *SSE Configuration and Operation*, 86/1543-CRA 119 1170/1