

# SmartEdge 600 Router Hardware Guide

## Release 11.1

---

### INSTALLATION

## **Copyright**

© Ericsson AB 2010–2011. All rights reserved. No part of this document may be reproduced in any form without the written permission of the copyright owner.

## **Disclaimer**

The contents of this document are subject to revision without notice due to continued progress in methodology, design and manufacturing. Ericsson shall have no liability for any error or damage of any kind resulting from the use of this document.

## **Trademark List**

**SmartEdge** is a registered trademark of Telefonaktiebolaget LM Ericsson.

**NetOp** is a trademark of Telefonaktiebolaget LM Ericsson.



# Contents

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>Site Preparation</b>                                   | <b>1</b>  |
| 1.1      | Agency Compliance Information                             | 1         |
| 1.2      | Electrical Specifications                                 | 1         |
| 1.3      | Electrical Power Connections                              | 3         |
| 1.4      | Environmental Requirements                                | 4         |
| 1.5      | Physical Specifications                                   | 5         |
| 1.6      | Select the Rack   | 6         |
| 1.7      | Select the Installation Method                            | 7         |
| 1.8      | Equipment and Personal Safety Warnings                    | 8         |
| 1.9      | DC Power Source Warnings                                  | 9         |
| 1.10     | Access During Initial Startup and Reload Operations       | 10        |
| 1.11     | Access During Normal Operations                           | 10        |
| 1.12     | Management Access Options                                 | 11        |
| 1.13     | Gathering Cables and Tools                                | 11        |
| 1.14     | Management Access Cables                                  | 12        |
| 1.15     | External Timing Cables                                    | 14        |
| 1.16     | Line Card Cable Specifications                            | 15        |
| 1.17     | Transceiver-Based SONET/SDH Line Card Cables              | 16        |
| 1.18     | 10/100 Ethernet and Fast Ethernet–Gigabit Ethernet Cables | 17        |
| <b>2</b> | <b>Installing the Hardware</b>                            | <b>19</b> |
| 2.1      | Install the Chassis Mounting Brackets                     | 20        |
| 2.2      | Install the Chassis                                       | 21        |
| 2.3      | Install the Cable Management Brackets                     | 22        |
| 2.4      | Connect Power and Ground Cables                           | 22        |
| 2.5      | Optional AC Power Shelf                                   | 26        |
| 2.6      | Card Slots  | 31        |
| 2.7      | Install Cards   | 33        |
| 2.8      | Connections for Management Access                         | 40        |
| 2.9      | Connections for External Timing Cables                    | 42        |
| 2.10     | Connections for Line Card Cables                          | 42        |
| 2.11     | Connect and Route Cables                                  | 43        |



|          |   |            |
|----------|---|------------|
| 2.12     | Power On and Off the System                         | 46         |
| <b>3</b> | <b>Hardware Control and Troubleshooting</b>         | <b>49</b>  |
| 3.1      | Hardware Status                                     | 49         |
| 3.2      | CLI Commands for Hardware Control                   | 50         |
| 3.3      | CLI Commands for Hardware Troubleshooting           | 52         |
| 3.4      | Values for CLI Input Arguments                      | 53         |
| 3.5      | Output Fields for the show licenses all Command     | 57         |
| 3.6      | Output Fields for the show chassis Command          | 57         |
| 3.7      | Output Fields for the show disk Command             | 59         |
| 3.8      | Output Fields for the show hardware Command         | 59         |
| 3.9      | Output Fields for the show port Command             | 67         |
| 3.10     | Output Fields for the show port transceiver Command | 77         |
| 3.11     | Troubleshoot with System and Card LEDs              | 80         |
| 3.12     | Troubleshoot with System Power and Alarm LEDs       | 80         |
| 3.13     | Troubleshooting with Card Status LEDs               | 92         |
| 3.14     | Troubleshoot with On-Demand Diagnostics             | 93         |
| 3.15     | Obtaining Assistance                                | 99         |
| <b>4</b> | <b>Servicing Hardware</b>                           | <b>101</b> |
| 4.1      | Servicing Line Cards                                | 101        |
| 4.2      | Servicing Controller Cards                          | 103        |
| 4.3      | Replacing a Transceiver                             | 107        |
| 4.4      | Cleaning Optical Connectors                         | 110        |
| 4.5      | Replacing the Fan Tray                              | 111        |
| 4.6      | Replacing the Air Filter                            | 112        |
| 4.7      | Remove and Replace an AC Power Module               | 113        |
| <b>5</b> | <b>System Description</b>                           | <b>115</b> |
| 5.1      | Specification Summary                               | 115        |
| 5.2      | Controller Card                                     | 115        |
| 5.3      | Line Card Interfaces                                | 115        |
| 5.4      | Advanced Services Engine Card                       | 116        |
| 5.5      | SmartEdge Storage Engine Card                       | 116        |
| 5.6      | Packet Mesh Architecture                            | 117        |
| 5.7      | Redundancy  | 117        |
| 5.8      | Alarms  | 117        |
| 5.9      | System Status                                       | 117        |



|          |   |            |
|----------|---|------------|
| 5.10     | SmartEdge 600 Router                        | 118        |
| <b>6</b> | <b>Card Descriptions</b>                    | <b>119</b> |
| 6.1      | Line Cards                                  | 119        |
| 6.2      | Controller Cards                            | 122        |
| 6.3      | 8-Port ATM OC-3c/STM-1c Card                | 129        |
| 6.4      | 2-Port ATM OC-12c/STM-4c Card               | 132        |
| 6.5      | 8-Port POS OC-3c/STM-1c Card                | 135        |
| 6.6      | 4-Port POS OC-12c/STM-4c Card               | 138        |
| 6.7      | 4-Port POS OC-48c/STM-16c Card              | 141        |
| 6.8      | 1-Port OC-192c/STM-64c Card                 | 144        |
| 6.9      | Channelized OC-3/STM-1 or OC-12/STM-4 Card  | 147        |
| 6.10     | 60-Port Fast Ethernet Card                  | 152        |
| 6.11     | 10-Port Gigabit Ethernet 1020 Card          | 154        |
| 6.12     | 20-Port Gigabit Ethernet 1020 Card          | 159        |
| 6.13     | 5-Port Gigabit Ethernet Card                | 163        |
| 6.14     | 10-Port Gigabit Ethernet DDR Card           | 168        |
| 6.15     | 20-Port Gigabit Ethernet DDR Card           | 172        |
| 6.16     | 1-Port 10 Gigabit Ethernet Card             | 178        |
| 6.17     | 4-Port 10 Gigabit Ethernet DDR Card         | 181        |
| 6.18     | 1-Port 10 Gigabit Ethernet/OC-192c DDR Card | 186        |
| <b>7</b> | <b>Advanced Services Engine</b>             | <b>195</b> |
| 7.1      | LEDs  | 196        |
| 7.2      | Provisioning and Configuring the ASE Card   | 197        |
| 7.3      | ASE Operational Commands                    | 197        |
| 7.4      | Operating Status                            | 198        |
| <b>8</b> | <b>SmartEdge Storage Engine</b>             | <b>199</b> |
| 8.1      | Hard Disk Drive Description                 | 199        |
| 8.2      | Specifications and LEDs                     | 199        |
| 8.3      | Provision and Configure the SSE Card        | 202        |
| 8.4      | SSE Operational Commands                    | 202        |
| 8.5      | Operating Status                            | 204        |
|          | <b>Reference List</b>                       | <b>205</b> |





# 1 Site Preparation

Select the installation site for the SmartEdge® 600 router, considering maintenance, electrical, and ventilation requirements. In addition, consider current and future cabling requirements.

## 1.1 Agency Compliance Information

*Table 1 Agency Compliance Standards*

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

---



---

### Caution!

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

---



---

**Note:** The SmartEdge 600 router is suitable for installation in Network Telecommunications Facilities and as part of the Common Bonding Network (CBN).

## 1.2 Electrical Specifications

*Table 2 DC Electrical Specifications*

| Requirement            | Value                                 |
|------------------------|---------------------------------------|
| Input voltage, nominal | -48.0 VDC                             |
| Input voltage range    | -40.0 VDC to -57.5 VDC <sup>(1)</sup> |

**Table 2 DC Electrical Specifications**

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

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

**Table 3 AC (Optional) Electrical Specifications**

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

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

| Component  | Operating Current | Inrush Current <sup>(1)</sup> |
|--|-------------------|-------------------------------|
| ATM OC-3c/STM-1c (8-port)                                  | 2.98              | 0.55                          |
| ATM OC-12c/STM-4c (2-port)                                 | 2.98              | 0.55                          |
| POS OC-3c/STM-1c (8-port)                                  | 2.10              | 1.10                          |
| POS OC-12c/STM-4c (4-port)                                 | 2.16              | 1.10                          |
| POS OC-48c/STM-16c (4-port)                                | 3.25              | 1.10                          |
| OC-192c/STM-64c (1-port)                                   | 1.80              | 10.52 (max duration is 28 ms) |
| Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port) | 2.80              | 0.82 (max duration is 52 ms)  |
| Fast Ethernet-Gigabit Ethernet (60-port FE, 2-port GE)     | 2.80              | 0.62 (max duration is 28 ms)  |
| Gigabit Ethernet 1020 (10-port)                            | 2.95              | 14.20 (max duration is 20 μs) |
| Gigabit Ethernet 1020 (20-port)                            | 3.70              | 12.40 (max duration is 20 μs) |
| Gigabit Ethernet (5-port)                                  | 2.30              | 1.46 (max duration is 25 ms)  |
| Gigabit Ethernet DDR (10-port)                             | 2.65              | 0.74 (max duration is 28 ms)  |
| Gigabit Ethernet DDR (20-port)                             | 6.25              | 1.50                          |
| 10 Gigabit Ethernet (1-port)                               | 2.72              | 10.52 (max duration is 20 μs) |



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

| Component                                | Operating Current | Inrush Current <sup>(1)</sup> |
|--|-------------------|-------------------------------|
| 10 Gigabit Ethernet DDR (4-port)         | 6.25              | 1.50                          |
| 10 Gigabit Ethernet/OC-192c DDR (1-port) | 2.65              | 0.72 (max duration is 25 ms)  |

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

**Table 5 Operating and Inrush Current for Chassis Components at –48 VDC**

| Component                 | Operating Current | Inrush Current                |
|---------------------------|-------------------|-------------------------------|
| XCRP4 (active or standby) | 2.21              | 0.52 (max duration is 25 ms)  |
| Advanced Services Engine  | 2.68              | 1.20 (max duration is 120 ms) |
| SmartEdge Storage Engine  | 2.80              | 0.86 (max duration is 48 ms)  |
| Fan tray (nominal speed)  | 2.20              | 7.42                          |
| Fan tray (high speed)     | 6.04              | 7.42                          |

## 1.3 Electrical Power Connections

**Note:** The SmartEdge 600 is to be installed in a restricted access area (dedicated equipment rooms, equipment closets, or other restricted-access area) and in accordance with Articles 110-26 and 110-27 of the National Electric Code, ANSI/NFPA 70, or in accordance with the applicable code in the country of installation.

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

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

Each power connection must be able to supply a minimum of 75 amperes. DC power connections require copper wire of a size suitable for the installation in accordance with the National Electrical Code (in the United States) or applicable local jurisdiction (outside the United States) installation requirements. An external fuse panel, either a stand-alone unit or incorporated in a DC power supply system, or a circuit breaker panel is required for power-on and power-off control. A DC-powered system uses –48 VDC power and is powered from a fuse panel, which can be damaged by overloaded circuits.



---

---

## Caution!

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

---

---

### 1.3.1 AC Power Option

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

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

## 1.4 Environmental Requirements

The installation area for the SmartEdge 600 hardware must allow the following clearances:

- A minimum of 6.0 inches (15.2 cm) at the back of the chassis (for cable routing)
- A minimum of 20.0 inches (50.8 cm) at the front of the chassis (for maintenance)

---

---

## Caution!

Risk of equipment damage. The SmartEdge 600 router can be damaged by lack of proper cooling and ventilation. To reduce the risk, never install the chassis in an unventilated area, and always ensure that cooling equipment sufficient to maintain a temperature of less than 104°F (40°C) is available.

---

---

Table 6 Environmental Requirements

| Specification                                    | Value                        |
|--|------------------------------|
| Cooling  | Forced air (fan cooled)      |
| Operating temperature, nominal                   | 41° to 104°F (5° to 40°C)    |
| Operating temperature, short term <sup>(1)</sup> | 23° to 131°F (-5° to 55°C)   |
| Storage temperature                              | -38° to 150°F (-40° to 70°C) |
| Operating relative humidity                      | 5 to 95% RH (noncondensing)  |

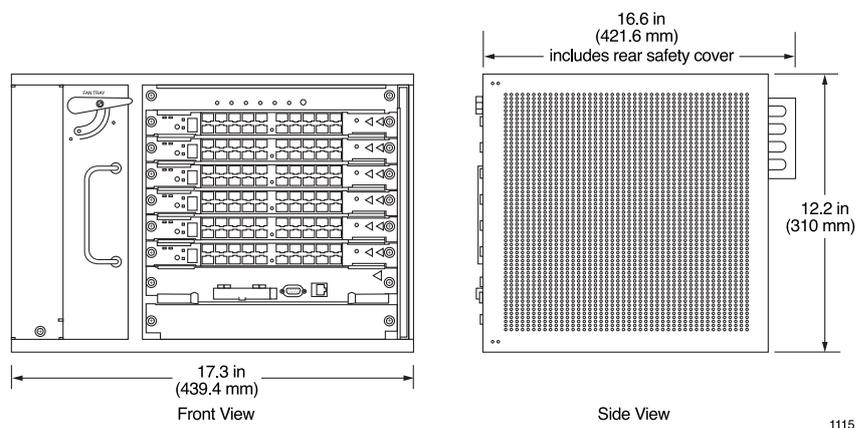


**Table 6 Environmental Requirements**

| Specification                | Value                              |
|------------------------------|------------------------------------|
| Storage relative humidity    | 5 to 95% RH (noncondensing)        |
| Operating altitude           | 0 to 10,000 ft (3,048m)            |
| Earthquake                   | Telcordia 63-CORE Zone 4-compliant |
| Thermal dissipation, maximum | 2,736 watts (9,336 BTU/hour)       |

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

## 1.5 Physical Specifications



**Figure 1 SmartEdge 600 Chassis Dimensions**

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

**Table 7 SmartEdge 600 Chassis Physical Specifications**

| Mechanical Specification         | Value  |
|----------------------------------|--|
| SmartEdge 600 chassis dimensions | 12.2 inches (310.0 mm) height<br>17.3 inches (439.4 mm) width<br>16.6 inches (421.6 mm) depth <sup>(1)</sup> |
| Chassis weight                   | 48.7 lb (22.1 kg) all card slots empty, ready for installation<br>94 lb (42.6 kg) with all slots filled      |
| Chassis mounting                 | 19- or 23-inch rack  |
| Total slots                      | 8  |
| Line card slots                  | 6  |
| Common equipment slots           | 2  |
| Card dimensions                  | 9.75 inches (247.7 mm) height<br>12.73 inches (323.3 mm) depth   |

(1) Includes rear safety cover.



Table 8 SmartEdge 600 Connections

| Card Connections   | Connector Type   |
|--|--|
| ATM OC-3c/STM-1c (8-port)                                  | LC, front chassis access   |
| ATM OC-12c/STM-4c (2-port)                                 | LC, front chassis access   |
| POS OC-3c/STM-1c (8-port)                                  | LC, front chassis access   |
| POS OC-12c/STM-4c (4-port)                                 | LC, front chassis access   |
| OC-48c/STM-16c (4-port)                                    | LC, front chassis access   |
| OC-192c/STM-64c (1-port)                                   | LC, front chassis access   |
| Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port) | LC, front chassis access   |
| Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)     | MRJ21 (FE ports), RJ-45 (GE ports), front chassis access <sup>(1)</sup>    |
| Gigabit Ethernet 1020 (10-port)                            | LC, front chassis access   |
| Gigabit Ethernet 1020 (20-port) <sup>(2)</sup>             | 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) <sup>(2)</sup>              | LC, front chassis access   |
| 10 Gigabit Ethernet (1-port)                               | LC, front chassis access   |
| 10 Gigabit Ethernet DDR (4-port)                           | LC, front chassis access   |
| 10 Gigabit Ethernet/OC-192c DDR (1-port)                   | LC, front chassis access   |
| <b>Operations Connections</b>                              |  |
| 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) <sup>(3)</sup>                 | DB-25, rear chassis access   |
| Alarm <sup>(3)</sup>                                       | DB-25, rear chassis access   |
| Status/Ctl <sup>(3)</sup>                                  | DB-37, rear chassis access   |
| Power and chassis ground                                   | 1/4-20 threaded holes on 0.625-inch (1.59 cm) centers, rear chassis access |
| Advanced Services Engine                                   | RJ-45, front chassis access  |

(1) The front panel has 5 MRJ21 connectors, each supporting 12 FE ports; a breakout cable, which uses RJ-45 connectors for the individual ports, is available from Ericsson.

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

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

## 1.6 Select the Rack

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




---



---

## Caution!

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

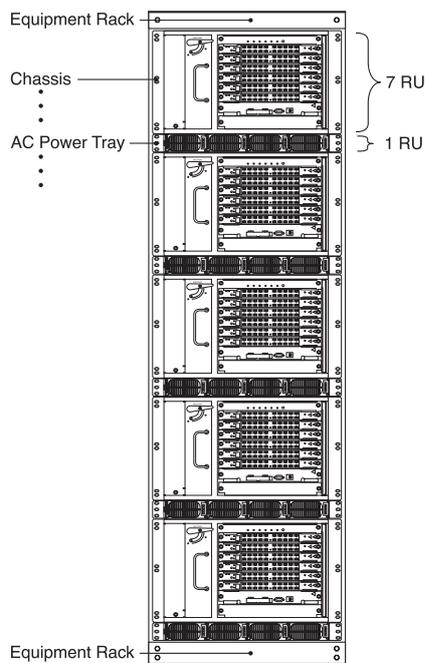
---



---

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

**Note:** Ericsson does not supply fuse panels.



*Figure 2 SmartEdge 600 Chassis in 42-RU Rack*

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

## 1.7 Select the Installation Method

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



Two possible installation scenarios are to:

- Install the chassis as shipped.

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

- Install the chassis with all components already installed.

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

## 1.8 Equipment and Personal Safety Warnings

---

---

### Warning!

Risk of electrical shock. Always remove the fuses in the fuse panel for all power sources to the chassis before connecting the power cables to the chassis. After the power cables are connected to the chassis and the fuse panel, the system is fully powered on; there is no power switch.

---

---

---

---

### Warning!

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

---

---

---

---

### Warning!

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

---

---



---

---

### **Caution!**

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

---

---

---

---

### **Warning!**

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

---

---

## 1.9 DC Power Source Warnings

---

---

### **Warning!**

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

---

---

---

---

### **Warning!**

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

---

---



---

---

## Warning!

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

---

---

### 1.10 Access During Initial Startup and Reload Operations

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

You access the SmartEdge 600 router with a terminal connected to the console port, either directly or through a terminal server.

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

### 1.11 Access During Normal Operations

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

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

For redundancy, we recommend using two different methods (for example, a remote workstation and a remote console terminal with a connection to a terminal server). Further, if the configuration of the SmartEdge 600 router includes redundant controller cards, you should use the same means of access to connect each controller card, so that consistent management access, despite a failure, is guaranteed.



## 1.12 Management Access Options

Table 9 Options for Management Access

| Option  | Equipment Requirements   |
|---|--|
| Ethernet port connection to a local management workstation  | A PC or workstation with support for SSH and Telnet. Shielded Ethernet crossover cable.  |
| Ethernet port connection to a remote management workstation | A PC or workstation with support for SSH and Telnet. Shielded Ethernet straight cable (shipped with the system). Router or bridge.   |
| Craft 2 port connection to a local console terminal         | Local terminal—choose one of the following options: <ul style="list-style-type: none"> <li>• ASCII/VT100 console terminal or equivalent that runs at 9600 bits per second, 8 data bits, no parity, 1 stop bit.</li> <li>• PC or workstation in the same configuration as the ASCII/VT100 terminal.</li> </ul> Terminal server.<br>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"> <li>• ASCII/VT100 console terminal or equivalent that runs at 9600 bits per second, 8 data bits, no parity, 1 stop bit.</li> <li>• PC or workstation in the same configuration as the ASCII/VT100 terminal.</li> </ul> A modem that runs at 56 kbps (maximum), 8 data bits, no parity, 1 stop bit, or terminal server.<br>Modem or terminal server cable. |

## 1.13 Gathering Cables and Tools

You need cables for the following connections:

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

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

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

| Tool   | Purpose   |
|--|---|
| Heavy-duty cart                              | Transport chassis and system equipment from the receiving area to the installation site.  |
| Power lifter                                 | Optional (depending on installation scenario). Position the chassis in the rack.  |
| #1 Phillips screwdriver                      | Remove and install the fan tray and cable tray; remove and install the cards. The screwdriver needs a 0.1875-inch barrel that is 5 to 6 inches long to install and remove the cable tray. |
| #2 or #3 Phillips screwdriver <sup>(1)</sup> | 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 <sup>(2)</sup>           | Secure barrel or open lugs to the DC power and chassis ground cables. <sup>(3)</sup>  |

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

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

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

## 1.14 Management Access Cables

A management access cable connects a console terminal, management workstation, or modem to a port on a controller card or the chassis.

**Table 11 Cable Specifications for Management Access Cables**

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

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

### 1.14.1 Craft Console Cable

This cable connects a local Craft console to the Craft 2 port on a controller card. The cable is constructed as a straight-through connection between a DB-9 male connector at the system end and a DB-9 female connector at the computer terminal end.

**Table 12 Craft Console Cable Pin Assignments**

| Signal Name <sup>(1)</sup> | Signal Function               | Notes                |
|----------------------------|-------------------------------|----------------------|
| DCD (input)                | Received Line Signal Detector | Not used             |
| TXD (output)               | Transmitted Data              | SmartEdge 600 output |
| RXD (input)                | Received Data                 | SmartEdge 600 input  |
| DSR (input)                | DCE Ready                     | Not used             |
| –                          | Signal Ground                 | –                    |



**Table 12** *Craft Console Cable Pin Assignments*

| Signal Name <sup>(1)</sup> | Signal Function | Notes    |
|----------------------------|-----------------|----------|
| DTR (output)               | DTE Ready       | Not used |
| CTS (input)                | Clear to Send   | Not used |
| RTS (output)               | Request to Send | Not used |
| RI (input)                 | Ring Indicator  | Not used |

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

### 1.14.2 Ethernet Crossover Cable

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

**Table 13** *Ethernet Crossover Cable Pin Assignments*

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

### 1.14.3 Ethernet Straight Cable

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

**Table 14** *Ethernet Straight Cable Pin Assignments*

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

*Table 14 Ethernet Straight Cable Pin Assignments*

| Signal Name | Notes         |
|-------------|---------------|
| Rx (-)      | -             |
| -           | No connection |
| -           | No connection |

## 1.15 External Timing Cables

An external timing cable provides a connection from an external synchronization source, such as a building integrated timing supply (BITS) or synchronization supply unit (SSU), to the SmartEdge 600 router. Using two cables you can connect the SmartEdge 600 router to primary and secondary inputs on the external equipment.

*Table 15 Cable Specification for External Timing Cable*

| Interface       | Description           | Chassis Connectors <sup>(1)</sup> | Cable Connector |
|-----------------|-----------------------|-----------------------------------|-----------------|
| External Timing | Shielded twisted-pair | DB-9 female                       | DB-9 male       |

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

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

**Note:** The XCRP4 Controller card can receive timing data only.

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

One end of the cable is terminated with a DB-9 male connector; the other end of the cable is left unterminated for attachment to the wire wrap posts of the external equipment. Both of the DB-9 connectors (PRIMARY and SECONDARY) on the rear panel of the SmartEdge 600 router have identical pin assignments.

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

To bring a signal from external equipment into the SmartEdge 600 router:

- For the DS-1 interface (BITS)—Connect the DS-1 output of the external equipment to pins 2 and 6 of the DB-9 connector on the rear panel of the router. The polarity of the signal does not matter. The router accepts a standard BITS source transmitting a framed-all-ones pattern at the DS-1 rate of 1.544 Mbps.
- For the E1 interface (SSU)—Connect the E1 output of the external equipment to pins 2 and 6 of the SSU DB-9 connector on the rear panel of the router. The polarity of the signal does not matter. The router



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

**Table 16 External Timing Cable Pin Assignments**

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

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

## 1.16 Line Card Cable Specifications

**Table 17 Cable Specifications for Line Cards**

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

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

### 1.16.1 Transceiver-Based Gigabit Ethernet Line Card Cables

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

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

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

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

(1) The SC connectors on the card are type SC/PC; cable and card connectors must match.

(2) To comply with GR-1089 intrabuilding lightning surge requirements, intrabuilding wiring must be shielded, and the shield for the wiring must be grounded at both ends.

(3) When the port level lossless flow control is enabled, the distance reach is limited to 43.5 mi (70.0 km).

(4) The ZR XFP transceiver is a multi-rate device and can be used in the 10GE line card and the SONET OC-192c/STM-64c LR line card.

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

(6) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

(7) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35, 36, 37, 53, and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

## 1.17 Transceiver-Based SONET/SDH Line Card Cables

**Table 19 Cable Specifications for the SONET/SDH Line Cards**

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



**Table 19 Cable Specifications for the SONET/SDH Line Cards**

| Transceiver Type | Description                           | Card Connector <sup>(1)</sup> | Cable Connector | Maximum Distance  |
|------------------|---------------------------------------|-------------------------------|-----------------|-------------------|
| LR-1 / SM        | Single-mode fiber 9/125 $\mu\text{m}$ | LC female                     | LC male         | 24.9 mi - 40.0 km |
| LR-2 / SM        | Single-mode fiber 9/125 $\mu\text{m}$ | LC female                     | LC male         | 49.7 mi - 80.0 km |

(1) The SC connectors on the card are type SC/PC; cable and card connectors must match.

(2) For SFP-OC12-MM transceiver, the maximum distance is 500 meters.

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

## 1.18 10/100 Ethernet and Fast Ethernet–Gigabit Ethernet Cables

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

**Table 20 Cable Options for a 10/100 Ethernet Line Card**

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

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

### 1.18.1 10/100 Ethernet Crossover Cable Pin Assignments

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

**Table 21 10/100 Ethernet Crossover Cable Pin Assignments**

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



## 1.18.2 10/100 Ethernet Straight Cable Pin Assignments

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

Table 22 10/100 Ethernet Straight Cable Pin Assignments

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

## 1.18.3 Fast Ethernet Breakout Cable Pin Assignments

Table 23 Fast Ethernet Breakout Cable Pin Assignments

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

## 2 Installing the Hardware

---

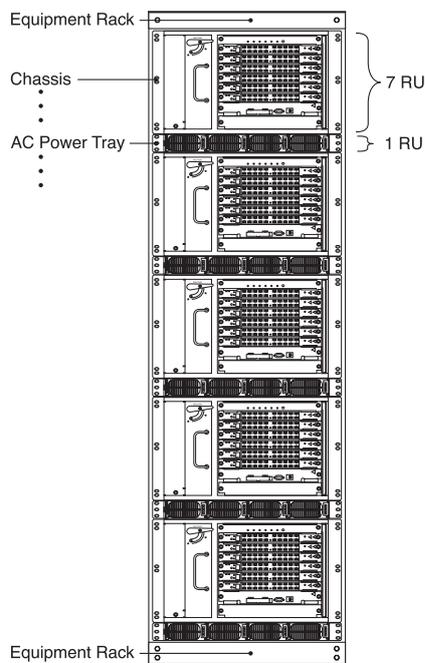
---

### Stop!

The SmartEdge 600 router is to be installed in a restricted access area (dedicated equipment rooms, equipment closets, or other restricted-access area) and in accordance with Articles 110-26 and 110-27 of the National Electric Code, ANSI/NFPA 70, or in accordance with the applicable code in the country of installation.

---

---



1119  
*Figure 3 Fully Loaded 42 RU Rack Configuration*

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

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



---

---

### Caution!

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

---

---

## 2.1 Install the Chassis Mounting Brackets

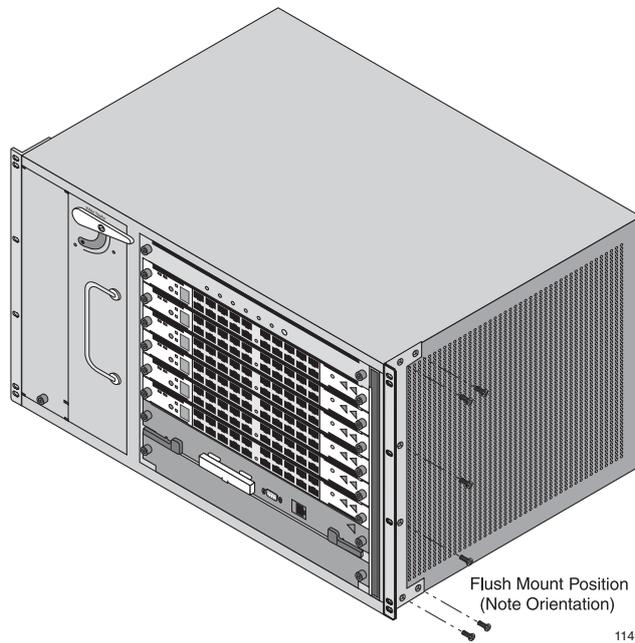


Figure 4 Installing Chassis Brackets for Flush Mount Position

---

---

### Caution!

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

---

---

To install brackets:

1. Position a mounting bracket against one side of the chassis, lining up the screw holes in the bracket with the screw holes in the side of the chassis.



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

## 2.2 Install the Chassis

---

---

### **Warning!**

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

---

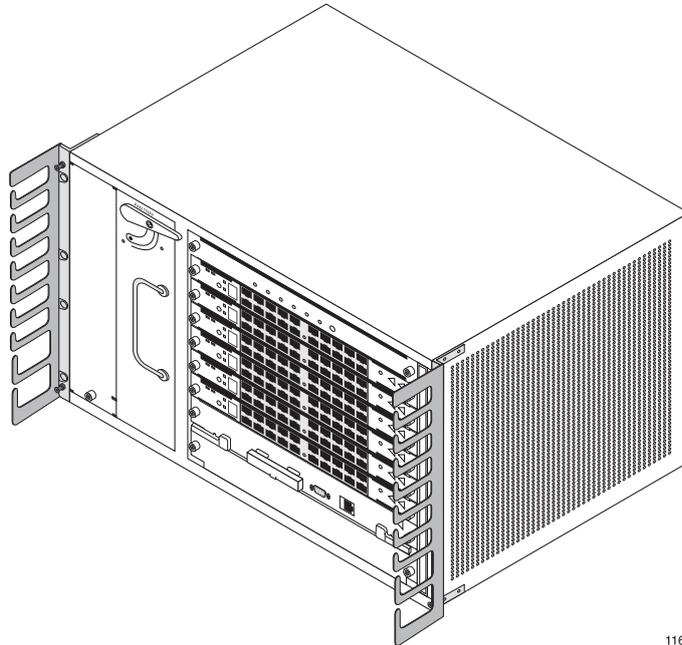
---

Install the chassis in the rack:

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



## 2.3 Install the Cable Management Brackets



1164

Figure 5 Installing the Cable Management Brackets

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

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

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

## 2.4 Connect Power and Ground Cables

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

The chassis ground terminal is located at the bottom-right corner of the back panel. The ground cables must be of a size suitable for the installation, and must be installed in accordance with the National Electrical Code (in the United States), or the applicable local jurisdiction (outside the United States) installation requirements.

Connect a chassis ground cable:

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



- Note:** Bare connectors and all grounding surfaces must be brought to a bright finish and coated with an antioxidant before crimp connections are made.
- Note:** The size of the ground cable, if installed in a Central Office, must be 6 - 8 AWG, or greater. If the connector cannot handle this, the ground cable must be the same AWG as the power conductors.
2. Secure the connection with a pair of bolts and split washers, which are supplied in the Installation Kit. Tighten the bolts to a maximum torque of 15.0 inch-lbs (1.7 Newton-meters).
  3. Connect the other end of the cable to an appropriate ground point.
- Note:** To properly secure power and ground connections, use star washers for anti-rotation and thread-forming screws with paint-piercing washers, where applicable.

### 2.4.1 Connect DC Power Sources

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

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

The terminal studs are labeled RETURN and -48V. Each power cable must be of a size suitable for the installation and installed in accordance with the National Electrical Code (in the United States) or applicable local jurisdiction (outside the United States) installation requirements.

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

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

---

---

## Warning!

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

---

---



---

---

### **Warning!**

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

---

---

---

---

### **Warning!**

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

---

---

---

---

### **Warning!**

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

---

---

---

---

### **Warning!**

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

---

---




---



---

## Warning!

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

---



---



---



---

## Caution!

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

---



---



---



---

## Caution!

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

---



---

### 2.4.1.1

#### Connect Power Cables

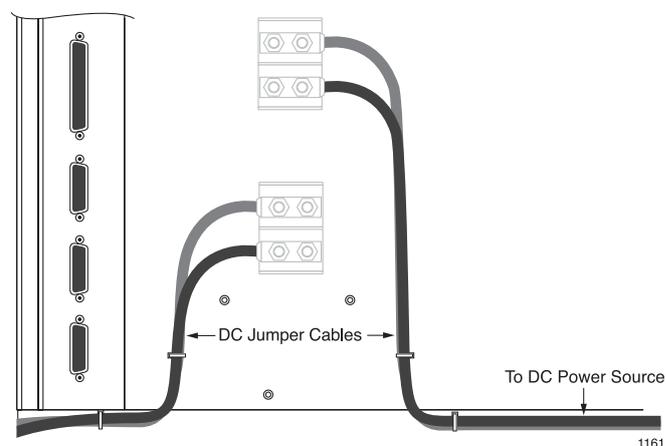


Figure 6 DC Power Connections



Connect the power cables:

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

## 2.5 Optional AC Power Shelf

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

---

---

### Warning!

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

---

---

Table 24 Order Numbers

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



---

---

## Warning!

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

---

---

### 2.5.1 Install the AC Power Shelf

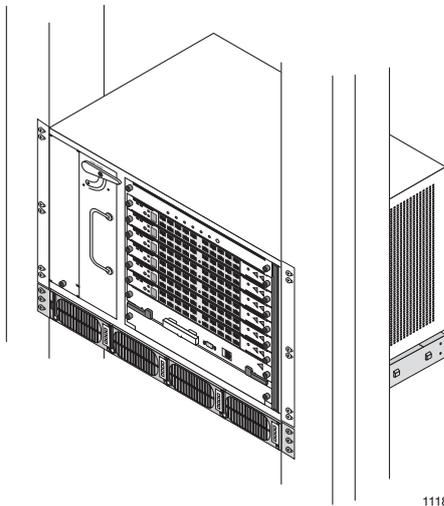


Figure 7 Positioning an AC Power Shelf

Install the AC power shelf:

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



### 2.5.1.1 Install the Ground Bracket

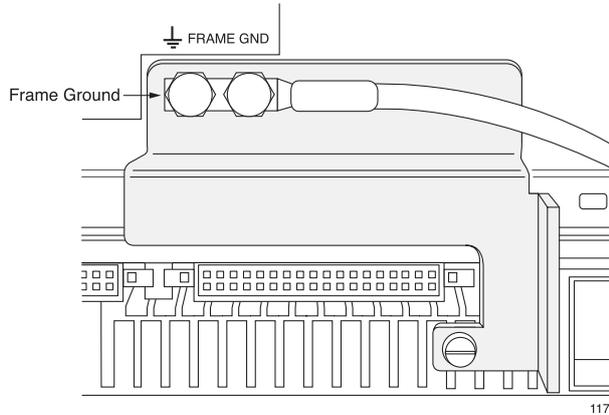


Figure 8 Ground Bracket

Install the ground bracket between the shelf and the chassis:

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

### 2.5.1.2 Install AC Power Modules

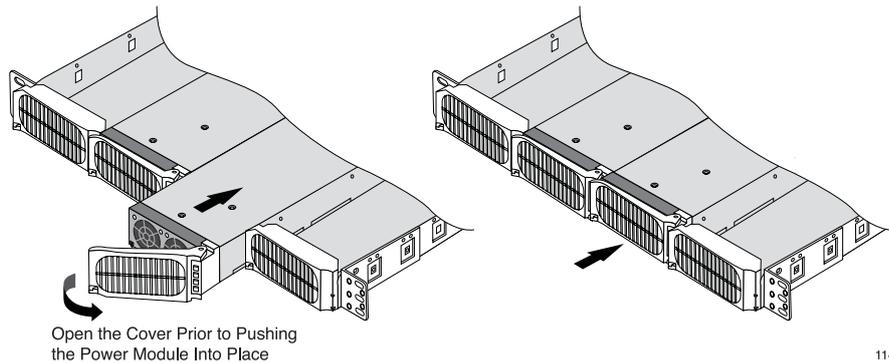


Figure 9 AC Power Modules

Install AC power modules in the shelf:

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



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

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

### 2.5.1.3

#### Connect the AC Power Shelf to the Chassis

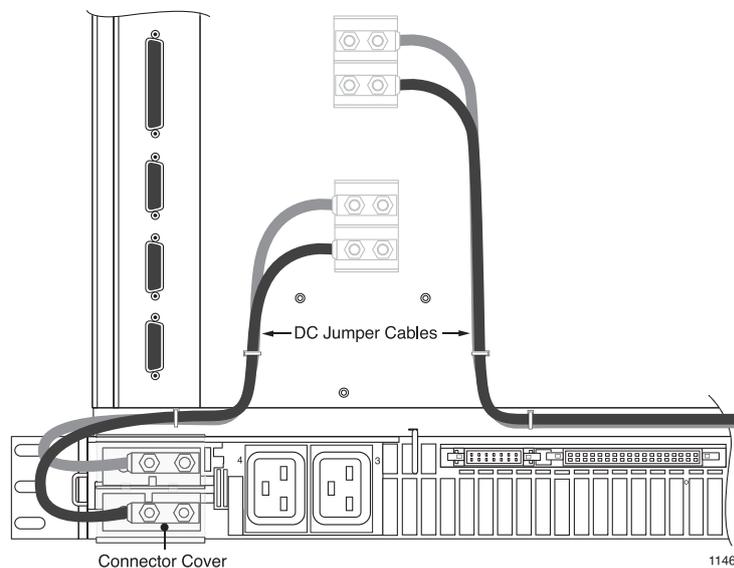


Figure 10 AC Power Connections

### Warning!

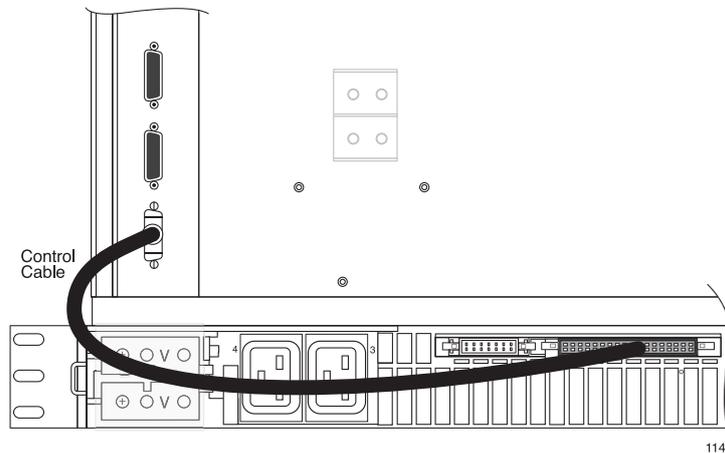
Do not connect the AC power cords to the building outlets until you have completed the installation. If you connect the other end of the AC power cord to a building outlet, you power on the system; there is no ON/OFF switch on the AC power shelf.

Connect the shelf to the chassis:

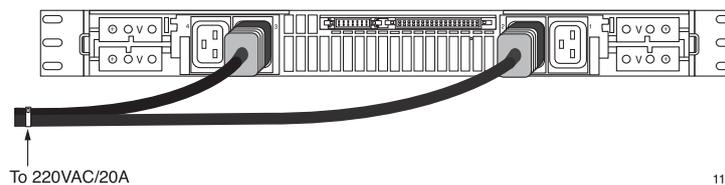
1. Unpack the two 6AWG red and two black DC jumper cables.
2. Flip open the touch-safe lug landing cover on the left-side terminal block.
3. Attach the short pair of red and black DC jumper cables to the left-side terminals—red cable to the top terminal (+) and black cable to the bottom one (-).



4. Secure each connection with a pair of 1/4-20 lug nuts; tighten to a maximum torque of 62.0 inch-lbs (7 Newton-meters).
5. Snap the cover shut.
6. Attach the remaining ends to the bottom (BATTERY B) terminal block of the chassis—red cable to the top terminal (RETURN) and black to bottom one (-48V).
7. Secure the connections with pairs of lock washers and lug nuts; tighten to a maximum torque of 62.0 inch-lbs (7 Newton-meters).
8. Use the provided metal loops on the chassis to dress the cables with tie wraps.  
  
**Note:** Dress the DC jumper cables so the push-through air filter and fan tray can be serviced from the rear of the chassis.
9. Repeat this procedure for the right-side self connections using the long pair of DC jumper cables.
10. Install the safety cover.
11. Connect the control cable from J1 (right-side flat connector) on the shelf to the chassis connector labeled AC STATUS/CTL.



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



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

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

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

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

## 2.6 Card Slots

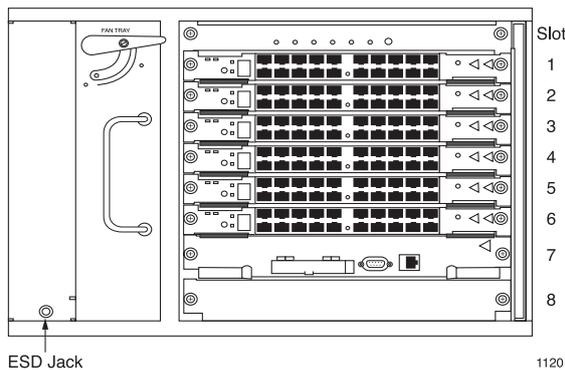


Figure 11 SmartEdge 600 Card Slots

Table 25 Slot Assignments for SmartEdge 600 Cards

| Card       | Slots Available |
|------------|-----------------|
| Controller | 7, 8            |

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

| Card  | Slots Available       |
|---|-----------------------|
| ATM OC-3c/STM-1c (8-port)<br>ATM OC-12c/STM-4c (2-port)<br>POS OC-3c/STM-1c (8-port)<br>POS OC-12c/STM-4c (4-port)<br>POS OC-48c/STM-16c (4-port)<br>OC-192c/STM-64c (1-port)<br>Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port)<br>Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)<br>Gigabit Ethernet 1020 (10-port)<br>Gigabit Ethernet (5-port)<br>Gigabit Ethernet DDR (10-port)<br>10 Gigabit Ethernet (1-port)<br>10 Gigabit Ethernet/OC-192c DDR (1-port) | 1 to 6                |
| Gigabit Ethernet 1020 (20-port)<br>Gigabit Ethernet DDR (20-port)   | 1 to 5 <sup>(1)</sup> |
| Advanced Services Engine  | 1 to 6                |
| SmartEdge Storage Engine  | 1 to 6                |

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



## 2.7 Install Cards

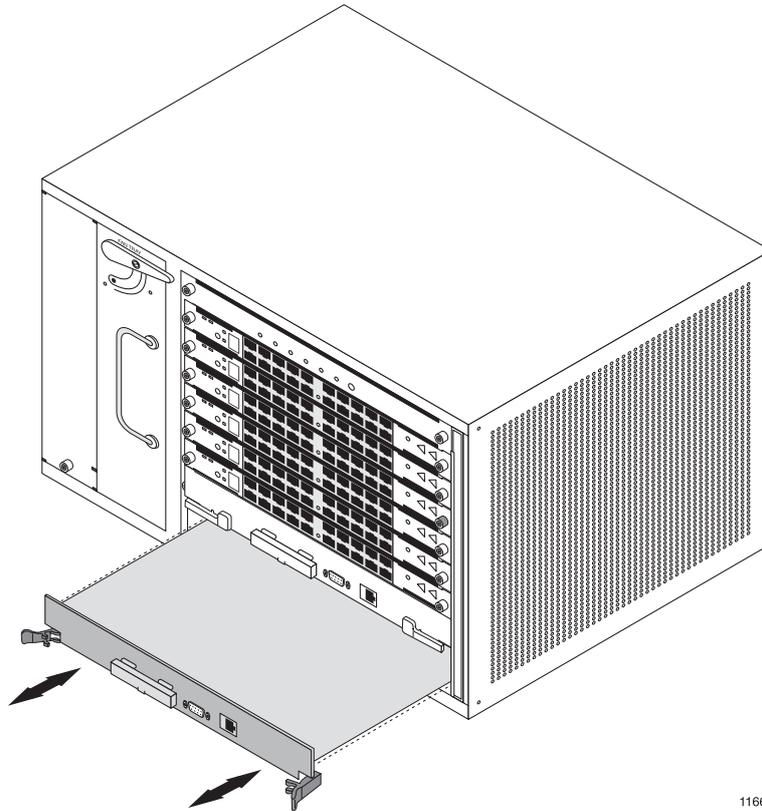


Figure 12 Installing Cards

1166

---

---

### Warning!

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

---

---

---

---

### Caution!

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

---

---



---

---

## Caution!

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

---

---

Install cards:

1. Put on an ESD wrist strap, and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located on the front of the fan and alarm unit.
2. Select the slot for the card.
3. Remove the card from its antistatic bag. Save the bag for later use.
4. Align the card with the card guides at the right and left sides of the slot.

---

---

## Caution!

Risk of equipment damage. If you feel any resistance, or hear the card touching the components on the card installed in the adjacent slot at the left, do not force the card into the slot. Ensure that the card is perpendicular to the slot. If you feel any resistance, slightly lift the bottom edge of the front panel until it can slide easily into the slot.

---

---

5. Position the ejector levers away from the front panel and then carefully slide the card into the slot. The ejector levers rotate as the latching mechanisms engage the walls of the slot and the connectors on the card are inserted into the connectors on the backplane.
6. Push on the ejector levers until they are parallel with the front panel; this action fully seats the connectors with the backplane.
7. Secure the card in the chassis by tightening the screw at the top and bottom of the front panel. Use a Phillips screwdriver to tighten each screw to a maximum torque of 5.0 inch-lbs (0.6 Newton-meters).
8. Repeat steps 2 to 7 for each card to be installed.

## 2.7.1 Install Blank Cards

---



---

### Caution!

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

---



---

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

## 2.7.2 Install Transceivers

---



---

### Caution!

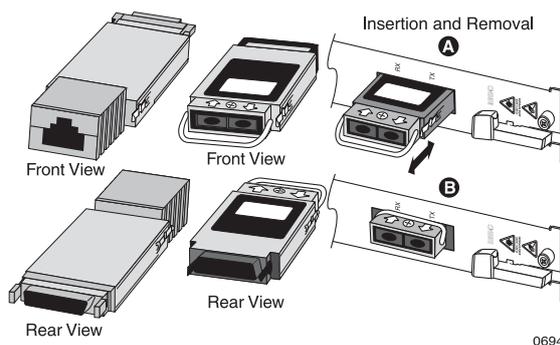
Risk of severe damage to your eyes. Do not stare into the connector or directly view the laser beam emerging from the connector. All versions of the optical cards are Class 1 products, which use lasers to convert electrical signals to optical signals that can damage your eyes. Keep the connectors covered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

---



---

### Install Transceivers



0694  
**Figure 13** *Installing a GBIC Transceiver*

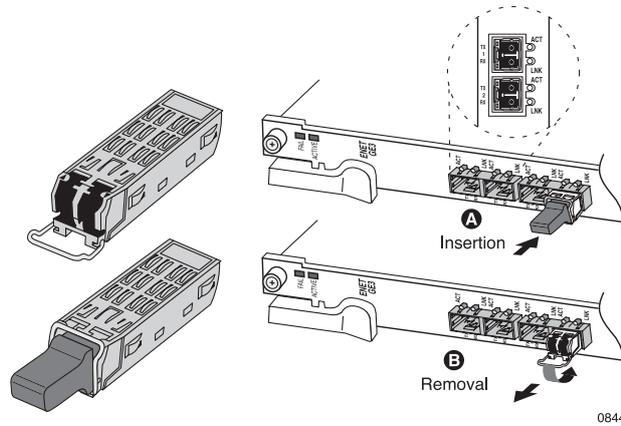


Figure 14 Installing an SFP Transceiver

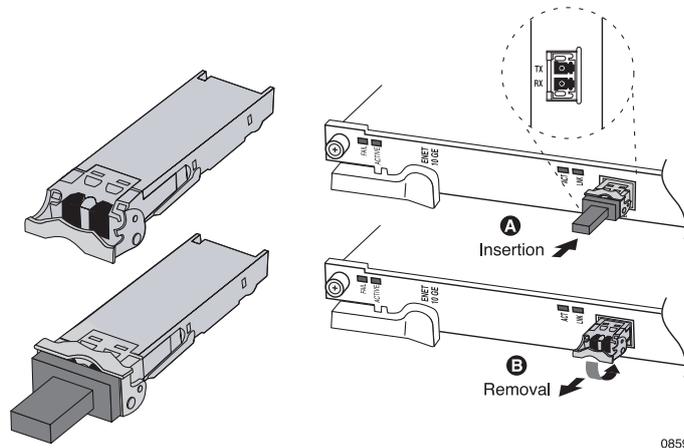


Figure 15 Installing an XFP Transceiver

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

Table 26 Transceiver Types for Line Cards

| Line Card  | Transceiver <sup>(1)</sup> | Supported Versions  |
|--|----------------------------|---|
| ATM OC-3c/STM-1c (8-port)                                  | SFP                        | SR-0, IR-1  |
| ATM OC-12c/STM-1c (2-port)                                 | SFP                        | SR-0, R-1   |
| POS OC-3c/STM-1c (8-port)                                  | SFP                        | SR-0, IR-1  |
| POS OC-12c/STM-4c (4-port)                                 | SFP                        | SR-0, IR-1  |
| POS OC-48c/STM-16c (4-port)                                | SFP                        | SR-1, IR-1, LR-2  |
| Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port) | SFP                        | IR-1  |
| Gigabit Ethernet 1020 (10-port)                            | SFP                        | SX, LX, TX, ZX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn <sup>(2)</sup> |
| Gigabit Ethernet 1020 (20-port) <sup>(3)</sup>             | SFP                        | SX, LX, TX, ZX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn <sup>(2)</sup> |



**Table 26 Transceiver Types for Line Cards**

| Line Card                                     | Transceiver <sup>(1)</sup> | Supported Versions   |
|---|----------------------------|--|
| Gigabit Ethernet (5-port)                     | SFP                        | SX, LX, TX <sup>(2)</sup> , ZX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn <sup>(2)</sup>                                  |
| Gigabit Ethernet DDR (10-port)                | SFP                        | SX, LX, ZX <sup>(2)</sup> , TX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn <sup>(2)</sup>                                  |
| Gigabit Ethernet DDR (20-port) <sup>(3)</sup> | SFP                        | SX, LX, TX <sup>(2)</sup> , ZX, BX-D-20, BX-U-20, CWDMnnnn, DWDMnn <sup>(2)</sup>                                  |
| 10 Gigabit Ethernet (1-port)                  | XFP                        | SR, LR, ER, ZR, DWDMnn <sup>(4)</sup>  |
| 10 Gigabit Ethernet DDR (4-port)              | XFP                        | SR, LR, ER, ZR, DWDMnn <sup>(4)</sup> , OTN-DWDMITUnn <sup>(4)</sup>   |
| 10 Gigabit Ethernet/OC-192c DDR (1-port)      | XFP                        | SR-1, IR-2, LR-2, SR/SW, LR/LW <sup>(4)</sup> , ER/EW, ZR/ZW, DWDMnn <sup>(4)</sup> , OTN-DWDMITUnn <sup>(4)</sup> |
| OC-192c/STM-64c (1-port)                      | XFP                        | SR-1, IR-2, LR-2   |

(1) If the transceiver has not been qualified for use in the line card, the system displays a warning message.

(2) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

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

(4) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35,36,37,53,and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

---



---

## Stop!

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

---



---

To install a transceiver of any type:

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

---



---

## Stop!

Risk of ESD damage. Always use an ESD wrist or ankle strap when handling any transceiver. Avoid touching its connector pins.

---



---

2. Ensure that the latching mechanism is closed.



3. With the transceiver connectors aligned with the RX and TX labels on the front panel of the line card (as shown in Figure 14 or Figure 15), slide the transceiver into the opening for the port until the rear connector is seated and the locking mechanism snaps into place.

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

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

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

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

To remove a transceiver of any type:

1. Shut down all activities on the port with the transceiver you want to replace. See *Command List Reference* [5].
2. Put on an antistatic wrist strap and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located on the front of the fan tray.

---

---

### Stop!

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

---

---

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

---

---

### Stop!

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

---

---

4. Release the latching mechanism:



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

### 2.7.3

### Install Compact Flash (CF) Cards

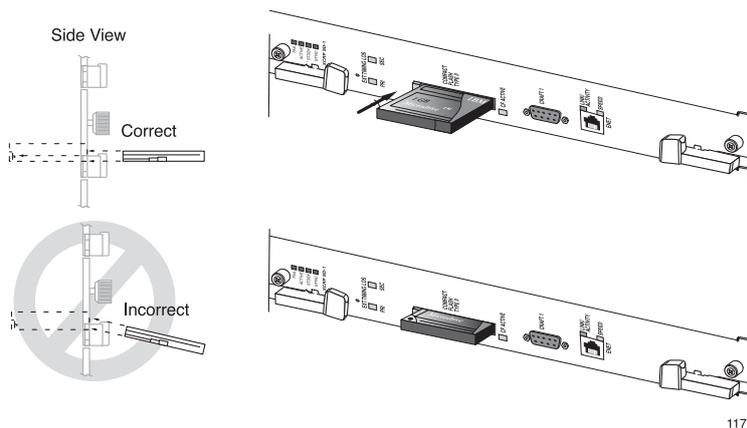


Figure 16 Installing a CF Card

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

If you install an external storage device in the active controller card, the standby controller card, if installed, must also have an external storage device installed; however, the device types need not match. The XCRP4 controller card supports Type I devices only.

To install an external storage device:

1. If you are installing the device in an XCRP4 controller card, open the door that covers the CF Type 1 slot until it “snaps” open.
2. Hold the device so that its pin-hole side faces the slot in the controller front panel.
3. Horizontally align the device as close to the bottom edge of the slot as possible and perpendicular to it.
4. Slowly insert the device in the slot. If the device does not engage the connectors with approximately 0.5 inches (1.27 cm) of the device outside the slot, do not continue. Remove the device and repeat this step. Do not force the device into its slot. Check for one of the following conditions:

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

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





A management workstation is connected to the SmartEdge 600 router using the Ethernet port on the front of a controller card. This type of connection provides access to the SmartEdge OS command-line interface (CLI) after you have configured the port.

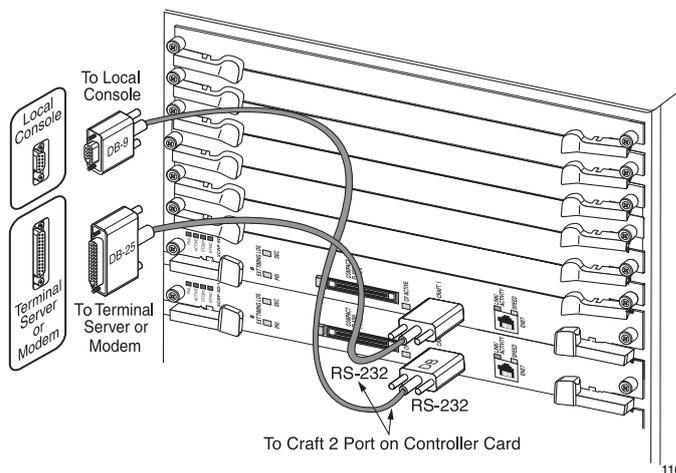
Two types of connections are supported:

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

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

## 2.8.2

### Local or Remote Console Terminal



*Figure 18 Connections for a Local or Remote Console*

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

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

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

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

## 2.9 Connections for External Timing Cables

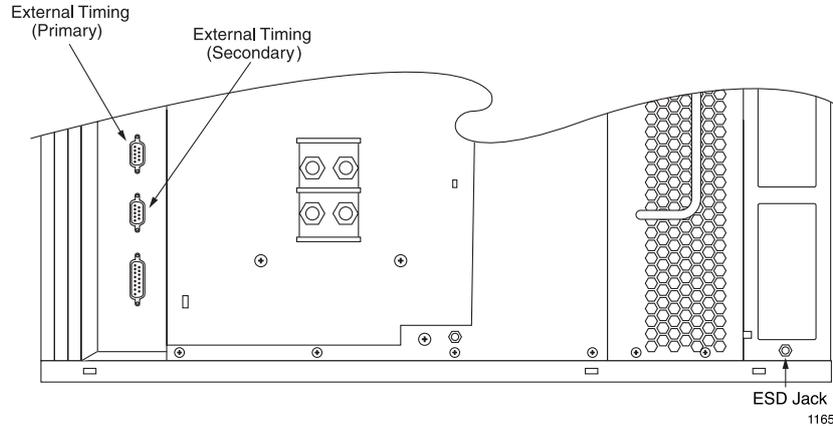


Figure 19 Connections for External Timing Cables

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

The controller cards can receive timing data only.

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

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

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

## 2.10 Connections for Line Card Cables

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

Table 27 Port Data for Line Cards

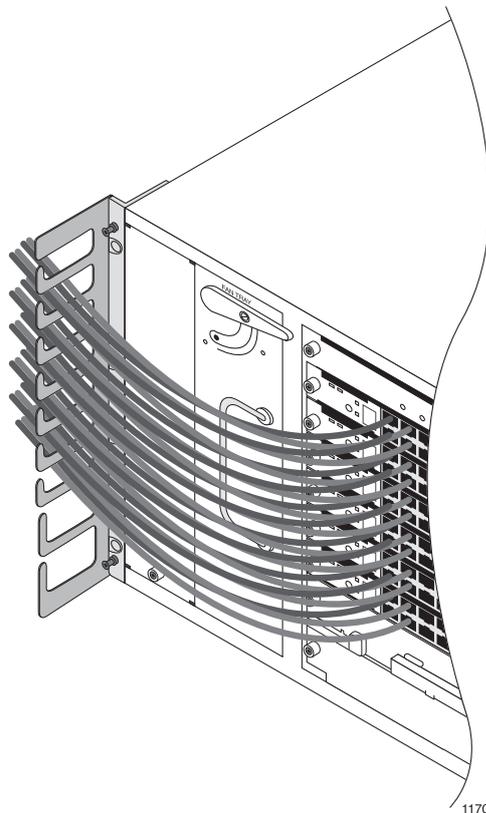
| Line Card Type and Card Description                        | Physical Ports | Low-Density Version | Low-Density Port Numbers |
|--|----------------|---------------------|--------------------------|
| ATM OC-3c/STM-1c (8-port)                                  | 8              | No                  |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

**Table 27** Port Data for Line Cards

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

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

## 2.11 Connect and Route Cables



**Figure 20** Cable Routing

Cable connections are made with standard cables.



---

---

### Caution!

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

---

---

---

---

### Caution!

Risk of damage to fiber-optic cables. These cables are fragile and are easily damaged when bent. Never step on a cable. Never twist it when connecting it to or disconnecting it from a line card.

---

---

Connect and route the cables:

1. Put on an antistatic wrist strap, and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located in the lower right corner of the air intake panel on the front of the chassis.
2. Connect and route the management access cables, depending on the type of management access you have selected. To connect and route the cables:
  - a Thread the system ends of the cables through the lowest opening in the cable management bracket at the right side of the card slot.
  - b Insert each cable in the appropriate connector on the card.
  - c Tie-wrap the cables from each controller card to form a bundle, and then tie each bundle to the rack.
3. Starting with the line card installed in slot 6, connect and route the line card cables:
  - a Thread the system ends of the cables through an opening in the cable management bracket at the right side of the card slot. Select an opening that provides space for all cables to be connected to this card.
  - b Insert each cable in the appropriate connector on the card.
  - c Tie-wrap the cables to form a bundle, and then tie each bundle to the rack.



4. Connect and route the breakout cables for the FE–GE line cards:
  - a Thread the MRJ21 connector end of a breakout cable through the cable management bracket at the right side of the card slot.
  - b Attach the breakout cable to the right-most connector to be cabled on an FE–GE line card. Position the connector so that the incised label “KEY” on the connector is on the bottom side of the connector as you face the chassis; see Figure 21.

---

---

### Caution!

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

---

---

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

### Caution!

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

---

---

- d Tie-wrap the breakout cable to the rack so that it supports the weight of the cable.
      - e Continue to connect and route the breakout cables for the other MRJ21 connectors on the card.
      - f Connect and route the cables for the GE ports on the FE–GE card as described in Step 3



---

---

### Caution!

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

---

---

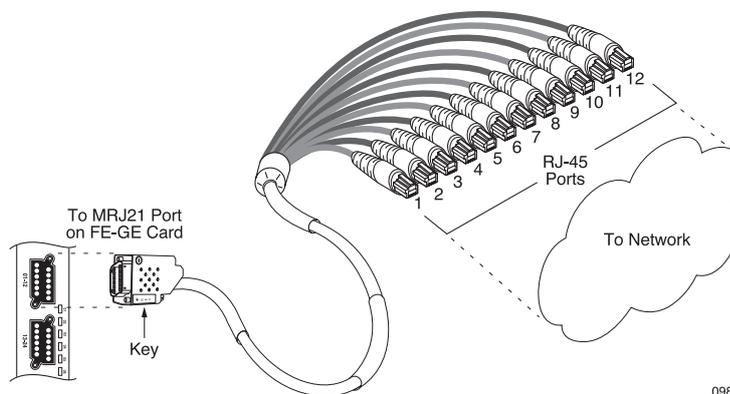


Figure 21 Connecting an FE-GE Breakout Cable

## 2.12 Power On and Off the System

---

---

### Caution!

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

---

---

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

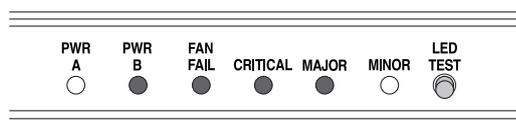


Figure 22 SmartEdge 600 Status LEDs



**Table 28 SmartEdge 600 Status LEDs**

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

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

During the power-on sequence for a SmartEdge 600 router, the line cards are held in low-power mode until the operating system determines which slot has the active controller card. After the active controller card (and the standby controller card, if it is installed) are initialized, the operating system initializes the configured line cards starting with the lowest-numbered slot. If a line card is not configured, no power is allocated to it.

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

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

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

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

## 2.12.1 Power-On Diagnostics

Power-on diagnostics verify the correct operation of the controller cards, backplane, fan tray, and each installed line card during a power-on or reload sequence of the SmartEdge 600 router. These tests also run whenever a controller or line card is installed in a running system. The power-on diagnostics



for each component consist of a series of tests, each of which can indicate a component failure.

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

The maximum test time is 130 seconds: 60 seconds for a controller card, 10 seconds for the backplane and fan tray, and 5 seconds for each installed line card. If the system has two controller cards, the controller tests run in parallel.

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

```
show diag pod component
```

```
show diag pod component detail
```

Table 29 Components Tested by POD

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

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

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

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



## 3 Hardware Control and Troubleshooting

The operating system command-line interface (CLI) includes commands that display hardware configuration and status information, allow hardware troubleshooting, and provide hardware control and recovery. You enter all commands through the management port or the console port on the active controller card. When the system is powered on or reloaded, the active controller card is in slot 7.

The modes in which you enter commands are as follows:

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

### 3.1 Hardware Status

The CLI commands that display status information, such as power, temperature, ports, alarms, and bit error rate tests (BERTs), for the fan and alarm unit and individual cards and ports. Required characters and keywords are shown in bold; arguments for which you must supply a value are shown in italics. You can enter **show** commands in any mode.

For descriptions of the output for any CLI command, see *Command List Reference* [5].

*Table 30 CLI Commands for Hardware Status*

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



Table 30 CLI Commands for Hardware Status

| Task or Information Needed  | CLI Command   | Comments   |
|---|---|--|
| Status of a specific port, including alarms   | <code>slot/portdetail</code>  |  |
| Status of the SmartEdge Service Engine (SSE) group <sup>(1)</sup>                                     | <pre> <b>show administrators</b> <b>show chassis</b> <b>show chassis power</b> <b>show configuration</b> <b>show configuration sse</b> <b>show disk sse</b> <b>show disk sse counters</b> <b>show hardware</b> <b>show sse {group   partition}</b> <b>show sse group counters</b> <b>show system alarm sse</b> </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 card. The command shows software version information, system uptime, task information, configuration information, and current state of each line card.   |

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

## 3.2 CLI Commands for Hardware Control

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

Table 31 CLI Commands for Hardware Configuration and Control

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



Table 31 CLI Commands for Hardware Configuration and Control

| Task or Information Needed  | CLI Command   | Comments  |
|---|---|---|
| Restart the system (reload both controller cards) <sup>(2)</sup>  | <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><br><code>no shutdown</code>   |   |
| Shut down (disable) a port  | <code>port port-type slot/port</code><br><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 <sup>(3)</sup>  |   |   |
| Shut down (disable) a card  |   |   |
| Unshut (no shutdown) <sup>(4)</sup>   |   |   |
| <b>Hardware data—Version, slot number, port number, physical layer interface, speed, mode, counters</b> |   |   |
| Summary information   | <code>show chassis</code><br><code>show chassis power</code><br><code>show hardware</code><br><code>show port</code>  |   |
| Detailed information  | <code>show chassis power inventory</code><br><code>show hardware fan tray detail</code><br><code>show hardware card slot slot detail</code><br><code>show port details slot/port</code> |   |
| <b>Configuration data—Slots, ports</b>  |   |   |
| Summary information for each slot   | <code>show chassis</code>   |   |
| Current configuration information for all SSE groups <sup>(1)</sup>                                     | <code>show configuration sse</code>   |   |
| Summary information for each SSE hard disk drive <sup>(1)</sup>   | <code>show disk sse slot</code>   |   |
| Summary information for all SSE hard disk drive counters <sup>(1)</sup>                                 | <code>show disk sse counters slot 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 <sup>(1)</sup>   | <code>show sse { group [ group_name ]   partition [ partition_name ] }</code>   |   |
| Summary information for all SSE group counters <sup>(1)</sup>   | <code>show sse group counters</code>  |   |



Table 31 CLI Commands for Hardware Configuration and Control

| Task or Information Needed  | CLI Command   | Comments |
|---|---|----------|
| Summary information for all SSE group and partition alarms <sup>(1)</sup> | <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) This command is not supported on the SmartEdge 400 and 800 chassis.

(2) For other forms of this command, see Command List Reference [5].

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

(4) Use this command to enable the card after using the **shutdown** command to stop the normal operation and halt the traffic.

### 3.3 CLI Commands for Hardware Troubleshooting

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

Table 32 CLI Commands for Hardware Troubleshooting

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

Table 33 Loopback Types

| Loopback Type                        | Description  |
|--------------------------------------|--|
| —                                    | No loopback type is specified for Ethernet and Gigabit Ethernet ports. |
| <code>internal</code> <sup>(1)</sup> | Loops the transmit line to the receive line.                           |



Table 33 Loopback Types

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

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

### 3.4 Values for CLI Input Arguments

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

Table 34 Values for CLI Input Arguments

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



**Table 34 Values for CLI Input Arguments**

| Argument             | Range of Values/Description  | Restrictions  |
|----------------------|--|---|
| <i>loopback-type</i> | <p>Type of loopback:</p> <ul style="list-style-type: none"> <li>• internal—Loops the transmit line to receive line.</li> <li>• line—Loops the receive line to the transmit line.</li> <li>• local—Loops the transmit line to the receive line to test internal functions.</li> <li>• 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"> <li>* 1 to 24 – DS-0s under channelized DS-1.</li> <li>* 1 to 31 – DS-0s under channelized E-1.</li> </ul> </li> <li>• 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"> <li>* 1 to 24 – DS-0s under channelized DS-1.</li> <li>* 1 to 31 – DS-0s under channelized E-1.</li> </ul> </li> <li>• remote—Verifies remote link connectivity and quality: channels with C-bit framing; the admin state must be Up.</li> <li>• remote line fdl ansi—Facility data link (FDL) ANSI loopback: channels with Extended Superframe Format (ESF) framing.</li> <li>• remote line fdl bellcore—FDL Telcordia loopback: channels with ESF framing.</li> <li>• remote line inband—Inband loopback: channels with either ESF or Superframe Format (SF) framing; the Admin state must be Up.</li> <li>• remote payload—Payload loopback: channels with ESF framing.</li> </ul> <p>See Table 33 for a list of loopback types and the ports and channels to which they apply.</p> |   |
| <i>pattern</i>       | <p>Pattern to use to exercise the line or channel during a BERT:</p> <ul style="list-style-type: none"> <li>• 0s,1s, 1100</li> <li>• 1-in-2, 1-in-8, 1-in-12, 1-in-32</li> <li>• 2<sup>15</sup>, 2<sup>20</sup>, 2<sup>23</sup>, 10<sup>3</sup>~10<sup>7</sup></li> <li>• qrss, user-defined</li> </ul>  |   |
| <i>port</i>          | 1 to 62, depending on line card type.  | The Ethernet management port on a controller card is always port 1. |
| <i>port-type</i>     | See Table 36 and Table 37 for the types of ports and channels.   |   |
| <i>slot</i>          | <p>The slot in which a line card or primary controller card is installed.</p> <ul style="list-style-type: none"> <li>• SmartEdge 400: 1 to 4</li> <li>• SmartEdge 600: 1 to 4</li> <li>• SmartEdge 800: 1 to 6, 9 to 14</li> <li>• SmartEdge 1200: 1 to 6, 9 to 14</li> <li>• SmartEdge 1200H: 1 to 6, 9 to 14</li> </ul>  |   |

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

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



Table 35 Card Types

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

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

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

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

Table 36 Port Types

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



Table 37 Channel Types

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

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

Table 38 Supported Subchannel Types

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



### 3.5 Output Fields for the show licenses all Command

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

*Table 39 Output Fields for the show licences all Command with the all-ports detail Keyword*

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

### 3.6 Output Fields for the show chassis Command

*Table 40 Output Fields for the show chassis Command*

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



Table 40 Output Fields for the show chassis Command

| Field Name  | Description   |
|-------------|---|
| Initialized | State of card: <ul style="list-style-type: none"> <li>• No—PPAs have not been initialized for this card.</li> <li>• Yes—PPAs have been initialized for this card.</li> </ul>  |
| Flags       | Status of card <sup>(3)(4)</sup> <ul style="list-style-type: none"> <li>• A — Active Crossconnect</li> <li>• B — Standby Crossconnect</li> <li>• C — SARCs (Segmentation And Reassembly Controllers)</li> <li>• D — Default Traffic Card<sup>(5)</sup></li> <li>• E — EPPA (Egress Packet Processing ASIC) Ready</li> <li>• G — Upgrading FPGA (Field Programmable Gate Array)</li> <li>• H — Card Admin State SHUT<sup>(6)</sup></li> <li>• I — IPPA (Ingress PPA) Ready</li> <li>• M — FPGA Upgrade Required<sup>(7)(8)</sup></li> <li>• N — SONET EU Enabled</li> <li>• O — Card Admin State ODD<sup>(9)</sup></li> <li>• P — Coprocessor Ready (SSE card)</li> <li>• P1 — ASP1 Ready (ASE card)</li> <li>• P2 — ASP2 Ready (ASE card)</li> <li>• R — Traffic Card Ready</li> <li>• S — SPPA (Segmented PPA) Ready</li> <li>• U — Card PPAs/ASP UP (All cards: PPAs are up; ASE card: at least one APS is up; SSE card: coprocessor is up.)</li> <li>• W—Warm Reboot (Card has not been reloaded since the last switchover.)</li> <li>• X—XCRP Mismatch. (The standby and active controller cards are not identical.)</li> </ul> |

(1) A line card is configured with the **card** command (in global configuration mode); it might not be installed.

(2) The SSE card is not supported on the SmartEdge 400 and 800 chassis

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

(4) A line card is ready (R flag) when the card has been initialized and the code for the PPAs has been downloaded; it is up (U flag) when the PPAs on the card are registered with the requisite NetBSD process

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

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

(7) The version of the FPGA that is installed on this line card and the version that is shipped with this release of the SmartEdge OS do not match; you must update the FPGA on this line card for it to successfully initialize. To upgrade the FPGAs on this line card, see *Installing the SmartEdge OS Reference* [11].

(8) This flag only appears when an FPGA version on the selected line card is available for an upgrade. Otherwise, it is not displayed even when the installed and file versions are different in the **show hardware card <slot> detail** command.

(9) A line card is placed in the ODD state with the **on-demand diagnostic** command (in card configuration mode).



## 3.7 Output Fields for the show disk Command

Table 41 Output Fields for the show disk Command

| Field                     | Description   |
|---------------------------|---|
| Location                  | Location of the storage device: <ul style="list-style-type: none"> <li>• internal—Internal-storage device (compact-flash card) typically installed in a slot</li> <li>• external—External-storage device installed in an external slot</li> </ul>   |
| 512-blocks <sup>(1)</sup> | Size of the file system in 512-byte blocks: <ul style="list-style-type: none"> <li>• 362,526—192-MB internal compact-flash card, root file system</li> <li>• 484,079—256-MB internal compact-flash card, root file system</li> <li>• 968,158—512-MB internal compact-flash card, root file system</li> <li>• 1,021,244—1-GB mass-storage device, /md file system<sup>(2)</sup></li> </ul> |
| 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) <sup>(3)</sup> <sup>(4)</sup>   |
| Mounted on                | Device on which the file system is mounted: <ul style="list-style-type: none"> <li>• /—Internal compact-flash card</li> <li>• /md—Mass-storage device in the external slot</li> </ul>   |

(1) The size of the root file system includes the sizes of the /flash file system and the p0 and p1 partitions on the internal-storage device.

(2) The size of the /md file system does not include the partition for SmartEdge OS core dumps on the external storage device; the partition for core dumps is approximately 500 MB.

(3) The number of usable 512-byte blocks (the sum of the Used and Avail fields) on a storage device is approximately 95% of the number of 512-byte blocks.

(4) The capacity of an external storage device can decrease slightly over time if sectors are marked as unusable (cannot be read or written).

## 3.8 Output Fields for the show hardware Command

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

Table 42 Output Fields for the show hardware Command

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



Table 42 Output Fields for the show hardware Command

| Field Name    | Field Data Reported and Data Descriptions   |
|---------------|---|
| Active Alarms | Alarm conditions for this unit: <ul style="list-style-type: none"> <li>• NONE—No alarm conditions exist.</li> <li>• <i>condition</i>—Alarm condition is in effect.</li> </ul> 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"> <li>• <i>slot</i>—Slot number for this unit.</li> <li>• N/A—No slot number for this unit.</li> </ul>   |
| Type          | Unit: <ul style="list-style-type: none"> <li>• backplane—Backplane.</li> <li>• <i>controller-card-type</i>—Controller card is installed.</li> <li>• fan tray—Fan and alarm unit is installed.</li> <li>• <i>traffic-card-type</i>—Line card is installed.</li> <li>• unknown—Controller card is inserted but not initialized.</li> </ul>  |
| Mfg Date      | <i>dd/mm/yyyy</i> —Date unit was manufactured.  |
| Voltage       | <ul style="list-style-type: none"> <li>• N/A—Voltage is not applicable for this unit.</li> <li>• NOT OK—Voltage for this card is outside its operating range.</li> <li>• OK—Voltage for this card is within its operating range.</li> </ul>   |
| Temperature   | Temperature condition and actual temperature reading in degrees Celsius: <ul style="list-style-type: none"> <li>• Cold—Temperature is colder than normal.</li> <li>• Normal—Temperature is within normal operating range for this unit.</li> <li>• Hot—Temperature is hotter than normal.</li> <li>• Extreme—Temperature is much hotter than normal.</li> <li>• N/A—Temperature does not apply to this unit.</li> </ul> |

Table 43 Product Codes for SmartEdge Chassis Types

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

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

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



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

| Field Name                       | Field Data Reported and Data Descriptions   |
|----------------------------------|---|
| Active Alarms <sup>(1)</sup>     | Alarm conditions for this unit: <ul style="list-style-type: none"> <li>• NONE—No alarm conditions exist.</li> <li>• <i>condition</i>—Alarm condition is in effect.</li> </ul> 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 <sup>(2)</sup> | <ul style="list-style-type: none"> <li>• Present—Alarm card is installed and working (SmartEdge 400 chassis only).</li> <li>• Not Present—Alarm card is not installed (SmartEdge 400 chassis only).</li> </ul>  |
| Card Status                      | For line cards only: <ul style="list-style-type: none"> <li>• FPGA mismatch—Card needs an FPGA upgrade.</li> <li>• FPGA upgrade—FPGA upgrade has been started.</li> <li>• HW detected—Card is detected and being initialized.</li> <li>• HW failure—Card has experienced a failure.</li> <li>• HW initialized—Card is initialized and ready.</li> </ul>   |
| Chass Entitlement                | Type of chassis for which this card is intended: <ul style="list-style-type: none"> <li>• All—Card is entitled in every chassis.</li> <li>• List of chassis, separated by slashes (/)—Listed chassis only.</li> </ul>   |
| 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. <sup>(3)</sup>   |
| 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.  |
| Ericsson Approved                | State of transceiver testing for this SFP optical transceiver in SmartEdge routers: <ul style="list-style-type: none"> <li>• No—Not tested.</li> <li>• Yes—Tested.</li> </ul>   |
| Fan Tray Status                  | <ul style="list-style-type: none"> <li>• Present—Fan and alarm unit (SmartEdge 800 chassis) or fan tray (SmartEdge 400, SmartEdge 600, SmartEdge 1200, or SmartEdge 1200H chassis) is installed.</li> <li>• 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.</li> </ul> |
| Fan(s) Status                    | <ul style="list-style-type: none"> <li>• Failed—At least one fan is not working.</li> <li>• Normal—All fans are working.</li> </ul>   |
| 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<br>HubFpga file rev  | Hub FPGA revision and file revision; N/A or not displayed if not applicable for this card.  |
| IPPA memory                      | <i>nnn</i> MB—Size of ingress and egress PPA memory.  |



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

| Field Name         | Field Data Reported and Data Descriptions   |
|--------------------|---|
| ITU ch             | International Telecommunications Union (ITU) channel number (corresponds to the wavelength displayed in the Wavelength field); not displayed if not applicable for the transceiver installed in this port.  |
| LEDs               | State of Fail, Active, Standby, and Sync LEDs: <ul style="list-style-type: none"> <li>• Blink—ODD test is in progress.</li> <li>• On—LED is lit.</li> <li>• Off—LED is not lit.</li> </ul> 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"> <li>• Max—All memory on the controller card is enabled.</li> <li>• <i>nnnn</i> MB—Size in MB of enabled memory.</li> </ul>  |
| 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"> <li>• Aborted—The session was terminated by the user or by the standby controller card being removed.</li> <li>• Incomplete—At least one of the requested tests could not be run.</li> <li>• In-progress—Session is currently in progress.</li> <li>• Not available—No session of the ODD has been run for this unit.</li> <li>• Passed—All tests have passed.</li> <li>• <i>n</i> Failure(s)—One or more tests have failed.</li> </ul> |
| 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"> <li>• Success—Unit passed all POD tests.</li> <li>• Failure—Unit failed one or more POD tests.</li> </ul>  |
| 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"> <li>• <i>n1, n2, n3, . . .</i>—Entitled ports.</li> <li>• All—All physical ports on the line card are entitled.</li> </ul>  |



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

| Field Name  | Field Data Reported and Data Descriptions  |
|---|--|
| SmartEdge 400 chassis:<br><ul style="list-style-type: none"> <li>Power Supply A Status</li> <li>Power Supply B Status</li> </ul>  | SmartEdge 400 with AC Power Supply: <ul style="list-style-type: none"> <li>AC Unit No Power—The AC power supply is not installed or is not fully inserted.</li> <li>AC Unit High Temp—High temperature has been detected at the AC source.</li> <li>AC Unit Failure—AC power source has failed.</li> <li>AC Unit Normal—Power is being supplied by the AC source.</li> </ul> SmartEdge 400 with DC Power Supply: <ul style="list-style-type: none"> <li>DC Unit Normal—Power is being supplied by the DC source.</li> <li>No Power—DC Power has failed, is disconnected, or is not installed.</li> </ul> |
| SmartEdge 800 chassis:<br><ul style="list-style-type: none"> <li>Power Supply A Status</li> <li>Power Supply B Status</li> </ul>  | SmartEdge 800 chassis: <ul style="list-style-type: none"> <li>No Power—Power has failed, is disconnected, or is not installed.</li> <li>Normal—Power is being supplied by this power supply.</li> </ul>  |
| SmartEdge 1200 chassis:<br><ul style="list-style-type: none"> <li>Power Supply A1 Status</li> <li>Power Supply A2 Status</li> <li>Power Supply B1 Status</li> <li>Power Supply B2 Status</li> </ul> | SmartEdge 1200 chassis: <ul style="list-style-type: none"> <li>No Power—Power has failed, is disconnected, or is not installed.</li> <li>Normal—Power is being supplied by this power supply.</li> </ul>   |
| RxPwrMin[dbm] <sup>(4)</sup><br>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. <sup>(5)</sup> <ul style="list-style-type: none"> <li>atm priority—ATM priority mode.</li> <li>ip-priority—IP priority mode.</li> <li>vc-fair—Virtual circuit (VC) fairness mode.</li> <li>hsvc-fair—Hierarchical shaping virtual circuit (HSVC) fairness mode.</li> </ul>  |
| 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"> <li>OK—SARC is ready.</li> <li>Not Ready—SARC is not ready.</li> <li>Unknown—Unable to read SARC status.</li> </ul>  |
| SCC id  | ID for the system communication controller (SCC) ASIC on a controller card; the SCC controls and communicates with the line cards.   |
| Serial No   | nnnnnnnnnnnnnn—Unique identifier for this unit; 14 alphanumeric characters.  |



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

| Field Name                                    | Field Data Reported and Data Descriptions   |
|---|---|
| SFP / Media type                              | <p>SFP Transceivers—Ethernet line cards:</p> <ul style="list-style-type: none"> <li>• FX / MM—Short reach transceiver, multimode fiber.</li> <li>• LX10 / SM—Long reach transceiver, single-mode fiber.</li> <li>• SX / MM—Short reach transceiver, multimode fiber.</li> <li>• LX / SM—Long reach transceiver, single-mode fiber.</li> <li>• ZX / SM—Extended long reach transceiver, single-mode fiber.</li> <li>• BX / SM—Bidirectional transceiver, single-mode fiber.</li> <li>• T / Cat5—Copper-based transceiver.</li> <li>• CWDM / SM—Coarse wavelength-division multiplexing (CWDM) transceiver, single-mode fiber.</li> <li>• DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber.<sup>(6)</sup></li> </ul> <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"> <li>• SR / MM—Short reach transceiver, multimode fiber.</li> <li>• SR / SM—Short reach transceiver, single-mode fiber.</li> <li>• IR / SM—Intermediate reach transceiver, single-mode fiber.</li> <li>• LR / SM—Long reach transceiver, single-mode fiber.</li> </ul> |
| SFP Serial No                                 | nnnnnnnnn—Unique identifier for this transceiver; 10 alphanumeric characters.   |
| Slot  | <ul style="list-style-type: none"> <li>• <i>slot</i>—Slot number for this unit.</li> <li>• N/A—No slot number for this unit.</li> </ul>   |
| 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"> <li>• Cold—Temperature is colder than normal.</li> <li>• Normal—Temperature is within normal operating range for this unit.</li> <li>• Hot—Temperature is hotter than normal.</li> <li>• Extreme—Temperature is much hotter than normal.</li> <li>• N/A—Temperature does not apply to this unit.</li> </ul> <p>Table 45 lists descriptions of each temperature condition.<br/>Table 46 lists temperature ranges for card types.</p>  |
| TxPwrMin[dbm] <sup>(4)</sup><br>TxPwrMax[dbm] | -nn.nn—Transmitter optical output power (minimum and maximum) for the version of the SFP transceiver installed in this port.  |



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

| Field Name                | Field Data Reported and Data Descriptions   |
|---------------------------|---|
| Type                      | Unit: <ul style="list-style-type: none"> <li>backplane—Backplane.</li> <li><i>controller-card-type</i>—Controller card is installed.</li> <li>fan tray—Fan and alarm unit is installed.</li> <li><i>traffic-card-type</i>—Line card is installed.</li> </ul>  |
| 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 <sup>(4)</sup> | Center wavelength for the version of the SFP optical transceiver installed in this port: <ul style="list-style-type: none"> <li>0.00 [nm]—Wavelength is not reported by this transceiver.</li> <li><i>nnnn.nn</i> [nm]—Wavelength for this transceiver version.</li> </ul> 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"> <li>SR / SM—Short reach transceiver, single-mode fiber.</li> <li>SW / SM—Short reach transceiver, single-mode fiber.</li> <li>SR / MM—Short reach transceiver, multimode fiber.</li> <li>IR / SM—Intermediate reach transceiver, single-mode fiber.</li> <li>LR / SM—Long reach transceiver, single-mode fiber.</li> <li>LW / SM—Long reach transceiver, single-mode fiber.</li> <li>ER / SM—Extended long reach transceiver, single-mode fiber.</li> <li>EW / SM—Extended long reach transceiver, single-mode fiber.</li> <li>ZR / SM—Extreme reach transceiver, single-mode fiber.<sup>(7)</sup></li> <li>ZW / SM—Extreme reach transceiver, single-mode fiber.<sup>(7)</sup></li> <li>10GE-DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber.<sup>(8)</sup></li> <li>OTN-DWDM—OTN-DWDMITU XFP transceiver, single-mode fiber.<sup>(8)</sup></li> </ul> |

(1) Alarm severities conform to the definitions provided in *Generic Requirements, GR-474-CORE, Issue 1, December 1997, Network Maintenance: Alarm and Control for Network Elements*.

(2) Applies to SmartEdge 400 chassis only.

(3) The Converged Packet Gateway (CPG) supports a single hard disk for each SmartEdge Storage Engine (SSE) card

(4) Measured or reported values meet or exceed the transceiver specifications that are documented in *Transceivers for SmartEdge and SM Family Line Cards*.

(5) The 8-port ATM OC-3c/STM-1c (*atm-oc3e-8-port*) line card only supports the "vc-fair" and "hsvc-fair" atm modes.

(6) The range of GE-DWDM ITU channels is 17 to 60; see *ITU DWDM Transmit Frequencies and Wavelengths* for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

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

(8) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35,36,37,53,and 55; see *ITU DWDM Transmit Frequencies and Wavelengths* for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

**Table 45** *Definitions of Temperature Conditions*

| Condition | Description  |
|-----------|--|
| COLD      | Expected when the system first powers up in a cool or well air-conditioned environment.  |
| NORMAL    | Normal operating temperature.  |
| HOT       | <p>The card is running above normal operating temperature. The lifespan of the card will likely be reduced if this condition persists. The ambient temperature of the room could be too hot, or the chassis air filter or fans might need cleaning or replacing.</p> <p>When the card temperature is greater than TEMP_HOT for longer than 5 minutes, the system generates a minor alarm; if the condition persists longer than one hour, it generates a major alarm.</p> <p>When the card is an active-controller card and the peer controller temperature is NORMAL, the auto reload-switch-over is triggered, the system generates an OVERHEAT major alarm.</p> |
| EXTREME   | <p>The card is running well above normal operating temperature. The lifespan of the card will be reduced if this condition persists. The ambient temperature of the room is likely too hot, or the chassis air filter or fans might need cleaning or replacing.</p> <p>When the card's TEMP_EXTREME persists for 10 minutes or more, the line card will be shutdown automatically, and the system generates a CIRCUIT_PACK_FAIL major alarm.</p>   |
| N/A       | Temperature does not apply to this unit, or this unit does not have a built-in temperature sensor.   |

**Table 46** *Temperature Ranges for Card Types*

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



**Table 46** Temperature Ranges for Card Types

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

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

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

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

### 3.9 Output Fields for the show port Command

**Table 47** Output Fields for the show port Command

| Field Name        | Value/Description   |
|-------------------|---|
| Slot/Port         | slot/port—Slot and port numbers for this port.  |
| Ch:SubCh:SubSubCh | Channel numbers, if appropriate for this port:  |
| Type              | port-type or channel-type.  |
| State             | Port status (combination of the Admin state and Line state fields): <ul style="list-style-type: none"> <li>Down—Port has been configured to be Up, but is not working.</li> <li>Down - not entitled—Port is on the low-density version of the line card and is not available.</li> <li>No card—Port has been configured, but the card is not installed.</li> <li>Unconfigured—Port is not configured and down.</li> <li>Up—Port is working (active).</li> </ul> |



Table 48 Port Types

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

Table 49 Port/Channel Types

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

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

| Field Name    | Value/Description                                      |
|---------------|--|
| <b>Header</b> |  |
| Type          | <i>port-type</i> or <i>channel-type</i> .              |
| Slot/Port     | <i>slot/port</i> —Slot and port numbers for this port. |



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

| Field Name                                     | Value/Description   |
|--|---|
| State  | <p>Port status (combination of the and fields) for a line card:</p> <ul style="list-style-type: none"> <li>• Down—Port has been configured to be up, but is not working.</li> <li>• Down—not entitled—Port is on the low-density version of the line card and is not available.</li> <li>• No card—Port has been configured, but the card is not installed.</li> <li>• Unconfigured—Port is not configured and down.</li> <li>• Up—Port is working (active).</li> </ul> |
| <b>Port Parameters (in alphabetical order)</b> |   |
| Active Alarms                                  | <ul style="list-style-type: none"> <li>• getting LOS—Alarm is present.</li> <li>• getting ATM LCD—Alarm is present.</li> <li>• N/A—Not applicable to this type of port.</li> <li>• NONE—No alarms are present.</li> </ul> <p>For a complete list of conditions that can cause an alarm, see the Troubleshoot with System Power and Alarm LEDs section.</p>  |
| Admin state                                    | <p>State of the port as a result of an operator command:</p> <ul style="list-style-type: none"> <li>• Down—Port is not working.</li> <li>• Up—Port is working (active).</li> </ul>  |
| APS Group Name                                 | <p>Automatic Protection Switching group name. If the port is bound to an APS group, the details are displayed as follows:</p> <ul style="list-style-type: none"> <li>• APS Group Name: atm1</li> <li>• Group ID: 1</li> <li>• Port Type: Working or Protect</li> <li>• Tx Traffic: Active or Standby</li> <li>• Rx Traffic: Active or Standby</li> </ul>  |
| ATM MTU size                                   | <i>nnnn</i> bytes—Size of the hardware maximum transmission unit (MTU) (not configurable).  |
| ATM Payload Scramble                           | Condition of scrambling for ATM port (on or off).   |



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

| Field Name                  | Value/Description  |
|-----------------------------|--|
| 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"> <li>• enabled</li> <li>• disabled</li> </ul> Possible values for the <i>state</i> field are: <ul style="list-style-type: none"> <li>• negotiating—Ethernet drivers are in the process of auto-negotiating with the remote peer</li> <li>• success—Auto-negotiation was successful</li> <li>• fail—Auto-negotiation failed</li> <li>• force—Auto-negotiation failed and the port is in forced mode</li> <li>• unknown—This is an error state</li> </ul> The possible combinations of the <i>setting</i> and <i>state</i> fields are: <ul style="list-style-type: none"> <li>• disabled-unknown</li> <li>• disabled-negotiating</li> <li>• disabled-success</li> <li>• disabled-force</li> <li>• enabled-unknown</li> <li>• enabled-negotiating</li> <li>• enabled-success</li> <li>• enabled-fail</li> </ul> |
| Bandwidth                   | <i>nnnnnn</i> kbps—Speed of SONET/SDH port.<br><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><br><i>on—Port listening mode is enabled.</i><br><i>off—Port listening mode is disabled.</i>  |
| Clock Source <sup>(1)</sup> | <i>State of source of the transmit clock:</i><br><i>global-reference-system clock on the active controller card.</i> <sup>(2)</sup><br><i>local</i> —local clock located on the line card (onboard clock). <sup>(3)</sup><br><i>loop</i> —receive clock derived from the incoming signal on the port.<br><i>card-reference</i> —clock source that has been specified for the line cards.   |
| Crc                         | Configured value of the cyclic redundancy check for a SONET/SDH port (16 or 32).   |
| Dampening Count             | <i>n</i> —Number of instances this link-dampened port went down and came up within the limits set by the <code>link-dampening</code> command. This count is reset only when the port is removed from the configuration with the <code>no</code> form of the <code>port</code> command (in ATM OC, ATM DS-3, or port configuration mode).   |
| Description                 | Configured description.  |
| Diag Monitor                | <ul style="list-style-type: none"> <li>• No—SFP cannot monitor its faults nor report power readings</li> <li>• Yes—SFP can monitor its faults and report power readings</li> </ul>   |
| Distant Alarm Detection     | Distant alarm (RAI) detection condition (on or off) on E1 channel.   |
| Distant Alarm Generation    | Distant alarm (RAI) generation condition (on or off) on E1 channel.  |



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

| Field Name                   | Value/Description   |
|------------------------------|---|
| DSU Bandwidth <sup>(4)</sup> | <i>nn.nn</i> Mbps—Bandwidth of configured data service unit (DSU).  |
| DSU Mode <sup>(4)</sup>      | <i>digital-link</i> —Configured vendor of DSU.  |
| DSU Scramble <sup>(4)</sup>  | DSU scramble condition (on or off).   |
| Duplex Mode                  | <ul style="list-style-type: none"> <li>• full—Port condition, Ethernet or Gigabit Ethernet (any version).</li> <li>• half—Port condition, 10/100 Ethernet only.</li> </ul>  |
| Encapsulation                | <p>The encapsulation for this port:</p> <ul style="list-style-type: none"> <li>• 802.1q</li> <li>• atm</li> <li>• cisco-hdlc</li> <li>• ethernet</li> <li>• ppp</li> </ul>  |
| Equipment Loopback           | <p>Configured equipment loopback:</p> <ul style="list-style-type: none"> <li>• customer—DS-3 or DS-1 channel responds to remote loopback requests.</li> <li>• network—DS-3 or DS-1 channel ignores remote loopback requests.</li> <li>• NONE—DS-3 or DS-1 channel ignores remote loopback requests.</li> </ul>  |
| FEAC code received           | <p>Far end alarm condition (of the remote system):</p> <ul style="list-style-type: none"> <li>• DS3 LOS.</li> <li>• DS3 out of frame (OOF).</li> <li>• DS3 alarm indication signal (AIS) received.</li> <li>• DS3 Idle Received—The far end box is sending the idle pattern and no other data.</li> <li>• Service affecting (SA) equipment failed.</li> <li>• Nonservice affecting (NSA) equipment failed.</li> <li>• Common equipment failed.</li> <li>• N/A or NONE—No alarm condition received.</li> </ul> |
| Flow control                 | Condition of flow control for Gigabit Ethernet port, any version, (on or off).  |
| Framing                      | <p>Configured framing for the port:</p> <ul style="list-style-type: none"> <li>• c-bit</li> <li>• crc4</li> <li>• esf</li> <li>• g751</li> <li>• m23</li> <li>• no-crc4</li> <li>• sf</li> <li>• sdh (an option of ATM OC, POS, and WAN-PHY ports)</li> <li>• sonet (an option of ATM OC, POS, and WAN-PHY ports)</li> <li>• unframed</li> </ul>  |
| Idle Character               | Configured idle character (flags or marks).   |



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

| Field Name      | Value/Description  |
|-----------------|--|
| Keepalive       | State of keepalive timer: <ul style="list-style-type: none"> <li>• Not Set—Keepalive timer is not configured.</li> <li>• Set (n sec)—Keepalive timer is set for n seconds.</li> </ul>  |
| 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"> <li>• Down—Port has been configured to be up, but is not working.</li> <li>• Down— not entitled—Port is on the low-density version of the line card and is not available.</li> <li>• No card—Port has been configured, but the card is not installed.</li> <li>• Unconfigured—Port is not configured and down.</li> <li>• Unconfigured - not licensed—Port is configured without the “all-port” license. <sup>(5)</sup></li> <li>• Up—Port is working (active).</li> </ul>  |
| Link Dampening  | For ATM, Ethernet, and POS ports only. Status of link dampening: <ul style="list-style-type: none"> <li>• enabled—Link dampening is enabled.</li> <li>• disabled—Link dampening is disabled.</li> </ul>  |
| Link up delay   | nnnnn msec—Configured or default value (in milliseconds) for the delay time for down-to-up transitions.  |
| Link down delay | nnnnn msec—Configured or default value (in milliseconds) for the delay time for up-to-down transitions.  |
| Link Distance   | For Gigabit Ethernet ports with single-mode fiber (SMF) transceivers (LX or LX10) only. Distance supported by the installed transceiver: <ul style="list-style-type: none"> <li>• n—Distance supported by the transceiver.</li> <li>• N/A—No transceiver installed or transceiver does not report the distance supported.</li> </ul>   |
| Loopback        | Type of loopback: <ul style="list-style-type: none"> <li>• internal—Loops the transmit line to receive line.</li> <li>• line—Loops the receive line to the transmit line.</li> <li>• local—Loops the transmit line to the receive line to test internal functions.</li> <li>• network line—Full loopback from the receive line to the transmit line; channels with all timeslots configured (1 to 24).</li> <li>• network payload—Payload loopback from the receive line to the transmit line: channels with all timeslots configured (1 to 24).</li> <li>• remote—Verifies remote link connectivity and quality: channels with C-bit framing; the admin state must be Up.</li> <li>• remote line fdl ansi—Facility data link (FDL) ANSI loopback: channels with Extended Superframe Format (ESF) framing.</li> <li>• remote line fdl bellcore—FDL Telcordia loopback: channels with ESF framing.</li> <li>• remote line inband—Inband loopback: channels with either ESF or Superframe Format (SF) framing; the Admin state must be Up.</li> <li>• remote payload—Payload loopback: channels with ESF framing.</li> </ul> |
| MAC address     | nn : nn : nn : nn : nn : nn—Medium access control address for this port.   |



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

| Field Name                       | Value/Description  |
|----------------------------------|--|
| Media type                       | <p>Physical interface:</p> <ul style="list-style-type: none"> <li>• 100Base-TX—10/100 Ethernet or Ethernet management port (at either 10 or 100 Mbps).</li> <li>• 1000Base-LX—Long reach SFP or Gigabit interface converter (GBIC) transceiver.</li> <li>• 1000Base-LX10—Extended reach GBIC transceiver.</li> <li>• 1000Base-SX—Short reach SFP or GBIC transceiver.</li> <li>• 1000Base-T—Copper-based SFP, or GBIC transceiver or GE port on an FE-GE line card.</li> <li>• 1000Base-SR—Short reach SFP transceiver.</li> <li>• 1000Base-IR—Intermediate reach SFP transceiver.</li> <li>• 1000Base-LR—Long reach SFP transceiver.</li> <li>• 1000Base-CWDM—Coarse wavelength-division multiplexing (CWDM) SFP transceiver.</li> <li>• 1000Base-DWDM—Dense wavelength-division multiplexing (DWDM) SFP transceiver.<sup>(6)</sup></li> <li>• 10GE-SR (Displays 10000Base-SR)—Short reach XFP transceiver (10GE or OC-192c/STM-64c port).</li> <li>• 10GE-SW (Displays 10000Base-SW).</li> <li>• 10GE-SR+10GE-SW (Displays 10000Base-SR for LAN-PHY) or 10000Base-SW for WAN-PHY.)</li> <li>• 10GE-IR—Intermediate reach XFP transceiver (OC-192c/STM-64c port).</li> <li>• 10GE-LR (Displays 10000Base-LR.)—Long reach XFP transceiver (10GE or OC-192c/STM-64c port).</li> <li>• 10GE-LW (Displays 10000Base-LW).*</li> <li>• 10GE-LR+10GE-LW (Displays 10000Base-LR for LAN-PHY) or 10000Base-LW for WAN-PHY.)</li> <li>• 10GE-ER (Displays 10000Base-ER.)—Extended reach XFP transceiver (10GE port).</li> <li>• 10GE-EW (Displays 10000Base-EW).</li> <li>• 10GE-ER+10GE-EW (Displays 10000Base-ER for LAN-PHY) or 10000Base-EW for WAN-PHY.)</li> <li>• 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).</li> <li>• 10GE-DWDM (Displays 10000Base-DWDM)—Dense-wavelength-division-multiplexing (DWDM) XFP transceiver.<sup>(7)</sup></li> <li>• OTN-DWDM—OTN-DWDMITU XFP transceiver, single-mode fiber.<sup>(7)</sup></li> <li>• No GBIC—GBIC transceiver is not installed in this GE port.</li> <li>• No transceiver—XFP transceiver is not installed in this 10GE or OC-192c/STM-64c port.</li> <li>• Sonet OCn —SONET/SDH OC-n (OC-3c/STM-1c, OC-12c/STM-4c, or OC-48c/STM-16c) port.</li> <li>• unknown—Unknown type of transceiver is installed in this Gigabit Ethernet port.</li> </ul> |
| Mini-RJ21 Connector              | Ports n1-n2—Range of port numbers for this connector on an FE-GE line card.  |
| MTU size                         | nnnn Bytes—Configured size of the MTU for the port.  |
| NAS Port Type                    | <ul style="list-style-type: none"> <li>• 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 Reference</i> [2].</li> <li>• blank—Not configured or not applicable to this port.</li> </ul>   |
| Optical Transport <sup>(8)</sup> | <ul style="list-style-type: none"> <li>• otu2e—An OTN XFP is inserted.</li> <li>• NONE—No optical transport</li> </ul>   |



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

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



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

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



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

| Field Name                 | Value/Description   |
|----------------------------|---|
| Wavelength <sup>(12)</sup> | Center wavelength for the version of the SFP optical transceiver installed in this port: <ul style="list-style-type: none"> <li>• 0.00 [nm]—Wavelength is not reported by this transceiver.</li> <li>• nnnn.nn [nm], ITU ch nn—Wavelength and International Telecommunications Union (ITU) channel number (if applicable) for this transceiver version.</li> </ul> For wavelength data for each type of transceiver and its versions, see <i>Transceivers for SmartEdge and SM Family Line Cards Reference</i> [7]. |
| Yellow Alarm Detection     | Yellow alarm (RAI) detection condition (on or off) on T1(Ds-1) channel.   |
| Yellow Alarm Generation    | Yellow alarm (RAI) generation condition (on or off) on T1(DS-1) channel.  |

(1) Changes to the clock source setting will not cause LOF on the 8-port ATM OC-3c/STM-1c.

(2) This is the default card clock source on the 8-port ATM OC-3c/STM-1c card.

(3) This is the default card clock source on previous ATM cards, except for the 8-port OC-3c/STM-1c card.

(4) This field is not supported on the Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port) card.

(5) At the **show port all** command output on the Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 line card.

(6) The range of GE-DWDM ITU channels is 17 to 60; see *ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.*

(7) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35,36,37,53,and 55; see *ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.*

(8) This field is only applicable for the 10G LAN-PHY port type.

(9) Only supported in hsvc-fair mode on the 8-port ATM OC-3c/STM-1c (atm-oc3e-8-port) line card. When executed in vc-fair mode, an error message occurs if executed with any value other than 150 Mbps.

(10) When Payload line-rate (150 Mbps) is selected, the actual line-rate received is 149.76 Mbps.

(11) This field is only applicable for the line cards that support WAN-PHY mode.

(12) Measured or reported values meet or exceed the transceiver specifications that are documented in *Transceivers for SmartEdge and SM Family Line Cards.*

Table 51 XFP Auxiliary Measurement Displayed by the show port Command with the detail Keyword

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



**Table 51** XFP Auxiliary Measurement Displayed by the show port Command with the detail Keyword

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

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

### 3.10 Output Fields for the show port transceiver Command

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

**Table 52** Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data

| State            | Description   |
|------------------|---|
| SFP / Media type | <p>SFP Transceivers—Ethernet line cards:</p> <ul style="list-style-type: none"> <li>• FX / MM—Short reach transceiver, multimode fiber.</li> <li>• LX10 / SM—Long reach transceiver, single-mode fiber.</li> <li>• SX / MM—Short reach transceiver, multimode fiber.</li> <li>• LX / SM—Long reach transceiver, single-mode fiber.</li> <li>• ZX / SM—Extended long reach transceiver, single-mode fiber.</li> <li>• BX / SM—Bidirectional transceiver, single-mode fiber.</li> <li>• T / Cat5—Copper-based transceiver.</li> <li>• CWDM / SM—Coarse wavelength-division multiplexing (CWDM) transceiver, single-mode fiber.</li> <li>• DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber.<sup>(1)</sup></li> </ul> <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"> <li>• SR / MM—Short reach transceiver, multimode fiber.</li> <li>• SR / SM—Short reach transceiver, single-mode fiber.</li> <li>• IR / SM—Intermediate reach transceiver, single-mode fiber.</li> <li>• LR / SM—Long reach transceiver, single-mode fiber.</li> </ul> |



**Table 52** Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data

| State                 | Description  |
|-----------------------|--|
| SFP / Media type      | <p>SFP Transceivers—Ethernet line cards:</p> <ul style="list-style-type: none"> <li>• FX / MM—Short reach transceiver, multimode fiber.</li> <li>• LX10 / SM—Long reach transceiver, single-mode fiber.</li> <li>• SX / MM—Short reach transceiver, multimode fiber.</li> <li>• LX / SM—Long reach transceiver, single-mode fiber.</li> <li>• ZX / SM—Extended long reach transceiver, single-mode fiber.</li> <li>• CWDM / SM—Coarse wavelength-division multiplexing (CWDM) transceiver, single-mode fiber.</li> <li>• DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber.<sup>(2)</sup></li> </ul> <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"> <li>• SR / SM—Short reach transceiver, single-mode fiber.</li> <li>• SR / MM—Short reach transceiver, multimode fiber.</li> <li>• IR / SM—Intermediate reach transceiver, single-mode fiber.</li> <li>• LR / SM—Long reach transceiver, single-mode fiber.</li> </ul> |
| XFP / Media type      | <p>10-Gbps SFP (XFP) transceivers—OC-192 and 10-Gig Ethernet line cards:</p> <ul style="list-style-type: none"> <li>• SR or SW / SM—Short reach transceiver, single-mode fiber.</li> <li>• SR / MM—Short reach transceiver, multimode fiber.</li> <li>• IR / SM—Intermediate reach transceiver, single-mode fiber.</li> <li>• LR or LW / SM—Long reach transceiver, single-mode fiber.</li> <li>• ER or EW / SM—Extended long reach transceiver, single-mode fiber.</li> <li>• ZR or ZW / SM—Extreme reach transceiver, single-mode fiber.<sup>(3)</sup></li> <li>• 10GE-DWDM / SM—Dense wavelength-division multiplexing (DWDM) transceiver, single-mode fiber.<sup>(4)</sup></li> <li>• OTN-DWDM—OTN-DWDMITU transceiver, single-mode fiber.<sup>(4)</sup></li> </ul>  |
| Ericsson Approved     | <p>State of transceiver testing for transceiver in SmartEdge routers:</p> <ul style="list-style-type: none"> <li>• No—Not tested.</li> <li>• Yes—Tested.</li> </ul>  |
| Diagnostic monitoring | Whether the installed transceiver supports diagnostic monitoring compliant to SFF-8472 for SFPs or INF-8077i for XFPs.   |
| Serial number         | nnnnnnnnnnnn—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"> <li>• 0.00 [nm]—Wavelength is not reported by this transceiver.</li> <li>• nnnn.nn [nm]—Wavelength for this transceiver version.</li> </ul>   |
| Tx Pwr [dbm]          | <p>Transmitter optical output power (measured, minimum, and maximum limits) for the version of the transceiver installed in this port.</p> <p>For a complete list of alarms and warnings supported by the SFP and XFP transceivers, see the Troubleshoot with System Power and Alarm LEDs section.</p>   |
| Rx Pwr [dbm]          | Receiver sensitivity (measured, minimum, and maximum limits) for the version of the transceiver installed in this port.  |
| Temperature [oC]      | Temperature (measured, minimum, and maximum limits) in degrees Centigrade.   |



**Table 52 Output Fields for the show port Command with the transceiver Keyword - for SFP or XFP Transceiver Port Data**

| State   | Description  |
|---|--|
| Laser bias current                              | Magnitude of the laser bias power setting current (measured, minimum and maximum limits), in milliamperes (mA).<br><br>The laser bias provides direct modulation of laser diodes and allows the user to monitor the "health" of the laser. |
| Vcc [V]   | Magnitude of the supply voltage to the transceiver (measured, minimum, and maximum limits), in Volts (V).  |
| AUX1 <sup>(5)</sup> (for XFP transceivers only) | Auxiliary measurement 1 for XFP transceivers—defined in Byte 222 Page 01h in INF-8077i.  |
| AUX2 <sup>(5)</sup> (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 <code>port/slot</code> : <ul style="list-style-type: none"> <li>NONE—No alarm conditions exist</li> <li>Condition—Alarm condition is in effect.</li> </ul>                                      |

(1) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

(2) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

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

(4) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35,36,37,53,and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

(5) See Table 53 for a list of auxiliary input types monitored by each auxiliary A/D channel of the XFP transceivers.

**Table 53 XFP Transceivers Measurements and Threshold Values**

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



### 3.11 Troubleshoot with System and Card LEDs

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

### 3.12 Troubleshoot with System Power and Alarm LEDs

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

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

Table 54 Problems Indicated by Power and Alarm LEDs

| Problem   | Solution  |
|---|---|
| FAN (red) is on; one or more fans are not operating.  | Replace the fan and alarm unit.   |
| PWR A or PWR B (green) is off.  | <p>No power is present at the A-side or B-side power input; perform the following checks or actions:</p> <ul style="list-style-type: none"> <li>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.</li> <li>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.</li> <li>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.</li> </ul> |
| MAJOR (red) is on; one or more line cards are not operable (in low-power mode), resulting from a mismatched pair of controller cards (the standby controller card is not the same version as the active controller card). | Remove the standby controller card; if available, install a standby controller card of the same version as the active controller card.  |

#### 3.12.1 Chassis Alarms

Table 55 Chassis Alarms

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



Table 55 Chassis Alarms

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

### 3.12.2 Line Card Alarms

Table 56 Line Card Alarms

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

**Table 56** Line Card Alarms

| Description                             | Severity | Probable Cause         | Service Affecting |
|---|----------|------------------------|-------------------|
| Circuit pack power-on diagnostic failed | Major    | ReplaceableUnitProblem | Yes               |
| Circuit pack reset completed            | Warning  | OperationNotification  | Yes               |
| Diagnostic fail                         | Major    | ReplaceableUnitProblem | Yes               |
| Loss of backplane clock                 | Major    | ReplaceableUnitProblem | Yes               |
| Software download completed             | Warning  | OperationNotification  | Yes               |
| Software download failed                | Warning  | OperationFailure       | Yes               |
| Synchronization failure                 | Critical | TimingProblem          | Yes               |
| Voltage failure detected                | Major    | ReplaceableUnitProblem | Yes               |

(1) Applies to SSE and PPA3-based line cards only.

(2) For additional information, refer to SW-WHP-0129 White Paper on PMA3 Line Card Silent Traffic Halt Faults Detection and Alarms Reporting”.

### 3.12.3 Controller Card Alarms

**Table 57** Controller Card Alarms

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



Table 57 Controller Card Alarms

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

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

### 3.12.4 SSE Card Alarms

Table 58 SSE Card Alarms

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

### 3.12.5 SSE Disk Alarms

Table 59 SSE Disk Alarms

| Description                            | Severity | Probable Cause              | Service Affecting |
|--|----------|-----------------------------|-------------------|
| Hard disk health degraded              | Minor    | replaceableUnitProblem      | No                |
| Hard disk failed                       | Major    | diskFailure                 | Yes               |
| Hard disk missing <sup>(1)</sup>       | 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 60 SSE Group Alarms

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

### 3.12.7 SSE Group Partition Alarms

Table 61 SSE Group Partition Alarms

| Description   | Severity | Probable Cause        | Service Affecting |
|---|----------|-----------------------|-------------------|
| SSE group partition not operational <sup>(1)</sup>            | Major    | operationFailure      | Yes               |
| SSE group partition sync in progress                          | Minor    | operationNotification | No                |
| SSE group partition data sync failed                          | Major    | operationFailure      | Yes               |
| SSE group partition full                                      | Major    | operationNotification | Yes               |
| SSE group partition low space                                 | Minor    | operationNotification | No                |
| SSE group partition not operational at standby <sup>(2)</sup> | Major    | databaseInconsistency | Yes               |

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

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

### 3.12.8 Optical Port Alarms

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



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

**Table 62** *Optical Port Alarms—Physical Layer*

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

**Table 63** *Optical Port Alarms—Section/Regenerator Section Layer*

| Description   | Severity | Probable Cause          | Service Affecting |
|---|----------|-------------------------|-------------------|
| Loss of frame                                       | Critical | LossOfFrame             | Yes               |
| Loss of signal                                      | Critical | LossOfSignal            | Yes               |
| Section DCC (data communications channel) link down | Major    | ExternallFDeviceProblem | Yes               |
| Section signal degrade (BER [bit error rate])       | Major    | DegradedSignal          | Yes               |
| Section signal failure (BER)                        | Major    | ExcessiveBER            | Yes               |

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

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

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

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

**Table 65** *SFP Transceiver Alarms*

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



Table 66 XFP Transceiver Alarms

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



### 3.12.9 DS-3 Channel or Port and E3 Port Alarms

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

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

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



### 3.12.10 DS-1 Channel and Path Alarms

Table 68 DS-1 Channel and Path Alarms

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

### 3.12.11 E1 Channel or Port Alarms

Table 69 E1 Channel or Port Alarms

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

### 3.12.12 Ethernet Port Alarms

Table 70 Ethernet Port Alarms

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

**Table 70 Ethernet Port Alarms**

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

### 3.12.13 Gigabit Ethernet Port Alarms

**Table 71 Gigabit Ethernet Port Alarms**

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

### 3.12.14 VT Path Alarms

**Table 72 VT Path Alarms**

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

### 3.12.15 TU-12 Path Alarms

**Table 73 TU-12 Path Alarms**

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



Table 73 TU-12 Path Alarms

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

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

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

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

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

Table 75 VC-3 Path Alarms—High-Order Path Layer

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

### 3.12.18 VC-4 Path Alarms

Table 76 VC-4 Path Alarms

| Description   | Severity | Probable Cause        | Service Affecting |
|---|----------|-----------------------|-------------------|
| AU-4 (administrative unit-4) path alarm indication signal (AIS) | Major    | AIS                   | Yes               |
| AU-4 loss of pointer (LOP)                                      | Major    | 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 77 STS and STM Path Alarms

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

## 3.13 Troubleshooting with Card Status LEDs

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

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

Table 78 Problems Indicated by Card Status LEDs

| Problem                | Solution   |
|------------------------|--|
| FAIL (red) is on.      | The card has failed. Replace the card.   |
| ACTIVE (green) is off. | Perform the following checks or actions:<br>Check the STDBY LED: <ul style="list-style-type: none"> <li>• If the STDBY LED is on, this is a normal condition.</li> <li>• If the STDBY LED is off, check the FAIL LED.</li> </ul> Check the FAIL LED: <ul style="list-style-type: none"> <li>• If the FAIL LED is on, replace the card.</li> <li>• If the FAIL LED is off, check the FAIL LED.</li> </ul> |
| LOS (yellow) is on.    | The port is experiencing a loss of signal. Check the cable connections and correct them if necessary.  |
| SYNC (green) is off.   | This condition is normal if no external timing cable is installed. Otherwise, all external timing signals have failed; the system is running with the onboard controller clock. Check the cable connections and correct them if necessary.   |



Table 78 Problems Indicated by Card Status LEDs

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

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

## 3.14 Troubleshoot with On-Demand Diagnostics

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

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

**Note:** You cannot run ODD tests on the active controller card.

- Low-density versions of line cards are also supported, but only the enabled ports are tested.

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



Table 79 ODD Tests

| Level | Components                               | Tests  |
|-------|--|--|
| 1     | All                                      | Duplicates the tests of the power-on diagnostics; runs in 5 to 10 seconds.   |
| 2     | Standby controller card, 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     | Line cards only                          | Includes level 2 tests; tests and verifies the card data paths for the entire card with internal loopbacks; runs in 10 to 15 minutes.  |
| 4     | Line cards only                          | Includes level 3 tests; tests the entire card using external loopbacks; must be run on site with external loopback cables installed; runs in 10 to 15 minutes. <sup>(1)(2)(3)</sup>  |

(1) To run external loopback tests on the Fast Ethernet-Gigabit Ethernet line card, install external loopback plugs on the FE and GE ports. Alternatively, the GE ports can be connected back to back.

(2) To run external loopback tests on the BiDirectional SFPs, require both left and right hand BiDi SFPs. Also BiDi SFPs require explicit cabling between left and right hand ports. The 5-port GE line card is an exception for this ODD test, as it has an extra port. One way to test this extra port is by having two 5-port GE cards in the system.

(3) To run external loopback tests on the Copper SFPs, install external loopback cables between the neighboring ports.

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

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

If you are connected to the system using the Ethernet management port, you must enter the `terminal monitor` command (in exec mode) before you start the test session so that the system displays the completion message. For more information about the `terminal monitor` command, see *Command List Reference* [5].

### 3.14.1 Initiate ODD Session

Table 80 Parameters for an ODD Session

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

Table 81 Card Types and Slots for the card Command

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



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

| Type of Line Card/Description   | card-type Keyword    | slot Argument Range |
|---|----------------------|---------------------|
| POS OC-3c/STM-1c (8-port)   | oc3e-8-port          | 1 to 6 and 9 to 14  |
| POS OC-12c/STM-4c (4-port)  | oc12e-4-port         | 1 to 6 and 9 to 14  |
| POS OC-48c/STM-16c (4-port)   | oc48e-4-port         | 1 to 6 and 9 to 14  |
| OC-192c/STM-64c (1-port)  | oc192-1-port         | 1 to 6 and 9 to 14  |
| Channelized OC-3/STM-1 (8/4-port) / OC-12/STM-4 (2/1-port) <sup>(1)</sup> | 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) <sup>(2)</sup>                            | 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) <sup>(3)(2)</sup>                          | ge4-20-port          | 1 to 6 and 9 to 14  |
| 10 Gigabit Ethernet (1-port)  | 10ge-1-port          | 1 to 6 and 9 to 14  |
| 10 Gigabit Ethernet DDR (4-port) <sup>(3)</sup>                           | 10ge-4-port          | 1 to 6 and 9 to 14  |
| 10 Gigabit Ethernet/OC-192c DDR (1-port)                                  | 10ge-oc192-1-port    | 1 to 6 and 9 to 14  |
| Advanced Services Engine  | ase                  | 1 to 4              |
| SmartEdge Storage Engine <sup>(3)</sup>                                   | sse                  | 1 to 6 and 9 to 14  |

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

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

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

To initiate an ODD session:

1. If you are testing a line card, change its state to ODD; otherwise, proceed to step 2.
2. To prepare a line card for an ODD session, perform the tasks listed in Table 82; Table 81 lists values for the *card-type* and *slot* arguments.

**Table 82 Prepare a Line Card for an ODD Session**

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

**Table 82** Prepare a Line Card for an ODD Session

| Task  | Command                           | Notes   |
|---|-----------------------------------|---|
| 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. |

- To test one or more components, enter one of the commands listed in Table 83; all commands are entered in exec mode. Table 80 lists the values for the `level-num` and `loop-num` arguments. The arguments `slot`, `slot1`, `slot2`, and `slotn` are chassis slot numbers for the line cards to be tested.

**Table 83** Test Components

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

**Table 84** ODD and LED Conditions for a Card

| State of Indicator After | Clear Log <sup>(1)</sup> | Clear History | Replace Card <sup>(2)</sup> | Reload System      | Reload Card or Change State—ODD to OSS | Successful ODD Session    |
|--------------------------|--------------------------|---------------|-----------------------------|--------------------|--|---------------------------|
| Alarm conditions         | On                       | On            | Cleared                     | Cleared            | On                                     | Cleared                   |
| Alarm status             | On                       | On            | Cleared                     | Cleared            | On                                     | Cleared                   |
| FAIL LED                 | On                       | On            | Cleared                     | Cleared            | On                                     | Cleared                   |
| LED status               | Unchanged                | Unchanged     | N/A <sup>(2)</sup>          | N/A <sup>(2)</sup> | N/A <sup>(2)</sup>                     | See Table 86              |
| ODD history              | Unchanged                | Cleared       | Unchanged                   | Unchanged          | Unchanged                              | History file is updated   |
| ODD log                  | Cleared                  | Unchanged     | Unchanged                   | Unchanged          | Unchanged                              | Log is updated            |
| ODD status               | Failed                   | Failed        | Not available               | Not available      | Failed                                 | No failures were detected |

(1) You can clear the ODD log or history using the **clear diag** command (in exec mode).

(2) Replacing a card or reloading the system causes the power-on diagnostics to run; the LED status reflects the results of the power-on diagnostic tests. You cannot reload a card if it is in the ODD state.

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

### 3.14.2 Return Line Card to the In-Service State

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

**Table 85** Return a Line Card to the In-Service State

| Task   | Command                | Notes                                  |
|--|------------------------|--|
| Access global configuration mode.                                    | <code>configure</code> | Enter this command in exec mode.       |
| Specify the card that was tested and access card configuration mode. | <code>card</code>      | Specify the card type and slot number. |



**Table 85** *Return a Line Card to the In-Service State*

| Task   | Command                              | Notes   |
|--|--------------------------------------|---|
| Remove the card from the ODD state and put it in the out-of-service state. | <code>no on-demand-diagnostic</code> |   |
| Return the card to the in-service state; restore any cross-connections.    | <code>no shutdown</code>             | 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.      | <code>end</code>                     |   |

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

### 3.14.3 Results from an ODD Session

**Table 86** *LED States During and After an ODD Session*

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

To display the results from one or more ODD sessions, perform one of the tasks listed in Table 87; all commands are entered in any mode.

**Table 87** *Display Results from ODD Sessions*

| Task   | Command                                    |
|--|--|
| Display results for all components from the last initiated session.  | <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 <code>n</code> sessions. The latest session is displayed first. Up to 100 sessions can be listed. | <code>show diag on-demandhistory n</code>  |

**Table 88** *Status Descriptions for an ODD Session*

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

**Table 88** *Status Descriptions for an ODD Session*

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

**Table 89** *Status Descriptions for a Test*

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

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

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

### 3.14.4 Clear Results from ODD Sessions

To clear the results from one or more ODD sessions, perform one of the tasks listed in Table 90; enter all commands in exec mode.

**Table 90** *Clear Results from ODD Sessions*

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

### 3.14.5 ODD Examples

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



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

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

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

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

## 3.15 Obtaining Assistance

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

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



## 4 Servicing Hardware

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

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

---



---

### Caution!

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

---



---

*Table 91 Tools Needed for Installation and Replacement Procedures*

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

### 4.1 Servicing Line Cards

---



---

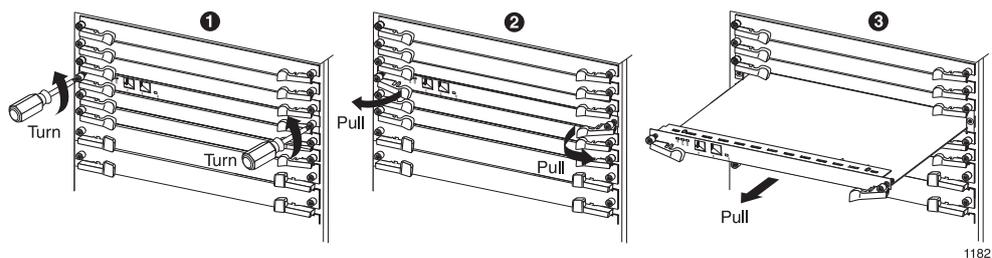
#### Stop!

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

---



---



*Figure 23 Removing a Card from the SmartEdge 600 Chassis*

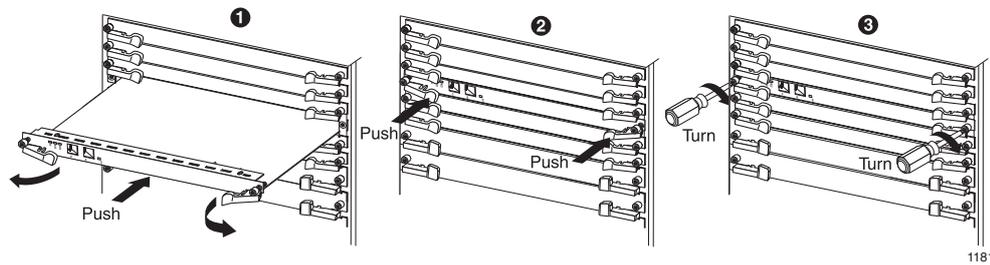


Figure 24 Replacing a Card in the SmartEdge 600 Chassis

---

---

## Stop!

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

---

---

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

- In a system with dual controller cards, ensure that the standby controller is fully synchronized with the active controller card. Use the `show redundancy` command (in any mode) to display the status of the standby controller.
- In a system with a single controller card, ensure that you have the CLI prompt on the console.
- If the system is not currently in an operational state, you need to power off the system. To power off the system, remove all fuses in the fuse panel.
- The SmartEdge 600 router has an EEPROM that supplies the medium access control (MAC) address for the chassis. If it should ever be necessary to replace the EEPROM, consult your local technical representative.
- If the controller cards are not the same type with same main memory configuration, the system might need to shut down one or more line cards to free up enough available power for the standby controller card. The operating system always reserves enough power during system configuration so that if the system has only a single controller card installed, a standby controller card of the same type can be installed at a later time.
- If the controller cards are mismatched, the system issues an alarm for mismatched controllers, allocates power for the second controller card, and recalculates available power. If the available power is not sufficient to power all the installed line cards, the operating system begins putting installed line cards into low-power mode, starting with the highest-numbered slot, until enough power is available to initialize the standby controller card.



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

## 4.2 Servicing Controller Cards

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

---

---

### Stop!

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

---

---

### 4.2.1 Adding a Second Controller Card

To add a second controller card:

1. Put on an antistatic wrist strap, and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located on the front of the fan tray.
2. Loosen the captive screws and remove the blank card that is installed in slot 7 or 8.
3. Install the card.
4. If the first controller card includes a CF card, install a CF card in the controller card you have just installed. To install the CF card, see [Install Compact Flash \(CF\) Cards](#).
5. Verify the operational status: the FAIL LED must not be lit.
6. Generally, duplicate the cable connections of the active controller card on the standby controller card and route the cables accordingly.

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



## 4.2.2 Replacing a Controller Card

If the system configuration includes a single controller card, you will disrupt traffic when you remove the card.

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

---

---

### Stop!

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

---

---

To replace a controller card:

1. For dual controller cards, ensure that the system is fully operational: the standby controller must be fully synchronized with the active controller card. Use the `show redundancy` command to display the status of the standby controller.
2. For dual controller cards, upgrade the active controller to run the latest release of the system software.
3. For a controller card with a CF card installed, dismount the device by entering the following command in exec mode:

```
unmount /md
```

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

---

---

### Stop!

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

---

---



4. Put on an antistatic wrist strap, and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located on the front of the fan tray.
5. Label and disconnect any cables from the front of the controller card being removed.
6. Remove the current card.
7. Install the card.
8. If a CF card was installed in the previous controller card, remove the device from its slot and install it in the new controller card; perform the procedure in Replacing a CF Card.
9. Verify the operational status: the FAIL LED must not be lit.
10. Reconnect the cables you previously disconnected.

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

### 4.2.3 Upgrading a Controller Card

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

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

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

1. Power down the SmartEdge router. You cannot upgrade the controller cards in a running system.
2. Replace each controller card currently installed in the chassis. In a dual-controller system, you must replace both controller cards.  
**Note:** Both replacement controller cards must be the same version with the same amount of memory. You cannot mix controller types or memory configurations in the same chassis.
3. Power on the SmartEdge router.
4. Verify the operational status of both controller cards: the FAIL LED must not be on.
5. Reconnect the cables you previously disconnected.
6. Determine if you need to upgrade the SmartEdge OS that is shipped on the card.



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

#### 4.2.4 Replacing a CF Card

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

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

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

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

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

---

---

### Stop!

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

---

---

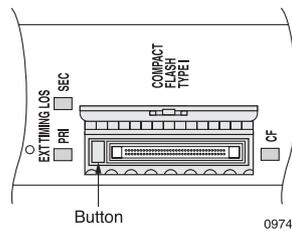
To replace a CF card:

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



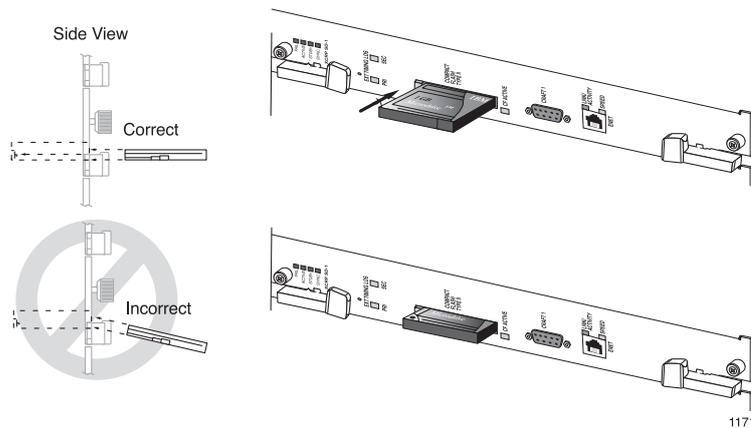
**Note:** If the system cannot successfully unmount the file system on the CF card, the CF Active LED stops blinking and is unlit. You must enter the `unmount` command (in exec mode) to unmount the file system on the card.

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



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

5. Installing a CF Card



6. Close the door.

After replacing the CF card, re-seat the XCRP4 Controller card so the Power-on Diagnostic (POD) can run on the XCRP card. For information on the POD, see Section 2.12.1 Power-On Diagnostics on page 47.

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

## 4.3 Replacing a Transceiver

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

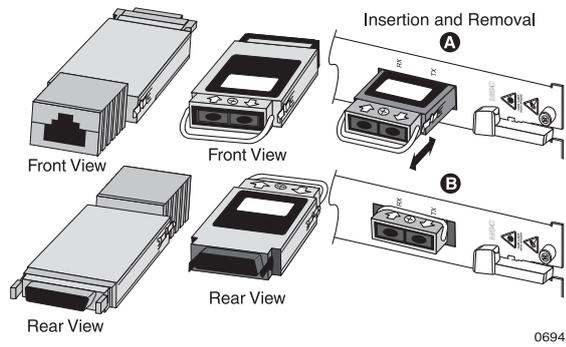


Figure 25 GBIC Transceiver

0694

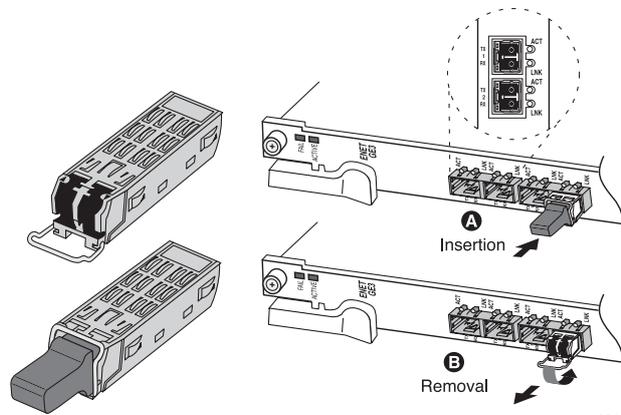


Figure 26 SFP Transceiver

0844

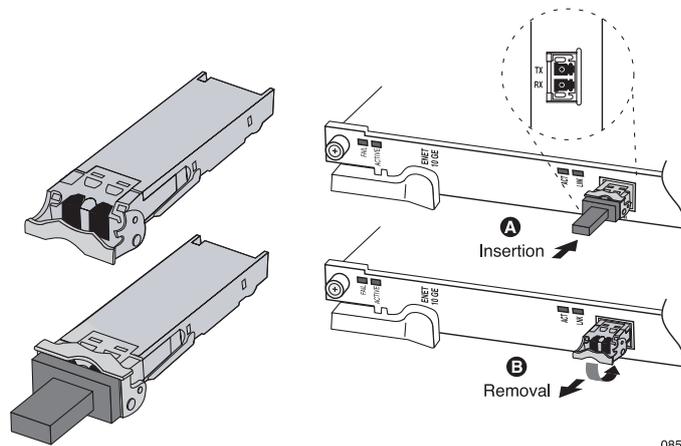


Figure 27 XFP Transceiver

0859



---

---

### Caution!

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

---

---

---

---

### Stop!

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

---

---

---

---

### Stop!

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

---

---

To remove a transceiver of any type:

1. Shut down all activity on the port with the transceiver you want to replace. See *Command List Reference* [5].
  2. Put on an antistatic wrist strap, and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface; an ESD convenience jack is located on the front of the fan tray.
- 
- 

### Caution!

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

---

---

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



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

To install a transceiver of any type:

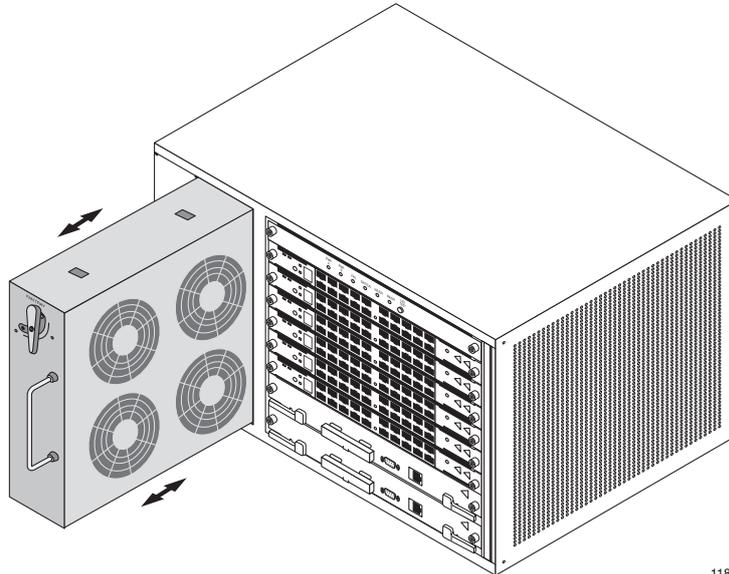
1. Put on an antistatic wrist strap, and attach it to an appropriate grounded surface; an ESD convenience jack. Do not attach the wrist strap to a painted surface.
2. Ensure that the latching mechanism is closed.
3. With the transceiver connectors aligned with the RX and TX labels on the front panel of the line card slide the transceiver into the opening for the port until the rear connector is seated and the locking mechanism snaps into place. The labels for the TX and RX connectors vary by vendor. An arrow, which can be incised on the case, usually indicates the traffic direction.
4. Remove the dust cover if you are installing an optical transceiver.

## 4.4 Cleaning Optical Connectors

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



## 4.5 Replacing the Fan Tray



1185

Figure 28 Replacing the Fan Tray

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

---

---

### Caution!

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

---

---

To replace the fan tray:

1. Put on an antistatic wrist strap, and attach it to an appropriate grounded surface. Do not attach the wrist strap to a painted surface.
2. Rotate the locking lever down to the unlocked position.
3. Remove the fan tray.
4. Install the new fan tray from the front or rear of the chassis.
5. Rotate the locking lever up to the locked position.
6. Check the LED on the front of the fan tray; the ENGAGED LED should be lit.
7. Check the LEDs on the alarm card; the FAN FAIL LED should not be lit.

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

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

## 4.6 Replacing the Air Filter

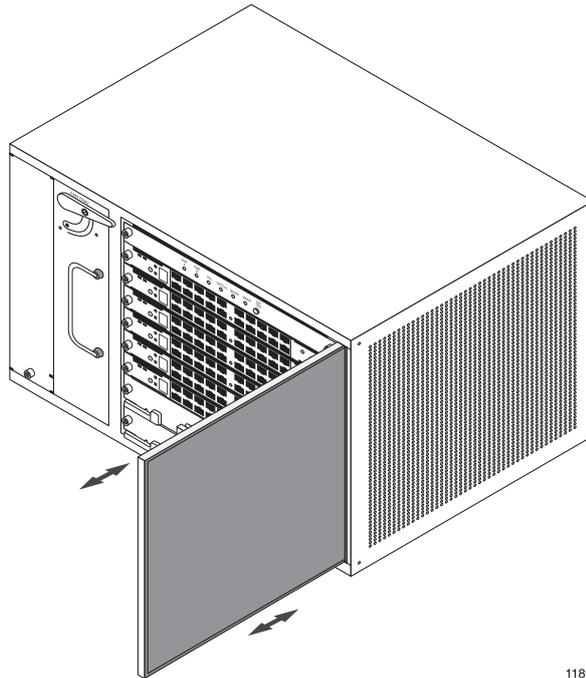


Figure 29 Air Filter

1186

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

---

---

### Caution!

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

---

---

To replace the air filter:



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

---



---

### Caution!

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

---



---

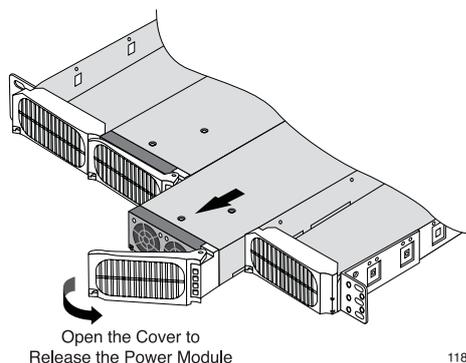
2. For single-sided access (front or rear), attach the correct hook or loop side of the new filter to the old one and then use the new filter to pull out the old one.
 

**Note:** If a cable management bracket is stalled on the right side of the chassis, you must remove the air filter from the rear.
3. Insert the replacement filter by pushing it into place.
4. Update the service date for the air filter; either enter the following command in exec mode or ask the system administrator to do so:

```
service air-filter
```

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

## 4.7 Remove and Replace an AC Power Module



**Figure 30** Removing an AC Power Module

To remove an AC power module:

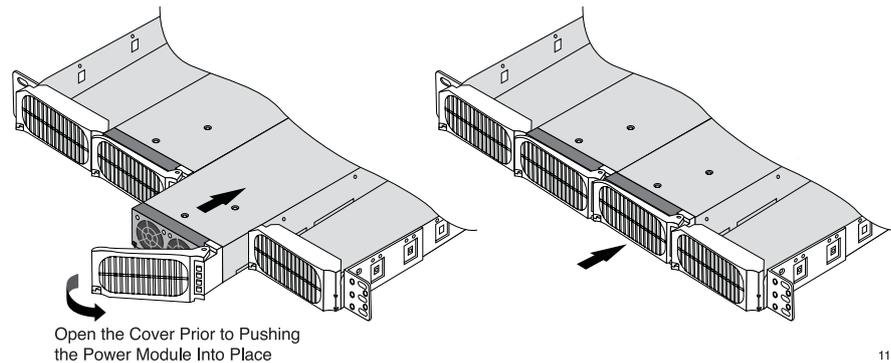
1. Open the front ejector (fan cover) of the power module by squeezing the latch spring and pulling open the ejector.



2. Slide the module from the shelf.

To replace the AC power module:

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



**Figure 31** *Inserting an AC Power Module*

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



## 5 System Description

The SmartEdge 600 router is a carrier-class product with an architecture that supports packetized traffic. It can be used as an edge aggregation router and simultaneously as a broadband remote access server (BRAS) to directly connect customers to the network. It supports a variety of interfaces and vital services, such as routing protocols, quality of service (QoS), and inbound and outbound access control lists (ACLs).

### 5.1 Specification Summary

Table 92 General Specifications

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

### 5.2 Controller Card

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

### 5.3 Line Card Interfaces

Table 93 SmartEdge 400 Line Cards

| Type of Card               | Number of Cards | Number of Ports <sup>(1)</sup> | Low-Density Version | Low-Density Ports <sup>(2)</sup> | Protection Ratios <sup>(3)</sup> |
|----------------------------|-----------------|--------------------------------|---------------------|----------------------------------|----------------------------------|
| 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                    |



Table 93 SmartEdge 400 Line Cards

| Type of Card   | Number of Cards | Number of Ports <sup>(1)</sup> | Low-Density Version | Low-Density Ports <sup>(2)</sup> | Protection Ratios <sup>(3)</sup> |
|--|-----------------|--------------------------------|---------------------|----------------------------------|----------------------------------|
| 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) | 12              | 8, 2<br>4, 1                   | No                  | —                                | None, 1+1 APS                    |
| Fast Ethernet–Gigabit Ethernet (60-port FE, 2-port GE)     | 12              | 60, 2                          | No                  | —                                | None                             |
| Gigabit Ethernet 1020 (10-port)                            | 12              | 10                             | No                  | —                                | None                             |
| Gigabit Ethernet 1020 (20-port) <sup>(4)</sup>             | 6               | 20                             | No                  | —                                | None                             |
| Gigabit Ethernet (5-port)                                  | 12              | 5                              | No                  | —                                | None                             |
| Gigabit Ethernet DDR (10-port)                             | 12              | 10                             | No                  | —                                | None                             |
| 10 Gigabit Ethernet (1-port)                               | 12              | 1                              | No                  | —                                | None                             |
| 10 Gigabit Ethernet/OC-192-c 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 are dependent on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.

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

## 5.4 Advanced Services Engine Card

Table 94 Advanced Services Engine Card

| Type of Card                      | Number of Cards | Number of Ports <sup>(1)</sup> | Low-Density Version | Low-Density Ports | Protection Ratios |
|-----------------------------------|-----------------|--------------------------------|---------------------|-------------------|-------------------|
| Advanced Services Engine (4-port) | 12              | 4 <sup>(2)</sup>               | No                  | —                 | None              |

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

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

## 5.5 SmartEdge Storage Engine Card

Table 95 SmartEdge Storage Engine Card

| Type of Card             | Number of Cards | Number of Hard Disk Drives |
|--------------------------|-----------------|----------------------------|
| SmartEdge Storage Engine | 12              | 21                         |



## 5.6 Packet Mesh Architecture

The SmartEdge 600 router implements a grid of cross connections in its backplane that allows any line card to communicate directly to any other line card in the chassis. Each line card uses a combination of a Packet Mesh ASIC (PMA) and Packet Processing ASICs (PPAs) to perform this function.

## 5.7 Redundancy

Redundancy features include:

- Dual power connections, each with separate A-side and B-side power connections
- Redundant controller cards and redundant file systems
- Redundant external timing sources, such as building integrated timing supply (BITS) or synchronization supply unit (SSU), with internal timing if both sources should fail.

## 5.8 Alarms

System alarms include:

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

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

## 5.9 System Status

The system status LEDs are located on the fan tray:

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



## 5.10 SmartEdge 600 Router

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

### 5.10.1 Chassis Card Cage

The SmartEdge 600 router has a card cage with 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

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

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

---

---

### Caution!

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

---

---

### 5.10.3 Chassis Power

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



## 6 Card Descriptions

### 6.1 Line Cards

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

*Table 96 Line Card Order Numbers*

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



Table 96 Line Card Order Numbers

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



Table 96 Line Card Order Numbers

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

(1) This line card accepts XFP transceivers, including SR, IR, and LR types.

(2) Use Software License FAL1241079/1 number.

(3) Use Software License FAL1240782/1 with this part number.

(4) The front panel has 5 MRJ21 connectors, each supporting 12 FE ports; a breakout cable, which uses RJ-45 connectors for the individual ports, is available from Ericsson (CBL-FE-RJ21-2M).

(5) This card is not supported on the SmartEdge 400 and 800 chassis.

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

(7) The 1-port 10GE-OC192 line card supports 10GE and OC-192c/STM-64c functionalities.

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

Table 97 SmartEdge Line Cards

| Line Card Type and Card Description                                       | Physical Ports | Low-Density Version | Low-Density Port Numbers |
|---|----------------|---------------------|--------------------------|
| ATM OC-3c/STM-1c (8-port)   | 8              | No                  | —                        |
| ATM OC-12c/STM-4c (2-port)  | 2              | No                  | —                        |
| POS OC-3c/STM-1c (8-port) <sup>(1)</sup>                                  | 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) <sup>(2)</sup> | 8, 2<br>4, 1   | No                  | —                        |
| Fast Ethernet—Gigabit Ethernet (60-port FE, 2-port GE)                    | 60, 2          | No                  | —                        |



Table 97 SmartEdge Line Cards

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

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

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

(3) Because the TX SFP is larger than a standard SFP, you cannot insert two TX SFPs side by side on the 20-port GE DDR and 20-port GE1020 line cards.

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

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

(6) The 1-port 10GE-OC192 line card supports 10GE and OC-192c/STM-64c functionalities.

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

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

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

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

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

## 6.2 Controller Cards

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



The XCRP4 Controller card supports applications that require high volumes of traffic; it also supports more subscribers than the other controller cards. The interface to BITS or SSU equipment does not support the transmission of timing data to the external equipment.

The controller card is responsible for:

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

*Table 98 XCRP4 Controller Card Features*

| Feature  | XCRP4   |
|--|---|
| Processors                                       | Four processors with shared memory that run independently and perform different functions   |
| Control processor functions                      | <ul style="list-style-type: none"> <li>• SONET/SDH software</li> <li>• SmartEdge OS software</li> <li>• NetOp EMS software</li> <li>• External timing (synchronization) software</li> </ul> |
| Main memory (total)                              | 8 GB DDR-II SDRAM   |
| NVRAM  | 512 KB DRAM with battery backup   |
| Internal timing                                  | SONET minimum clock ( $\pm 20.0$ ppm in freerun mode, normal mode only)   |
| Real-time clock                                  | Yes, synchronized with NTP server   |
| External timing implementation <sup>(1)</sup>    | Software selectable   |
| Internal storage for system images and files     | 2 GB  |
| External storage for core dumps and system files | 1 GB (NEBS certified)   |
| External ports                                   | 1 DB-9 (CRAFT)<br>1 10/100/1000 Ethernet <sup>(2)</sup>   |

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

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

## 6.2.1 Controller Card LEDs

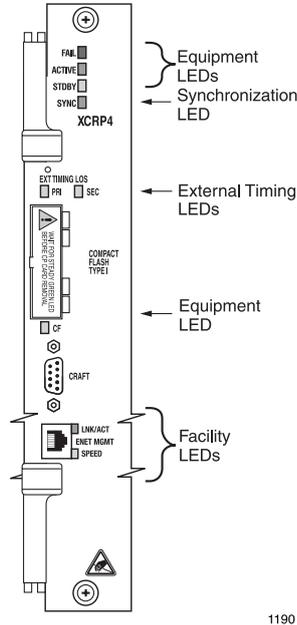


Figure 32 LEDs on Controller Cards

Each controller card has:

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

Table 99 Equipment LEDs on Controller Cards

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



**Table 99** *Equipment LEDs on Controller Cards*

| Label | Activity | Color | Description  |
|-------|----------|-------|--|
| CF    | On       | Green | <ul style="list-style-type: none"> <li>The slot is empty, and it is safe to insert a CF card.</li> <li>The file system on the installed CF card is not mounted, and it is safe to remove the CF card.</li> </ul> |
|       | Blinking | Green | A CF card is installed in the slot, and the SmartEdge OS is mounting or unmounting the file system.  |
|       | Off      | None  | A CF card is installed, the file system is mounted, and the SmartEdge OS might be transferring data to or from the CF card.  |
|       | Off      | None  | No read or write operation on the external storage device is in progress.  |

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

(2) The synchronization process is not affected by line card installation and removal; the active controller, and hence the system, continues to be responsive to traffic forwarding and continues to detect and notify the administrator of any faults that occur while the standby controller is being synchronized.

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

---



---

## Stop!

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

---



---

## Stop!

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

---



---

**Table 100 Facility LEDs on Controller Cards**

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

**Table 101 Synchronization and External Timing LEDs on Controller Cards**

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

## 6.2.2 Supporting Information

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

### 6.2.2.1 Processors

The XCRP4 Controller card has four processors: one processor runs the low-level software and the other three processors run the BRAS and routing software. Support for more than one processor to run the BRAS and routing software depends on the release of the SmartEdge OS.

### 6.2.2.2 Main Memory

Synchronous Dynamic Random Access Memory (SDRAM) is used by the SmartEdge OS shared databases that are accessed by the line cards. In a chassis with two controller cards, both cards must have the same memory configuration



### 6.2.2.3 NVRAM with Battery

The NVRAM battery on the XCRP4 Controller card is rechargeable; it is recharged from the power supplied to the SmartEdge router during normal operations. The battery typically lasts more than two years when fully charged and without benefit of being recharged by being powered on.

### 6.2.2.4 System Clock

The internal clock on an XCRP4 Controller card is a SONET minimum clock (SMC) at  $\pm 20.0$  ppm in free-run and normal modes only. The system clock performs timing functions for system hardware, regardless of the source of its timing data. Using the SmartEdge OS, you can specify external equipment (external timing mode), the received clock of a line card (line timing mode), or the internal clock on the controller card (internal mode) as the source for the system clock. The real-time clock (RTC) on the XCRP4 Controller cards is initialized before the system is shipped. It is not affected by power failures, system shutdown, or reload. The RTC uses the NVRAM battery. By default, the source of the transmit clock for the ports on a line card is its onboard clock. Depending on the type of line card, the transmit clock for a port on a line card can use instead the receive clock derived from an incoming signal to the port or system clock. Because a port does not interface to the source of the system clock directly, line card synchronization is independent of the type of external timing equipment and the version of the controller card installed in the chassis.

### 6.2.2.5 External Timing Connection

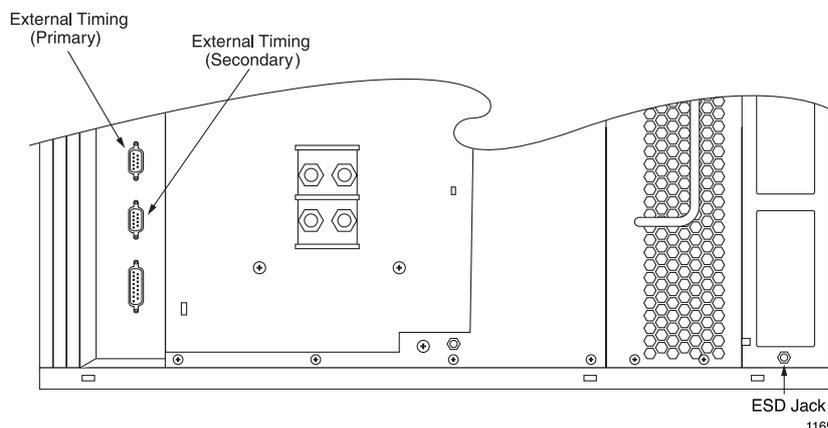


Figure 33 External Timing Cables Connections

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

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



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

Two connections are possible: one from a primary source and one from a secondary source. Either connection can provide timing for the entire chassis (input), regardless of the configuration of the controller cards. See Figure 33 for the location of the connectors for these cables.

An adapter, available as an option, provides wire wrap pins to allow you to attach a cable without a connector. Support for the other ports depends on the release of the operating system.

#### 6.2.2.6 Internal Storage for SmartEdge OS files

A controller card has one or two CF cards (Type I), which store SmartEdge OS images and files. SmartEdge OS storage is organized into three partitions: p0, p1, and /flash. The p0 and p1 partitions each store a system image and its files; the memory on a controller card can be loaded from either partition. The third partition, /flash, stores SmartEdge OS configuration files and other system- and user-created data files. The capacity of the CF cards can vary; the CF cards installed in the active and standby controller cards need not have the same capacity.

#### 6.2.2.7 Optional CF Card

---

---

### Caution!

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

---

---

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

#### 6.2.2.8 Ports for System Management Access

The XCRP4 Controller card has a single Craft port, labeled CRAFT. The CRAFT 2 port is the only enabled Each port has a DB-9 connector and provides an RS-232 connection to a local console terminal, a terminal server, or a modem. The Craft port provides access to the SmartEdge OS CLI for configuring and monitoring tasks; it is enabled on both the active and standby controller cards.



All controller cards have a single Ethernet port with an RJ-45 connector that runs at 100 Mbps and provides a connection to an Ethernet device such as a switch or hub. This port provides access to the SmartEdge OS CLI from either a local or remote management workstation for configuring and monitoring tasks. Using this port, the system can also communicate with a remote workstation that is running the NetOp EMS software. Support for 1-Gbps speed of the port on the XCRP4 Controller card depends on the release of the SmartEdge OS. The Ethernet management port on the standby controller card is disabled unless the card becomes the active controller card.

### 6.2.2.9 Monitoring Temperature and Voltage

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

### 6.2.2.10 Fully Redundant Configuration

When two controller cards are installed in the SmartEdge 600 chassis, one functions as the active controller and the other card functions as the standby controller, providing full redundancy for high-reliability networking requirements. If a controller card fails, the redundant card automatically becomes the active controller, thereby avoiding any unnecessary service disruption in the network. If you upgrade the active controller card with a new software release, the active controller upgrades the standby controller. Redundancy extends to the console connections on the controller cards: the console ports can each be connected to a terminal server, and the Ethernet management ports can be connected to the same Ethernet hub with individual cables. The software automatically switches to the external timing secondary source should the primary source fail. If both sources fail, the active controller card uses an internal timing source.

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

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

This PPA2-based, third-generation ATM OC-3c/STM-1c card has an increased minimum memory capacity of 1 GB. It also has increased circuit density of 24K with eight CoS queues, or 32K with two or four CoS queues. The 2-port card provides improved performance and supports more ATM VPs and PVCs than the 4-port card.

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



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

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

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

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

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

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

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

*Table 102 8-Port ATM OC-3c/STM-1c Card Specifications*

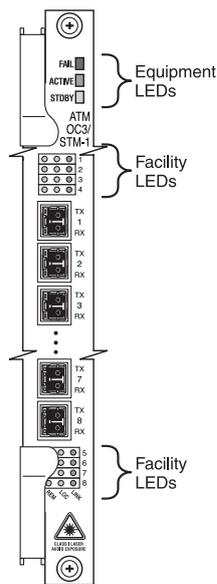
| Specification                        | SR-0  | IR-1 <sup>(1)</sup>   |
|--------------------------------------|---|---|
| Number of ports <sup>(2)</sup>       | 8   | 8   |
| Speed                                | 155.52 Mbps   | 155.52 Mbps   |
| Protection (facility) <sup>(3)</sup> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> |
| Interface                            | SR-0  | SONET OC-3 IR-1 / SDH STM I-1   |
| Link power budget <sup>(4)</sup>     | .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<br>ANSI-T1.105.06 SR-0   | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957   |
| <b>Transmitter</b>                   |   |   |
| Optical output power                 | –14.0 dBm (max)<br>–20.0 dBm (min)  | –8.0 dBm (max)<br>–15.0 dBm (min)   |
| Center wavelength range              | 1270 to 1360 nm   | 1270 to 1360 nm   |

**Table 102 8-Port ATM OC-3c/STM-1c Card Specifications**

| Specification        | SR-0               | IR-1 <sup>(1)</sup> |
|----------------------|--------------------|---------------------|
| Extinction ratio     | 10.0 dB (min)      | 8.2 dB (min)        |
| Spectral width       | 7.7 nm (max) (RMS) | 4.0 nm (max) (RMS)  |
| <b>Receiver</b>      |                    |                     |
| Wavelength range     | 1260 to 1360 nm    | 1270 to 1580 nm     |
| Sensitivity (min)    | -29.0 dBm          | -28.0 dBm           |
| Overload level (max) | -14.0 dBm          | -8.0 dBm            |

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

**6.3.1 Status LEDs**



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

**Table 103 Equipment LEDs on 8-Port ATM OC-3c/STM-1c Card**

| Label | Activity | Color | Description                                  |
|-------|----------|-------|--|
| FAIL  | On       | Red   | A failure exists on the card. <sup>(1)</sup> |
|       | Off      | None  | No failure exists on the card.               |

**Table 103** Equipment LEDs on 8-Port ATM OC-3c/STM-1c Card

| Label  | Activity | Color  | Description  |
|--------|----------|--------|--|
| ACTIVE | On       | Green  | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card is in service when no other port is configured.</li> <li>At least one non-APS port carries active traffic.</li> <li>At least one APS port carries active traffic.</li> </ul> |
|        | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card has failed (when the FAIL LED is On).</li> <li>All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).</li> </ul>   |
| STDBY  | On       | Yellow | At least one of the ports on this card configured as a protection port. <sup>(2)</sup>   |
|        | Off      | None   | None of the ports on this card configured as a protection port.  |

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

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

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

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

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

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

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

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



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

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

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

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

The following SFP transceivers are supported on the card ports:

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

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

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

| Specification         | SR-0  | IR-1 <sup>(1)</sup>   | 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"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> |
| 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 <sup>(2)</sup>   | 13.0 dB <sup>(2)</sup>  | 24.0 dB <sup>(3)</sup>  |
| 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<br>ANSI-T1.105.06 SR-0   | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957   | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957   |
| <b>Transmitter</b>    |   |   |   |
| Optical output power  | -14.0 dBm (max)<br>-20.0 dBm (min)  | -8.0 dBm (max)<br>-15.0 dBm (min)   | +2.0 dBm (max)<br>-3.0 dBm (min)  |



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

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

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

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

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

(4) Measured 20 dB down from center wavelength.

### 6.4.1 Status LEDs

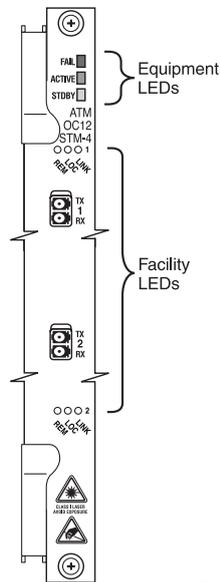


Figure 35 LEDs on 2-Port ATM OC-12c/STM-4c Line Card

Table 106 Equipment LEDs on 2-Port ATM OC-12c/STM-4c Line Card

| Label | Activity | Color | Description                                  |
|-------|----------|-------|--|
| FAIL  | On       | Red   | A failure exists on the card. <sup>(1)</sup> |
|       | Off      | None  | No failure exists on the card.               |



**Table 106 Equipment LEDs on 2-Port ATM OC-12c/STM-4c Line Card**

| Label  | Activity | Color  | Description  |
|--------|----------|--------|--|
| ACTIVE | On       | Green  | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card is in service when no other port is configured.</li> <li>At least one non-APS port carries active traffic.</li> <li>At least one APS port carries active traffic.</li> </ul> |
|        | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card has failed (when the FAIL LED is On).</li> <li>All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).</li> </ul>   |
| STDBY  | On       | Yellow | At least one of the ports on this card configured as a protection port. <sup>(2)</sup>   |
|        | Off      | None   | None of the ports on this card configured as a protection port.  |

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

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

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

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

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

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

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

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

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

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



- SONET OC-3/STM-1 IR-1—Intermediate Reach

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

**Table 108** 8-Port POS OC-3c/STM-1c Card Specifications

| Specification                        | SR-0  | IR-1 <sup>(1)</sup>   |
|--------------------------------------|---|---|
| Interface                            | SR-0  | SONET OC-3 IR-1 / SDH STM I-1   |
| Speed                                | 155.52 Mbps   | 155.52 Mbps   |
| Protection (facility) <sup>(2)</sup> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> |
| Link power budget <sup>(3)</sup>     | .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<br>ANSI-T1.105.06 SR-0   | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957   |
| <b>Transmitter</b>                   |   |   |
| Optical output power                 | –14.0 dBm (max)<br>–20.0 dBm (min)  | –8.0 dBm (max)<br>–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)  |
| <b>Receiver</b>                      |   |   |
| Wavelength range                     | 1260 to 1360 nm   | 1270 to 1580 nm   |
| Sensitivity (min)                    | –29.0 dBm   | –28.0 dBm   |
| Overload level (max)                 | –14.0 dBm   | –8.0 dBm  |

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

(2) Protection features for various types of cards and ports depend on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.

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

### 6.5.1 Status LEDs

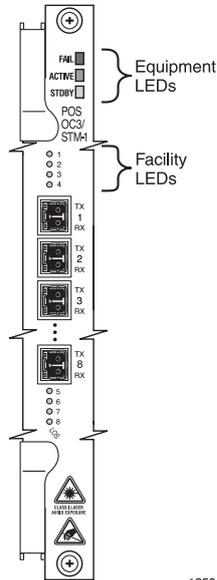


Figure 36 Status LEDs on 8-Port POS OC-3c/STM-1c Card

Table 109 Equipment LEDs on 8-Port POS OC-3c/STM-1c Card

| Label  | Activity | Color  | Description  |
|--------|----------|--------|--|
| FAIL   | On       | Red    | A failure exists on the card. <sup>(1)</sup>   |
|        | Off      | None   | No failure exists on the card.   |
| ACTIVE | On       | Green  | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card is in service when no other port is configured.</li> <li>At least one non-APS port carries active traffic.</li> <li>At least one APS port carries active traffic.</li> </ul> |
|        | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card has failed (when the FAIL LED is On).</li> <li>All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).</li> </ul>   |
| STDBY  | On       | Yellow | At least one of the ports on this card has been configured as a protection port. <sup>(2)</sup>  |
|        | 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 110 Facility LED on 8-Port POS OC-3c/STM-1c Card

| Label | Activity | Color  | Description  |
|-------|----------|--------|--|
| LOS   | On       | Yellow | This port has been configured and enabled, but is experiencing an LOS.   |
|       | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>Has been configured (provisioned) and enabled, and is receiving or transmitting traffic.</li> <li>Has been configured, but is currently disabled.</li> <li>Has not yet been configured.</li> </ul> |

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

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

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

The following SFP transceivers are supported on the card ports:

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

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

Table 111 4-Port POS OC-12c/STM-4c Card Specifications

| Specification                        | SR-0  | IR-1 <sup>(1)</sup>   | LR-1  |
|--------------------------------------|---|---|---|
| Number of ports                      | 4   | 4   | 4   |
| Speed                                | 622.08 Mbps   | 622.08 Mbps   | 622.08 Mbps   |
| Protection (facility) <sup>(2)</sup> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> |
| 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 <sup>(3)</sup>   | 13.0 dB <sup>(3)</sup>  | 24.0 dB <sup>(4)</sup>  |
| Nominal wavelength                   | 1310 nm   | 1310 nm   | 1310 nm   |
| Connector type                       | LC  | LC  | LC  |
| Cable type                           | MMF   | SMF   | SMF   |



**Table 111 4-Port POS OC-12c/STM-4c Card Specifications**

| Specification               | SR-0  | IR-1 <sup>(1)</sup>                                     | LR-1  |
|-----------------------------|---|---|---|
| Transceiver type            | SFP   | SFP   | SFP   |
| Compliance                  | SFF-8472 and INF-8074i<br>ANSI-T1.105.06 SR-0 | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957 | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957 |
| <b>Transmitter</b>          |   |   |   |
| Optical output power        | -14.0 dBm (max)<br>-20.0 dBm (min)            | -8.0 dBm (max)<br>-15.0 dBm (min)                       | +2.0 dBm (max)<br>-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) <sup>(5)</sup>                             |
| <b>Receiver</b>             |   |   |   |
| 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

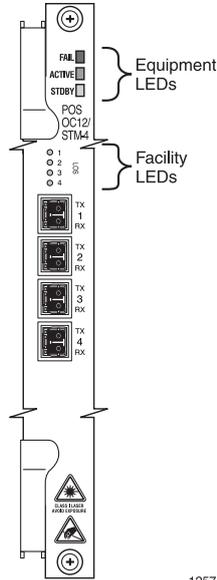


Figure 37 Status LEDs on 4-Port POS OC-12c/STM-4c Card

Table 112 Equipment LEDs on 4-Port POS OC-12c/STM-4c Card

| Label  | Activity | Color  | Description  |
|--------|----------|--------|--|
| FAIL   | On       | Red    | A failure exists on the card. <sup>(1)</sup>   |
|        | Off      | None   | No failure exists on the card.   |
| ACTIVE | On       | Green  | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card is in service when no other port is configured.</li> <li>At least one non-APS port carries active traffic.</li> <li>At least one APS port carries active traffic.</li> </ul> |
|        | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card has failed (when the FAIL LED is On).</li> <li>All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).</li> </ul>   |
| STDBY  | On       | Yellow | At least one of the ports on this card has been configured as a protection port. <sup>(2)</sup>  |
|        | 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 113 Facility LED on 4-Port POS OC-12c/STM-4c Card**

| Label | Activity | Color  | Description  |
|-------|----------|--------|--|
| LOS   | On       | Yellow | This port has been configured and enabled, but is experiencing an LOS.   |
|       | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>Has been configured (provisioned) and enabled, and is receiving or transmitting traffic.</li> <li>Has been configured, but is currently disabled.</li> <li>Has not yet been configured.</li> </ul> |

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

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

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

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

The following SFP transceivers are supported on the card ports:

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

**Table 114 4-Port POS OC-48c/STM-16c Card Specifications**

| Specification                           | SR-1  | IR-1  | LR-2  |
|---|---|---|---|
| Number of ports                         | 4   | 4   | 4   |
| Speed                                   | 2488.32 Mbps  | 2488.32 Mbps  | 2488.32 Mbps  |
| Protection (facility) <sup>(1)(2)</sup> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>• None</li> <li>• 1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> |
| 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 <sup>(3)</sup>   | 13 dB <sup>(3)</sup>  | 24.0 dB <sup>(4)</sup>  |
| Nominal wavelength                      | 1310 nm   | 1310 nm   | 1550 nm   |
| Connector type                          | LC  | LC  | LC  |
| Cable type                              | SMF   | SMF   | SMF   |
| Transceiver type                        | SFP   | SFP   | SFP   |



Table 114 4-Port POS OC-48c/STM-16c Card Specifications

| Specification               | SR-1  | IR-1  | LR-2  |
|-----------------------------|---|---|---|
| Compliance                  | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957 | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957 | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957 |
| <b>Transmitter</b>          |   |   |   |
| Optical output power        | −3.0 dBm (max)<br>−10.0 dBm (min)                       | 0.0 dBm (max)<br>−5.0 dBm (min)                         | 3.0 dBm (max)<br>−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) <sup>(5)</sup>                       | 1.0 nm (max) <sup>(6)</sup>                             | 1.0 nm (max) <sup>(6)</sup>                             |
| <b>Receiver</b>             |   |   |   |
| Wavelength range            | 1270 to 1580 nm   | 1270 to 1580 nm   | 1500 to 1580 nm   |
| Sensitivity                 | −18.0 dBm   | −18.0 dBm   | −28.0 dBm   |
| Overload level              | −3.0 dBm  | 0.0 dBm   | −9.0 dBm  |
| Optical reflectance         | −14.0 dB (max)  | −27.0 dB (max)  | −27.0 dB (max)  |

(1) Protection features for various types of cards and ports depend on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.

(2) POS APS is not supported on the 4-port POS OC-48c/STM-16c card.

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

(4) The link power budget is calculated using (minimum output power) – (minimum sensitivity) – (optical path power penalty); power penalty is 2.0 dB.

(5) Root mean square (RMS) value.

(6) Measured 20 dB down from center wavelength.

### 6.7.1 Status LEDs

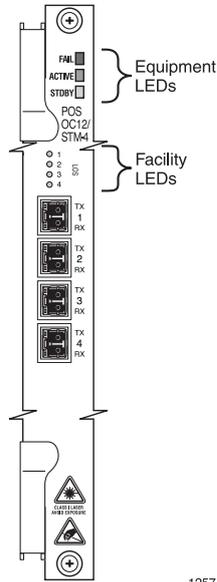


Figure 38 Status LEDs on 4-Port POS OC-48c/STM-16c Card

Table 115 Equipment LEDs on 4-Port POS OC-48c/STM-16c Card

| Label  | Activity | Color  | Description  |
|--------|----------|--------|--|
| FAIL   | On       | Red    | A failure exists on the card. <sup>(1)</sup>   |
|        | Off      | None   | No failure exists on the card.   |
| ACTIVE | On       | Green  | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card is in service when no other port is configured.</li> <li>At least one non-APS port carries active traffic.</li> <li>At least one APS port carries active traffic.</li> </ul> |
|        | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card has failed (when the FAIL LED is On).</li> <li>All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).</li> </ul>   |
| STDBY  | On       | Yellow | At least one of the ports on this card has been configured as a protection port. <sup>(2)</sup>  |
|        | 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 116 Facility LED on 4-Port POS OC-48c/STM-16c Card

| Label | Activity | Color  | Description  |
|-------|----------|--------|--|
| LOS   | On       | Yellow | This port has been configured and enabled, but is experiencing an LOS.   |
|       | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>Has been configured (provisioned) and enabled, and is receiving or transmitting traffic.</li> <li>Has been configured, but is currently disabled.</li> <li>Has not yet been configured.</li> </ul> |

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

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

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

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

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

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

---



---

### Caution!

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

---



---

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

Table 117 1-Port OC-192c/STM-64c Card Specifications

| Specification <sup>(1)</sup> | SR-1        | IR-2         | LR-2 <sup>(2)</sup> |
|------------------------------|-------------|--------------|---------------------|
| Number of port               | 1           | 1            | 1                   |
| Speed                        | 9.953 Gbps  | 9.953 Gbps   | 9.953 Gbps          |
| Interface                    | SR-1/I-64.1 | IR-2/S-64.2b | LR-2/P1L1-2D2       |



**Table 117 1-Port OC-192c/STM-64c Card Specifications**

| Specification <sup>(1)</sup>     | SR-1  | IR-2   | LR-2 <sup>(2)</sup>   |
|----------------------------------|---|--|---|
| Link power budget <sup>(3)</sup> | 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<br>GR-1377-CORE<br>ITU G.691 I-64.1 | Telcordia GR-253 IR-2<br>GR-1377-CORE<br>ITU G.691 S-64.2b | Telcordia GR-253 LR-2<br>GR-1377-CORE<br>ITU G.691 P1L1-2D2 |
| <b>Transmitter</b>               |   |  |   |
| Optical output power             | -6.0 dBm (min)<br>-1.0 dBm (max)                          | -1.5 dBm (min)<br>2.0 dBm (max)                            | 0.0 dBm (min)<br>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 <sup>(4)</sup>    | 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)   |
| <b>Receiver</b>                  |   |  |   |
| 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 <sup>(5)</sup>                                    | -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.

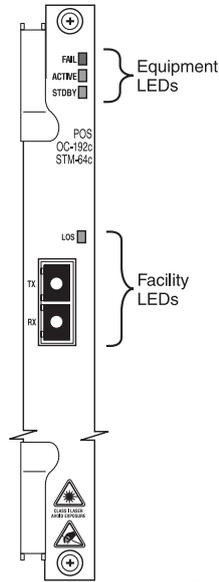
(2) Use part number RDH90168/2 (XFP-OC192-LR2) when ordering the XFP transceivers with 10GE ZR functionality.

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

Table 118 Equipment LEDs on 1-Port OC-192c/STM-64c Card

| Label  | Activity | Color  | Description   |
|--------|----------|--------|---|
| FAIL   | On       | Red    | A failure exists on the card. <sup>(1)</sup>  |
|        | 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. <sup>(2)</sup> |
|        | Off      | None   | None of the ports on this card has been configured as a protection port.                        |

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

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

Table 119 Facility LED on 1-Port OC-192c/STM-64c Card

| Label | Activity | Color  | Description  |
|-------|----------|--------|--|
| LOS   | On       | Yellow | This port has been configured and enabled, but is experiencing a LOS.  |
|       | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>Has been configured (provisioned) and enabled, and is receiving or transmitting traffic.</li> <li>Has been configured, but is currently disabled.</li> <li>Has not yet been configured.</li> </ul> |



## 6.9 Channelized OC-3/STM-1 or OC-12/STM-4 Card

There are two Channelized OC-3/STM-1 or OC-12/STM-4 cards available:

- ROA1283420/1 – 8 ports of OC-3/STM-1 with two ports configurable as OC-12/STM-4 (Software License – FAL1241079/1)
- ROA1283420/2 – 4 ports of OC-3/STM-1 with one port configurable as OC-12/STM-4 (Software License – FAL1240782/1)

The Channelized 8-port OC-3/STM-1 or 2-port OC-12/STM-4 line card (ROA1283420/1) is equipped with a license (FAL1241079/1) that must be loaded against a slot in the SmartEdge router to enable all ports. The license is granted through the ELIS licensing system by your local Ericsson market unit contact.

The Channelized 4-port OC-3/STM-1 or 1-port OC-12/STM-4 line card (ROA1283420/2) can be upgraded in the future to enable the remaining four OC-3/OC-3/STM-1 or OC-12/STM-4 ports by purchasing a separate license (FAL1240782/1).

All ports on a Channelized OC-3/STM-1 or OC-12/STM-4 line card must be configured for either SONET framing (OC-3/OC-12) or SDH framing (STM-1/STM-4). That is, all ports on a card must be SONET or SDH; a combination of SONET and SDH is not supported. The first port configured on the card limits the configuration of the remaining ports on that card to the same framing type.

Ports 1 and 5 on the Channelized cards are multirate ports, configurable as Channelized OC-3/STM-1 or OC-12/STM-4. The adjacent three Channelized OC-3/STM-1 ports in a port group cannot be used when ports 1 and 5 are operating as Channelized OC-12/STM-4 ports. For example: On the Channelized 8-port OC-3/STM-1 or 2-port OC-12/STM-4 line card, if port 1 is used as a Channelized OC-12/STM-4 port, ports 2 to 4 are not available and ports 5 to 8 can be used as Channelized OC-3/STM-1 ports.

The Channelized OC-3/STM-1 card supports eight or four SONET SMF ports; each operates at 155.52 Mbps. The Channelized OC-12/STM-4 card supports two or one SONET SMF ports; each operates at 622.08 Mbps. Both OC-3/12 and STM-1/4 ports can be channelized to DS0.

This card does not support concatenated STN-n/STM-n signals, such as STS-3c and OC-3c.

For more information on how to configure the channelized ports, see *Configuring Channelized Ports* Reference [3].

There are two 4-port groups on this channelized card:

- Group 1 contains ports 1 through 4, where port 1 has the OC-3/12 or STM-1/4 dual-rate capability.



- Group 2 contains ports 5 through 8, where port 5 has the OC-3/12 or STM-1/4 dual-rate capability.
- When ports 1 and 5 are in use as OC-12/SMT-4, the other six ports are not available.
- A total of 1000 unchannelized channels of Packet Over SONET (POS) are supported on each 4-port group.

Hardware features, most of which are software configurable, include:

- SONET and SDH mappings
- Channelized Point-to-Point Protocol (PPP)
- Cisco HDLC (C-HDLC)
- Single Hop Bidirectional Forwarding Detection (BFD)
- Multi-Link Point-to-Point Protocol (MLPPP)
- Priority Weighted-Fair Queuing (PWFQ) for PPP, C-HDLC, and MLPPP
- Automatic Protection Switching (APS) for PPP, C-HDLC, and MLPPP
- Circuit Emulation Services (CES)
- CES over Packet Switched Networks (CESoPSN)
- APS for CES
- DS3, T1, E1, VT1.5, C11, C12, DS0, nx64K, channelization for all POS services
- T1, E1, VT1.5, C11, C12, DS0, nx64K, channelization for CES services

This card is the same size as all other SmartEdge line cards and occupies a single slot in the chassis.

*Table 120 Port-Type Configuration*

| Port Type | Mode 1     | Mode 2      | Mode 3      | Mode 4      |
|-----------|------------|-------------|-------------|-------------|
| Port 1    | OC-3/STM-1 | OC-12/STM-4 | OC-12/STM-4 | OC-3/STM-1  |
| Port 2    | OC-3/STM-1 |             |             | OC-3/STM-1  |
| Port 3    | OC-3/STM-1 |             |             | OC-3/STM-1  |
| Port 4    | OC-3/STM-1 |             |             | OC-3/STM-1  |
| Port 5    | OC-3/STM-1 | OC-12/STM-4 | OC-3/STM-1  | OC-12/STM-4 |
| Port 6    | OC-3/STM-1 |             | OC-3/STM-1  |             |
| Port 7    | OC-3/STM-1 |             | OC-3/STM-1  |             |
| Port 8    | OC-3/STM-1 |             | OC-3/STM-1  |             |



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

**Table 121** 8/4-Port Channelized OC-3/STM-1 Card SFP Specifications — SR-0 and IR-1

| Specification                        | SR-0  | IR-1 <sup>(1)</sup>   |
|--------------------------------------|---|---|
| Number of ports                      | 8/4   | 8/4   |
| Speed                                | 155.52 Mbps   | 155.52 Mbps   |
| Protection (facility) <sup>(2)</sup> | <ul style="list-style-type: none"> <li>None</li> <li>1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>None</li> <li>1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> |
| Interface                            | SR-0  | SONET OC-3 IR-1 / SDH STM I-1   |
| Link power budget <sup>(3)</sup>     | 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<br>ANSI-T1.105.06 SR-0   | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957   |
| <b>Transmitter</b>                   |   |   |
| Optical output power                 | –14.0 dBm (max)<br>–20.0 dBm (min)  | –8.0 dBm (max)<br>–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)  |
| <b>Receiver</b>                      |   |   |
| Wavelength range                     | 1260 to 1360 nm   | 1270 to 1580 nm   |
| Sensitivity (min)                    | –29.0 dBm   | –28.0 dBm   |
| Overload level (max)                 | –14.0 dBm   | –8.0 dBm  |

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

(2) Protection features for various types of cards and ports depend on the release of the SmartEdge OS; the system supports a mix of protected and unprotected ports.

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

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



**Table 122 2/1-Port Channelized OC-12/STM-4 Card SFP Specifications — SR-0, IR-1, and LR-1**

| Specification                        | SR-0  | IR-1 <sup>(1)</sup>   | LR-1  |
|--------------------------------------|---|---|---|
| Number of ports                      | 2/1   | 2/1   | 2/1   |
| Speed                                | 622.08 Mbps   | 622.08 Mbps   | 622.08 Mbps   |
| Protection (facility) <sup>(2)</sup> | <ul style="list-style-type: none"> <li>None</li> <li>1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>None</li> <li>1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> | <ul style="list-style-type: none"> <li>None</li> <li>1+1 APS: Bidirectional; revertive or nonrevertive switching</li> </ul> |
| 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 <sup>(3)</sup>   | 13.0 dB <sup>(3)</sup>  | 24.0 dB <sup>(4)</sup>  |
| 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<br>ANSI-T1.105.06 SR-0   | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957   | SFF-8472 and INF-8074i<br>Telcordia GR-253<br>ITU G.957   |
| <b>Transmitter</b>                   |   |   |   |
| Optical output power                 | -14.0 dBm (max)<br>-20.0 dBm (min)  | -8.0 dBm (max)<br>-15.0 dBm (min)   | +2.0 dBm (max)<br>-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) <sup>(5)</sup>   |
| <b>Receiver</b>                      |   |   |   |
| 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

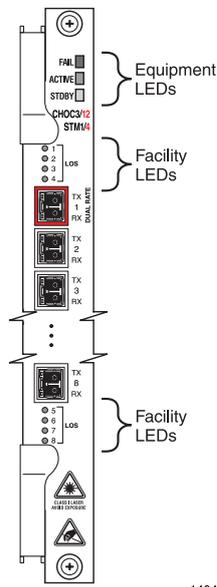


Figure 40 LEDs on 8/4-Port Channelized OC-3/STM-1 or 2/1-Port Channelized OC-12/STM-4 Card

Table 123 Equipment LEDs on 8/4-Port Channelized OC-3/STM-1 or 2/1-Port Channelized OC-12/STM-4 Card

| Label  | Activity | Color  | Description  |
|--------|----------|--------|--|
| FAIL   | On       | Red    | A failure exists on the card. <sup>(1)</sup>   |
|        | Off      | None   | No failure exists on the card.   |
| ACTIVE | On       | Green  | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card is in service when no other port is configured.</li> <li>At least one non-APS port carries active traffic.</li> <li>At least one APS port carries active traffic.</li> </ul> |
|        | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>This card has failed (when the FAIL LED is On).</li> <li>All ports are configured as APS working or protect ports and carry no active traffic (when the FAIL LED is Off).</li> </ul>   |
| STDBY  | On       | Yellow | At least one of the ports on this card has been configured as a protection port. <sup>(2)</sup>  |
|        | 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 124 Facility LEDs on 8/4-Port Channelized OC-3/STM-1 or 2/1-Port Channelized OC-12/STM-4 Card**

| Label | Activity | Color  | Description  |
|-------|----------|--------|--|
| LOS   | On       | Yellow | This port has been configured and enabled, but is experiencing an LOS.   |
|       | Off      | None   | This port is in one of the following states: <ul style="list-style-type: none"> <li>Has been configured and enabled, and is receiving or transmitting traffic.</li> <li>Has been configured, but is currently disabled.</li> <li>Has not yet been configured.</li> </ul> |

## 6.10 60-Port Fast Ethernet Card

The 60-port Fast Ethernet (FE) card, which provides 60 FE ports and two Gigabit Ethernet (GE) ports, is also referred to as the FE–GE card. The FE ports are copper-based 10Base-T or 100Base-TX with selectable speeds of 10 Mbps or 100 Mbps, and the GE ports are copper-based 1000Base-TX with selectable speeds of 100 or 1000 Mbps.

This card is the same size as all other SmartEdge line cards and occupies a single slot in the chassis.

**Table 125 60-Port Fast Ethernet Card Specifications**

| Specification             | Value   |
|---------------------------|---|
| Number of ports           | 60 - 10/100 Mbps<br>2 - 10/1000                                     |
| Speed                     | 10, 100, or 1000 Mbps (user selectable, 100 Mbps is auto-sensing)   |
| Protection                | None  |
| Protocol                  | 10 Mbps: 10Base-T<br>100 Mbps: 100Base-TX<br>1000 Mbps: 1000Base-TX |
| Line code                 | 10 Mbps: Manchester coding<br>100 Mbps: MLT-3<br>1000 Mbps: PAM-5   |
| Flow control negotiation  | Yes   |
| Interface                 | Electrical  |
| Impedance                 | 100 ohms  |
| Connector type            | MRJ21 <sup>(1)</sup> , RJ-45  |
| Cable type <sup>(2)</sup> | 2 pair, Category 5 shielded-twisted pair                            |
| Compliance                | IEEE 802.3, 802.3u  |

(1) In addition to RJ-45 connectors for the GE ports, the FE–GE card has 5 MRJ21 connectors, each of which supports 12 FE ports; the MRJ21 breakout cable has RJ-45 connectors for the individual ports.

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

### 6.10.1 Status LEDs

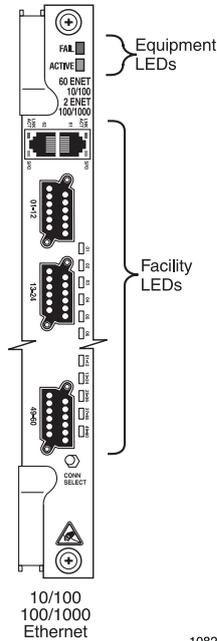


Figure 41 Status LEDs on 60-Port Fast Ethernet Card

Table 126 Equipment LEDs on 60-Port Fast Ethernet Card

| Label  | Activity | Color | Description                                  |
|--------|----------|-------|--|
| FAIL   | On       | Red   | A failure exists on the card. <sup>(1)</sup> |
|        | Off      | None  | No failure exists on the card.               |
| ACTIVE | On       | Green | This card is in service.                     |
|        | Off      | None  | This card has failed (the FAIL LED is on).   |

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

Table 127 Facility LEDs for 10/100 Ports on 60-Port Fast Ethernet Card

| Label   | Activity | Color  | Description   |
|---|----------|--------|---|
| 01 – 12   | On       | Yellow | This port is operating at 10 Mbps; the link is up.  |
|   | Blinking | Yellow | This port is operating at 10 Mbps; the link is up and active.                                       |
|   | On       | Green  | This port is operating at 100 Mbps; the link is up.   |
|   | Blinking | Green  | This port is operating at 100 Mbps; the link is up and active.                                      |
|   | Off      | None   | This port is not configured (no link), no activity exists, or the link is down.                     |
| 01 – 12<br>13 – 24<br>25 – 36<br>37 – 48<br>49 – 60 | On       | Green  | The connector for these ports is selected (using the push button at the bottom of the front panel). |
|   | Off      | None   | The connector for these ports is not selected.  |



Because of the number of 10/100 ports on the 60-port Fast Ethernet card, facility LEDs on those ports are organized differently. Each 10/100 port is identified by two LEDs:

- A connector LED identifies which connector has been selected using the push button (labeled CONN SELECT) at the bottom of the front panel.
- A port LED identifies the operating speed of the port and its status.

*Table 128 Facility LEDs for 100/1000 Ports on 60-Port Fast Ethernet Card*

| Label   | Activity | Color    | Description                                    |
|---------|----------|----------|--|
| LNK ACT | On       | Green    | The link is present and active.                |
|         | On       | Blinking | The link is transmitting and receiving frames. |
|         | Off      | None     | The link has no active frame.                  |
| SPD     | On       | Yellow   | The link is operating at 100 Mbps.             |
|         | On       | Green    | The link is operating at 1000 Mbps.            |
|         | Off      | None     | The link is operating at 10 Mbps.              |

## 6.11 10-Port Gigabit Ethernet 1020 Card

The 10-port Gigabit Ethernet 1020 (GE1020) card is designed for traffic management. This PPA2-based card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the ports.

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

The following SFP optical transceivers are supported on the card ports:

- 1000Base-SX—Short Reach
- 1000Base-LX—Long Reach
- 1000Base-ZX—Extended Reach
- 1000Base-TX—Copper
- 1000Base-BX-D-20—20 km Bidirectional
- 1000Base-BX-U-20—20 km Bidirectional
- 1000Base-CWDM—Coarse Wavelength Division Multiplexing
- 1000Base-DWDM—Dense Wavelength Division Multiplexing



## Caution!

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

**Table 129 10-Port Gigabit Ethernet 1020 Card Specifications — 1000Base SX, LX, ZX, and TX**

| Specification                    | SX                              | LX                                | ZX                              | TX <sup>(1)</sup>               |
|----------------------------------|---------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| 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 <sup>(2)</sup> | 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 |
| <b>Transmitter</b>               |                                 |                                   |                                 |                                 |
| Optical output power             | –9.5 dBm (min)<br>0.0 dBm (max) | –11.0 dBm (min)<br>–3.0 dBm (max) | –3.0 dBm (min)<br>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) <sup>(3)</sup>    | –                               |
| <b>Receiver</b>                  |                                 |                                   |                                 |                                 |
| Wavelength range <sup>(4)</sup>  | 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  $\geq 1570$  nm.

**Table 130 10-Port Gigabit Ethernet 1020 Card Specifications — 1000Base BX-D-20 and BX-U-20**

| Specification <sup>(1)</sup>     | 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 <sup>(2)</sup> | 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          |
| <b>Transmitter</b>               |                                 |                                 |
| Optical output power             | -7.0 dBm (min)<br>0.0 dBm (max) | -7.0 dBm (min)<br>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) <sup>(3)</sup>    | 3.50 nm (max) (RMS)             |
| <b>Receiver</b>                  |                                 |                                 |
| Center wavelength                | 1310 nm                         | 1490 nm                         |
| Sensitivity (min)                | -18.7 dBm                       | -18.7 dBm                       |
| Overload level (max)             | 0.0 dBm                         | 0.0 dBm                         |

(1) The Bidirectional SFP transceivers must be used in pairs, one BX-D-20 and one BX-U-20; otherwise, the links will not work.

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

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

**Table 131 10-Port Gigabit Ethernet 1020 Card Specifications — 1000Base CWDM and DWDM**

| Specification                    | CWDM                             | DWDM <sup>(1)</sup>  |
|----------------------------------|----------------------------------|--|
| Number of ports                  | 10                               | 10   |
| Speed                            | 1 Gbps                           | 1 Gbps   |
| Interface                        | 1000Base-CWDMnnnn <sup>(2)</sup> | 1000Base-DWDMITUnn <sup>(3)</sup>  |
| Link power budget <sup>(4)</sup> | 21.0 dB                          | 24.0 dB  |
| Nominal wavelength               | 1471 to 1611 nm                  | See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data. |
| Connector type                   | LC                               | LC   |
| Cable type                       | SMF                              | SMF  |
| Transceiver type                 | SFP                              | SFP  |
| Compliance                       | ITU G.694.2                      | ITU G.694.1  |



**Table 131 10-Port Gigabit Ethernet 1020 Card Specifications — 1000Base CWDM and DWDM**

| Specification                   | CWDM                            | DWDM <sup>(1)</sup>  |
|---------------------------------|---------------------------------|--|
| <b>Transmitter</b>              |                                 |  |
| Optical output power            | -2.0 dBm (min)<br>5.0 dBm (max) | 0.0 dBm (min)<br>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) <sup>(5)</sup>    | 0.30 nm (max)  |
| <b>Receiver</b>                 |                                 |  |
| Wavelength range <sup>(6)</sup> | 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  $\geq$  1570 nm.

**Table 132 ITU DWDM Frequencies and Wavelengths**

| ITU <sup>(1)(2)(3)</sup> | Frequency (THz) | Wavelength (nm) | ITU | Frequency (THz) | Wavelength (nm) |
|--------------------------|-----------------|-----------------|-----|-----------------|-----------------|
| 17                       | 191.7           | 1563.86         | 40  | 194.0           | 1545.32         |
| 18                       | 191.8           | 1563.05         | 41  | 194.1           | 1544.53         |
| 19                       | 191.9           | 1562.23         | 42  | 194.2           | 1543.73         |
| 20                       | 192.0           | 1561.42         | 43  | 194.3           | 1542.94         |
| 21                       | 192.1           | 1560.61         | 44  | 194.4           | 1542.14         |
| 22                       | 192.2           | 1559.79         | 45  | 194.5           | 1541.35         |
| 23                       | 192.3           | 1558.98         | 46  | 194.6           | 1540.56         |
| 24                       | 192.4           | 1558.17         | 47  | 194.7           | 1539.77         |
| 25                       | 192.5           | 1557.36         | 48  | 194.8           | 1538.98         |
| 26                       | 192.6           | 1556.55         | 49  | 194.9           | 1538.19         |
| 27                       | 192.7           | 1555.75         | 50  | 195.0           | 1537.40         |
| 28                       | 192.8           | 1554.94         | 51  | 195.1           | 1536.61         |
| 29                       | 192.9           | 1554.13         | 52  | 195.2           | 1535.82         |
| 30                       | 193.0           | 1553.33         | 53  | 195.3           | 1535.04         |



Table 132 ITU DWDM Frequencies and Wavelengths

| ITU <sup>(1)(2)(3)</sup> | Frequency (THz) | Wavelength (nm) | ITU | Frequency (THz) | Wavelength (nm) |
|--------------------------|-----------------|-----------------|-----|-----------------|-----------------|
| 31                       | 193.1           | 1552.52         | 54  | 195.4           | 1534.25         |
| 32                       | 193.2           | 1551.72         | 55  | 195.5           | 1533.47         |
| 33                       | 193.3           | 1550.92         | 56  | 195.6           | 1532.68         |
| 34                       | 193.4           | 1550.12         | 57  | 195.7           | 1531.90         |
| 35                       | 193.5           | 1549.32         | 58  | 195.8           | 1531.12         |
| 36                       | 193.6           | 1548.51         | 59  | 195.9           | 1530.33         |
| 37                       | 193.7           | 1547.72         | 60  | 196.0           | 1529.55         |
| 38                       | 193.8           | 1546.92         | 61  | 196.1           | 1528.77         |
| 39                       | 193.9           | 1546.12         |     |                 |                 |

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

(2) The range of GE-DWDM ITU channels is 17 to 60.

(3) The 10GE-DWDM and OTN-DWDM XFP transceivers support ITU channels 20, 33, 35, 36, 37, 53, and 55.

### 6.11.1 Status LEDs

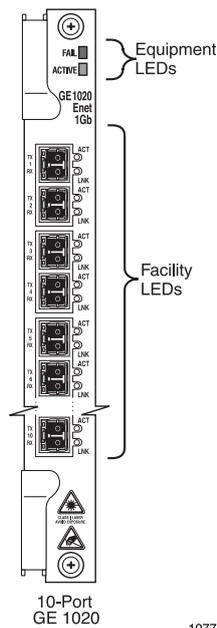


Figure 42 Status LEDs on 10-Port Gigabit Ethernet 1020 Card

Table 133 Equipment LEDs on 10-Port Gigabit Ethernet 1020 Card

| Label | Activity | Color | Description                                  |
|-------|----------|-------|--|
| FAIL  | On       | Red   | A failure exists on the card. <sup>(1)</sup> |
|       | Off      | None  | No failure exists on the card.               |



**Table 133 Equipment LEDs on 10-Port Gigabit Ethernet 1020 Card**

| Label  | Activity | Color | Description                                |
|--------|----------|-------|--|
| ACTIVE | On       | Green | This card is in service.                   |
|        | Off      | None  | This card has failed (the FAIL LED is on). |

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

**Table 134 Facility LEDs on 10-Port Gigabit Ethernet 1020 Card**

| Label | Activity | Color  | Description                                   |
|-------|----------|--------|---|
| ACT   | On       | Yellow | The link is transmitting or receiving frames. |
|       | Off      | None   | The link has no active frame.                 |
| LNK   | On       | Green  | The link is up.                               |
|       | Off      | None   | The link is down.                             |

## 6.12 20-Port Gigabit Ethernet 1020 Card

The 20-port Gigabit Ethernet 1020 (GE1020) card is designed for traffic management. This PPA2-based card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the ports.

This card is bigger than all other SmartEdge line cards and occupies two adjacent slots in the chassis.

The following SFP optical transceivers are supported on the card ports:

- 1000Base-SX—Short Reach
- 1000Base-LX—Long Reach
- 1000Base-ZX—Extended Reach
- 1000Base-TX—Copper
- 1000Base-BX-D-20—20 km Bidirectional
- 1000Base-BX-U-20—20 km Bidirectional
- 1000Base-CWDM—Coarse Wavelength Division Multiplexing
- 1000Base-DWDM—Dense Wavelength Division Multiplexing



## Caution!

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

**Table 135 20-Port Gigabit Ethernet 1020 Card Specifications — 1000Base SX, LX, ZX, and TX**

| Specification                    | SX                              | LX                                | ZX                              | TX <sup>(1)</sup>               |
|----------------------------------|---------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| 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 <sup>(2)</sup> | 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 |
| <b>Transmitter</b>               |                                 |                                   |                                 |                                 |
| Optical output power             | –9.5 dBm (min)<br>0.0 dBm (max) | –11.0 dBm (min)<br>–3.0 dBm (max) | –3.0 dBm (min)<br>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) <sup>(3)</sup>    | –                               |
| <b>Receiver</b>                  |                                 |                                   |                                 |                                 |
| Wavelength range <sup>(4)</sup>  | 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  $\geq 1570$  nm.



**Table 136 20-Port Gigabit Ethernet 1020 Card Specifications — 1000Base BX-D-20 and BX-U-20**

| Specification <sup>(1)</sup>     | 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 <sup>(2)</sup> | 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          |
| <b>Transmitter</b>               |                                 |                                 |
| Optical output power             | -7.0 dBm (min)<br>0.0 dBm (max) | -7.0 dBm (min)<br>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) <sup>(3)</sup>    | 3.50 nm (max) (RMS)             |
| <b>Receiver</b>                  |                                 |                                 |
| Center wavelength                | 1310 nm                         | 1490 nm                         |
| Sensitivity (min)                | -18.7 dBm                       | -18.7 dBm                       |
| Overload level (max)             | 0.0 dBm                         | 0.0 dBm                         |

(1) The Bidirectional SFP transceivers must be used in pairs, one BX-D-20 and one BX-U-20; otherwise, the links will not work.

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

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

**Table 137 20-Port Gigabit Ethernet 1020 Card Specifications — 1000Base CWDM and DWDM**

| Specification                    | CWDM                          | DWDM <sup>(1)</sup>   |
|----------------------------------|-------------------------------|---|
| Number of ports                  | 20                            | 20  |
| Speed                            | 1 Gbps                        | 1 Gbps  |
| Interface                        | 1000Base-CWDMn <sup>(2)</sup> | 1000Base-DWDMITUn <sup>(3)</sup>  |
| Link power budget <sup>(4)</sup> | 21.0 dB                       | 24.0 dB   |
| Nominal wavelength               | 1471 to 1611 nm               | See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data |
| Connector type                   | LC                            | LC  |
| Cable type                       | SMF                           | SMF   |
| Transceiver type                 | SFP                           | SFP   |
| Compliance                       | ITU G.694.2                   | ITU G.694.1   |



Table 137 20-Port Gigabit Ethernet 1020 Card Specifications — 1000Base CWDM and DWDM

| Specification                   | CWDM                            | DWDM <sup>(1)</sup>   |
|---------------------------------|---------------------------------|---|
| <b>Transmitter</b>              |                                 |   |
| Optical output power            | -2.0 dBm (min)<br>5.0 dBm (max) | 0.0 dBm (min)<br>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) <sup>(5)</sup>    | 0.30 nm (max)   |
| <b>Receiver</b>                 |                                 |   |
| Wavelength range <sup>(6)</sup> | 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  $\geq$  1570 nm.

### 6.12.1 Status LEDs

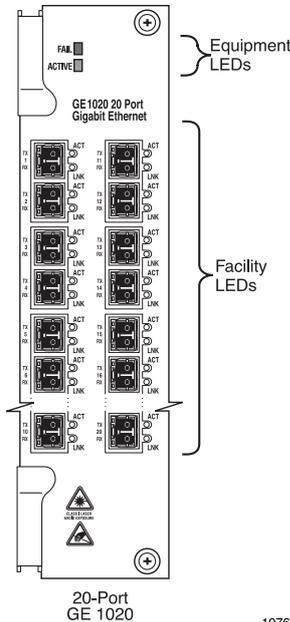


Figure 43 Status LEDs on 20-Port Gigabit Ethernet 1020 Card

Table 138 Equipment LEDs on 20-Port Gigabit Ethernet 1020 Card

| Label  | Activity | Color | Description                                  |
|--------|----------|-------|--|
| FAIL   | On       | Red   | A failure exists on the card. <sup>(1)</sup> |
|        | Off      | None  | No failure exists on the card.               |
| ACTIVE | On       | Green | This card is in service.                     |
|        | Off      | None  | This card has failed (the FAIL LED is on).   |

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

Table 139 Facility LEDs on 20-Port Gigabit Ethernet 1020 Card

| Label | Activity | Color  | Description                                   |
|-------|----------|--------|---|
| ACT   | On       | Yellow | The link is transmitting or receiving frames. |
|       | Off      | None   | The link has no active frame.                 |
| LNK   | On       | Green  | The link is up.                               |
|       | Off      | None   | The link is down.                             |

## 6.13 5-Port Gigabit Ethernet Card

The 5-port Gigabit Ethernet card is designed for traffic management. This PPA2-based, third-generation GE card has an increased minimum memory capacity of 1 GB. It can also process data internally at a much higher rate than the PPAs on the first and second generations of the GE card.



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

The following SFP optical transceivers are supported on the card ports:

- 1000Base-SX—Short Reach
- 1000Base-LX—Long Reach
- 1000Base-ZX—Extended Reach
- 1000Base-TX—Copper
- 1000Base-BX-D-20—20 km Bidirectional
- 1000Base-BX-U-20—20 km Bidirectional
- 1000Base-CWDM—Coarse Wavelength Division Multiplexing
- 1000Base-DWDM—Dense Wavelength Division Multiplexing

---



---

### Caution!

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

---



---

*Table 140 5-Port Gigabit Ethernet Card Specifications — 1000Base SX, LX, ZX, and TX*

| Specification                    | SX                              | LX                                | ZX                              | TX <sup>(1)</sup>               |
|----------------------------------|---------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| 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 <sup>(2)</sup> | 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 |
| <b>Transmitter</b>               |                                 |                                   |                                 |                                 |
| Optical output power             | –9.5 dBm (min)<br>0.0 dBm (max) | –11.0 dBm (min)<br>–3.0 dBm (max) | –3.0 dBm (min)<br>5.0 dBm (max) | —                               |
| Center wavelength range          | 830 to 860 nm                   | 1270 to 1355 nm                   | 1540 to 1560 nm                 | —                               |



**Table 140 5-Port Gigabit Ethernet Card Specifications — 1000Base SX, LX, ZX, and TX**

| Specification                   | SX                  | LX                  | ZX                           | TX <sup>(1)</sup> |
|---------------------------------|---------------------|---------------------|------------------------------|-------------------|
| 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) <sup>(3)</sup> | –                 |
| <b>Receiver</b>                 |                     |                     |                              |                   |
| Wavelength range <sup>(4)</sup> | 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  $\geq 1570$  nm.

**Table 141 5-Port Gigabit Ethernet Card Specifications — 1000Base BX-D-20 and -BX-U-20**

| Specification <sup>(1)</sup>     | 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 <sup>(2)</sup> | 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          |
| <b>Transmitter</b>               |                                 |                                 |
| Optical output power             | –7.0 dBm (min)<br>0.0 dBm (max) | –7.0 dBm (min)<br>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) <sup>(3)</sup>    | 3.50 nm (max) (RMS)             |
| <b>Receiver</b>                  |                                 |                                 |
| Center wavelength                | 1310 nm                         | 1490 nm                         |

**Table 141 5-Port Gigabit Ethernet Card Specifications — 1000Base BX-D-20 and -BX-U-20**

| Specification <sup>(1)</sup> | BX-D-20   | BX-U-20   |
|------------------------------|-----------|-----------|
| Sensitivity (min)            | -18.7 dBm | -18.7 dBm |
| Overload level (max)         | 0.0 dBm   | 0.0 dBm   |

(1) The Bidirectional SFP transceivers must be used in pairs, one BX-D-20 and one BX-U-20; otherwise, the links will not work.

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

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

**Table 142 5-Port Gigabit Ethernet Card Specifications — 1000Base CWDM and DWDM**

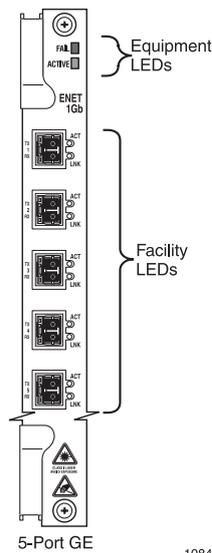
| Specification                    | CWDM                             | DWDM <sup>(1)</sup>   |
|----------------------------------|----------------------------------|---|
| Number of ports                  | 5                                | 5   |
| Speed                            | 1 Gbps                           | 1 Gbps  |
| Interface                        | 1000Base-CWDMnnnn <sup>(2)</sup> | 1000Base-DWDMITUnn <sup>(3)</sup>   |
| Link power budget <sup>(4)</sup> | 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   |
| <b>Transmitter</b>               |                                  |   |
| Optical output power             | -2.0 dBm (min)<br>5.0 dBm (max)  | 0.0 dBm (min)<br>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) <sup>(5)</sup>     | 0.30 nm (max)   |
| <b>Receiver</b>                  |                                  |   |
| Wavelength range <sup>(6)</sup>  | 1260 to 1620 nm                  | 1260 to 1620 nm   |

**Table 142 5-Port Gigabit Ethernet Card Specifications — 1000Base CWDM and DWDM**

| Specification        | CWDM      | DWDM <sup>(1)</sup> |
|----------------------|-----------|---------------------|
| Sensitivity (min)    | -23.0 dBm | -24.0 dBm           |
| Overload level (max) | -7.0 dBm  | -9.0 dBm            |

- (1) The ranges of DWDM ITU channels are application specific.
- (2) The nominal wavelengths of CWDM SFP transceivers are 1471, 1491, 1511, 1531, 1551, 1571, 1591, and 1611; specified in ITU G.694.2.
- (3) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
- (4) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
- (5) Measured 20 dB down from the center wavelength peak.
- (6) Receiver sensitivity is degraded 1.0 dB for wavelengths ≥ 1570 nm.

### 6.13.1 Status LEDs



**Figure 44 LEDs on 5-Port Gigabit Ethernet Card**

**Table 143 Equipment LEDs on 5-Port Gigabit Ethernet Card**

| Label  | Activity | Color | Description                                  |
|--------|----------|-------|--|
| FAIL   | On       | Red   | A failure exists on the card. <sup>(1)</sup> |
|        | Off      | None  | No failure exists on the card.               |
| ACTIVE | On       | Green | This card is in service.                     |
|        | Off      | None  | This card has failed (the FAIL LED is on).   |

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

**Table 144** Facility LEDs on 5-Port Gigabit Ethernet Card

| Label | Activity | Color  | Description                                   |
|-------|----------|--------|---|
| ACT   | On       | Yellow | The link is transmitting or receiving frames. |
|       | Off      | None   | The link has no active frame.                 |
| LNK   | On       | Green  | The link is up.                               |
|       | Off      | None   | The link is down.                             |

## 6.14 10-Port Gigabit Ethernet DDR Card

The 10-port Gigabit Ethernet DDR-based card is designed for traffic management using second-generation PPAs. This card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the ports. It also has increased circuit density of 32K with a minimum of 24K with eight CoS queues.

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

The following SFP optical transceivers are supported on the card ports:

- 1000Base-SX—Short Reach
- 1000Base-LX—Long Reach
- 1000Base-ZX—Extended Reach
- 1000Base-TX—Copper
- 1000Base-BX-D-20—20 km Bidirectional
- 1000Base-BX-U-20—20 km Bidirectional
- 1000Base-CWDM—Coarse Wavelength Division Multiplexing
- 1000Base-DWDM—Dense Wavelength Division Multiplexing

---

---

### Caution!

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

---

---



**Table 145 10-Port GE DDR Card Specifications (1000Base SX, LX, ZX, and TX)**

| Specification                    | SX                              | LX                                | ZX                              | TX <sup>(1)</sup>               |
|----------------------------------|---------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| 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 <sup>(2)</sup> | 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 |
| <b>Transmitter</b>               |                                 |                                   |                                 |                                 |
| Optical output power             | –9.5 dBm (min)<br>0.0 dBm (max) | –11.0 dBm (min)<br>–3.0 dBm (max) | –3.0 dBm (min)<br>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) <sup>(3)</sup>    | –                               |
| <b>Receiver</b>                  |                                 |                                   |                                 |                                 |
| Wavelength range <sup>(4)</sup>  | 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  $\geq 1570$  nm.

**Table 146 10-Port GE DDR Card Specifications (1000Base BX-D-20 and BX-U-20)**

| Specification <sup>(1)</sup>     | 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 <sup>(2)</sup> | 13.0 dB          | 13.0 dB          |
| Nominal wavelength               | 1490 nm          | 1310 nm          |
| Connector type                   | LC               | LC               |
| Cable type                       | SMF              | SMF              |
| Transceiver type                 | SFP              | SFP              |



**Table 146 10-Port GE DDR Card Specifications (1000Base BX-D-20 and BX-U-20)**

| Specification <sup>(1)</sup> | BX-D-20                         | BX-U-20                         |
|------------------------------|---------------------------------|---------------------------------|
| Compliance                   | IEEE 802.3 and 802.3ah          | IEEE 802.3 and 802.3ah          |
| <b>Transmitter</b>           |                                 |                                 |
| Optical output power         | -7.0 dBm (min)<br>0.0 dBm (max) | -7.0 dBm (min)<br>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) <sup>(3)</sup>    | 3.50 nm (max) (RMS)             |
| <b>Receiver</b>              |                                 |                                 |
| Center wavelength            | 1310 nm                         | 1490 nm                         |
| Sensitivity (min)            | -18.7 dBm                       | -18.7 dBm                       |
| Overload level (max)         | 0.0 dBm                         | 0.0 dBm                         |

(1) The Bidirectional SFP transceivers must be used in pairs, one BX-D-20 and one BX-U-20; otherwise, the links will not work.

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

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

**Table 147 10-Port GE DDR Card Specifications (1000Base CWDM and DWDM)**

| Specification                    | CWDM                             | DWDM <sup>(1)</sup>   |
|----------------------------------|----------------------------------|---|
| Number of ports                  | 10                               | 10  |
| Speed                            | 1 Gbps                           | 1 Gbps  |
| Interface                        | 1000Base-CWDMnnnn <sup>(2)</sup> | 1000Base-DWDMITUnn <sup>(3)</sup>   |
| Link power budget <sup>(4)</sup> | 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   |
| <b>Transmitter</b>               |                                  |   |
| Optical output power             | -2.0 dBm (min)<br>5.0 dBm (max)  | 0.0 dBm (min)<br>4.0 dBm (max)  |
| Center wavelength range          | 1471 to 1611 nm                  | See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data |
| Extinction ratio                 | 9.0 dB (min)                     | 8.2 dB (min)  |
| Center wavelength                | 1471 to 1611 nm                  | See ITU DWDM Transmit Frequencies and Wavelengths for ITU frequency and wavelength data |



**Table 147 10-Port GE DDR Card Specifications (1000Base CWDM and DWDM)**

| Specification                   | CWDM                         | DWDM <sup>(1)</sup> |
|---------------------------------|------------------------------|---------------------|
| Spectral width                  | 1.00 nm (max) <sup>(5)</sup> | 0.30 nm (max)       |
| <b>Receiver</b>                 |                              |                     |
| Wavelength range <sup>(6)</sup> | 1260 to 1620 nm              | 1260 to 1620 nm     |
| Sensitivity (min)               | -23.0 dBm                    | -24.0 dBm           |
| Overload level (max)            | -7.0 dBm                     | -9.0 dBm            |

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

(2) The nominal wavelengths of CWDM SFP transceivers are 1471, 1491, 1511, 1531, 1551, 1571, 1591, and 1611; specified in ITU G.694.2.

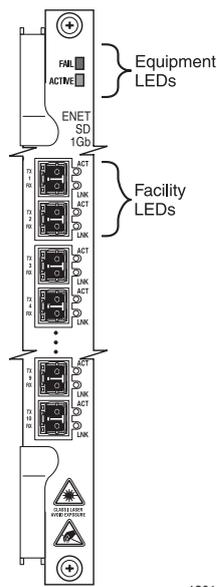
(3) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

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

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

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

### 6.14.1 Status LEDs



**Figure 45 LEDs on 10-Port Gigabit Ethernet DDR Card**

**Table 148 Equipment LEDs on 10-Port GE DDR Card**

| Label | Activity | Color | Description                                  |
|-------|----------|-------|--|
| FAIL  | On       | Red   | A failure exists on the card. <sup>(1)</sup> |
|       | Off      | None  | No failure exists on the card.               |

**Table 148** Equipment LEDs on 10-Port GE DDR Card

| Label  | Activity | Color | Description                                |
|--------|----------|-------|--|
| ACTIVE | On       | Green | This card is in service.                   |
|        | Off      | None  | This card has failed (the FAIL LED is On). |

(1) When the card is first plugged in to the chassis, both the FAIL and ACTIVE LEDs stay on until the card is initialized by the Smartedge OS. FAIL - On does not necessarily indicate a card failure.

**Table 149** Facility LEDs on 10-Port GE DDR Card

| Label | Activity | Color  | Description                                   |
|-------|----------|--------|---|
| ACT   | On       | Yellow | The link is transmitting or receiving frames. |
|       | Off      | None   | The link has no active frame.                 |
| LNK   | On       | Green  | The link is up.                               |
|       | Off      | None   | The link is down.                             |

## 6.15 20-Port Gigabit Ethernet DDR Card

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

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



## Caution!

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

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

| Specification <sup>(1)</sup>     | FX                                 |
|----------------------------------|------------------------------------|
| Number of ports                  | 20                                 |
| Speed                            | 100 Mbps                           |
| Interface                        | 100Base-FX                         |
| Link power budget <sup>(2)</sup> | 13.5 dB                            |
| Nominal wavelength               | 1310 nm                            |
| Connector type                   | LC                                 |
| Cable type                       | MMF                                |
| Transceiver type                 | SFP                                |
| Compliance                       | SFF-8472 and INF-8074i             |
| <b>Transmitter</b>               |                                    |
| Optical output power             | -19.0 dBm (min)<br>-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)               |
| <b>Receiver</b>                  |                                    |
| Wavelength range <sup>(3)</sup>  | 1270 to 1380 nm                    |
| Sensitivity                      | -32.5 dBm (min)<br>-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  $\hat{S}$  1570 nm.

**Table 151 20-Port Gigabit Ethernet Card DDR Specifications — 1000Base SX, LX, ZX, and TX**

| Specification   | SX | LX | ZX | TX <sup>(1)</sup> |
|-----------------|----|----|----|-------------------|
| Number of ports | 20 | 20 | 20 | 20                |



**Table 151 20-Port Gigabit Ethernet Card DDR Specifications — 1000Base SX, LX, ZX, and TX**

| Specification                    | SX                              | LX                                | ZX                              | TX <sup>(1)</sup>               |
|----------------------------------|---------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| Speed                            | 1 Gbps                          | 1 Gbps                            | 1 Gbps                          | 1 Gbps                          |
| Interface                        | 1000Base-SX                     | 1000Base-LX                       | 1000Base-ZX                     | 1000Base-TX                     |
| Link power budget <sup>(2)</sup> | 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 |
| <b>Transmitter</b>               |                                 |                                   |                                 |                                 |
| Optical output power             | –9.5 dBm (min)<br>0.0 dBm (max) | –11.0 dBm (min)<br>–3.0 dBm (max) | –3.0 dBm (min)<br>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) <sup>(3)</sup>    | –                               |
| <b>Receiver</b>                  |                                 |                                   |                                 |                                 |
| Wavelength range <sup>(4)</sup>  | 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 152 20-Port Gigabit Ethernet DDR Card Specifications — 1000Base BX-D-20 and BX-U-20**

| Specification <sup>(1)</sup>     | 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 <sup>(2)</sup> | 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 152 20-Port Gigabit Ethernet DDR Card Specifications — 1000Base BX-D-20 and BX-U-20**

| Specification <sup>(1)</sup> | BX-D-20                         | BX-U-20                         |
|------------------------------|---------------------------------|---------------------------------|
| Compliance                   | IEEE 802.3 and 802.3ah          | IEEE 802.3 and 802.3ah          |
| <b>Transmitter</b>           |                                 |                                 |
| Optical output power         | -7.0 dBm (min)<br>0.0 dBm (max) | -7.0 dBm (min)<br>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) <sup>(3)</sup>    | 3.50 nm (max) (RMS)             |
| <b>Receiver</b>              |                                 |                                 |
| Center wavelength            | 1310 nm                         | 1490 nm                         |
| Sensitivity (min)            | -18.7 dBm                       | -18.7 dBm                       |
| Overload level (max)         | 0.0 dBm                         | 0.0 dBm                         |

(1) The Bidirectional SFP transceivers must be used in pairs, one BX-D-20 and one BX-U-20; otherwise, the links will not work.

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

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

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

| Specification                    | CWDM                            | DWDM <sup>(1)</sup>   |
|----------------------------------|---------------------------------|---|
| Number of ports                  | 20                              | 20  |
| Speed                            | 1 Gbps                          | 1 Gbps  |
| Interface                        | 1000Base-CWDMn <sup>(2)</sup>   | 1000Base-DWDMITUn <sup>(3)</sup>  |
| Link power budget <sup>(4)</sup> | 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   |
| <b>Transmitter</b>               |                                 |   |
| Optical output power             | -2.0 dBm (min)<br>5.0 dBm (max) | 0.0 dBm (min)<br>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)  |



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

| Specification                   | CWDM                         | DWDM <sup>(1)</sup>   |
|---------------------------------|------------------------------|---|
| 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) <sup>(5)</sup> | 0.30 nm (max)   |
| <b>Receiver</b>                 |                              |   |
| Wavelength range <sup>(6)</sup> | 1260 to 1620 nm              | 1260 to 1620 nm   |
| Sensitivity (min)               | -23.0 dBm                    | -24.0 dBm   |
| Overload level (max)            | -7.0 dBm                     | -9.0 dBm  |

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

(2) The nominal wavelengths of CWDM SFP transceivers are 1471, 1491, 1511, 1531, 1551, 1571, 1591, and 1611; specified in ITU G.694.2.

(3) The range of GE-DWDM ITU channels is 17 to 60; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

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

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

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

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

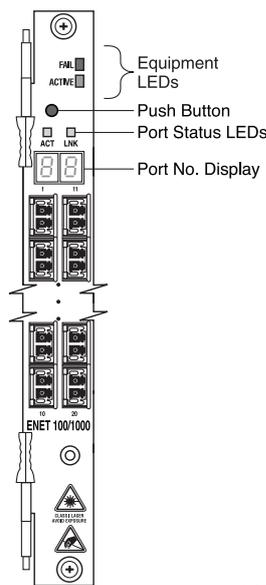
| Specification <sup>(1)</sup>            | CWDM                             | DWDM   |
|---|----------------------------------|--|
| Number of ports <sup>(2)</sup>          | 20                               | 20   |
| Speed                                   | 1 Gbps                           | 1 Gbps   |
| Protection                              | None                             | None   |
| Interface                               | 1000Base-CWDMnnnn <sup>(3)</sup> | 1000Base-DWDMITUnn <sup>(4)</sup>  |
| Line code                               | 8B/10B                           | 8B/10B   |
| Flow control negotiation <sup>(5)</sup> | Yes                              | Yes  |
| Connector type                          | LC                               | LC   |
| Cable type                              | SMF                              | SMF  |
| Transceiver type                        | SFP                              | SFP  |
| Compliance                              | ITU G.694.2                      | ITU G.694.1  |
| <b>Transmitter</b>                      |                                  |  |
| Optical output power                    | -2.0 dBm (min)<br>5.0 dBm (max)  | 0.0 dBm (min)<br>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) <sup>(6)</sup>     | 0.30 nm (max)  |

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

| Specification <sup>(1)</sup>    | CWDM            | DWDM            |
|---------------------------------|-----------------|-----------------|
| <b>Receiver</b>                 |                 |                 |
| Wavelength range <sup>(7)</sup> | 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  $\geq 1570$  nm.

### 6.15.1 Status LEDs



**Figure 46 LEDs on 20-Port Gigabit Ethernet DDR Card**

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

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



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

**Table 155 LINK LEDs on 20-Port Gigabit Ethernet DDR Card**

| Label  | Activity | Color | Description                                  |
|--------|----------|-------|--|
| FAIL   | On       | Red   | A failure exists on the card. <sup>(1)</sup> |
|        | Off      | None  | No failure exists on the card.               |
| ACTIVE | On       | Green | This card is in service.                     |
|        | Off      | None  | This card has failed (the FAIL LED is on).   |

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

**Table 156 Facility LEDs on 20-Port Gigabit Ethernet DDR Card**

| Label | Activity | Color  | Description                                   |
|-------|----------|--------|---|
| ACT   | On       | Yellow | The link is transmitting or receiving frames. |
|       | Off      | None   | The link has no active frame.                 |
| LNK   | On       | Green  | The link is up.                               |
|       | Off      | None   | The link is down.                             |

## 6.16 1-Port 10 Gigabit Ethernet Card

The 1-port 10 Gigabit Ethernet (1x10GE) card is designed for traffic management using the second-generation PPAs. This card has an increased minimum memory capacity of 1 GB and can process data internally to match the speed of the port, which runs at 10 Gbps.

The port on this line card can be configured as LAN-PHY at 10320 Mbits/s, or WAN-PHY at 9953.25 Mbits/s.

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

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

- 10GE-SR—Short Reach
- 10GE-LR—Long Reach
- 10GE-ER—Extended Reach
- 10GE-ZR—Extreme Reach
- 10GE-DWDM—Dense wavelength-division multiplexing



## Caution!

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

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

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

| Specification                    | SR                               | LR                              | ER                              | ZR <sup>(1)</sup>              |
|----------------------------------|----------------------------------|---------------------------------|---------------------------------|--------------------------------|
| 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 <sup>(2)</sup> | 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                    | -                              |
| <b>Transmitter</b>               |                                  |                                 |                                 |                                |
| Optical output power             | -7.3 dBm (min)<br>-1.0 dBm (max) | -8.2 dBm (min)<br>0.5 dBm (max) | -4.7 dBm (min)<br>4.0 dBm (max) | 0.0 dBm (min)<br>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                     | -                               | -                               | -                              |
| <b>Receiver</b>                  |                                  |                                 |                                 |                                |
| Wavelength range                 | 840 to 860 nm                    | 1270 to 1565 nm                 | 1270 to 1565 nm                 | 1270 to 1565 nm                |

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

| Specification        | SR                      | LR        | ER                      | ZR <sup>(1)</sup> |
|----------------------|-------------------------|-----------|-------------------------|-------------------|
| Sensitivity (min)    | -11.1 dBm               | -12.6 dBm | -14.1 dBm               | -22.1 dBm         |
| Overload level (max) | -1.0 dBm <sup>(3)</sup> | 0.5 dBm   | -1.0 dBm <sup>(4)</sup> | -7.0 dBm          |

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

(2) Informative value only. This estimate is a worst case with the OMA as specified and extinction ratio as specified for the transmitter.

(3) The SR receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 1.0 dB, unless otherwise noted.

(4) The ER receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 5.0 dB.

**Table 158 1-Port 10 Gigabit Ethernet Card Specifications — DWDM**

| Specification                    | DWDM <sup>(1)</sup>   |
|----------------------------------|---|
| Number of port                   | 1   |
| Speed                            | 10.3125 Gbps  |
| Interface                        | DWDMnn <sup>(2)</sup>   |
| Link power budget <sup>(3)</sup> | 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<br>GR-253 LR-2b                       |
| <b>Transmitter</b>               |   |
| Optical output power             | -1.0 dBm (min)<br>+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) <sup>(4)</sup>   |
| <b>Receiver</b>                  |   |
| Wavelength range                 | 1270 nm to 1600 nm  |
| Sensitivity (min)                | -24.0 dBm   |
| Overload level (max)             | -7.0 dBm  |

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

(2) The 10GE-DWDM XFP transceivers support ITU channels 20, 33, 35,36,37,53,and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

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

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

### 6.16.1 Status LEDs

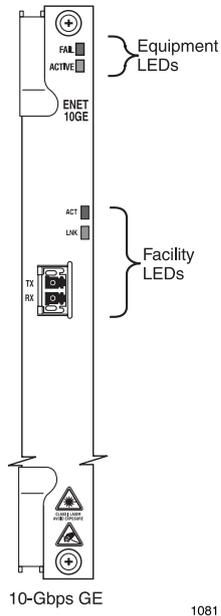


Figure 47 LEDs on 1-Port 10 Gigabit Ethernet Card

Table 159 Equipment LEDs on 1-Port 10 Gigabit Ethernet Card

| Label  | Activity | Color | Description                                  |
|--------|----------|-------|--|
| FAIL   | On       | Red   | A failure exists on the card. <sup>(1)</sup> |
|        | Off      | None  | No failure exists on the card.               |
| ACTIVE | On       | Green | This card is in service.                     |
|        | Off      | None  | This card has failed (the FAIL LED is on).   |

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

Table 160 Facility LEDs on 1-Port 10 Gigabit Ethernet Card

| Label | Activity | Color  | Description                                   |
|-------|----------|--------|---|
| ACT   | On       | Yellow | The link is transmitting or receiving frames. |
|       | Off      | None   | The link has no active frame.                 |
| LNK   | On       | Green  | The link is up.                               |
|       | Off      | None   | The link is down.                             |

## 6.17 4-Port 10 Gigabit Ethernet DDR Card

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



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

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

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

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

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

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

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

---

---

### Caution!

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

---

---

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



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

| Specification                    | SR                               | LR                              | ER                              | ZR <sup>(1)</sup>              |
|----------------------------------|----------------------------------|---------------------------------|---------------------------------|--------------------------------|
| 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 <sup>(2)</sup> | 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                    | -                              |
| <b>Transmitter</b>               |                                  |                                 |                                 |                                |
| Optical output power             | -7.3 dBm (min)<br>-1.0 dBm (max) | -8.2 dBm (min)<br>0.5 dBm (max) | -4.7 dBm (min)<br>4.0 dBm (max) | 0.0 dBm (min)<br>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                     | -                               | -                               | -                              |
| <b>Receiver</b>                  |                                  |                                 |                                 |                                |
| 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 <sup>(3)</sup>          | 0.5 dBm                         | -1.0 dBm <sup>(4)</sup>         | -7.0 dBm                       |

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

(2) Informative value only. This estimate is a worst case with the OMA as specified and extinction ratio as specified for the transmitter.

(3) The SR receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 1.0 dB, unless otherwise noted.

(4) The ER receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 5.0 dB.

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

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

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

| Specification           | DWDM <sup>(1)</sup>   |
|-------------------------|---|
| Cable type              | SMF   |
| Transceiver type        | XFP   |
| Compliance              | ITU G.959.1 P1L1-2D2, ITU-T G698.1, and ITU 694.1<br>GR-253 LR-2b                                 |
| <b>Transmitter</b>      |   |
| Optical output power    | -1.0 dBm (min)<br>+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) <sup>(4)</sup>   |
| <b>Receiver</b>         |   |
| Wavelength range        | 1270 nm to 1600 nm  |
| Sensitivity (min)       | -24.0 dBm   |
| Overload level (max)    | -7.0 dBm  |

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

(2) The 10GE-DWDM XFP transceivers support ITU channels 20, 33, 35, 36, 37, 53, and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

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

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

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

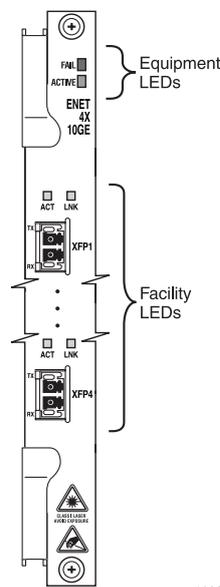
| Specification                    | OTN-DWDM <sup>(1)(2)(3)</sup>   |
|----------------------------------|---|
| Number of ports                  | 4   |
| Speed                            | 11.0957 Mbps  |
| Interface                        | OTN-DWDMnn <sup>(4)</sup>   |
| Link power budget <sup>(5)</sup> | 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<br>SFF INF-8077i, SFF 8477<br>IEEE 802.3ae-2004 |
| <b>Transmitter</b>               |   |
| Optical output power             | 0.0 dBm (min)<br>+3.0 dBm (max)   |

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

| Specification           | OTN-DWDM <sup>(1)(2)(3)</sup>   |
|-------------------------|---|
| 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) <sup>(6)</sup>   |
| <b>Receiver</b>         |   |
| Wavelength range        | 1527 nm to 1567 nm  |
| Sensitivity (min)       | -28.0 dBm   |
| Overload level (max)    | +5.0 dBm  |

- (1) The OTN-DWDM XFP transceivers can vary slightly, depending on the manufacturer.
- (2) The OTN-DWDM XFP transceiver is an 80km device by default.
- (3) The OTN-DWDM XFP transceiver has FEC (Forward Error Correction) enabled by default.
- (4) The OTN-DWDM XFP transceivers support ITU channels 20, 33, 35, 36, 37, 53, and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.
- (5) Link power budget is calculated using (minimum output power) – (minimum sensitivity).
- (6) Measured 20 dB down from the center wavelength peak.

### 6.17.1 Status LEDs



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

**Table 164 Equipment LEDs on 4-Port 10 Gigabit Ethernet DDR Card**

| Label | Activity | Color | Description                                  |
|-------|----------|-------|--|
| FAIL  | On       | Red   | A failure exists on the card. <sup>(1)</sup> |
|       | Off      | None  | No failure exists on the card.               |

**Table 164** Equipment LEDs on 4-Port 10 Gigabit Ethernet DDR Card

| Label  | Activity | Color | Description                                |
|--------|----------|-------|--|
| ACTIVE | On       | Green | This card is in service.                   |
|        | Off      | None  | This card has failed (the FAIL LED is on). |

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

**Table 165** Facility LEDs on 4-Port 10 Gigabit Ethernet DDR Card

| Label | Activity | Color  | Description                                   |
|-------|----------|--------|---|
| ACT   | On       | Yellow | The link is transmitting or receiving frames. |
|       | Off      | None   | The link has no active frame.                 |
| LNK   | On       | Green  | The link is up.                               |
|       | Off      | None   | The link is down.                             |

## 6.18 1-Port 10 Gigabit Ethernet/OC-192c DDR Card

The 1-port 10GE/OC-192c DDR-based card designed for traffic management using second-generation PPAs. This multimode DDR card supports the 10GE LAN-PHY, 10GE WAN-PHY, 10GE-DWDM, POS OC-192c, OC-192c DWDM, or OTN-DWDM modes for the SmartEdge routers.

This card supports a minimum of 1 GB of memory capacity and can process data internally to match the speed of the port — 10.3125 Gbps in 10GE LAN-PHY or 10GE-DWDM mode; 9.953 Gbps in 10GE WAN-PHY, POS OC-192c, or OC-192c DWDM mode; and 11.0957 Gbps in OTN-DWDM mode.

For Ethernet LAN-PHY and WAN-PHY modes, this card supports dot1q, PPPoE, and plain Ethernet encapsulations. For POS mode, it supports PPP, HDLC, and FR encapsulations.

For 10GE LAN-PHY, 10GE WAN-PHY, 10GE-DWDM, or OTN-DWDM mode, the maximum MTU is 9,198 bytes; for POS OC-192c or OC-192c DWDM mode, 12,800 bytes.

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

The following XFP transceivers are supported on the card port:

- 10GE-SR/SW—Short Reach
- 10GE-LR/LW—Long Reach
- 10GE-ER/EW—Extended Reach
- 10GE-ZR/ZW—Extreme Reach



- 10GE-DWDM—Dense Wavelength Division Multiplexing
- OTN-DWDM—80 km OTU2e Transport
- SONET OC-192/STM-64-SR-1—Short Reach
- SONET OC-192/STM-64-IR-2—Intermediate Reach
- SONET OC-192/STM-64-LR-2—Long Reach

---



---

### Caution!

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

---



---

**Note:** When ordering the XFP transceivers with 10GE ZR/ZW functionality, use part number XFP-OC192-LR2.

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

| Specification                    | SR                               | LR                              | ER                              | ZR <sup>(1)</sup>              |
|----------------------------------|----------------------------------|---------------------------------|---------------------------------|--------------------------------|
| 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 <sup>(2)</sup> | 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                    | —                              |
| <b>Transmitter</b>               |                                  |                                 |                                 |                                |
| Optical output power             | -7.3 dBm (min)<br>-1.0 dBm (max) | -8.2 dBm (min)<br>0.5 dBm (max) | -4.7 dBm (min)<br>4.0 dBm (max) | 0.0 dBm (min)<br>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                     | —                               | —                               | —                              |
| <b>Receiver</b>                  |                                  |                                 |                                 |                                |



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

| Specification        | SR                      | LR              | ER                      | ZR <sup>(1)</sup> |
|----------------------|-------------------------|-----------------|-------------------------|-------------------|
| 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 <sup>(3)</sup> | 0.5 dBm         | -1.0 dBm <sup>(4)</sup> | -7.0 dBm          |

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

(2) Informative value only. This estimate is a worst case with the OMA as specified and extinction ratio as specified for the transmitter.

(3) The SR receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 1.0 dB, unless otherwise noted.

(4) The ER receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 5.0 dB.

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

| Specification                    | SW                               | LW                              | EW                              | ZW <sup>(1)</sup>              |
|----------------------------------|----------------------------------|---------------------------------|---------------------------------|--------------------------------|
| 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 <sup>(2)</sup> | 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                    | -                              |
| <b>Transmitter</b>               |                                  |                                 |                                 |                                |
| Optical output power             | -7.3 dBm (min)<br>-1.0 dBm (max) | -8.2 dBm (min)<br>0.5 dBm (max) | -4.7 dBm (min)<br>4.0 dBm (max) | 0.0 dBm (min)<br>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                     | -                               | -                               | -                              |
| <b>Receiver</b>                  |                                  |                                 |                                 |                                |
| Wavelength range                 | 840 to 860 nm                    | 1270 to 1565 nm                 | 1270 to 1565 nm                 | 1270 to 1565 nm                |



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

| Specification        | SW                      | LW        | EW                      | ZW <sup>(1)</sup> |
|----------------------|-------------------------|-----------|-------------------------|-------------------|
| Sensitivity (min)    | -11.1 dBm               | -12.6 dBm | -14.1 dBm               | -22.1 dBm         |
| Overload level (max) | -1.0 dBm <sup>(3)</sup> | 0.5 dBm   | -1.0 dBm <sup>(4)</sup> | -7.0 dBm          |

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

(2) Informative value only. This estimate is a worst case with the OMA as specified and extinction ratio as specified for the transmitter.

(3) The SR receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 1.0 dB, unless otherwise noted.

(4) The ER receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 5.0 dB.

**Table 168 1-Port 10GE/OC-192c DDR Card Specifications — DWDM**

| Specification                    | DWDM <sup>(1)</sup>   |
|----------------------------------|---|
| Number of port                   | 1   |
| Speed                            | 10GE: 10.3125 Gbps<br>OC-192c: 9.953 Gbps   |
| Interface                        | DWDMnn <sup>(2)</sup>   |
| Link power budget <sup>(3)</sup> | 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<br>GR-253 LR-2b                       |
| <b>Transmitter</b>               |   |
| Optical output power             | -1.0 dBm (min)<br>+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) <sup>(4)</sup>   |
| <b>Receiver</b>                  |   |
| Wavelength range                 | 1270 nm to 1600 nm  |
| Sensitivity (min)                | -24.0 dBm   |
| Overload level (max)             | -7.0 dBm  |

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

(2) The 10GE-DWDM XFP transceivers support ITU channels 20, 33, 35, 36, 37, 53, and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

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

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

**Table 169 1-Port 10GE/OC-192c DDR Card Specifications — OTN-DWDM**

| Specification                    | OTN-DWDM <sup>(1)(2)(3)</sup>   |
|----------------------------------|---|
| Number of port                   | 1   |
| Speed                            | 11.0957 Gbps  |
| Interface                        | OTN-DWDM <sup>(4)</sup>   |
| Link power budget <sup>(5)</sup> | 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<br>SFF INF-8077i, SFF 8477<br>IEEE 802.3ae-2004 |
| <b>Transmitter</b>               |   |
| Optical output power             | 0.0 dBm (min)<br>+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) <sup>(6)</sup>   |
| <b>Receiver</b>                  |   |
| Wavelength range                 | 1527 nm to 1567 nm  |
| Sensitivity (min)                | -28.0 dBm   |
| Overload level (max)             | +5.0 dBm  |

(1) The OTN-DWDM XFP transceivers can vary slightly, depending on the manufacturer.

(2) The OTN-DWDM XFP transceiver is an 80km device by default.

(3) The OTN-DWDM XFP transceiver has FEC (Forward Error Correction) enabled by default.

(4) The OTN-DWDM XFP transceivers support ITU channels 20, 33, 35, 36, 37, 53, and 55; see ITU DWDM Transmit Frequencies and Wavelengths for the frequency and wavelength of each ITU channel; specified in ITU G.694.1.

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

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

---



---

## Caution!

Risk of data loss. Because the 10 Gigabit Ethernet/OC-192c DDR (1-port) line card has multi-rate capability, it is important that you choose the proper XFP transceiver for the intended application.

---



---



**Table 170 1-Port 10GE/OC-192c DDR Card Specifications — POS OC-192c/STM-64c**

| Specification <sup>(1)</sup>     | SR-1  | IR-2   | LR-2 <sup>(2)</sup>   |
|----------------------------------|---|--|---|
| 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 <sup>(3)</sup> | 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<br>GR-1377-CORE<br>ITU G.691 I-64.1 | Telcordia GR-253 IR-2<br>GR-1377-CORE<br>ITU G.691 S-64.2b | Telcordia GR-253 LR-2<br>GR-1377-CORE<br>ITU G.691 P1L1-2D2 |
| <b>Transmitter</b>               |   |  |   |
| Optical output power             | -6.0 dBm (min)<br>-1.0 dBm (max)                          | -1.5 dBm (min)<br>2.0 dBm (max)                            | 0.0 dBm (min)<br>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 <sup>(4)</sup>    | 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)   |
| <b>Receiver</b>                  |   |  |   |
| 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 <sup>(5)</sup>                                    | -1.0 dBm   | -7.0 dBm  |
| Optical reflectance              | -14.0 dB  | -27.0 dB   | -27.0 dB  |

(1) To display static transceiver data, enter the show hardware command (in any mode) with the **card** and **detail** keywords, or, for dynamic data, enter the show port command (in any mode) with the detail keyword. Measured or reported values may meet or exceed performance parameters that are specified in this table.

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

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

(4) Measured 20 dB down from the central wavelength peak.

(5) The receiver tolerates, without damage, continuous exposure to an optical input signal having an overload level equal to the stated value, plus at least 1.0 dB, unless otherwise noted.

### 6.18.1 Status LEDs

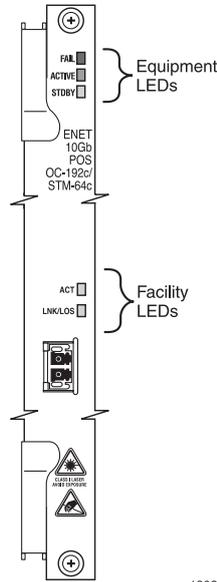


Figure 49 LEDs on 1-Port 10GE/OC-192c DDR Card

Table 171 Equipment LEDs on 1-Port 10GE/OC-192c DDR Card

| Label                   | Activity | Color  | Description  |
|-------------------------|----------|--------|--|
| FAIL <sup>(1)</sup>     | On       | Red    | The card is configured, but a failure exists. <sup>(2)</sup>                             |
|                         | Off      | None   | No failure exists on the card.   |
| ACTIVE <sup>(1)</sup>   | 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 <sup>(1)(3)</sup> | On       | Yellow | The POS OC-192 c/STM-64c port works as APS standby.                                      |
|                         | Off      | None   | The port is not configured as a protection port.   |

(1) APS protection is only supported on the POS OC-192c/STM-64c port, and not the 10 Gigabit Ethernet port.

(2) When the card is first powered up, both the FAIL and ACTIVE LEDs stay on until the card is initialized by the SmartEdge OS. FAIL - On does not necessarily indicate a card failure.

(3) Applies to the POS OC-192c/STM-64c port only.

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

| Label                                  | Activity | Color          | Description                                     |
|--|----------|----------------|---|
| <b>In 10GE LAN-PHY or WAN-PHY Mode</b> |          |                |   |
| ACT                                    | On       | Green Blinking | The link is transmitting or receiving frames.   |
|  | Off      | None           | The link has no active frame.                   |
| LNK/LOS <sup>(1)</sup>                 | On       | Green          | The port is configured and the link is Up.      |
|  | Off      | None           | The port is not configured or the link is Down. |
| <b>In POS OC-192c/STM-64c Mode</b>     |          |                |   |



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

| Label                  | Activity | Color          | Description  |
|------------------------|----------|----------------|--|
| ACT                    | On       | Green Blinking | The link is transmitting or receiving frames.            |
|                        | Off      | None           | The link has no active frame.                            |
| LNK/LOS <sup>(1)</sup> | On       | Yellow         | The port is configured and a LOS condition exists.       |
|                        | Off      | None           | The port is not configured or no LOS condition occurred. |

*(1) LNK LED concept applied in both Ethernet LAN-PHY and WAN-PHY modes; LOS LED concept is applied in POS OC-192c/STM-64c mode only.*





## 7 Advanced Services Engine

The Advanced Services Engine (ASE) card provides advanced security functions to protect the network at its edge. Using Deep Packet Inspection (DPI), the ASE card can identify and process point-to-point (P2P) applications, and provide a more efficient and secured network operation.

Security features on the ASE card ensure minimal network disruption and provide secure tunnels for end-user applications. You perform IP Security (IPSec) configuration, management, and reporting with NetOp Element Manager System.

*Table 173 ASE Card Specifications*

| Specification   | Value                       |
|-----------------|-----------------------------|
| Number of ports | Two for each ASP            |
| Speed           | 10/100/1000 Mbps            |
| Protection      | None                        |
| Interface       | Ethernet BaseT              |
| Connection type | RJ-45                       |
| Compliance      | IEEE 802.3, 802.3u, 802.3ab |

*Table 174 ASE Card Port Data*

| Type of Card and Card Description | Physical Ports <sup>(1)</sup>     | Low-Density Version | Low-Density Port Numbers |
|-----------------------------------|-----------------------------------|---------------------|--------------------------|
| Advanced Services Engine          | 4 (2 for each ASP) <sup>(2)</sup> | 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

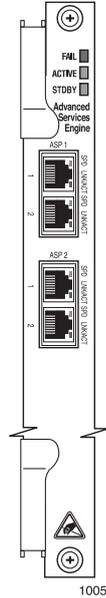


Figure 50 LEDs on ASE Card

Table 175 Equipment LEDs on the ASE Card

| Label  | Activity | Color  | Description  |
|--------|----------|--------|--|
| FAIL   | On       | Red    | A failure exists on the card. <sup>(1)</sup>                                       |
|        | 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 176 Facility LEDs for the ASE Card

| Label   | Activity | Color                 | Description                                      |
|---------|----------|-----------------------|--|
| LNK ACT | On       | Green                 | The link is present and active.                  |
|         | On       | Blinking              | The link is transmitting or receiving frames.    |
|         | Off      | None                  | The link has no active frame.                    |
| SPD     | On       | Yellow <sup>(1)</sup> | 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. <sup>(2)</sup> |

(1) The default condition for no link or cable attached is yellow.

(2) The LED shows green for both 10 and 1000 Mbps.



## 7.2 Provisioning and Configuring the ASE Card

---

---

### Stop!

The Advanced Services Engine (ASE) card must be running the correct version of the boot ROM and so must the SmartEdge OS system. To avoid a serious equipment outage in the field, if you are running SmartEdge OS Release 6.4.1.2 or later on either the ASE or the SmartEdge OS system, DO NOT DOWNGRADE to 6.4.1.1 or earlier. If you must downgrade, contact your support representative for an equipment-safe procedure. Downgrading from these releases can cause permanent damage to the ASE.

---

---

The following steps give a brief overview of how to provision and configure applicable SmartEdge chassis for the ASE card:

1. To provision a chassis for the ASE card, use either the NetOp Element Management System (EMS) or the `card ase slot` CLI command.

**Note:** The ASPs of the ASE card must be configured under an ASP pool before the processor can be brought up.

For more information about ASE-related CLI commands, see *Advanced Services Configuration and Operation Using the SmartEdge OS CLI Reference* [12].

2. To monitor the progress of provisioning the chassis for the ASE card, use the `show chassis` command.

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

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

For more information about Security Services using NetOp EMS Security Services software, see *Advanced Services Configuration and Operation Using the NetOp EMS Software Reference* [12].

## 7.3 ASE Operational Commands

The following are ASE operational commands:

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

**Note:** ASP status will show only if the ASE card has been provisioned in the chassis and the XCRP is correctly configured.



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

**Note:** This operation can take several minutes to complete.

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

```
[local]Egle6#sh chassis
Current platform is SE1200
Flags:
A-Active Crossconnect      B-Standby Crossconnect    C-SARC Ready
D-Default Traffic Card     E-EPPA Ready              G-Upgrading FPGA
H-Card Admin State SHUT    I-IPPA Ready              M-FPGA Upgrade Required
N-SONET EU Enabled         O-Card Admin State ODD    P-Coprocessor Ready
P1-ASP1 Ready              P2-ASP2 Ready             R-Traffic Card Ready
S-SPPA Ready               U-Card PPAs/ASP UP        W-Warm Reboot
X-XCRP mismatch)
Slot: Configured-type      Slot: Installed-type      Initialized      Flags
2 : ase                    2 : ase                   Yes              P1P2UR
7 : xcrp                    7 : xcrp                   Yes
```

[local]Egle6#

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

For more information about ASE-related CLI commands, see *Advanced Services Configuration and Operation Using the SmartEdge OS CLI Reference* [12].

## 7.4 Operating Status

The ASE card has equipment LEDs at the top of each card to indicate the current status of the card, and facility LEDs to indicate the status of the ports.

**Note:** The ASE card is not NEBS compliant; therefore, when installed in the SmartEdge 400 chassis, it is not capable of operating at 104°F (40°C.)



## 8 SmartEdge Storage Engine

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

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

### 8.1 Hard Disk Drive Description

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

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

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

### 8.2 Specifications and LEDs

*Table 177 SSE Card Specifications*

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

**Table 177 SSE Card Specifications**

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

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

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

**Table 178 SAS Connector Pin Assignments**

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

**Table 179 SSE Card Slot Data**

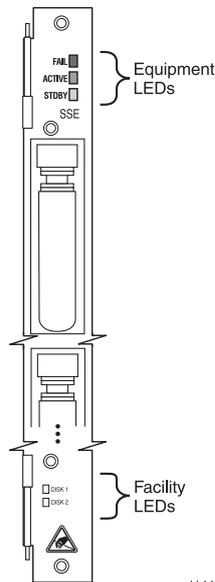
| Type of Card and Card Description | Physical Slots <sup>(1)</sup>             |
|-----------------------------------|---|
| SmartEdge Storage Engine          | 2 <sup>(2)</sup> HDD slots <sup>(3)</sup> |

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

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

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

The SSE card provides equipment LEDs at the top of each card to indicate the current status of the card, and facility LEDs to indicate the status of the HDDs.



1144

Figure 51 LEDs on SSE Cards

Table 180 Equipment LEDs on the SSE Card

| Label  | Activity | Color  | Description  |
|--------|----------|--------|--|
| FAIL   | On       | Red    | A failure exists on the card. <sup>(1)</sup>                                       |
|        | Off      | None   | No failure exists on the card.   |
| ACTIVE | On       | Green  | This card is in service.   |
|        | Off      | None   | This card is on standby (the STDBY LED is on) or has failed (the FAIL LED is on).  |
| STDBY  | On       | Yellow | This card is on standby.   |
|        | Off      | None   | This card is in service (the ACTIVE LED is on) or has failed (the FAIL LED is on). |

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

Table 181 Facility LEDs for the HDD on the SSE Card

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



## 8.3 Provision and Configure the SSE Card

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

## 8.4 SSE Operational Commands

The following are SSE operational commands:

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

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

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

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



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

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



## 8.5 Operating Status

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



## Reference List

- [1] *Configuring Cards*, 10/1543-CRA 119 1170/1
- [2] *Configuring ATM, Ethernet, and POS Ports*, 9/1543-CRA 119 1170/1
- [3] *Configuring Channelized Ports*, 93/1543-CRA 119 1170/1
- [4] *Configuring Circuits*, 12/1543-CRA 119 1170/1
- [5] *Command List*, 1/190 77-CRA 119 1170/1
- [6] *Application Traffic Management Command Reference*, 190 80-CRA 119 1170/1
- [7] *Transceivers for SmartEdge and SM Family Line Cards*, 24/153 30-CRA 119 1170/1
- [8] *Technical Product Description*, 4/221 02-CRA 119 1170/1
- [9] *Installing the SmartEdge OS*, 1/190 47-CRA 119 1170/1
- [10] *Inspection And Cleaning Of Optical Connectors*, 1/1020-FEA 206 8203/1
- [11] *Installing the SmartEdge OS*, 1/190 47-CRA 119 1170/1-V1
- [12] *Advanced Services Configuration and Operation Using the SmartEdge OS CLI*, 1/1543-CRA 119 1170/1
- [13] *SSE Configuration and Operation*, 86/1543-CRA 119 1170/1