Cisco ASR 1000 MIP and EPA 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

This document describes the Cisco ASR 1000 Series Modular Interface Processor (MIP) that is supported on the Cisco ASR 1000 Series Aggregation Services Routers, as well as the Ethernet port adapters (EPAs) that are supported in the MIP. This document also describes how to install the MIP and EPAs, and how to troubleshoot the installation.

Document Revision History

The Document Revision History records changes made to this document. The table shows the Cisco IOS XE software release number and document revision number pertaining to the change, the date of the change, and a brief summary of the change.

Release No.	Date	Change Summary
Cisco IOS XE 16.9.1	August, 2018	Added support for EPA-QSFP-1X100GE.
Cisco IOS XE 16.6.2	November, 2017	Added support for EPA-1X40GE and EPA-2X40GE
Cisco IOS XE 16.2.1	April, 2016	Added support for EPA-10X10GE
Cisco IOS XE Release 3.16.2S	February, 2016	Added support for EPA-CPAK-2X40GE
Cisco IOS XE Release 3.16.1S	November, 2015	First version of the document.

Organization

This document contains the following chapters:

Chapter	Title	Description
Chapter 1	Overview of the Cisco ASR 1000 Series MIP and EPAs	Provides an introduction to the Cisco ASR 1000 Series Modular Interface Processor (MIP) and Ethernet port adapters (EPAs). Also provides a compatibility summary for the MIP, characteristics of the cards, and overview.
Chapter 2	Preparing to Install a MIP or EPA	Describes the required tools, equipment, and safety guidelines for installing the MIP and EPAs.
Chapter 3	Installing and Removing a MIP	Describes the procedures for installing and removing the MIP in a Cisco ASR 1000 Series Aggregation Services Router.
Chapter 4	Installing and Removing an EPA	Describes the procedures for installing and removing an EPA in the MIP.
Chapter 5	Installing and Removing the SFP+, CPAK, and QSFP Modules	Describes the procedures for installing and removing the small form-factor pluggable (SFP+), CPAK, and QSFP modules on the EPA.
Chapter 6	Troubleshooting	Provides information about troubleshooting the installation of the MIP. It also describes the debug commands and provides packing instructions.

Related Documentation

This section refers you to other documentation that might be useful as you configure your Cisco ASR 1000 Series MIP.

Cisco IOS XE Features and Software Configuration

- Information about supported features and their configuration on the Cisco ASR 1000 Series Aggregation Services Routers are available in the Cisco IOS XE software configuration guides at:

  http://www.cisco.com/en/US/products/ps9587/products_installation_and_configuration_guides_list.html

- A summary of the new features in a particular release can be found at:

  http://www.cisco.com/en/US/products/ps9587/products_feature_guides_list.html

- Command documentation for the Cisco ASR 1000 Series Aggregation Services Routers is available at:

  http://www.cisco.com/en/US/products/ps9587/prod_command_reference_list.html

Cisco ASR 1000 Series Aggregation Services Routers Documentation

Some of the other publications pertaining to the Cisco ASR 1000 Series Aggregation Services Routers might be useful to you as you configure your Cisco ASR 1000 Series Aggregation Services Router:

- *Cisco ASR 1000 Series Aggregation Services Routers Hardware Installation Guide*
  http://www.cisco.com/c/en/us/td/docs/routers/asr1000/install/guide/asr1routers/asr1higV8.html

- *Cisco ASR 1000 Series Modular Ethernet Line Card Software Configuration Guide*
  http://www.cisco.com/c/en/us/td/docs/interfaces_modules/shared_port_adapters/configuration/ASR1000/modular_ethernet_linecard/ASRmelcconf_guide.html

- Command Reference Guide:

    - *Cisco IOS Quality of Service Solutions Command Reference guide at the URL:*
      http://www.cisco.com/c/en/us/td/docs/ios/qos/command/reference/qos_book.html

- *Regulatory Compliance and Safety Information for the Cisco ASR 1000 Series Aggregation Services Routers*
  http://http://www.cisco.com/c/en/us/td/docs/routers/asr1000/rcsi/asr1rcsi.html

- *Cisco ASR 1000 Series Aggregation Services Routers Software Configuration Guide*
  http://www.cisco.com/c/en/us/td/docs/routers/asr1000/configuration/guide/chassis/asrswcfg.html

- *Cisco ASR 1000 Series Aggregation Services Routers MIB Specifications Guide*
  http://http://www.cisco.com/c/en/us/td/docs/routers/asr1000/mib/guide/asr1kmib.html

- *Release Notes for Cisco ASR 1000 Series Aggregation Services Routers*
  http://http://www.cisco.com/c/en/us/td/docs/routers/asr1000/release/notes/asr1k_rn_rel_notes.html

Several other publications are also related to the Cisco ASR 1000 Series Aggregation Services Routers. For a complete reference of related documentation, see the *Cisco ASR 1000 Series Aggregation Services Router Documentation Roadmap* located at the following URL:
http://www.cisco.com/en/US/products/ps9343/products_documentation_roadmaps_list.html

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

http://www.cisco.com/cisco/web/psa/default.html?mode=prod

Document Conventions

Within the guide, 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 documentation uses the following conventions:

Convention	Description
^ or **Ctrl**	The **^** and **Ctrl** symbols represent the Control key. For example, the key combination **^D** or **Ctrl-D** means hold down the **Control** key while you press the **D** key. Keys are indicated in capital letters, but are not case sensitive.
string	A string is a nonquoted set of characters shown in italics. For example, when setting a Simple Network Management Protocol (SNMP) *community* string to *public*, do not use quotation marks around the string. If you do, the string will include the quotation marks.

Command syntax descriptions use the following conventions:

Convention	Description
bold	Bold text indicates commands and keywords that you enter exactly as shown.
italics	Italic text indicates arguments for which you supply values.
[x]	Square brackets enclose an optional element (keyword or argument).
		A vertical line indicates a choice within an optional or required set of keywords or arguments.
[x	y]	Square brackets enclosing keywords or arguments separated by a vertical line indicate an optional choice.
{x	y}	Braces enclosing keywords or arguments separated by a vertical line indicate a required choice.

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

Convention	Description
[x {y	z}]	Braces and a vertical line within square brackets indicate a required choice within an optional element.

Examples use the following conventions:

Convention	Description
`screen`	Examples of information displayed on the screen are set in Courier font.
`bold screen`	Examples of text that you must enter are set in Courier bold font.
`<    >`	Angle brackets enclose text that is not printed to the screen, such as passwords.
`!`	An exclamation point at the beginning of a line indicates a comment line. (Exclamation points are also displayed by the Cisco IOS software for certain processes.)
`[    ]`	Square brackets enclose default responses to system prompts.

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.

Note   Means *reader take note*. Notes contain helpful suggestions or references to materials that may not be contained in this manual.

Tip   Means *the following information will help you solve a problem*. The tips information might not be troubleshooting or even an action, but could be useful information, similar to a Timesaver.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, using the Cisco Bug Search Tool (BST), submitting a service request, and gathering additional information, see *What's New in Cisco Product Documentation* at: http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html.

Subscribe to *What's New in Cisco Product Documentation*, which lists all new and revised Cisco technical documentation, as an RSS feed and deliver content directly to your desktop using a reader application. The RSS feeds are a free service.

Overview of the Cisco ASR 1000 Series MIP and EPAs

This chapter provides an overview of the Cisco ASR 1000 Series Modular Interface Processor (ASR1000-MIP100), and Ethernet port adapters (EPAs).

This chapter includes the following sections:

Introduction to MIPs and EPAs

Cisco ASR 1000 Series modular interface processors (MIPs) and Ethernet port adapters (EPAs) use a carrier card and port adapter architecture that increases modularity, flexibility, and density across Cisco routers for network connectivity. This section describes the MIPs and EPAs, and provides some guidelines for their use.

Modular Interface Processors

The ASR1000-MIP100 is a modular interface processor with a 100 Gbps connection to the backplane, for the ASR 1000 platform. However, it can have an interface bandwidth of up to 200 Gbps. The ASR1000-MIP100 provides higher I/O speeds, increased density, and interface flexibility to the ASR1000.

The ASR1000-MIP100 is capable of 100 Gbps full-duplex traffic forwarded using a modular-port interface design. The ASR1000-MIP100 architecture is composed of a host carrier card, which accepts up to two EPAs.

Figure 1-1   *ASR1000-MIP100 with EPAs Installed*
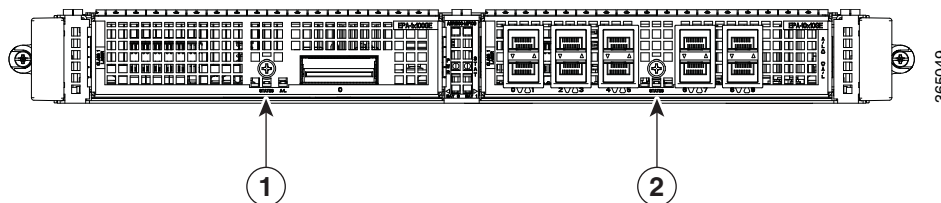
| 1 | MIP, with EPA in subslot 0 | 2 | MIP, with EPA in subslot 1 |

The following list describes some of the general characteristics of a MIP:

- A MIP is a carrier card that inserts into a router slot like a line card. It provides no network connectivity on its own.

- A MIP has two subslots, which are used to house up to two EPAs. The EPA provides interface ports for network connectivity.

- During normal operation, the MIP should reside in the router fully populated either with functional EPAs in all subslots, or with a blank filler plate (EPA-BLANK=) inserted in all empty subslots.

- MIPs support online insertion and removal (OIR) with EPAs inserted in their subslots. EPAs also support OIR and can be inserted or removed independently from the MIP.

Note   Fully populate all slots and subslots with functional EPAs or blank filler plates for maximum efficiency of the cooling system.

Ethernet Port Adapters

EPAs are small plug-in modules containing circuitry to provide optical or electrical network interfaces. The packet data between the EPA and MIP carrier card can support a 100Gbps full-duplex bandwidth. The data path supports operating at various predefined data rates and protocols.

The following list describes some of the general characteristics of an EPA:

- An EPA is a modular type of port adapter that inserts into a subslot of a compatible MIP carrier card to provide network connectivity and increased interface port density.

- EPA inserts into one of the MIP-EPA bay, with EPA subslots as shown in Figure 1-1.

- Each EPA provides a certain number of connectors, or ports, that are the interfaces to one or more networks. These interfaces can be individually configured using the Cisco IOS command-line interface (CLI).

- Either a blank filler plate or a functional EPA should reside in every subslot of a MIP during normal operation to maintain cooling integrity.

EPAs support online insertion and removal (OIR). They can be inserted or removed independently from the MIP. MIPs also support OIR with EPAs inserted in their subslots.

Figure 1-2 **1-Port 100 Gigabit Ethernet EPA (EPA-1X100GE)**
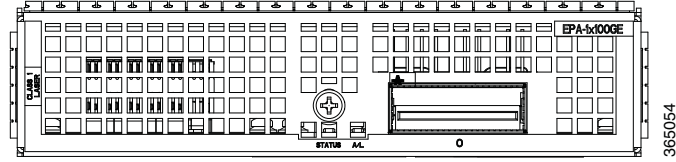
Figure 1-3 **2-Port 40 Gigabit Ethernet EPA with CPAK and Breakout Cable (EPA-CPAK-2X40GE)**
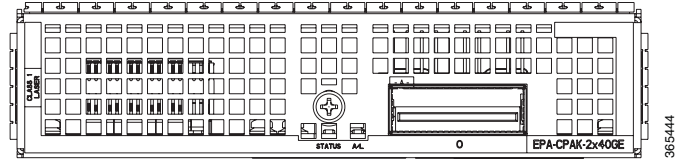
Figure 1-4 **10-Port 10 Gigabit Ethernet EPA (EPA-10X10GE)**
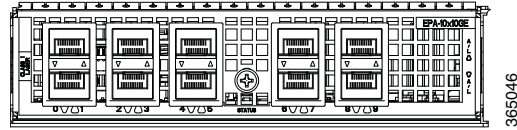
Figure 1-5 **18-Port 1 Gigabit Ethernet EPA (EPA-18X1GE)**
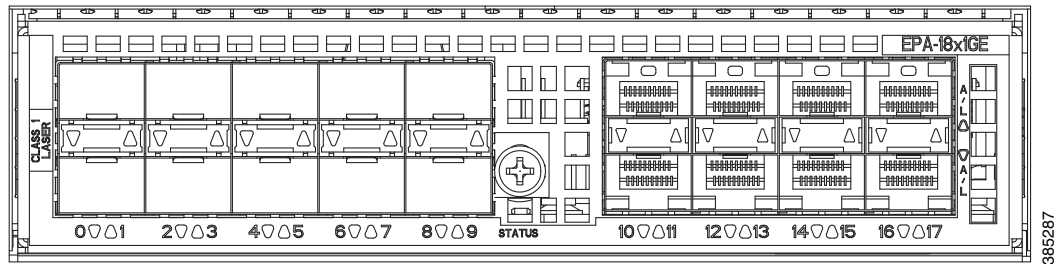
Figure 1-6 **1-Port 40 Gigabit QSFP Ethernet EPA (EPA-1x40GE) and 2-Port 40 Gigabit QSFP Ethernet EPA (EPA-2x40GE)**
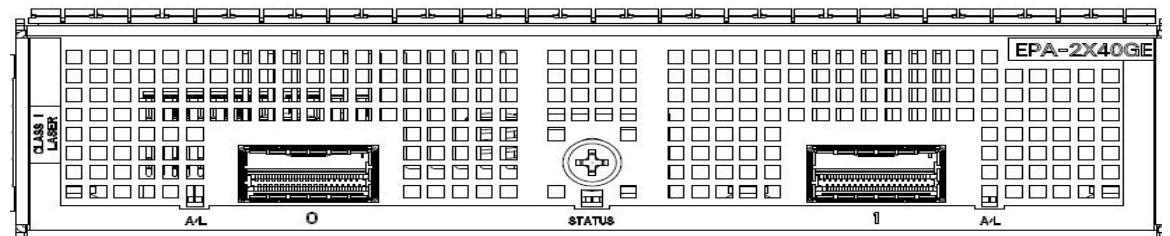
Figure 1-7   **1-Port 100 Gigabit QSFP Ethernet EPA (EPA-QSFP-1x100GE)**
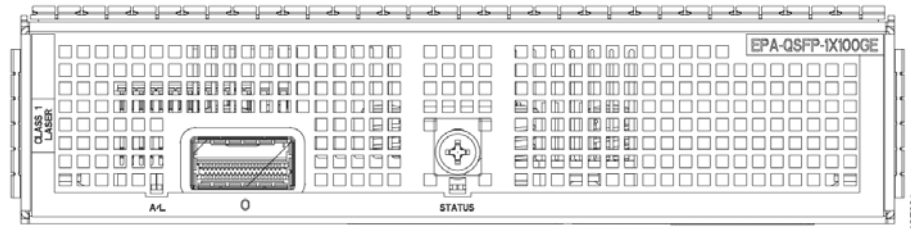
The QSFP based EPA supports transceiver modules based on a QSFP form factor. Whereas EPA-1X100G supports CFP-based transceivers.

The 1-port 40 Gigabit Ethernet EPA and the 2-port 40 Gigabit Ethernet EPA are QSFP-based EPAs. Both these EPAs support Ethernet features, Synchronous Ethernet and MACsec. The 2-port 40 Gigabit EPA has two 40GE ports without any licenses. The 1-port 40 Gigabit EPA has two 40 GE interfaces but only the first port is usable without license. Second port is licensed-based and supports Cisco Smart Licensing.

The 1-port 100 Gigabit Ethernet EPA is a QSFP-based EPA. This EPAs support Ethernet features, Synchronous Ethernet and MACsec. The port is license-based and supports Cisco Smart Licensing(FLSA1-MACSEC100G / L-FLA1-MACSEC100G=)nimum Software for MACsec Support

Synchronous Ethernet Support

The following EPAs support Synchronous Ethernet:

- EPA-10X10GE
- EPA-18X1GE
- EPA-1X40GE
- EPA-2X40GE
- EPA-1X100GE
- EPA-QSPF-1x100GE
- Built-in EPAs on ASR1001-HX, ASR1002-HX

Modular Optics Compatibilities

The EPA-1X100GE uses a CPAK module to provide network connectivity. The EPA-CPAK-2X40GE uses a CPAK module and a 2x40 GE breakout cable to provide network connectivity. The EPA-10X10GE uses small form-factor pluggable (SFP+) optical transceivers to provide network connectivity. The EPA-18X1GE uses SFP optical transceivers to provide network connectivity.

For more information, see Cisco Optics Compatibility Matrix (https://tmgmatrix.cisco.com/)

Displaying the Cisco ASR 1000 Series MIP Hardware Type

To verify the Cisco ASR 1000 Series MIP hardware type that is installed in your Cisco ASR 1000 series router, use the **show platform** command.

The following is a sample output of the **show platform** command for the MIP that is installed in Cisco ASR 1009-X Router.

```
Router# show platform
Chassis type: ASR1009-X

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
0         ASR1000-MIP100      ok                    03:10:14
1         ASR1000-MIP100      ok                    03:10:14
 1/0      EPA-10X10GE         ok                    00:01:32
 1/1      EPA-1X100GE         ok                    00:01:24
2         ASR1000-MIP100      ok                    09:34:16
 2/0      EPA-1X100GE         ok                    09:00:29
```

The following is a sample output of the **show platform** command for the MIP that is installed in Cisco ASR 1013 Router with EPA-QSFP-1X100GE inserted in slot 3.

```
Router# show platform
Chassis type: ASR1013


Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
0         ASR1000-MIP100      ok                    14:47:17
 0/0      EPA-10X10GE         ok                    14:44:55
 0/1      EPA-1X100GE         ok                    00:00:09
1         ASR1000-MIP100      ok                    14:47:17
 1/0      EPA-18X1GE          ok                    14:44:57
3         ASR1000-MIP100      ok                    14:47:17
 3/0      EPA-QSFP-1X100GE    ok                    04:41:12
 3/1      EPA-1X40GE          ok                    10:16:05
4         ASR1000-SIP40       ok                    14:47:17
 4/0      SPA-2X1GE-V2        ok                    14:45:25
 4/1      SPA-5X1GE-V2        ok                    14:45:25
 4/3      SPA-1X10GE-L-V2     ok                    14:45:19
5         ASR1000-2T+20X1GE   ok                    14:47:17
 5/0      BUILT-IN-2T+20X1GE  ok                    14:45:10
R1        ASR1000-RP2         ok, active            14:47:17
F0        ASR1000-ESP200      ok, active            14:47:17
P0        ASR1013-PWR-AC      ok                    14:46:19
P1        ASR1013-PWR-AC      ok                    14:46:17
P2        ASR1013-PWR-AC      ok                    14:46:17
P3        ASR1013/06-PWR-AC   ok                    14:46:16

Slot      CPLD Version        Firmware Version
--------- ------------------- ---------------------------------------
0         15072100            16.3(2r)
1         15072100            16.3(2r)
3         15072100            16.3(2r)
4         00200800            16.3(2r)
5         00010000            12.2(20120809:045831) [lokbuild 114]
R1        14111801            16.3(2r)
F0        13041200            16.3(2r)
```

Table 1-1 shows the hardware description that appears in the **show interfaces** command output for each Cisco ASR 1000 Series MIP that is supported on the Cisco ASR 1000 Series Router.

Table 1-1   MIP Hardware Descriptions in show interfaces Command Output

MIP and EPA	Description in the show interfaces Command
ASR1000-MIP100 and EPA-1X100GE	Hardware is EPA-1X100GE
ASR1000-MIP100 and EPA-CPAK-2x40GE	Hardware is EPA-CPAK-2x40GE
ASR1000-MIP100 and EPA-10X10GE	Hardware is EPA-10X10GE
ASR1000-MIP100 and EPA-18X1GE	Hardware is EPA-18X1GE
ASR1000-MIP100 and EPA-1X40GE	Hardware is EPA-1X40GE
ASR1000-MIP100 and EPA-2X40GE	Hardware is EPA-2X40GE
ASR1000-MIP100 and EPA-QSFP-1X100GE	Hardware is EPA-QSFP-1X100GE

The following is a sample output of the **show interfaces** command on a Cisco ASR 1000 Series Aggregation Services Router with the MIP installed in slot 0 and the EPA-2X40 GE in subslot 2:

```
Router# show interfaces fo0/2/1
FortyGigabitEthernet0/2/1 is up, line protocol is up
  Hardware is EPA-2X40GE, address is 74a2.e625.4421 (bia 74a2.e625.4421)
  MTU 1500 bytes, BW 40000000 Kbit/sec, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  Full Duplex, 40000Mbps, link type is force-up, media type is QSFP-H40GE-ACU10M
  output flow-control is on, input flow-control is on
  EoMPLS Remote Link up
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 02:31:52, output 02:31:52, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     41 packets input, 3625 bytes, 0 no buffer
     Received 1 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog, 26 multicast, 0 pause input
     78 packets output, 5824 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 unknown protocol drops
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier, 0 pause output
     0 output buffer failures, 0 output buffers swapped out
     3 carrier tr
...
...
```

The following is a sample output of the **show interfaces HundredGigE** command on a Cisco ASR 1000 Series Aggregation Services Router with the MIP installed in slot1and the EPA-1X100GE in subslot 1:

```
Router# show interfaces HundredGigE 1/1/0
HundredGigE1/1/0 is up, line protocol is up
  Hardware is EPA-1X100GE, address is 74a0.2ff9.b7a0 (bia 74a0.2ff9.b7a0)
  MTU 7500 bytes, BW 100000000 Kbit/sec, DLY 10 usec,
     reliability 249/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
```

The following is a sample output of the **show interfaces HundredGigE** command on a Cisco ASR 1000 Series Aggregation Services Router with the MIP installed in slot 3 and EPA-QSFP-1X100GE installed in subslot 0:

```
Router# show interfaces HundredGigE 3/0/0
HundredGigE3/0/0 is up, line protocol is up
  Hardware is EPA-QSFP-1X100GE, address is badb.adba.e8c0 (bia badb.adba.e8c0)
  Internet address is 50.1.1.2/24
  MTU 7500 bytes, BW 100000000 Kbit/sec, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  Full Duplex, 100000Mbps, link type is force-up, media type is QSFP_100G_AOC15M
  output flow-control is on, input flow-control is on
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:04:23, output 00:35:50, output hang never
  Last clearing of "show interface" counters 00:00:05
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog, 0 multicast, 0 pause input
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 unknown protocol drops
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier, 0 pause output
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

The following is a sample output of the **show interfaces FortyGigabitEthernet** command on a Cisco ASR 1000 Series Aggregation Services Router with the MIP installed in slot 2 and the EPA-CPAK-2x40GE in subslot 1:

```
Router# show interfaces FortyGigabitEthernet 2/1/0
FortyGigabitEthernet2/1/0 is administratively up, line protocol is up
  Hardware is EPA-CPAK-2X40GE, address is 6c41.6ada.a7a0 (bia 6c41.6ada.a7a0)
  MTU 1500 bytes, BW 40000000 Kbit/sec, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
```

The following is a sample output of the **show interfaces GigabitEthernet** command on a Cisco ASR 1002-HX Router with the MIP installed in slot 0 and the EPA-18X1GE in subslot 2.

```
Router# show interfaces GigabitEthernet 0/2/0
```

```
GigabitEthernet0/2/0 is down, line protocol is down
  Hardware is EPA-18X1GE, address is 74a2.e624.e920 (bia 74a2.e624.e920)
  MTU 1500 bytes, BW 1000000 Kbit/sec, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  Full Duplex, 1000Mbps, link type is auto, media type is unknown media type
  output flow-control is on, input flow-control is on
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input never, output never, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog, 0 multicast, 0 pause input
     0 packets output, 0 bytes, 0 underruns
     0 output errors, 0 collisions, 2 interface resets
     0 unknown protocol drops
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier, 0 pause output
     0 output buffer failures, 0 output buffers swapped out
```

The following is a sample output of the **show interfaces FortyGigabitEthernet** command on a Cisco ASR 1000 Series Aggregation Services Router with the MIP installed in slot 0 and the EPA-1x40GE in subslot 2:

```
Router# show interface FortyGigabitEthernet0/2/1
FortyGigabitEthernet0/2/1 is up, line protocol is up
  Hardware is EPA-1X40GE, address is 74a2.e625.5d21 (bia 74a2.e625.5d21)
  Internet address is 39.1.1.1/30
  MTU 1500 bytes, BW 40000000 Kbit/sec, DLY 10 usec,
     reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation ARPA, loopback not set
  Keepalive not supported
  Full Duplex, 40000Mbps, link type is force-up, media type is QSFP_40GE_LR4
  output flow-control is on, input flow-control is on
  ARP type: ARPA, ARP Timeout 04:00:00
  Last input 00:00:00, output 00:00:00, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/375/0/0 (size/max/drops/flushes); Total output drops: 0
  Queueing strategy: fifo
  Output queue: 0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     7782 packets input, 2716260 bytes, 0 no buffer
     Received 2 broadcasts (0 IP multicasts)
     0 runts, 0 giants, 0 throttles
     2 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored
     0 watchdog, 7774 multicast, 0 pause input
     8169 packets output, 2756184 bytes, 0 underruns
     0 output errors, 0 collisions, 4 interface resets
     0 unknown protocol drops
     0 babbles, 0 late collision, 0 deferred
     0 lost carrier, 0 no carrier, 0 pause output
     0 output buffer failures, 0 output buffers swapped out
     4 carrier transitions
Router#
```

To display the transceiver type installed in an EPA, use the **show hw-module subslot** command.

The following is a sample output of the **show hw-module subslot** command on a Cisco ASR 1000 Series Router with the Cisco ASR 1000 Series Modular Interface Processor installed in slot 1 and the EPA-1X100GE in subslot 1:

```
Router# show hw-module subslot 1/1 transceiver 0 idprom
IDPROM for transceiver HundredGigE1/1/0:
  Description                          = CPAK optics (type 131)
  Transceiver Type:                    = CPAK 100GE SR10 (310)
  Product Identifier (PID)             = CPAK-100G-SR10
  Vendor Revision                      = V01
  Serial Number (SN)                   = FBN183122731
  Vendor Name                          = CISCO
  Vendor OUI (IEEE company ID)         = 00.00.0C (12)
  CLEI code                            = WOTRC5PBAA
  Cisco part number                    = 800-41495-
  Device State                         = Enabled.
  Date code (yyyy/mm/dd)               = 2014/08/03
  Connector type                       = MPO.
  Encoding                             = NRZ, Non-PSK.
  Bit Rate                             = 111.8 Gbps
  Maximum Bit Rate Network Lane        = 11.2 Gbits/s
  Maximum Bit Rate Host Lane           = 11.2 Gbits/s
```

The following is a sample output of the **show hw-module subslot** command on a Cisco ASR 1000 Series Router with the Cisco ASR 1000 Series Modular Interface Processor installed in slot 0 and the EPA-1X 40GE in subslot 2:

```
Router#show hw-module subslot 0/2 transceiver 1 idprom
IDPROM for transceiver FortyGigabitEthernet0/2/1:
  Description                          = QSFP optics (type 132)
  Transceiver Type:                    = QSFP 40GE LR (323)
  Product Identifier (PID)             = QSFP-40G-LR4
  Vendor Revision                      = 01
  Serial Number (SN)                   = AVM2049M1AE
  Vendor Name                          = CISCO-AVAGO
  Vendor OUI (IEEE company ID)         = 00.17.6A (5994)
  CLEI code                            = CMUIAE7CAB
  Cisco part number                    = 10-2842-02
  Device State                         = Enabled.
  Date code (yy/mm/dd)                 = 16/12/08
  Connector type                       = LC
  Encoding                             = 64B66B
  Nominal bitrate per channel          = Multi-rate 40G-LR4 (10800 Mbits/s)
Router#
```

The following is a sample output of the **show hw-module subslot** command on a Cisco ASR 1000 Series Router with the Cisco ASR 1000 Series Modular Interface Processor installed in slot 3 and the EPA-QSFP-1x100GE in port 0:

```
Router# show hw-module subslot 3/0 transceiver 0 idprom
IDPROM for transceiver HundredGigE3/0/0:
  Description                          = QSFP28 optics (type 134)
  Transceiver Type:                    = QSFP 100GE AOC15M (462)
  Product Identifier (PID)             = QSFP-100G-AOC15M
  Vendor Revision                      = A
  Serial Number (SN)                   = FIW213706D6-A
  Vendor Name                          = CISCO-FINISAR
  Vendor OUI (IEEE company ID)         = 00.90.65 (36965)
```

```
CLEI code                             = CMPQAEXCAA
Cisco part number                     = 10-3178-02
Device State                          = Enabled.
Date code (yy/mm/dd)                  = 17/09/16
Connector type                        = No separable connector
Encoding                              = 64B66B
Nominal bitrate per channel           =  (25500 Mbits/s)
```

The following is a sample output of the **show hw-module subslot transceiver status** command on a Cisco ASR 1000 Series Router with the Cisco ASR 1000 Series Modular Interface Processor installed in slot 3 and the transceiver in port 0:

```
Router# show hw-module subslot 3/0 transceiver 0 status
The Transceiver in slot 3 subslot 0 port 0 is enabled.
  Module temperature                  = +38.164 C
  Transceiver Tx supply voltage       = 3.2183 Volts
  Transceiver Tx power                = -40.0 dBm (0.0 mW)
  Transceiver Rx optical power        = <-40 dBm


  Tx power Network Lane[00]           = -40.0 dBm (0.0 mW)
  Tx power Network Lane[01]           = -40.0 dBm (0.0 mW)
  Tx power Network Lane[02]           = -40.0 dBm (0.0 mW)
  Tx power Network Lane[03]           = -40.0 dBm (0.0 mW)


  Rx power Network Lane[00]           = -40.0 dBm (0.0 mW)
  Rx power Network Lane[01]           = -40.0 dBm (0.0 mW)
  Rx power Network Lane[02]           = -40.0 dBm (0.0 mW)
  Rx power Network Lane[03]           = -40.0 dBm (0.0 mW)


  Bias Current Network Lane[00]       = 7.800 mA
  Bias Current Network Lane[01]       = 7.800 mA
  Bias Current Network Lane[02]       = 7.942 mA
  Bias Current Network Lane[03]       = 7.938 mA
```

Power Management

A MIP consumes chassis power. You must, therefore, ensure that the chassis is within the power budget on the Cisco ASR 1000 Series Aggregation Services Routers.

LED Details

This section provides information about the LEDs on the MIP and EPAs.

MIP LEDs

The ASR1000-MIP100 has two LEDs on the front panel to show the status of the card, as shown in .

Figure 1-8   **MIP LEDs**
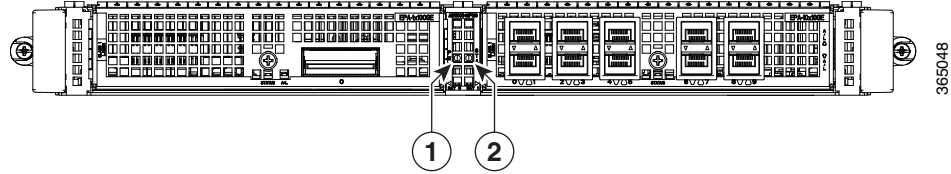
1	PWR LED	2	STAT LED

Table 1-2 describes the details of the LEDs.

Table 1-2   **Power and Status LEDs**

Function	Color or State	Description
Power	Green	Line card is powered on and is operational.
	Off	Line card is powered off and not operational.
Status	Green	The OS has booted.
	Amber	BOOTROM has successfully loaded.
	Red	Line card failure has occurred.
	Flashing red	Secure-boot failure has occurred.

EPA LEDs

The EPAs have two types of LEDs: an A/L (Active/Link) LED for each port on the EPA, and one STATUS LED, as shown in Figure 1-9, Figure 1-10, Figure 1-11 and Figure 1-12.

Figure 1-9   EPA-10x10GE LEDs
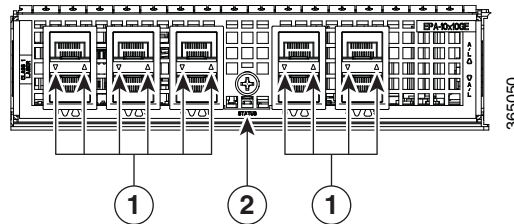
1	A/L	2	STATUS

Figure 1-10   EPA-1x100GE and EPA-CPAK-2x40GE LEDs
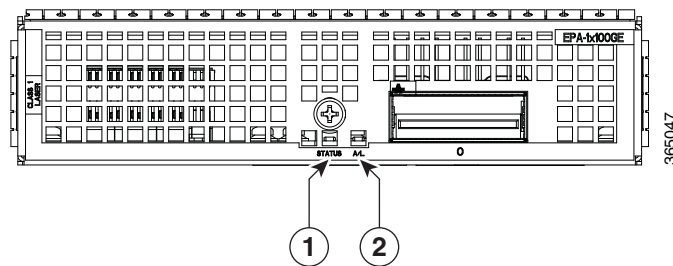
1	STATUS	2	A/L

Figure 1-11   EPA-18x1GE LEDs
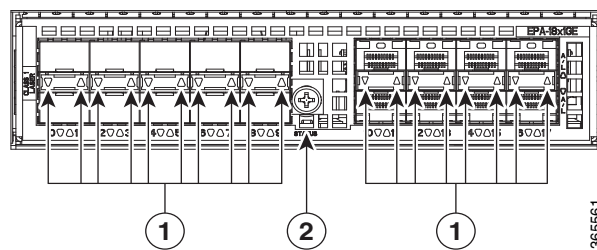
1	A/L	2	STATUS

Figure 1-12   EPA-1x40GE and EPA-2x40GE LEDs
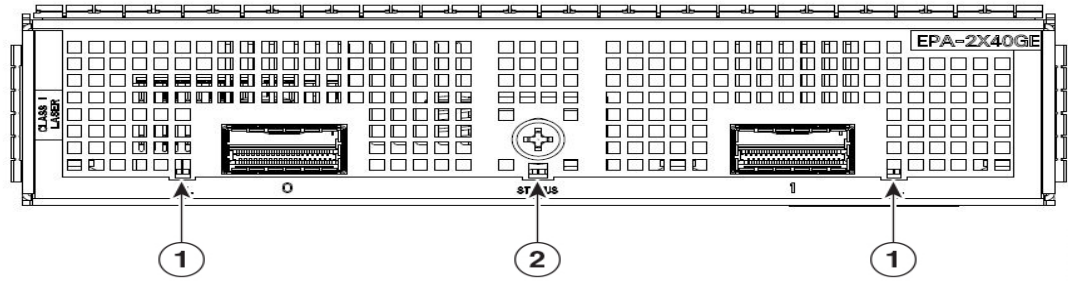
1	A/L	2	STATUS

Table 1-3 describes the details of the LEDs.

Table 1-3   EPA LEDs

Function	Color or State	Description	
		EPA-18X1GE, EPA-10X10GE , EPA-1X100GE, EPA-1X40GE, EPA-2X40GE, and EPA-QSPF-1X100GE	**EPA-CPAK-2X40GE**
A/L (Active/Link)	Green	Port is enabled and the link is up.	Both ports are enabled and the links are up.
	Amber	Port is enabled but the link is down.	One of the ports is not enabled.
	Off	Port is not enabled.	Ports are not enabled.
Status	Green	EPA is ready and operational.	
	Amber	EPA power is on and good, and the EPA is being configured.	
	OFF	EPA power is off.	

Preparing to Install a MIP or EPA

This chapter describes the general equipment, safety, and site preparation requirements for installing the Cisco ASR 1000 Series Modular Interface Processor (ASR1000-MIP100), 1-Port 100 Gigabit Ethernet EPA (EPA-1X100GE), 10-Port 10 Gigabit Ethernet EPA (EPA-10X10GE), and 2-Port 40 Gigabit Ethernet EPA with CPAK and breakout cable (EPA-CPAK-2x40GE). This chapter contains the following sections:

- Required Tools and Equipment, page 2-1
- Safety Guidelines, page 2-2
- Laser and LED Safety, page 2-8

Required Tools and Equipment

You need the following tools and parts to remove and install the Cisco ASR 1000 modular Ethernet line card. If you need additional equipment, contact a Cisco service representative.

- ASR1000-MIP100
- EPA-1X100GE, EPA-CPAK-2x40GE, EPA-10X10GE, or blank filler plate (EPA-BLANK=)
- Interface cables to connect the EPAs with another router or switch
- Any small form-factor pluggable (SFP+) or CPAK modules that you have to install (and have not already installed)
- Number 1 Phillips screwdriver and a 3/16-inch flat-blade screwdriver
- Number 2 Phillips screwdriver
- Your own electrostatic discharge (ESD)-prevention equipment or ESD-preventive wrist strap or ankle strap along with 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, see the "Cleaning Optical Devices" section on page 5-16.

Safety Guidelines

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

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

Varoitus   **TÄRKEITÄ TURVALLISUUSOHJEITA**

Tämä varoitusmerkki merkitsee vaaraa. Tilanne voi aiheuttaa ruumiillisia vammoja. Ennen kuin käsittelet laitteistoa, huomioi sähköpiirien käsittelemiseen liittyvät riskit ja tutustu onnettomuuksien yleisiin ehkäisytapoihin. Turvallisuusvaroitusten käännökset löytyvät laitteen mukana toimitettujen käännettyjen turvallisuusvaroitusten joukosta varoitusten lopussa näkyvien lausuntonumeroiden avulla.

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, référez-vous au numéro de l'instruction situé à la fin de chaque avertissement.

CONSERVEZ CES INFORMATIONS

Warnung   **WICHTIGE SICHERHEITSHINWEISE**

Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu Verletzungen führen kann. Machen Sie sich vor der Arbeit mit Geräten mit den Gefahren elektrischer Schaltungen und den üblichen Verfahren zur Vorbeugung vor Unfällen vertraut. Suchen Sie mit der am Ende jeder Warnung angegebenen Anweisungsnummer nach der jeweiligen Übersetzung in den übersetzten Sicherheitshinweisen, die zusammen mit diesem Gerät ausgeliefert wurden.

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 SIKKERHETSINSTRUKSJONER**

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

TA VARE PÅ DISSE INSTRUKSJONENE

Aviso   **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

■   **Safety Guidelines**

¡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

Varning!   **VIKTIGA SÄKERHETSANVISNINGAR**

Denna varningssignal signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanliga förfaranden för att förebygga olyckor. Använd det nummer som finns i slutet av varje varning för att hitta dess översättning i de översatta säkerhetsvarningar som medföljer denna anordning.

SPARA DESSA ANVISNINGAR

Figyelem   **FONTOS BIZTONSÁGI ELOÍRÁSOK**

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

ORIZZE MEG EZEKET AZ UTASÍTÁSOKAT!

Предупреждение   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

警告   重要的安全性说明

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述されています。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に留意してください。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おいてください。

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 장치와 함께 제공되는
번역된 안전 경고문에서 해당 번역문을 찾으십시오.

이 지시 사항을 보관하십시오.

تحذير   إرشادات الأمان الهامة

يوضح رمز التحذير هذا وجود خطر. وهذا يعني أنك متواجد في مكان قد ينتج عنه التعرض لإصابات. قبل بدء العمل،
احذر مخاطر التعرض للصدمات الكهربائية وكن على علم بالإجراءات القياسية للحيلولة دون وقوع أي حوادث. استخدم
رقم البيان الموجود في أخر كل تحذير لتحديد مكان ترجمته داخل تحذيرات الأمان المترجمة التي تأتي مع الجهاز.
قم بحفظ هذه الإرشادات

Upozorenje   VAŽNE SIGURNOSNE NAPOMENE

Ovaj simbol upozorenja predstavlja opasnost. Nalazite se u situaciji koja može prouzročiti
tjelesne ozljede. Prije rada s bilo kojim uređajem, morate razumjeti opasnosti vezane uz
električne sklopove, te biti upoznati sa standardnim načinima izbjegavanja nesreća. U
prevedenim sigurnosnim upozorenjima, priloženima uz uređaj, možete prema broju koji se
nalazi uz pojedino upozorenje pronaći i njegov prijevod.

SAČUVAJTE OVE UPUTE

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

Προειδοποίηση	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 κινδύνους 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 μετάφρασή της στις μεταφρασμένες προειδοποιήσεις ασφαλείας που συνοδεύουν τη συσκευή.

ΦΥΛΑΞΤΕ ΑΥΤΕΣ ΤΙΣ ΟΔΗΓΙΕΣ

אזהרה	**הוראות בטיחות חשובות**

סימן אזהרה זה מסמל סכנה. אתה נמצא במצב העלול לגרום לפציעה. לפני שתעבוד עם ציוד כלשהו, עליך להיות מודע לסכנות הכרוכות במעגלים חשמליים ולהכיר את הנהלים המקובלים למניעת תאונות. השתמש במספר ההוראה המסופק בסופה של כל אזהרה כד לאתר את התרגום באזהרות הבטיחות המתורגמות שמצורפות להתקן.

שמור הוראות אלה

Ostrzeżenie	**WAŻNE INSTRUKCJE DOTYCZĄCE BEZPIECZEŃSTWA**

Ten symbol ostrzeżenia oznacza niebezpieczeństwo. Zachodzi sytuacja, która może powodować obrażenia ciała. Przed przystąpieniem do prac przy urządzeniach należy zapoznać się z zagrożeniami związanymi z układami elektrycznymi oraz ze standardowymi środkami zapobiegania wypadkom. Na końcu każdego ostrzeżenia podano numer, na podstawie którego można odszukać tłumaczenie tego ostrzeżenia w dołączonym do urządzenia dokumencie z tłumaczeniami ostrzeżeń.

NINIEJSZE INSTRUKCJE NALEŻY ZACHOWAĆ

Upozornenie	**DÔLEŽITÉ BEZPEČNOSTNÉ POKYNY**

Tento varovný symbol označuje nebezpečenstvo. Nachádzate sa v situácii s nebezpečenstvom úrazu. Pred prácou na akomkoľvek vybavení si uvedomte nebezpečenstvo súvisiace s elektrickými obvodmi a oboznámte sa so štandardnými opatreniami na predchádzanie úrazom. Podľa čísla na konci každého upozornenia vyhľadajte jeho preklad v preložených bezpečnostných upozorneniach, ktoré sú priložené k zariadeniu.

USCHOVAJTE SI TENTO NÁVOD

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 power and all the 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. The Cisco ASR 1000 Series Modular Interface Processors comprise printed circuit boards that are fixed to metal carriers. Electromagnetic interference (EMI) shielding and connectors are integral components of these carriers. Although the metal carriers help to protect the boards from ESD, use a preventive antistatic strap when handling the line cards.

The following are the guidelines for preventing ESD damage:

- Always use an ESD wrist strap or ankle strap and ensure that it is touching the skin.
- 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 the 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 the carriers using the 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 on 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 protects only 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 and 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 a 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 2-1. The multimode aperture contains a Class 1 LED warning label, as shown in Figure 2-2.

Figure 2-1   Class 1 Laser Warning Labels for Single-Mode Port

CLASS 1 LASER PRODUCT
LASERPRODUKT DER KLASSE 1

PRODUIT LASER DE CLASSE 1
クラス1　レーザ製品
PRODUCTO LASER CLASE 1

H6655

Figure 2-2   Class 1 LED Warning Label for Multimode Port

CLASS 1 LED PRODUCT
PRODUKT MIT KLASSE 1 LED
PRODUIT AVEC VOYANT DEL
DE CLASSE 1
クラス1 LED 製品
PRODUCTO LED DE LA CLASE 1

11773

⚠️

Warning	**Class 1 laser product.** Statement 1008
Waarschuwing	**Klasse-1 laser produkt.**
Varoitus	**Luokan 1 lasertuote.**
Attention	**Produit laser de classe 1.**
Warnung	**Laserprodukt der Klasse 1.**
Avvertenza	**Prodotto laser di Classe 1.**

Advarsel	**Laserprodukt av klasse 1.**
Aviso	**Produto laser de classe 1.**
¡Advertencia!	**Producto láser Clase I.**
Varning!	**Laserprodukt av klass 1.**
Figyelem	**Class 1 besorolású lézeres termék.**
Предупреждение	Лазерное устройство класса 1.
警告	这是１类激光产品。
警告	クラス1レーザー製品です。
주의	클래스 1 레이저 제품.
Aviso	**Produto a laser de classe 1.**
Advarsel	**Klasse 1 laserprodukt.**
تحذير	Class 1 Laser ١ منتج
Upozorenje	**Laserski proizvod klase 1**
Upozornění	**Laserový výrobek třídy 1.**
Προειδοποίηση	Προϊόν λέιζερ κατηγορίας 1.
אזהרה	מוצר לייזר Class 1.
предупредување	Ласерски производ од класа 1.
Ostrzeżenie	**Produkt laserowy klasy 1.**
Upozornenie	**Laserový výrobok triedy 1.**
Opozorilo	**Laserski izdelek 1. razreda.**

警告   類別 1 雷射產品。

Предупреждение   **Лазерен продукт от клас 1.**

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

Attention   **Les fibres ou connecteurs débranchés risquent d'émettre des rayonnements laser invisibles à l'œil. Ne regardez jamais directement les faisceaux laser à l'œil nu, ni d'ailleurs avec des instruments optiques.**

Warnung   **Unterbrochene Fasern oder Steckerverbindungenkönnen unsichtbare Laserstrahlung abgeben. Blicken Sie weder mit bloßem Auge noch mit optischen Instrumenten direkt in Laserstrahlen.**

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.**

Varning!   **Osynlig laserstrålning kan avges från frånkopplade fibrer eller kontaktdon. Rikta inte blicken in i strålar och titta aldrig direkt på dem med hjälp av optiska instrument.**

Figyelem   **A nem csatlakoztatott üvegszálak és csatlakozók láthatatlan lézersugárzást bocsáthatnak ki. Ne nézzen bele a sugárba, 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.

警告   断开的光纤或接头有可能发出不可见的激光辐射。请勿直视光束或直接用光学仪器观看光束。

警告   光ファイバ ケーブルまたはコネクタを取り外した状態では、目に見えないレーザー光が放射されて
       いることがあります。光線をのぞきこんだり、光学機器を使用して光線を直接見たりしないでくだ
       さい。

주의   연결이 해제된 섬유나 커넥터에서 눈에 보이지 않는 레이저 방사열이 방출될 수 있습니다. 레이저 빔
       을 눈으로 쳐다 보거나 광학 기구를 사용하여 직접 보지 마십시오.

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 انبعاث أشعة الليزر من الألياف غير المتصلة أو التوصيلات. لا تحدق النظر في الشعاع أو النظر مباشرة بدون
       أي أداة بصرية.

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

Προειδοποίηση Από αποσυνδεδεμένες ίνες ή υποδοχές μπορεί να εκπέμπεται αόρατη
       ακτινοβολία λέιζερ. Μην κοιτάτε απευθείας τις δέσμες φωτός και μην τις
       απεικονίζετε απευθείας με οπτικά όργανα.

אזהרה   תתיכן פליטה של קרינת לייזר בלתי-נראית מסיבים או
       ממחברים מנותקים. אל תביט ישירות לתוך קרני אור ואל
       תביט באמצעות במכשירים אופטיים.

Opomena Невидливо ласерско зрачење може да зрачи од исклучените влакна или
       приклучоци. 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 wiązkę lasera ani
       bezpośrednio obserwować jej przy użyciu przyrządów optycznych.

Upozornenie Odpojené vlákna káblov alebo konektory môžu vyžarovať neviditeľné
       laserové žiarenie. Nepozerajte sa do lúčov ani ich nepozorujte priamo
       pomocou optických prístrojov.

Warning   **Class 1 LED product.** Statement 1027

Installing and Removing a MIP

This chapter describes how to install and remove a MIP on the Cisco ASR 1000 Series Aggregation Services Routers. This chapter contains the following sections:

Handling the MIP

Each MIP circuit board is mounted on a metal carrier and is sensitive to electrostatic discharge (ESD) damage. Before you begin installation, read Chapter 2, "Preparing to Install a MIP or EPA" for a list of parts and tools required for installation.
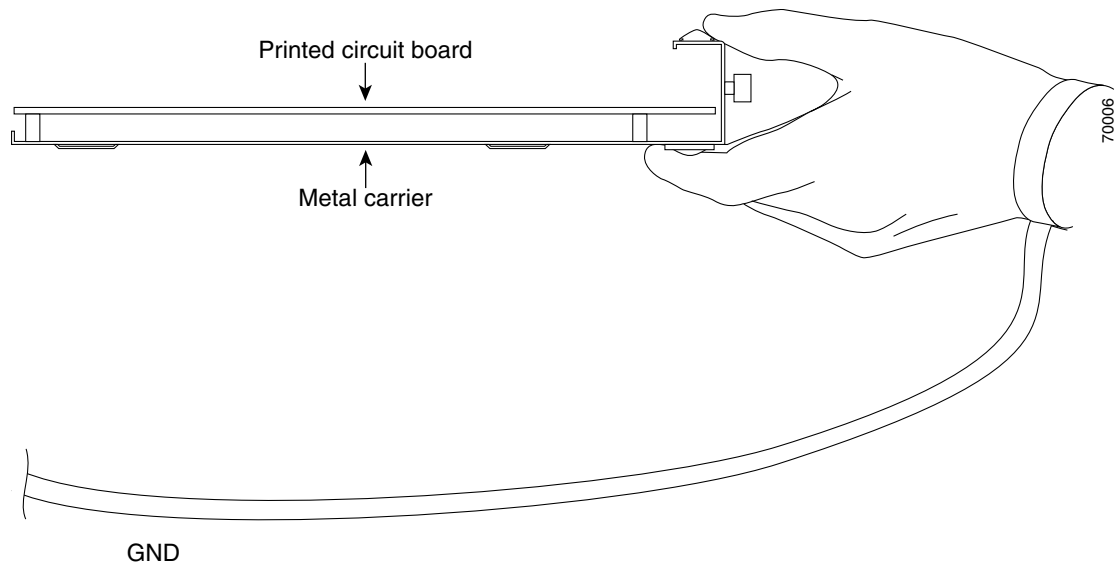
> ⚠ **Caution** Always handle the MIP by the carrier edges and handles; never touch the line card components or connector pins.

Figure 3-1   Handling a MIP

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) emission requirements and to allow proper airflow across the installed modules. If you plan to install the MIP in a slot that is not in use, you must first remove the blank filler plate.

Online Insertion and Removal

The Cisco ASR 1000 Series Aggregation Services Routers support online insertion and removal (OIR) of the MIP, the EPAs, and the SFP+ and CPAK modules. Therefore, you can remove the MIP with its SFP+ or CPAK modules still intact, or you can remove SFP+ or CPAK modules independently from the MIP, leaving the line card installed in the router.

This section includes the following topics on OIR support:

- Preparing for Online Removal of the MIP, page 3-2
- Deactivating a MIP, page 3-3
- Reactivating a MIP, page 3-3
- Verifying the Deactivation and Activation of the MIP, page 3-3

Preparing for Online Removal of the MIP

The Cisco ASR 1000 series router support OIR of the MIP. If you plan to remove a MIP, deactivate the line card first using the **hw-module slot** *slotnumber* **shutdown** global configuration command.

When you deactivate the MIP using this command, it automatically deactivates each of the SFP+ or CPAK modules that are installed in the MIP. Therefore, it is not necessary to deactivate each of the SFP+ or CPAK modules prior to deactivating the MIP.

Although graceful deactivation of the MIP is preferred using the **hw-module slot** *slotnumber* **shutdown** command, the Cisco ASR 1000 series router do support the removal of the MIP without deactivating it first.

Deactivating a MIP

To deactivate a MIP and its installed SFP+ or CPAK modules prior to the removal of the MIP, use the following command in the global configuration mode:

Command	Purpose
Router(config)# **hw-module slot** *slotnumber* **shutdown**	Shuts down the installed interfaces and deactivates the MIP in the specified slot, where: *slotnumber*—Specifies the chassis slot number in which the MIP is installed.

Reactivating a MIP

After you deactivate the MIP, whether or not you have performed an OIR, you must use the **no hw-module slot** *slotnumber* **shutdown** global configuration command to reactivate the MIP.

The installed SFP+ or CPAK modules automatically get reactivated upon reactivation of the MIP in the router. For example, consider a scenario where you remove a MIP from the router to replace it with another MIP. You reinsert the same EPAs and SFP+ or CPAK modules into the new MIP. When you enter the **no hw-module slot** *slotnumber* **shutdown** command on the router, the SFP+ or CPAK modules will automatically get reactivated with the new MIP.

To reactivate a MIP and its installed SFP+ or CPAK modules after the MIP has been deactivated, use the following command in the global configuration mode:

Command	Purpose
Router(config)# **no hw-module slot** *slotnumber* **shutdown**	Reactivates the line card in the specified slot and its installed SFP+ or CPAK modules. Here: *slotnumber*—Specifies the slot number of the chassis on which the MIP is installed. **Note** This command is used only if this card was previously shut down using the **hw-module slot** *slotnumber* **shutdown** global configuration command. A newly inserted line card does not require this command to activate the card.

Verifying the Deactivation and Activation of the MIP

To verify the deactivation of the MIP, enter the **show platform** command in the privileged EXEC configuration mode. Observe the State field associated with the MIP that you want to verify.

The following example shows the MIP located in slot 1. In this scenario, slot 1 is powered down. This is indicated by its disabled status.

```
Router(config)# hw-module slot 1 shutdown

Router# show platform
Chassis type: ASR1009-X

Slot      Type               State                Insert time (ago)
--------- ------------------ -------------------- -----------------
0         ASR1000-MIP100     ok                   03:04:17
1         ASR1000-MIP100     disabled             03:04:17
...
<output truncated>
...

Router# show platform diag

Chassis type: ASR1009-X
Slot: 1, ASR1000-MIP100
  Running state                : disabled
  Internal state               : offline
  Internal operational state   : disabled
  Physical insert detect time  : 00:00:52 (03:05:30 ago)
  Software declared up time    : 00:35:26 (02:30:56 ago)
  CPLD version                 : 15072100
  Firmware version             : 15.5(3r)S1
```

To verify the activation and proper operation of a MIP, enter the **no hw-module slot 1 shutdown** command. After this, enter the **show platform** command and observe slot 1 in the ok state. Finally, enter the **show platform diag** command and observe ok in the Running state field, as shown in the following example:

```
Router(config)# no hw-module slot 1 shutdown

Router# show platform
Chassis type: ASR1009-X

Slot      Type               State                Insert time (ago)
--------- ------------------ -------------------- -----------------
0         ASR1000-MIP100     ok                   03:04:17
1         ASR1000-MIP100     ok                   03:04:17
...
<output truncated>
...

Router# show platform diag

Chassis type: ASR1009-X
Slot: 1, ASR1000-MIP100
  Running state                : ok
  Internal state               : online
  Internal operational state   : ok
  Physical insert detect time  : 00:00:52 (03:05:30 ago)
  Software declared up time    : 00:35:26 (02:30:56 ago)
  CPLD version                 : 15072100
  Firmware version             : 15.5(3r)S1
```

MIP Installation and Removal

This section provides step-by-step instructions for installing and removing a MIP.

⚠️

Caution   When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the MIP. Some platforms have an ESD connector for attaching the wrist strap. Do not directly touch the midplane or backplane with your hand or any metal tool.

To install a MIP, refer to Figure 3-2 and do the following:

Step 1   Before inserting a MIP, make sure that the chassis is grounded.

Step 2   To insert the MIP, carefully align the edges of the MIP between the guide rails in the router slot.

Step 3   Carefully slide the MIP into the router slot until the MIP makes contact with the backplane.

Step 4   Tighten the captive installation screws on both sides of the MIP.

To remove a MIP, refer to Figure 3-2 and do the following:

Step 1   To remove the MIP, first disconnect all cables from the SPF+ or CPAK interfaces.

Step 2   Loosen the captive installation screws on both sides of the MIP.

Step 3   Slide the MIP out of the router slot.

Figure 3-2   MIP Installation and Removal
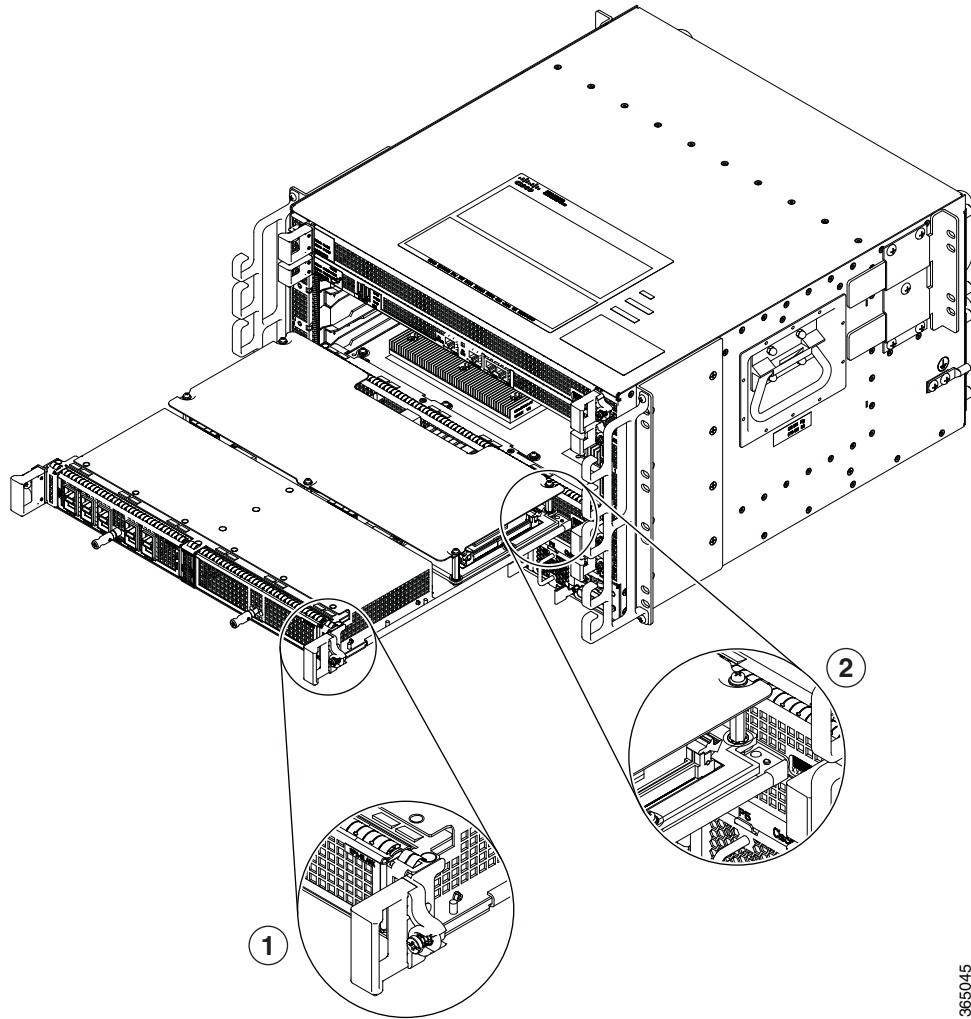
1	Captive installation screw	2	Guide rails

CHAPTER **4**

Installing and Removing an EPA

This chapter describes how to install or remove Ethernet port adapters (EPAs) in a MIP. This chapter contains the following sections:

- Handling EPAs, page 4-1
- Online Insertion and Removal, page 4-2
- EPA Installation and Removal, page 4-4
- Checking the Installation, page 4-6
- EPA Blank Filler Plates, page 4-9

Handling EPAs

Each EPA circuit board is mounted to a metal carrier and is sensitive to electrostatic discharge (ESD) damage. See the "Preventing Electrostatic Discharge Damage" section on page 2-7 for ESD precautions.

Before you begin installation, read Chapter 2, "Preparing to Install a MIP or EPA", for a list of parts and tools required for installation.

⚠️
Caution   Always handle the EPA by the carrier edges and handle; never touch the EPA components or connector pins. (See Figure 4-1.)

When a subslot is not in use, an EPA blank filler plate must fill the empty subslot to allow the router to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the EPAs. If you plan to install an EPA in a subslot that is not in use, you must first remove the EPA blank filler plate.

Figure 4-1   Handling an EPA

Printed circuit board

Metal carrier

GND
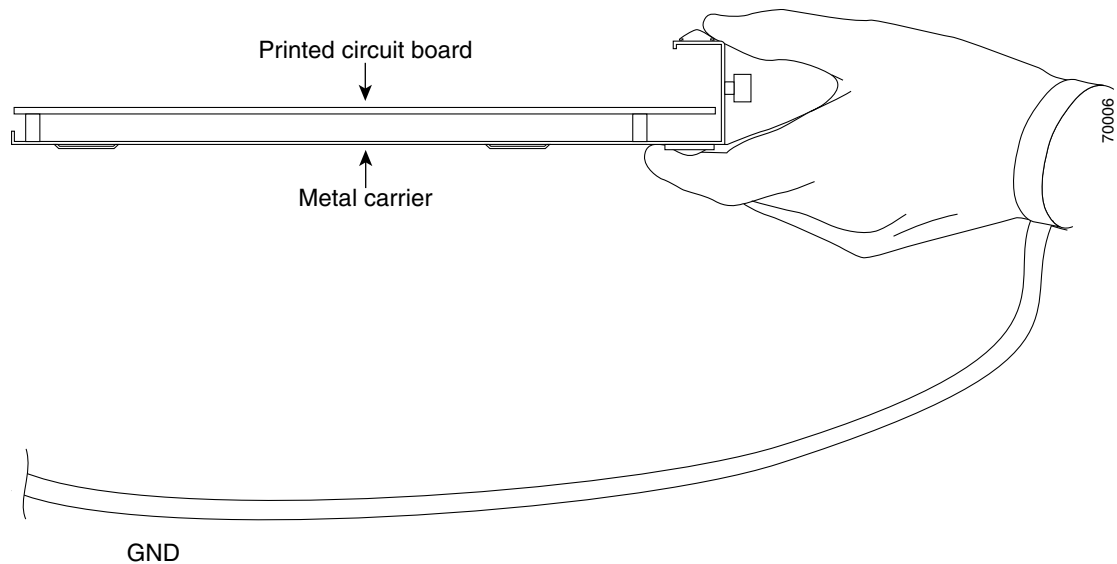
Online Insertion and Removal

The Cisco ASR 1000 Series Routers support the OIR of an EPA independent of removing the MIP. This means that a MIP can remain installed in the Cisco ASR 1000 Series Router with one EPA remaining active, while you remove another EPA from one of the MIP subslots. If you are not planning to immediately replace an EPA into the MIP, ensure that you install a blank filler plate in the subslot. The MIP should always be fully installed with either functional EPAs or blank filler plates.

If you are planning to remove a MIP along with its EPAs, you do not have to follow the instructions provided in this section. To remove a MIP, see the "Preparing for Online Removal of the MIP" section on page 3-2.

This section includes the following topics on OIR support:

- Preparing for Online Removal of the EPA, page 4-2
- Deactivating EPA, page 4-3
- Reactivating EPA, page 4-3
- Verifying the Deactivation and Activation of the EPA, page 4-4

Preparing for Online Removal of the EPA

The Cisco ASR 1000 series router support OIR of the EPA. If you plan to remove an EPA, deactivate the EPA first using the **hw-module subslot** *slotnumber/subslotnumber* **shutdown** global configuration command.

When you deactivate the EPA using this command, it automatically deactivates each of the SFP+ or CPAK modules that are installed in the EPA. Therefore, it is not necessary to deactivate each of the SFP+ or CPAK modules prior to deactivating the EPA.

Although graceful deactivation of the EPA is preferred using the **hw-module subslot** *slotnumber*/*subslotnumber* **shutdown** command, the Cisco ASR 1000 series router do support the removal of the EPA without deactivating it first.

Deactivating EPA

To deactivate an EPA and its installed SFP+, CPAK or QSFP modules prior to the removal of the EPA, use the following command in the global configuration mode:

Command	Purpose
Router(config)# **hw-module subslot** *slotnumber*/*subslotnumber* **shutdown**	Shuts down the installed interfaces and deactivates the EPA in the specified slot and subslot of the MIP, where: • *slotnumber*—Specifies the chassis slot number in which the MIP is installed • *subslotnumber*—Specifies the subslot number on a MIP where an EPA is installed

Reactivating EPA

After you deactivate the EPA, whether or not you have performed an OIR, you must use the **no hw-module slot** *slotnumber*/*subslotnumber* **shutdown** global configuration command to reactivate the EPA. The installed SFP+, CPAK or QSFP modules automatically get reactivated upon reactivation of the EPA in the router.

To reactivate a EPA and its installed SFP+, CPAK or QSFP modules after the EPA has been deactivated, use the following command in the global configuration mode:

Command	Purpose
Router(config)# **no hw-module subslot** *slotnumber*/*subslotnumber* **shutdown**	Reactivates the line card in the specified slot and its installed SFP+, CPAK or QSFP modules. Here: • *slotnumber*—Specifies the chassis slot number in which the MIP is installed. • *subslotnumber*—Specifies the subslot number on a MIP where an EPA is installed **Note** This command is used only if this card was previously shut down using the **hw-module slot** *slotnumber*/*subslotnumber* **shutdown** global configuration command. A newly inserted line card does not require this command to activate the card.

Verifying the Deactivation and Activation of the EPA

To verify the deactivation of the EPA, enter the **show hw-module subslot all oir** command in the privileged EXEC configuration mode. Observe the State field associated with the EPA that you want to verify.

The following example shows the EPA located in slot 1, subslot 1 as administratively down.

```
Router(config)# hw-module subslot 1/1 shutdown

Router# show hw-module subslot all oir
Module          Model              Operational Status
-------------- ------------------ ------------------------
subslot 1/0    EPA-10X10GE        ok
subslot 1/1    EPA-1X100GE        admin down
```

To verify the activation and proper operation of an EPA, enter the **show hw-module subslot all oir** and observe slot 1, subslot 0, in the ok state, as shown in the following example:

```
Router(config)# no hw-module subslot 1/1 shutdown

Router# show hw-module subslot all oir
Module          Model              Operational Status
-------------- ------------------ ------------------------
subslot 1/0    EPA-10X10GE        ok
subslot 1/1    EPA-1X100GE        ok
```

EPA Installation and Removal

This section provides step-by-step instructions for installing and removing an EPA in a MIP.

⚠

Caution   When performing the following procedures, wear a grounding wrist strap to avoid ESD damage to the EPA. Some platforms have an ESD connector for attaching the wrist strap. Do not directly touch the midplane or backplane with your hand or any metal tool.

To install an EPA in a MIP, refer to Figure 4-2 and do the following:

Step 1   To insert the EPA in the MIP, locate the guide rails inside the MIP that hold the EPA in place.

Step 2   Align the EPA with the guide rails and carefully slide the EPA all the way into the MIP slot until the EPA stops.

Step 3   Use a number 2 Phillips screwdriver to fully seat the EPA by turning the captive screw clockwise. When fully seated, the EPA should be flush with the MIP faceplate.

✎

Note   Avoid over torquing the EPA captive screw when installing the EPA. Tighten the captive screw on the EPA to a torque of 11 +/-1 inch-pounds.

To remove the EPA from the MIP, refer to Figure 4-2 and do the following:

Step 1   Disconnect all cables from the SPF+, CPAK or QSFP interfaces

Step 2   Loosen the captive screw in the center of the EPA by turning it counterclockwise.

Step 3   Slide the EPA out of the MIP.

Figure 4-2   MIP Installation and Removal
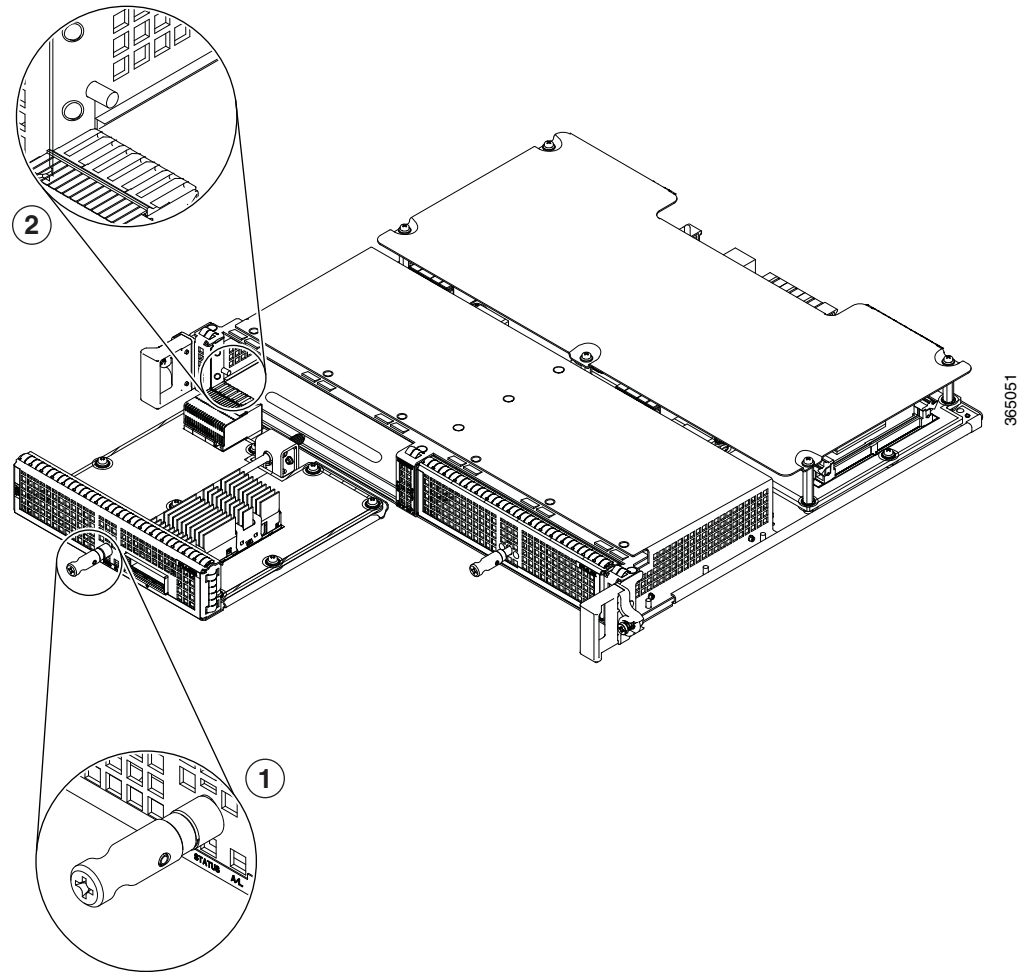
| **1** | Captive installation screw | **2** | Guide rails |

Checking the Installation

This section describes the procedures you can use to verify the MIP and EPA installation, and includes information on the following topics:

Verifying the Installation

This section describes how to verify the MIP and EPA installation by observing the MIP LED states, EPA LED states, and the information displayed on the console terminal.

When the system has reinitialized all interfaces, the MIP STATUS LED should be green (on) and the EPA STATUS LEDs should be green (on). The port LEDs may be green (on), depending on your connections and configuration. The console screen also displays a message as the system discovers each interface during reinitialization.

Use the following procedure to verify that a MIP and EPA are installed correctly:

Step 1   Observe the console display messages and verify that the system discovers the MIP, while the system reinitializes each interface, as follows:

- When a new EPA is inserted into the system, the default configuration will be used for the associated interfaces.

- As a MIP is initialized, the STATUS LED will first be amber, indicating that power is on, but the MIP is being configured. When the MIP is active, the STATUS LED will illuminate green.

- EPAs will follow the same sequence once the MIP has completed its initialization. The EPA STATUS LEDs will illuminate amber, turning to green when the EPAs become active.

- When the MIP and EPA STATUS LEDs are green, all associated interfaces are configurable.

Note   Refer to the *Cisco ASR 1000 Series Modular Ethernet Line Card Software Configuration Guide* for configuration instructions.

- If a MIP or EPA is replaced with a module of the same type (as in an OIR or hardware swap), the previous configuration will be reinstated when the MIP or EPA becomes active.

- If a MIP or EPA has not been previously installed in the same slot or subslot, then the configuration for all associated interfaces will be empty.

Note   New interfaces are not available until you configure them.

Step 2   If the MIPs and EPAs have not become active within three minutes, refer to the system console messages as follows:

- If a MIP or EPA is undergoing a field-programmable device (FPD) upgrade, then console messages will indicate that the FPD process has been initiated. The upgrade process might take several minutes. Use the **show upgrade fpd progress** command to obtain information about the FPD process. MIPs or EPAs that undergo an FPD upgrade will automatically be rebooted. Return to Step 1.

- If there is no indication that an FPD upgrade is under way, see Chapter 6, "Troubleshooting."

Using show Commands to Verify the MIP and EPA Status

The following procedure uses **show** commands to verify that the new EPAs are configured and operating correctly.

Step 1   Use the **show running-config** command to display the system configuration. Verify that the configuration includes the new EPA interfaces.

Step 2   Display all of the current EPAs and a summary of their status using the **show hw-module subslot all oir** command.

Step 3   Display information about the installed MIPs using the **show diag** command.

Step 4   Use the **show hw-module subslot all fpd** command to verify the FPD version information of the EPAs installed in the system.

Note   If an EPA does not meet the minimum FPD version required, it will be updated automatically. If the update fails, the failing EPA will be powered down and an error message will be reported on the system console.

For more information about FPD upgrades, refer to the "Upgrading Field-Programmable Devices" chapter of the *Cisco ASR 1000 Series Modular Ethernet Line Card Software Configuration Guide.*

Step 5   Use the **show version** command to obtain a few details on the installed MIPs and interfaces.

Using show Commands to Display EPA Information

Table 4-1 describes the **show** commands you can use to display EPA information.

Table 4-1   show Commands to Display EPA Information

Command	Type of Information Provided
show controllers *type slot/subslot/port*	Network link status, register contents, and controller chip errors.
show diag subslot	EPA type in that slot, number of ports, hardware revision, part number, and EEPROM contents.
show hw-module subslot all fpd	FPD version information of EPAs in the system.
show hw-module subslot all oir	The operational status of all EPAs in the system.
show interfaces *type slot/subslot/port*	Line status and data link protocol status for a particular EPA port. Statistics about data traffic sent and received by the port.
show platform	Information about the router. Provides operational status of a MIP or EPA.
show running-config	The router's running configuration and interfaces available in the system.
show version	Cisco IOS software version, names and sources of configuration files, and boot images.

The following example shows the output of the **show diag subslot** *slot/subslot* **eeprom detail** command for an EPA located in slot 3, subslot 1:

```
Router# show diag subslot 3/1 eeprom detail
SPA EEPROM data for subslot 3/1:

EEPROM version : 4
Compatible Type : 0xFF
Controller Type : 3164
Hardware Revision : 1.0
Boot Timeout : 400 msecs
PCB Serial Number : JAE181802LS
PCB Part Number : 73-16553-01
PCB Revision : 00
Fab Version : 01
RMA Test History : 00
RMA Number : 0-0-0-0
RMA History : 00
Deviation Number : 0
Product Identifier (PID) : EPA-1X100GE
Version Identifier (VID) : V01
Top Assy. Part Number : 68-5101-01
Top Assy. Revision : 1
IDPROM Format Revision : 36
System Clock Frequency : 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00
```

```
CLEI Code : UNASSIGNED
Base MAC Address : 00 00 00 00 00 00
MAC Address block size : 0
Manufacturing Test Data : 00 00 00 00 00 00 00 00
Field Diagnostics Data : 00 00 00 00 00 00 00 00
Calibration Data : Minimum: 0 dBmV, Maximum: 0 dBmV
Calibration values :
Power Consumption : 22000 mWatts (Maximum)
Power Consumption Mode 1 : 22000 mWatts
Environment Monitor Data : 03 30 0C E4 46 28 09 C4
46 28 05 DC 46 28 04 B0
46 28 04 B0 46 28 04 B0
46 28 03 E8 46 28 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 FE 02 F6 26
Processor Label : 00 00 00 00 00 00 00
Platform features : 01 00 00 27 10 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00
00 00 00 00 00 00 00
Asset ID :
Asset Alias :
```

EPA Blank Filler Plates

EPA blank filler plates (EPA-BLANK=) are available to fill an unused EPA subslot.

When an EPA subslot is not in use, an EPA blank filler plate must be installed in the empty subslot to allow the router or switch to conform to electromagnetic interference (EMI) emissions requirements and to allow proper airflow across the EPAs. If you plan to install a new EPA in a subslot that is not in use, you must first remove the EPA blank filler plate.

CHAPTER **5**

Installing and Removing the SFP+, CPAK, and QSFP Modules

This chapter describes how to install and remove small form-factor pluggable (SFP+), CPAK, and QSFP modules in the EPAs. This chapter contains the following sections:

Preparing for Online Removal of SFP+, CPAK, and QSFP Modules

The Cisco ASR 1000 series router support OIR of an SFP+, CPAK, or a QSFP module without removing the EPA or MIP.

The interface configuration is retained or recalled if an EPA, MIP, SFP+, or CPAK is removed and then replaced with one of the same type.

However, if the line card is already installed in the router and the system is operational, we recommend that you shut down the port using the **interface config** command before removing the SFP+, or CPAK, or QSFP modules.

Installing and Removing SFP+ Modules

Note The EPA supports only the SFP+ modules listed in the "Modular Optics Compatibilities" section on page 1-4. An SFP+ check is run every time an SFP+ module is inserted into an EPA, and only those SFP+ modules that pass this check are usable.

Before you remove or install an SFP+ module, read the installation information provided in this section and the "Laser and LED Safety" section on page 2-8.

> **Caution**   Protect the SFP+ modules by inserting clean dust covers on them after the cables are removed. Ensure that you 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**   We recommend that you do not install or remove the SFP+ module with fiber-optic cables attached to it because of potential damage to the cable, the cable connector, or the optical interfaces in the SFP+ module. Disconnect all the cables before removing or installing an SFP+ module.
>
> Removing and inserting an SFP+ module can shorten its useful life. Therefore, you should not remove and insert SFP+ modules unless it is absolutely necessary.
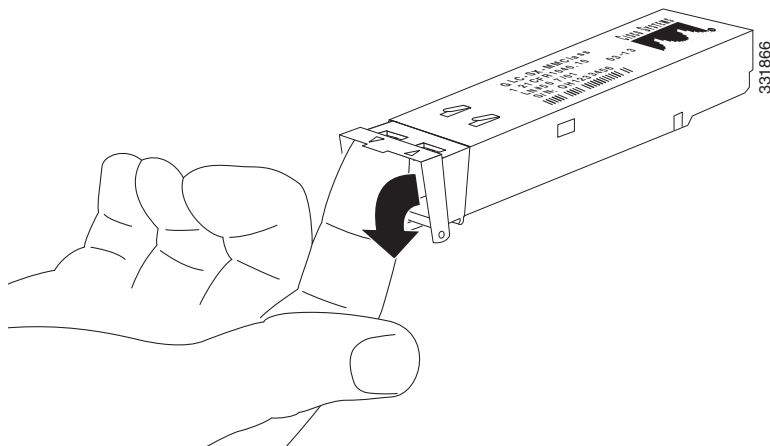
SFP+ modules use one of four different latching devices to install and remove the module from a port. The four types of SFP+ module-latching devices are described in the following sections:

Bale Clasp SFP+ Module

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

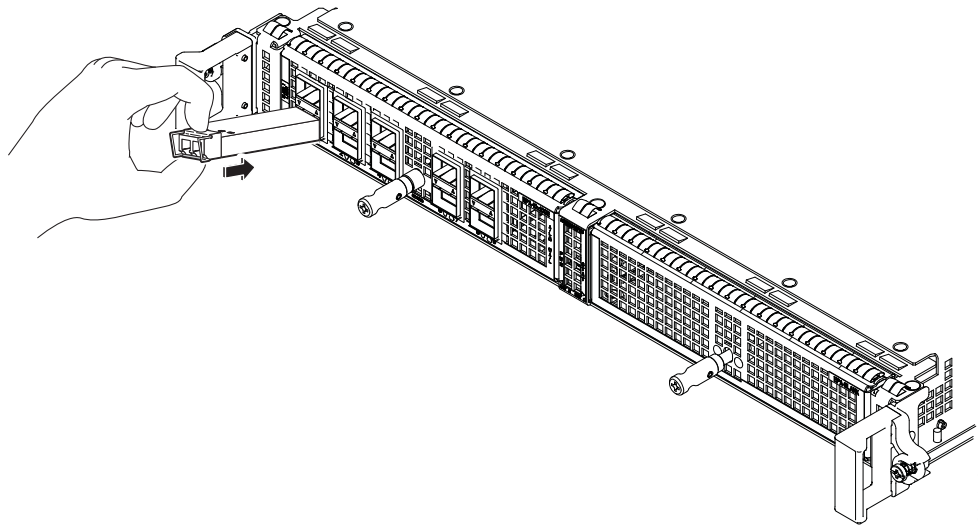**Figure 5-1   Bale Clasp SFP+ Module**

Installing a Bale Clasp SFP+ Module

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

Step 1   Attach an ESD-preventive wrist strap or ankle strap according to the instructions provided.

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 5-2.)

Figure 5-2   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 at the bottom of the SFP+ module snaps into the hole in the receptacle.

Removing a Bale Clasp SFP+ Module

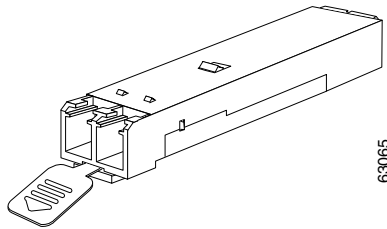To remove this type of SFP+ module, follow these steps:

Step 1   Attach an ESD-preventive wrist strap or ankle strap by following the instructions provided.

Step 2   Disconnect and remove all the interface cables from the ports and 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 5-3. 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 5-3.

Figure 5-3   *Removing a Bale Clasp SFP+ Module*
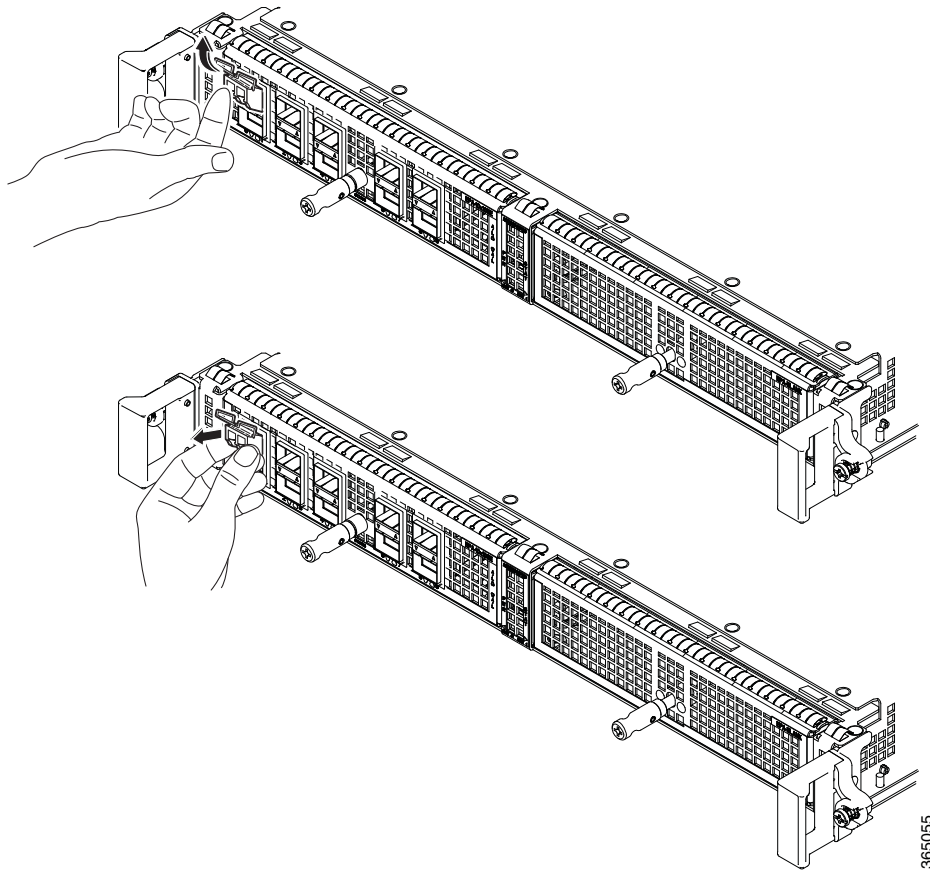
Step 5   Place the removed SFP+ module on an antistatic mat, or immediately place it in a static shielding bag if you plan to return it to the factory.

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

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.)

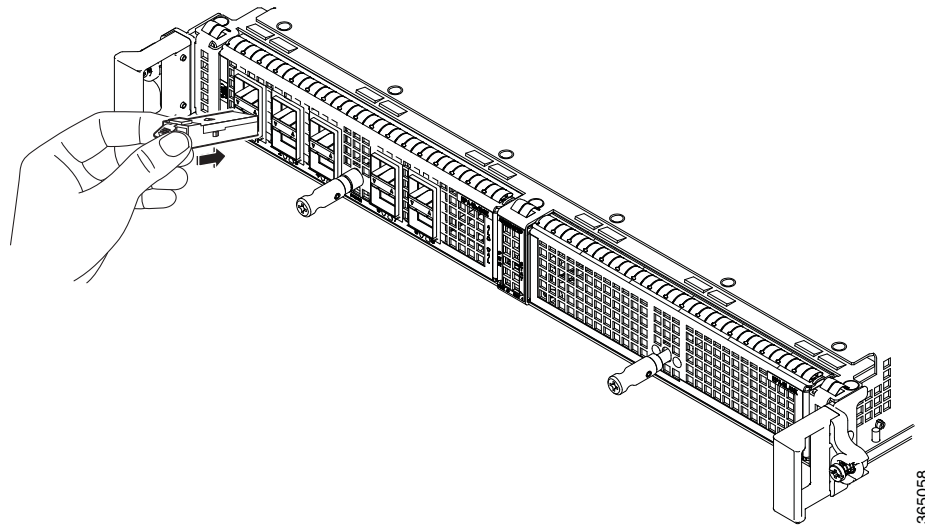*Figure 5-4*   *Mylar Tab SFP+ Module*

Installing a Mylar Tab SFP+ Module

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

Step 1   Attach an ESD-preventive wrist strap or ankle strap according to the instructions provided.

Step 2   Line up the SFP+ module with the port, and slide it into place. (See Figure 5-5.)

Figure 5-5   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 at the bottom of the SFP+ module snaps into the hole in the receptacle.
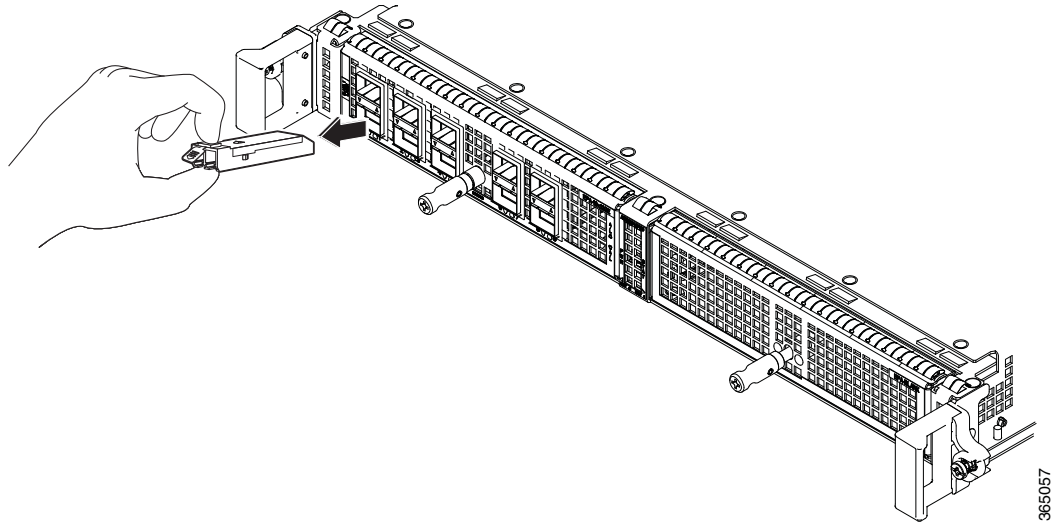
Removing a Mylar Tab SFP+ Module

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

Step 1   Attach an ESD-preventive wrist strap or ankle strap according to the instructions provided.

Step 2   Disconnect and remove all the 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 and then pull the SFP+ module out. (See Figure 5-6.)

> ⚠
> **Caution**   When pulling the tab to remove the SFP+ module, be sure to pull it in a straight outward motion so that you can 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.

Figure 5-6   *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 on the optical module cage when there is no SFP+ module installed.

Actuator Button SFP+ Module

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

Figure 5-7   *Actuator Button SFP+ Module*
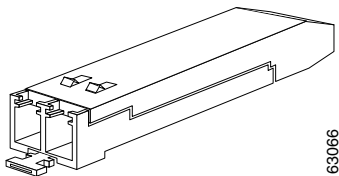
Installing an Actuator Button SFP+ Module

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

Step 1   Attach an ESD-preventive wrist strap or ankle strap according to the instructions provided.

Step 2   Line up the SFP+ module with the port and slide it in until the actuator button clicks into place. (See Figure 5-8.) Do not press the actuator button as you insert the SFP+ module because you might inadvertently disengage the SFP+ module from the port.

Figure 5-8   Installing an Actuator Button SFP+ Module
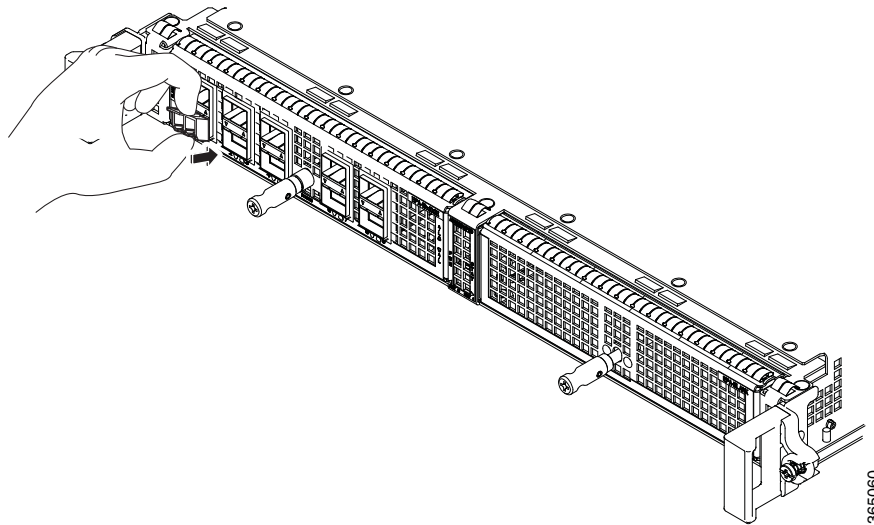
✎ **Note**   Verify that the SFP+ modules are completely seated and secured in their assigned receptacles on the line card by firmly pushing on each SFP+ module. If the SFP+ module is not completely seated and secured in the receptacle, you will hear a click as the triangular pin at the bottom of the SFP+ module snaps into the hole in the receptacle.

Removing an Actuator Button SFP+ Module

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

Step 1   Attach an ESD-preventive wrist strap or ankle strap according to the instructions provided.

Step 2   Disconnect and remove all the 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 is activated, releasing the SFP+ module from the port. (See Figure 5-9.)

Figure 5-9   *Removing an Actuator Button SFP+ Module from a Port*
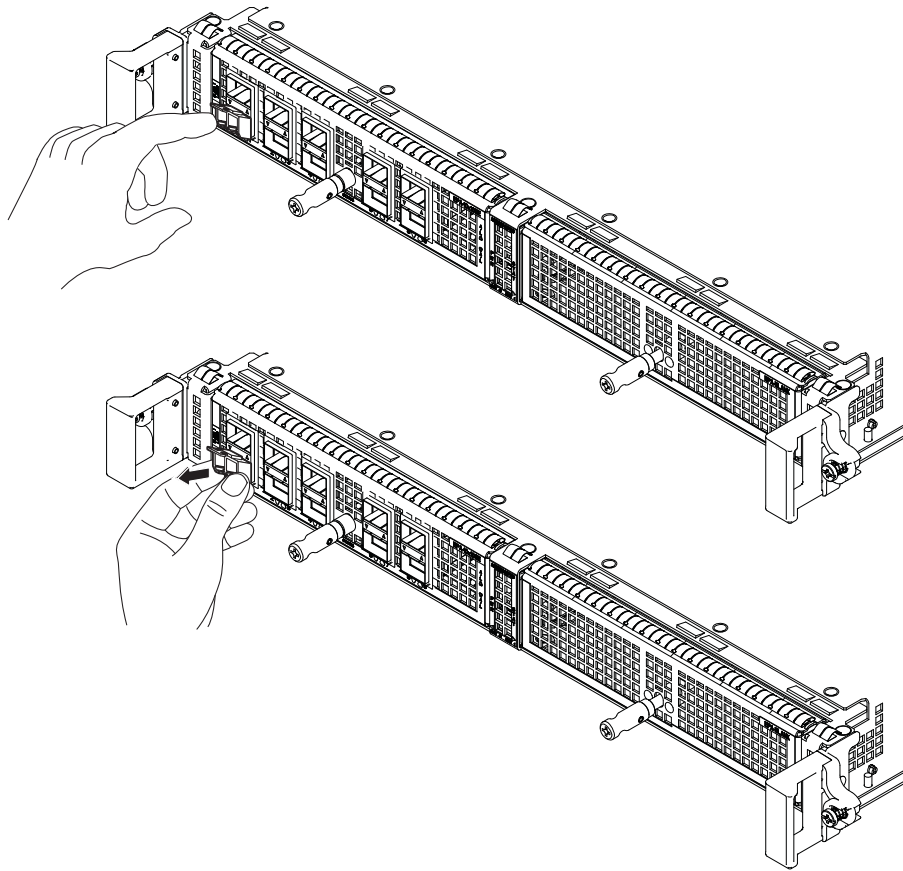
Step 4   Grasp the actuator button between your thumb and index finger and carefully pull the SFP+ module from the port.

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 on the optical module cage when there is no SFP+ module installed.

Slide Tab SFP+ Module

The slide tab SFP+ module has a tab underneath the front of the SFP+ module. Use the tab to disengage the module from a port. (See Figure 5-10.)

Figure 5-10   Slide Tab SFP+ Module
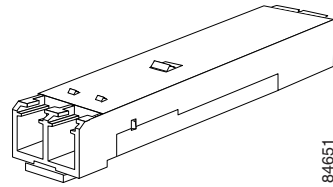
Installing a Slide Tab SFP+ Module

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

Step 1   Attach an ESD-preventive wrist strap or ankle strap according to the instructions provided.

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 avoid damage to 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 5-11.)

Figure 5-11   Installing a Slide 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.

Removing a Slide Tab SFP+ Module
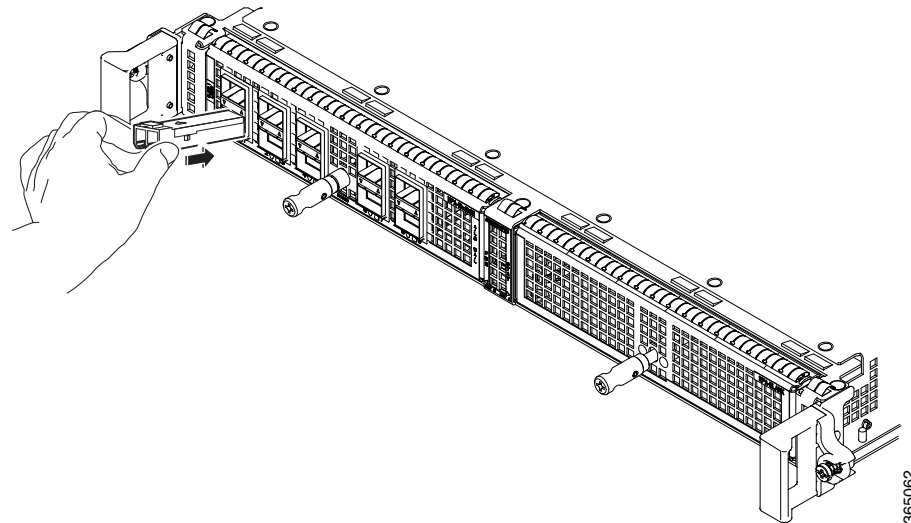
To remove this type of SFP+ module, follow these steps:

Step 1   Attach an ESD-preventive wrist strap or ankle strap according to the instructions provided.

Step 2   Disconnect and remove all the 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 at 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 5-12.)

Figure 5-12   Disengaging the Slide Tab
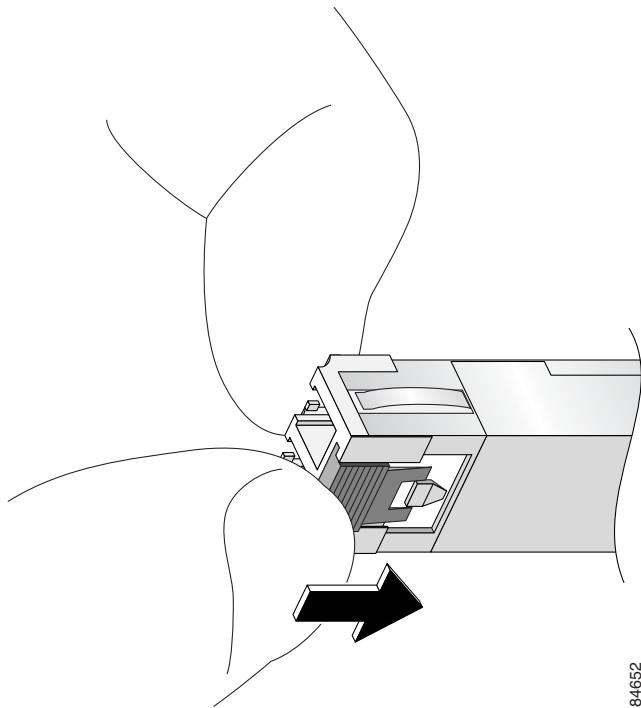
Step 5   With the tab still pushed, carefully pull the SFP+ module from the port, as shown in Figure 5-13.
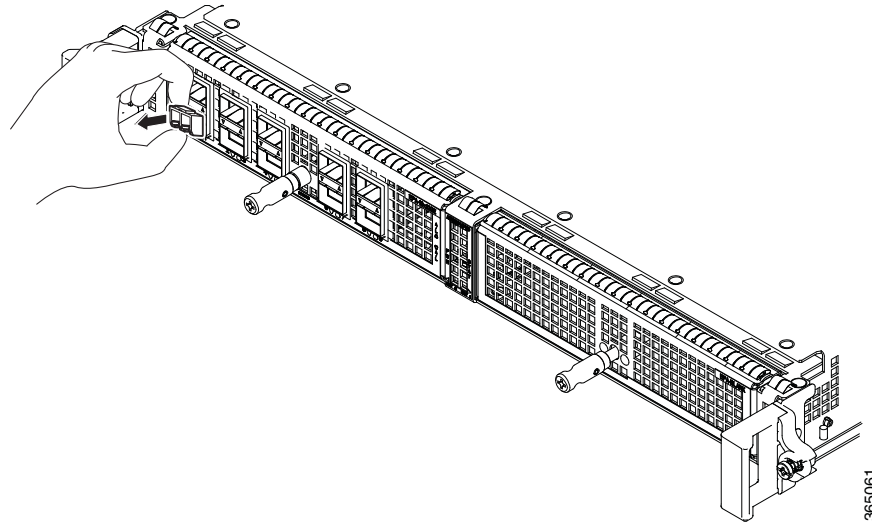
⚠
Caution   You must disengage the SFP+ module by pushing on the slide tab before you pull out the SFP+ module. If you pull the SFP+ module without disengaging the tab, you can damage the SFP+ module.

Figure 5-13   *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 on the optical module cage when there is no SFP+ module installed.

Installing and Removing CPAK Modules

The CPAK transceiver module is a hot-swappable I/O device that plugs into the 1-Port 100 Gigabit Ethernet EPA (EPA-1X100GE). The modules have a total of 82 pins (40 pins on the top row and 42 on the bottom row) on the electrical interface and either a duplex SC or 24 fibers-MPO connector on the optical interface.

The following types of CPAK modules or adapters are supported:

- CPAK 100GBASE-SR10 (CPAK-100G-SR10)

    Delivers 100-Gbps links over 24-fiber ribbon cables terminated with MPO/MTP connectors. It supports link lengths of 100m and 150m on laser-optimized OM3 and OM4 multifiber cables.

Note   The EPA-CPAK-2x40GE supports only the CPAK-100G-SR10 and CAB-MPO24-2XMPO12 (breakout cable).

- CPAK 100GBASE-LR4 (CPAK-100G-LR4)

  Supports 100-Gbps optical links over standard single-mode fiber (SMF, G.652) terminated with SC connectors. Nominal power consumption is less than 5.5W.

  The LR4 module is IEEE 802.3ba-compliant and supports link lengths of up to 10 km over standard SMF, G.652. It delivers an aggregate data signal of 100-Gbps, carried over four wavelength-division multiplexing (WDM) wavelengths operating at a nominal 25 Gbps per lane in LAN mode. Optical multiplexing and demultiplexing of the four wavelengths are managed within the module.

- CPAK 100GBASE-ER4L (CPAK-100G-ER4L)

Supports 100-Gbps optical links over standard single-mode fiber (SMF, G.652) terminated with SC connectors. Nominal power consumption is less than 5.5W.

The LR4 module is IEEE 802.3ba-compliant and supports link lengths of up to 25 km over standard SMF, G.652. It delivers an aggregate data signal of 100-Gbps, carried over four wavelength-division multiplexing (WDM) wavelengths operating at a nominal 25 Gbps per lane in LAN mode. Optical multiplexing and demultiplexing of the four wavelengths are managed within the module.

Figure 5-14   100-Gigabit Ethernet CPAK Transceiver Module
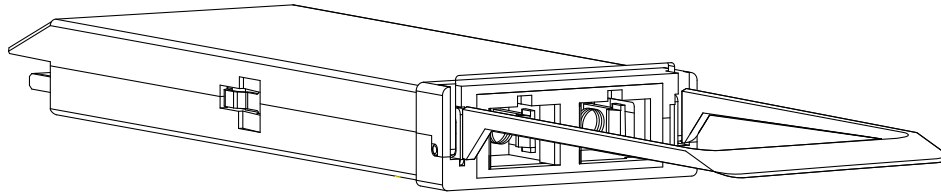
Installing the CPAK Module

⚠

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

To install an CPAK transceiver, follow these steps:

Step 1   Attach an ESD wrist strap to yourself and a properly grounded point on the chassis or the rack.

Step 2   Remove the CPAK transceiver from its protective packaging.

✎

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

Step 3   Check the label on the CPAK transceiver body to verify that you have the correct model for your network.

Step 4   Remove the optical bore dust plug and set it aside.

Step 5   Align the CPAK module in front of the module's socket opening and carefully slide the CPAK module into the socket until the module makes contact with the socket electrical connector.

Step 6 Press firmly on the front of the CPAK module with your thumb to fully seat the module in the module's socket.

⚠

Caution If the latch is not fully engaged, you might accidentally disconnect the CPAK transceiver or adapter module.

Step 7 Reinstall the dust plug into the CPAK transceiver or adapter module optical bore until you are ready to attach the network interface cable. Do not remove the dust plug until you are ready to attach the network interface cable.

Attaching the Optical Network Cable

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.

- Inspect and clean the MPO connector end faces just before you make any connections. See the "Cleaning Optical Devices" section on page 5-17 for information about fiber-optic inspection and cleaning.

- Grasp the MPO connector only by the housing to plug or unplug a fiber-optic cable.

✎

Note For the CPAK-100G-SR10 module, the multiple-fiber push-on (MPO) connectors use network interface cables with either physical contact (PC) or ultra-physical contact (UPC) flat polished face types.

Step 1 Remove the dust plugs from the optical network interface cable connectors. Save the dust plugs for future use.

Step 2 Inspect and clean the connector's fiber-optic end faces.

🔍

Tip For complete information on inspecting and cleaning fiber-optic connections, see the "Cleaning Optical Devices" section on page 5-17.

Step 3 Remove the dust plugs from the CPAK transceiver module optical bores.

Step 4 Immediately attach the network interface cable connectors to the CPAK module.

Removing the CPAK Transceiver Module

⚠

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

To remove an CPAK transceiver, follow these steps:

Step 1   Disconnect the network interface cable from the CPAK transceiver connectors.

Step 2   Immediately install the dust plug into the module's optical bore.

Step 3   Grasp the tab and gently pull straight out to release the module from the socket.

Step 4   Slide the module out of the socket.

Step 5   Place the CPAK module into an antistatic bag.

Installing and Removing QSFP Modules

The QSFP transceiver module is a hot-swappable I/O device that supports 40-Gbps optical links over standard single-mode fiber (SMF, G.652) terminated with SC connectors. Nominal power consumption is less than 3.5W.

The LR4 module is IEEE 802.3ba-compliant and supports link lengths of up to 10 km over standard SMF, G.652. It delivers an aggregate data signal of 40-Gbps, carried over four wavelength-division multiplexing (WDM) wavelengths operating at a nominal 10 Gbps per lane in LAN mode. 40-Gigabit Ethernet QSFP Transceiver Module
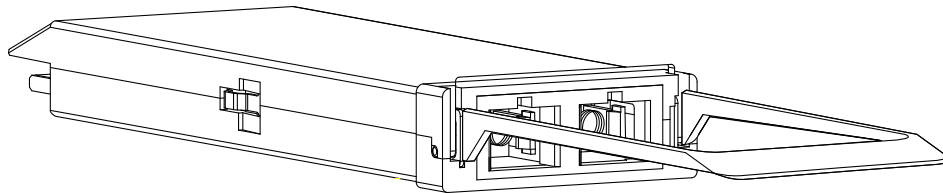
Installing the QSFP Module

⚠️

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

To install an QSFP transceiver, follow these steps:

Step 1   Attach an ESD wrist strap to yourself and a properly grounded point on the chassis or the rack.

Step 2   Remove the QSFP transceiver from its protective packaging.

✎

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

Step 3   Check the label on the QSFP transceiver body to verify that you have the correct model for your network.

Step 4   Remove the optical bore dust plug and set it aside.

Step 5   Align the QSFP module in front of the module's socket opening and carefully slide the QSFP module into the socket until the module makes contact with the socket electrical connector.

Step 6   Press firmly on the front of the QSFP module with your thumb to fully seat the module in the module's socket.

⚠
Caution   If the latch is not fully engaged, you might accidentally disconnect the QSFP transceiver or adapter module.

Step 7   Reinstall the dust plug into the QSFP transceiver or adapter module optical bore until you are ready to attach the network interface cable. Do not remove the dust plug until you are ready to attach the network interface cable.

Attaching the Optical Network Cable

Step 1   Remove the dust plugs from the optical network interface cable connectors. Save the dust plugs for future use.

Step 2   Inspect and clean the connector's fiber-optic end faces.

🔍
Tip   For complete information on inspecting and cleaning fiber-optic connections, see the "Cleaning Optical Devices" section on page 5-17.

Step 3   Remove the dust plugs from the QSFP transceiver module optical bores.

Step 4   Immediately attach the network interface cable connectors to the QSFP module.

Removing the QSFP Transceiver Module

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

To remove an QSFP transceiver, follow these steps:

Step 1   Disconnect the network interface cable from the QSFP transceiver connectors.

Step 2   Immediately install the dust plug into the module's optical bore.

Step 3   Grasp the tab and gently pull straight out to release the module from the socket.

Step 4   Slide the module out of the socket.

Step 5   Place the QSFP module into an antistatic bag.

Optical Device Maintenance

Any contamination of the fiber connection can cause failure of the component or failure of the whole system. A particle that partially or completely blocks the core generates strong back reflections, which can cause instability in the laser system. Inspection, cleaning, and reinspection are critical steps to take before making fiber-optic connections.

Cleaning Optical Devices

See the *Inspection and Cleaning Procedures for Fiber-Optic Connections* and the *Compressed Air Cleaning Issues for Fiber-Optic Connections* documents for information on cleaning optical devices.

Troubleshooting

This chapter describes how to troubleshoot the installation of the Cisco ASR 1000 Series Modular Interface Processor on the Cisco ASR 1000 Series Aggregation Services Routers. This chapter contains the following sections:

Troubleshooting Installation Issues

This section provides troubleshooting information pertaining to the installation of the Cisco ASR 1000 Series Modular Interface Processor. Possible problems, observations and comments, and solutions are indicated for the following troubleshooting symptoms:

- Cisco ASR 1000 Series Modular Interface Processor transitions repeatedly from on to off
- Cisco ASR 1000 Series Modular Interface Processor is deactivated

Cisco ASR 1000 Series Modular Interface Processor Transitions Repeatedly From On to Off		
Possible Problem	**Observations and Comments**	**Solutions**
Cisco ASR 1000 Series Modular Interface Processor is booting up, which is a normal operation.	Cisco ASR 1000 Series Modular Interface Processor STATUS LED alternates between green, amber, or off.	Wait for 150 seconds until the boot process completes and the STATUS LED stays on.
Cisco ASR 1000 Series Modular Interface Processor does not go beyond the bootup stage.	Cisco ASR 1000 Series Modular Interface Processor STATUS LED transitions continue and alternate between green, amber, or off.	Follow the recommended action for the displayed error message.
Cisco ASR 1000 Series Modular Interface Processor is not up to date.	During the Cisco ASR 1000 Series Modular Interface Processor initialization, the need to update the field-programmable gate array (FPGA) is automatically detected.	Follow the system prompts to update the FPGA image. If the Cisco ASR 1000 Series Modular Interface Processor is cycling because of a field-programmable device (FPD) problem, the most likely cause is an FPD failure or that the FPD package file is not present.

Cisco ASR 1000 Series Modular Interface Processor is Deactivated		
Possible Problem	**Observations and Comments**	**Solutions**
Cisco ASR 1000 Series Modular Interface Processor is not fully seated in the chassis slot.	Output of the **show diag** *slot* command. STATUS LED is off.	Follow this procedure: 1. Remove the Cisco ASR 1000 Series Modular Interface Processor from the slot. 2. Inspect the Cisco ASR 1000 Series Modular Interface Processor. Verify that there are no bent pins or parts and that there is nothing that could prevent a good connection. 3. Insert the Cisco ASR 1000 Series Modular Interface Processor into the chassis slot.
Cisco ASR 1000 Series Modular Interface Processor is not at the minimum hardware-programmable revision level.	Error message indicating that the Cisco ASR 1000 Series Modular Interface Processor 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.

Troubleshooting Line Card States

Table 6-1   Troubleshooting Line Card States

Problem	Observation
Various problems with the line card states.	• The LED on the line card front panel is green, indicating that the that line card is up and running with Cisco IOS. • The **show platform** command shows the status of line card slot as **ok**. • The **show hw-module subslot** *x/y* **oir** [*internal*] command indicates that the EPA operation status is **ok**. • The **show running-config** command shows interfaces for the line card. • The **show ip interface brief** command shows the configured interfaces for the line card if they are ready for configuration.

Using debug Commands

The **debug hw-module subslot** command is intended for use by Cisco Systems technical support personnel.

⚠

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 the other **debug** commands supported on the Cisco ASR 1000 series router error messages, including messages related to the Cisco ASR 1000 Series Modular Interface Processor, refer to the following documents:

- *Cisco IOS Release 12.2 SR Command References*
- *Cisco ASR 1000 Series Modular Ethernet Line Card Software Configuration Guide*

Packing a Cisco ASR 1000 Series Modular Interface Processor for Shipment

This section provides step-by-step instructions for packing a Cisco ASR 1000 Series Modular Interface Processor 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 ASR 1000 native line cards. Failure to use Cisco Systems packaging properly may result in damage or loss of product.

⚠

Caution   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 electrocute yourself.

✎

Note   The following instructions assume that the Cisco ASR 1000 Series Modular Interface Processor has been removed from the router according to the procedures specified in this guide.

To pack a Cisco ASR 1000 Series Modular Interface Processor for shipment, perform the following steps:

Step 1   Insert the Cisco ASR 1000 Series Modular Interface Processor into the static shielding bag.

Step 2   Insert the bagged Cisco ASR 1000 Series Modular Interface Processor into the smaller inner carton. Ensure that you position the Cisco ASR 1000 Series Modular Interface Processor such 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 ASR 1000 Series Modular Interface Processor 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.