Cisco 7600 Series Ethernet Services
20G Line Card Hardware Installation Guide

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Preface

This preface describes the objectives and organization of this document and explains how to find additional information on related products and services. This preface contains the following sections:

- Objectives, page vii
- Document Revision History, page vii
- Organization, page viii
- Related Documentation, page viii
- Cisco 7600 Series Router Documentation, page ix
- Document Conventions, page x
- Obtaining Documentation and Submitting a Service Request, page xi

Objectives

This document describes the Cisco 7600 Series Ethernet Services 20G line cards, hereinafter referred to as the Cisco 7600 ES20 line cards, that are supported on the Cisco 7600 Series Routers. This document also describes how to install the Cisco 7600 ES20 line cards and how to troubleshoot the installation.

Document Revision History

Table 1 records technical changes to this document. The table shows the Cisco IOS software release number and document revision number for the change, the date of the change, and a brief summary of the change.

<table>
<thead>
<tr>
<th>Release No.</th>
<th>Revision</th>
<th>Date</th>
<th>Change Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.4(2)S</td>
<td>OL-11908-08</td>
<td>July 2014</td>
<td>Added a new chapter, Chapter 6, “Removing and Installing a Cisco 7600 Series Ethernet Services 20G Line Card Memory.”</td>
</tr>
<tr>
<td>12.2(33) SRD5</td>
<td>OL-11908-07</td>
<td>October 2010</td>
<td>Added troubleshooting information to resolve line card issues in Chapter 7, “Troubleshooting”.</td>
</tr>
<tr>
<td>12.2(33) SRE</td>
<td>OL-11908-06</td>
<td>November 2009</td>
<td>• Added new DWDM optics support.</td>
</tr>
</tbody>
</table>
Preface

This document contains the following chapters:

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1</td>
<td>Cisco 7600 Series Ethernet Services 20G Line Card Product Overview</td>
<td>Provides an introduction to the Cisco 7600 Series Ethernet Services 20G line cards.</td>
</tr>
<tr>
<td>Chapter 2</td>
<td>Overview: Cisco 7600 Series Ethernet Services 20G Line Cards</td>
<td>Provides a compatibility summary for the Cisco 7600 Series Ethernet Services 20G line cards. For each supported ES20 line card, provides a summary of characteristics and an overview.</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Preparing to Install a Cisco 7600 Series Ethernet Services 20G Line Card</td>
<td>Describes the required tools, equipment, and safety guidelines for installing Cisco 7600 Series Ethernet Services 20G line cards.</td>
</tr>
<tr>
<td>Chapter 4</td>
<td>Installing and Removing a Cisco 7600 Series Ethernet Services 20G Line Card</td>
<td>Describes the procedures for installing and removing Cisco 7600 Series Ethernet Services 20G line cards on a Cisco 7600 series router.</td>
</tr>
<tr>
<td>Chapter 5</td>
<td>Installing and Removing SFP and XFP Modules</td>
<td>Describes the procedures for installing and removing SFP and XFP modules on Cisco 7600 Series Ethernet Services 20G line cards.</td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Troubleshooting</td>
<td>Provides information for troubleshooting the installation of Cisco 7600 Series Ethernet Services 20G line cards. It also describes helpful debug commands and provides packing instructions.</td>
</tr>
</tbody>
</table>

Related Documentation

This section refers you to other documentation that also might be useful as you configure your Cisco 7600 series router. The documentation listed below is available online.
Preface

Cisco 7600 Series Router Documentation

As you configure your Cisco 7600 series router, you should also refer to the following companion publication for important hardware installation information:

- Cisco 7600 Series Ethernet Services 20G Line Card Hardware Installation Guide

An overview of the Cisco 7600 series router features, benefits, and applications can be found in the Cisco 7600 Series Internet Router Essentials document located at the following URL:


Some of the following other Cisco 7600 series router publications might be useful to you as you configure your Cisco 7600 series router.

- Cisco 7600 Series Cisco IOS Software Configuration Guide
- Cisco 7600 Series Cisco IOS Command Reference
- Cisco 7600 Series Cisco IOS System Message Guide
- Cisco 7600 Series Internet Router MIB Specifications Guide

Several other publications are also related to the Cisco 7600 series router. For a complete reference of related documentation, refer to the Cisco 7600 Series Routers Documentation Roadmap located at the following URL:


Other Cisco IOS Software Publications

Your router and the Cisco IOS software running on it contain extensive features. You can find documentation for Cisco IOS software features at the following URL:


Cisco IOS Release 12.2SR Software Publications

 Documentation for Cisco IOS Release 12.2SR, including command reference and system error messages, can be found at the following URL:

Document Conventions

Within the SIP and SPA software configuration guides, the term router is generally used to refer to a variety of Cisco products (for example, routers, access servers, and switches). Routers, access servers, and other networking devices that support Cisco IOS software are shown interchangeably within examples. These products are used only for illustrative purposes; that is, an example that shows one product does not necessarily indicate that other products are not supported.

This document uses the following conventions:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>^ or Ctrl</td>
<td>The ^ and Ctrl symbols represent the Control key. For example, the key combination ^D or Ctrl means hold down the Control key while you press the D key. Keys are indicated in capital letters and are not case sensitive.</td>
</tr>
<tr>
<td>string</td>
<td>A string is a nonquoted set of characters shown in italics. For example, when setting an SNMP community string to public, do not use quotation marks around the string or the string will include quotation marks.</td>
</tr>
</tbody>
</table>

Command syntax descriptions use the following conventions:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bold</td>
<td>Bold text indicates commands and keywords that you enter exactly as shown.</td>
</tr>
<tr>
<td>italics</td>
<td>Italic text indicates arguments for which you supply values.</td>
</tr>
<tr>
<td>[x]</td>
<td>Square brackets enclose an optional element (keyword or argument).</td>
</tr>
<tr>
<td></td>
<td>A vertical line indicates a choice within an optional or required set of keywords or arguments.</td>
</tr>
<tr>
<td>[x</td>
<td>y]</td>
</tr>
<tr>
<td>{x</td>
<td>y}</td>
</tr>
</tbody>
</table>

Nested sets of square brackets or braces indicate optional or required choices within optional or required elements. For example:

<table>
<thead>
<tr>
<th>Convention</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[x {y</td>
<td>z}]</td>
</tr>
</tbody>
</table>

Examples use the following conventions:

The following conventions are used to attract the attention of the reader:

| Caution | Means reader be careful. In this situation, you might do something that could result in equipment damage or loss of data. |
Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly What’s New in Cisco Product Documentation, which also lists all new and revised Cisco technical documentation, at:


Subscribe to the What’s New in Cisco Product Documentation as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS Version 2.0.
Cisco 7600 Series Ethernet Services 20G Line Card Product Overview

This chapter provides an introduction to the Cisco 7600 Series Ethernet Services 20G (ES20) line card. It includes the following sections:

- Introduction to the Cisco 7600 Series Ethernet Services 20G Line Card, page 1-1
- Cisco IOS Software Release and Hardware Revision Requirements, page 1-3
- Modular Optics Compatibility, page 1-4
- Power Management, page 1-9

Introduction to the Cisco 7600 Series Ethernet Services 20G Line Card

The Cisco 7600 Series Ethernet Services 20G (ES20) line cards are a multiple-fabric, fixed-port Ethernet line card for the Cisco 7600 Series Routers that are capable of 20 Gbps of traffic forwarding using a fixed port interface design. The two versions of the Cisco 7600 Series Ethernet Services 20G line card are:

- 2-port version: 7600-ES20-10G.
- 20-port version: 7600-ES20-GE.

The difference between the two versions are the link interface daughter cards that accept small form-factor pluggable (SFP or XFP) optical transceivers. Additionally, each of the two versions has a packet engine daughter card and a control processor daughter card.

**Note**

SFP modules are optics modules with speeds lower than 10 Gbps; XFP modules are optics modules with speeds equal to or greater than 10 Gbps.

The SFP and XFP modules allow the line cards to be configured for different media types (copper or fiber) and different optical requirements (single mode fiber or multimode fiber) as available.

The 7600-ES20-10G uses a 2-port 10GE fixed interface daughter card that accepts pluggable XFP modules. The 7600-ES20-GE uses a 20-port GE fixed interface daughter card that accepts pluggable SFP modules.
Product Overview

The Cisco 7600 Series Ethernet Services 20G line cards have the following features:

- Large output buffers to prevent spurious packet loss. These output buffers provide up to 200 milliseconds (ms) of round-trip time buffer at an aggregate bandwidth of 10 Gbps
- Up to 8,000 queues per port, 16,000 queues total, for combined input and output queueing and scheduling
- The PXF processor provides programmable ingress and egress feature processing capability.
- NT3PE-500 with 128MB reduced latency DRAM (RLDRAM) per column
- 40+ Mpps Layer3/Layer4 forwarding, 125 Mpps Layer 2 forwarding
- Dual fabric attachment providing an aggregate bandwidth of 40 GBs, full duplex (each fabric channel provides 20 GBs full duplex)

Cisco 7600 Series Ethernet Services 20G Line Card Product Numbers

Table 1-1 lists the Cisco product numbers for the line cards.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cisco Product Number</th>
<th>Field-Replaceable Unit (FRU) Product ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco 7600 ES20 line card, 20xGE SFP with DFC 3C</td>
<td>7600-ES20-GE3C</td>
<td>7600-ES20-GE3C=</td>
</tr>
<tr>
<td>Cisco 7600 ES20 line card, 20xGE SFP with DFC 3CXL</td>
<td>7600-ES20-GE3CXL</td>
<td>7600-ES20-GE3CXL=</td>
</tr>
<tr>
<td>Cisco 7600 ES20 line card, 2x10GE XFP with DFC 3C</td>
<td>7600-ES20-10G3C</td>
<td>7600-ES20-10G3C=</td>
</tr>
<tr>
<td>Cisco 7600 ES20 line card, 2x10GE XFP with DFC 3CXL</td>
<td>7600-ES20-10G3CXL</td>
<td>7600-ES20-10G3CXL=</td>
</tr>
</tbody>
</table>

Note

The Distributed Forwarding Card (DFC) on a 7600-ES20-GE will function at the lowest common denominator with the rest of the system. Therefore if a 7600-ES20-GE with a DFC 3CXL is configured in a system with the PFC3BXL present, the system will function only at the 3BXL level. Similarly, if a DFC 3CXL is configured on a different line card, the system would function at the 3BXL level regardless of other 3CXL ASICs installed in the system.
Supported Platforms

Table 1-2 lists the supported router platforms for Cisco 7600 ES20 line cards.

<table>
<thead>
<tr>
<th>Cisco 7600 ES20 Line Card</th>
<th>Supported Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>7600-ES20-10G</td>
<td>All Cisco 7600 series routers except for the Cisco 7603 router</td>
</tr>
<tr>
<td>7600-ES20-GE</td>
<td>All Cisco 7600 series routers except for the Cisco 7603 router</td>
</tr>
</tbody>
</table>

Cisco IOS Software Release and Hardware Revision Requirements

The Cisco 7600 ES20 line cards have certain Cisco IOS software requirements. Also, to ensure compatibility with the software, your Cisco 7600 ES20 line card should have a specific hardware revision number. The number is printed on a label affixed to the component side of the card and is displayed by the `show diag` command.

Table 1-3 lists the hardware and software requirements for Cisco 7600 ES20 line cards.

<table>
<thead>
<tr>
<th>Cisco 7600 ES20 Line Card</th>
<th>Cisco Product Number</th>
<th>Required Hardware Version</th>
<th>Minimum Cisco IOS Software Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco 7600 ES20 line card, 20xGE SFP with DFC 3C</td>
<td>7600-ES20-GE3C</td>
<td>68-2919-01</td>
<td>Cisco IOS Release 12.2SRB</td>
</tr>
<tr>
<td>Cisco 7600 ES20 line card, 2x10GE XFP with DFC 3C</td>
<td>7600-ES20-10G3C</td>
<td>68-2917-01</td>
<td>Cisco IOS Release 12.2SRB</td>
</tr>
<tr>
<td>Cisco 7600 ES20 line card, 20xGE SFP with DFC 3CXL</td>
<td>7600-ES20-GE3CXL</td>
<td>68-2918-01</td>
<td>Cisco IOS Release 12.2SRB</td>
</tr>
<tr>
<td>Cisco 7600 ES20 line card, 2x10GE XFP with DFC 3CXL</td>
<td>7600-ES20-10G3CXL</td>
<td>68-2916-01</td>
<td>Cisco IOS Release 12.2SRB</td>
</tr>
</tbody>
</table>

The `show diag slot_number`, `show version`, and `show hardware` commands display the current hardware configuration of the router, including the system software version that is currently loaded and running, and the hardware revision number. For complete descriptions of `show` commands, refer to the Cisco IOS Configuration Fundamentals Configuration Guide and the Cisco IOS Configuration Fundamentals Command Reference for the installed Cisco IOS release.

If the command displays indicate that the Cisco IOS software is a version earlier than you need, check the contents of flash memory to determine if the required images are available on your system. The `dir devicename` command displays a list of all files stored in flash memory. If you do not have the correct software version, contact Cisco customer service.

For software configuration information, refer to the Cisco IOS software configuration and command reference publications for the installed Cisco IOS release. Also refer to the Cisco IOS software release notes for additional information.
Modular Optics Compatibility

The Cisco 7600 ES20 line cards use small form-factor pluggable (SFP or XFP) optical transceivers to provide network connectivity. Table 1-4 lists the supported modules, Table 1-4 lists the supported optics on a 1-GE port of the RSP720-10GE interface, Table 1-5 lists the supported optics on a 10GE interface, and Table 1-6 lists the optics support on a 10GE port of the WS-X6708-10GE interface.

Table 1-4 Supported Modules

<table>
<thead>
<tr>
<th>Line Cards</th>
<th>Supported Modules (Cisco Part Numbers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7600-ES20-10G</td>
<td>XFP-10GLR-OC192SR</td>
</tr>
<tr>
<td></td>
<td>XFP-10GER-OC192IR</td>
</tr>
<tr>
<td></td>
<td>XFP-10GZR-OC192LR1</td>
</tr>
<tr>
<td></td>
<td>XFP-10GER-OC192IR+</td>
</tr>
<tr>
<td></td>
<td>DWDM-SFP-xxxx(^1) and CWDM-SFP-xxxx(^2)</td>
</tr>
</tbody>
</table>

1. See Table 1-5 for information on the supported DWDM SFP modules.
2. See Table 1-4 for information on the supported CWDM SFP modules.

Supported CWDM-SFP Modules

Table 1-5 lists the pluggable SFP modules supported on Cisco 7600-ES20-1GE. For details on removing or installing the SFP modules, see “Removing and Installing SFP Modules, page 5-1”.

Table 1-5 Supported SFP Modules

<table>
<thead>
<tr>
<th>Product ID (append “=” for spare)</th>
<th>Product Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>CWDM-SFP-1470=</td>
<td>CWDM SFP 1470 nm; Gigabit Ethernet and 1G/2G FC</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>CWDM-SFP-1490=</td>
<td>CWDM SFP 1490 nm; Gigabit Ethernet and 1G/2G FC</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>CWDM-SFP-1510=</td>
<td>CWDM SFP 1510 nm; Gigabit Ethernet and 1G/2G FC</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>CWDM-SFP-1530=</td>
<td>CWDM SFP 1530 nm; Gigabit Ethernet and 1G/2G FC</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>CWDM-SFP-1550=</td>
<td>CWDM SFP 1550 nm; Gigabit Ethernet and 1G/2G FC</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>CWDM-SFP-1570=</td>
<td>CWDM SFP 1570 nm; Gigabit Ethernet and 1G/2G FC</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>CWDM-SFP-1590=</td>
<td>CWDM SFP 1590 nm; Gigabit Ethernet and 1G/2G FC</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>CWDM-SFP-1610=</td>
<td>CWDM SFP 1610 nm; Gigabit Ethernet and 1G/2G FC</td>
<td>12.2(33) SRD</td>
</tr>
</tbody>
</table>
Supported DWDM-XFP and DWDM-SFP Modules

Table 1-6 lists the pluggable XFP modules supported on Cisco 7600-ES20-10GE. For details on removing or installing the XFP modules, see “Removing and Installing XFP Modules” section on page 5-11.

Table 1-6 Supported XFP and SFP Modules

<table>
<thead>
<tr>
<th>Product ID (append “=” for spares)</th>
<th>Product Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWDM-SFP-3346</td>
<td>DWDM SFP 1533.47 nm SFP (100 GHz ITU grid)</td>
<td>12.2(33) SRE</td>
</tr>
<tr>
<td>DWDM-SFP-3739</td>
<td>DWDM SFP 1537.40 nm SFP (100 GHz ITU grid)</td>
<td>12.2(33) SRE</td>
</tr>
<tr>
<td>DWDM-SFP-4134</td>
<td>DWDM SFP 1541.35 nm SFP (100 GHz ITU grid)</td>
<td>12.2(33) SRE</td>
</tr>
<tr>
<td>DWDM-SFP-4532</td>
<td>DWDM SFP 1545.32 nm SFP (100 GHz ITU grid)</td>
<td>12.2(33) SRE</td>
</tr>
<tr>
<td>DWDM-SFP-4931</td>
<td>DWDM SFP 1549.32 nm SFP (100 GHz ITU grid)</td>
<td>12.2(33) SRE</td>
</tr>
<tr>
<td>DWDM-SFP-5332</td>
<td>DWDM SFP 1553.33 nm SFP (100 GHz ITU grid)</td>
<td>12.2(33) SRE</td>
</tr>
<tr>
<td>DWDM-SFP-5736</td>
<td>DWDM SFP 1557.36 nm SFP (100 GHz ITU grid)</td>
<td>12.2(33) SRE</td>
</tr>
<tr>
<td>DWDM-SFP-6141</td>
<td>DWDM SFP 1561.42 nm SFP (100 GHz ITU grid)</td>
<td>12.2(33) SRE</td>
</tr>
<tr>
<td>DWDM-SFP-3033</td>
<td>1000BASE-DWDM 1530.33 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-SFP-3112</td>
<td>1000BASE-DWDM 1531.12 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-SFP-3190</td>
<td>1000BASE-DWDM 1531.90 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-SFP-3268</td>
<td>1000BASE-DWDM 1532.68 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-SFP-3425</td>
<td>1000BASE-DWDM 1534.25 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-SFP-3504</td>
<td>1000BASE-DWDM 1535.04 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-SFP-3582</td>
<td>1000BASE-DWDM 1535.82 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-SFP-3661</td>
<td>1000BASE-DWDM 1536.61 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-SFP-3819</td>
<td>1000BASE-DWDM 1538.19 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-SFP-3898</td>
<td>1000BASE-DWDM 1538.98 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
</tbody>
</table>
## Modular Optics Compatibility

### Table 1-6 Supported XFP and SFP Modules

<table>
<thead>
<tr>
<th>Product ID (append &quot;=&quot; for spares)</th>
<th>Product Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWDM-SFP-3977 1000BASE-DWDM 1539.77 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-4056 1000BASE-DWDM 1540.56 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-4214 1000BASE-DWDM 1542.14 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-4294 1000BASE-DWDM 1542.94 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-4373 1000BASE-DWDM 1543.73 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-4453 1000BASE-DWDM 1544.53 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-4612 1000BASE-DWDM 1546.12 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-4692 1000BASE-DWDM 1546.92 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-4772 1000BASE-DWDM 1547.72 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-4851 1000BASE-DWDM 1548.51 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-5012 1000BASE-DWDM 1550.12 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-5092 1000BASE-DWDM 1550.92 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-5172 1000BASE-DWDM 1551.72 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-5252 1000BASE-DWDM 1552.52 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-5413 1000BASE-DWDM 1554.13 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-5494 1000BASE-DWDM 1554.94 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-5575 1000BASE-DWDM 1555.75 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-5655 1000BASE-DWDM 1556.55 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-5817 1000BASE-DWDM 1558.17 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>DWDM-SFP-5898 1000BASE-DWDM 1558.98 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
<td></td>
</tr>
<tr>
<td>Product ID</td>
<td>Product Description</td>
<td>Version</td>
</tr>
<tr>
<td>-----------------</td>
<td>--------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>DWDM-SFP-5979</td>
<td>1000BASE-DWDM 1559.79 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-SFP-6061</td>
<td>1000BASE-DWDM 1560.61 nm SFP (100-GHz ITU grid)</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>DWDM-XFP-30.33</td>
<td>DWDM XFP 1530.33 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-31.12</td>
<td>DWDM XFP 1531.12 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-31.90</td>
<td>DWDM XFP 1531.90 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-32.68</td>
<td>DWDM XFP 1532.68 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-34.25</td>
<td>DWDM XFP 1535.25 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-35.04</td>
<td>DWDM XFP 1535.04 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-35.82</td>
<td>DWDM XFP 1535.82 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-36.61</td>
<td>DWDM XFP 1536.61 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-38.19</td>
<td>DWDM XFP 1538.19 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-38.98</td>
<td>DWDM XFP 1538.98 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-39.77</td>
<td>DWDM XFP 1539.77 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-40.56</td>
<td>DWDM XFP 1540.56 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-42.14</td>
<td>DWDM XFP 1542.14 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-42.94</td>
<td>DWDM XFP 1542.94 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-43.73</td>
<td>DWDM XFP 1543.73 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-44.53</td>
<td>DWDM XFP 1544.53 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-46.12</td>
<td>DWDM XFP 1546.12 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-46.92</td>
<td>DWDM XFP 1546.92 nm XFP (100 GHz ITU grid)</td>
<td>12.2(33)SRB3</td>
</tr>
</tbody>
</table>
### Table 1-6  
**Supported XFP and SFP Modules**

<table>
<thead>
<tr>
<th>Product ID (append &quot;=&quot; for spares)</th>
<th>Product Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWDM-XFP-47.72</td>
<td>DWDM XFP 1547.72 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-48.51</td>
<td>DWDM XFP 1548.51 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-50.12</td>
<td>DWDM XFP 1550.12 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-50.92</td>
<td>DWDM XFP 1550.92 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-51.72</td>
<td>DWDM XFP 1551.72 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-52.52</td>
<td>DWDM XFP 1552.52 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-54.13</td>
<td>DWDM XFP 1554.13 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-54.94</td>
<td>DWDM XFP 1554.94 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-55.75</td>
<td>DWDM XFP 1555.75 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-56.55</td>
<td>DWDM XFP 1556.55 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-58.17</td>
<td>DWDM XFP 1558.17 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-58.98</td>
<td>DWDM XFP 1558.98 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-59.79</td>
<td>DWDM XFP 1559.79 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
<tr>
<td>DWDM-XFP-60.61</td>
<td>DWDM XFP 1560.61 nm XFP</td>
<td>12.2(33)SRB3</td>
</tr>
</tbody>
</table>
Supported BX-SFP Modules

Table 1-7 lists the supported BX-SFP modules in a Cisco ES20 line card.

<table>
<thead>
<tr>
<th>Cisco 7600 ES20 Line Card</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLC-BX-D</td>
<td>1000BASE-BX10-D Downstream bidirectional single fiber; with DOM</td>
<td>12.2(33) SRD</td>
</tr>
<tr>
<td>GLC-BX-U</td>
<td>1000BASE-BX10-U Upstream bidirectional single fiber; with DOM</td>
<td>12.2(33) SRD</td>
</tr>
</tbody>
</table>

Power Management

The Cisco ES20 line cards consume chassis power; you must make sure the chassis is within the power budget on Cisco 7600 Series Routers. See Table 1-8.

Table 1-8 Cisco 7600 ES20 Line Card Power Consumption

<table>
<thead>
<tr>
<th>Cisco 7600 ES20 Line Card</th>
<th>Power Consumption (Maximum in Watts)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7600-ES20-GE3C</td>
<td>489</td>
</tr>
<tr>
<td>7600-ES20-GE3CXL</td>
<td>489</td>
</tr>
<tr>
<td>7600-ES20-10G3C</td>
<td>494</td>
</tr>
<tr>
<td>7600-ES20-10G3CXL</td>
<td>494</td>
</tr>
</tbody>
</table>

If the power limit is exceeded, the Cisco ES20 line card is not powered up and an error message is displayed.

Router# %C7KPWR-SP-4-POWERDENIED: insufficient power, module in slot 3 power denied.

On a Cisco 7600 series router, use the `show power` command on the Route Processor to determine how much power you have available in the chassis and how much is being used or reserved by line cards, supervisor engines, and fan trays.

The following example shows the sample output for the `show power` command on a Cisco 7600 series router:

```
Router# show power
system power redundancy mode = redundant
system power redundancy operationally = non-redundant
system power total = 2669.10 Watts (63.55 Amps @ 42V)
system power used = 1530.90 Watts (36.45 Amps @ 42V)
system power available = 1138.20 Watts (27.10 Amps @ 42V)
  Power-Capacity PS-Fan Output Oper
    PS  Type               Watts   A @42V Status Status State
    ---- ------------------ ------- ------ ------ ------ ----- 
    1    PWR-2700-AC        1319.22 31.41  -      -      off
    2    PWR-2700-AC        2669.10 63.55  OK     OK     on

  Pwr-Allocated Oper
    Fan  Type               Watts   A @42V State
    ----- ------------------- ------- ------ 
    1    FAN-MOD-6HS        180.18  4.29  OK
```
### Power Management

<table>
<thead>
<tr>
<th>Slot</th>
<th>Card-Type</th>
<th>Pwr-Requested Watts</th>
<th>Pwr-Allocated Watts @42V</th>
<th>Admin Oper Watts</th>
<th>Admin Oper Watts @42V</th>
<th>State</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>7600-ES20-BASE</td>
<td>340.20</td>
<td>8.10</td>
<td>340.20</td>
<td>8.10</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>4</td>
<td>7600-ES20-BASE</td>
<td>340.20</td>
<td>8.10</td>
<td>340.20</td>
<td>8.10</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>5</td>
<td>7600-SIP-600</td>
<td>341.88</td>
<td>8.14</td>
<td>341.88</td>
<td>8.14</td>
<td>on</td>
<td>on</td>
</tr>
<tr>
<td>6</td>
<td>WS-SUP720-3EXL</td>
<td>328.44</td>
<td>7.82</td>
<td>328.44</td>
<td>7.82</td>
<td>on</td>
<td>on</td>
</tr>
</tbody>
</table>
Overview: Cisco 7600 Series Ethernet Services 20G Line Cards

This chapter describes the Cisco 7600 Series Ethernet Services 20G (ES20) line cards that are supported on the Cisco 7600 Series Routers and contains the following sections:

- Cisco 7600 Series Ethernet Services 20G Line Card Summary, page 2-1
- Identifying Slots and Subslots for the Cisco 7600 Series Ethernet Services 20G Line Cards, page 2-2
- Cisco 7600-ES20-10G Line Card Overview, page 2-3
- Cisco 7600-ES20-GE Line Card Overview, page 2-6

Cisco 7600 Series Ethernet Services 20G Line Card Summary

Summary descriptions of the Cisco 7600 Series Ethernet Services 20G line cards that are supported on the Cisco 7600 Series Routers are shown in Table 2-1.

<table>
<thead>
<tr>
<th>Cisco ES20 Line Card</th>
<th>Product Numbers</th>
<th>Description</th>
<th>Maximum Number of SFPs or XFPs</th>
<th>Minimum Cisco IOS Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>7600-ES20-10G</td>
<td>7600-ES20-10G3C, 7600-ES20-10G3CX L</td>
<td>2-port 10 Gigabit Ethernet line card providing core-facing redundant 10 Gigabit Ethernet uplinks with H-VPLS support.</td>
<td>2</td>
<td>Cisco IOS Release 12.2SRB</td>
</tr>
<tr>
<td>7600-ES20-GE</td>
<td>7600-ES20-GE3C, 7600-ES20-GE3CX L</td>
<td>20-port 1 Gigabit Ethernet line card providing core-facing redundant Ethernet uplinks with H-VPLS support.</td>
<td>20</td>
<td>Cisco IOS Release 12.2SRB</td>
</tr>
</tbody>
</table>
Checking Hardware and Software Compatibility

To check the minimum software requirements of Cisco IOS software with the hardware installed on your router, Cisco maintains the Software Advisor tool on Cisco.com. This tool does not verify whether the Cisco 7600 ES20 line cards within a system are compatible, but it does provide the minimum Cisco IOS requirements for individual hardware modules or components.

**Note**
Access to this tool is limited to users with Cisco.com login accounts.

To access Software Advisor, click **Login** at Cisco.com, type “Software Advisor” in the SEARCH box, and click **GO**. Click the link for the Software Advisor tool.

Choose a product family or enter a specific product number to search for the minimum supported software release needed for your hardware.

Identifying Slots and Subslots for the Cisco 7600 Series Ethernet Services 20G Line Cards

This section describes how to specify the physical location of a Cisco 7600 Series Ethernet Services 20G line cards on the Cisco 7600 series routers within the command-line interface (CLI) to configure or monitor those devices.

Specifying the Slot Location for a Cisco 7600 Series Ethernet Services 20G Line Cards

The Cisco 7600 series routers support different chassis models, each of which supports a certain number of chassis slots.

**Note**

The Cisco 7600 ES20 line cards are not supported with a Supervisor Engine 1, Supervisor Engine 1A, Supervisor Engine 2, or Supervisor Engine 720-3A.

For information about the chassis slots available in different Cisco 7600 series router models, see [http://www.cisco.com/univercd/cc/td/doc/product/core/cis7600/hardware/cis_76xx/osr_over.htm](http://www.cisco.com/univercd/cc/td/doc/product/core/cis7600/hardware/cis_76xx/osr_over.htm).

Some commands allow you to display information about the Cisco 7600 ES20 line card itself, such as `show module`, `show idprom module`, `show hw-module slot`, and `show diagbus`. These commands require you to specify the chassis slot location where the Cisco 7600 ES20 line card that you want information about is installed.

For example, to display status and information about the Cisco 7600 ES20 line card installed in slot 6 of a Cisco 7609 router, enter the following command:

```
Router# show module 6
```

For more information about Cisco 7600 ES20 line card commands, see the “Command Summary for the Cisco 7600 Series Ethernet Services 20G Line Card” and the “Cisco 7600 Series Ethernet Services 20G Line Card Commands” chapters in the Cisco 7600 Series Router SIP, SSC, and SPA Software Configuration Guide.
Cisco 7600-ES20-10G Line Card Overview

The Cisco 7600 ES20 line card must be in a slot that provides two primary serial channels. Dual serial channels are not available in all slots of a 13-slot chassis. Dual fabric connectivity is supported in slots 9 to 13.

Cisco 7600-ES20-10G Line Card Slot, Bay, and Port Locations

The Cisco 7600-ES20-10G line card uses a slot/bay/port numbering scheme. The slot refers to whichever slot the line card occupies in the router. The bay number is always 0. The port number is either 0 or 1.

Executing the `show interface` command for a Cisco 7600-ES20-10G line card located in slot 4 of a Cisco 7600 series router chassis produces the following:

```
show interface TenGigabitEthernet4/0/0   (first interface)
show interface TenGigabitEthernet4/0/1   (second interface)
```

Cisco 7600-ES20-GE Line Card Slot, Bay, and Port Locations

The Cisco 7600-ES20-GE line card uses a <slot, bay, port> numbering scheme. The slot refers to whichever slot the line card occupies in the router. The bay number is always zero. The port number is zero through 19.

Executing the `show interface` command for a Cisco 7600-ES20-GE line card located in slot 6 of a Cisco 7600 series router chassis produces the following (only first six interfaces are shown):

```
show interface TenGigabitEthernet6/0/0 (first interface)
show interface TenGigabitEthernet6/0/1 (second interface)
show interface TenGigabitEthernet6/0/2 (third interface)
show interface TenGigabitEthernet6/0/3 (fourth interface)
show interface TenGigabitEthernet6/0/4 (fifth interface)
show interface TenGigabitEthernet6/0/5 (sixth interface)
```

For more information about Cisco 7600 ES20 line card commands, see the “Command Summary for the Cisco 7600 ES20 Line Cards” and the “Cisco 7600 ES20 Line Card Commands” chapters in the Cisco 7600 Series Router SIP, SSC, and SPA Software Configuration Guide.

Cisco 7600-ES20-10G Line Card Overview

The following sections describe the Cisco 7600-ES20-10G line card:

- Cisco 7600-ES20-10G Line Card Processor, page 2-4
- Cisco 7600-ES20-10G Line Card LEDs, page 2-4
- Cisco 7600 SIP-200 Physical Specifications, page 2-5
- Cisco 7600 SIP-200 Line Card Memory Options, page 2-5
- Cisco 7600-ES20-10G Cables and Connectors, page 2-5
Cisco 7600-ES20-10G Line Card Processor

The processor on a Cisco 7600-ES20-GE line card is described in Table 2-2.

<table>
<thead>
<tr>
<th>Type</th>
<th>Speed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>400 megahertz (MHz) internal operating frequency</td>
<td>Broadcom 1125 MIPS-based design</td>
</tr>
</tbody>
</table>

Cisco 7600-ES20-10G Line Card LEDs

The Cisco 7600-ES20-10G line card has three LEDs, as shown in Figure 2-1. There is one Status LED and two A/L (Active Loopback) LEDs. Table 2-3 provides LED descriptions.

<table>
<thead>
<tr>
<th>LED Label</th>
<th>Color</th>
<th>State</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATUS</td>
<td>Red</td>
<td>On</td>
<td>The line card has encountered an error.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>On</td>
<td>The line card is online.</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
<td>On</td>
<td>The line card is loading.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Off</td>
<td>The line card is powered off.</td>
</tr>
<tr>
<td>A/L</td>
<td>Amber</td>
<td>On</td>
<td>The port is enabled but there is not a valid Ethernet link.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>On</td>
<td>The port is enabled and a valid Ethernet link has been established.</td>
</tr>
<tr>
<td></td>
<td>Green and Amber</td>
<td>On</td>
<td>Undefined condition.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Off</td>
<td>The port is not enabled by software.</td>
</tr>
</tbody>
</table>
Cisco 7600 SIP-200 Physical Specifications

The Cisco 7600-ES20-10G physical specifications are shown in Table 2-4.

<table>
<thead>
<tr>
<th>Description</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical dimensions</td>
<td>The Cisco 7600-ES20-10G line card occupies one module slot and can be operated in all Cisco 7600 Series Routers.</td>
</tr>
<tr>
<td>Shipping weight</td>
<td>8 lb (3.64 kg)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>32 to 104°F (0 to 40°C)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>10 to 90 percent, noncondensing</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>–4 to 149°F (–20 to 65°C)</td>
</tr>
</tbody>
</table>

Cisco 7600 SIP-200 Line Card Memory Options

Table 2-5 lists the memory options available for the Cisco 7600-ES20-10G line card:

<table>
<thead>
<tr>
<th>Line Card</th>
<th>Memory Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco 7600-ES20-10G</td>
<td>1 GB</td>
</tr>
</tbody>
</table>

Cisco 7600-ES20-10G Cables and Connectors

The Cisco 7600-ES20-10G line card supports the XFP-10GLR-OC192SR and XFP-10GER-OC192IR XFP modules.

The XFP-10GLR-OC192SR and XFP-10GER-OC192IR XFPs modules include an optical transmitter and receiver pair integrated with Clock and Data Recovery (CDR) integrated circuits.

The XFP modules provide high-speed serial links at the following rates: 9.95 Gbps (OC-192) and 10.3125 Gbps (10 Gigabit Ethernet) on single-mode fiber (SMF). The transmit side recovers and retimes the 10-Gbps serial data and passes it to a laser driver. The laser driver biases and modulates a 1310-nm or 1550-nm laser, enabling data transmission over SMF through an LC connector. The receive side recovers and retimes the 10-Gbps optical data stream from a photo-detector transimpedance amplifier and passes it to an output driver.

See the label on the XFP module for technology type and model.

- XFP module dimensions are:
  - Height: 12.5 mm
  - Width: 18.35 mm
  - Length: 71.1mm

The XFP module temperature range is 0°C to 70°C.
Table 2-6 lists XFP module port cabling specifications.

**Table 2-6** Port Cabling Specifications.

<table>
<thead>
<tr>
<th>XFP</th>
<th>Wavelength</th>
<th>Fiber Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>XFP-10GLR-OC192SR</td>
<td>1310 nm</td>
<td>SMF</td>
</tr>
<tr>
<td>XFP-10GER-OC192IR</td>
<td>1550 nm</td>
<td>SMF</td>
</tr>
<tr>
<td>XFP-10GZR-OC192LR</td>
<td>1550 nm</td>
<td>SMF</td>
</tr>
</tbody>
</table>

Figure 2-3 shows the cable type for use with the XFP optical transceiver module on the Cisco 7600-ES20-10G line card.

**Cisco 7600-ES20-GE Line Card Overview**

The following sections describe the Cisco 7600-ES20-GE line card:

- **Cisco 7600-ES20-GE Line Card Processor**, page 2-7
- **Cisco 7600-ES20-GE Line Card LEDs**, page 2-7
- **20-Port 10GE ES20 Physical Specifications**, page 2-8
Cisco 7600-ES20-GE Line Card Processor

The processor on a Cisco 7600-ES20-GE line card is described in Table 2-7.

Table 2-7 Cisco 7600-ES20-GE Line Card Processor

<table>
<thead>
<tr>
<th>Type</th>
<th>Speed</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>400 megahertz (MHz) internal operating frequency</td>
<td>Broadcom 1125 MIPS-based design</td>
</tr>
</tbody>
</table>

Cisco 7600-ES20-GE Line Card LEDs

The Cisco 7600-ES20-GE line card has 21 LEDs, as shown in Figure 2-4.

Figure 2-4 Cisco 7600-ES20-GE Line Card Faceplate

There is one line card STATUS LED and twenty A/L (Active Loopback) LEDs. Table 2-8 provides LED descriptions.

Table 2-8 Cisco 7600-ES20-GE Line Card LEDs

<table>
<thead>
<tr>
<th>LED Label</th>
<th>Color</th>
<th>State</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATUS</td>
<td>Red</td>
<td>On</td>
<td>The line card has encountered an error.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>On</td>
<td>The line card is online.</td>
</tr>
<tr>
<td></td>
<td>Yellow</td>
<td>On</td>
<td>The line card is loading.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Off</td>
<td>The line card is powered off.</td>
</tr>
<tr>
<td>A/L</td>
<td>Amber</td>
<td>On</td>
<td>The port is enabled but there is not a valid Ethernet link.</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>On</td>
<td>The port is enabled and a valid Ethernet link has been established.</td>
</tr>
<tr>
<td></td>
<td>Green and Amber</td>
<td>On</td>
<td>Undefined condition.</td>
</tr>
<tr>
<td></td>
<td>Off</td>
<td>Off</td>
<td>The port is not enabled by software.</td>
</tr>
</tbody>
</table>
Cisco 7600-ES20-GE Line Card Overview

Chapter 2      Overview: Cisco 7600 Series Ethernet Services 20G Line Cards

20-Port 10GE ES20 Physical Specifications

The Cisco 7600-ES20-GE line card physical specifications are shown in Table 2-9.

Table 2-9  
Cisco 7600-ES20-GE Line Card Physical Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical dimensions</td>
<td>The Cisco 7600-ES20-GE line card occupies one module slot and can be operated in all Cisco 7600 Series Routers.</td>
</tr>
<tr>
<td>Shipping weight</td>
<td>8 lb (3.64 kg)</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>32 to 104°F (0 to 40°C)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>10 to 90 percent, noncondensing</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>–4 to 149°F (–20 to 65°C)</td>
</tr>
</tbody>
</table>

Cisco 7600-ES20-GE Line Card Memory Options

Table 2-10 lists the memory options available for the Cisco 7600-ES20-GE line card:

Table 2-10  
Cisco 7600-ES20-10G Line Card Memory Options

<table>
<thead>
<tr>
<th>Line Card</th>
<th>Memory Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco 7600-ES20-GE line card</td>
<td>1 GB</td>
</tr>
</tbody>
</table>

Cisco 7600-ES20-GE Line Card Cables and Connectors

The Cisco 7600-ES20-GE line card uses a small form-factor pluggable (SFP) optical transceiver module installed in each GE SFP port.

Figure 2-5  
SFP Optics Module
Long-range SFP optical transceiver modules (for long-reach configurations) cannot be connected back-to-back without using an attenuator between the two of them.

**Note**

When shorter distances of single-mode fiber are used, it may be necessary to insert an inline optical attenuator in the link to avoid overloading the receiver.

---

**Table 2-11** provides cabling specifications for the SFP modules that can be installed on the Cisco 7600-ES20-GE line card. Note that all SFP ports have LC-type connectors.

**Table 2-11 SFP Module Port Cabling Specifications**

<table>
<thead>
<tr>
<th>SFP Modules</th>
<th>Wavelength (nm)</th>
<th>Fiber Type</th>
<th>Core Size (micron)</th>
<th>Modal Bandwidth (MHz/km)</th>
<th>Maximum Cable Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFP-GE-S</td>
<td>850</td>
<td>MMF¹</td>
<td>62.5</td>
<td>160</td>
<td>722 ft (220 m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>62.5</td>
<td>200</td>
<td>984 ft (300 m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50.0</td>
<td>400</td>
<td>1640 ft (500 m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50.0</td>
<td>500</td>
<td>1804 ft (550 m)</td>
</tr>
<tr>
<td>SFP-GE-L</td>
<td>1300</td>
<td>MMF² and SMF</td>
<td>62.5</td>
<td>500</td>
<td>1804 ft (550 m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50.0</td>
<td>400</td>
<td>1804 ft (550 m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50.0</td>
<td>500</td>
<td>1804 ft (550 m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9/10</td>
<td>—</td>
<td>6.2 miles (10 km)</td>
</tr>
<tr>
<td>SFP-GE-Z</td>
<td>1550</td>
<td>SMF</td>
<td>9/10</td>
<td>—</td>
<td>49.7 miles (80 km)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SMF³</td>
<td>8</td>
<td>62.1 miles (100 km)</td>
</tr>
<tr>
<td>SFP-GE-T</td>
<td>N/A</td>
<td>Copper</td>
<td>N/A</td>
<td>N/A</td>
<td>328 ft. (100 m)</td>
</tr>
</tbody>
</table>

1. Multimode fiber (MMF) only.
2. A mode-conditioning patch cord is required.
   When using the SFP-GE-L with 62.5-micron diameter MMF, you must install a mode-conditioning patch cord between the SFP module and the MMF cable on both the transmit and the receive ends of the link when link distances are greater than 984 ft (300 m).
   We do not recommend using the SFP-GE-L and MMF with no patch cord for very short link distance (tens of meters). The result could be an elevated bit error rate (BER).
Table 2-12  DWDM SFP Module Specifications

<table>
<thead>
<tr>
<th>SFP Modules</th>
<th>Fiber Type</th>
<th>Core Size (micron)</th>
<th>Modal Bandwidth (MHz/km)</th>
<th>Maximum Cable Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>DWDM-SFP-3346=</td>
<td>SMF</td>
<td>9um</td>
<td>N/A</td>
<td>49.7 miles (80 km)</td>
</tr>
<tr>
<td>DWDM-SFP-3739=</td>
<td>SMF</td>
<td>9um</td>
<td>N/A</td>
<td>49.7 miles (80 km)</td>
</tr>
<tr>
<td>DWDM-SFP-4134=</td>
<td>SMF</td>
<td>9um</td>
<td>N/A</td>
<td>49.7 miles (80 km)</td>
</tr>
<tr>
<td>DWDM-SFP-4532=</td>
<td>SMF</td>
<td>9um</td>
<td>N/A</td>
<td>49.7 miles (80 km)</td>
</tr>
<tr>
<td>DWDM-SFP-4931=</td>
<td>SMF</td>
<td>9um</td>
<td>N/A</td>
<td>49.7 miles (80 km)</td>
</tr>
<tr>
<td>DWDM-SFP-5332=</td>
<td>SMF</td>
<td>9um</td>
<td>N/A</td>
<td>49.7 miles (80 km)</td>
</tr>
<tr>
<td>DWDM-SFP-5736=</td>
<td>SMF</td>
<td>9um</td>
<td>N/A</td>
<td>49.7 miles (80 km)</td>
</tr>
<tr>
<td>DWDM-SFP-6141=</td>
<td>SMF</td>
<td>9um</td>
<td>N/A</td>
<td>49.7 miles (80 km)</td>
</tr>
</tbody>
</table>

For information on the supported wavelengths for the DWDM SFP modules specified in Table 2-11, see Table 1-5.
Preparing to Install a Cisco 7600 Series Ethernet Services 20G Line Card

This chapter describes the general equipment, safety, and site preparation requirements for installing a Cisco 7600 Series Ethernet Services 20G (ES20) line card. This chapter contains the following sections:

- Required Tools and Equipment, page 3-1
- Safety Guidelines, page 3-1
- Laser/LED Safety, page 3-8

Required Tools and Equipment

You need the following tools and parts to remove and install Cisco 7600 ES20 line cards. If you need additional equipment, contact a service representative.

- Cisco 7600 ES20 line card
- Interface cables to connect the Cisco 7600 ES20 line card with another router or switch
- Any SFP or XFP modules, or memory you need to install (and are not already installed)
- Number 1 Phillips and a 3/16-inch flat-blade screwdriver
- Number 2 Phillips screwdriver
- Your own electrostatic discharge (ESD)-prevention equipment or the ESD-preventive wrist or ankle strap and instructions supplied with your line card
- Antistatic mat
- Antistatic container
- Fiber-optic end-face cleaning tools and inspection equipment. For complete information on inspecting and cleaning fiber-optic connections, refer to the white-paper document at this URL: http://www.cisco.com/en/US/tech/tk482/tk876/technologies_white_paper09186a0080254eba.shtml

Safety Guidelines

This section provides safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.
General Precautions

Follow these general precautions while handling the line card hardware:

- The module needs to be properly aligned and that the module MUST be gently pushed into the chassis.
- Customers must take care while inserting a line card, to insert the line card through appropriate guides provided along the sides of the chassis. Failure to do so can result in connector damage and non functional chassis.
- As a general caution before installing any line card or supervisor engine, you must inspect both the chassis and line card connectors and verify for existing damage. If damage is present, do not insert the line card(s) into the chassis. A case should be opened with Cisco TAC to further troubleshoot the problem.

Safety Warnings

Safety warnings appear throughout this publication in procedures that, if performed incorrectly, might harm you. A warning symbol precedes each warning statement.

Warning Definition

**Warning**

**IMPORTANT SAFETY INSTRUCTIONS**

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071

**SAVE THESE INSTRUCTIONS**

**Waarschuwing**

**BELANGRIJKE VEILIGHEIDSINSTRUCTIES**

Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van de standaard praktijken om ongelukken te voorkomen. Gebruik het nummer van de verklaring onderaan de waarschuwing als u een vertaling van de waarschuwing die bij het apparaat wordt geleverd, wilt raadplegen.

**BEWAAR DEZE INSTRUCTIES**
Chapter 3  Preparing to Install a Cisco 7600 Series Ethernet Services 20G Line Card

Safety Guidelines

Varoitus  TÄRKEITÄ TURVALLISUUSOHJEITA


SÄILYTÄ NÄMÄ OHJEET

Attention  IMPORTANTES INFORMATIONS DE SÉCURITÉ

Ce symbole d’avertissement indique un danger. Vous vous trouvez dans une situation pouvant entraîner des blessures ou des dommages corporels. Avant de travailler sur un équipement, soyez conscient des dangers liés aux circuits électriques et familiarisez-vous avec les procédures couramment utilisées pour éviter les accidents. Pour prendre connaissance des traductions des avertissements figurant dans les consignes de sécurité traduites qui accompagnent cet appareil, réfrez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

CONSERVEZ CES INFORMATIONS

Warnung  WICHTIGE SICHERHEITSHINWEISE


BEWAHREN SIE DIESE HINWEISE GUT AUF.

Avvertenza  IMPORTANTI ISTRUZIONI SULLA SICUREZZA

Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di intervenire su qualsiasi apparecchiatura, occorre essere al corrente dei pericoli relativi ai circuiti elettrici e conoscere le procedure standard per la prevenzione di incidenti. Utilizzare il numero di istruzione presente alla fine di ciascuna avvertenza per individuare le traduzioni delle avvertenze riportate in questo documento.

CONSERVARE QUESTE ISTRUZIONI

Advarsel  VIKTIGE SIKKERHETSIINSTRUKSJONER

Dette advarselssymbolet betyr fare. Du er i en situasjon som kan føre til skade på person. Før du begynner å arbeide med noe av utstyr, må du være oppmerksom på farene forbundet med elektriske kretser, og kjenne til standardprosedyrer for å forhindre ulykker. Bruk nummeret i slutt av hver advarsel for å finne oversettelsen i de oversatte sikkerhetsadvarsleene som fulgte med denne enheten.

TA VARE PÅ DISSE INSTRUKSJONENE
INSTRUÇÕES IMPORTANTES DE SEGURANÇA

Este símbolo de aviso significa perigo. Você está em uma situação que poderá ser causadora de lesões corporais. Antes de iniciar a utilização de qualquer equipamento, tenha conhecimento dos perigos envolvidos no manuseio de circuitos elétricos e familiarize-se com as práticas habituais de prevenção de acidentes. Utilize o número da instrução fornecido ao final de cada aviso para localizar sua tradução nos avisos de segurança traduzidos que acompanham este dispositivo.

GUARDE ESTAS INSTRUÇÕES

¡Advertencia! INSTRUCCIONES IMPORTANTES DE SEGURIDAD

Este símbolo de aviso indica peligro. Existe riesgo para su integridad física. Antes de manipular cualquier equipo, considere los riesgos de la corriente eléctrica y familiarícese con los procedimientos estándar de prevención de accidentes. Al final de cada advertencia encontrará el número que le ayudará a encontrar el texto traducido en el apartado de traducciones que acompaña a este dispositivo.

GUARDE ESTAS INSTRUCCIONES

VIKTIGA SÄKERHETSANVISNINGAR


SPARA DESSA ANVISNINGAR

FONTOS BIZTONSÁGI ELOÍRÁSOK

Ez a figyelmezteto jel veszélyre utal. Sérülésveszélyt rejto helyzetben van. Mielott bármely berendezésen munkát végezze, legyen figyelemmel az elektromos áramkörök okozta kockázatokra, és ismerkedjen meg a szokásos balesetvédelmi eljárásokkal. A kiadványban szereplő figyelmeztetések fordítása a készülékhez mellékel biztonsági figyelmeztetések között található; a fordítás az egyes figyelmeztetések végén látható szám alapján kereshető meg.

ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

ВАЖНЫЕ ИНСТРУКЦИИ ПО СОБЛЮДЕНИЮ ТЕХНИКИ БЕЗОПАСНОСТИ

Этот символ предупреждения обозначает опасность. То есть имеет место ситуация, в которой следует опасаться телесных повреждений. Перед эксплуатацией оборудования выясните, каким опасностям может подвергаться пользователь при использовании электрических цепей, и ознакомьтесь с правилами техники безопасности для предотвращения возможных несчастных случаев. Воспользуйтесь номером заявления, приведенным в конце каждого предупреждения, чтобы найти его переведенный вариант в переводе предупреждений по безопасности, прилагаемом к данному устройству.

СОХРАНИТЕ ЭТИ ИНСТРУКЦИИ
Chapter 3      Preparing to Install a Cisco 7600 Series Ethernet Services 20G Line Card

Safety Guidelines

警告 重要な安全性说明

此警告符号代表危险。您正处于可能受到严重伤害的工作环境中。在您使用设备开始工作之前，必须充分意识
到触电的危险，并熟练掌握防止事故发生的标准工作程序。请根据每项警告结尾提供的声明号码来找到此
设备的安全性警告说明的翻译文本。

请保存这些安全性说明

警告 安全上の重要な注意事項

「危険」の意味です。人身事故を予防するための注意事項が記録されています。装置の取り扱い作業を
行うときは、電気回路の危険性に注意し、一般的な事故防止策を留意してください。警告の各国語版は、
各注意事項の番号を基に、装置に付属の「Translated Safety Warnings」を参照してください。

これらの注意事項を保管してください。

주의 중요 안전 지침

이 경고 기호는 위험을 나타냅니다. 작업자가 신체 부상을 일으킬 수 있는 위험한 환경에 있습니다.
장비에 작업을 수행하기 전에 전기 회로와 관련된 위험을 숙지하고 표준 작업 관례를 숙지하여 사고
를 방지하십시오. 각 경고의 마지막 부분에 있는 경고문 번호를 참조하여 이 장치의 함께 제공되는
번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

تحذير إرشادات الأمان الهامة

يوضح رمز التحذير هذا وجود خطر. هذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات قبل بدء العمل.
إحترم مخاطر التعرض للإصابات الكبيرة وكن على علم بالإجراءات القصيدة للعزلة دون وقوع أي حوادث. استخدم
إرشادات الامان الموضحة في آخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز.

Čime ih pohitit te oznake upozorenja

Ovaj simbol upozorenja predstavlja opasnost. Najznačajnije opasnosti i njihove uzroke

SAČUVAJTE OVE Upute
Chapter 3 Preparing to Install a Cisco 7600 Series Ethernet Services 20G Line Card

Safety Guidelines

**Upozornění**

DŮLEŽITÉ BEZPEČNOSTNÍ POKYNY

Tento upozorňující symbol označuje nebezpečí. Jste v situaci, která by mohla způsobit nebezpečí úrazu. Před prací na jakémkoliv vybavení si uvědomte nebezpečí související s elektrickými obvody a seznamte se se standardními opatřeními pro předcházení úrazům. Podle čísla na konci každého upozornění vyhledejte jeho překlad v přeložených bezpečnostních upozorněních, která jsou přiložena k zařízení.

**USCHOVEJTE TYTO POKYNY**

**ΣΗΜΑΝΤΙΚΕΣ ΟΔΗΓΙΕΣ ΑΣΦΑΛΕΙΑΣ**

Αυτό το προειδοποιητικό σύμβολο σημαίνει κίνδυνο. Βρίσκεστε σε κατάσταση που μπορεί να προκαλέσει τραυματισμό. Πριν εργαστείτε σε οποιοδήποτε εξοπλισμό, να έχετε υπόψη σας τους κίνδυνους που σχετίζονται με τα ηλεκτρικά κυκλώματα και να έχετε εξοικειωθεί με τις συνήθεις πρακτικές για την αποφυγή ατυχημάτων. Χρησιμοποιήστε τον αριθμό δήλωσης που παρέχεται στο τέλος κάθε προειδοποίησης, για να εντοπίσετε τη μετάφραση της στις μεταφρασμένες προειδοποιητικές οδηγίες ασφαλείας που συνοδεύουν τη συσκευή.

ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ

**חזרה הביטוי השימוע**

希欧尔 זיראה היא הגורם האפשרי ביותר. האה נצאת במובלעת העולה לדגימה מעלית. İn כוחות על יעדים כנראה, עלייך לשווק את כל היצירתות הממסות השכליים ולוחמי את התוכן המסובלים למדינת תואמות השתייש. התוכן במטפס החוזרים הממונעים מسقط כלומר הכתר את התוכן בצרות התוכן בתוכנות שמצטרפים לתחנה.

**שמרו חזרה על זה**
**Safety Guidelines**

**Electrical Equipment Guidelines**

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe; carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

**Telephone Wiring Guidelines**

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
• Use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. An Cisco 7600 ES20 line card comprises printed circuit boards that are fixed in a metal carrier. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

• Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
• Connect the equipment end of the strap to an unfinished chassis surface.
• When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
• When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
• Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
• Place a removed board component-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
• Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
• Never attempt to remove the printed circuit board from the metal carrier.

Caution

For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohms).

Laser/LED Safety

An optical single-mode transmitter uses a small laser to transmit the light signal to the network ring. Keep the transmit port covered whenever a cable is not connected to it. Although multimode transceivers typically use LEDs for transmission, it is good practice to keep open ports covered and avoid staring into open ports or apertures. The single-mode aperture port contains a laser warning label, as shown in Figure 3-1. The multimode aperture contains a Class 1 LED warning label, as shown in Figure 3-1. These warnings apply to SFP and XFP modules that transmit signals via an optical carrier signal.
Figure 3-1  Class 1 Laser Warning Labels for Single-Mode Port

Warning  Class 1 laser product. Statement 1008

Warning  Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

Waarschuwing  Losgekoppelde of losgeraakte glasvezels of aansluitingen kunnen onzichtbare laserstraling produceren. Kijk niet rechtstreeks in de straling en gebruik geen optische instrumenten rond deze glasvezels of aansluitingen.

Varoitus  Irrotetusta kuiduista tai liittimistä voi tulla näkymätöntä lasersäteilyä. Älä tuijota säteitä tai katso niitä suoraan optisilla välineillä.


Avvertenza  Le fibre ottiche ed i relativi connettori possono emettere radiazioni laser. I fasci di luce non devono mai essere osservati direttamente o attraverso strumenti ottici.

Advarsel  Det kan forekomme usynlig laserstråling fra fiber eller kontakter som er frakoblet. Stirr ikke direkte inn i strålene eller se på dem direkte gjennom et optisk instrument.

Aviso  Radiação laser invisível pode ser emitida de conectores ou fibras desconectadas. Não olhe diretamente para os feixes ou com instrumentos ópticos.

¡Advertencia!  Es posible que las fibras desconectadas emitan radiación láser invisible. No fije la vista en los rayos ni examine éstos con instrumentos ópticos.

Warning!  Osynlig laserstråling kan avges från fränkopplade fiber eller kontaktdon. Rikta inte blicken in i strålar och titta aldrig direkt på dem med hjälp av optiska instrument.

A nem csatlakoztatott üvegszáliak és csatlakozók láthatatlan lézersugárzást bocsáthatnak ki. Ne nézzen bele a sugárbá, és ne nézze közvetlenül, optikai berendezések segítségével!

Предупреждение  Отключенные световоды и разъемы могут испускать невидимое лазерное излучение. Не допускайте попадания лазерного луча в глаза и не смотрите на него через оптические приборы.
Chapter 3 Preparing to Install a Cisco 7600 Series Ethernet Services 20G Line Card

Laser/LED Safety

Aviso Radiação laser invisível pode ser emitida a partir de fibras ou conectores desconectados. Não fixe o olhar nos feixes e nem olhe diretamente com instrumentos ópticos.

Advarsel Usynlig laserstråling kan forekomme fra brugte fibre eller stik. Stir ikke ind i stråler eller direkte med optiske instrumenter.

 تحذير من المحتمل ابعاد أشعة الليزر من الألياف غير الملتصلة أو التوصيلات. لا تتحقت النظر في الشعاع أو النظر مباشرة بدون أي أداة بصرية.

Upozornění Odpojená vlákna kabelů či konektory mohou vyzařovat neviditelné laserové záření. Nedívajte se do paprsků ani nepozorujte přímo pomocí optických přístrojů.

Proeídoπιπηση Από αποσυνδεδεμένες ίνες ή υποδοχές μπορεί να εκπέμπεται σάρανη ακτινοβολία λέξεων. Μην κοιτάτε απευθείας τις δέσμες φωτός και μην τις απεικονίζετε απευθείας με οπτικά όργανα.

azziha تنيق فلتين شل كرينات ليدر-كلمات مكسوين ًًً ألا متمبرين متألقتين. لا تنظر بصرية بشكل مباشر لأولا تبين بمستشعر بكمبيوتر أوفتيمن. 

Opomena Невидимо лазерско зрачење може да ће зраки од исключените влакна или прикључци. Не гледајте во зраци и не прегледувајте ги директно со оптички инструменти.

Ostrzeżenie Odłączone światłowody lub złącza mogą emitować niewidzialne promieniowanie laserowe. Nie należy patrzeć prosto w wiązku lasera ani bezpośrednio obserwować jej przy użyciu przyrządów optycznych.

Upozornenie Odpojené vlákna káble ake konektory môžu vyžiavať neviditeľné laserové žiarenie. Nepozorujte sa do lúčov ani ich nepozorujte priamo pomocou optických prístrojov.
Warning: Invisible laser radiation may be emitted from disconnected fibers or connectors. Do not stare into beams or view directly with optical instruments. Statement 1051

Warning: Class 1 LED product. Statement 1027
Installing and Removing a Cisco 7600 Series Ethernet Services 20G Line Card

This chapter describes how to install or remove Cisco 7600 Series Ethernet Services 20G (ES20) line cards on the Cisco 7600 Series Routers. This chapter contains the following sections:

- Handling Cisco 7600 Series Ethernet Services 20G Line Cards, page 4-1.
- Online Insertion and Removal, page 4-2.

Handling Cisco 7600 Series Ethernet Services 20G Line Cards

Each Cisco 7600 ES20 line card circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage. Before you begin installation, read Chapter 3, “Preparing to Install a Cisco 7600 Series Ethernet Services 20G Line Card,” for a list of parts and tools required for installation.

Caution

Always handle the Cisco 7600 ES20 line card by the carrier edges and handle; never touch the line card components or connector pins. (See Figure 4-1.)

When a slot is not in use, a blank filler plate must be installed in the empty slot to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the installed modules. If you plan to install a Cisco 7600 ES20 line card in a slot that is not in use, you must first remove the blank filler plate.
Online Insertion and Removal

The Cisco 7600 series routers support online insertion and removal (OIR) of the Cisco 7600 ES20 line card, as well as OIR for the SFP or XFP modules. Therefore, you can remove a Cisco 7600 ES20 line card with its SFP or XFP modules still intact, or you can remove SFP or XFP modules independently from the Cisco 7600 ES20 line card, leaving the line card installed in the router.

This section includes the following topics on OIR support:

- Preparing for Online Removal of a Cisco 7600 Series Ethernet Services 20G Line Card, page 4-2
- Verifying Deactivation and Activation of a Cisco 7600 Series Ethernet Services 20G Line Card, page 4-4
- Preparing for Online Removal of a SFP or XFP Modules, page 4-5

Preparing for Online Removal of a Cisco 7600 Series Ethernet Services 20G Line Card

The Cisco 7600 series routers support OIR of the Cisco 7600 ES20 line card. To do this, you can power down a Cisco 7600 ES20 line card (which automatically deactivates any installed SFP or XFP modules) and remove the Cisco 7600 ES20 line card with the SFP or XFP modules still intact.

Although graceful deactivation of a ES20 line card is preferred using the **no power enable module** command, the Cisco 7600 series routers do support removal of the ES20 line card without deactivating it first.

If you plan to remove a Cisco 7600 ES20 line card, you can deactivate the Cisco 7600 ES20 line card first, using the **no power enable module** global configuration command.
When you deactivate a Cisco 7600 ES20 line card using this command, it automatically deactivates each of the SFP or XFP modules that are installed in that Cisco 7600 ES20 line card. Therefore, it is not necessary to deactivate each of the SFP or XFP modules prior to deactivating the Cisco 7600 ES20 line card.

**Deactivating a Cisco 7600 Series Ethernet Services 20G Line Card**

To deactivate a ES20 Ethernet line card and its installed SFPs or XFPs prior to removal of the ES20 line card, use the following command in global configuration mode:

```
Router(config)# no power enable module slot
```

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Router(config)# no power enable module slot</td>
<td>Shuts down any installed interfaces, and deactivates the ES20 line card in the specified slot, where:</td>
</tr>
<tr>
<td></td>
<td>• slot—Specifies the chassis slot number where the ES20 line card is installed.</td>
</tr>
</tbody>
</table>

For more information about chassis slot numbering, refer to the Chapter 2, “Identifying Slots and Subslots for the Cisco 7600 Series Ethernet Services 20G Line Cards,” section in this guide.

**Reactivating a Cisco 7600 Series Ethernet Services 20G Line Card**

Once you deactivate a Cisco 7600 ES20 line card, whether or not you have performed an OIR, you must use the **power enable module** global configuration command to reactivate the Cisco 7600 ES20 line card.

If you did not issue a command to deactivate the SFP or XFP modules installed in a Cisco 7600 ES20 line card, but you did deactivate the Cisco 7600 ES20 line card using the **no power enable module** command, then you do not need to reactivate the SFP or XFP modules after an OIR of the Cisco 7600 ES20 line card. The installed SFP or XFP modules automatically reactivate upon reactivation of the Cisco 7600 ES20 line card in the router.

For example, consider the case where you remove a Cisco 7600 ES20 line card from the router to replace it with another Cisco 7600 ES20 line card. You reinstall the same SFP or XFP modules into the new Cisco 7600 ES20 line card. When you enter the **power enable module** command on the router, the SFP or XFP modules will automatically reactivate with the new Cisco 7600 ES20 line card.

To activate a Cisco 7600 ES20 line card and its installed SFP or XFP modules after the Cisco 7600 ES20 line card has been deactivated, use the following command in global configuration mode:

```
Router(config)# power enable module slot
```

<table>
<thead>
<tr>
<th>Command</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Router(config)# power enable module slot</td>
<td>Activates the ES20 line card in the specified slot and its installed SFPs or XFPs, where:</td>
</tr>
<tr>
<td></td>
<td>• slot—Specifies the chassis slot number where the ES20 line card is installed.</td>
</tr>
</tbody>
</table>

For more information about chassis slot numbering, refer to the Identifying Slots and Subslots for the Cisco 7600 Series Ethernet Services 20G Line Cards, page 2-2 section in this guide.
Verifying Deactivation and Activation of a Cisco 7600 Series Ethernet Services 20G Line Card

To verify the deactivation of a ES20 line card, enter the `show module` command in privileged EXEC configuration mode. Observe the Status field associated with the ES20 line card that you want to verify.

The following example shows that the ES20 line cards located in slots 2 and 4 are deactivated. This is indicated by its “PwrDown” status.

```
Router# show module
Mod Ports Card Type                              Model              Serial No.
--- ----- -------------------------------------- ------------------ -----------
2  20 ESM20G                                 7600-ES20-BASE     JAB1030007C
4  20 ESM20G                                 7600-ES20-BASE     JAB10230687
5  1 1-subslot SPA Interface Processor-600  7600-SIP-600       JAB091604D2
6  2 Supervisor Engine 720 (Active)         WS-SUP720-3BXL     SAL10265W03
Mod MAC addresses                       Hw    Fw           Sw           Status
--- ---------------------------------- ------ ------------ ------------ -------
2  00e0.aabb.cc00 to 00e0.aabb.cc00   1.0   12.2(2006032 12.2(2006110 PwrDown
4  00e0.aabb.cc00 to 00e0.aabb.cc00   0.32  12.2(2006032 12.2(2006110 PwrDown
5  0016.468f.554c to 0016.468f.558b   1.0   12.2(18r)SX4 12.2(2006110 Ok
6  0014.a982.2684 to 0014.a982.2687   5.2   8.4(2)       12.2(2006110 Ok
Mod Sub-Module                  Model              Serial       Hw     Status
---- --------------------------- ------------------ ----------- ------- -------
2  ESM20G/PFC3C Distributed Fo 7600-ES20-D3C      JAB1030008H  1.0    PwrDown
4  ESM20G Distributed Forward 7600-ESM-DPC-3CXL  JAB10230672  0.16   PwrDown
5  SIP-600 Distributed Forward 7600-SIP-600-DC  JAB091604DU  1.0    Ok
5/0 1x10GE XFP SPA                     SPA-1XTENGE-XFP    PRTA2104311  3.2    Ok
6  Policy Feature Card 3              WS-F6K-PFC3BXL     SAL10265EF8  1.8    Ok
6  MSFC3 Daughterboard                WS-SUP720          SAL09253VH8  2.5    Ok
Mod  Online Diag Status
---- -------------------
2  Not Applicable
4  Not Applicable
5  Bypass
5/0 Bypass
6  Bypass
```

To verify activation and proper operation of a ES20 line card, enter the `show module` command and observe “Ok” in the Status field as shown in the following example:

```
Router# show module
Mod Ports Card Type                              Model              Serial No.
--- ----- -------------------------------------- ------------------ -----------
2  20 ESM20G                                 7600-ES20-BASE     JAB1030007C
4  20 ESM20G                                 7600-ES20-BASE     JAB10230687
5  1 1-subslot SPA Interface Processor-600  7600-SIP-600       JAB091604D2
6  2 Supervisor Engine 720 (Active)         WS-SUP720-3BXL     SAL10265W03
Mod MAC addresses                       Hw    Fw           Sw           Status
--- ---------------------------------- ------ ------------ ------------ -------
2  00e0.aabb.cc00 to 00e0.aabb.cc00   1.0   12.2(2006032 12.2(2006110 Ok
4  00e0.aabb.cc00 to 00e0.aabb.cc00   0.32  12.2(2006032 12.2(2006110 Ok
5  0016.468f.554c to 0016.468f.558b   1.0   12.2(18r)SX4 12.2(2006110 Ok
6  0014.a982.2684 to 0014.a982.2687   5.2   8.4(2)       12.2(2006110 Ok
Mod Sub-Module                  Model              Serial       Hw     Status
---- --------------------------- ------------------ ----------- ------- -------
2  ESM20G/PFC3C Distributed Fo 7600-ES20-D3C      JAB1030008H  1.0    Ok
4  ESM20G Distributed Forward 7600-ESM-DPC-3CXL  JAB10230672  0.16   Ok
5  SIP-600 Distributed Forward 7600-SIP-600-DC  JAB091604DU  1.0    Ok
5/0 1x10GE XFP SPA                     SPA-1XTENGE-XFP    PRTA2104311  3.2    Ok
6  Policy Feature Card 3              WS-F6K-PFC3BXL     SAL10265EF8  1.8    Ok
6  MSFC3 Daughterboard                WS-SUP720          SAL09253VH8  2.5    Ok
```

To verify activation and proper operation of a ES20 line card, enter the `show module` command and observe “Ok” in the Status field as shown in the following example:
Preparing for Online Removal of a SFP or XFP Modules

The Cisco 7600 series routers support OIR of a SFP or XFP modules independently of removing the Cisco 7600 ES20 line card. This means that a Cisco 7600 ES20 line card can remain installed in the router with one XFP remaining active, while you remove another XFP from one of the line card ports. Or, that an Cisco 7600 ES20 line card can remain installed in the router with some number of SFP modules remaining active, while you remove other SFP modules from the line card ports.

The interface configuration is retained (recalled) if a Cisco 7600 ES20 line card or SFP or XFP is removed and then replaced with one of the same type.

If you are planning to remove a Cisco 7600 ES20 line card along with its SFP or XFP modules, then you do not need to follow the instructions in this section. To remove a Cisco 7600 ES20 line card, see the “Preparing for Online Removal of a Cisco 7600 Series Ethernet Services 20G Line Card” section on page 4-2.

SFP Module or XFP Module OIR

The SFP and XFP modules support online insertion and removal (OIR). However, if the line card is already installed in the router and the system is operational, we recommend that you administratively shut down the SFP or XFP module port before installing a new module.
Installing and Removing SFP and XFP Modules

This chapter describes how to install or remove small form-factor pluggables (SFP modules or XFP modules) on the Cisco 7600 Series Ethernet Services 20G (ES20) line card. This chapter contains the following sections:

- Removing and Installing SFP Modules, page 5-1.
- Removing and Installing XFP Modules, page 5-11.

Removing and Installing SFP Modules

Note

The Cisco 7600-ES20-GE will only support the SFP modules listed in this document. An SFP check is run every time an SFP module is inserted into a Cisco 7600-ES20-GE and only SFP modules that pass this check are usable.

Caution

Before you remove or install an SFP module, read the installation information in this section and the “Laser/LED Safety” section on page 3-8.

Caution

Protect the SFP modules by inserting clean dust covers into them after the cables are removed. Be sure to clean the optic surfaces of the fiber cables before you plug them back into the optical ports of another SFP module. Avoid getting dust and other contaminants into the optical ports of your SFP modules, because the optics will not work correctly when obstructed with dust.

Caution

It is strongly recommended that you do not install or remove the SFP module with fiber-optic cables attached to it because of the potential of damaging the cable, the cable connector, or the optical interfaces in the SFP module. Disconnect all cables before removing or installing an SFP module. Removing and inserting an SFP module can shorten its useful life, so you should not remove and insert SFP modules any more often than is absolutely necessary.
SFP modules use one of four different latching devices to install and remove the module from a port. The four types of SFP module latching devices are described in the following sections:

- Bale Clasp SFP Module, page 5-2
- Mylar Tab SFP Module, page 5-4
- Actuator Button SFP Module, page 5-6
- Slide Tab SFP Module, page 5-8

### Bale Clasp SFP Module

The bale clasp SFP module has a clasp that you use to remove or install the SFP module. (See Figure 5-1.)

![Bale Clasp SFP Module](image)

### Removing a Bale Clasp SFP Module

To remove this type of SFP module, follow these steps:

**Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

**Step 2** Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

**Step 3** Open the bale clasp on the SFP module with your index finger in a downward direction, as shown in Figure 5-2. If the bale clasp is obstructed and you cannot use your index finger to open it, use a small flat-blade screwdriver to open the bale clasp.

**Step 4** Grasp the SFP module between your thumb and index finger and carefully remove it from the port, as shown in Figure 5-2.
Chapter 5 Installing and Removing SFP and XFP Modules

Removing and Installing SFP Modules

Figure 5-2 Removing a Bale Clasp SFP Module

Step 5 Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

Step 6 Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.

Installing a Bale Clasp SFP Module

To install this type of SFP module, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
Step 2  Close the bale clasp before inserting the SFP module.

Step 3  Line up the SFP module with the port and slide it into the port. (See Figure 5-3.)

**Figure 5-3 Installing a Bale Clasp SFP Module into a Port**

---

**Note**
Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module. If the SFP module is not completely seated and secured in the receptacle, you will hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle.

---

**Mylar Tab SFP Module**

The mylar tab SFP module has a tab that you pull to remove the module from a port. (See Figure 5-4.)

**Figure 5-4 Mylar Tab SFP Module**

---

**Removing a Mylar Tab SFP Module**

To remove this type of SFP module, follow these steps:

**Step 1**  Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.
## Removing and Installing SFP Modules

### Step 2
Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

### Step 3
Pull the tab gently in a slightly downward direction until it disengages from the port, then pull the SFP module out. (See Figure 5-5.)

*Figure 5-5 Removing a Mylar Tab SFP Module*

### Step 4
Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

### Step 5
Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.

---

**Caution**
When pulling the tab to remove the SFP module, be sure to pull in a straight outward motion so you remove the SFP module from the port in a parallel direction. Do not twist or pull the tab, because you might disconnect it from the SFP module.

## Installing a Mylar Tab SFP Module

To install this type of SFP module, follow these steps:

### Step 1
Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

### Step 2
Line up the SFP module with the port, and slide it into place. (See Figure 5-6.)
Removing and Installing SFP Modules

Chapter 5 Installing and Removing SFP and XFP Modules

Removing and Installing SFP and XFP Modules

Figure 5-6 Installing a Mylar Tab SFP Module

Note Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module. If the SFP module is not completely seated and secured in the receptacle, you will hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle.

Actuator Button SFP Module

The actuator button SFP module includes a button that you push in order to remove the SFP module from a port. (See Figure 5-7.)

Figure 5-7 Actuator Button SFP Module

Removing an Actuator Button SFP Module

To remove this type of SFP module, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

Step 3 Gently press the actuator button on the front of the SFP module until it clicks and the latch mechanism activates, releasing the SFP module from the port. (See Figure 5-8.)
Step 4 Grasp the actuator button between your thumb and index finger and carefully pull the SFP module from the port.

Step 5 Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

Step 6 Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.
Installing an Actuator Button SFP Module

To install this type of SFP module, follow these steps:

**Step 1**  Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

**Step 2**  Line up the SFP module with the port and slide it in until the actuator button clicks into place. (See Figure 5-9.) Be sure not to press the actuator button as you insert the SFP module because you might inadvertently disengage the SFP module from the port.

**Note**  Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module. If the SFP module is not completely seated and secured in the receptacle, you will hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle.

Slide Tab SFP Module

The slide tab SFP module has a tab underneath the front of the SFP module that you use to disengage the module from a port. (See Figure 5-10.)
Removing a Slide Tab SFP Module

To remove this type of SFP module, follow these steps:

**Step 1** Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

**Step 2** Disconnect and remove all interface cables from the ports; note the current connections of the cables to the ports on the line card.

**Step 3** Grasp the SFP module between your thumb and index finger.

**Step 4** With your thumb, push the slide tab on the bottom front of the SFP module in the direction of the line card to disengage the module from the line card port. (See Figure 5-11.)

![Figure 5-11 Disengaging the Slide Tab](image)

**Step 5** With the tab still pushed, carefully pull the SFP module from the port as shown in Figure 5-12.

**Caution** You must disengage the SFP module by pushing on the slide tab before you can pull out the SFP module. If you pull on the SFP module without disengaging the tab, you can damage the SFP module.
Removing and Installing SFP Modules

Figure 5-12 Removing a Slide Tab SFP Module

Step 6 Place the removed SFP module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

Step 7 Protect your line card by inserting clean SFP module cage covers into the optical module cage when there is no SFP module installed.

Installing a Slide Tab SFP Module

To install this type of SFP module, follow these steps:

Step 1 Attach an ESD-preventive wrist or ankle strap and follow its instructions for use.

Step 2 Hold the SFP module with the hardware label facing up.

Caution The SFP module must be inserted with the hardware label facing up to avoiding damaging the module or the line card.

Step 3 Insert the SFP module into the appropriate slot and gently push on it until it snaps into the slot tightly. (See Figure 5-13.)
Verifying SFP Module Installation

Verify that the SFP modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP module. If the SFP module is not completely seated and secured in the receptacle, you will hear a click as the triangular pin on the bottom of the SFP module snaps into the hole in the receptacle.

Removing and Installing XFP Modules

Notes on XFP Transceivers

The dual LC connector on the XFP transceiver modules support network interface cables with either Physical Contact (PC) or Ultra-Physical Contact (UPC) polished face types. The dual LC connector on the XFP transceiver modules do not support network interface cables with an Angle Polished Connector (APC) polished face type.

The 10-Gigabit XFP transceiver module is a hot-swappable I/O device that plugs into 10-Gigabit ports. (See Figure 5-14.) The XFP transceiver module connects the electrical circuitry of the system with the optical network.
Figure 5-14  10-Gigabit XFP Transceiver Module

1. Transmit optical bore
2. Receive optical bore
3. Transceiver socket connector
4. Bale clasp (locked position)
5. Dust plug
6. Bale clasp (unlocked position)
Table 5-1 lists the port cabling specifications for the 10-Gigabit XFP transceiver modules. Table 5-2 lists the XFP transceiver optical transmit and receive specifications.

### Table 5-1  XFP Transceiver Port Cabling Specifications

<table>
<thead>
<tr>
<th>XFP Product Number</th>
<th>Nominal Wavelength (nm)</th>
<th>Cable Type</th>
<th>Core Size (microns)</th>
<th>Modal Bandwidth (MHz/km)</th>
<th>Maximum Cabling Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>XFP-10GLR-OC192SR=</td>
<td>1310</td>
<td>SMF</td>
<td>G.652</td>
<td>—</td>
<td>10 km (6.2 miles)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10-Gigabit Ethernet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 km (1.24 miles)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OC-192/STM-64 SR1</td>
</tr>
<tr>
<td>XFP-10GER-OC192IR=</td>
<td>1550</td>
<td>SMF</td>
<td>G.652</td>
<td>—</td>
<td>40 km (24.86 miles)</td>
</tr>
<tr>
<td>XFP-10GZR-OC192IR=</td>
<td>1550</td>
<td>SMF</td>
<td>G.652</td>
<td>—</td>
<td>80 km (10 miles)</td>
</tr>
</tbody>
</table>

### Table 5-2  XFP Transceiver Optical Transmit and Receive Specifications

<table>
<thead>
<tr>
<th>XFP Product Number</th>
<th>Transceiver Operating Mode</th>
<th>Transmit Power (dBm)</th>
<th>Receive Power (dBm)</th>
<th>Transmit and Receive Wavelength (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>XFP-10GLR-OC192SR=</td>
<td>10GBASE-LR, 1310-nm SMF</td>
<td>+0.5 Max</td>
<td>+0.5 (Max)</td>
<td>1260 to 1355 (TX)</td>
</tr>
<tr>
<td></td>
<td>(10.3125-Gbps line rate)</td>
<td>−8.2 Min</td>
<td>−14.4 (Min)</td>
<td>1260 to 1565 (RX)</td>
</tr>
<tr>
<td></td>
<td>OC-192/STM-64 SR1, 1310-nm SMF</td>
<td>−1.0 Max</td>
<td>−1.0 (Max)</td>
<td>1290 to 1330 (TX)</td>
</tr>
<tr>
<td></td>
<td>(9.95328-Gbps line rate)</td>
<td>−6.0 Min</td>
<td>−11.0 (Min)</td>
<td>1260 to 1565 (RX)</td>
</tr>
<tr>
<td>XFP-10GER-OC192IR=</td>
<td>10GBASE-ER, 1550-nm SMF</td>
<td>+4.0 Max</td>
<td>−1.0 (Max)</td>
<td>1530 to 1565 (TX)</td>
</tr>
<tr>
<td></td>
<td>(10.3125-Gbps line rate)</td>
<td>−4.7 Min</td>
<td>−15.8 (Min)</td>
<td>1260 to 1565 (RX)</td>
</tr>
<tr>
<td></td>
<td>OC-192/STM-64 IR2, 1550-nm SMF</td>
<td>+2.0 Max</td>
<td>+2.0 (Max)</td>
<td>1530 to 1565 (TX)</td>
</tr>
<tr>
<td></td>
<td>(9.95328-Gbps line rate)</td>
<td>−1.0 Min</td>
<td>−14.0 (Min)</td>
<td>1260 to 1565 (RX)</td>
</tr>
<tr>
<td>XFP-10GEZR-OC192IR=</td>
<td>10GBASE-ZR, 1550-nm SMF</td>
<td>+4.0 Max</td>
<td>−24 (Max)</td>
<td>1260 to 1565</td>
</tr>
<tr>
<td></td>
<td>(10.3125-Gbps line rate)</td>
<td>0 Min</td>
<td>−7 (Min)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OC-192/STM-64 LR2, 1550-nm SMF</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Installing the 10-Gigabit XFP Transceiver Module

Caution

The XFP transceiver is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling XFP transceivers or coming into contact with system modules.

To install an XFP transceiver, follow these steps:

Step 1
Remove the XFP transceiver from its protective packaging.

Note
Do not remove the optical bore dust plugs until directed to do so later in the procedure.

Step 2
Check the label on the XFP transceiver body to verify that you have the correct model for your network.

Step 3
Position the XFP transceiver in front of the XFP socket opening on the module. Slide the XFP transceiver part of the way into the transceiver socket on the system module front panel.

Step 4
Remove the optical bore dust plug from the XFP transceiver.

Step 5
Pivot the bale clasp up so that it is parallel with the transceiver body. (See Figure 5-15.)

Step 6
Continue sliding the XFP transceiver into the socket until the XFP transceiver is mated with the transceiver socket connector.

Step 7
Latch the XFP transceiver in the transceiver socket by pivoting the bale clasp down so that the bale clasp is perpendicular to the transceiver body. (See Figure 5-15.)

Caution
If the latch is not fully engaged, you may accidentally disconnect the XFP transceiver.

Step 8
Immediately reinstall the dust plug in the XFP transceiver optical bores. Do not remove the dust plug until you are ready to attach the network interface cable.
Chapter 5 Installing and Removing SFP and XFP Modules

Removing and Installing XFP Modules

Figure 5-15 Installing the 10-Gigabit XFP Transceiver Module

Note

10-Gigabit XFP transceivers are keyed to prevent incorrect insertion.

Note

Before removing the dust plugs and making any optical connections, follow these guidelines:

- Always keep the protective dust plugs on the unplugged fiber-optic cable connectors and the transceiver optical bores until you are ready to make a connection.
- Always inspect and clean the LC connector end faces just before making any connections. Refer to the Tip on this page for a pointer to a fiber-optic inspection and cleaning white paper.
- Always grasp the LC connector housing to plug or unplug a fiber-optic cable.

a. Remove the dust plugs from the optical network interface cable LC connectors. Save the dust plugs for future use.

b. Inspect and clean the LC connector’s fiber-optic end faces.
Tip
For complete information on inspecting and cleaning fiber-optic connections, refer to this URL:

c. Remove the dust plugs from the XFP transceiver module optical bores.
d. Immediately attach the network interface cable LC connectors to the XFP transceiver module. (See Figure 5-16 for cabling the XFP transceiver module.)

Figure 5-16 Cabling a 10-Gigabit XFP Transceiver Module

Removing the 10-Gigabit XFP Transceiver Module

Caution
The XFP transceiver is a static-sensitive device. Always use an ESD wrist strap or similar individual grounding device when handling XFP transceivers or coming into contact with modules.

If you are removing an XFP transceiver, follow these steps:

Step 1 Disconnect the network interface cable from the XFP transceiver connectors. Immediately reinstall the dust plug in the fiber-optic cable LC connector.
Step 2 Pivot the XFP transceiver bale clasp up to release the XFP transceiver from the socket. (See Figure 5-17.)
Step 3 Slide the XFP transceiver out of the socket. Pivot the bale clasp down and immediately install the dust plug in the XFP transceiver optical bores. (See Figure 5-17.)
Step 4 Immediately place the XFP transceiver in an antistatic bag.
Figure 5-17  Removing the 10-Gigabit XFP Transceiver
Removing and Installing a Cisco 7600 Series Ethernet Services 20G Line Card Memory

This chapter describes how to remove or install memory on the Cisco 7600 Series Ethernet Services 20G (ES20) line card.

Warning
Only trained and qualified personnel should be allowed to install, replace, or service this equipment. Statement 1030.

Caution
Only memory approved by Cisco is supported. Do not attempt to install other devices or DIMMs, which are not approved by Cisco, in the DIMM sockets.

Caution
DIMMs are ESD-sensitive components and can be damaged due to mishandling. Ensure that they are handled with care during installation and removal.

To remove a DIMM and install a new DIMM for a Cisco 7600 Series Ethernet Services 20G (ES20 line card), follow these steps:

Before You Begin

Remove the Cisco 7600 Series Ethernet Services 20G (ES20) line card from the Cisco 7600 Series Router. See the “Installing and Removing a Cisco 7600 Series Ethernet Services 20G Line Card” section on page 4-1.
**Step 1**  Wear an ESD-preventative wrist strap and attach it to an unpainted part of the router surface.

**Step 2**  Locate the daughterboard on the line card. See Figure 6-1.

*Figure 6-1  Locating the Daughterboard*

<table>
<thead>
<tr>
<th>Label</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Daughterboard</td>
</tr>
</tbody>
</table>
Step 3  Remove the six small screws from the daughterboard. See Figure 6-2.

Figure 6-2  Removing Screws from the Daughterboard
**Step 4** Lift the daughterboard to disconnect the interboard connector between the daughterboard and the motherboard. See Figure 6-3.

*Figure 6-3 Removing the Daughterboard*
Step 5 Locate the DIMM on the daughterboard. See Figure 6-4.

Figure 6-4 Locating the DIMM on the Daughterboard

![Diagram showing the location of DIMM](image)

<table>
<thead>
<tr>
<th>Label</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DIMM</td>
</tr>
</tbody>
</table>

**Caution**

Handle the DIMM only along the edges. Do not touch the memory modules, pins, or traces (metal fingers along the connector edge), to avoid damage.

Step 6 Pull the retaining clips holding the DIMM away with your thumb. See A in Figure 6-5.

Step 7 When both ends of the DIMM are released from the socket, grasp the ends of the DIMM with your thumb and forefinger, and pull it completely out of the socket. See Figure 6-6 and A in Figure 6-5. Then, in compliance with electronic waste laws, dispose the DIMM.
**Figure 6-5** Removing and Installing a DIMM

![Diagram of DIMM installation](image)

<table>
<thead>
<tr>
<th>Label</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DIMM</td>
</tr>
<tr>
<td>2</td>
<td>Retaining clips</td>
</tr>
</tbody>
</table>

**Figure 6-6** Holding the DIMM

![Diagram of DIMM holding](image)
Caution: It is normal to feel some resistance when installing a DIMM. Do not use excessive force or touch the surface components, to avoid damage.

Step 8: Install the replacement DIMM by holding the component-side facing up, with the connector edge (the metal fingers) away from you. Keep the sides of the DIMM between your thumb and index finger. See Figure 6-6 and B in Figure 6-5.

Step 9: Tilt the DIMM at a 30 degree angle to the socket, and then insert the connector edge of the DIMM into the socket. Verify that the notches on the DIMM are properly aligned with the ones on the connector before fully inserting the DIMM.

Step 10: Press down on the DIMM until the retaining clips lock the DIMM in place. See section B in Figure 6-5.

Step 11: Check the two alignment notches, and ensure that the clips are visible. If necessary, remove and reseat the DIMM. See B in Figure 6-5.
Caution

Improper alignment can permanently damage the interboard connectors between the daughterboard and motherboard. It is normal to feel some resistance when connecting the interboard connectors. Do not use excessive force, to avoid damage.

Step 12

Press the daughterboard back on the motherboard to connect the interboard connectors between the daughterboard and the motherboard. See Figure 6-7.

Figure 6-7  Replacing the Daughterboard
Step 13  Insert and tighten the six screws that were removed in Step 3. See Figure 6-8.

Figure 6-8    Installing the Screws on the Daughterboard
Troubleshooting

This chapter describes how to troubleshoot the installation of the Cisco 7600 Series Ethernet Services 20G (ES20) line card on the Cisco 7600 Series Routers. This chapter contains the following sections:

- Troubleshooting Installation Issues, page 7-1
- Troubleshooting Line Card Power Issues, page 7-3
- Miscellaneous Line Card Issues, page 7-4
- Troubleshooting ES20 Line Card States, page 7-7
- Packing a Cisco 7600 ES20 Line Card for Shipment, page 7-8

Troubleshooting Installation Issues

This section describes troubleshooting the installation of the Cisco 7600 ES20 line card. Possible problems, observations and comments, and solutions are indicated for the following troubleshooting symptoms:

- Cisco 7600 ES20 line card transitions repeatedly from on to off.
- Cisco 7600 ES20 line card is deactivated.

<table>
<thead>
<tr>
<th>Possible Problem</th>
<th>Observations and Comments</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco 7600 ES20 line card is booting up; this is normal operation</td>
<td>Cisco 7600 ES20 line card STATUS LED alternates green, amber, or off</td>
<td>Wait 30 seconds until the boot process completes and the STATUS LED stays on.</td>
</tr>
</tbody>
</table>
Cisco 7600 ES20 Line Card Transitions Repeatedly From On to Off

<table>
<thead>
<tr>
<th>Possible Problem</th>
<th>Observations and Comments</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco 7600 ES20 line card does not go beyond the bootup stage</td>
<td>Cisco 7600 ES20 line card STATUS LED transitions continue and alternates green, amber, or off</td>
<td>Follow the recommended action for the displayed error message.</td>
</tr>
<tr>
<td>Cisco 7600 ES20 line card is not up to date</td>
<td>During Cisco 7600 ES20 line card initialization, the need to update the FPGA is automatically detected</td>
<td>Follow the system prompts to update the FPGA image. If the Cisco 7600 ES20 line card is cycling because of an FPD problem, the most likely cause is a FPD failure or that the FPD package file is not present. For more information about performing FPD upgrades, refer to the “Upgrading Field-Programmable Devices” chapter in the Cisco 7600 Series Router SIP, SSC, and SPA Software Configuration Guide.</td>
</tr>
</tbody>
</table>

Cisco 7600 ES20 Line Card Is Deactivated

<table>
<thead>
<tr>
<th>Possible Problem</th>
<th>Observations and Comments</th>
<th>Solutions</th>
</tr>
</thead>
</table>
| Cisco 7600 ES20 line card is not fully seated in the chassis slot | Output of the `show diag slot` command. STATUS LED is off                                                     | Follow this procedure:  
  - Remove the Cisco 7600 ES20 line card from the slot.  
  - Inspect the Cisco 7600 ES20 line card. Verify there are no bent pins or parts and that there is nothing that could prevent a good connection.  
  - Insert the Cisco 7600 ES20 line card into the chassis slot. |
| Cisco 7600 ES20 line card is not at the minimum hardware revision level | Error message indicating the Cisco 7600 ES20 line card is not at the minimum FPGA revision level  
  Output of the `show hw-module subslot fpd` command  
  Output of the `show diag slot` command. STATUS LED is off | Follow the FPD upgrade process to update the FPGA.  
For more information about performing FPD upgrades, refer to the “Upgrading Field-Programmable Devices” chapter in the Cisco 7600 Series Router SIP, SSC, and SPA Software Configuration Guide from the following URL: http://www.cisco.com/en/US/docs/interfaces_modules/shared_port_adapters/configuration/7600series/sipspasw.html |
| Digital Optical Monitoring (DOM) alarm conditions                | No change in the LED status unless the link is down due to high receiver power.                               | To remove the alarm, ensure that appropriate attenuators are incrementally used. However, when the received power exceeds a lower threshold, a lower db attenuator should be used. The supported attenuators in a lab scenario are:  
  - 5 db  
  - 10 db  
  - 15 db  
  - 20 db |
## Troubleshooting Line Card Power Issues

Table 7-1 provides solutions for troubleshooting line card issues.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>If a line card fails to operate or power up</td>
<td>1. Ensure that the card is seated firmly in the slot.</td>
</tr>
<tr>
<td></td>
<td>2. Ensure that you have placed the gold edge of the PCB in the guide rails of the chassis. This</td>
</tr>
<tr>
<td></td>
<td>prevents damage to the connector placed at the rear side the board.</td>
</tr>
<tr>
<td></td>
<td>3. Check whether the ejector levers are latched and that the captive screws are fastened properly.</td>
</tr>
<tr>
<td></td>
<td>If you’re uncertain, unlatch the levers, loosen the screws, and attempt to reset the supervisor</td>
</tr>
<tr>
<td></td>
<td>again.</td>
</tr>
<tr>
<td></td>
<td>4. Examine the power supply to see whether the complete chassis is receiving power.</td>
</tr>
<tr>
<td></td>
<td>5. Use the show power command to confirm if the chassis has sufficient power to initiate the</td>
</tr>
<tr>
<td></td>
<td>new inserted line card.</td>
</tr>
<tr>
<td></td>
<td>6. Use the status LED on the line card to verify the correct installation of the card. If the card</td>
</tr>
<tr>
<td></td>
<td>is installed correctly, the Status LED turns green.</td>
</tr>
<tr>
<td></td>
<td>7. Ensure that you have installed the line cards in their designated slots.</td>
</tr>
</tbody>
</table>

### Note

All line cards can be inserted in all the slots of chassis; however 7613 chassis has exceptions. Dual fabric channel line cards such as (ES20 and ES+ cards) can be inserted only in 9 to 13 slots of 7613 chassis.
## Miscellaneous Line Card Issues

Table 7-2 provides solutions for troubleshooting line card issues.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
</table>
| Insufficient power                                 | • When multiple line cards are inserted in the 7600 chassis, some cards may not be able to power up due to insufficient power. If the power required by the line card exceeds the power available in the system, the line card is denied power and is shut down. In such a case, use the `show power` command to verify how much power is used and available.  
• Execute the command in the configuration mode to deny power to a line card.  
  
  ```sh
  Router# configure terminal
  Router(config)# no power enable module <slot_number>
  ```
  On doing this, the power consumed by the line card before turning it OFF, is returned to the total power available in the system. This is handy in bringing up another line card. If you have manually disabled power to a line card, you can enable it with the following config mode command:  
  
  ```sh
  Router(config)# power enable module <slot_number>
  ```
| Line card image not bundled in the IOS image       | • For a line card to bootup, the line card image has to be bundled in the IOS image. Not all line cards are supported with every image. A line card does not bootup if its image is not bundled with the system image. Execute the `show power` and `dir sup-microcode` commands to determine if the line card image is bundled with the IOS image. |
| Find Master Timer expiry                           | • This problem occurs when the RP does not process the Find Master Messages in time, or line card crashes or is unable to download the image from the supervisor.  
• If one of the CPUs is not able to load the image from the SP, try with a different image and if the issue persists, replace the flexwan. If any of the CPUs has crashed, collect the crash information data to analyze further. |
Chapter 7  Troubleshooting

### Faulty hardware

**Note**

Bad hardware can also be a reason for the line card not booting up. There are no specific pointers which indicate that the line card hardware is bad. But if none of the above reasons match the failure of the line card, it could be a bad hardware issue.

- This following message indicates that the module software cannot read the module hardware version. This condition indicates a hardware error.

  > 00:02:51: %CWPA-2-BAD_HWVERS: Unable to determine board hardware version

---

### SCP Keepalive Failure

- The SP and the MSFC periodically poll each individual LC in the chassis for its health via SCP keepalives. Each LC in turn, must respond within a certain amount of time (dictated by the SCP keepalive timer) to indicate its health. If the LC fails to respond to the keepalives within the stipulated period of time, the MSFC assumes that there is an issue with the LC and power cycles it. When the LC comes back online, the SCP keepalives are resumed.

- A line card might be unable to respond to the scp keepalives under situations of extreme stress when the CPU is busy with higher priority tasks, such as packet switching, interrupt processing etc.

- Execute the `show scp status` and `show scp line cards` command to gather detailed information about the SCP process and health of each LC. A `show diagbus` indicates any errors with the LC.

- Execute the `test scp line card keepalive disable` exec command on the RP console to disable the SCP keepalive timer and debug LC issues. To prevent the LC from being power cycled and losing its information, ensure that you disable the SCP keepalives for some time.
### Problem | Solution
---|---
Line Card in ROM monitor | • Linecards have a ROMMON variable `DL_DISABLE` depending on which line card auto boots or remains in ROMMON waiting for manual boot. If `DL_DISABLE` is set to 0, line card does not boot automatically but waits for the user to manually boot with respective line card image (from line card console). Line card auto boots only if `DL_DISABLE`=1. When `DL_DISABLE`=0 and line card doe not initialize, SCP Keepalive Failure messages appear on RP console.

SCP Download Failures | • A line card is reset by the SP with messages that SCP download failed or module reloaded during reset. This occurs at the time of bootup with a heavy configuration and a many line cards. Execute the `debug cwan oir` command to check the RP status. When a line card sends a Find Master to the RP, some of the messages are sent to SP to confirm if the module is online. If the message fails to reach the SP, then SP resets the module with message that SCP download has failed. If the line card, does not receive the response in the time, the line card resets itself.

| • Reload the line card and connect the LC console and check the status. If there is a problem with ROMMON download of the image from the SP, then the ROMMON of the line card should then be upgraded to the latest version. If a bay crashes, collect the stack trace to identify problem.
Troubleshooting ES20 Line Card States

Table 7-3 provides solutions for troubleshooting line card issues.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Troubleshooting Line Card States</td>
<td>• LED on the line card front panel is green indicating that the line card is up and running with IOS.</td>
</tr>
<tr>
<td></td>
<td>• The show module command shows the status of line card slot as <strong>Ok</strong> and the status of the Distributed Forwarding submodule as <strong>Ok</strong> indicating that supervisor recognizes the line card and if the line card is powered up and online in the C7600 system or not.</td>
</tr>
<tr>
<td></td>
<td>• LED on the SPA front panel is green.</td>
</tr>
<tr>
<td></td>
<td>• The show hw-module subslot x/y [internal] command indicates that the SPA operation status is <strong>Ok</strong>.</td>
</tr>
<tr>
<td></td>
<td>• The show running-config command shows interfaces for the line card and if the controllers for the installed SPAs (if any) are installed.</td>
</tr>
<tr>
<td></td>
<td>• The show ip interface brief command shows the configured interfaces for the line card if they are ready for configuration.</td>
</tr>
</tbody>
</table>

Using debug Commands

The **debug hw-module subslot** command is intended for use by Cisco Systems technical support personnel. For more information about the **debug hw-module subslot** command, see the Cisco 7600 Series Router SIP, SSC, and SPA Software Configuration Guide.

**Caution**

Because debugging output is assigned high priority in the CPU process, it can render the system unusable. For this reason, use **debug** commands only to troubleshoot specific problems or during troubleshooting sessions with Cisco technical support staff. Moreover, it is best to use **debug** commands during periods of lower network traffic and fewer users. Debugging during these periods decreases the likelihood that increased **debug** command processing overhead will affect system use.

For information about other **debug** commands supported on the Cisco 7600 ES20 line card and to view the explanations and recommended actions for the Cisco 7600 series router error messages, including messages related to the Cisco 7600 ES20 line card, refer to the following documents:

- *Cisco IOS Release 12.2 SR Command References*
- *Cisco 7600 Series Cisco IOS System Message Guide, 12.2SR*
Packing a Cisco 7600 ES20 Line Card for Shipment

This section provides step-by-step instructions for packing a Cisco 7600 ES20 line card for shipment. Before beginning this procedure, you should have the following original Cisco Systems packaging materials:

- Static shielding bag
- Smaller inner carton
- Larger exterior carton
- Two foam packing cushions

Caution

The Cisco Systems original packaging is to be used for the shipment of all Cisco 7600 ES20 line cards. Failure to properly use Cisco Systems packaging can result in damage or loss of product.

Warning

During this procedure, wear grounding wrist straps to avoid ESD damage to the card. Do not directly touch the backplane with your hand or any metal tool, or you could shock yourself. Statement 93.

Note

These instructions assume that the Cisco 7600 ES20 line card has been removed from the router according to the recommended procedures specified in this guide.

To pack a Cisco 7600 ES20 line card for shipment, perform the following steps:

Step 1  Insert the Cisco 7600 ES20 line card into the static shielding bag.

Step 2  Insert the bagged Cisco 7600 ES20 line card into the smaller inner carton. Be careful to position the Cisco 7600 ES20 line card so that the bottom motherboard lip is held by the packaging cutout.

Step 3  Close the smaller inner carton and tape the sides closed.

Step 4  Place the sealed smaller inner carton containing the Cisco 7600 ES20 line card into the two foam packing cushions (they only fit one way).

Step 5  Place the sealed smaller inner carton and packing cushions into the larger exterior carton, and seal the larger exterior carton with tape for shipment.
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