

SmartEdge 1200H Router Hardware Guide

Release 12.1

INSTALLATION

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1 Site Preparation

Select the installation site for the SmartEdge® 1200H 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 III ⁽¹⁾
UL 60950-1	FCC part 15, Class A	EN61000-4-2	GR-63-CORE
CSA 22.2 No. 60950-1	ETSI EN300 386	EN61000-4-3	GR-1089-CORE
IEC60950-1	CISPR 22 Class A	EN61000-4-4	
EN60950-1	VCCI Class A	EN61000-4-5	
AS/NZS 60950-1	EN55022, Class A	EN61000-4-6	
	AS/NZA 3548 Class A	ETSI EN300 386	

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

Caution!

Risk of equipment damage. The intrabuilding ports of the line cards are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding ports of the line cards must not be metalically 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 in order to connect these interfaces metalically to OSP wiring.

Note: The SmartEdge 1200H is suitable for installation in Network Telecommunication Facilities and as part of the Common Bonding Network (CBN).

1.2 Electrical Specifications

Table 2 Electrical Specifications

Requirement	Value
Input nominal voltage	–48 VDC

**Table 2** *Electrical Specifications*

Requirement	Value
Input voltage range	–40 VDC to –57.5 VDC ⁽¹⁾
Input power, maximum	5856VA
Input power per feed, maximum	2928VA
Input current rating per feed	61A @ –48 VDC
Source DC power requirement	<ul style="list-style-type: none"> Sufficient to supply the rated input current Local codes apply
Number of input feeds	4: 2 from battery plant A and 2 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 *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⁾	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⁾	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) ⁽³⁾⁽⁴⁾	6.25	1.50
10 Gigabit Ethernet (1-port)	2.72	10.52 (max duration is 20 μs)
10 Gigabit Ethernet DDR (4-port) ⁽⁴⁾	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.

(2) By default, this card is licensed for use with the first four ports – ports 1-4 (ROA1283420/2); and requires a different license (ROA1283420/1) to enable the additional four ports – ports 5-8.

(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 in the SmartEdge 400 and SmartEdge 800 routers.



Table 4 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 (ASE)	2.68	1.20 (max duration is 120 ms)
Advanced Services Engine 2 (ASE2) ⁽¹⁾	3.84	1.40 (max duration is 120 ms)
SmartEdge Storage Engine (SSE) ⁽¹⁾	2.80	0.86 (max duration is 48 ms)
Fan tray (nominal speed)	2.20	1.80
Fan tray (high speed)	7.70	1.80

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

1.3 Electrical Power Connections

Note: The SmartEdge 1200H 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 1200H router power architecture has connectors for two power zones, each with primary and backup sources. Zone 1 powers slots 1 to 7; zone 2 powers slots 8 to 14. Both zones provide power to the fan tray. Both zones 1 and 2 must be connected for the chassis to be operational.

Primary sources are designated as A sources; backup sources are B sources. A1 refers to the primary power source for zone 1; B1 refers to the backup power source for zone 1. For a fully redundant power configuration, all four sources must be connected.

Table 5 Slot and Power Zone Configuration Options

Slot Power Configuration	Power Zone Configuration	Power Connection Options
All slots have redundant power.	Redundant power for zones 1 and 2	A1, B1, A2, B2
All slots have nonredundant power.	Nonredundant power for zones 1 and 2	A1, A2 or B1, B2 or A1, B2 or B1, A2
Slots 1 to 7 have nonredundant power. Slots 8 to 14 have redundant power.	Power to both zones Redundant power for zone 2 only	A1, A2, B2 or B1, A2, B2
Slots 1 to 7 have redundant power. Slots 8 to 14 have nonredundant power.	Power to both zones Redundant power for zone 1 only	A1, B1, A2 or A1, B1, B

Nonoperable conditions can occur for either or both of the following causes:

- The original power configuration was not fully redundant.



- Both the primary and the backup power source for a zone has failed.

Table 6 *Nonoperable Power Conditions*

Slot Power Condition	Power Zone Condition	Currently Available Power
Slots 1 to 7 have no power. Slots 8 to 14 have redundant power.	No power for zone 1 Redundant power for zone 2	A2, B2 A1 and B1 are not connected or have failed.
Slots 1 to 7 have no power. Slots 8 to 14 have nonredundant power.	No power for zone 1 Nonredundant power for zone 2	A2 or B2 A1 and B1 are not connected or have failed.
Slots 1 to 7 have redundant power. Slots 8 to 14 have no power.	Redundant power for zone 1 No power for zone 2	A1, B1 A2 and B2 are not connected or have failed.
Slots 1 to 7 have nonredundant power. Slots 8 to 14 have no power.	Nonredundant power for zone 1 No power for zone 2	A1 or B1 A2 and B2 are not connected or have failed.

Each power connection must be able to supply a minimum 61 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, is powered from a fuse panel, and 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.

1.4 Environmental Requirements

The installation area for the SmartEdge 1200H 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. A SmartEdge router can be damaged by lack of proper cooling and ventilation. To reduce the risk, never install the chassis in an unventilated area, and always ensure that cooling equipment sufficient to maintain a temperature of less than 104°F (40°C) is available.

Table 7 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)
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	5,856 watts (19,980 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

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

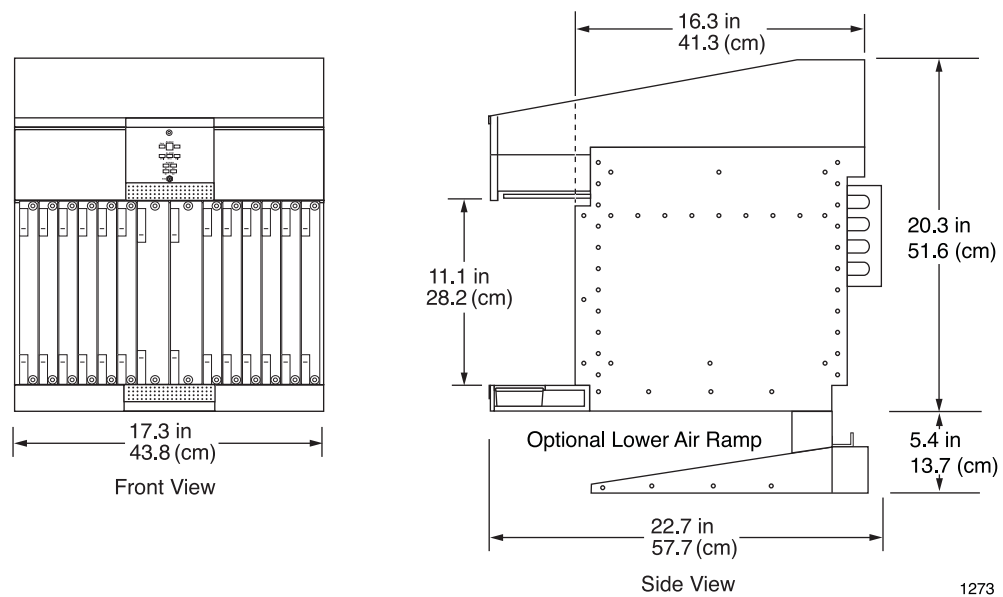
Table 8 SmartEdge 1200H Physical Specifications

Mechanical Specification	Value
1200H chassis dimensions	20.3 inches (51.6 cm) height 17.3 inches (43.8 cm) width 22.7 inches (57.7 cm) depth
Chassis weight ⁽¹⁾	55 lbs (25 kg) all card slots empty, ready for installation 110 lbs (50 kg) all card slots filled
Fan tray weight	16 lb (7.28 kg) - included in the chassis weight listed above
Chassis mounting	19- or 23-inch rack
Total slots	14
Line card slots	12

**Table 8 SmartEdge 1200H Physical Specifications**

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

(1) Included the fan tray weight of 16 lb (7.28 kg).

**Figure 1 SmartEdge 1200H Chassis Dimensions****Table 9 SmartEdge 1200H 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
POS OC-48c/STM-16c (4-port)	LC, front chassis access
OC-192c/STM-64c (1-port)	LC, front chassis access
Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port) ⁽¹⁾	LC, front chassis access
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	MRJ21 _{1/2} (FE ports), RJ-45 (GE ports), front chassis access ⁽²⁾
Gigabit Ethernet 1020 (10-port)	LC, front chassis access
Gigabit Ethernet 1020 (20-port) ⁽³⁾	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) ⁽³⁾⁽⁴⁾	LC, front chassis access
10 Gigabit Ethernet (1-port)	LC, front chassis access



Table 9 SmartEdge 1200H Connections

Card Connections	Connector Type
10 Gigabit Ethernet DDR (4-port) ⁽⁴⁾	LC, front chassis access
10 Gigabit Ethernet/OC-192c DDR (1-port)	LC, front chassis access
Operations Connections	Connector Type
Management workstation (LAN)	RJ-45, front chassis access
Craft console (RS-232)	DB-9, front chassis access
External Timing, Primary and Secondary (DS-1 or E1)	DB-9, rear chassis access
Modem, SL7 and SL8 (RS-232) ⁽⁵⁾	DB-25, rear chassis access
Alarm ⁽⁵⁾	DB-25, rear chassis access
Status/Ctl ⁽⁵⁾	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) By default, this card is licensed for use with the first four ports – ports 1-4 (ROA1283420/2); and requires a different license (ROA1283420/1) to enable the additional four ports – ports 5-8.

(2) 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.

(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 in the SmartEdge 400 and SmartEdge 800 routers.

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

1.6 Select the Rack

You can mount the SmartEdge 1200H chassis in a standard 19- or 23-inch rack. Brackets for the 23-inch rack are not shipped with the chassis but are available from Ericsson in the bracket spares kit.

The SmartEdge 1200H chassis requires 12 RUs and 3 RUs for the 1200H bottom air ramp. A stand-alone external fuse panel requires one RU.

Note: Ericsson does not supply fuse panels.

Figure 2 shows the installation of several SmartEdge 1200H chassis in a 45-RU rack. In this installation, 3 RUs of empty space exist at the rack.

The lower air ramp is required in this installation. The upper air ramp, which is an integral part of the chassis, also serves as the lower air ramp for the chassis installed above it.

Caution!

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

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

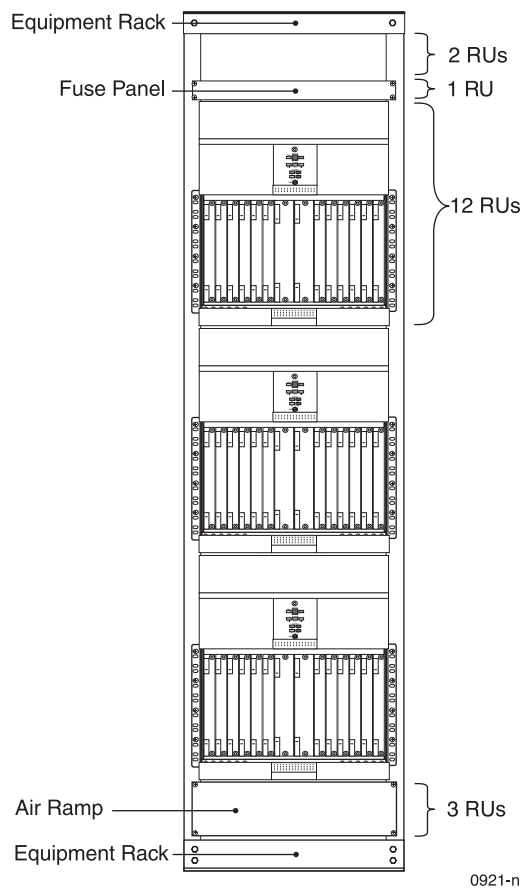


Figure 2 SmartEdge 1200H Chassis in 42 RU Rack

Regardless of rack width and height, mounting positions for the SmartEdge 1200H chassis include:

- Recessed mount—The fan tray and cable tray extend approximately 4.6 inches (11.7 cm) beyond the front of the rack.
- Flush mount—The fan tray and cable tray extend approximately 7.9 inches (20.1 cm) beyond the front of the rack.



- Extended mount—The fan tray and cable tray extend approximately 10.1 inches (25.7 cm) beyond the front of the rack.
- Centered mount—The fan tray and cable tray extend approximately 11.1 inches (28.2 cm) beyond the front of the rack.

Note: Because the fan tray and cable tray extend beyond the front of the rack in any of the four mounting positions, a rack with a front door might not be suitable for the installation unless the door is removed.

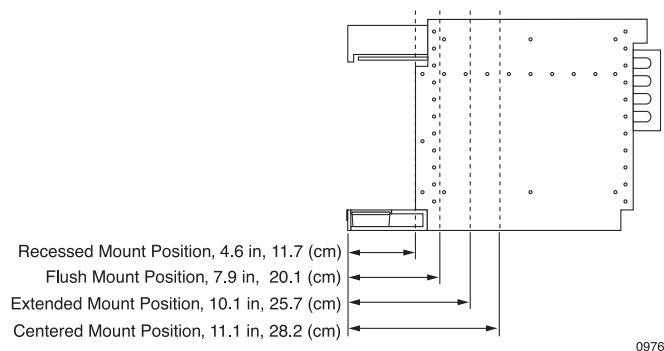


Figure 3 *SmartEdge 1200H Chassis Extensions Beyond the Front of the Rack for Each Mounting Position*

1.7 Select the Installation Method

The SmartEdge 1200H chassis is heavy, as much as 110 lb (50 kg) when all slots have cards installed, and somewhat unwieldy. When planning the installation, consider how the chassis can best be installed at the site you have chosen. Two possible installation scenarios are:

- 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 55 lb (25 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. The effective weight of a fully loaded chassis is approximately 110 lb (50 kg).



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 power zones (A1 and A2, B1 and B2) before connecting the power cables to the chassis. After the power cables are connected to the chassis and the fuse panel, the system is fully powered on; there is no power chassis.

Warning!

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

Warning!

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

Warning!

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



1.9 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 the Initial Startup and Reload Operations

During the initial startup, only the console port (labeled CRAFT on the XCRP4 Controller card) is operable until you have configured the Ethernet management port (labeled ENET MGMT on the XCRP4 Controller card). During a reload operation, the management port is disabled until the initial stage of the reload is complete; all messages displayed during the reload are sent to the console port.

You access the SmartEdge 1200H router with a terminal connected to the console port, either directly or through a terminal server.

For more information about configuring cards, ports, and circuits, see .



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 1200H 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 10 Options for Management Access

Option	Equipment Requirements
Ethernet port connection to a local management workstation	<ul style="list-style-type: none">• A PC-type workstation, running Windows XP, NT, 2000, 98, 95, 3.01, or DOS with Telnet client• Shielded Ethernet crossover cable
Ethernet port connection to a remote management workstation	<ul style="list-style-type: none">• A PC-type workstation, running Windows NT, 2000, 98, 95, 3.01, or DOS with Telnet client• Shielded Ethernet straight cable (shipped with the system)• Router or bridge
Craft 2 port connection to a local console terminal	Local terminal—Choose one of the following options: <ul style="list-style-type: none">• ASCII/VT100 console terminal or equivalent that runs at 9600 baud, 8 data bits, no parity, 1 stop bit• PC-type workstation, running Windows NT, 2000, 98, 95, 3.01, or DOS with terminal emulator, in the same configuration as the ASCII/VT100 terminal Terminal server. Craft console cable (shipped with the system)
Craft 2 port connection to a remote console terminal	Local terminal—Choose one of the following options: <ul style="list-style-type: none">• ASCII/VT100 console terminal or equivalent that runs at 9600 baud, 8 data bits, no parity, 1 stop bit• PC-type workstation, running Windows NT, 2000, 98, 95, 3.01, or DOS with terminal emulator, in the same configuration as the ASCII/VT100 terminal Terminal server cable.



1.13 Gathering Cables and Tools

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

- Line card cables:
 - ATM cards
 - POS cards
 - 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 11 Tools Needed for SmartEdge 1200H 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, there will be other options 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 12** Cable Specifications for Management Access Cables

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

(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 13 Craft Console Cable Pin Assignments

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

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

1.14.2 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 14 Ethernet Crossover Cable Pin Assignments

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



Table 14 Ethernet Crossover Cable Pin Assignments

Signal Name	Pin	Notes
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 15 Ethernet Straight Cable Pin Assignments

Signal Name	Notes
Tx (+)	–
Tx (–)	–
Rx (+)	–
–	No connection
–	No connection
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 a SmartEdge router. Using two cables you can connect a SmartEdge chassis to primary and secondary inputs on the external equipment.

Table 16 Cable Specification for External Timing Cable

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

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

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

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



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 wirewrap posts of the external equipment. Both of the DB-9 connectors (PRIMARY and SECONDARY) on the rear panel of a SmartEdge chassis have identical pin assignments.

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

To bring a signal from external equipment into the SmartEdge router:

- For the DS-1 interface (BITS):

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

- For the E1 interface (SSU):

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

Table 17 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 18 Cable Specifications for Line Cards

Line Card Type	Description	Card Connector	Cable Connector	Maximum Distance
ATM OC-12c/STM-4c (any version)	Single-mode fiber	LC female	LC male	9.3 mi - 15.0 km
ATM OC-3c-STM-1c SR-0	Multimode fiber 62.5/125 μ m	LC female	LC male	1.2 mi - 2.0 km
ATM OC-3c-STM-1c IR-1	Single-mode fiber 9/125 μ m	LC female	LC male	9.3 mi - 15.0 km
Advanced Services Engine	Category 5 shielded twisted-pair	RJ-45 female	RJ-45 male	328.1ft - 100.0 m
10/100 Ethernet	Category 5 shielded twisted-pair Ethernet straight or crossover ⁽¹⁾	RJ-45 male	RJ-45 male	328.1ft - 100.0 m
FE-GE: 10/100 ports	Category 5 UTP braid shielded #24 AWG solid jacket, with copper braid, tin shielded for each port	MRJ21 female	RJ-45 modular plug, shielded, male	328.1ft - 100.0 m
FE-GE: 100/1000 ports	Category 5 shielded twisted-pair	RJ-45 male	RJ-45 male	328.1ft - 100.0 m

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

1.17 Transceiver-Based Gigabit Ethernet Line Card Cables

Table 19 Cable Specifications for Transceiver-Based Gigabit Ethernet Line Cards

Transceiver Type	Description ⁽¹⁾	Card Connector	Cable Connector	Maximum Distance
SX GBIC transceiver	Multimode fiber 62.5/125 μ m	SC female	SC male	1,804.4 ft - 550.0 m
	Multimode fiber 50/125 μ m	SC female	SC male	656.2 ft - 200.0 m
TX transceiver	4-pair, Category 5 shielded twisted-pair ⁽²⁾	RJ-45	RJ-45	328.1 ft - 100.0 m
LX GBIC transceiver	Single-mode fiber 9/125 μ m	SC female	SC male	6.2 mi - 10.0 km
LX70 GBIC transceiver	Single-mode fiber 9/125 μ m	SC female	SC male	43.5 mi - 70.0 km
SX SFP transceiver	Multimode fiber 62.5/125 μ m	LC female	LC male	1,640.4 ft - 500.0 m
	Multimode fiber 50/125 μ m	LC female	LC male	656.2 ft - 200.0 m
LX SFP transceiver	Single-mode fiber 9/125 μ m	LC female	LC male	6.2 mi - 10.0 km
ZX SFP transceiver	Single-mode fiber 9/125 μ m	LC female	LC male	49.7 mi - 80.0 km ⁽³⁾
SR SFP transceiver	Multimode fiber 62.5/125 μ m	LC female	LC male	984.4 ft - 300.0 m
SR XFP transceiver	Multimode fiber 50/125 μ m	LC female	LC male	656.2 ft - 200.0 m
IR SFP transceiver	Multimode fiber 50/125 μ m	LC female	LC male	6.2 mi - 10.0 km
LRP transceiver	Multimode fiber 62.5/125 μ m	LC female	LC male	984.4 ft - 300.0 m
LR/LW XFP transceiver	Single-mode fiber 9/125 μ m	LC female	LC male	6.2 mi - 10.0 km
ER XFP transceiver	Single-mode fiber 9/125 μ m	LC female	LC male	24.9 mi - 80.0 km

**Table 19** Cable Specifications for Transceiver-Based Gigabit Ethernet Line Cards

Transceiver Type	Description ⁽¹⁾	Card Connector	Cable Connector	Maximum Distance
ZR XFP transceiver ⁽⁴⁾ ⁽⁵⁾	Single-mode fiber 9/125 μ m	LC female	LC male	49.7 mi - 80.0 km
DWDM transceiver ⁽⁶⁾ ⁽⁷⁾	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) 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 (70.0km).

(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.

1.18 Transceiver-Based SONET/SDH Line Card Cables

Table 20 Cable Specifications for the SONET/SDH Line Cards

Transceiver Type	Description	Card Connector ⁽¹⁾	Cable Connector	Maximum Distance
SR / SM ⁽²⁾	Single-mode fiber 9/125 μ m	LC, FC, or SC female	LC, FC, or SC male	1.2 mi - 2.0 km
IR / SM ⁽²⁾	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
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) Part number RDH90159/1 supports dual mode SR/IR capability and uses SMF. Part number RDH90158/1 supports SR only and uses MMF.

1.19 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 21 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.

1.19.1 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 22 10/100 Ethernet Crossover Cable Pin Assignments

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

1.19.2 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 23 10/100 Ethernet Straight Cable Pin Assignments

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

1.19.3 Fast Ethernet Breakout Cable Pin Assignments

Table 24 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

**Table 24** *Fast Ethernet Breakout Cable Pin Assignments*

Port	MRJ21 Pins	RJ-45 Pins	Colors
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 1200H 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.

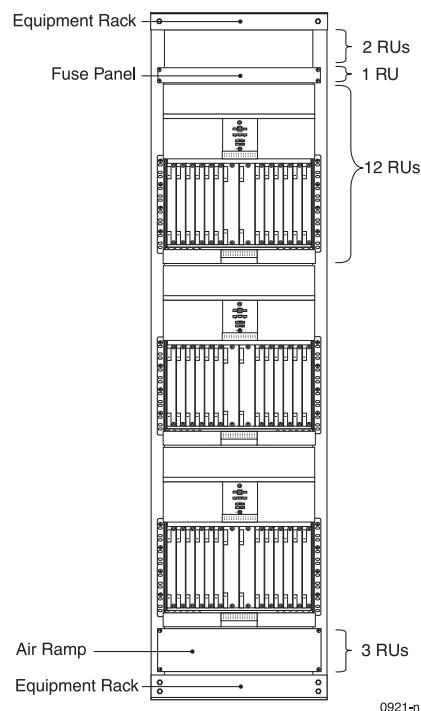


Figure 4 Fully Loaded 42 RU Rack Configuration

To install system hardware:

1. Install an external fuse panel.

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

2. Select the chassis position in the rack:
 - a The SmartEdge 1200H chassis requires 13 RUs.



- b If you install the chassis at the bottom of the rack, you must install a separate air ramp below the chassis. This air ramp requires three RUs.
- c A stand-alone external fuse panel requires one RU.

Caution!

Risk of equipment damage. In a rack that has not been stabilized, the chassis can cause a rack to overbalance. To reduce the risk, never install the chassis in a rack that has not been stabilized by being bolted to the floor and to the ceiling and always select a mounting position that is suitable to the type of rack in which the chassis is being installed.

3. Determine alignment and install the chassis mounting brackets:
 - a Recessed mount—The fan tray and cable tray extend approximately 4.6 inches (11.7 cm) beyond the front of the rack.
 - b Flush mount—The fan tray and cable tray extend approximately 7.9 inches (20.1 cm) beyond the front of the rack.
 - c Extended mount—The fan tray and cable tray extend approximately 10.1 inches (25.7 cm) beyond the front of the rack.
 - d Centered mount—The fan tray and cable tray extend approximately 11.1 inches (28.2 cm) beyond the front of the rack.

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

The same chassis mounting brackets accommodate each of these mounting options; the brackets are simply attached to the chassis in different positions. The chassis can be mounted front- or rear-facing in any of the mounting positions. Brackets for the 23-inch rack are not shipped with the chassis but are available in the bracket spares kit (SXX 109 8786/1).

2.1 Installing the Chassis Mounting Brackets

A pair of chassis mounting brackets for a 19-inch rack are shipped with the chassis. Each bracket requires four 10-32 x 0.25-inch flat-head screws.

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

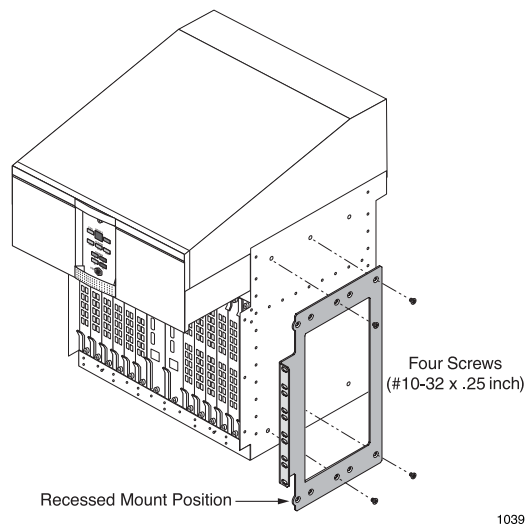


Figure 5 *Installing Chassis Brackets for the Recessed Mount Position*

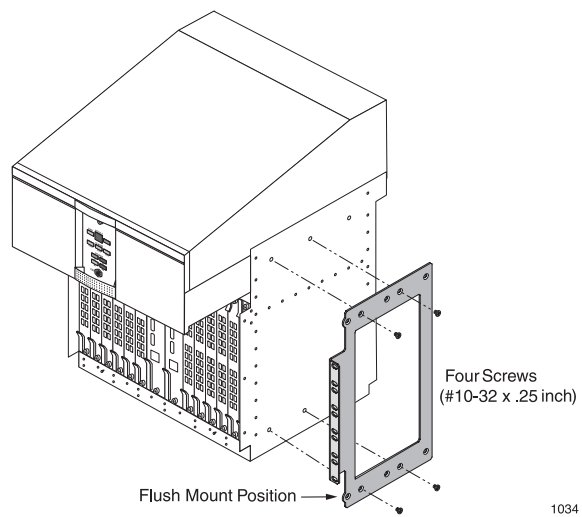


Figure 6 *Installing Chassis Brackets for the Flush Mount Position*

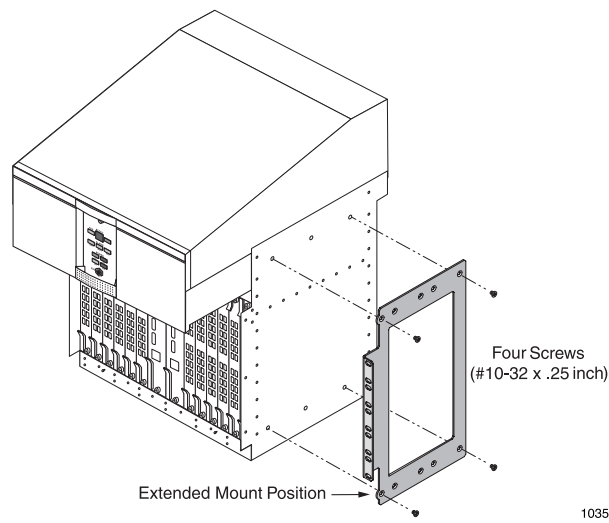


Figure 7 *Installing Chassis Brackets for the Extended Mount Position*

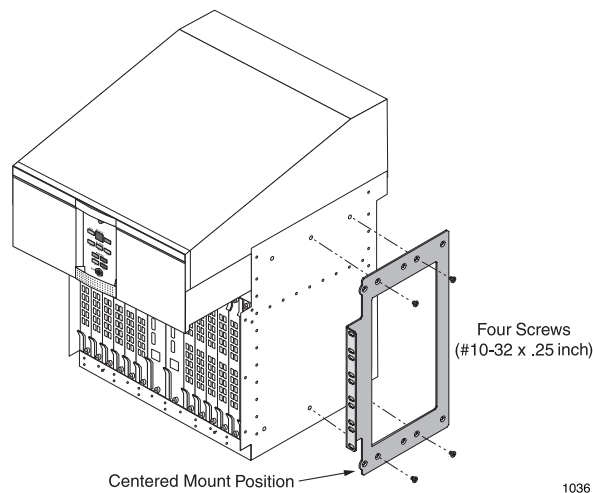


Figure 8 *Installing Chassis Brackets for the Centered Mount Position*

Caution!

Risk of equipment damage. Always use the number and type of screws specified in the instructions. Failure to use the proper screws to attach the mounting brackets to the SmartEdge 1200H chassis and the brackets to the rack can damage the chassis.

To install either type of bracket:

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



Refer to the proper orientation for installing the brackets in Figure 5, Figure 6, Figure 7, and Figure 8.

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

2.2 Install the Chassis

Warning!

Risk of personal injury. Do not lift or move the chassis without the aid of another trained person. The empty chassis weighs almost 55 lb (25 kg) and can cause injury if one person attempts to lift or move it.

Caution!

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

Perform the following steps when only two installers are available to install the chassis. In this scenario, the two installers lift the chassis into the rack; then one installer steadies it from the rear while the second installer inserts and tightens the rack mounting screws.

To install the SmartEdge 1200H chassis in the rack:

1. Before you begin, you need eight 12-24 or equivalent screws.
2. Move the heavy-duty cart so that the rear of the chassis is closest to the rack.
3. Remove the fan tray:
 - a Using a Phillips screwdriver, loosen the captive screw on the front of the unit.
 - b Gently slide it from the chassis and set it aside.

4. Create temporary rest points for the chassis.

Partially insert two of the 12-24 screws in the holes in the rack just below those that you intend to align with the lowest screw holes in the mounting bracket. You rest the mounting brackets on these temporary rest points after you have lifted the chassis into the rack; see Figure 9.

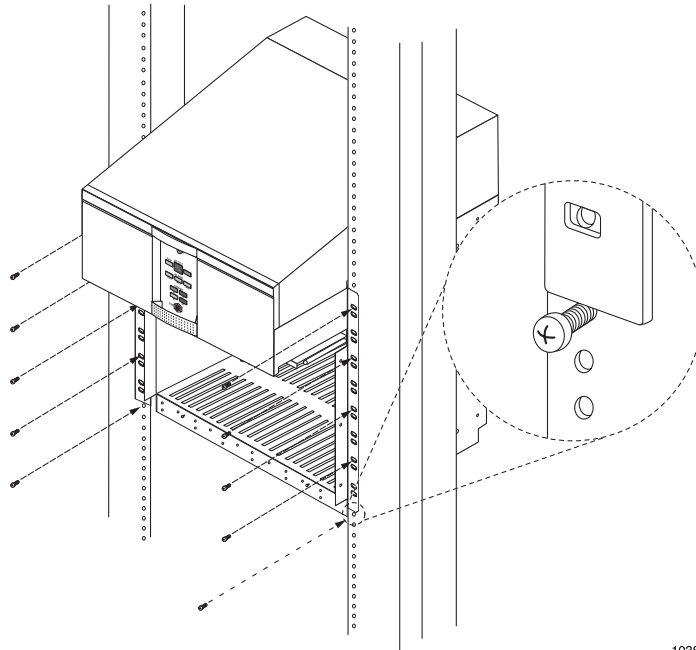
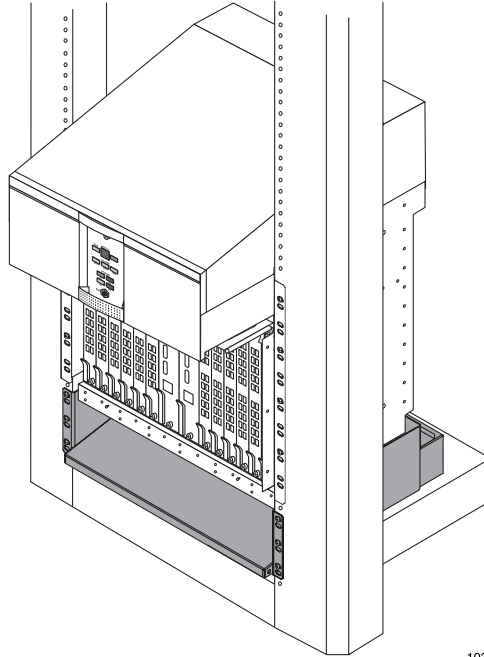


Figure 9 Using Rest Points for Chassis Installation

5. With one person at the rear of the rack and one at the front of the chassis, lift the chassis into the rack; let the mounting brackets rest on the two screws with the person at the rear of the rack steadying the chassis.
6. With the Phillips screwdriver, secure the chassis to the rack with the remaining 12-24 or equivalent screws; then remove the two screws you used as rest points and insert them in the remaining screw holes in the brackets. Tighten each screw to a maximum torque of 30.0 inch-lbs (3.4 Newton-meters).
7. Install the fan tray:
 - a Insert the unit into the chassis.
 - b With a Phillips screwdriver, tighten the screw on the front of the unit to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters).
8. If a lower air ramp is required, proceed to Mounting the Lower Air Ramp to continue the installation.



2.3 Mounting the Lower Air Ramp



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Figure 10 Positioning the Lower Air Ramp

You must install a lower air ramp below the chassis when you install the chassis at the bottom of the rack or when you install other equipment below the chassis. This additional air ramp is needed for proper ventilation; see Figure 4.

Caution!

Risk of equipment damage. Always mount the air ramp at the same mounting depth as the SmartEdge 1200H chassis above it. Improper installation of the lower air ramp can cause loss of cooling and damage the SmartEdge 1200H chassis.

2.3.1 Install Air Ramp Mounting Brackets

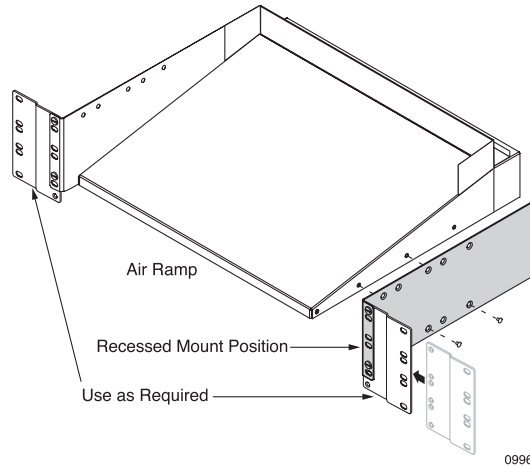


Figure 11 *Installing Air Ramp Brackets for the Recessed Mount Position*

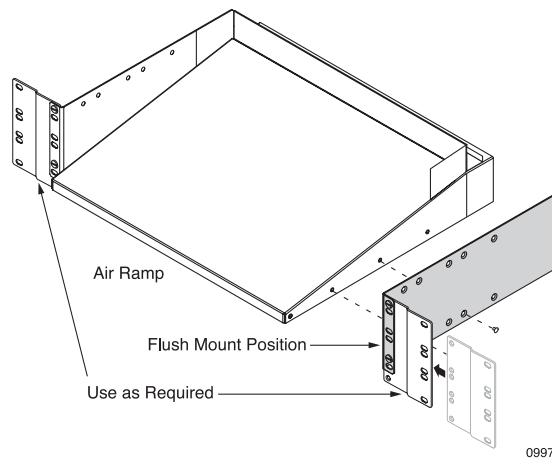


Figure 12 *Installing Air Ramp Brackets for the Flush Mount Position*

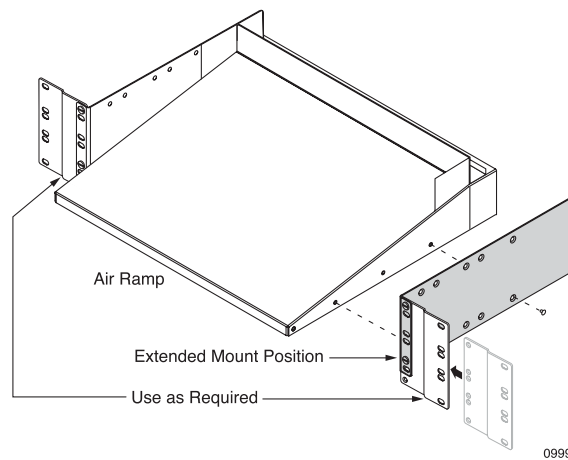


Figure 13 *Installing Air Ramp Brackets for the Extended Mount Position*

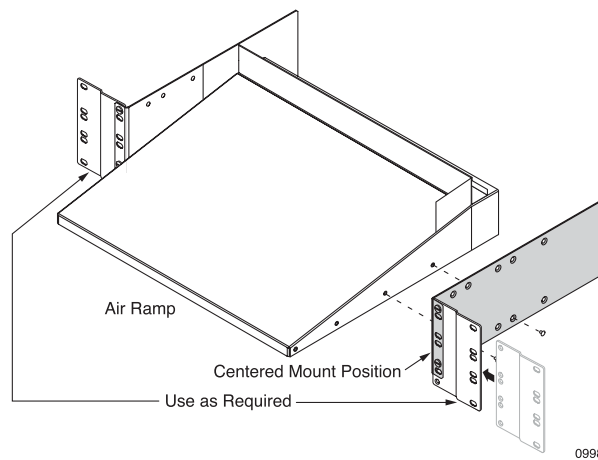


Figure 14 *Installing Air Ramp Brackets for the Centered Mount Position*

To install the air ramp mounting brackets:

1. Position a mounting bracket against one side of the lower air ramp, lining up two of the screw holes in the bracket with two of the screw holes in the side of the air ramp. Ensure that the bracket position corresponds to the position of the chassis mounting brackets; see Figure 11, Figure 12, Figure 13, and Figure 14 for these details.
2. Using a Phillips screwdriver, secure the bracket to the air ramp; tighten each screw to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).
3. Repeat Step 1 and Step 2 to install the second bracket on the other side of the air ramp.

2.3.2

Install Lower Air Ramp

To install the lower air ramp:

1. Position the air ramp just below the SmartEdge 1200H chassis so that the screw holes in the air ramp mounting brackets are aligned with the screw holes in the rack just below the chassis; see Figure 10.
2. Using the Phillips screwdriver, secure the air ramp to the rack or extension hardware with four 12-24 or equivalent screws; tighten each screw to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).

2.4 Connecting the Power Cables

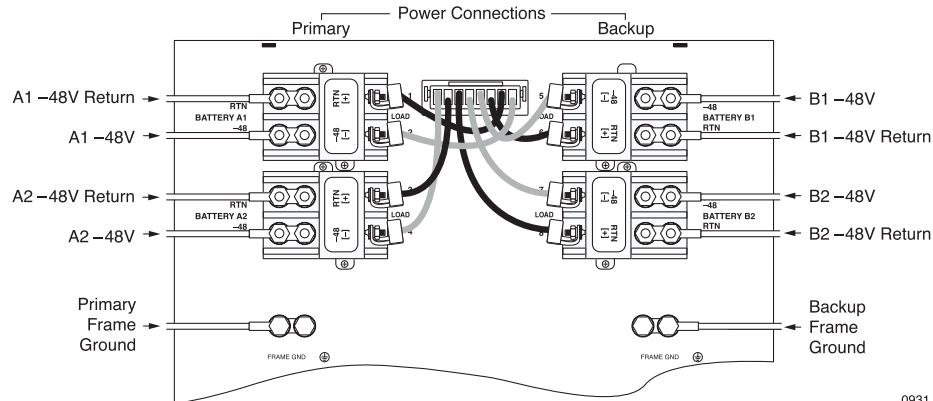


Figure 15 Connecting the Power Cables

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

The SmartEdge 1200H chassis has terminal studs for the primary and backup power sources for zones 1 and 2; these terminal studs are located on four power filters that are mounted on the rear of the chassis. The power cables are connected to separate connectors on the external fuse panel or circuit breaker panel. Two redundant connectors for ground cables also exist on the rear of the chassis.

Figure 15 shows the location of the power and chassis ground connectors. A safety cover, secured to the chassis by tabs and captive Phillips screws, prevents the cables from being deliberately disconnected and the connectors from being accidentally touched.

Note: In Figure 15, the SmartEdge 1200H 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 chassis requires AWG #4 wire for power and chassis ground cables, but AWG #6 might be acceptable; follow the National Electrical Code (NEC) (in the United States) or local codes (outside the United States) that apply. Compression lugs, washers, locking washers, and hex-head nuts are shipped with the chassis; the compression lugs are intended for AWG #4 cables only.

2.4.1 Connect Chassis Ground Cables

The back panel of the SmartEdge 1200H chassis has two connectors for chassis ground cables for redundant connections. Each connector consists of a pair of 1/4-20 threaded holes on 0.625-inch (1.59 cm) centers, which are labeled FRAME GND. These are located at the rear of the chassis; see Figure 15.



Each chassis ground cable must be AWG #4, but AWG #6 might be acceptable, and installed in accordance with the NEC (in the United States) or applicable local jurisdiction (outside the United States) installation requirements.

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

To connect the chassis ground cables:

1. Attach a compression lug to one end of a chassis 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.

- a Insert one end of the chassis ground cable into the lug.
 - b Slip the tool over the compression lug and squeeze the handles several times to grip the connector.
 - c Continue to squeeze the handles until the automatic tool release indicates a completed compression.
2. For each opening in a compression lug, insert a lock washer over a hex-head bolt followed by a washer; then insert the compression lug and hex-head bolts and washers into the pair of threaded holes labeled "FRAME GND" on one side of the chassis.
 3. Using a 7/16-inch torque wrench, tighten each hex-head bolt to a maximum torque of 25.0 inch-lbs (2.8 Newton-meters).
 4. Ensure that the other end of the cable is connected to an appropriate ground point.
 5. Repeat steps 1 to 4 for a redundant frame ground connection.

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

2.4.2

Connect Power Cables

The SmartEdge 1200H chassis has four power filters mounted on the back panel of the chassis, one filter for each of the four power sources. Each filter has two connectors, labeled -48V and RTN for a pair of power cables. Each power cable must be AWG #4, but AWG # 6 might be acceptable, and installed in accordance with the NEC or applicable local jurisdiction (outside the United States) installation requirements. The following DC power source warnings and cautions apply when connecting DC power sources:



Warning!

Risk of electrical shock. The 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 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.

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. Verify that the power sources for the SmartEdge 1200H chassis meet the power specifications provided in Site Preparation and ensure that DC power cables meet the specifications provided in the same chapter before connecting the power cables.

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.



Warning!

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

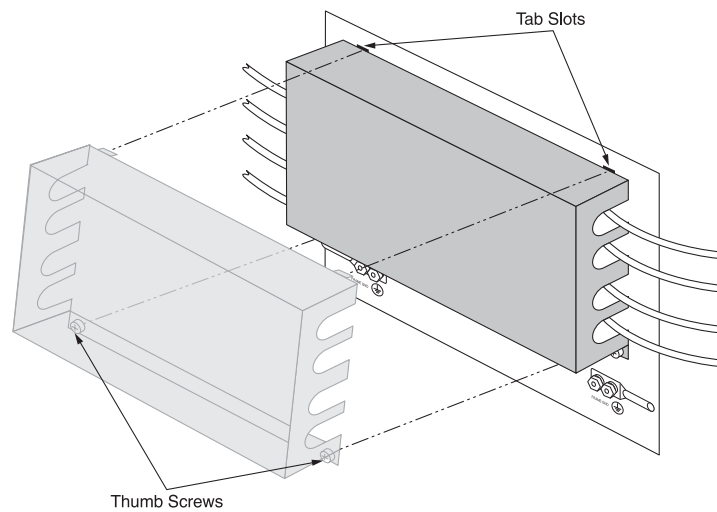
Caution!

Risk of equipment damage. 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.

To connect a pair of power cables to a filter:

1. Remove the power safety cover; see Figure 16
 - a Using a Phillips screwdriver, loosen the captive screws at the lower edge of the cover.
 - b Lift the cover up and out to release the tabs that are inserted in the slots on the rear of the chassis.
2. To connect a power cable:
 - a Insert one end of the power cable into the lug.
 - b Slip the tool over the compression lug and squeeze the handles several times to grip the connector.
 - c Continue to squeeze the handles until the automatic tool release indicates a completed compression.
3. Repeat Step 2 to connect the second power cable to the terminal stud labeled RTN.
4. Repeat Step 2 and Step 3 to connect the power cables to each of the other power filters.
5. Install the power safety cover; see Figure 16
 - a Insert the tabs on the top edge of the safety cover into the slots on the rear of the chassis.

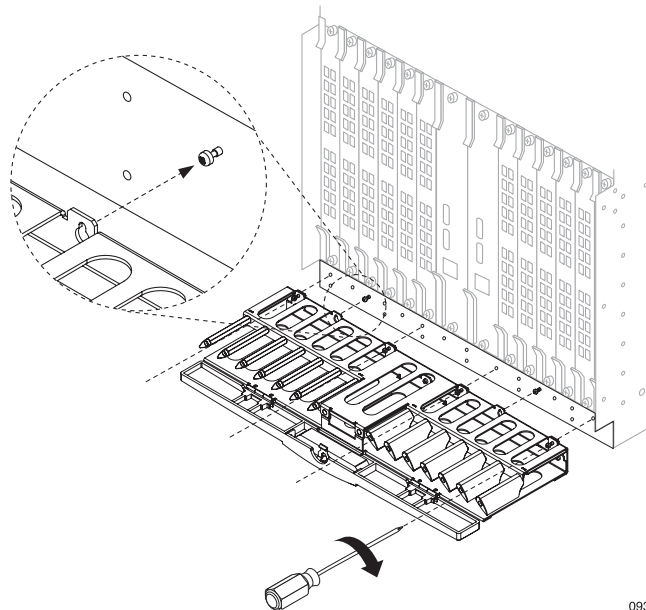
- b Push on the lower edge of the cover so that the captive screws are inserted in the screw holes.
 - c Thumb tighten the captive screws; then, using a Phillips screwdriver, secure the safety cover to the rear of the chassis, to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters).
6. Tie and route the A-side and B-side power cables to convenient locations on the rack.



0932

Figure 16 *Installing the Power Safety Cover*

2.5 Installing the Cable Tray



0934

Figure 17 *Installing the Cable Tray*



To install the cable tray:

1. Position the cable tray so that the two posts on the front of the chassis slide into the two keyhole cutouts on the cable tray and then adjust the position of the cable tray until it rests on the chassis posts; see Figure 17.
2. Grasp the handle at the center of the cable tray and press the latch just behind it to open the front panel of the cable tray.
3. Using a Phillips screwdriver, tighten the seven captive 4-40 screws to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters). Four of these screws are at the top and are reached by inserting the screwdriver through the cable guide directly in front of the screw. The other three screws are at the bottom of the tray and are directly accessible.

2.6 Completing the Installation

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

2.6.1 Select the Slots

Card slots in the SmartEdge 1200H chassis are numbered sequentially from left to right as you face the front of the chassis.

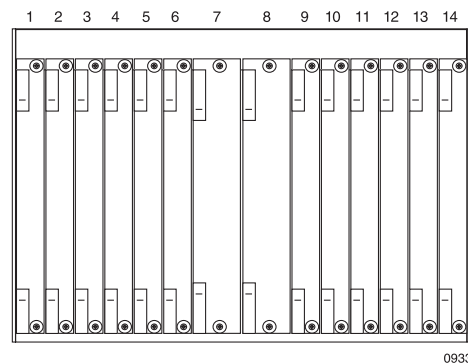


Figure 18 SmartEdge 1200H Chassis Card Slots

Note: When you first power on the system, the active controller card is in slot 7. Thereafter, the slot changes whenever a switchover occurs.

Observe the following configuration rules when installing the cards:

- Slots 7 and 8 are reserved for the controller cards only.

When you first power on the system, the active controller card is in slot 7. Thereafter, the slot changes whenever a switchover occurs.



- Optical, Ethernet, and the other Gigabit Ethernet cards, with the exception of the 20-port GE1020 line card, can be installed in any of slots 1 to 6 and 9 to 14; because the 20-port GE1020 card requires two adjacent slots, the slot range is 1 to 5 and 9 to 13.

The breakout cables for an FE–GE line card can impinge on the cable routing for other cards in the chassis. When selecting a slot for an FE–GE card in a SmartEdge 1200H chassis, choose one of the outer slots on the left side of the chassis.

- The XCRP4 Controller card does not support channelized SONET and SDH line cards.

The breakout cables for an FE–GE line card can impinge on the cable routing for other cards in the chassis. When selecting a slot for an FE–GE card in a SmartEdge 1200H chassis, choose one of the outer slots on the left side of the chassis.

2.6.2

Install Cards

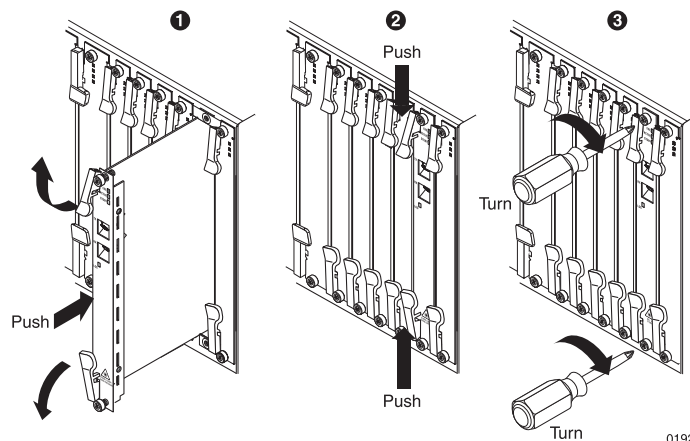


Figure 19 Installing a Card

To install a card:

1. Select an available slot for the card:

Table 25 Slot Assignments for SmartEdge 1200 Cards

Card	Slots Available
Controller	7, 8



Table 25 Slot Assignments for SmartEdge 1200 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) Gigabit Ethernet DDR (20-port) ⁽¹⁾ 10 Gigabit Ethernet (1-port) 10 Gigabit Ethernet/OC-192c DDR (1-port)	1 to 6 or 9 to 14
Gigabit Ethernet 1020 (20-port) Gigabit Ethernet DDR (20-port) ⁽¹⁾	1 to 5 or 9 to 13 ⁽²⁾
Advanced Services Engine	1 to 6 or 9 to 14
Advanced Services Engine 2 ⁽¹⁾	1 to 6 or 9 to 14
SmartEdge Storage Engine ⁽¹⁾	1 to 6 or 9 to 14

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

(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.

Stop!

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

- Put on an antistatic wrist strap and attach it to an appropriate grounded surface.
- Loosen the captive screws and remove the current traffic or blank card that is installed in the slot for the new card.
- Align the new card with the card guides; these are located at the top and bottom of the card slot in the chassis.



Caution!

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

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

Repeat steps 2 to 7 for each card to be installed.

2.6.3 Install Blank Cards

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

Caution!

Risk of equipment damage. SmartEdge 1200H cards can be damaged by lack of cooling. To reduce the risk, always insert a blank card in each empty slot to ensure proper airflow through the chassis.



2.6.4

Install Transceivers

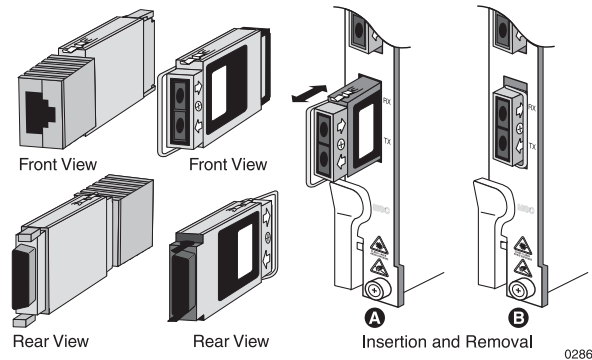


Figure 20 GBIC Transceivers

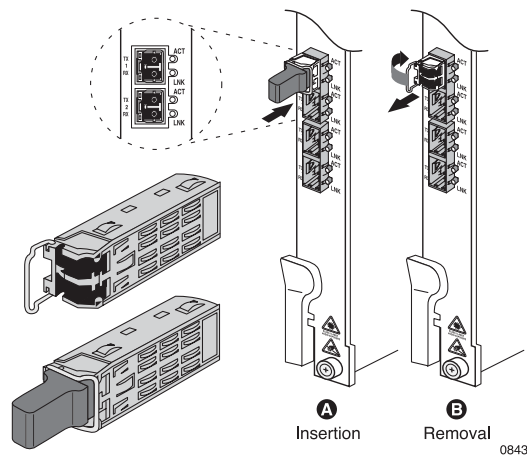


Figure 21 SFP Transceivers

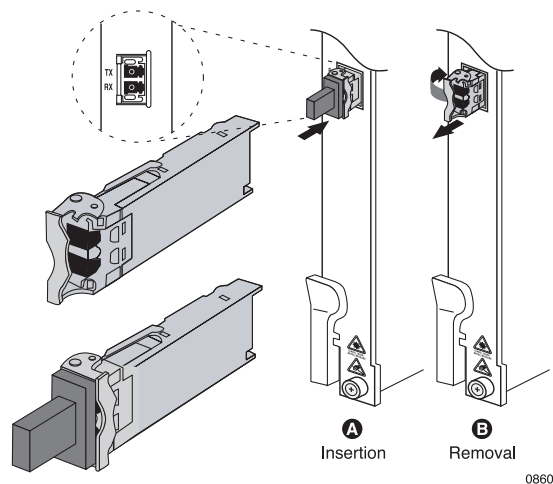


Figure 22 XFP Transceivers

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, IR-1
POS OC-3c/STM-1c (8-port)	SFP	SR-0, IR-1
POS OC-12c/STM-4c (4-port)	SFP	SR-0, IR-1
POS OC-48c/STM-16c (4-port)	SFP	SR-1, IR-1, LR-2
Channelized OC-3/STM-1 (8/4-port) / OC-12-STM-4 (2/1-port)	SFP	IR-1
Gigabit Ethernet 1020 (10-port)	SFP	SX, LX, 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⁾
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 DDR 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 21 or Figure 22), slide the transceiver into the opening for the port until the rear connector is seated and the locking mechanism snaps into place.

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

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

2.6.5 Install Compact Flash (CF) Cards

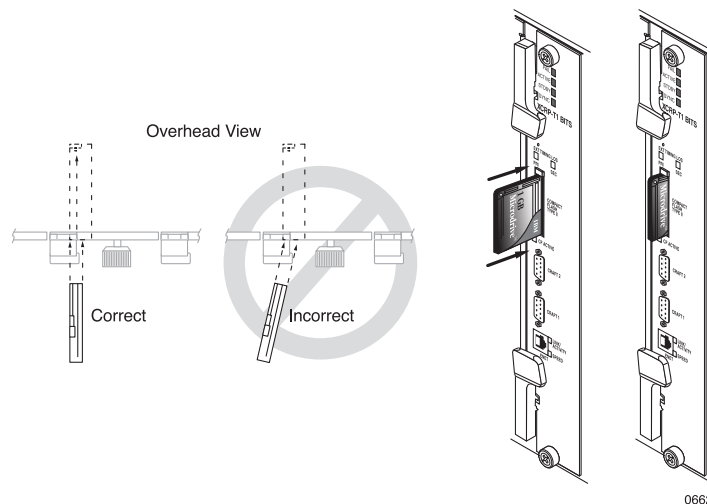


Figure 23 Installing a CF Card

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

If you install a CF card 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 (3.3 mm thick) CF cards only.



Caution!

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

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

To install a CF card:

1. If you are installing the CF card in an XCRP4 Controller card, open the door that covers the CF Type 1 slot until it “snaps” open.
2. Hold the CF card so that its pin-hole side faces the slot in the controller front panel.
3. Vertically align the CF card as close to the left edge of the slot as possible and perpendicular to it; see Figure 23.
4. Slowly insert the CF card in the slot. If the CF card does not engage the connectors with approximately 0.50 inches (1.27 cm) of the CF card outside the slot, do not continue. Remove the CF card and repeat this step.
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 2.13.1 Power-On Diagnostics on page 53.

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*.



2.7 Cable Management

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

2.8 Connections for Management Access

Connecting a console terminal or management workstation to the SmartEdge 1200H chassis is often a two-stage process. Initially, the console terminal is connected to the Craft port (also referred to as the console port) to configure the Ethernet port (also referred to as the management port). When the configuration is complete, you might need to alter the connections for normal operations.

2.8.1 Management Workstation

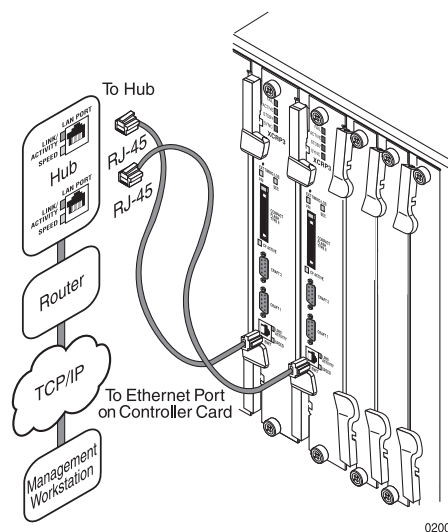


Figure 24 Connections for a Management Workstation

A management workstation connects to the SmartEdge 1200H chassis using the Ethernet port on the front of a controller card. This type of connection provides access to the operating system 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

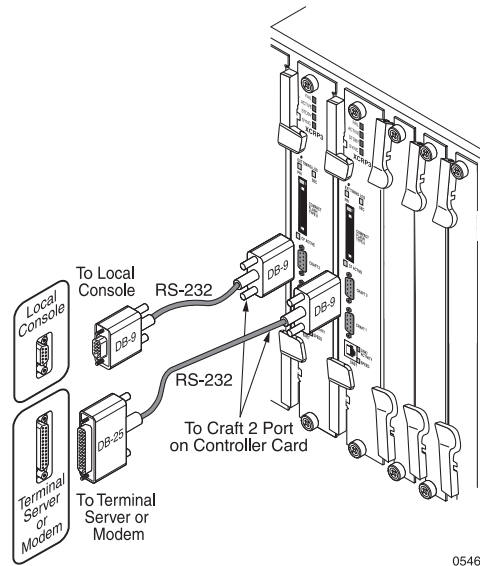


Figure 25 Connections for a Local or Remote Console

A local or remote console terminal connects to the SmartEdge 1200H chassis 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.

When you first power on the system, the active controller card is in slot 7. Thereafter, the slot changes whenever a switchover occurs.

2.9 Connections for Line Card Cables

All line card cables are connected to the front panels of the cards; see Section 1.16 on page 17 Site Preparation for cable specifications.

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

Table 27 Port Data for 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	—



Table 27 Port Data for SmartEdge Line Cards

Line Card Type and Card Description	Physical Ports	Low-Density Version	Low-Density Port Numbers
POS OC-3c/STM-1c (8-port)	8	No	—
POS OC-12c/STM-4c (4-port)	4	No	—
POS OC-48c/STM-16c (4-port)	4	No	—
OC-192c/STM-64c (1-port)	1	No	—
Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port)	8, 2 4, 2	No	—
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) ⁽¹⁾	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	—
Advanced Services Engine	4 ⁽²⁾ (2 for each ASP) ⁽³⁾	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 DDR cards.

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

(3) These ports are not used for control or data traffic.



2.9.1 Connect and Route Cables at the Front of the Chassis

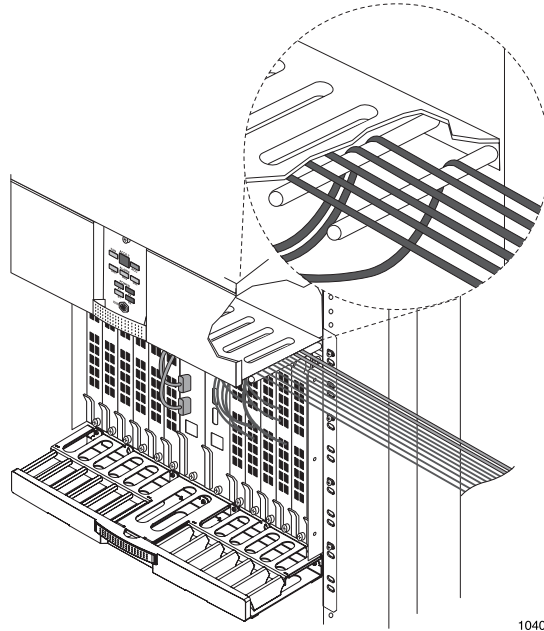


Figure 26 Copper Cable Routing

You route the copper cables upward, using the cable bars on the underside of the fan tray to separate the cables for each card.

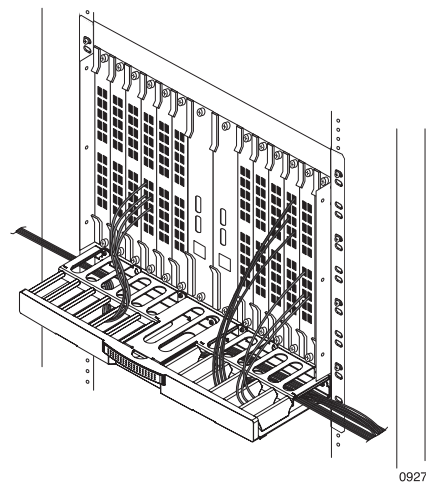
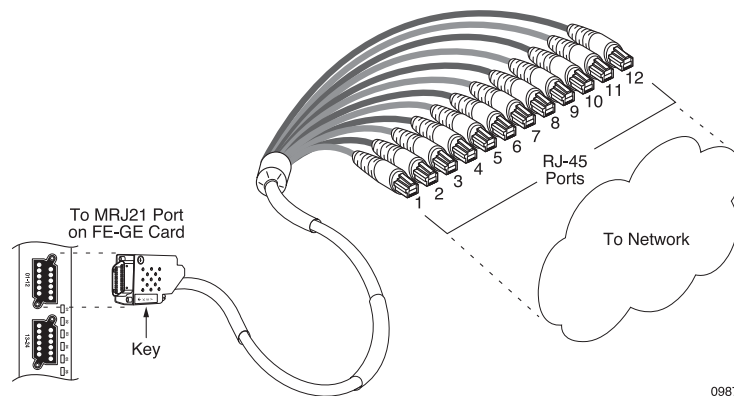
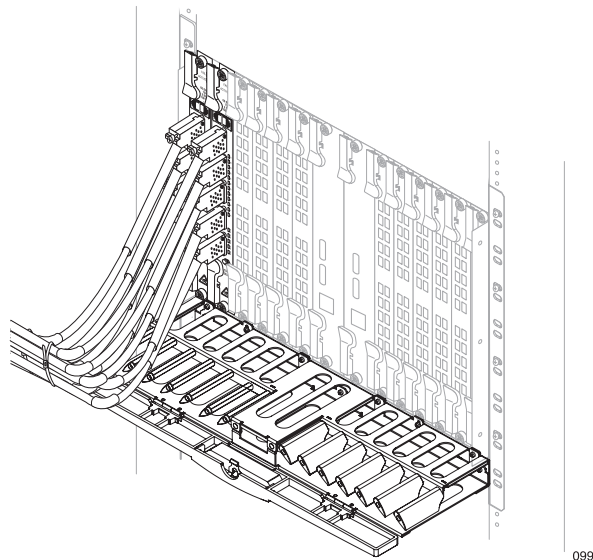


Figure 27 Fiber-Optic Cable Routing



0987

Figure 28 FE-GE Breakout Cable



0991

Figure 29 Routing an FE-GE Breakout Cable

After all copper cables are routed, you route the fiber-optic cables, using the cable guides in the cable tray to separate the cables for each card.

Cable connections are made with standard cables.

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

1. Connect and route the copper cables; see Figure 26
 - a Insert each cable into the appropriate connector on the card.
 - b Starting with the cards installed in the inner slots (4 to 7 and 8 to 11), insert the cables for a card between the two cable bars for that card on the underside of the fan tray.
 - c With the cables resting on top of the cable bars, slide them to the outer edge of the fan tray.



- d Tie-wrap the bundled cables from each card to the outside edge of the rack.
 - e Continue routing all copper cables, working toward the outer slots (1 to 3 and 12 to 14).
2. Connect and route the fiber-optic cables; see Figure 27

Caution!

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.

- a If it is not already open, grasp the handle at the center of the cable tray and press the latch just behind it to open the front panel of the cable tray.
 - b Insert each cable into the appropriate connector on the card.
 - c Starting with the cards installed in the inner slots (4 to 7 and 8 to 11), insert the cables for a card between the cable guides for that card in the outer partition.
 - d Slide the cables under the slotted cover of the inner partition as much as is possible, but do not allow the cables to have a bend radius of more than 1.25 inches (3.18 cm).
 - e Tie-wrap the bundled cables from each card to the outside edge of the rack.
 - f Continue routing all fiber-optic cables, working toward the outer slots (1 to 3 and 12 to 14).
3. 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.



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.
-
-

Stop!

Risk of equipment damage. Never allow the front panel to support the weight of the cable; support the cable and immediately route it before you connect another cable. 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.

- 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.
-
-

Caution!

Risk of equipment damage. Use a different opening in the cable management bracket for the GE port cables. 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.



2.10 Connections for Advanced Services Card Cables

Table 28 Port Data for Advanced Services Cards

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

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

(2) These ports are not used for control or data traffic.

2.11 Connections for External Timing Cables

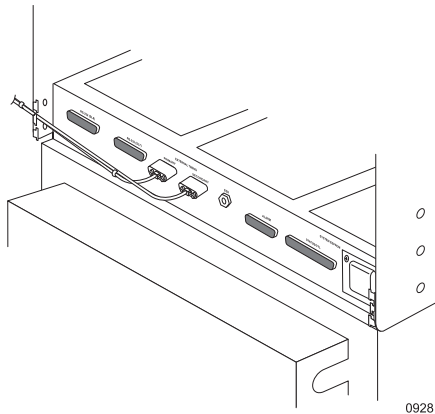


Figure 30 System Management Cable Routing at the Rear of the Chassis

To connect and route the external timing and power cables at the rear of the chassis:

1. Connect and route the external timing cables.

Attach the DB-9 ends of the external timing cables to the primary and secondary connectors, labeled PRIMARY and SECONDARY, at the center rear of the SmartEdge 1200H chassis; tie the cables to the rack.

If your cables do not have a connector on the system end, you can install an adapter, available as an option, in each chassis connector and then wire wrap the cable pins to the adapter.

2. Tie and route the chassis ground cables and the power cables to convenient locations on the rack.

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

2.12 Connections for Equipment and Network Ends Cables

To connect the cables from the front of the chassis:

1. Connect the line card cables to their networks.



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

To connect the cables from the rear of the chassis:

1. If you have installed external timing cables, attach the unterminated ends of the cables to the wire-wrap posts of the external equipment.
2. Complete the power connection to the external fuse panel or circuit breaker panel. The procedure for the circuit breaker panel is beyond the scope of this book.
3. Connect the management access cables to the equipment or their networks; perform this step for one or more of these options, depending on the cables you have connected to the system.

To connect to a fuse panel:

1. Remove the fuses for the connectors on the external fuse panel that you intend to use for the four pairs of the power cables.
2. Connect the primary power zone 1 cables (A1) to their –48V and RTN connectors on the external fuse panel.
3. Connect the primary power zone 2 cables (A2) to their –48V and RTN connectors on the external fuse panel.
4. If you are installing redundant power, connect the backup power zone 1 and power zone 2 cables (B1 and B2) to their –48V and RTN connectors on the external fuse panel.

Warning!

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



2.13 Powering On and Off the Chassis

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 the SmartEdge 1200H chassis 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.

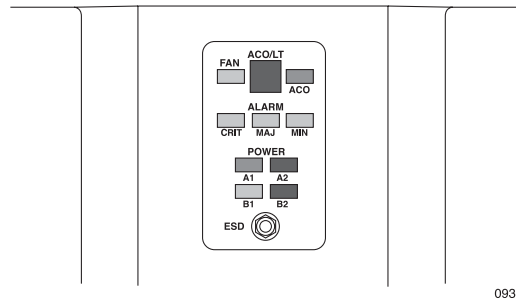


Figure 31 SmartEdge 1200H Status LEDs

Table 29 SmartEdge 1200H Status LEDs

Label	Activity	Color	Description
A1, B1	On	Green	The zone 1 –48 VDC power source (primary or backup) is present: <ul style="list-style-type: none">A1—Primary sourceB1—Backup source
	Off	None	The zone 1 –48 VDC power source (primary or backup) is absent.
A2, B2	On	Green	The zone 2 –48 VDC power source (primary or backup) is present: <ul style="list-style-type: none">A2—Primary sourceB2—Backup source
	Off	None	The zone 2 (primary or backup) –48 VDC power source 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 the SmartEdge 1200H chassis, 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 for both power zones (primary and backup for each zone) in the fuse panel.

2.13.1 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 1200H chassis. 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 30 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 or 9 to 14)

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 are 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*.

Table 31 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	
Status of a specific port, including alarms	slot/portdetail	

**Table 31** CLI Commands for Hardware Status

Task or Information Needed	CLI Command	Comments
Status of the SmartEdge Service Engine (SSE) group ⁽¹⁾	<pre>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</pre>	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	<code>show port transceiver</code>	
Status of standby controller	<code>show redundancy</code>	
Status of all alarms at system, slot, port, transceiver, sse group, sse partition, and sse disk level	<code>show system alarm all</code>	
Status of alarms for specific card, port, or channel	<code>show system alarm</code>	<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 <code>show alarm system alarm</code> 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	<code>system alarm</code>	The transceiver alarm reporting (including corresponding SNMP traps) is disabled by default.
Status of the ASE card	<code>show tech-support ase</code>	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⁾	<code>show tech-support ase2</code>	

⁽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 32 CLI Commands for Hardware Configuration and Control

Task or Information Needed	CLI Command	Comments
Reload the SSE disk ⁽¹⁾	<pre>reload disk slot_number_disk_num</pre>	



Table 32 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 32 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 .

(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 33 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 34 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 34 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 35 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 35 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 34 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 37 and Table 38 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 6 • 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 36 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 37 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 38** *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 39 *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 40 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 41 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"> • <i>line-card-type</i>—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"> • <i>line-card-type</i>—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 41 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*.

(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 42 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 43 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 43** *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 44 *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 45 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 45** *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 45 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 600 chassis: <ul style="list-style-type: none"> Power Supply A Status Power Supply B Status 	SmartEdge 600 chassis: <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 45** *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 46 lists descriptions of each temperature condition.</p> <p>Table 47 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 45 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 46** *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 47 *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 47 *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 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 48 *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. • 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⁾ <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 / 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.



Table 48 Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data

State	Description
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.
Laser bias current	<p>Magnitude of the laser bias power setting current (measured, minimum and maximum limits), in milliamperes (mA).</p> <p>The laser bias provides direct modulation of laser diodes and allows the user to monitor the “health” of the laser.</p>
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.

**Table 48** Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data

State	Description
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 49 for a list of auxiliary input types monitored by each auxiliary A/D channel of the XFP transceivers.

Table 49 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

3.10 Output Fields for the show port Command

Table 50 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 50 *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 51 *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 52 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 53 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. <p>For a complete list of conditions that can cause an alarm, see the Troubleshoot with System Power and Alarm LEDs section.</p>



Table 53 *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 53 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 53 *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 53** *Output Fields for the show port Command with the detail Keyword*

Field Name	Value/Description
Loopback	Type of loopback: <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 53 Output Fields for the show port Command with the detail Keyword

Field Name	Value/Description
Media type	Physical interface: <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.⁽⁷⁾ • OTN-DWDM—OTN-DWDMITU XFP transceiver, single-mode fiber.⁽⁷⁾ • No GBIC—GBIC transceiver is not installed in this GE port. • No transceiver—XFP transceiver is not installed in this 10GE or OC-192c/STM-64c port. • Sonet OCn —SONET/SDH OC-<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>. • 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 53** *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. CH-OC3/CH-OC12: <ul style="list-style-type: none"> • STS Path • VT Path CH-STM1/CH-STM4: <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 For a complete list of conditions that can cause an alarm, see the Troubleshoot with System Power and Alarm LEDs section.
Path Trace Length	The maximum size that the TX path trace message can be set to.
Physical Layer ⁽¹¹⁾	<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) Alarm is reported, but the port is not shut down.
Scramble	Status of X ⁴³ + 1 payload scrambling for a POS port (on or off).



Table 53 Output Fields for the `show port` Command with the `detail` Keyword

Field Name	Value/Description
Speed	<ul style="list-style-type: none"> <code>nnn</code> Mbps—Speed of the 10/100 Ethernet port. <code>nn</code> Gbps—Speed of the Gigabit Ethernet port (any version). <code>auto</code>—Speed of the 10/100 Ethernet port has been determined by sensing the line.
Support Lossless Large MTU	Status of this FE port on an FE-GE line card with regard to guaranteed lossless flow control for jumbo frames: <ul style="list-style-type: none"> <code>Disabled</code>—Port supports this feature but is not enabled for it. <code>Enabled</code>—Port is enabled for this feature. <code>Not Configurable</code>—Port does not support this feature. <code>Shutdown</code>—Port is a member of a port group that is enabled for this feature and has been shut down because it does not support it.
Temperature	SFP Transceiver temperature
Timeslot	Time slots configured for DS-0 channels.
Tx C2 byte Rx C2 byte	Value of the C2 byte: <ul style="list-style-type: none"> <code>ATM OC ports</code>—0x13 <code>POS OC ports</code>—0x16 <code>WANPHY port</code>—0x1a <code>Ch-OC3/CH-OC12</code> (depends channel-mapping): <ul style="list-style-type: none"> * <code>VT1.5</code>—0x16 * <code>STS-1</code>—0x04 <code>CH-STM1/CH-STM4</code> (depends aug-mapping): <ul style="list-style-type: none"> * <code>AU3-NO-TUG/AU4-TU3</code>—0x04 * <code>AU3-TU12/AU3-TU11/AU4-TU12/AU4-TU11</code>—0x02
Tx Fault Rx Fault	<i>Fault status for the transmit or receive side of the SFP transceiver installed in this port:</i> <ul style="list-style-type: none"> <code>LowPwrWarning</code>—Measured power has dropped below the level needed by the transceiver to maintain connectivity without errors. <code>NoFault</code>—No power fault has occurred. <code>PwrFault</code>—Measured power is outside the range displayed in the <code>PwrMin</code> and <code>PwrMax</code> fields by the <code>show hardware</code> command (in any mode) with the <code>detail</code> keyword.
Tx National bit Rx National bit	Value of the national bit (bit 12 of set 1) in the E3 frame: <ul style="list-style-type: none"> <code>Enabled</code> <code>Disabled</code>
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"> <code>Up</code>—Port is working (active). <code>Down</code>—Port has been configured to be up, but is not working.
Vcc Measured	SFP Transceiver Vcc

**Table 53** 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> .
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 54 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 54 *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.

3.11 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 55 *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 56 Chassis Alarms

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

Description	Severity	Probable Cause	Service Affecting
Bridging Transmission Convergence (BTC) interface error detected	Major	ReplaceableUnitProblem	Yes
BTC not ready	Major	ReplaceableUnitProblem	Yes
Circuit pack backplane RX error ⁽¹⁾⁽²⁾	Major	BackplaneFailure	Yes
Circuit pack backplane TX error ⁽¹⁾⁽²⁾	Major	BackplaneFailure	Yes
Circuit pack card code mismatch	Minor	ReplaceableUnitTypeMismatch	No
Circuit pack failure	Critical	ReplaceableUnitProblem	Yes
Circuit pack mismatch	Critical	ReplaceableUnitTypeMismatch	Yes
Circuit pack missing	Critical	ReplaceableUnitMissing	Yes
Circuit pack overheating	Major	LineCardProblem	Yes
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 58 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



Table 58 Controller Card Alarms

Description	Severity	Probable Cause	Service Affecting
Controller (card) software not supported	Major	SoftwareError	Yes
Controller (card) switch completed ⁽¹⁾	Major	OperationNotification	Yes
Controller (card) switch failed ⁽¹⁾	Major	OperationFailure	Yes
Controller (card) temperature critical	Major	ReplaceableUnitProblem	Yes
Controller (card) temperature hot	Minor	ReplaceableUnitProblem	Yes
Controller (card) type mismatch	Major	ReplaceableUnitTypeMismatch	Yes
Diagnostic test fail	Major	ReplaceableUnitProblem	Yes
Local backplane inventory fail	Major	ReplaceableUnitProblem	Yes
Local fan tray inventory fail	Major	ReplaceableUnitProblem	Yes
Local inventory fail	Major	ReplaceableUnitProblem	Yes
Nonvolatile memory fail	Major	CorruptData	Yes
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 59 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 60 SSE Disk Alarms

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

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

3.12.6 SSE Group Alarms

Table 61 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 62 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



Table 62 SSE Group Partition Alarms

Description	Severity	Probable Cause	Service Affecting
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*. The severity levels in the table are the default levels, not the degraded levels.

Table 63 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 64 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	ExternallFDeviceProblem	Yes
Section signal degrade (BER [bit error rate])	Major	DegradedSignal	Yes
Section signal failure (BER)	Major	ExcessiveBER	Yes

**Table 65** *Optical Port Alarms—Line/Multiplex Section Layer*

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

Table 66 *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

**Table 66 SFP Transceiver Alarms**

Description	Severity	Probable Cause	Service Affecting
Transceiver receive power–low	Major	Replaceable Unit Problem	Yes
Transceiver receive power–low warning	Minor	Replaceable Unit Problem	No
Transceiver temperature–high	Major	Replaceable Unit Problem	Yes
Transceiver temperature–high warning	Minor	Replaceable Unit Problem	No
Transceiver temperature–low	Major	Replaceable Unit Problem	Yes
Transceiver temperature–low warning	Minor	Replaceable Unit Problem	No
Transceiver TX power–high	Major	Replaceable Unit Problem	Yes
Transceiver TX power–high warning	Minor	Replaceable Unit Problem	No
Transceiver TX power–low	Major	Replaceable Unit Problem	Yes
Transceiver TX power–low warning	Minor	Replaceable Unit Problem	No
Transceiver voltage–high	Major	Replaceable Unit Problem	Yes
Transceiver voltage–high warning	Minor	Replaceable Unit Problem	No
Transceiver voltage–low	Major	Replaceable Unit Problem	Yes
Transceiver voltage–low warning	Minor	Replaceable Unit Problem	No

Table 67 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

**Table 67** *XFP Transceiver Alarms*

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

3.12.9 DS-3 Channel or Port and E3 Port Alarms

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

Table 68 *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

**Table 68 DS-3 Channel or Port and E3 Port Alarms**

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

3.12.10 DS-1 Channel and Path Alarms

Table 69 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

**Table 69 DS-1 Channel and Path Alarms**

Description	Severity	Probable Cause	Service Affecting
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 70 E1 Channel or Port Alarms

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

3.12.12 Ethernet Port Alarms

Table 71 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 72 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

**Table 72 Gigabit Ethernet Port Alarms**

Description	Severity	Probable Cause	Service Affecting
Port terminal loopback enabled	Minor	OperatorNotification	No
Receive loss of signal (LOS)	Critical	LossOfSignal	Yes

3.12.14 VT Path Alarms

Table 73 VT Path Alarms

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

3.12.15 TU-12 Path Alarms

Table 74 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 75 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 76 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 77 VC-4 Path Alarms

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

3.12.19 STS and STM Path Alarms

Table 78 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 79 Problems Indicated by Card Status LEDs

Problem	Solution
FAIL (red) is on.	The card has failed. Replace the card.
ACTIVE (green) is off.	Perform the following checks or actions: Check the STDBY LED: <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*.
- 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 80 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*.

3.14.1 Initiate ODD Session

Table 81 Parameters for an ODD Session

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

Table 82 Card Types and Slots for the card Command

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



Table 82 Card Types and Slots for the card Command

Type of Line Card/Description	card-type Keyword	slot Argument Range
Advanced Services Engine 2 ⁽³⁾	ase2	1 to 6 and 9 to 14
SmartEdge Storage Engine ⁽³⁾	sse	1 to 6 and 9 to 14

(1) To use ports 5 through 8 on a Channelized 8-port OC-3/STM-1 or 2-port OC-12/STM-4 line card (ROA1283420/1), an all-ports software license (FAL1241079/1) is needed. A separate software license (FAL1240782/1) is required for the Channelized 4-port OC-3/STM-1 or 1-port OC-12/STM-4 line card (ROA1283420/2).

(2) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE1020 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 83; Table 82 lists values for the *card-type* and *slot* arguments.

Table 83 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 84; all commands are entered in exec mode. Table 81 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 84 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 85 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



Table 85 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 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 87
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 86 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 87 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.



Table 87 LED States During and After an ODD Session

Card State	State of LEDs
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 88; all commands are entered in any mode.

Table 88 Display Results from ODD Sessions

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

Table 89 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.
<i>n</i> Failures	Session was completed with a number of test failures.
Passed	All tests passed.

Table 90 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 91; enter all commands in exec mode.

Table 91 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

The SmartEdge 1200H chassis has an EEPROM that supplies the medium access control (MAC) address for the chassis. If it should ever be necessary to replace the EEPROM, contact your local technical representative or the Ericsson Technical Assistance Center (TAC) for directions.

Caution!

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

Table 92 Tools needed for Servicing Hardware

Tool	Purpose
#1 Phillips screwdriver	Remove and install the fan and alarm unit, and cards. The screwdriver must have a 4.5-inch (11.5-cm) shaft to reach the screws that secure the fan tray in the chassis.

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.

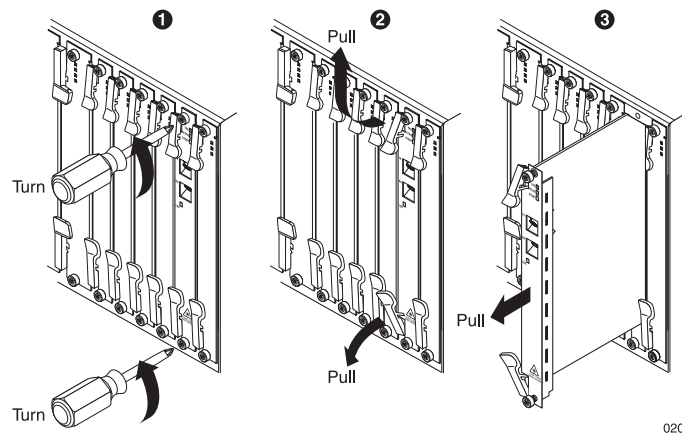


Figure 32 Removing a Card from the SmartEdge 1200H Chassis

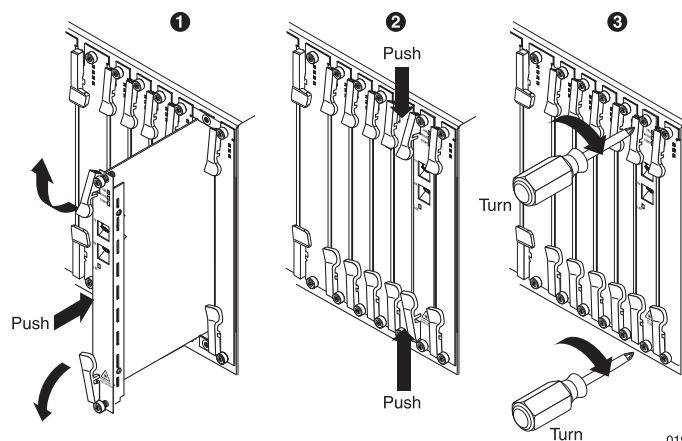


Figure 33 Replacing a Card in the SmartEdge 1200H Chassis

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.

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

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

- In a system with dual controller cards, ensure that the standby controller is fully synchronized with the active controller card. Use the `show`



redundancy command (in any mode) to display the status of the standby controller.

- In a system with a single controller card, ensure that you have the CLI prompt on the console.
- If the system is not currently in an operational state, you need to power off the system. To power off the system, remove all fuses for both power zones (primary and backup for each zone) in the fuse panel.
- The design of the SmartEdge 1200H router permits you to install and replace all cards without powering off the system.

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. Verify the operational status: the FAIL LED must not be lit.
5. Generally, duplicate the cable connections of the active controller card on the standby controller card.
6. If the first controller card includes a CF card, install a CF card in the controller card you have just installed.
7. Verify the operational status: the FAIL LED must not be on.



8. Generally, duplicate the cable connections of the active controller card on the standby controller card (see the procedures in *Connect and Route Cables at the Front of the Chassis*, 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 the software release on the controller card that you are installing is different from the release on the active controller, the active controller overwrites the release on the replacement controller card after you complete the replacement procedure.

If you are replacing one of a pair of controller cards, the replacement controller card must be the same type (XCRP4) and have the same memory size as the current controller card; you can check the CLEI codes to ensure that they are identical.

Caution!

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

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 card 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.

Caution!

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.
9. Verify the operational status: the FAIL LED must not be on.
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. In a dual-controller system, you must upgrade both controller cards. You cannot mix controller types in the same chassis.

To upgrade a controller card:

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.



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.

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 entering the `unmount /md` command can permanently damage the CF card and cause the kernel to crash. To reduce the risk, always enter the `unmount /md` command before removing the CF card.

For more information about the `unmount` command, see *Command List*.

Caution!

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

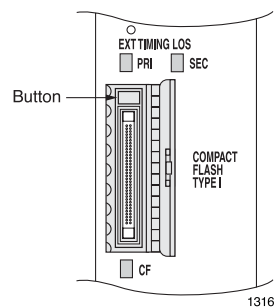
To replace a CF card:

1. Enter the following command in exec mode: `unmount /md`.
2. If you are removing the CF card in an XCRP4 Controller card, perform the following steps:
 - a. Open the door that covers the CF Type 1 slot until it “snaps” open. This action begins unmounting the file system on the CF card. The CF Active LED blinks during the unmounting process.
 - b. Wait until the CF Active LED stops blinking. It is now safe to remove the CF card.

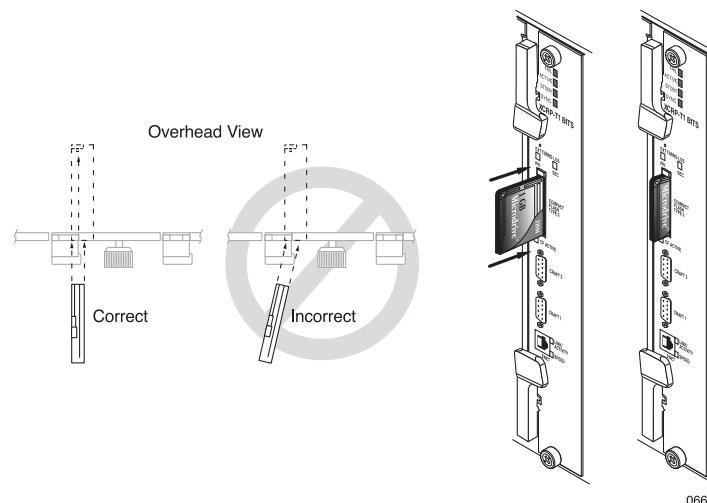


Note: If the system cannot successfully unmount the file system on the CF card, the CF Active LED stops blinking and is off. You must enter the `unmount` command (in exec mode) to unmount the file system on the card.

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



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



6. Close the door.

After replacing the CF card, re-seat the XCRP4 Controller card so the Power-on Diagnostic (POD) can run on the XCRP card. For information on the POD, see Section 2.13.1 Power-On Diagnostics on page 53.

For detailed instructions on how to install a CF card, see Section 2.6.5 on page 41.

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.

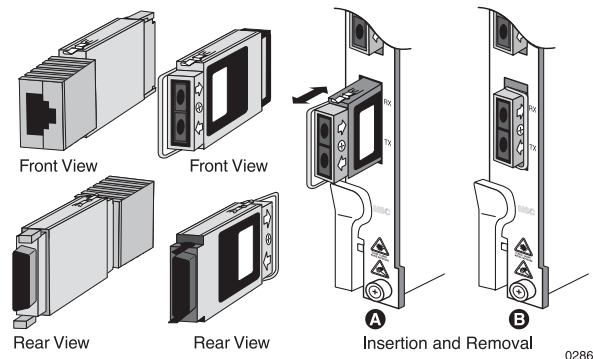


Figure 34 GBIC Transceivers

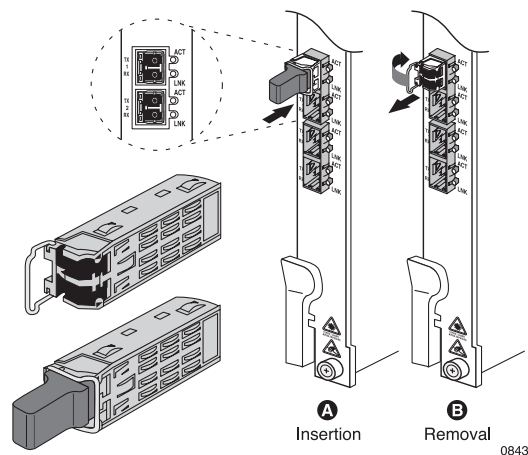


Figure 35 SFP Transceivers

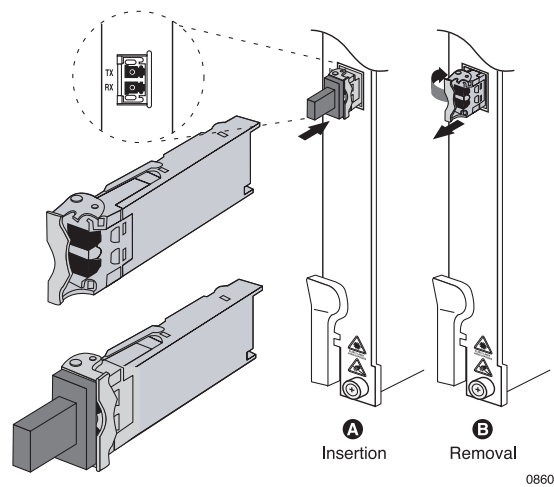


Figure 36 XFP Transceivers



To remove a transceiver of any type:

1. Shut down all activities on the port with the transceiver you want to replace, see *Command List* .
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; never twist it when connecting it to or disconnecting it from a line card.

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

Release the latching mechanism:

- a If the transceiver has a wire handle, unlatch it, and rotate it 90° to 180°.
 - b If the transceiver has latching tabs, squeeze and hold the tabs.
4. Withdraw the transceiver from its port and insert a dust cover over the optical connectors.

4.4 Cleaning Optical Connectors

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

4.5 Servicing the Advanced Services Engine

Caution!

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



4.5.1 Adding an ASE or ASE2 Card

To add an ASE or ASE2 card to an operational system:

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

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

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

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

4.5.2 Replacing an ASE or ASE2 Card

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



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

Caution!

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

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

4.6 Servicing the SmartEdge Storage Engine

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 components inside the chassis.

4.6.1 Remove and Replace an SSE

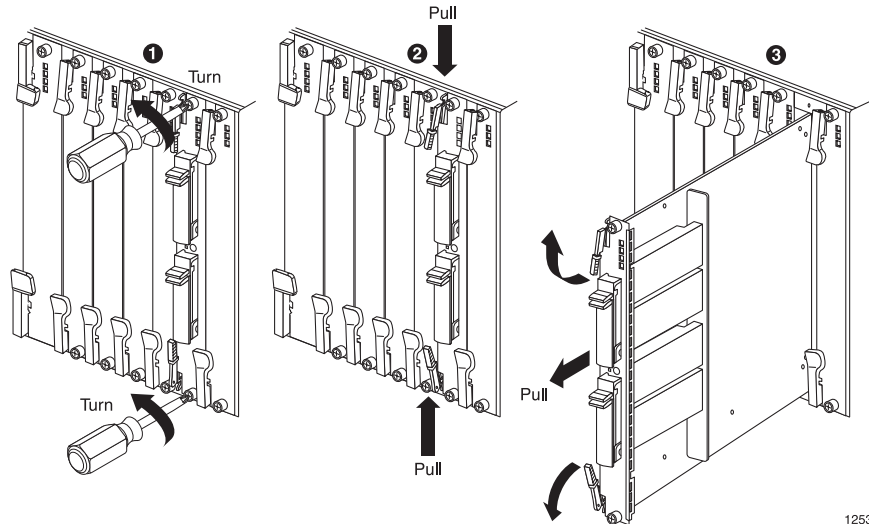


Figure 37 Removing SSE

Stop!

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

To remove the SSE:

1. With a Phillips screwdriver, loosen the screws on the front panel.
2. Pull on the ejector levers until they are parallel with the front panel. This will disengage the SSE from the connectors on the backplane.
3. Carefully slide the SSE out of the slot.

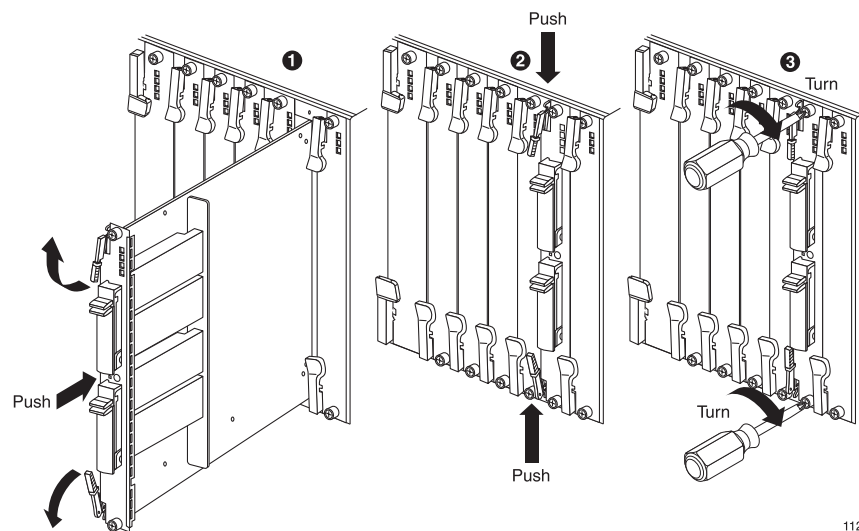


Figure 38 Replacing SSE

1129

Warning!

Risk of equipment damage. The SSE overheats when the slot to the right of it is empty. Insert blank cards into all empty slots.

To replace the SSE:

1. Put on an antistatic wrist strap and attach it to an appropriate grounded surface.
2. Align the SSE with the guides; these are located at the top and bottom of the slot in the chassis.

Caution!

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

3. Position the ejector levers away from the front panel and then carefully slide the SSE into the slot. The ejector levers rotate as the latching mechanisms

engage the walls of the slot and the connectors on the SSE are inserted into the connectors on the backplane.

4. Fully seat the connectors with the backplane by pushing on the ejector levers until they are parallel with the front panel.
5. Tighten the screws on the front panel. Then with a Phillips screwdriver, tighten each screw to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters).

4.6.2 Remove and Replace an HDD

Caution!

Risk of EMI. To shield against EMI when operating an SSE with an empty HDD carrier, always install a blank cover plate on the empty carrier.

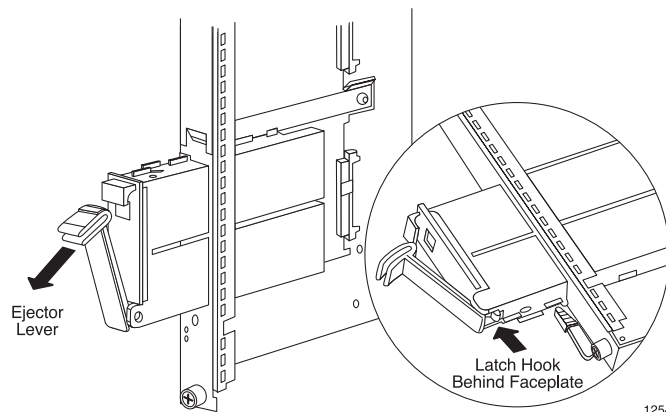


Figure 39 Removing HDD

To remove the Hard Disk Drive (HDD), pull the ejector lever open and then slide the HDD out of the SSE carrier.

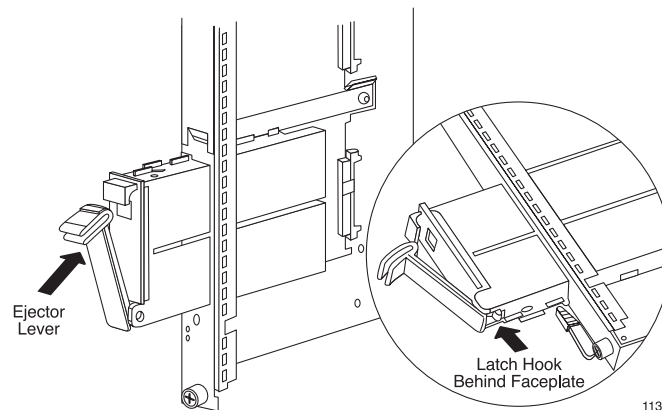


Figure 40 Replacing HDD

Warning!

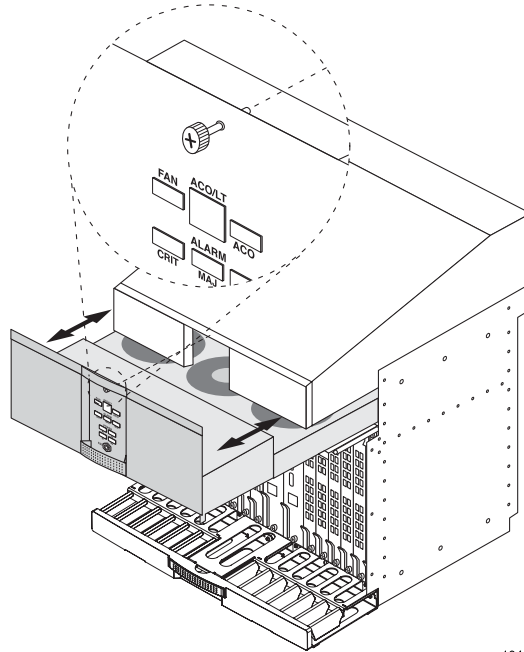
Risk of equipment damage. If only one hard disk drive (HDD) is installed, it must be located in the top carrier to ensure proper air flow and cooling.

To replace the HDD:

1. Pull the ejector lever open, align the HDD with the guides, and then slide it into the carrier.
2. Verify that the bottom hook of the latch is properly positioned behind the faceplate and then fully seat the HDD into the connector by pushing on the ejector lever until it is parallel with the front panel.
3. Verify the operational status as described in the hardware guide for your chassis.

For information about SSE configuration and operation, see *SSE Configuration and Operation* , or consult your technical support representative.

4.7 Replacing the Fan Tray



1044

Figure 41 Replacing the Fan Tray

You do not have to power off the system to remove the fan tray because the SmartEdge 1200H router can operate without the fans for a short time.

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 1200H 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; an ESD convenience jack is located on the front of the fan tray.
2. Remove the fan tray:
 - a Using a Phillips screwdriver, loosen the captive screw on the front of the fan tray.
 - b Gently slide the fan tray out of the chassis and set it aside.

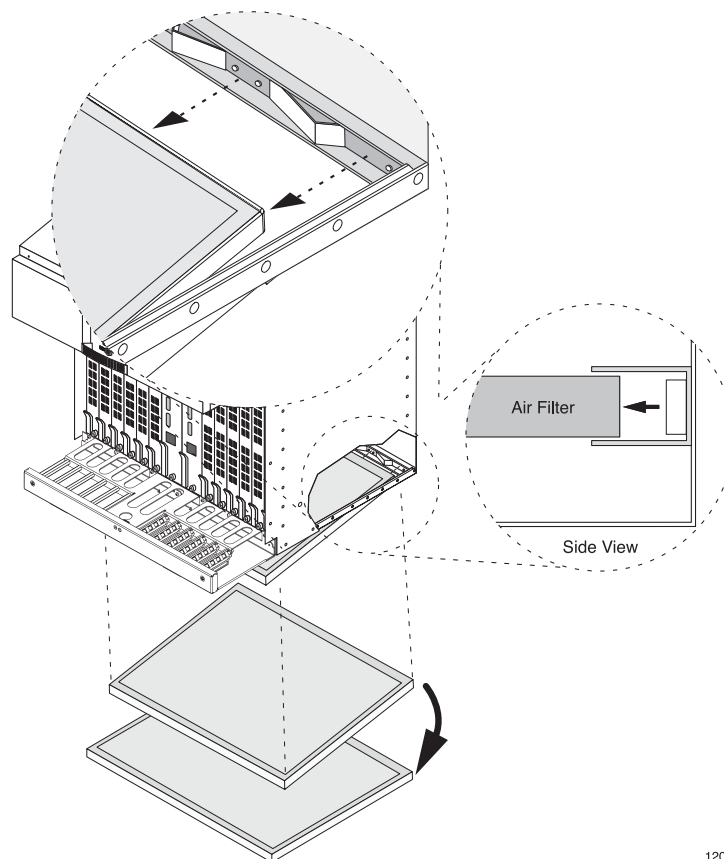


3. Install the new fan tray:
 - a Insert the fan tray into the chassis.
 - b With a Phillips screwdriver, tighten the screw on the front of the fan tray to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters).
4. Check the LEDs on the front of the fan tray; the FAN LED must not be on.
5. Replace the air filter and update the service date.

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.

4.8 Replacing the Air Filter

The SmartEdge 1200H chassis has a built-in air filter mounted at the bottom of the chassis.



1200

Figure 42 Removing the Air Filter

The SmartEdge 1200H chassis has a built-in air filter that is used with the fan tray to cool the system. The filter is mounted at the bottom of the chassis. A label on the filter allows you to record the date the filter should be replaced.



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 1200H chassis for it to operate without overheating system components.

To replace the air filter:

1. On the label of the replacement filter, record the date that it should be replaced.
2. Remove the current filter: standing at the front of the chassis, reach under the chassis to the filter, and grasp the tab at the front of the filter; then push the filter back toward the rear of the chassis and, at the same time, pull down on the tab. You will feel the spring at the rear of the chassis give, and the filter will clear the restraining lip at the front of the chassis.
3. Insert the replacement filter: insert the filter under the chassis and press it into the spring at the rear of the chassis to clear the restraining lip of the chassis; then lift the front of the filter and let it snap into place behind the restraining lip.
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.



5 System Description

The SmartEdge 1200H router is a carrier-class product with an architecture that supports packetized traffic. It has a higher power rating than the SmartEdge 1200 router allowing it to support a greater number of PPA3-based line cards.

The SmartEdge 1200H router can be used as an edge aggregation router and simultaneously as a broadband remote access server (BRAS) to directly connect customers to the network. It supports a variety of interfaces and vital services, such as routing protocols, quality of service (QoS), and inbound and outbound access control lists (ACLs). New services can easily be added with software upgrades.

Because of the optimized packet-forwarding capabilities and support of high-bandwidth uplink interfaces, the SmartEdge 1200H router can also be used in the metropolitan core to aggregate traffic from other routers into the long-haul transit core.

5.1 Specification Summary

Table 93 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 card: 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

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

5.2 Controller Card

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



5.3 Line Card Interfaces

The SmartEdge 1200H router supports a wide variety of interfaces, such as:

- Asynchronous Transfer Mode (ATM) using SONET/SDH OC-3c/STM-1c and OC-12c/STM-4c
- Packet over Synchronous Optical Network/Synchronous Digital Hierarchy (POS) OC-3c/STM-1c, OC-12c/STM-4c, OC-48c/STM-16c, and OC-192c/STM-64c
- Ethernet 10Base-T, 100Base-TX, 1000Base-LX, 1000Base-SX, 1000Base-LH, 1000Base-ZX, 1000Base-TX, 1000Base-CWDM, 1000Base-DWDM, 10GE-ER, 10GE-LR, 10GE-SR, 10GE-ZR, and 10GE-DWDM

Note: Neither the SmartEdge 1200 nor SmartEdge 1200H chassis provides support for line cards that require BNC connections.

Table 94 SmartEdge 1200H Line Cards

Type of Card	Number of Cards	Number of Ports ⁽¹⁾	Low-Density Version ⁽²⁾	Low-Density Ports	Protection Ratios ⁽³⁾
ATM OC-3c/STM-1c (8-port)	12	8	No	—	None, 1+1 APS
ATM OC-12c/STM-4c (2-port)	12	2	No	—	None, 1+1 APS
POS OC-3c/STM-1c (8-port)	12	8	No	—	None, 1+1 APS
POS OC-12c/STM-4c (4-port)	12	4	No	—	None, 1+1 APS
POS OC-48c/STM-16c (4-port)	12	4	No	—	None, 1+1 APS
OC-192c/STM-64c (1-port)	12	1	No	—	None, 1+1 APS
Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port) ⁽⁴⁾	12	8, 2	No	—	None, 1+1 APS
Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)	12	60, 2	No	—	None
Gigabit Ethernet 3 (4-port)	12	4	No	—	None
Gigabit Ethernet 1020 (10-port)	12	10	No	—	None
Gigabit Ethernet 1020 (20-port) ⁶⁽⁵⁾	6 ⁽⁶⁾	20	No	—	None
Gigabit Ethernet (5-port)	12	5	No	—	None
Gigabit Ethernet DDR (10-port)	12	10	No	—	None
Gigabit Ethernet DDR (20-port) ⁽⁵⁾⁽⁷⁾	12	20	No	—	None
10 Gigabit Ethernet (1-port)	12	1	No	—	None



Table 94 SmartEdge 1200H Line Cards

Type of Card	Number of Cards	Number of Ports ⁽¹⁾	Low-Density Version ⁽²⁾	Low-Density Ports	Protection Ratios ⁽³⁾
10 Gigabit Ethernet DDR (4-port) ⁽⁷⁾	12	4	No	—	None
10 Gigabit Ethernet/OC-192c DDR (1-port)	12	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 depend on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.

(4) By default, this card is licensed for use with the first four ports – ports 1-4 (ROA1283420/2); and requires a different license (ROA1283420/1) to enable the additional four ports – ports 5-8.

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

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

5.4 Advanced Services Engine Card

Table 95 Advanced Services Engine Card

Type of Card	Number of Cards	Protection Ratios
Advanced Services Engine (ASE)	12	None
Advanced Services Engine 2 (ASE2) ⁽¹⁾	12	None

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

5.5 SmartEdge Storage Engine Card

Table 96 SmartEdge Storage Engine Card

Type of Card	Number of Cards	Number of Hard Disk Drives
SmartEdge Storage Engine (SSE) ⁽¹⁾	12	2

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

5.6 Packet Mesh Architecture

The SmartEdge 1200H 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
- 1+1 Automatic Protection Switching (APS) protection for ATM second-generation line cards: 4-port ATM OC-3c/STM-1c and 2-port ATM OC-12c/STM-4c IR

Protection for cards and ports is configurable on a per-port basis; a mix of protected and unprotected ports is supported. Protection features and the types of ports that support APS depend on the release of the software.

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

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



5.10 SmartEdge 1200H Chassis

The SmartEdge 1200H router is NEBS compliant and designed for mounting in a standard 19- or 23-inch rack.

5.10.1 Chassis Card Cage

The SmartEdge 1200H chassis has a card cage with 14 slots. Two slots are dedicated to the controller cards and 12 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

The fan tray installed directly above the card slots cools the chassis. 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, traffic, or blank card installed in it. SmartEdge cards can be damaged by lack of cooling when the chassis has empty slots.

5.10.3 Chassis Power

The SmartEdge 1200H router power architecture has two power zones, each with primary (A) and backup (B) sources. A1 refers to the primary power source for zone 1; B1 refers to the backup power source for zone 1. Both zones 1 and 2 must be connected for the chassis to be operational; the connections can be



any combination of A and B sources. For a fully redundant power configuration, all four sources must be connected.

Zone 1 sources provide power to slots 1 to 7 in the chassis; zone 2 sources provide power to slots 8 to 14. The chassis fan tray is powered from either zone.



6 Card Descriptions

6.1 Line Cards

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

Table 97 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 97 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
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
ROA1283184/2	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 97 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*.

Table 98 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 98 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) Part number RDH90159/1 supports dual mode SR/IR capability and uses SMF. Part number RDH90158/1 supports SR only and uses MMF.

(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 Card

The SmartEdge 1200H router supports the XCRP4 Controller card.

This controller card supports applications that require high volumes of traffic; it also supports more subscribers than the other controller cards. the interface to BITS or SSU equipment does not support the transmission of timing data to the external equipment.

The controller card is responsible for:

- Packet routing protocols.
- Operating system command-line interface (CLI).



- Communication with a network management system running the NetOp Element Management System (EMS) software.
- Loading of all configuration information necessary for the line cards.

Table 99 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 ⁽²⁾
Internal storage for system images and files	2 GB
External storage for core dumps and system files	1 GB (NEBS certified)
External ports	1 DB-9 (CRAFT) 1 10/100/1000 Ethernet ⁽³⁾

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

(2) The XCRP4 can receive data only.

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

6.2.1 Controller Card LEDs

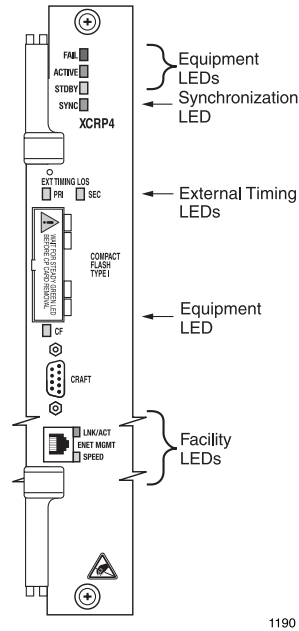


Figure 43 LEDs on Controller Cards

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 100 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 100 *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.
CF ACTIVE	Blinking	Green	The external storage device in the slot in the active controller card is being read or written.
	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.

Caution!

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

Caution!

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

**Table 101 Facility LEDs on Controller Cards**

Label	Activity	Color	Description
LINK/ACTIVITY	On	Green	The link is present and active.
LINK/ACT	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 102 Synchronization and External Timing LEDs on Controller Cards

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

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

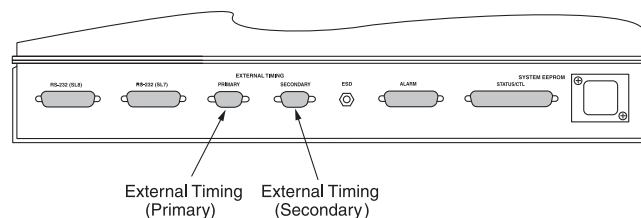


Figure 44 External Timing Cables Connections

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 44 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. You can corrupt the system if you attempt to install a CF card not obtained from Ericsson because these items have not been tested with the SmartEdge router. To reduce the risk, use only the CF cards provided by Ericsson.

A controller card has an external slot on the front panel in which you can install an optional Type I CF card. The XCRP4 Controller card supports Type I CF cards only.

When installed (the system is shipped with the slot empty), the CF card captures crash dumps and provides an alternate source for loading SmartEdge OS software, if it is not possible to download it over the network. If a CF card is installed in the active controller card, the standby controller card, if installed, must also have a CF card installed.

6.2.2.8 Ports for System Management Access

The XCRP4 Controller card has a single Craft port, labeled CRAFT. Each port has a DB-9 connector and provides an RS-232 connection to a local console terminal, a terminal server, or a modem. The Craft port provides access to the SmartEdge OS CLI for configuring and monitoring tasks; it is enabled on both the active and standby controller cards. All controller cards have a single Ethernet port with an RJ-45 connector that runs at 100 Mbps and provides a



connection to an Ethernet device such as a switch or hub. This port provides access to the SmartEdge OS CLI from either a local or remote management workstation for configuring and monitoring tasks. Using this port, the system can also communicate with a remote workstation that is running the NetOp EMS software. Support for 1-Gbps speed of the port on the XCRP4 Controller card depends on the release of the SmartEdge OS. The Ethernet management port on the standby controller card is disabled unless the card becomes the active controller card.

6.2.2.9 Monitoring Temperature and Voltage

Temperature is monitored at both air inlet and air outlet locations on a controller card; an over-temperature interrupt signals the SmartEdge OS when the temperature rises above safe operating conditions. Voltages are also monitored and reported to the SmartEdge OS. Administrators can display both temperature and voltage data using commands in the SmartEdge OS CLI.

6.2.2.10 Fully Redundant Configuration

When two controller cards are installed in the SmartEdge 1200H 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 103 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
Compliance	SFF-8472 and INF-8074i ANSI-T1.105.06 SR-0	SFF-8472 and INF-8074i Telcordia GR-253 ITU G.957
Transmitter		



Table 103 8-Port ATM OC-3c/STM-1c Card Specifications

Specification	SR-0	IR-1 ⁽¹⁾
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

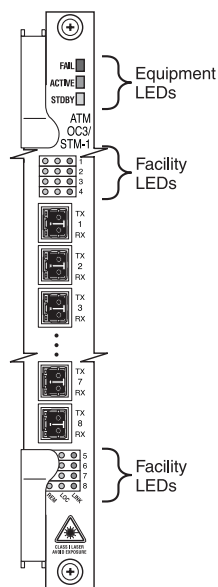


Figure 45 Status LEDs on 8-Port ATM OC-3c/STM-1c Card

Table 104 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.

**Table 104 Equipment LEDs on 8-Port ATM OC-3c/STM-1c Card**

Label	Activity	Color	Description
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 105 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 106 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; 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 L-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 106 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

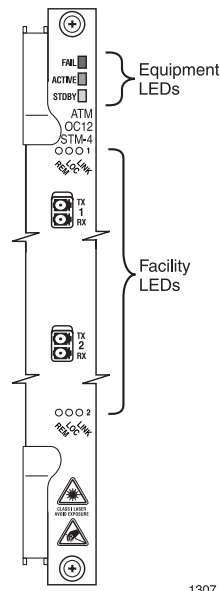


Figure 46 LEDs on 2-Port ATM OC-12c/STM-4c Line Card

Table 107 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 108 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 108 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 109 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 109 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

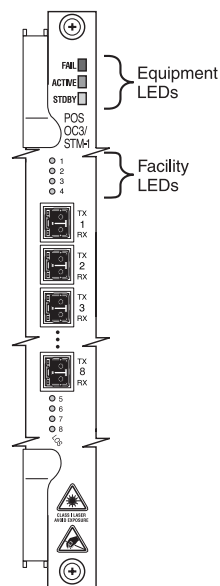


Figure 47 Status LEDs on 8-Port POS OC-3c/STM-1c Card

**Table 110 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 111 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 112 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

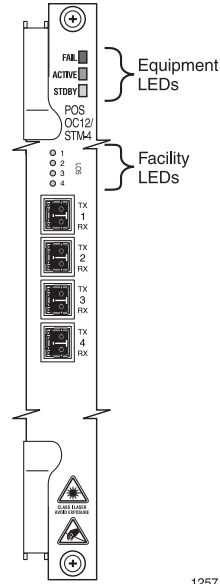


Figure 48 Status LEDs on 4-Port POS OC-12c/STM-4c Card

Table 113 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 114 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 115 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 115 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.

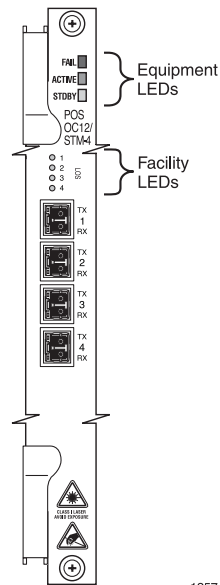
(5) Root mean square (RMS) value.

(6) Measured 20 dB down from center wavelength.



6.7.1

Status LEDs



1257

Figure 49 Status LEDs on 4-Port POS OC-48c/STM-16c Card

Table 116 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 117 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 118 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 118 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.

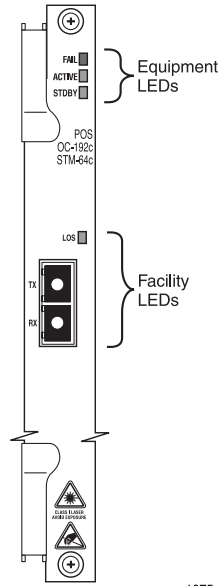
(2) Use part number RDH90168/2 (XFP-OC192-LR2) when ordering the XFP transceivers with 10GE ZR functionality.

(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



1075

Figure 50 Status LEDs on 1-Port OC-192c/STM-64c Card

Table 119 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 120 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*.

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 121 *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 122 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 123 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

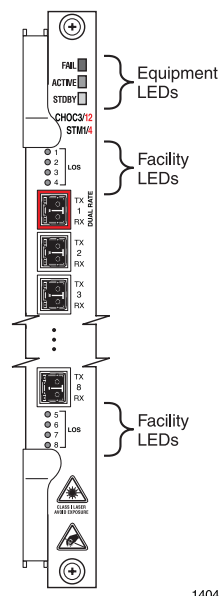


Figure 51 LEDs on 8/4-Port Channelized OC-3/STM-1 or 2/1-Port Channelized OC-12/STM-4 Card

Table 124 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 125 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 126 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**

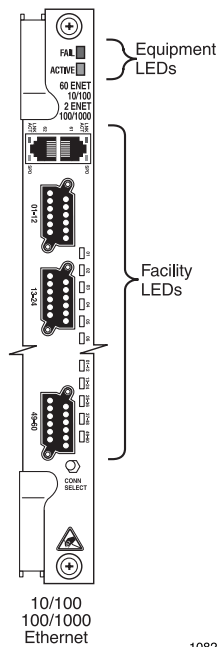


Figure 52 Status LEDs on 60-Port Fast Ethernet Card

Table 127 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 128 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 129 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 130 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 131 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 132 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 132 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 133 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 133 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

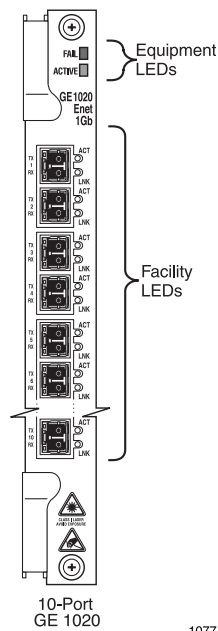


Figure 53 Status LEDs on 10-Port Gigabit Ethernet 1020 Card

Table 134 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 134 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 135 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 136 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 137 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 138 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 138 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

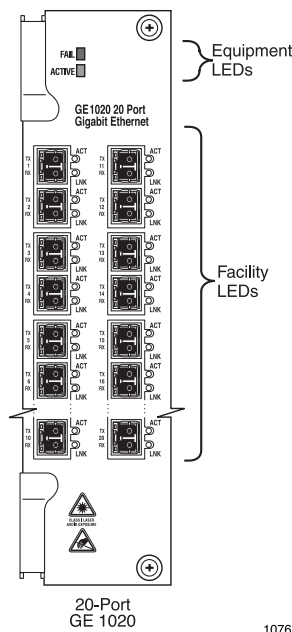


Figure 54 Status LEDs on 20-Port Gigabit Ethernet 1020 Card

Table 139 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 140 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 141 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 141 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 142 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 142 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 143 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 143 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

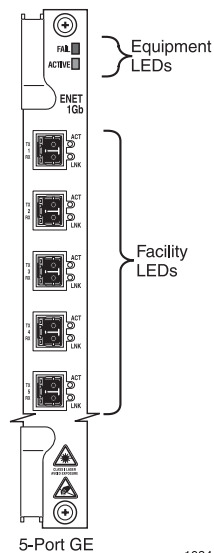


Figure 55 LEDs on 5-Port Gigabit Ethernet Card

Table 144 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 145 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 146 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 147 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 147 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 148 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 148 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

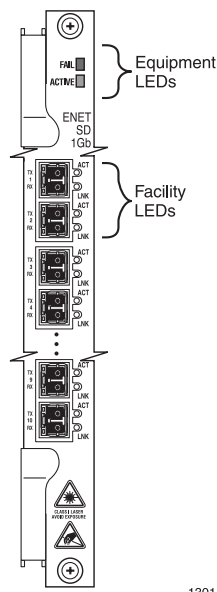


Figure 56 LEDs on 10-Port Gigabit Ethernet DDR Card

Table 149 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 149** 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 150 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 151 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 151 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 152 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 153 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 154 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 154 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 155 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 155 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

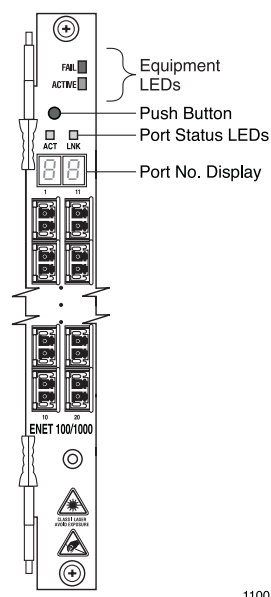


Figure 57 LEDs on 20-Port Gigabit Ethernet DDR Card



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 156 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 157 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 158 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 158 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 159 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

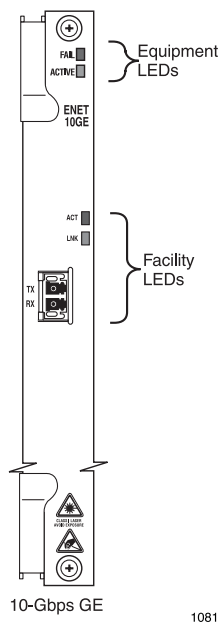


Figure 58 LEDs on 1-Port 10 Gigabit Ethernet Card

Table 160 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 161 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*.

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 162 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 163 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 163 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 164 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 164 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

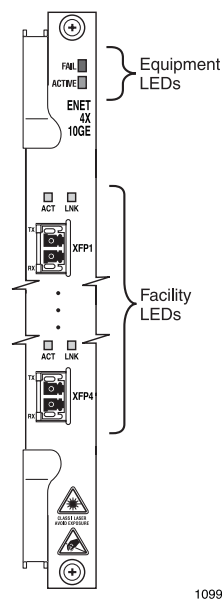


Figure 59 LEDs on 4-Port 10 Gigabit Ethernet DDR Card

Table 165 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 165** 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 166 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 167 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 167 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 168 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 168 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 169 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 170 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 171 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

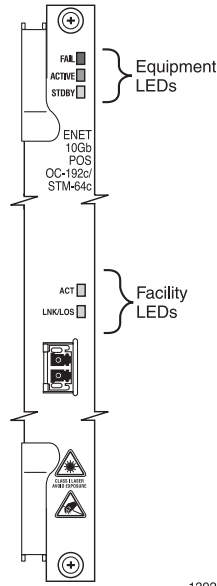


Figure 60 LEDs on 1-Port 10GE/OC-192c DDR Card

Table 172 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 173 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 173 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 174 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 175 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 176 Port Data

Type of Card and Card Description	Physical Ports ⁽¹⁾	Low-Density Version	Low-Density Port Numbers
Advanced Services Engine Advanced Services Engine 2	4 (2 for each ASP) ⁽²⁾	No	—

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

(2) These ports are not used for control or data traffic. They are used for netboot only in a development environment.

7.1 LEDs

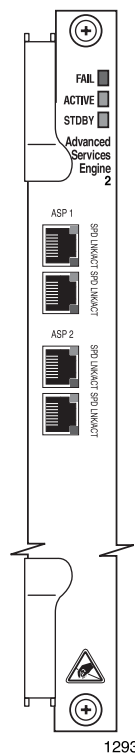


Figure 61 LEDs on ASE and ASE2 Cards

Table 177 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 178 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.