

# Cisco ASR 1001-HX Router and Cisco ASR 1002-HX Router Hardware Installation Guide

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# Preface


- Document Revision History, on page ix
- Document Objectives, on page ix
- Audience, on page ix
- Document Organization, on page x
- Conventions, on page x
- Related Documentation, on page xii
- Obtaining Documentation and Submitting a Service Request, on page xii


## Document Revision History

The following table records the changes made to this document.

| Date | Change Summary |
|---|---|
| May 2016 | First version of the document. |

## Document Objectives

This publication describes the installation of the  and replacement or upgrade of field-replaceable units (FRUs).

## Audience

This publication is primarily designed for persons responsible for installing, maintaining, and troubleshooting the . The users of this guide should:

- Be familiar with electronic circuitry and wiring practices.
- Have experience working as electronic or electromechanical technicians.
- Have experience in installing high-end networking equipment.

**Note** Certain procedures described in this guide require a certified electrician.

# Document Organization

The following table describes the chapters and appendixes in this installation guide:

| Chapter and Appendix | | Description |
|---|---|---|
| 1 | Cisco ASR 1002-HX Router Overview | Provides an overview of the |
| 2 | Cisco ASR 1002-HX Supported Hardware Components | Provides an overview of the hardware components for the |
| 3 | Preparing Your Site for Installation | Provides site preparation guidelines for installing the |
| 4 | Cisco ASR 1002-HX Router Installation | Provides information about the installation methods and steps to install the |
| 5 | Cisco ASR 1002-HX Router Power Up and Initial Configuration | Provides basic system startup and initial configuration information |
| 6 | Cisco ASR 1002-HX Router License Verification | Provides information about the licenses |
| 7 | Removing and Replacing FRUs from the Cisco ASR 1002-HX Router | Provides instructions for removing and replacing the various FRUs in the |
| A | Cisco ASR 1002-HX Router Specifications | Provides router specifications for the |
| B | Cisco ASR 1002-HX Router Signals and Pinouts | Lists pinout specifications for the |

# Conventions

| Text Type | Indication |
|---|---|
| User input | Text the user should enter exactly as shown or keys a user should press appear in **`this font`**. |
| Document titles | Document titles appear in *this font*. |
| System output | Terminal sessions and information that the system displays appear in `this font`. |
| CLI commands | CLI command keywords appear in **this font**.<br>Variables in a CLI command appear in *this font*. |

| Text Type | Indication |
|---|---|
| [ ] | Elements in square brackets are optional. |
| {x \| y \| z} | Required alternative keywords are grouped in braces and separated by vertical bars. |
| [x \| y \| z] | Optional alternative keywords are grouped in brackets and separated by vertical bars. |
| string | A nonquoted set of characters. Do not use quotation marks around the string or the string will include the quotation marks. |
| < > | Nonprinting characters such as passwords are in angle brackets. |
| [ ] | Default responses to system prompts are in square brackets. |
| !<br>#<br> | An exclamation point (!) or a pound sign (#) at the beginning of a line of code indicates a comment line. |



**Note** Means *reader take note*. Notes contain helpful suggestions or references to material not covered in the document.



**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.



**Caution** Means *reader be careful*. In this situation, you might perform an action that could result in equipment damage or loss of data.



**Timesaver** Means *the described action saves time*. You can save time by performing the action described in the paragraph.



**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.

SAVE THESE INSTRUCTIONS

# Related Documentation

See the following documentation for Cisco ASR 1001-HX Router:

- *Release Notes for Cisco ASR 1000 Series, Cisco IOS XE Denali 16.3*
- *Open Source Used In Cisco ASR 1001-HX Router*
- *Cisco IOS XE Denali 16.3 Migration Guide for Access and Edge Routers*

See the following documentation for Cisco ASR 1002-HX Router:

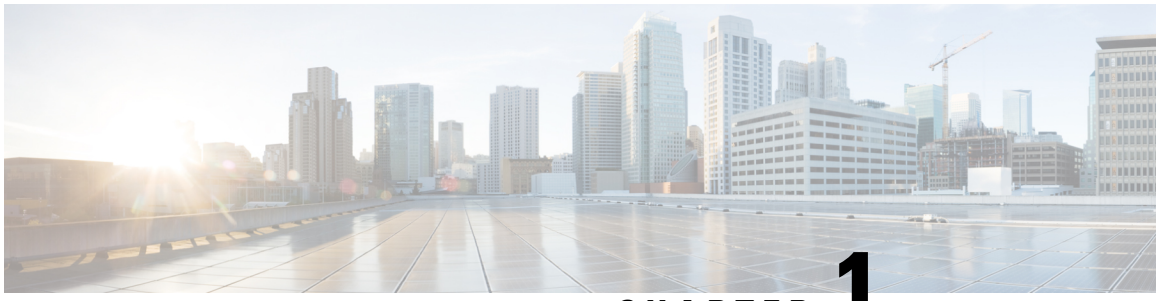
- *Release Notes for Cisco ASR 1000 Series, Cisco IOS XE Denali 16.2*
- *Open Source Used In Cisco ASR 1002-HX Router*
- *Cisco IOS XE Denali 16.2 Migration Guide for Access and Edge Routers*

The Documentation Roadmap for Cisco ASR 1000 Series, Cisco IOS XE Denali 16.x provides links to all Cisco ASR 1000 Series product documentation.

# Obtaining Documentation and Submitting a Service Request

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

Subscribe to the *What's New in Cisco Product Documentation* as a Really Simple Syndication (RSS) feed and set content to be delivered directly to your desktop using a reader application. The RSS feeds are a free service and Cisco currently supports RSS version 2.0.



CHAPTER 1

# Overview

The Cisco ASR 1000 Series Aggregation Services Routers are mid-range edge routers that establish a new price-to-performance class offering benefits to both enterprise and service providers alike. The Cisco ASR 1000 Series Aggregation Services Routers portfolio is based on an innovative custom-built ASIC called Quantum Flow Processor that aggregates services at scale.

The Cisco ASR 1001-HX Router and Cisco ASR 1002-HX Router are a part of the Cisco ASR 1000 Series and offers a compact form factor that consumes less rack space and power while offering 100 Gbps forwarding throughput. The Cisco ASR 1001-HX Router and Cisco ASR 1002-HX Router support all the general-purpose routing and security features of the Cisco ASR 1000 Series Aggregation Services Routers.


- Hardware Features, on page 1
- Cisco Product Identification Standard, on page 5
- Serial Number and PID/VID Label Location, on page 7


# Hardware Features

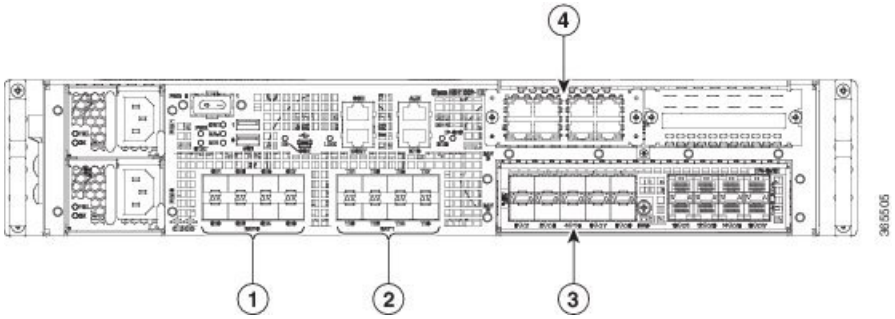
## Front View

### Slot Numbering

The Cisco ASR 1002-HX supports one Ethernet port adapter (EPA) in Bay 2 and one NIM in Bay 3 (for one single-wide or one double-wide NIM) .

The following figure shows slot numbering on the .

***Figure 1: Slot Numbering***

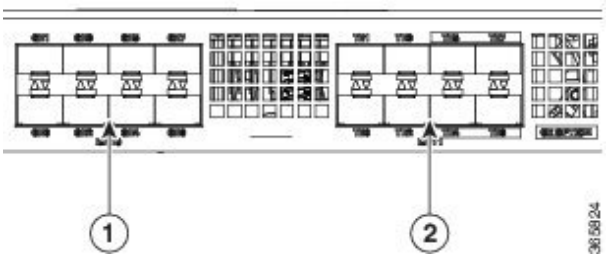


| | | | |
|---|---|---|---|
| 1 | Bay 0—Subslot 0/0/*n* connected to the built-in 1GE SFP interfaces | 3 | Bay 2—Subslot 0/2/*n* connected to the EPA interfaces<br>See Supported EPAs, on page 9. |
| 2 | Bay 1—Subslot 0/1/*n* connected to the built-in 10GE SFP+ interfaces | 4 | Bay 3—Subslot 0/3 connected to the NIM interfaces |

## Built-In SFP and SFP+ Ports

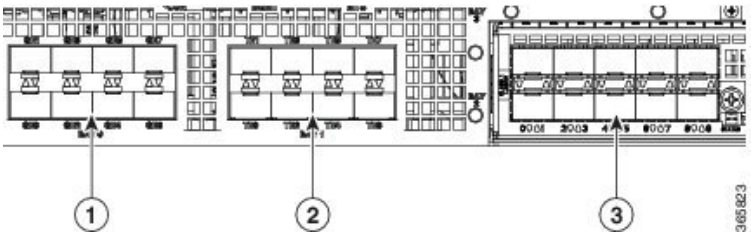
The following figure shows the port numbering for the built-in ports.

***Figure 2: Port Numbering***




| | | | |
|---|---|---|---|
| 1 | Bay 0—The ports in Bay 0 use 1GE SFP transceivers and are labeled GE0 - GE7. | 2 | |

***Figure 3: Port Numbering***




| | | | |
|---|---|---|---|
| 1 | Bay 0—The ports in Bay 0 use 1GE SFP transceivers and are labeled GE0 - GE7. | 2 | Bay 1— The ports in Bay 1 use 10GE SFP+ transceivers and are labeled TE0 - TE7. |
| 3 | Bay 2—EPA Slot | | |

**Note** Interfaces from 0 - 3 on both Bay 0 and Bay 1 on the and are enabled by default. Interfaces from 4 - 7 can be enabled by purchasing the Paired Port License.

The port LEDs behave as follows:

- Off—Indicates the port is not enabled by software.
- Amber—Indicates the port is enabled by software but there is a problem with the link.

- Green—Indicates the port is enabled by software and there is valid link.

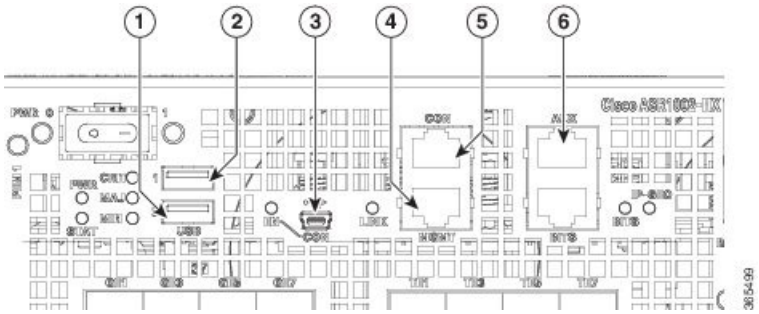
**Note** On Cisco ASR1001-HX platform, 1G SFP or 10G SFP+ can be configured with dual-rate 10GE ports as follows:

- **10G SFP+ on dual-rate 10GE Interface:** Auto-negotiation protocol is not supported, and automatic negotiation cannot be configured using the **negotiation auto** command.
- **1G SFP on dual-rate 10GE Interface:** Auto-negotiation protocol is supported, and automatic negotiation can be configured using **negotiation auto** command. To disable auto negotiation, use **no negotiation auto** command.

## Management and Storage Connections

The following figure shows the management and storage connections for the ASR 1002-HX Router.

***Figure 4: Management and Storage Connections for the Cisco ASR 1002-HX Router***

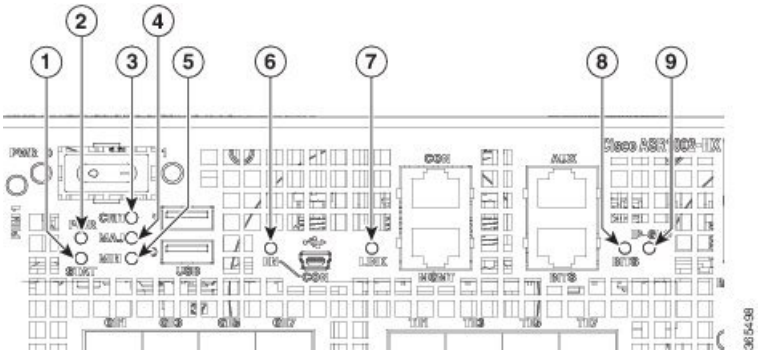



| | | | |
|---|---|---|---|
| 1 | USB port 0 | 4 | MGMT—RJ-45 10/100/1000 management Ethernet port. |
| 2 | USB port 1 | 5 | CON—RJ-45/RS-232 compatible console port. |
| 3 | CON—Mini USB connector console port. | 6 | AUX—RJ-45/RS-232 compatible auxiliary port. |

## LEDs

The following figure shows the LEDs on the front panel of the Cisco ASR 1002-HX Router.

*Figure 5: Cisco ASR 1002-HX LEDs*

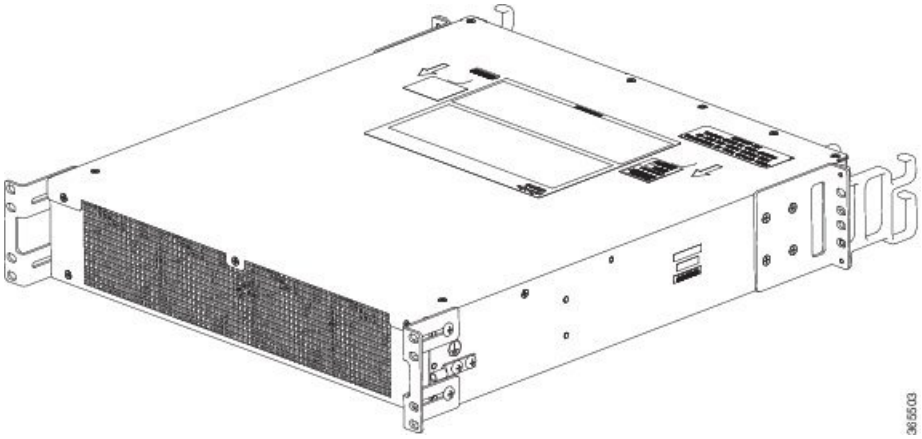



| No. | LED Label | Description | Color | Behavior |
|---|---|---|---|---|
| 1 | STATUS | Status | Green | Cisco IOS has successfully booted. |
| | | | Amber | The system is at ROMMON. |
| | | | Red | System failure. |
| 2 | PWR | Power | Green | All the power supplies are within operational limits. |
| 3 | CRIT | Critical alarm | Red | Critical alarm indicator. |
| 4 | MAJ | Major alarm | Red | Major alarm indicator. |
| 5 | MIN | Minor alarm | Amber | Minor alarm indicator. |
| 6 | EN | USB console enable | Green | Indicates that the mini USB connector is used as the console. |
| | | | Off | Indicates that the RJ-45 connector is being used as the console. |
| 7 | LINK | Management | Blinking green | Indicates the negotiated Ethernet speed (1 blink equals 10 Mbps, 2 blinks equals 100 Mbps, 3 blinks equals 1000 Mbps). |
| | | | Off | Not connected. |
| 8 | BITS | Building Integrated Timing Supply (BITS) | Off | The BITS port is not supported in this software release. |
| 9 | IP-SEC | Crypto module | Green | Indicates the crypto module is present and operational. |
| | | | Amber | Indicates the crypto module is present but inoperable. |
| | | | Off | Indicates the crypto module is not installed. |

## Rear View

The following figure shows the rear of the .

***Figure 6: Rear View***



The chassis has a front-to-rear airflow. Four internal fans draw cooling air in through the front of the chassis and across internal components to maintain an acceptable operating temperature. The fans are located at the rear of the chassis. The fans are numbered from 0 to 3, right to left.

# Cisco Product Identification Standard

This section describes the Cisco products and services product identification standard. This feature provides you with the ability to effectively integrate and manage Cisco products in your network and business operations.

## Unique Device Identifier

The Unique Device Identifier (UDI) is the Cisco product identification standard for hardware products. A product identification standard removes barriers to enterprise automation and can help you reduce operating expenses.

The UDI provides a consistent electronic, physical, and associated business-to-business information product identification standard.

The UDI is a combination of five data elements. The following table lists the UDI elements.

***Table 1: UDI Elements***

| UDI Data Element | Electronic Visibility | Physical Visibility | Description |
|---|---|---|---|
| PID | Yes | Yes | Product ID, also known as product name, model name, product number |
| VID | Yes | Yes | Version ID |
| SN | Yes | Yes | Serial number, the unique instance of the PID |

| UDI Data Element | Electronic Visibility | Physical Visibility | Description |
|---|---|---|---|
| Entity Name | Yes | — | Type, such as chassis, slot, or power supply |
| Product Description | Yes | — | Additional product information |

The combination of serial number and product ID (PID) is unique and consistent across all Cisco products. The PID that is coded on hardware is called a base product identifier.

Additional orderable PIDs can be associated to a base PID. For instance, an orderable PID may describe a packaging configuration for a product or a bundled group of products sold, tested, and shipped together. Specific unique device identifier (UDI) benefits include the following:

- Identifies:
  - Individual Cisco products in your networks
  - PIDs and serial numbers for service and replaceable products
  - Version IDs (VIDs) for product version visibility
- Facilitates discovery of products subject to recall or upgrade
- Enhances inventory automation of Cisco products

The Cisco product identification standard provides the following features:

- Version visibility—Cisco continuously improves products through feature additions. Product changes are indicated by incrementing the VID, which provides version visibility to help you understand and manage product changes. VID management ensures consistency of changes from product to product.
- Operating expense reduction—Cisco UDIs provide accurate and detailed network inventory information; identifying each Cisco product in a network element through a standard interface. Cisco operating systems can view and use this data, allowing you to automate your electronic inventory.
- Consistency across product layers—The UDIs are embedded in the hardware products and cannot be overwritten. Operating and management systems discover UDIs through standard interfaces and display UDIs in standard outputs. Standard interfaces include the IETF standard ENTITY-MIB.

### show diag chassis eeprom detail Command

The **show diag chassis eeprom** command displays the PID, VID, PCB serial number, hardware revision, and other such information.

The following is sample output from the **show diag chassis eeprom** command:

```
Router# show diag chassis eeprom
MIDPLANE EEPROM data:

        Product Identifier (PID) : ASR1002-HX
        Version Identifier (VID) : V00
        PCB Serial Number        : JAE1931098U
        Top Assy. Part Number    : 68-5448-02
        Hardware Revision        : 0.3
        Asset ID                 :
        CLEI Code                : SAMPL00XYZ
```

**Note** Common Language Equipment Identification (CLEI) code is a ten-digit character code that identifies a specific product. A CLEI code is applied to each part within a Cisco ASR1002-HX Router as they are programmed in manufacturing for shipment to customers.

### show license udi Command

The **show license udi** command displays UDI information.

The following is sample output from the **show license udi** command:

```
Router# show license udi

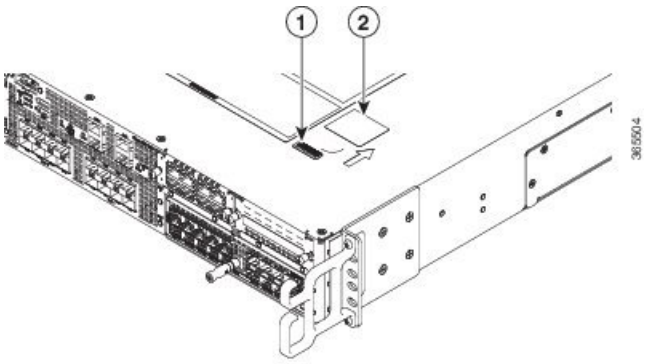
SlotID   PID                  SN                     UDI
-------------------------------------------------------------------------------
*        ASR1002-HX           JAE1931098U     ASR1002-HX:JAE1931098U
```

**Note** For complete information on the product identification standard, see http://www.cisco.com/go/udi/.

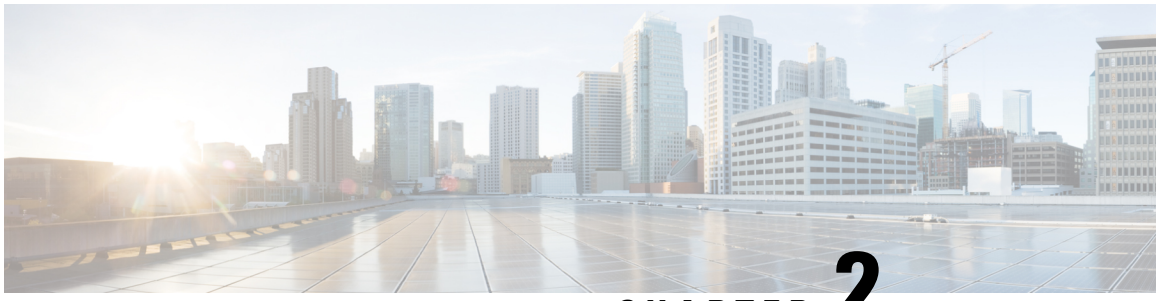
# Serial Number and PID/VID Label Location

The following figure shows the location of the serial number and the PID/VID label on the .

***Figure 7: Cisco ASR 1002-HX Router Serial Number and PID/VID Label Location***




| | | | |
|---|---|---|---|
| 1 | Serial Number | 2 | PID/VID Label |



CHAPTER 2

# Supported Hardware Components


- Supported EPAs, on page 9
- Supported NIMs, on page 10
- Supported Transceivers, on page 10
- Supported Crypto Module, on page 12
- Supported DIMM Upgrade , on page 12
- Power Supplies, on page 12


## Supported EPAs

For the latest and complete list of EPAs supported on the Cisco ASR 1002-HX Router, refer to the Cisco Technology Migration Matrix (https://tmgmatrix.cisco.com/). This resource is continuously updated, ensuring you have access to the most current information.

An EPA has two types of LEDs: an A/L (Active/Link) LED for each port on the EPA, and a STATUS LED, as shown in the following figure.

| | | | |
|---|---|---|---|
| 1 | A/L | 2 | STATUS |

***Table 2: EPA LEDs***

| Function | Color or State | Description |
|---|---|---|
| A/L (Active/Link) | Green | Port is enabled and the link is up. |
| | Amber | Port is enabled and the link is down. |
| | Off | Port is 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. |

**Related Topics**

Removing and Replacing an EPA, on page 104

# Supported NIMs

The following table lists the supported NIMs on the Cisco ASR 1002-HX router.

| PID | Description |
|---|---|
| NIM-SSD | The solid state drive (SSD) carrier card network interface module (NIM) enables SSD support on the platform NIM slot. It provides flash storage to the platform and supports dual 2.5" (7mm max) SATA SSDs. The carrier card fits into the NIM slot in the router. The router supports only a single SSD Carrier Card NIM. |

# Supported Transceivers

The Cisco ASR 1001-HX Router and Cisco ASR 1002-HX Router support the following small form-factor pluggable (SFP) optical transceiver types:

| Bay | Ports | Cisco ASR 1002-HX Router |
|---|---|---|
| Bay 0 | Ports GE0 – GE7 | SFP |
| Bay 1 | Ports TE0 – TE3 operate in 10GE mode only,use 10GE SFP+<br>Ports TE4 – TE7 operate in both 1GE and 10GE modes. Use SFP in 1GE and 10GE SFP+ in 10GE mode. | SFP+ |
| Bay 2 | | CPAK |
| Bay 3 | NIM | Not supported in this software release. |

***Table 3: Supported SFP Transceivers***

| PID | Description |
|---|---|
| GLC-GE-100FX | 100BASE-FX SFP transceiver module, MMF, 1310nm |
| GLC-SX-MMD | 1000BASE-SX SFP transceiver module, MMF, 850nm, DOM |
| GLC-LH-SMD | 1000BASE-LX/LH SFP transceiver module, MMF/SMF, 1310nm, DOM |
| SFP-GE-T | 1000BASE-T SFP (NEBS 3 ESD) |
| GLC-BX-U | 1000BASE-BX SFP, 1310nm |

| PID | Description |
|---|---|
| GLC-BX-D | 1000BASE-BX SFP, 1490nm |
| GLC-TE | 1000BASE-T SFP transceiver module for category 5 copper wire |
| GLC-SX-MM | GE SFP, LC connector SX transceiver |
| GLC-LH-SM | GE SFP, LC connector LX/LH transceiver |
| GLC-EX-SMD | GE SFP, LC Connector, EX transceiver |
| GLC-ZX-SMD | 1000BASE-ZX SFP transceiver module, SMF, 1550nm, DOM |
| DWDM-SFP | 1000BASE DWDM |
| CWDM-SFP | 1000BASE CWDM |

***Table 4: Supported SFP+ Transceivers***

| PID | Description |
|---|---|
| SFP-10G-SR | 10GBASE-SR SFP+ Module for MMF |
| SFP-10G-SR-X | 10GBASE-SR SFP+ Module for Extended Temp range |
| SFP-10G-LR | 10GBASE-LR SFP+ Module for SMF |
| SFP-10G-LR-X | 10GBASE-LR SFP+ Module for Extended Temp range |
| SFP-10G-ER | 10GBASE-ER SFP+ Module for SMF |
| SFP-H10GB-ACU7M | 10GBASE-CU SFP+ Cable 7 Meter, active |
| SFP-H10GB-ACU10M | 10GBASE-CU SFP+ Cable 10 Meter, active |
| DWDM-SFP10G-C | 10GBASE DWDM SFP+ Tunable Optic |



**Note** On Cisco ASR1001-HX platform, 1G SFP or 10G SFP+ can be configured with dual-rate 10GE ports as follows:

- **10G SFP+ on dual-rate 10GE Interface:** Auto-negotiation protocol is not supported, and automatic negotiation cannot be configured using the **negotiation auto** command.
- **1G SFP on dual-rate 10GE Interface:** Auto-negotiation protocol is supported, and automatic negotiation can be configured using **negotiation auto** command. To disable auto negotiation, use **no negotiation auto** command.

# Supported Crypto Module

The  supports the following crypto module:

| PID | Description |
|---|---|
| ASR1002HX-IPSECHW | Cisco ASR1002-HX crypto module with no default crypto throughput. You can upgrade the throughput (8 Gbps, 16 Gbps, or 25 Gbps) by applying a software-activated performance upgrade license. |

**Related Topics**

Removing and Replacing the Crypto Module in a Cisco ASR 1001-HX Router, on page 87
Removing and Replacing the Crypto Module in a Cisco ASR 1002-HX Router, on page 89

# Supported DIMM Upgrade

The  supports the following DIMM upgrade:

| PID | Description |
|---|---|
| M-ASR1002HX-32GB | The Cisco ASR 1002-HX Router has four DIMM slots and supports 16-GB configuration by default (two 8-GB DIMMS), and can be upgraded to 32-GB (four 8-GB DIMMS) configuration. |

**Related Topics**

Removing and Replacing a DIMM, on page 95

# Power Supplies

The Cisco ASR 1001-HX Router and Cisco ASR 1002-HX Router support AC or DC power supply options. The modular chassis configurations support the installation of two power supplies for redundancy. When an external power supply fails or is removed, the other power supply provides power requirements for the chassis. This allows you to hot-swap the power supply without impacting the functionality of the router.

**Caution** A router can support two AC or two DC power supplies. Do not install mixed AC and DC power supply units in the same chassis.

The power supplies are used in a 1 + 1 redundant configuration. There is no input switch on the faceplate of the power supplies. A power supply is switched from Standby to On by way of a system chassis power switch.

The following table lists the power supplies that you can order:

| Part Number | Power Supply |
|---|---|
| ASR1000X-AC-750W | Cisco ASR 1002-HX Router power supply module with plug-side intake airflow, A/C, 750W, 85–264V |

| Part Number | Power Supply |
|---|---|
| ASR1000X-AC-750W= | Cisco ASR 1002-HX Router power supply module with plug-side intake airflow, A/C, 750W, 85–264V, spare |
| ASR1000X-DC-950W | Cisco ASR 1002-HX Router power supply module with plug-side intake airflow, DC 950W |
| ASR1000X-DC-950W= | Cisco ASR 1002-HX Router power supply module with plug-side intake airflow, DC 950W, spare |

**Related Topics**

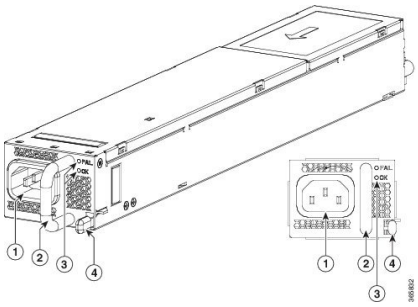
Removing and Replacing the Power Supplies

# AC Power Supply

**Note** The direction of the airflow is different for the Cisco ASR 1001-HX Router and the Cisco ASR 1002-HX Router as shown by the arrows in the illustrations below.

The following figure shows the Cisco ASR 1001-HX Router AC power supply.

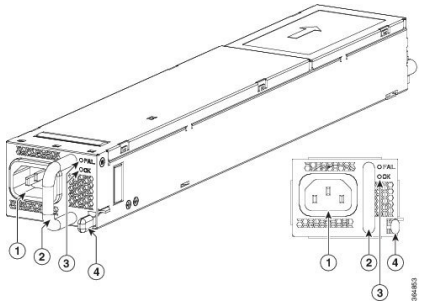
***Figure 8: ASR1KX-AC-750W-R Power Supply Used in the Cisco ASR 1001-HX Router***



| | | | |
|---|---|---|---|
| 1 | AC power connector | 3 | FAIL and OK LEDs |
| 2 | Handle | | Retaining latch |

The following figure shows the Cisco ASR 1002-HX Router AC power supply.

*Figure 9: ASR1000X-AC-750W AC Power Supply Used in the Cisco ASR 1002-HX Router*



| | | | |
|---|---|---|---|
| 1 | AC power connector | 3 | FAIL and OK LEDs |
| 2 | Handle | | Retaining latch |

# DC Power Supply

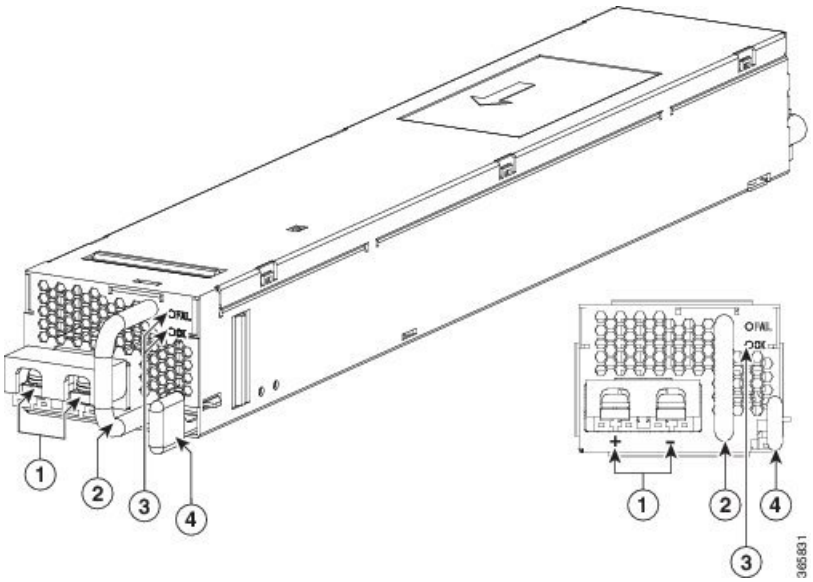
The ASR1000X-DC-950W input connector is a two-wire connector with connection polarity from left to right (when facing the unit) of positive (+) negative (–).

The power supply has a handle to be used for insertion and extraction. The module must be supported with one hand because of its length.

**Note** The direction of the airflow is different for the Cisco ASR 1001-HX Router and the Cisco ASR 1002-HX Router as shown by the arrows in the illustrations below.

The following figure shows the Cisco ASR 1001-HX Router DC power supply.

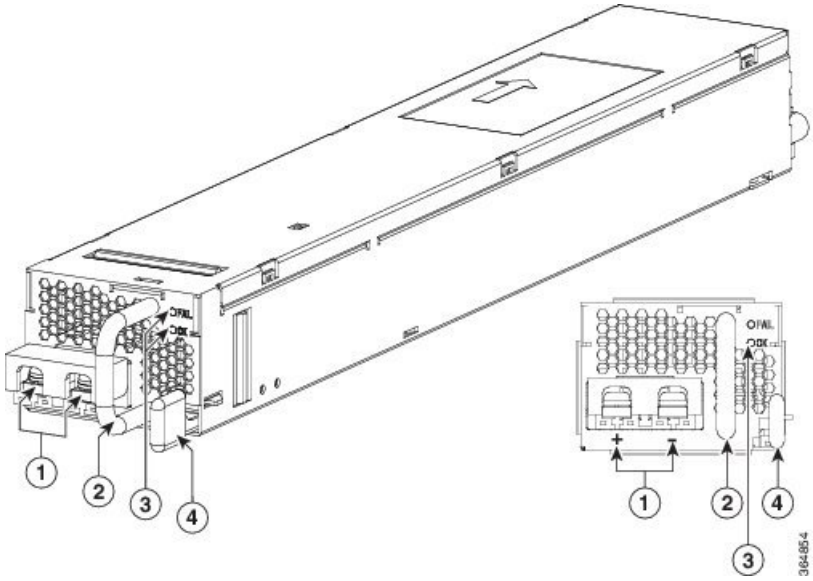
*Figure 10: ASR1KX-DC-950W-R DC Power Supply Used in the Cisco ASR 1001-HX Router*



| | | | |
|---|---|---|---|
| 1 | DC power connections | 3 | FAIL and OK LEDs |
| 2 | Handle | | Retaining latch |

The following figure shows the Cisco ASR 1002-HX Router DC power supply.

***Figure 11: ASR1000X-DC-950W DC Power Supply Used in the Cisco ASR 1002-HX Router***




| | | | |
|---|---|---|---|
| 1 | DC power connections | 3 | FAIL and OK LEDs |
| 2 | Handle | | Retaining latch |

# Power Supply LEDs

The following table describes the power supply LEDs.

***Table 5: AC and DC Power Supply LEDs***

| Power Supply Condition | Green (OK) LED Status | Amber (FAIL) LED Status |
|---|---|---|
| No AC power to all power supplies | OFF | OFF |
| Power Supply Failure (includes over voltage, over current, over temperature and fan failure) | OFF | ON |
| Power Supply Warning events where the power supply continues to operate (high temperature, high power and slow fan) | OFF | 1Hz Blinking |
| AC Present/3.3VSB on (PSU OFF) | 1Hz Blinking | OFF |
| Power Supply ON and OK | ON | OFF |

# Power Supply Fans

The fans in the power supply module are used for cooling the power supply module itself while system-level cooling is provided by fans within the chassis. The power supplies do not depend on the system-level fans for cooling. Fan failure is determined by fan-rotation sensors.

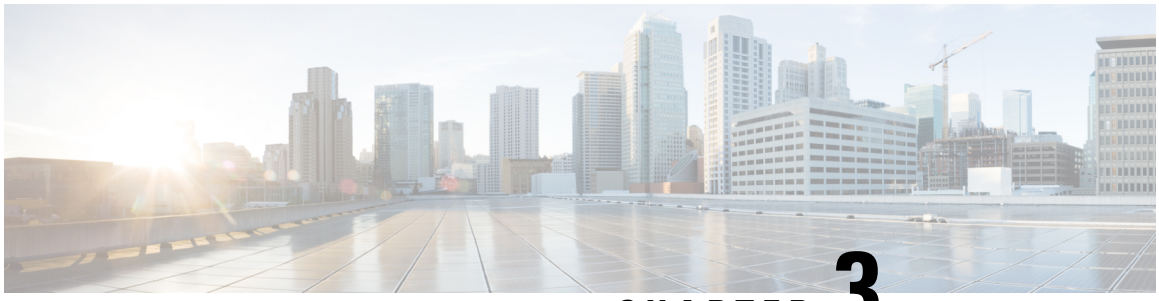


**Note** The fans in the power supply modules will run as soon as the power supply is plugged in, even if the power switch is in the Standby position.

# Power Cords

The following table lists the supported power cords.

| Power Cord Item Number | Description |
|---|---|
| CAB-AC | Power Cord, 110 V |
| CAB-ACA Plug | Power Cord, Australia, 10 A |
| CAB-ACC | Power Cord, China |
| CAB-ACE AC | Power Cord, Europe, C13, CEE 7, 1.5 M |
| CAB-ACI AC | Power Cord, Italy, C13, CEI 23-16, 2.5 m |
| CAB-ACR AC | Power Cord, Argentina, C13, EL 219 (IRAM 2073), 2.5m |
| CAB-ACS AC | Power Cord, Switzerland, C13, IEC 60884-1, 2.5 m |
| CAB-ACU AC | Power Cord, UK, C13, BS 1363, 2.5 m |
| CAB-IND AC | Power Cord, India |
| CAB-JPN AC | Power Cord, Japan, C13, JIS C 8303, 2.5 m |
| CAB-L620P-C13-US | Power Cord, 250 VAC, 15A, NEMA L6-20 to C13, U.S. |
| CAB-L620P-C13-JPN | Power Cord, 250 VAC, 15A, NEMA L6-20 to C13, Japan |
| CAB-C13-CBN Cabinet Jumper | Power Cord, 250 VAC 10 A, C14-C13 Connectors |
| CAB-C13-C14-JMPR Cabinet Jumper | Power Cord, 250 VAC 13 A, C14-C15 Connector |
| CAB-C13-C14-2M | Power Cord Jumper, C13-C14 Connectors, 2-Meter Length |
| CAB-C13-C14-AC | Power Cord Jumper, C13-C14 Connectors, 3-Meter Length |



CHAPTER 3

# Preparing Your Site for Installation

This chapter contains important safety information you should know before working with the , and guides you through the process of preparing your site for router installation.


- Prerequisites and Preparation, on page 17
- Safety Guidelines, on page 18
- Cautions and Regulatory Compliance Statements for NEBS, on page 19
- Standard Warning Statements, on page 20
- Site Planning, on page 23
- Preventing Electrostatic Discharge Damage, on page 32
- Electrical Safety, on page 32
- Chassis-Lifting Guidelines, on page 33
- Tools and Equipment, on page 33
- Unpacking and Verifying Shipping Contents, on page 34
- Installation Checklist, on page 35


## Prerequisites and Preparation

Before you perform the procedures in this guide, we recommend that you:

- Read the safety guidelines in the next section and review the electrical safety and ESD-prevention guidelines in this guide.
- Ensure that you have all of the necessary tools and equipment (see the "Tools and Equipment" section).
- Ensure that you have access to the *Cisco ASR 1000 Series Aggregation Services Routers Software Configuration Guide* (an online document that is available for viewing or download at Cisco.com) during the installation.
- Ensure that the power and cabling requirements are in place at your installation site.
- Ensure that the equipment required to install the router is available.
- Ensure that your installation site meets the environmental conditions to maintain normal operation.

Before installing the router, you must consider power and cabling requirements that must be in place at your installation site, special equipment for installing the router, and the environmental conditions your installation site must meet to maintain normal operation.

The shipping package for the router is engineered to reduce the chances of product damage associated with routine material handling experienced during shipment:

- Router should always be transported or stored in its shipping package in the upright position.
- Keep the router in the shipping container until you have determined the installation site.

**Note** Inspect all items for shipping damage. If an item appears damaged, contact a Cisco customer service representative immediately.

## Site Planning Checklist

Use the following checklist to perform and account for all the site-planning tasks described in this chapter:

- The site air conditioning system can compensate for the heat dissipation of the router.
- Electrical service to the site complies with the requirements.
- The electrical circuit servicing the router complies with the requirements.
- Consideration has been given to console port wiring and limitations of the cabling involved, according to TIA/EIA-232F.
- The Ethernet cabling distances are within limitations.
- The equipment rack in which you plan to install the router chassis complies with requirements. Careful consideration has be given to safety, ease of maintenance, and proper airflow in selecting the location of the rack.

# Safety Guidelines

Before you begin the installation or replacement procedure, review the safety guidelines in this section to avoid injuring yourself or damaging the equipment.

**Note** This section contains guidelines, and do not include every potentially hazardous situation. When you install a router, always use common sense and caution.

## Safety Warnings

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

Before you install, configure, or perform maintenance on the router, review the documentation for the procedure you are about to perform, paying special attention to the safety warnings.

**Note** Do not unpack the system until you are ready to install it. Keep the chassis in the shipping container to prevent accidental damage until you determine an installation site. Use the appropriate unpacking documentation included with the system.

Read the installation instructions in this document before you connect the system to its power source. Failure to read and follow these guidelines could lead to an unsuccessful installation and possibly damage the system and components.

## Safety Recommendations

The following guidelines will help to ensure your own safety and protect your Cisco equipment. This list does not cover all potentially hazardous situations, so *be alert*.

- Cisco safety policy mandates that all its routers must conform to the requirements of IEC 60950, with appropriate national deviations, as a minimum. In addition, Cisco routers must also meet the requirements of any other normative documents, for example, standards, technical specifications, laws or regulations.
- Review the safety warnings listed in *Regulatory Compliance and Safety Information for the Cisco ASR 1000 Series Aggregation Services Routers* (available online at Cisco.com) before installing, configuring, or maintaining the router.
- Never attempt to lift an object that might be too heavy for you to lift by yourself.
- Always turn all power supplies off and unplug all power cables before opening the chassis.
- Always unplug the power cable before installing or removing a chassis.
- Keep the chassis area clear and dust free during and after installation.
- Keep tools and chassis components away from walk areas.
- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught in the chassis. Fasten your tie or scarf and sleeves.
- The router operates safely when it is used in accordance with its marked electrical ratings and product-usage instructions.

# Cautions and Regulatory Compliance Statements for NEBS

The following table lists cautions, regulatory compliance statements, and requirements for the Network Equipment Building System (NEBS) certification from the Telcordia Electromagnetic Compatibility and Electrical Safety – Generic Criteria for Network Telecommunications Equipment (A Module of LSSGR, FR-64; TSGR, FR-440; and NEBSFR, FR-2063) Telcordia Technologies Generic Requirements, GR-1089-CORE.

| |
|---|
| Attach an ESD-preventive wrist strap to your wrist and to a bare metal surface. |

| |
|---|
| **Caution**<br>The intrabuilding ports of the equipment or subassembly are only suitable for connection to intrabuilding or unexposed wiring or cabling. The intrabuilding ports of the equipment or subassembly must not be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use only as intrabuilding interfaces (Type 2 or Type 4 ports as described in GR-1089-CORE), and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring. |
| Products that have an AC power connection are intended for deployments where an external surge protective device (SPD) is used at the AC power service equipment as defined by the National Electric Code (NEC). |
| This product is designed for a common bonding network (CBN) installation. |
| This product can be installed in a network telecommunication facility or location where the NEC applies. |
| An electrical conducting path shall exist between the product chassis and the metal surface of the enclosure or rack in which it is mounted or to a grounding conductor. Electrical continuity shall be provided by using thread-forming type mounting screws that remove any paint or nonconductive coatings and establish a metal-to-metal contact. Any paint or other nonconductive coatings shall be removed on the surfaces between the mounting hardware and the enclosure or rack. The surfaces shall be cleaned and an antioxidant applied before installation. |
| The grounding architecture of this product is DC-isolated (DC-I). |
| DC-powered products have a nominal operating DC voltage of 48 VDC. Minimal steady-state DC operating voltage is 40.5 VDC. Reference American National Standards Institute (ANSI) T1.315, Table 1. |

# Standard Warning Statements

**Note** The English warnings in this document are preceded by a statement number. To see the translations of a warning in other languages, look up its statement number in the *Regulatory Compliance and Safety Information for the Cisco ASR 1000 Series Aggregation Services Routers*.

This section describes the warning definition and then lists core safety warnings grouped by topic.

**Warning** IMPORTANT SAFETY INSTRUCTIONS

Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Read the installation instructions before using, installing, or connecting the system to the power source. Use the statement number at the beginning of each warning statement to locate its translation in the translated safety warnings for this device.

SAVE THESE INSTRUCTIONS



# General Safety Warnings

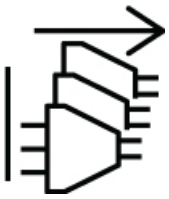
**Warning** There are no serviceable parts inside. To avoid risk of electric shock, do not open.

**Warning** To reduce risk of electric shock or fire, installation of the equipment must comply with local and national electrical codes.

**Warning** **Statement 1005—**Circuit Breaker: This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that the protective device is rated not greater than

- AC: 20 A U.S. maximum (ASR 1001-HX Router and ASR 1002-HX Router)
- DC: 20 A U.S. maximum (ASR 1001-HX Router)
- DC: 30 A U.S maximum (ASR 1002-HX Router)

**Warning** This unit might have more than one power supply connection. To reduce risk of electric shock, remove all connections to de-energize the unit.



**Warning** This unit is intended for installation in restricted access areas. Only skilled, instructed, or qualified personnel can access a restricted access area.

**Warning** Hazardous voltage or energy may be present on power terminals. To reduce the risk of electric shock, make sure the power terminal cover is in place when the power terminal is not being serviced. Be sure uninsulated conductors are not accessible when the cover is in place.

**Warning** This equipment must be grounded. To reduce the risk of electric shock, never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.

**Warning** This product is a Class 1 laser product.

**Warning** Invisible laser radiation is present. Do not expose to users of telescopic optics. This applies to Class 1/1M laser products.




**Warning** Invisible laser radiation may be emitted from the end of the unterminated fiber cable or connector. Do not view directly with optical instruments. Viewing the laser output with certain optical instruments, for example, eye loupes, magnifiers, and microscopes, within a distance of 100 mm, may pose an eye hazard.

| Fiber type and Core diameter (µm) | Wavelength (nm) | Max. Power (mW) | E |
|---|---|---|---|
| SM 11 | 1200 - 1400 | 39 - 50 | |
| MM 62.5 | 1200 - 1400 | 150 | |
| MM 50 | 1200 - 1400 | 135 | |
| SM 11 | 1400 - 1600 | 112 - 145 | |

**Warning** To reduce risk of fire, explosion, or leakage of flammable liquid or gas:

- Replace the battery only with the same or equivalent type recommended by the manufacturer.
- Do not dismantle, crush, puncture, use a sharp tool to remove, short the external contacts, or dispose of the battery in fire.
- Do not use if battery is warped or swollen.
- Do not store or use battery in a temperature > .
- Do not store or use battery in low air pressure environment < .

**Warning** To prevent personal injury or damage to the chassis, never attempt to lift or tilt the chassis using the handles on modules, such as power supplies, fans, or cards. These types of handles are not designed to support the weight of the unit.

**Warning** **Statement 1047—**Overheating Prevention

To prevent the system from overheating, do not operate it in an area that exceeds the maximum recommended ambient temperature of:

104° F (40° C)

**Warning** Blank faceplates and cover panels serve three important functions: they reduce the risk of electric shock and fire, they contain electromagnetic interference (EMI) that might disrupt other equipment, and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.

# Site Planning

This section contains site-planning information, and will help you plan for the installation of the .

## General Precautions

Observe the following general precautions when using and working with the :

- Keep your system components away from radiators and heat sources and do not block cooling vents.
- Do not spill food or liquids on your system components and never operate the product in a wet environment.

- Do not push any objects into the openings of your system components. Doing so can cause fire or electric shock by shorting out interior components.
- Position system cables and power supply cable carefully. Route system cables and power supply cable and plug such that they cannot be stepped on or tripped over. Be sure that nothing else rests on your system component cables or power cable.
- Do not modify power cables or plugs. Consult a licensed electrician or your power company for site modifications. Always follow your local and national wiring rules.
- If you turn off your system, wait at least 30 seconds before turning it on again to avoid system component damage.

# Site Selection Guidelines

The  requires specific environmental operating conditions. Temperature, humidity, altitude, and vibration can affect the performance and reliability of the router. The following sections provide specific information to help you plan for a proper operating environment.

The  is designed to meet the industry EMC, safety, and environmental standards described in the *Regulatory, Safety, and Compliance Information for Cisco ASR 1000 Series Aggregation Services Routers* document.

## Site Environmental Requirements

Environmental monitoring protects the system and components from damage caused by excessive voltage and temperature conditions. To ensure normal operation and avoid unnecessary maintenance, plan and prepare your site configuration before installation. After installation, make sure the site maintains the environmental characteristics, as shown in the following table.

***Table 6: Environmental Tolerance***

| Environmental Characteristic | Minimum | Maximum |
|---|---|---|
| Operating temperature (nominal) | 32° F (0° C) | 104° F (40° C)<br>(40° C up to 10,000 feet) |
| Operating temperature (short term) | 32° F (0° C) | 122° F (50° C) |
| Storage temperature | –4° F (–20° C) | 158° F (70° C) |
| Operative humidity (nominal) (relative humidity) | 10% | 90% |
| Operative humidity (short term) | 5% | 90% |
| Storage humidity (relative humidity) | 5% | 95% |
| Altitude, operating: over allowable temperature range (0 to 50 degrees C) | –500 feet (–152.4 meters) | 6,000 feet (1829 meters) |

| Environmental Characteristic | Minimum | Maximum |
|---|---|---|
| Altitude, nonoperating: over allowable temperature range | –1000 feet (–304.8 meters) | 50,000 feet (15240 meters) |
| Thermal shock nonoperating with change over time of 3 minutes | –13° F (–25° C) | 158° F (70° C) |
| Thermal Shock - Operating at 2.5 degree C per minute | 32° F (0° C) | 122° F (50° C) |

## Physical Characteristics

Be familiar with the physical characteristics of the  to assist you in placing the system at a proper location.

**Note** For information regarding rack widths supported for the router, see the following sections:

- General Rack-Selection Guidelines, on page 30
- Guidelines for 23-in. (Telco) Racks, on page 30

The following table shows the weight and dimensions of the :

***Table 7: Physical Characteristics of the***

| Characteristic | |
|---|---|
| Height | 3.5 in. (88.9 mm) —2RU; rack-mount per EIA RS-310 |
| Width | 17.3 in. (439.42 mm) |
| Depth | 22.0 in. (558.8 mm)<br>Depth includes cable-management brackets; card and power-supply handles for mounting in a 600 mm enclosed cabinet. |
| Weight | 34 lb (15.42 kg) fully loaded |

The following list describes additional characteristics:

- Chassis height meets EIA-310 rack spacing 2RU (3.5 in. or 88.9 mm), universal rack mount
- Chassis width meets EIA-310 19 in. (17.3 in. or 439.42 mm) wide with rack brackets
- Cable-management brackets allow a bend radius of 1.5 in. (38.1 mm) for cables
- Ships with forward rack-mount brackets installed and an extra set included in the accessory kit

# Site Power Guidelines

The  has specific power and electrical wiring requirements. Adhering to these requirements ensures reliable operation of the system. Follow these precautions and recommendations when planning your site for the :

- The redundant power option provides a second, identical power supply to ensure that power to the chassis continues uninterrupted if one power supply fails or input power on one line fails.
- In systems configured with the redundant power option, connect each of the two power supplies to a separate input power source. If you fail to do this, your system might be susceptible to total power failure due to a fault in the external wiring or a tripped circuit breaker.
- To prevent a loss of input power, be sure the total maximum load on each circuit supplying the power supplies is within the current ratings of the wiring and breakers.
- Check the power at your site before installation, and periodically after installation, to ensure that you are receiving clean power. Install a power conditioner if necessary.
- Provide proper grounding to avoid personal injury and damage to the equipment due to lightning striking power lines or due to power surges. The chassis ground must be attached to a central office or other interior ground system.

**Caution** This product requires short-circuit (overcurrent) protection to be provided as part of the building installation. Install only in accordance with national and local wiring regulations.

**Note** The  installation must comply with all applicable codes and is approved for use with copper conductors only. The ground bond fastening hardware should be of compatible material and preclude loosening, deterioration, and electrochemical corrosion of hardware and joined material. Attachment of the chassis ground to a central office or other interior ground system must be made with an AWG #6 gauge wire, copper ground conductor at a minimum.

## Electrical Circuit Requirements

Each  requires a dedicated electrical circuit. If you equip it with dual-power feeds, you must provide a separate circuit for each power supply to avoid compromising the power redundancy feature.

The  can be powered by a DC or AC source. Ensure that equipment grounding is present and observe power-strip ratings. Make sure that the total ampere rating of all the products plugged into the power strip does not exceed 80 percent of the rating.

**Note** The  can support two AC or two DC power supplies. Do not install mixed AC and DC power supply units in the same chassis.

The following table contains specifications for DC-powered systems for the .

*Table 8: DC Power Supply System Input Requirements*

| System Input Rating (Amps) | Circuit Breaker Amps | | AWG # Wire |
|---|---|---|---|
| | Minimum | Maximum | |
| 26 | 35 | 50 | 10 |

**Note** The AC power supply requires a 20 A circuit breaker.

The following table lists AC and DC power supply system rating requirements for the .

*Table 9: AC and DC Power Supply System Rating Specifications for the*

| Description | Specification |
|---|---|
| Power supply declared ratings | AC = 85–264 VAC<br>DC = –40–72 VDC |
| Line frequency rating | 50/60 Hz for AC power supplies |

# Site Cabling Guidelines

This section contains guidelines for wiring and cabling at your site. When preparing your site for network connections to the , consider the type of cable required for each component, and the cable limitations. Consider the distance limitations for signaling, EMI, and connector compatibility. Possible cable types are fiber, thick or thin coaxial, foil twisted-pair cabling, or unshielded twisted-pair cabling.

Also consider any additional interface equipment you need, such as transceivers, hubs, switches, modems, channel service units (CSUs), or data service units (DSUs).

Before you install the , have all the additional external equipment and cables at hand. For ordering information, contact a Cisco customer service representative.

The extent of your network and the distances between network interface connections depend in part on the following factors:

- Signal type
- Signal speed
- Transmission medium

The distance and rate limits referenced in the following sections are the IEEE-recommended maximum speeds and distances for signaling purposes. Use this information as guidelines when planning your network connections prior to installing the .

If wires exceed recommended distances, or if wires pass between buildings, give special consideration to the effect of a lightning strike in your vicinity. The electromagnetic pulse caused by lightning or other high-energy phenomena can easily couple enough energy into unshielded conductors to destroy electronic devices. If you

have had problems of this sort in the past, you may want to consult experts in electrical surge suppression and shielding.

## Console Port Connections

The  provides console and auxiliary ports to connect a terminal or computer for local console access.

Both ports have RJ-45 connectors, support RS-232 asynchronous data, and have distance recommendations specified in the IEEE RS-232 standard.

### USB Serial Console

The USB serial console port connects directly to the USB connector of a PC using a USB Type A to 5-pin mini USB Type-B cable. The USB Console supports full speed (12Mbps) operation. The console port does not support hardware flow control.



**Note**

- Always use shielded USB cables with a properly terminated shield. The USB serial console interface cable must not exceed 3 meters in length.
- Only one console port can be active at a time. When a cable is plugged into the USB console port, the RJ-45 port becomes inactive. Conversely, when the USB cable is removed from the USB port, the RJ-45 port becomes active.
- 4-pin mini USB Type-B connectors are easily confused with 5-pin mini USB Type-B connectors. Only 5-pin mini USB Type-B is supported.

## Interference Considerations

When wires are run for a significant distance, there is a risk that stray signals will be induced on the wires as interference. If interference signals are strong, they can cause data errors or damage to the equipment.

The following sections describe sources of interference and how to minimize its effects on the .

### Electromagnetic Interference

All the equipment powered by AC current can propagate electrical energy that can cause electromagnetic interference (EMI) and possibly affect the operation of other equipment. The typical sources of EMI are equipment power cords and power service cables from electric utility companies.

Strong EMI can destroy the signal drivers and receivers in the  and even create an electrical hazard by causing power surges through power lines into installed equipment. These problems are rare, but could be catastrophic.

To resolve these problems, you need specialized knowledge and equipment, which could consume substantial time and money. However, you should ensure that you have a properly grounded and shielded electrical environment, paying special attention to the need for electrical surge suppression.

The following table lists electrode magnetic compliance standards for the .

*Table 10: EMC and Safety Standards*

| | |
|---|---|
| **EMC Standards** | FCC 47 CFR Part 15 Class A<br>VCCI Class A<br>AS/NSZ Class A<br>ICES-003 Class A<br>EN55022/CISPR 22 Information Technology Equipment (Emissions)<br>EN55024/CISPR 24 Information Technology Equipment (Immunity)<br>EN300 386 Telecommunications Network Equipment (EMC)<br>EN50082-1/EN61000-6-1 Generic Immunity Standard |
| **Safety Standards** | UL60950-1<br>CSA C22.2 No. 60950-1-03<br>EN 60950-1<br>IEC 60950-1<br>AS/NZS 60950.1 |

### Radio Frequency Interference

When electromagnetic fields act over a long distance, radio frequency interference (RFI) can be propagated. Building wiring can often act as an antenna, receiving the RFI signals and creating more EMI on the wiring.

If you use twisted-pair cable in your plant wiring with a good distribution of grounding conductors, the plant wiring is unlikely to emit radio interference. If you exceed the recommended distances, use a high-quality twisted-pair cable with one ground conductor for each data signal.

### Lightning and AC Power Fault Interference

If signal wires exceed recommended cabling distances, or if signal wires pass between buildings, you should consider the effect that a lightning strike in your vicinity might have on the .

The electromagnetic pulse (EMP) generated by lightning or other high-energy phenomena can couple enough energy into unshielded conductors to damage or destroy electronic equipment. If you have previously experienced such problems, you should consult with RFI/EMI experts to ensure that you have adequate electrical surge suppression and shielding of signal cables in your  operating environment.

# Rack-Mounting Guidelines

This section describes guidelines on rack-mounting.

## Precautions for Rack-Mounting

The following rack-mounting guidelines are provided to ensure your safety:

- Do not move large racks by yourself. Due to the height and weight of a rack, a minimum of two people are required to accomplish this task.
- Ensure that the rack is level and stable before extending a component from the rack.

- Ensure that proper airflow is provided to the components in the rack.
- Do not step or stand on any component or system when servicing other systems or components in a rack.
- When mounting the  in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

## General Rack-Selection Guidelines

The  can be mounted in most two-post or four-post, 19-in. equipment racks that comply with the Electronics Industries Association (EIA) standard for equipment racks (EIA-310-D 19-in.). The rack must have at least two posts with mounting flanges to mount the chassis.

**Caution** When mounting a chassis in any type of rack equipment, ensure that the inlet air to the chassis does not exceed 131°F (55°C).

The distance between the center lines of the mounting holes on the two mounting posts must be 18.31 in. ± 0.06 in. (46.50 cm ± 0.15 cm). The rack-mounting hardware included with the chassis is suitable for most 19-in. (48.3-cm) equipment racks.

Consider installing the  in a rack with the following features:

- NEBS-compliant, 19-in. (48.3-cm) wide rack.
- EIA or ETSI hole patterns in the mounting rails. Required mounting hardware is shipped with the . If the rack that you plan to install the system in has metric-threaded rails, you must provide your own metric-mounting hardware.
- Perforated top and open bottom for ventilation to prevent overheating.
- Leveling feet for stability.

**Note** The  should *not* be installed in an enclosed rack because the chassis requires an unobstructed flow of cooling air to maintain acceptable operating temperatures for its internal components. Installing the router in any type of enclosed rack—*even with the front and back doors removed*—could disrupt the air flow, trap heat next to the chassis, and cause an overtemperature condition inside the router. If you use an enclosed rack, make certain that there are air vents on all sides of the rack and there is proper ventilation.

## Guidelines for 23-in. (Telco) Racks

If needed, you can also install the  in 23-in. (Telco) racks. For information on the adapters needed for 23 in. racks, contact the Newton Instrument Company:

http://www.enewton.com

111 East A Street, Butner NC, USA, 27509

919 575-6426

# Equipment Rack Guidelines

The placement of racks can affect personnel safety, system maintenance, and the system's ability to operate within the environmental characteristics described in Table 6: Environmental Tolerance , on page 24. Choose a proper location for the  by following the guidelines below.

## Locating for Safety

If the  is the heaviest or the only piece of equipment in the rack, consider installing it at or near the bottom to ensure that the rack's center of gravity is as low as possible.

For additional information about the proper placement of electronic equipment, see the document *GR-63-CORE, Network Equipment Building System (NEBS) Requirements: Physical Protection*.

## Locating for Easy Maintenance

Keep at least 3 feet of clear space in front of and behind the rack. This space ensures that you can remove the components and perform routine maintenance and upgrades easily.

Avoid installing the  in a congested rack and consider how the routing of cables from other pieces of equipment in the same rack might affect access to the routers cards.

The front and top of the chassis must remain unobstructed to ensure adequate airflow and prevent overheating inside the chassis.

Allow the following clearances for normal system maintenance:

- At the top of the chassis—At least 3 in. (7.6 cm)
- In front of the chassis—3 to 4 ft (91.44 cm to 121.92 cm)

To avoid problems during installation and ongoing operation, follow these general precautions when you plan the equipment locations and connections:

- Use the **show environment all** and the **show facility-alarm status** commands regularly to check the internal system status. The environmental monitor continually checks the interior chassis environment; it provides warnings for high temperature and creates reports on any occurrences. If warning messages are displayed, take immediate action to identify the cause and correct the problem. For more information on these commands, see the "Environmental Monitoring and Reporting Functions" section.
- Keep the  off the floor and out of the areas that collect dust.
- Follow ESD-prevention procedures to avoid damage to equipment. Damage from static discharge can cause immediate or intermittent equipment failure.

## Locating for Proper Airflow

Ensure that the location of the  has enough airflow to keep the system operating within the environmental characteristics, and the air temperature is sufficient to compensate for the heat dissipated by the system.

Avoid locating the  in a location in which the chassis air intake vents could draw in the exhaust air from adjacent equipment. Consider how the air flows through the router. The airflow direction is front to back with ambient air drawn in from the venting located on the chassis' front sides.

# Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage occurs when electronic cards or components are improperly handled resulting in complete or intermittent failures. Static electricity can harm delicate components inside your system. To prevent static damage, discharge static electricity from your body before you touch any of your system components, such as a microprocessor. As you continue to work on your system, periodically touch an unpainted metal surface on the computer chassis.

The following are guidelines for preventing ESD damage:

- Always use an ESD-preventive wrist or ankle strap and ensure that it makes good skin contact. Before removing a card from the chassis, connect the equipment end of the strap to the ESD plug at the bottom of the chassis below the power entry modules.
- Handle line cards by faceplates and carrier edges only; avoid touching the card components or connector pins.
- When removing a module, place the removed module component-side-up on an antistatic surface or in a static-shielding bag. If the module is to be returned to the factory, immediately place it in a static-shielding bag.
- Avoid contact between the modules and clothing. The wrist strap protects the card from ESD voltages only on the body; ESD voltages on clothing can still cause damage.
- When transporting a sensitive component, place it in an antistatic container or packaging.
- Handle all sensitive components in a static-safe area. If possible, use antistatic floor pads and workbench pads.



**Caution** For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 ohms.



**Caution** Always tighten the captive installation screws on all the system components when you are installing them. These screws prevent accidental removal of the module, provide proper grounding for the system, and help ensure that the bus connectors are properly seated in the backplane.

# Electrical Safety

All the system components are hot-swappable. They are designed to be removed and replaced while the system is operating, without presenting an electrical hazard or damage to the system.

Follow these basic guidelines when you are working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before installing or removing 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. Never install equipment that appears damaged.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

In addition, use the following guidelines when working with any equipment that is disconnected from a power source, but is still connected to telephone wiring or 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.



**Warning** **Statement 1001—**Work During Lightning Activity

Do not work on the system or connect or disconnect cables during periods of lightning activity.

# Chassis-Lifting Guidelines

The chassis is not intended to be moved frequently. Before you install the system, ensure that your site is properly prepared so that you can avoid having to move the chassis later to accommodate power sources and network connections.

Each time you lift the chassis or any heavy object, follow these guidelines:

- Ensure that your footing is solid, and balance the weight of the chassis between your feet.
- Lift the chassis slowly; never move suddenly or twist your body as you lift.
- Keep your back straight and lift with your legs, not your back. If you must bend down to lift the chassis, bend at the knees, not at the waist, to reduce the strain on your back muscles.
- Do not remove installed components from the chassis.
- Always disconnect all external cables before lifting or moving the chassis.

# Tools and Equipment

The following tools and equipment are recommended as the minimum necessary equipment to install the . You may need additional tools and equipment to install associated equipment and cables. You may also require test equipment to check electronic and optical signal levels, power levels, and communications links.

- Phillips hand screwdriver
- 3.5-mm flat-blade screwdriver
- Tape measure (optional)
- Level (optional)
- Power drill
- 8-gauge wire
- Rack-mount brackets
- Cable-management brackets

# Unpacking and Verifying Shipping Contents

When you receive your chassis, perform the following steps and use the shipping contents checklist in the following section.

**Procedure**

**Step 1** Inspect the box for any shipping damage. (If there is damage, contact your Cisco service representative).

**Step 2** Unpack the .

**Step 3** Perform a visual inspection of the chassis.

**Step 4** After you have unpacked the system, verify that you have received all of the required components, including all the accessory items. Using the packing list as a guide, verify that you have received all the equipment listed in your order, and ensure that the configuration matches the packing list.

# Checking the Shipping Container Contents

Use the components list shown in the following table to check the contents of the  shipping container. Do not discard the shipping container. You need the container if you move or have to ship the  in the future.

***Table 11: Shipping Container Contents***

| Component | Description |
|---|---|
| Chassis | are configured with dual AC or dual DC power supplies and an EPA and NIM blank panel if an EPA or NIM has not been ordered. |

| Component | Description |
|---|---|
| Accessories Kit<br>**Note**<br>You must order the Accessories Kit separately if you order the chassis as a spare. | Front chassis rack-mount brackets that you will attach to the chassis with their respective screws |
| | Two sets of screws, one each for:<br>• Front rack-mount brackets (4 screws for each bracket)<br>• Cable-management brackets ( 2 mounting screws for each ASR 1002-HX bracket. The ASR 1001-HX bracket has captive screws for mounting to the rack-mount brackets. |
| | Two cable-management brackets with U-feature design devices attached. |
| | 1 RJ-45 to RJ-45 crossover cable<br>1 RJ-45 to DB-9 (female) adapter |
| ESD, Wrist Strap (disposable) | One disposable wrist strap |
| Documentation | Pointer Doc |
| Optional Equipment | Power cord if an AC power supply was shipped. There are none for the DC power supply units. |

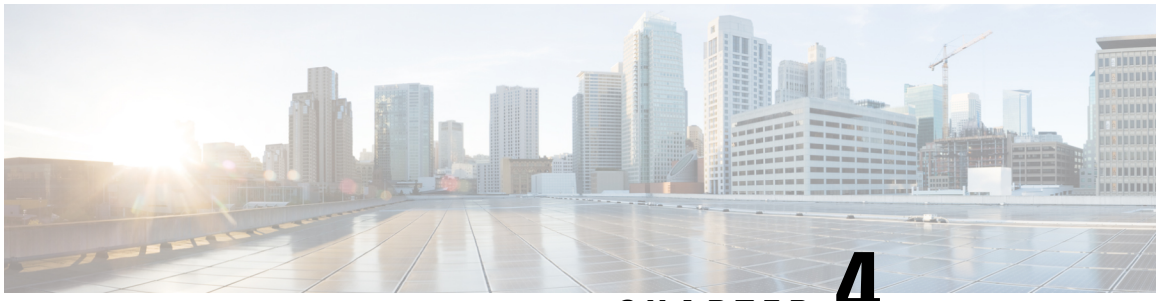
# Installation Checklist

To assist you with your installation and to provide a historical record of what was done by whom, print or photocopy the Installation Checklist below. Use this to record when each procedure or verification is completed. When the checklist is completed, place it in your site log along with the other records for your new router.

***Table 12: Installation Checklist***

| Task | Verified By | Date |
|---|---|---|
| Date chassis received | | |
| Chassis and all accessories unpacked | | |
| Types and numbers of interfaces verified | | |
| Safety recommendations and guidelines reviewed | | |
| Installation Checklist copied | | |
| Site log established and background information entered | | |
| Site power voltages verified | | |
| Site environmental specifications verified | | |

| Task | Verified By | Date |
|---|---|---|
| Required passwords, IP addresses, device names, and so on, available | | |
| Required tools available | | |
| Network connection equipment available | | |
| Cable-management brackets installed (optional, but recommended) | | |
| AC power cable(s) connected to AC source(s) and router | | |
| DC power cable(s) connected to DC source(s) and router | | |
| Network interface cables and devices connected | | |
| System power turned on | | |
| System boot complete (STATUS LED is on) | | |
| Ethernet port adapters and NIMs (where applicable) are operational | | |
| Correct hardware configuration displayed after system banner appears | | |
| Correct licenses installed on the router | | |



CHAPTER 4

# Installing the Router

This chapter provides procedures for installing the  on an equipment shelf, tabletop, or in an equipment rack.


- Installation Methods, on page 37
- Guidelines for a Standalone Equipment Shelf or Tabletop Installation, on page 38
- Installing the Router on a Standalone Equipment Shelf or Tabletop, on page 38
- Guidelines for Rack Installation, on page 39
- Attaching the Front Rack-Mount Brackets, on page 41
- Attaching the Rear Rack-Mount Brackets, on page 42
- Mounting the Router in the Rack, on page 42
- Attaching the Cable Management Bracket, on page 45
- Chassis Ground Connection, on page 46
- Connecting Cables, on page 48


## Installation Methods

The  is designed for standalone, 2-rail 19-inch rack-mount (front rail only), and 4-rail 19-inch rack-mount (front and rear rail) installations.

Although rack-mounting is the preferred method of installation, you can mount the chassis on an equipment shelf or tabletop.

**Warning** IMPORTANT SAFETY INSTRUCTIONS

Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Read the installation instructions before using, installing, or connecting the system to the power source. Use the statement number at the beginning of each warning statement to locate its translation in the translated safety warnings for this device.

SAVE THESE INSTRUCTIONS



**Warning** Read the installation instructions before using, installing, or connecting the system to the power source.

**Note** Proceed with the installation if you have already unpacked your chassis and read all the site requirements for your new equipment.

# Guidelines for a Standalone Equipment Shelf or Tabletop Installation

The chassis should already be in the area where you want to install it. If you have not determined where to install your chassis, see Chapter 3, "Preparing You Site for Installation," for information about site considerations.

When installing the  on a sturdy equipment shelf or tabletop, ensure that the surface is clean and that you have considered the following:

- The  requires at least 3 inches (7.62 cm) of clearance at the inlet and exhaust vents (the front and rear sides of the chassis).
- The chassis should be installed off the floor. Dust that accumulates on the floor is drawn into the interior of the router by the cooling fans. Excessive dust inside the router can cause overtemperature conditions and component failures.
- There must be approximately 19 inches (48.3 cm) of clearance at the front and rear of the chassis to install and replace FRUs, or to access network cables and equipment.
- The chassis needs adequate ventilation. Do not install it in an enclosed cabinet where ventilation is inadequate.
- Keep the cable-management bracket ready if you plan to install it on the front of the chassis.
- Ensure that an adequate chassis ground (earth) connection exists for your router chassis (see the "Attaching a Chassis Ground Connection" section).

# Installing the Router on a Standalone Equipment Shelf or Tabletop

**Procedure**

**Step 1** Remove any debris and dust from the tabletop or platform, as well as the surrounding area.

**Step 2** Lift the chassis into position on the equipment shelf or tabletop.

**Note**
Step 3 through Step 9 are optional if you are installing the  on a rack shelf. The chassis rack-mount brackets must be installed prior to installing the cable-management brackets. See the "Attaching the Front Rack-Mount Brackets" section.

**Step 3** Attach the front rack-mount brackets. Locate the threaded holes in the front sides of the chassis (first holes beyond the vent holes) and use the package of black screws that shipped with the chassis.

**Step 4** Align the front rack-mount bracket to one side of the chassis.

**Step 5** Insert and tighten the screws on one side.

**Step 6** Repeat Step 3 through Step 5 on the other side of the chassis. Use all the screws to secure the rack-mount brackets to the chassis.

**Step 7** Gather the two cable-management brackets and screws shipped with your chassis. See the "Attaching the Cable Management Bracket" section.

**Step 8** Screw a cable-management bracket to each side of the rack-mount brackets that are attached to the chassis. Use two screws for each cable-management bracket. Use a screw from the package of four screws.

**Note**
Ensure that the cable-management U feature device has the open end pointing outwards when you attach it to the chassis.

**Step 9** Check that all the screws are securely tightened.

### What to do next

Go to the "Attaching a Chassis Ground Connection" section for instructions about continuing the installation.

# Guidelines for Rack Installation

The  can be installed in the following rack types:

- Two-post rack, either 19 inch or 23 inch. Inner clearance (the width between the inner sides of the two posts or rails) must be at least 19 inches (48.26 cm). Airflow through the chassis is from front to back.
- Four-post, 19-inch equipment rack. Inner clearance (the width between the inner sides of the two posts or rails) must be at least 19 inches (48.26 cm). Airflow through the chassis is from front to back.

The  can be installed with both front or rear rack-mount brackets.

When planning your rack installation, consider the following guidelines:

- Measure the proposed rack location before mounting the chassis in the rack.
- Before using a particular rack, check for obstructions (such as a power strip) that could impair rack-mount installation. If a power strip does impair a rack-mount installation, remove the power strip before installing the chassis, and then replace it after the chassis is installed.
- Allow sufficient clearance around the rack for maintenance. If the rack is mobile, you can push it back near a wall or cabinet for normal operation and pull it out for maintenance (installing or moving cards, connecting cables, or replacing or upgrading components). Otherwise, allow 19 inches (48.3 cm) of clearance to remove field-replaceable units.

- Maintain a minimum clearance of 3 inches on the front and back sides of the chassis for the cooling air inlet and exhaust ports, respectively. Avoid placing the chassis in an overly congested rack or directly next to another equipment rack; the heated exhaust air from other equipment can enter the inlet air vents and cause an overtemperature condition inside the router.

**Caution** To prevent chassis overheating, never install a  in an enclosed space that is not properly ventilated or air conditioned.

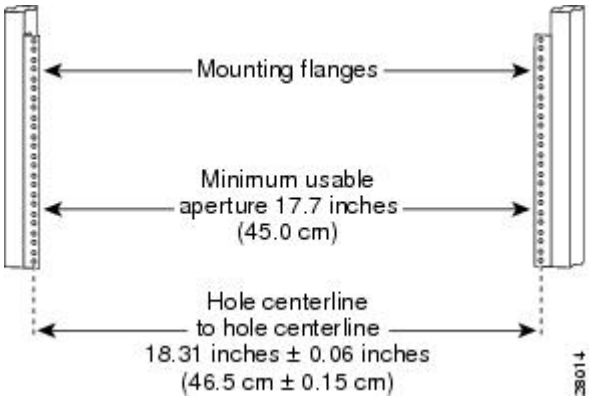
- Always install heavier equipment in the lower half of a rack to maintain a low center of gravity to prevent the rack from falling over.
- Install and use the cable-management brackets included with the  to keep cables organized and out of the way of the cards and processors. Ensure that cables from other equipment already installed in the rack do not impair access to the cards or require you to disconnect cables unnecessarily to perform equipment maintenance or upgrades.
- Provide an adequate chassis ground (earth) connection for your router chassis.

In addition to the preceding guidelines, review the precautions for avoiding excessive temperature conditions in the "Physical Characteristics" section and the "Site Environmental Requirements" section.

# Verifying Rack Dimensions

Before you install the chassis, measure the space between the vertical mounting flanges (rails) on your equipment rack to verify that the rack conforms to the measurements shown in the following figure.

***Figure 12: Verifying Equipment Rack Dimensions***




**Procedure**

**Step 1** Mark and measure the distance between two holes on the left and right mounting rails.

The distance should measure 18.31 inches ± 0.06 inches (46.5 cm ± 0.15 cm).

**Note**

Measure for pairs of holes near the bottom, middle, and top of the equipment rack to ensure that the rack posts are parallel.

**Step 2** Measure the space between the inner edges of the left front and right front mounting flanges on the equipment rack.

The space must be at least 17.7 inches (45 cm) to accommodate the chassis that is 17.25 inches (43.8 cm) wide and fits between the mounting posts on the rack.

# Attaching the Front Rack-Mount Brackets

### Before you begin

Before installing the chassis in the rack, you must install the rack-mount brackets on each side of the chassis.

Determine where in the rack you want the chassis to be mounted. If you are mounting more than one chassis in the rack, then start from the bottom up or the center of the rack. The following figure shows the brackets attached to the chassis. Depending on the bracket holes you use, the chassis may protrude in the rack.

**Note** The cable-management brackets are attached to the chassis after you install the chassis rack-mount brackets on the chassis and mount the chassis in the rack.

### Procedure

**Step 1** Locate the threaded holes on the side of the chassis. Ensure that you hold the front rack-mount bracket with the ear and holes facing outward and towards the front of the chassis.

The following figure shows where to attach the front rack-mount brackets to the .

| | | | |
|---|---|---|---|
| 1 | Front rack-mount bracket ear and holes | 3 | Front rack-mount bracket screws |
| 2 | Front rack-mount bracket | | |

**Step 2** Position the front rack-mount bracket top hole with the chassis, first top hole behind the side vent holes.

**Step 3** Insert and tighten the black screws on one side.

**Step 4** Repeat Step 1 through Step 3 on the other side of the chassis. Use black screws to secure the rack-mount brackets to the chassis.

# Attaching the Rear Rack-Mount Brackets

### Before you begin

**Note** This procedure is not required if you are installing the chassis in a two-post rack.

Before installing the chassis in a four-post rack, you must install the rear rack-mount brackets on each side of the chassis.

Determine where in the rack you want the chassis to be mounted. If you are mounting more than one chassis in the rack, then start from the bottom up or the center of the rack. The following figure shows the brackets attached to the chassis.

### Procedure

**Step 1** Locate the threaded holes on the side of the chassis. Ensure that you hold the rear rack-mount bracket with the ear and holes facing outward and towards the rear of the chassis.

The following figure shows where to attach the rear rack-mount brackets to the .

***Figure 13: Attaching the Rear Rack-Mount Brackets to the***

| | | | |
|---|---|---|---|
| 1 | Rear rack-mount bracket ear and holes | 3 | Rear rack-mount bracket screws |
| 2 | Rear rack-mount bracket | | |

**Step 2** Position the rear rack-mount bracket with the chassis.

**Step 3** Insert the black screws on one side. Do not fully tighten the screws.

The rear bracket holes are slotted to allow for adjustment. Do not fully tighten the screws until the chassis is installed in the four-post rack.

**Step 4** Repeat Step 1 through Step 3 on the other side of the chassis. Use black screws to secure the rack-mount brackets to the chassis.

# Mounting the Router in the Rack

After installing the rack-mount brackets on the chassis, mount the chassis by securing the rack-mount brackets to two posts or mounting strips in the rack using the screws provided. Because the rack-mount brackets support the weight of the entire chassis, ensure that you use all the screws to fasten the two rack-mount brackets to the rack posts.

# Two-Post Rack Installation

**Warning** To prevent bodily injury when mounting or servicing this unit in a rack, you must take special precautions to ensure that the system remains stable. The following guidelines are provided to ensure your safety:

- This unit should be mounted at the bottom of the rack if it is the only unit in the rack.
- When mounting this unit in a partially filled rack, load the rack from the bottom to the top with the heaviest component at the bottom of the rack.
- If the rack is provided with stabilizing devices, install the stabilizers before mounting or servicing the unit in the rack.

The  can be installed on a two-post rack, either 19 inch or 23 inch. We recommend that you allow at least 1 or 2 inches (2.54 or 5.08 cm) of vertical clearance between the router and any equipment directly above and below it.

### Procedure

**Step 1** On the chassis, ensure that all the screw fasteners on the installed components are securely tightened.

**Step 2** Make sure that your path to the rack is unobstructed. If the rack is on wheels, ensure that the brakes are engaged or that the rack is otherwise stabilized.

**Step 3** (Optional) Install a shelf in the rack to support the . If you use a shelf, it helps support the chassis while you secure it to the rack.

**Note**
If you are using a shelf, place the chassis on the shelf and slightly raise the front of the chassis to align the mounting bracket holes with the rack post holes while allowing the bottom of the chassis to rest on the shelf.

**Step 4** With two people, lift the chassis into position between the rack posts.

**Step 5** Align the mounting bracket holes with the rack post holes and attach the chassis to the rack.

**Step 6** Position the chassis until the rack-mounting flanges are flush against the mounting rails on the rack.

**Tip**
To allow space to attach the cable-management brackets to the chassis in the rack easily, use the rack-mount bracket ear holes mentioned in Steps 7 and 8.

**Step 7** Hold the chassis in position against the mounting rails in the equipment rack and follow these steps:

a) Insert the bottom screw into the second hole up from the bottom of the rack-mount ear and use a hand-held screwdriver to tighten the screw to the rack rail.

**Tip**
To make installation easier, insert one screw at the bottom of the chassis and the next screw at the top of the chassis diagonally from the first screw.

b) Insert the top screw into the second hole from the top of the rack-mount ear diagonally from the bottom screw and tighten the screw to the rack rail.

c) Insert the rest of the screws to secure the chassis to the rack equipment.

**Step 8** Tighten all the screws on each side to secure the chassis to the equipment rack.

The following figure shows the  on a two-post equipment rack.

| | | | |
|---|---|---|---|
| 1 | Rack equipment rail | 2 | Rack mount bracket ear and screws |

### What to do next

This completes the procedure for installing the chassis on a two-post rack. Proceed to the "Attaching a Chassis Ground Connection" section to continue the installation.

# Four-Post Rack Installation

### Procedure

**Step 1** (Optional) Install a shelf in the rack to support the . If you use a shelf, it helps support the chassis while you secure it to the rack.

**Note**
If you are using a shelf, place the chassis on the shelf and slightly raise the front of the chassis to align the mounting bracket holes with the rack post holes while allowing the bottom of the chassis to rest on the shelf.

**Step 2** With two people, lift the chassis into position between the rack posts.

**Step 3** Position the chassis until the rack-mounting flanges are flush against the mounting rails on the rack.

**Note**
Use the second hole up from the bottom of the rack-mount bracket and the second hole down from the top of the rack-mount bracket. This will make it easier to attach the cable-management bracket to the chassis in the equipment rack.

**Step 4** Hold the chassis in position against the mounting rails while the second person finger-tightens a screw to the rack rails on each side of the chassis.

**Step 5** Finger-tighten screws to the rack rails on each side of the chassis.

**Step 6** Tighten all the screws on each side to secure the chassis to the equipment rack.

The following figure shows the  on a four-post equipment rack.

***Figure 14:  in a Four-Post Rack—Front and Rear Rack-Mounting***

| | | | |
|---|---|---|---|
| 1 | Rear rack equipment rail | 3 | Front rack mount bracket ear and screws |
| 2 | Rear rack mount bracket ear and screws | 4 | Front rack equipment rail |

**Step 7** Use a level to verify that the tops of the two brackets are level, or use a measuring tape to verify that both brackets are the same distance from the top of the rack rails.

### What to do next

This completes the procedure for installing the chassis in the rack. Proceed to the "Attaching a Chassis Ground Connection" section to continue the installation.

# Attaching the Cable Management Bracket

The cable management brackets should be mounted to each rack-mount bracket on the chassis to provide cable management to both sides of the chassis (parallel with card orientation). These brackets are screw-mounted to the rack-mount brackets to allow easy installation and removal of cables.

The cable-management brackets for the  contain one independent cable-management U-type feature with two screws for each bracket.

**Note** Make certain that the cable-management bracket "U" feature is facing upwards when you attach it to the chassis.

### Procedure

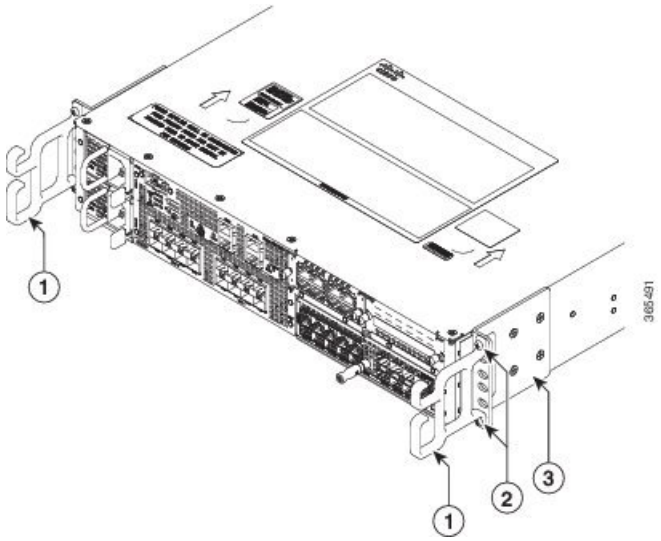
**Step 1** Align the cable-management bracket to the rack-mount bracket on one side of the . The cable-management bracket aligns to the top hole of the chassis rack-mount bracket.

**Step 2** Using a Phillips screwdriver, insert one screw through the top screw hole of the cable-management bracket and into the chassis rack-mount bracket and tighten the screw.

**Note**
Use the package of screws that came with your chassis containing four screws.

The following figure shows where to attach the cable-management brackets to the .

*Figure 15: Attaching the Cable-Management Brackets to the Cisco ASR 1002-HX Router*




| | | | |
|---|---|---|---|
| 1 | Cable-management bracket "U" feature | 3 | Chassis front rack-mount bracket |
| 2 | Cable-management bracket screw holes | | |

**Step 3** Do one of the following as appropriate:

- Cisco ASR 1001-HX Router—Insert the cable management screw into the screw hole of the cable-management bracket and into the chassis rack-mount bracket and tighten the screw using a Phillips screwdriver.
- Cisco ASR 1002-HX Router—Insert one screw through the bottom screw hole of the cable-management bracket and into the chassis rack-mount bracket and tighten the screw using a Phillips screwdriver. Insert another screw through the top screw hole of the cable-management bracket and tighten the screw.

**Step 4** Repeat Step 1 through Step 3 for the other side of the chassis.

# Chassis Ground Connection

Connecting the  chassis to ground is required for all DC powered installations and any AC powered installation where compliance with Telcordia grounding requirements is necessary.

**Warning** This equipment must be grounded. To reduce the risk of electric shock, never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available.

Before you connect power or turn on power to your chassis, you must provide an adequate chassis ground (earth) connection for the chassis. A chassis ground connector is provided on each . There is a stud on the rear left side of the chassis.

**Caution** The grounding wire should always be the first to be installed or connected and the last to be removed or disconnected.

Have the recommended tools and supplies available before you begin this procedure.

# Recommended Tools and Supplies

The following tools, equipment, and supplies are necessary to connect the system ground to the chassis:

- Phillips screwdriver
- 3.5-mm flat blade screwdriver (Phoenix # 1205053 or equivalent 3.5-mm flat blade)
- Dual-lug chassis ground component
- Grounding wire

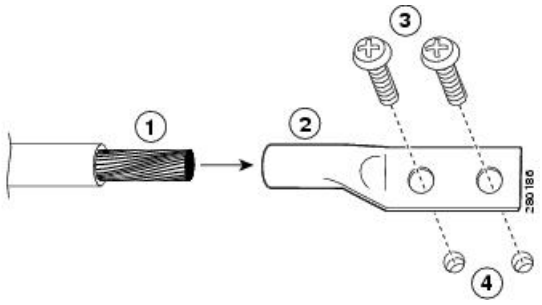
# Attaching a Chassis Ground Connection for Cisco ASR 1001-HX Router and Cisco ASR 1002-HX Router

### Procedure

**Step 1** Use the wire stripper to strip one end of the AWG #6 wire approximately 0.75 inches (19.05 mm).

**Step 2** Insert the AWG #6 wire into the open end of the grounding lug.

***Figure 16: Attaching a Grounding Lug to the Chassis Ground Connector***




| | | | |
|---|---|---|---|
| 1 | Chassis ground lead wire | 3 | Ground screws |
| 2 | Grounding lug | 4 | Chassis ground connector holes |

**Step 3** Use the crimping tool to carefully crimp the wire receptacle around the wire. This step is required to ensure a proper mechanical connection.

**Step 4** Locate the chassis ground connector on the side of your chassis.

**Step 5** Insert the two screws through the holes in the grounding lug.

The following figure shows how to attach a grounding lug to the chassis ground connector.

**Step 6** Use the Number 2 Phillips screwdriver to carefully tighten the screws until the grounding lug is held firmly to the chassis. Do not over tighten the screws.

**Step 7** Connect the opposite end of the grounding wire to the appropriate grounding point at your site to ensure an adequate chassis ground.

# Connecting Cables

Keep the following guidelines in mind when connecting any external cable to the :

- To reduce the chance of interference, avoid crossing high-power lines with any interface cables.
- Verify all the cabling limitations (particularly distance) before powering on the system.

## Connecting the Console and Auxiliary Port Cables

The router uses RJ-45 ports for both auxiliary ports and console ports to attach a console terminal. The router has an asynchronous serial (EIA/TIA-232) RJ-45 console port labeled CON on its front panel. You can connect this port to most types of video terminals with a console cable kit that is included with your router. The console cable kit contains:

- One RJ-45-to-RJ-45 crossover cable
- One RJ-45-to-DB-9 (female) adapter

A crossover cable reverses pin connections from one end to the other. In other words, it connects pin 1 (at one end) to pin 8 (at the other end), pin 2 to pin 7, pin 3 to pin 6, and so on. You can identify a crossover cable by comparing the two modular ends of the cable. Hold the cable ends in your hand, side-by-side, with the tabs at the back. Ensure that the wire connected to the outside (left) pin of the left plug (pin 1) is the same color as the wire connected to the outside (right) pin of the right plug (pin 8).

Both the console and auxiliary ports are asynchronous serial ports; devices connected to these ports must be capable of asynchronous transmission.

Before connecting to the console interface on the router using a terminal or PC, perform the following steps:

**Note** Out of Band (OOB) access using a modem on the Auxiliary port is not tested or supported on the Cisco ASR 1001-HX Router and the Cisco ASR 1002-HX Router.

### Procedure

**Step 1** Before connecting a terminal to the console port, configure the terminal to match the chassis console port as follows: 9600 baud, 8 data bits, no parity, 1 stop bits (9600 8N1).

**Step 2** Connect one end of the RJ-45 cable to the serial RJ-45 console port (CON) on the  using the RJ-45 to DB-9 cable. Connect the DB-9 end to your terminal equipment.

**Note**
For information about how to change the default settings to meet the requirements of your terminal or host, see the *Cisco IOS Terminal Services Configuration Guide*.

**Step 3** After you establish normal router operation, you can disconnect the terminal.

Use the following procedure to connect a video terminal to the console port.

### What to do next

Go to the "Connecting to the Mini USB Console Port" section to continue the installation.

# Connecting to the Mini USB Console Port

The USB serial console port connects directly to the USB connector of a PC using a USB Type A to 5-pin mini USB Type-B cable. The USB Console supports full speed (12Mbps) operation. The console port does not support hardware flow control.

**Note**

- Always use shielded USB cables with a properly terminated shield. The USB serial console interface cable must not exceed 3 meters in length.
- Only one console port can be active at a time. When a cable is plugged into the USB console port, the RJ-45 port becomes inactive. Conversely, when the USB cable is removed from the USB port, the RJ-45 port becomes active.
- 4-pin mini USB Type-B connectors are easily confused with 5-pin mini USB Type-B connectors. Note that only the 5-pin mini USB Type-B is supported.

The default parameters for the console port are 9600 baud, 8 data bits, no parity, and 1 stop bit.

For operation with a Microsoft Windows OS version older than Windows 7, the Cisco Windows USB Console Driver must be installed on any PC connected to the console port. If the driver is not installed, prompts guide you through a simple installation process.

The Cisco Windows USB Console Driver allows plugging and unplugging the USB cable from the console port without affecting Windows HyperTerminal operations. No special drivers are needed for Mac OS X or Linux.

Baud rates for the USB console port are 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200 bps.

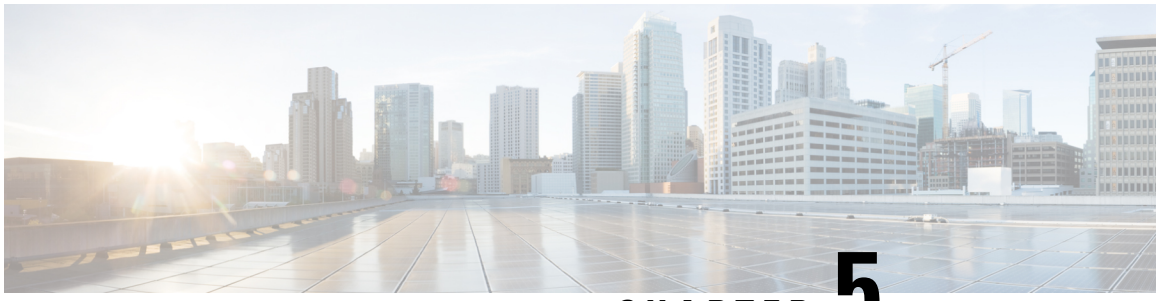
# Management Ethernet Port Cable Connection

**Caution** To comply with Class A emission requirements, a shielded Ethernet cable must be used for the connection.

### Procedure

**Step 1** Insert an Ethernet RJ-45 cable into the MGMT port.

**Step 2** Insert the other end of the RJ-45 cable to your management device or network.



CHAPTER 5

# Power Up and Initial Configuration

This chapter guides you through a basic router configuration, which is sufficient for you to access your network. Complex configuration procedures are beyond the scope of this publication and can be found in the modular configuration and modular command reference publications in the Cisco IOS software configuration documentation set that corresponds to the software release installed on your Cisco hardware.


- Checking Conditions Prior to System Startup, on page 51
- Powering Up the Router, on page 52
- Performing the Initial Configuration on the Router, on page 55
- Saving Your Router Configuration, on page 64
- Verifying the Initial Configuration, on page 64
- Powering Off the Router Safely, on page 65
- Environmental Monitoring and Reporting Functions, on page 66


## Checking Conditions Prior to System Startup

Ensure that all the card slots and compartments are closed. Install blank faceplates on empty slots. Always have power supply slots filled. If you leave a power supply slot uncovered, then you risk exposure to hazardous voltages on the power pins on the midplane.

**Warning** Blank faceplates and cover panels serve three important functions: they reduce the risk of electric shock and fire, they contain electromagnetic interference (EMI) that might disrupt other equipment, and they direct the flow of cooling air through the chassis. Do not operate the system unless all cards, faceplates, front covers, and rear covers are in place.

**Note** To view the boot sequence, you must have a console connection to the  before it powers up.

Ensure that the following conditions are addressed before starting up the router:

- The network interface cable or the optional Management port cable is connected.
- The chassis is securely mounted and grounded.
- The power and interface cables are connected.

- Your PC with terminal emulation program (hyperTerminal or equivalent) is connected to the console port, powered up, and is configured for 9600 baud, 8 data bits, 1 stop bit, no parity, with flow control set to none.
- You have selected passwords for access control.
- Captive installation screws are tight on all removable components.
- The console terminal is turned on.
- You have determined the IP addresses for the network interfaces.
- The EPA and the NIM are inserted in their slots, if applicable.
- Empty card slots are filled with card blanks. This ensures proper air flow through the chassis and electromagnetic compatibility (EMC).

# Powering Up the Router

You are now ready to power on the system for the first time. Follow these steps.

### Before you begin

Before you power on, make sure that:

- The power supply cord is plugged into the power supply inlet.
- All cables are connected.
- Your computer is powered up and connected.

### Procedure

**Step 1** Move the chassis power switch to the ON position. Listen for the fans; you should immediately hear them operating. Ensure that the power supply LED OK is green and the FAIL LED is not illuminated.

The front-panel indicator LEDs provide power, activity, and status information useful during bootup. For more detailed information about the LEDs, see the "LEDs" section.

**Step 2** Observe the initialization process. When the system boot is complete (the process takes a few seconds), the router begins to initialize.

### Loading from ROMMON with a System Image in Bootflash

The following is an example of what is displayed during the system boot process:

```
Initializing Hardware ...

System integrity status: 00000610
```

```
System Bootstrap, Version 15.4(2r)S, RELEASE SOFTWARE (fc1)
Copyright (c) 1994-2014  by cisco Systems, Inc.

Current image running: Boot ROM0
Last reset cause: PowerOn

ASR1002-HX platform with 16777216 Kbytes of main memory

File size is 0x2b08ddf7
Located asr1000-universalk9.BLD_V163_THROTTLE_LATEST_20160728_000855.SSA.bin
Image size 722001399 inode num 277985, bks cnt 176270 blk size 8*512
################################################################################################
################################################################################################
################################
Validating dev_mode signature
done

Boot image size = 722001399 (0x2b08ddf7) bytes

ROM:RSA Self Test Passed
ROM:Sha512 Self Test Passed
Self Tests Latency: 58 mSec

Package header rev 1 structure detected
Calculating SHA-1 hash...done
validate_package_cs: SHA-1 hash:
        calculated ef1e9e3f:519cec63:1f14c20f:c3b39303:dbb4c3c5
        expected   ef1e9e3f:519cec63:1f14c20f:c3b39303:dbb4c3c5

RSA Signed DEVELOPMENT Image Signature Verification Successful.
Validating subpackage signatures
Image validated
Validating dev_mode signature
done


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           San Jose, California 95134-1706



Cisco IOS Software, ASR1000 Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental
Version Denali 16.2.20160120:005403 [v162_1_throttle-BLD-BLD_V162_1_THROTTLE_LATEST_
20160119_234422 127]
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Compiled Tue 19-Jan-16 20:53 by mcpre


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```

```
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A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.


cisco ASR1002-HX (2KH) processor (revision 2KH) with 3724092K/6147K bytes of memory.
Processor board ID FXS1922Q0LL
Crypto Hardware Module present
26 Gigabit Ethernet interfaces
8 Ten Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
16777216K bytes of physical memory.
30056447K bytes of eUSB flash at bootflash:.
0K bytes of  at webui:.



Press RETURN to get started!

*Jan 21 17:57:38.704: %SMART_LIC-6-AGENT_READY: Smart Agent for Licensing is initialized
*Jan 21 17:57:39.462: %LICENSE-6-EULA_ACCEPT_ALL: The Right to Use End User License Agreement
 is accepted
*Jan 21 17:57:39.482: %IOS_LICENSE_IMAGE_APPLICATION-6-LICENSE_LEVEL: Module name = asr1002hx

  Next reboot level = adventerprise and License = adventerprise
*Jan 21 17:57:54.438: %SPANTREE-5-EXTENDED_SYSID: Extended SysId enabled for type vlan
*Jan 21 17:57:54.493:  ***** plat:0  0 flag:1 ****
*Jan 21 17:57:58.264: %VOICE_HA-7-STATUS: CUBE HA-supported platform detected.
*Jan 21 17:58:04.623: %LINK-3-UPDOWN: Interface Lsmpi0, changed state to up
*Jan 21 17:58:04.624: %LINK-3-UPDOWN: Interface EOBC0, changed state to up
*Jan 21 17:58:04.624: %LINEPROTO-5-UPDOWN: Line protocol on Interface VoIP-Null0, changed
state to up
*Jan 21 17:58:04.624: %LINEPROTO-5-UPDOWN: Line protocol on Interface LI-Null0, changed
state to up
*Jan 21 17:58:04.624: %LINK-3-UPDOWN: Interface GigabitEthernet0, changed state to down

.
.
.
```

# Performing the Initial Configuration on the Router

## Using the Cisco setup Command Facility

The **setup** command facility prompts you to enter the information that is needed to configure a router quickly. The facility takes you through an initial configuration, including LAN and WAN interfaces.

**Note** The setup command facility is entered automatically if there is no configuration on the router when it is booted into Cisco IOS-XE.

For information on modifying the configuration after you create it, see the *Cisco IOS XE Configuration Guide* and the *Cisco IOS XE Command References*.

This section explains how to configure a host name for the router, set passwords, and configure an interface to communicate with the management network.

**Note** If you make a mistake while using the setup command facility, you can exit and run the setup command facility again. Press Ctrl-C, and enter the setup command in privileged EXEC mode (Router#).

### Procedure

**Step 1** From the Cisco IOS-XE CLI, enter the setup command in privileged EXEC mode:

```
Router> enable
Password: <password>
Router# setup

         --- System Configuration Dialog ---
Continue with configuration dialog? [yes/no]:
```

The prompts in the **setup** command facility vary depending on your router model, on the installed interface modules, and on the software image. The following steps and the user entries (in bold) are shown as examples only.

**Step 2** To proceed using the setup command facility, enter **yes**.

```
Continue with configuration dialog? [yes/no]: yes

At any point you may enter a question mark '?' for help.

Use ctrl-c to abort configuration dialog at any prompt.
Default settings are in square brackets '[]'.
```

**Step 3** Basic management setup configures only enough connectivity.

```
Would you like to enter basic management setup? [yes/no]: yes
```

**Step 4** Enter a hostname for the router (this example uses myrouter):

```
Configuring global parameters:
Enter host name [Router]: myrouter
```

**Step 5** Enter an enable secret password. This password is encrypted (for more security) and cannot be seen when viewing the configuration.

```
The enable secret is a password used to protect access to
privileged EXEC and configuration modes. This password, after
entered, becomes encrypted in the configuration.
Enter enable secret: cisco
```

**Step 6** Enter an enable password that is different from the enable secret password. This password is not encrypted (and is less secure) and can be seen when viewing the configuration.

```
The enable password is used when you do not specify an
enable secret password, with some older software versions, and
some boot images.
Enter enable password: cisco123
```

**Step 7** Enter the virtual terminal password, which prevents unauthenticated access to the router through ports other than the console port:

```
The virtual terminal password is used to protect
access to the router over a network interface.
Enter virtual terminal password: cisco
```

**Step 8** Respond to the following prompts as appropriate for your network:

```
Configure SNMP Network Management? [no]: yes
    Community string [public]:
```

A summary of the available interfaces is displayed. The interface summary includes interface numbering, which is dependent on the router model and the installed modules and interface cards.

```
Current interface summary

Interface              IP-Address      OK? Method Status                Protocol

GigabitEthernet0/0/0   unassigned      YES unset  down                  down
GigabitEthernet0/0/1   unassigned      YES unset  up                    up
GigabitEthernet0/0/2   unassigned      YES unset  down                  down
GigabitEthernet0/0/3   unassigned      YES unset  up                    up
GigabitEthernet0/0/4   unassigned      YES unset  up                    up
GigabitEthernet0/0/5   unassigned      YES unset  down                  down
GigabitEthernet0/0/6   unassigned      YES unset  up                    up
GigabitEthernet0/0/7   unassigned      YES unset  up                    up
Te0/1/0                unassigned      YES unset  down                  down
Te0/1/1                unassigned      YES unset  down                  down
Te0/1/2                unassigned      YES unset  down                  down
Te0/1/3                unassigned      YES unset  down                  down
Te0/1/4                unassigned      YES unset  up                    up
Te0/1/5                unassigned      YES unset  down                  down
Te0/1/6                unassigned      YES unset  up                    up
Te0/1/7                unassigned      YES unset  down                  down
GigabitEthernet0       unassigned      YES unset  up                    up
```

```
Any interface listed with OK? value "NO" does not have a valid configuration
```

**Step 9** Respond to the following prompts as appropriate for your network:

```
Configuring interface GigabitEthernet0/0/1:
  Configure IP on this interface? [yes]: yes
    IP address for this interface [10.10.10.12]:
    Subnet mask for this interface [255.0.0.0] : 255.255.255.0
    Class A network is 10.0.0.0, 24 subnet bits; mask is /24
```

The following configuration command script is created:

```
hostname myrouter
enable secret 5 $1$t/Dj$yAeGKviLLZNOBX0b9eifO0
enable password cisco123
line vty 0 4
password cisco
snmp-server community public
!
no ip routing

!
interface GigabitEthernet0/0/0
shutdown
no ip address
!
interface GigabitEthernet0/0/1
no shutdown
ip address 10.10.10.12 255.255.255.0
!
interface GigabitEthernet0/0/2
shutdown
no ip address
!
.
.
.
end
```

**Step 10** Respond to the following prompts. Select [**2**] to save the initial configuration.

```
[0] Go to the IOS command prompt without saving this config.
[1] Return back to the setup without saving this config.
[2] Save this configuration to nvram and exit.

Enter your selection [2]: 2
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.

Press RETURN to get started! RETURN
```

The following user prompt is displayed:

```
myrouter>
```

## Completing the Configuration

When using the Cisco setup command facility, and after you have provided all the information requested by the facility as described in "Using the Cisco setup Command Facility" section, the final configuration appears. To complete your router configuration, follow these steps:

### Procedure

**Step 1** The facility prompts you to save the configuration.

- If you answer no, the configuration information you entered is *not* saved, and you return to the router enable prompt (`Router#`). Enter **setup** to return to the System Configuration dialog box.
- If you answer yes, the configuration is saved, and you are returned to the user EXEC prompt (`Router>`).

```
Use this configuration? {yes/no} : yes
Building configuration...
Use the enabled mode 'configure' command to modify this configuration.



%LINK-3-UPDOWN: Interface GigabitEthernet0/1/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/1/0, changed state to up

<Additional messages omitted.>
```

**Step 2** When messages stop appearing on your screen, press **Return** to get the `Router>` prompt.

**Step 3** The `Router>` prompt indicates that you are now at the command-line interface (CLI) and you have just completed an initial router configuration. Note that this is not a complete configuration. At this point, you have two choices:

- Run the setup command facility again, and create another configuration:

```
Router> enable
Password: password
Router# setup
```

- Modify the existing configuration or configure additional features by using the CLI:

```
Router> enable
Password: password
Router# configure terminal
Router(config)#
```

# Using the Cisco IOS-XE CLI—Manual Configuration

This section shows you how to access the CLI to perform the initial configuration on the router.

If the system configuration message does not appear, it means a default configuration file was installed on the router prior to shipping. Follow these steps to configure the router.

**Procedure**

**Step 1** Enter **no** when the following system message appears on the router:

```
--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no
```

**Step 2** Press **Return** and continue with the manual configuration:

Several log messages are displayed.

**Step 3** Press **Return** to bring up the `Router>` prompt.

**Step 4** Type **enable** to enter privileged EXEC mode:

```
Router> enable
Router#
```

## Configuring the Router Hostname

The hostname is used in CLI prompts and default configuration filenames. If you do not configure the router hostname, the router uses the factory-assigned default hostname **Router**.

**Procedure**

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>**Note** Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | **hostname** *name*<br>**Example:**<br>`Router(config)# hostname myrouter` | Specifies or modifies the hostname for the network server. |
| **Step 4** | **end**<br>**Example:**<br>`myrouter# end` | (Optional) Returns to privileged EXEC mode. |

# Configuring the Enable and Enable Secret Passwords

To provide an additional layer of security, particularly for passwords that cross the network or are stored on a TFTP server, you can use either the **enable password** command or **enable secret** command. Both commands accomplish the same thing—they allow you to establish an encrypted password that users must enter to access privileged EXEC (enable) mode.

We recommend that you use the **enable secret** command because it uses an improved encryption algorithm.

**Note** If you configure the **enable secret** command, it takes precedence over the **enable password** command; the two commands cannot be in effect simultaneously.

For more information, see the "Configuring Passwords and Privileges" chapter in the *Cisco IOS Security Configuration Guide*. Also see the *Cisco IOS Password Encryption Facts* tech note and the *Cisco Guide to Harden Cisco IOS Devices* tech note.

## Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>**Note** Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | **enable secret** *password*<br>**Example:**<br>`Router(config)# enable secret greentree` | Specifies an additional layer of security over the **enable password** command. |
| **Step 4** | **end**<br>**Example:**<br>`Router(config)# end` | Returns to privileged EXEC mode. |
| **Step 5** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>Verify that your new enable or enable secret password works. |
| **Step 6** | **end**<br>**Example:**<br>`Router(config)# end` | (Optional) Returns to privileged EXEC mode. |

# Configuring the Console Idle Privileged EXEC Timeout

By default, the privileged EXEC command interpreter waits 10 minutes to detect user input before timing out.

When you configure the console line, you can also set communication parameters, specify autobaud connections, and configure terminal operating parameters for the terminal that you are using. For more information on configuring the console line, see the Cisco IOS Configuration Fundamentals and Network Management Configuration Guide. In particular, see the "Configuring Operating Characteristics for Terminals" and "Troubleshooting and Fault Management" chapters.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>**Note** Enter your password if prompted. |
| **Step 2** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 3** | **line console 0**<br>**Example:**<br>`Router(config)# line console 0` | Configures the console line and starts the line configuration command collection mode. |
| **Step 4** | **exec-timeout** *minutes* [*seconds*]<br>**Example:**<br>`Router(config-line)# exec-timeout 0 0` | Sets the idle privileged EXEC timeout, which is the interval that the privileged EXEC command interpreter waits until user input is detected.<br>The example shows how to specify no timeout. Setting the exec-timeout value to 0 will cause the router to never log out once logged in. This could have security implications if you leave the console without manually logging out using the disable command. |
| **Step 5** | **end**<br>**Example:**<br>`Router(config)# end` | Returns to privileged EXEC mode. |
| **Step 6** | **show running-config**<br>**Example:**<br>`Router# show running-config` | Displays the running configuration file.<br>Verify that you have configured the idle privileged EXEC timeout correctly. |

### Example

The following example shows how to set the console idle privileged EXEC timeout to 2 minutes 30 seconds:

```
line console
 exec-timeout 2 30
```

The following example shows how to set the console idle privileged EXEC timeout to 30 seconds:

```
line console
 exec-timeout 0 30
```

# Gigabit Ethernet Management Interface Overview

The router provides an Ethernet management port named GigabitEthernet0.

The purpose of this interface is to allow users to perform management tasks on the router; it is an interface that should not, and often cannot, forward network traffic, but can be used to access the router via Telnet and SSH to perform management tasks on the router. The interface is most useful before a router has begun routing, or in troubleshooting scenarios when other forwarding interfaces are inactive.

The following aspects of the management Ethernet interface should be noted:

- The router has one management Ethernet interface named GigabitEthernet0.
- IPv4, IPv6, and ARP are the only routed protocols supported for the interface.
- The interface provides a way to access the router even if forwarding interfaces are not functional, or the Cisco IOS is down.
- The management Ethernet interface is part of its own VRF. See the *Cisco ASR 1000 Series Aggregation Services Routers Software Configuration Guide* for more details.

## Default Gigabit Ethernet Configuration

By default, a forwarding VRF is configured for the interface with a special group named Mgmt-intf. This cannot be changed. This isolates the traffic on the management interface away from the forwarding plane. Otherwise, the interface can be configured like other Gigabit Ethernet interfaces for most functions.

For example, the default configuration is as follows:

```
interface GigabitEthernet0
vrf forwarding Mgmt-intf
ip address 172.18.77.212 255.255.255.240
negotiation auto
```

## Configuring Gigabit Ethernet Interfaces

This sections shows how to assign an IP address and interface description to an Ethernet interface on your router.

For comprehensive configuration information on Gigabit Ethernet interfaces, see the “Configuring LAN Interfaces” chapter of the Cisco IOS Interface and Hardware Component Configuration Guide.

For information on interface numbering, see the software configuration guide pertaining to your router.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>**Note** Enter your password if prompted. |
| **Step 2** | **show ip interface brief**<br>**Example:**<br>`Router# show ip interface brief` | Displays a brief status of the interfaces that are configured for IP.<br>Learn which type of Ethernet interface is on your router. |
| **Step 3** | **configure terminal**<br>**Example:**<br>`Router# configure terminal` | Enters global configuration mode. |
| **Step 4** | **interface gigabitethernet 0**<br>**Example:**<br>`Router(config)# interface gigabitethernet 0` | Specifies the Ethernet interface and enters interface configuration mode. |
| **Step 5** | **ip address** *ip-address mask*<br>**Example:**<br>`Router(config-if)# ip address 172.16.74.3 255.255.255.0` | Sets a primary IP address for an interface. |
| **Step 6** | **no shutdown**<br>**Example:**<br>`Router(config-if)# no shutdown` | Enables an interface. |
| **Step 7** | **end**<br>**Example:**<br>`Router(config)# end` | Returns to privileged EXEC mode. |
| **Step 8** | **show ip interface brief**<br>**Example:**<br>`Router# show ip interface brief` | Displays a brief status of the interfaces that are configured for IP.<br>Verify that the interfaces are up and configured correctly. |

**Note** For comprehensive configuration information about IP routing and IP routing protocols, see the Configuring IP Routing Protocol-Independent Feature on Cisco.com.

# Saving Your Router Configuration

This section describes how to avoid losing your configuration at the next system reload or power cycle by saving the running configuration to the startup configuration in NVRAM. The NVRAM provides 32 MB of storage on the router.

**Note** To aid file recovery and minimize downtime in case of file corruption, we recommend that you save backup copies of the startup configuration file and the Cisco IOS-XE software system image file on a server.

**Note** To avoid losing work you have completed, be sure to save your configuration occasionally as you proceed. Use the **copy running-config startup-config** command to save the configuration to NVRAM.

### Procedure

| | Command or Action | Purpose |
|---|---|---|
| **Step 1** | **enable**<br>**Example:**<br>`Router> enable` | Enables privileged EXEC mode.<br>Enter your password if prompted. |
| **Step 2** | **copy running-config startup-config**<br>**Example:**<br>`Router# copy running-config startup-config` | Saves the running configuration to the startup configuration. |

# Verifying the Initial Configuration

Enter the following commands in Cisco IOS-XE to verify the initial configuration on the router:

- **show version**—Displays the system hardware version, the installed software version, the names and sources of configuration files, the boot images, and the amount of installed DRAM, NVRAM, and flash memory.
- **show diag**—Lists and displays diagnostic information about the installed controllers, interface processors, and port adapters.
- **show interfaces**— Shows if interfaces are operating correctly and if interfaces and line protocols are in the correct state, either up or down
- **show ip interface brief**—Displays a summary of the interfaces configured for IP protocol.
- **show configuration**—Helps verify if you have configured the correct hostname and password.

After you have completed and verified the initial configuration, the specific features and functions are ready to be configured. See the Cisco ASR 1000 Series Aggregation Services Routers Software Configuration Guide.

# Powering Off the Router Safely

### Before you begin

We recommend that before turning off all power to the chassis, you issue the reload command. This ensures that the operating system cleans up all the file systems.

### Procedure

**Step 1** Slip on the ESD-preventive wrist strap included in the accessory kit.

**Step 2** Enter the **reload** command.

**Step 3** Confirm the reload command:

```
Router# reload

Proceed with reload? [confirm]
Apr 21 03:42:45.619 EDT: %SYS-5-RELOAD: Reload requested by console. Reload Reason:
Reload Command.Apr 21 03:42:59.920 R0/0: %PMAN-5-EXITACTION: Process manager is
exiting: process exit with reload chassis code
```

**Step 4** After confirming the reload command, wait until the system bootstrap message is displayed before powering off the system:

```
System Bootstrap, Version 15.4(2r)S, RELEASE SOFTWARE (fc1)
Copyright (c) 1994-2014  by cisco Systems, Inc.

Current image running: Boot ROM0
Last reset cause: LocalSoft

ASR1002-HX platform with 16777216 Kbytes of main memory

rommon 1 >
```

**Step 5** Move the chassis power switch to the Standby position.

**Note**
The fans in the power supply modules will continue to run even if the chassis power switch is in the Standby position.

**Note**
After powering off the router, wait for a minimum of 30 seconds before powering it on again.

# Environmental Monitoring and Reporting Functions

Environmental monitoring and reporting functions allow you to maintain normal system operation by identifying and resolving adverse conditions prior to loss of operation.

**Caution** To prevent overheating of the chassis, ensure that your system is drawing cool inlet air. Over temperature conditions may occur if the system is drawing in the exhaust air of other equipment. Ensure adequate clearance around the sides of the chassis so that cooling air can flow through the chassis interior unimpeded and exhaust air exits the chassis and is not drawn into the inlet vent of another device.

## Alarm Monitoring

The  displays the CRIT, MAJ, and MIN alarm indicator LEDs. The three system alarm LEDs on the Cisco ASR 1002-HX Router provide visual alarm notification in the router. These LEDs indicate router status at all times, but you must directly observe these LEDs to become aware of a router alarm condition. Additionally, you can use the **show facility-alarm status** command to view the alarms.

```
Router# show facility-alarm status

System Totals  Critical: 2  Major: 0  Minor: 0

Source                  Time                  Severity    Description [Index]
------                  ------                --------    -------------------
Power Supply Module 0   Jan 21 2016 18:06:16  CRITICAL    Power Supply Failure [0]
Power Supply Bay 1      Jan 21 2016 18:06:15  CRITICAL    Power Supply/FAN Module Missing
 [0]
GigabitEthernet0/0/0    Jan 21 2016 18:08:21  INFO        Physical Port Administrative
State Down [2]
GigabitEthernet0/0/1    Jan 21 2016 18:08:21  INFO        Physical Port Administrative
State Down [2]
xcvr container 0/0/2    Jan 21 2016 18:08:21  INFO        Transceiver Missing [0]
GigabitEthernet0/0/3    Jan 21 2016 18:08:21  INFO        Physical Port Administrative
State Down [2]
GigabitEthernet0/0/4    Jan 21 2016 18:08:21  INFO        Physical Port Administrative
State Down [2]
GigabitEthernet0/0/5    Jan 21 2016 18:08:21  INFO        Physical Port Administrative
State Down [2]
GigabitEthernet0/0/6    Jan 21 2016 18:08:21  INFO        Physical Port Administrative
State Down [2]
GigabitEthernet0/0/7    Jan 21 2016 18:08:21  INFO        Physical Port Administrative
State Down [2]
TenGigabitEthernet0/1/0 Jan 21 2016 18:08:21  INFO        Physical Port Administrative
State Down [36]
xcvr container 0/1/1    Jan 21 2016 18:08:21  INFO        Transceiver Missing [0]
TenGigabitEthernet0/1/2 Jan 21 2016 18:08:21  INFO        Physical Port Administrative
State Down [36]
xcvr container 0/1/3    Jan 21 2016 18:08:21  INFO        Transceiver Missing [0]
.
.
.
```

**Note** There is no external alarm monitoring facility on the Cisco ASR 1002-HX Router.

To clear a visual alarm, you must resolve the alarm condition. The **clear facility-alarm** command does not clear an alarm LED on the . For example, if a critical alarm LED is illuminated because an active EPA was removed without a graceful deactivation of the EPA, the only way to resolve that alarm is to replace the EPA.

# Environmental Monitoring

The environmental monitoring functions use sensors to monitor the temperature of the cooling air as it moves through the chassis.

The local power supplies provide the ability to monitor:

- Input and output voltage
- Output current
- Outlet temperature

The  is expected to meet the following environmental operating conditions:

- Operating Temperature Nominal: 32° to 104° (0° to 40°C)
- Operating Temperature Short Term: 32° to 131° (0° to +55°C)
- Operating Humidity Nominal (relative humidity): 10 to 90% relative
- Operating Humidity Short Term: 5 to 90% relative
- Operating Altitude: –500 to 10,000 feet (–152.4 to 3048 meters)
- DC Input Range: –40 to –72 VDC
- AC Input Range: 85 to 264 VAC

In addition, the power supplies monitor internal power supply temperatures and voltages. A power supply is either within tolerance (normal) or out of tolerance (critical). If an internal power supply temperature or voltage reaches a critical level, the power supply shuts down without any interaction with the system processor.

The environmental monitoring functions use the following levels of status conditions to monitor the system:

- Normal—All monitored parameters are within normal tolerances.
- Warning—The system has exceeded a specified threshold. The system continues to operate, but operator action is recommended to bring the system back to a normal state.
- Critical—An out-of-tolerance temperature or voltage condition exists. The system continues to operate, but the system is approaching shutdown. Immediate operator action is required.
- Shutdown—Before any shutdown, the system logs the status of monitored parameters in NVRAM so that you can retrieve it later to help determine the cause of the problem.
- Power supply shutdown—The power supply detected an internal out-of-tolerance overvoltage, overcurrent, or temperature condition and shut itself down. All DC power remains disabled until you toggle the chassis power switch.

# Fan Failures

Four internal fans draw cooling air in through the front of the chassis and across internal components to maintain an acceptable operating temperature. The fans are located at the rear of the chassis. When the system power is on, all fans should be operational. However, the system continues to operate even if a fan fails.

Use the **show platform hardware slot** *slot* **fan status** command to view the status of the fans, for example:

```
Router# show platform hardware slot P2 fan status
Fan group 1 speed: 60%
Fan 0: Normal
Fan 1: Normal
Fan 2: Normal
Fan 3: Fail
```

# Reporting Functions

The chassis manager on the forwarding engine control processor manages the local resources of the forwarding processor. The  displays warning messages on the console if the chassis interface-monitored parameters exceed a threshold. You can also retrieve and display environmental status reports with the following commands:

- **show environment all**
- **show version**
- **show inventory**
- **show platform**
- **show platform software status control-processor**
- **show diag**

Parameters are measured and reporting functions are updated every 60 seconds. A brief description of each of these commands follows.

### show environment all Command

The **show environment all** command displays temperature, voltage, fan, and power supply information.

The following is sample output from the **show environment all** command.

```
Router# show environment all

Sensor List:  Environmental Monitoring
 Sensor           Location          State             Reading
 Vin              P0                Normal            0 V AC
 Iin              P0                Normal            0 A
 Vout             P0                Normal            0 V DC
 Iout             P0                Normal            1 A
 Temp1            P0                Normal            18 Celsius
 Temp2            P0                Normal            21 Celsius
 Temp3            P0                Normal            24 Celsius
 VPPB1: VX1       R0                Normal            1003 mV
 VPPB1: VX2       R0                Normal            6937 mV
 VPPB1: VX3       R0                Normal            758 mV
 VPPB1: VX4       R0                Normal            1049 mV
```

```
VPPB1: VP1       R0                Normal            1784 mV
VPPB1: VP2       R0                Normal            1517 mV
VPPB1: VP3       R0                Normal            1510 mV
VPPB1: VP4       R0                Normal            5057 mV
VPPB1: VH        R0                Normal            11982 mV
VPPB2: VX2       R0                Normal            818 mV
VPPB2: VX3       R0                Normal            856 mV
VPPB2: VP2       R0                Normal            3312 mV
VPPB2: VH        R0                Normal            11977 mV
VPPB3: VX1       R0                Normal            969 mV
VPPB3: VX2       R0                Normal            1004 mV
VPPB3: VP1       R0                Normal            2500 mV
VPPB3: VP2       R0                Normal            1207 mV
VPPB3: VP3       R0                Normal            1518 mV
VPPB3: VP4       R0                Normal            1518 mV
VPPB3: VH        R0                Normal            11987 mV
Temp: PPB IN     R0                Normal            21 Celsius
Temp: PPB OUT    R0                Normal            37 Celsius
Temp: Yoda 0     R0                Normal            48 Celsius
Temp: Yoda 1     R0                Normal            49 Celsius
Temp: CPU Die    R0                Normal            27 Celsius
Temp: FC FANS    R0                Fan Speed 60%     21 Celsius
VLIB1: VX1       R0                Normal            1001 mV
VLIB1: VX2       R0                Normal            7070 mV
VLIB1: VX3       R0                Normal            949 mV
VLIB1: VP1       R0                Normal            1796 mV
VLIB1: VP2       R0                Normal            2508 mV
VLIB1: VP3       R0                Normal            3309 mV
VLIB1: VH        R0                Normal            5033 mV
VLIB2: VX2       R0                Normal            752 mV
VLIB2: VX3       R0                Normal            751 mV
VLIB2: VP1       R0                Normal            1010 mV
VLIB2: VP2       R0                Normal            986 mV
VLIB2: VP3       R0                Normal            1195 mV
VLIB2: VP4       R0                Normal            1517 mV
VLIB2: VH        R0                Normal            11977 mV
Temp: LIB IN     R0                Normal            22 Celsius
Temp: LIB OUT    R0                Normal            32 Celsius
```

### show version Command

The **show version** command displays the system hardware configuration, software version, and names and sources of configuration files and boot images.

The following is sample output from the **show version** command:

```
Router# show version

Cisco IOS XE Software, Version BLD_V162_1_THROTTLE_LATEST_20160119_234422_V16_2_0_259
Cisco IOS Software, ASR1000 Software (X86_64_LINUX_IOSD-UNIVERSALK9-M), Experimental
Version Denali 16.2.20160120:005403 [v162_1_throttle-BLD-BLD_V162_1_THROTTLE_LATEST_
20160119_234422 127]
Copyright (c) 1986-2016 by Cisco Systems, Inc.
Compiled Tue 19-Jan-16 20:53 by mcpre


Cisco IOS-XE software, Copyright (c) 2005-2016 by cisco Systems, Inc.
All rights reserved.  Certain components of Cisco IOS-XE software are
licensed under the GNU General Public License ("GPL") Version 2.0.  The
software code licensed under GPL Version 2.0 is free software that comes
```

```
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GPL code under the terms of GPL Version 2.0.  For more details, see the
documentation or "License Notice" file accompanying the IOS-XE software,
or the applicable URL provided on the flyer accompanying the IOS-XE
software.


ROM: IOS-XE ROMMON

ASR1002-HX uptime is 6 minutes
Uptime for this control processor is 7 minutes
System returned to ROM by reload
System image file is "bootflash:asr1002hx-universalk9.BLD_V162_1_THROTTLE_LATEST_
20160119_234422_V16_2_0_259.SS"
Last reload reason: Reload Command



This product contains cryptographic features and is subject to United
States and local country laws governing import, export, transfer and
use. Delivery of Cisco cryptographic products does not imply
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wwl/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.

License Type: EvalRightToUse
License Level: adventerprise
Next reload license Level: adventerprise

cisco ASR1002-HX (2KH) processor (revision 2KH) with 3724092K/6147K bytes of memory.
Processor board ID FXS1922Q0LL
Crypto Hardware Module present
26 Gigabit Ethernet interfaces
8 Ten Gigabit Ethernet interfaces
32768K bytes of non-volatile configuration memory.
16777216K bytes of physical memory.
30056447K bytes of eUSB flash at bootflash:.
0K bytes of  at webui:.

Configuration register is 0x2142


Router#
```

### show inventory Command

The **show inventory** command displays an extended report that includes the product inventory listing of all the Cisco products installed in the networking device.

The following is sample output from the **show inventory** command:

```
Router# show inventory
NAME: "Chassis", DESCR: "Cisco ASR1002-HX Chassis"
```

```
PID: ASR1002-HX        , VID: V00  , SN: FXS1922Q0LL

NAME: "Power Supply Module 0", DESCR: "Cisco ASR1002-HX AC Power Supply"
PID: ASR1000X-AC-750W  , VID: V01  , SN: ART183011C

NAME: "Fan Tray", DESCR: "Cisco ASR1002-HX Fan Tray"
PID: ASR1002-HX-FANTRAY, VID:      , SN:

NAME: "module 0", DESCR: "Cisco ASR1002-HX Modular Interface Processor"
PID: ASR1002-HX        , VID:      , SN:

NAME: "SPA subslot 0/2", DESCR: "18-port Gigabit Ethernet Port Adapter"
PID: EPA-18X1GE        , VID: V00  , SN: JAE192700QL

NAME: "subslot 0/2 transceiver 17", DESCR: "GE SX"
PID: SFP-GE-S          , VID: 06   , SN: AGM1418P1TB

NAME: "SPA subslot 0/0", DESCR: "8-port Built-in Gigabit Ethernet Port Adapter"
PID: BUILT-IN-EPA-8x1G , VID: N/A  , SN: JAE12345678

NAME: "subslot 0/0 transceiver 0", DESCR: "GE SX"
PID: SFP-GE-S          , VID: 06   , SN: AGM1633P0R8

NAME: "subslot 0/0 transceiver 1", DESCR: "100BASE FX-GE"
PID: GLC-GE-100FX      , VID: A1A  , SN: OPT17501515

NAME: "subslot 0/0 transceiver 3", DESCR: "GE SX"
PID: SFP-GE-S          , VID: B    , SN: FNS16270V0S

NAME: "subslot 0/0 transceiver 4", DESCR: "GE SX"
PID: GLC-SX-MMD        , VID: 001  , SN: AGJ1825R4H0

NAME: "subslot 0/0 transceiver 5", DESCR: "GE SX"
PID: SFP-GE-S          , VID: B    , SN: FNS16270V1T

NAME: "subslot 0/0 transceiver 6", DESCR: "GE SX"
PID: FTRJ8519P1BNL-C5  , VID:      , SN: FNS0928K33L

NAME: "subslot 0/0 transceiver 7", DESCR: "GE SX"
PID: GLC-SX-MMD        , VID: A    , SN: FNS170907MM

NAME: "SPA subslot 0/1", DESCR: "8-port Built-in 10-Gigabit Ethernet Port Adapter"
PID: BUILT-IN-EPA-8x10G, VID: N/A  , SN: JAE87654321

NAME: "subslot 0/1 transceiver 0", DESCR: "SFP+ 10GBASE-SR"
PID: SFP-10G-SR        , VID: A    , SN: FNS17241B6A

NAME: "subslot 0/1 transceiver 2", DESCR: "SFP+ 10GBASE-SR"
PID: SFP-10G-SR        , VID: A    , SN: SPC144701S6

NAME: "subslot 0/1 transceiver 4", DESCR: "SFP+ 10GBASE-SR"
PID: SFP-10G-SR        , VID: G4.1 , SN: AVD1828A6PH

NAME: "subslot 0/1 transceiver 6", DESCR: "SFP+ 10GBASE-SR"
PID: SFP-10G-SR        , VID: A    , SN: FNS16190YXT

NAME: "module R0", DESCR: "Cisco ASR1002-HX Route Processor"
PID: ASR1002-HX        , VID: V00  , SN: JAE1931098U

NAME: "module F0", DESCR: "Cisco ASR1002-HX Embedded Services Processor"
PID: ASR1002-HX        , VID:      , SN:

Router#
```

### show platform Command

The **show platform** command displays platform information.

The following is sample output from the **show platform** command:

```
Router# show platform

Chassis type: ASR1001-HX

Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
0         ASR1001-HX          ok                    00:03:19
 0/0      BUILT-IN-EPA-8x1G   ok                    00:02:08
 0/1      BUILT-IN-8X10G/1G   ok                    00:02:10
R0        ASR1001-HX          ok                    00:03:19
 R0/0                         ok, active            00:03:19
 R0/1                         ok, standby           00:01:42
F0        ASR1001-HX          ok, active            00:03:19
P0        ASR1KX-AC-750W-R    ok                    00:03:00
P1        ASR1KX-AC-750W-R    ok                    00:03:00
P2        ASR1001HX-FAN       ok                    00:03:00

Slot      CPLD Version        Firmware Version
--------- ------------------- ---------------------------------------
0         15081816            16.2(2r)
R0        15081816            16.2(2r)
F0        15081816            16.2(2r)

Router#
```

### show platform software status control-processor Command

The **show platform software status control-processor** command displays the average load, memory usage, and CPU utilization levels at which the router is running. The output also specifies whether the levels of these system health parameters are within defined thresholds.

The following is sample output from the **show platform software status control-processor** command:

```
Router# show platform software status control-processor

RP0: online, statistics updated 4 seconds ago
Load Average: healthy
1-Min: 1.67, status: healthy, under 8.00
5-Min: 0.95, status: healthy, under 8.00
15-Min: 0.50, status: healthy, under 10.00
Memory (kb): healthy
Total: 8058196
Used: 3077968 (38%), status: healthy
Free: 4980228 (62%)
Committed: 3993016 (50%), under 95%
Per-core Statistics
CPU0: CPU Utilization (percentage of time spent)
User: 0.89, System: 3.29, Nice: 0.00, Idle: 95.70
IRQ: 0.00, SIRQ: 0.09, IOwait: 0.00
CPU1: CPU Utilization (percentage of time spent)
User: 0.20, System: 2.10, Nice: 0.00, Idle: 97.69
IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU2: CPU Utilization (percentage of time spent)
User: 1.10, System: 1.60, Nice: 0.00, Idle: 97.30
```

```
IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU3: CPU Utilization (percentage of time spent)
User: 0.19, System: 0.19, Nice: 0.00, Idle: 99.60
IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU4: CPU Utilization (percentage of time spent)
User: 0.60, System: 0.40, Nice: 0.00, Idle: 98.99
IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU5: CPU Utilization (percentage of time spent)
User: 0.30, System: 0.30, Nice: 0.00, Idle: 99.40
IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU6: CPU Utilization (percentage of time spent)
User: 0.70, System: 7.70, Nice: 0.00, Idle: 91.59
IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
CPU7: CPU Utilization (percentage of time spent)
User: 0.30, System: 0.40, Nice: 0.00, Idle: 99.30
IRQ: 0.00, SIRQ: 0.00, IOwait: 0.00
```

### show diag chassis eeprom detail Command

The **show diag chassis eeprom detail** command displays the configuration hardware information, including power or fan module P0 and P1 EPPROM data.

The following is sample output from the **show diag chassis eeprom detail** command:

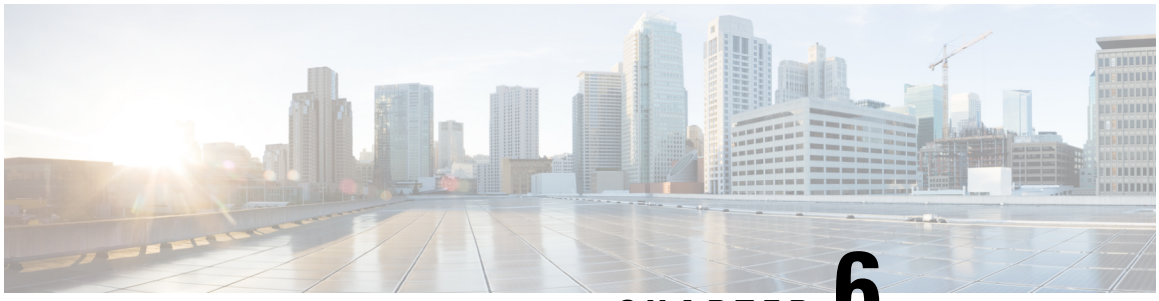
```
Router#: show diag chassis eeprom detail
MIDPLANE EEPROM data:

        EEPROM version           : 4
        Compatible Type          : 0xFF
        Controller Type          : 3236
        Hardware Revision        : 0.3
        PCB Part Number          : 73-16562-03
        Board Revision           : 01
        Deviation Number         : 0-0
        Fab Version              : 03
        PCB Serial Number        : JAE1931098L
        RMA Test History         : 00
        RMA Number               : 0-0-0-0
        RMA History              : 00
        Top Assy. Part Number    : 68-5448-02
        CLEI Code                : SAMPL00XYZ
        Product Identifier (PID) : ASR1002-HX
        Version Identifier (VID) : V00
        Manufacturing Test Data  : 00 00 00 00 00 00 00 00
        Field Diagnostics Data   : 00 00 00 00 00 00 00 00
        Chassis MAC Address      : 74a2.e624.fb00
        MAC Address block size   : 256
        Chassis Serial Number    : FXS1922Q0MJ
        Environment Monitor Data : 00 06 00 FA
        Asset ID                 :
Power/Fan Module P0 EEPROM data:

        EEPROM version           : 4
        Compatible Type          : 0xFF
        Hardware Revision        : 0.1
        Version Identifier (VID) : V01
        Product Identifier (PID) : ASR1000X-AC-750W
        PCB Serial Number        : ART183011B
        Top Assy. Part Number    : 341-00714-01
        Board Revision           : A0
        Deviation Number         : 0-0
```

```
        RMA Test History         : 00
        RMA Number               : 0-0-0-0
        RMA History              : 00
        CLEI Code                : TBD
        Manufacturing Test Data  : 00 00 00 00 00 00 00 00
        Field Diagnostics Data   : 00 00 00 00 00 00 00 00
        Unknown Field (type 00DA): 00 00 00 00 00 00 00 00
                                   00 00 00 00 00 00 00 00
        Asset ID                 :
        Power Supply Type        : AC
        Environment Monitor Data : 00 08 00 F8
        Environment Monitor Data : 02 A5 2E E2 EE 00 5B
        Environment Monitor Data : 05 02 03 50 03 58 00 4B
        Platform features        : 00 00 03 56 1E 53 0F 2A
                                   00 00 00 00 00 00 00 00
                                   FD
Power/Fan Module P1 EEPROM data:

        EEPROM version           : 4
        Compatible Type          : 0xFF
        Hardware Revision        : 0.1
        Version Identifier (VID) : V01
        Product Identifier (PID) : ASR1000X-AC-750W
        PCB Serial Number        : ART183011B
        Top Assy. Part Number    : 341-00714-01
        Board Revision           : A0
        Deviation Number         : 0-0
        RMA Test History         : 00
        RMA Number               : 0-0-0-0
        RMA History              : 00
        CLEI Code                : TBD
        Manufacturing Test Data  : 00 00 00 00 00 00 00 00
        Field Diagnostics Data   : 00 00 00 00 00 00 00 00
        Unknown Field (type 00DA): 00 00 00 00 00 00 00 00
                                   00 00 00 00 00 00 00 00
        Asset ID                 :
        Power Supply Type        : AC
        Environment Monitor Data : 00 08 00 F8
        Environment Monitor Data : 02 A5 2E E2 EE 00 5B
        Environment Monitor Data : 05 02 03 50 03 58 00 4B
        Platform features        : 00 00 03 56 1E 53 0F 2A
                                   00 00 00 00 00 00 00 00
                                   FD
```



CHAPTER 6

# License Verification

This chapter provides information about verifying the Cisco IOS license level, viewing the  license, and configuring the port license and crypto throughput level.


- Viewing the Cisco IOS License Level, on page 75
- Viewing License Information, on page 76
- Port Licensing, on page 82
- Evaluation License Features, on page 85
- Configuring the Crypto Throughput Level, on page 85


# Viewing the Cisco IOS License Level

Use the show version command to determine the Cisco IOS license level in the router. For example:

```
Router# show version
.
.
.
License Level: adventerprise
License Type: RightToUse
Next reload license Level: adventerprise
.
.
.
```

***Table 13: show version Command Output Description***

| Field Name | Description |
|---|---|
| License Level: adventerprise | Indicates the current Cisco IOS license code level. |
| License Type: RightToUse | Indicates the type of license that is used.<br>This example shows that the Right-to-Use license is used, which means that the purchase of a license is required.<br>Other license types could be: Permanent (purchased) license or an Evaluation 60-day license. |

| Field Name | Description |
|---|---|
| Next reload license Level: adventerprise | Indicates the startup configuration definition that will be used for the next reload instance. |

Use the **show running-config** command or the **show startup-config** command to view the license-level information. The following example displays sample output from the **show running-config** command:

```
Router# show running-config
.
.
.
license boot level adventerprise
.
.
.
```

***Table 14: show running-config Command Output Description***

| Field Name | Description |
|---|---|
| license boot level adventerprise | Indicates the current requested Cisco lOS license level to boot. |

# Viewing License Information

Use the **show license udi** command to determine the Universal Device Identifier (UDI) information of your chassis. This may be required at the time of purchasing a new license.

The following example displays sample output from the **show license udi** command:

```
Router# show license udi

SlotID   PID                   SN                      UDI
-------------------------------------------------------------------------------
*        ASR1002-HX            JAE1931098U     ASR1002-HX:JAE1931098U
```

Use the **show license all** command to display all the applicable licenses in both Primary License Storage and Built In License Storage.

**Note** Primary License Storage stores the currently purchased and installed licenses.

The following example displays sample output from the **show license all** command for the Cisco ASR 1001-HX Router:

```
Router# show license all

License Store: Primary License Storage
License Store: Built-In License Storage
StoreIndex: 0   Feature: adventerprise                    Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 5  weeks 2  days
```

```
            Period used: 3  weeks 1  day
            Transition date: Sep 02 2016 21:19:13
        License Count: Non-Counted
        License Priority: Low
StoreIndex: 1   Feature: advipservices                    Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 2   Feature: avc                              Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 3   Feature: fwnat_red                        Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 4   Feature: ipsec                            Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 5   Feature: lawful_intr                      Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 6   Feature: lisp                             Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 7   Feature: otv                              Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 8   Feature: sw_redundancy                    Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
```

```
            Evaluation period left: 7  weeks 4  days
            Period used: 6  days 7  hours
            Transition date: Sep 18 2016 23:31:13
        License Count: Non-Counted
        License Priority: Low
StoreIndex: 9   Feature: vpls                              Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 10  Feature: FoundationSuiteK9                 Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 11  Feature: AdvUCSuiteK9                      Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 12  Feature: 1HXIPS8G                          Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 5  weeks 3  days
            Period used: 3  weeks 0  day
            Transition date: Sep 04 2016 03:48:08
        License Count: Non-Counted
        License Priority: Low
StoreIndex: 13  Feature: 1HX8G16G                          Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 5  weeks 3  days
            Period used: 3  weeks 0  day
            Transition date: Sep 04 2016 03:48:14
        License Count: Non-Counted
        License Priority: Low
StoreIndex: 14  Feature: interface_10g                     Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 5  weeks 3  days
            Period used: 3  weeks 0  day
            Transition date: Sep 04 2016 02:34:06
        License Count: 2/0  (In-use/Violation)
        License Priority: Low
StoreIndex: 15  Feature: interface_1g                      Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 5  weeks 3  days
            Period used: 3  weeks 0  day
            Transition date: Sep 04 2016 00:20:43
        License Count: 2/0  (In-use/Violation)
```

```
        License Priority: Low

Router#
```

The following example displays sample output from the **show license all** command for the Cisco ASR 1002-HX Router:

```
Router# show license all
License Store: Primary License Storage
License Store: Built-In License Storage
StoreIndex: 0   Feature: adventerprise                    Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 3  days 13 hours
            Period used: 8  weeks 0  day
            Transition date: Jan 25 2016 07:31:44
        License Count: Non-Counted
        License Priority: Low
StoreIndex: 1   Feature: advipservices                    Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 2   Feature: avc                              Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 3   Feature: fwnat_red                        Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 4   Feature: ipsec                            Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 5   Feature: lawful_intr                      Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 6   Feature: lisp                             Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
```

```
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 7   Feature: otv                                Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 8   Feature: sw_redundancy                      Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 7  weeks 0  day
            Period used: 1  week  3  days
        License Count: Non-Counted
        License Priority: Low
StoreIndex: 9   Feature: vpls                               Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 10  Feature: FoundationSuiteK9                  Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 11  Feature: AdvUCSuiteK9                       Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 12  Feature: 2HXIPS8G                           Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 6  weeks 5  days
            Period used: 1  week  5  days
            Transition date: Mar 09 2016 16:10:35
        License Count: Non-Counted
        License Priority: Low
StoreIndex: 13  Feature: 2HX8G16G                           Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 14  Feature: 2HX8G25G                           Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
```

```
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 6  weeks 5  days
            Period used: 1  week  5  days
            Transition date: Mar 09 2016 16:10:35
        License Count: Non-Counted
        License Priority: Low
StoreIndex: 15  Feature: 2HX16G25G                        Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA not accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 4  days
            Period used: 0  minute  0  second
        License Count: Non-Counted
        License Priority: None
StoreIndex: 16  Feature: interface_10g                    Version: 1.0
        License Type: EvalRightToUse
        License State: Active, Not in Use, EULA accepted
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 7  weeks 1  day
            Period used: 1  week  2  days
        License Count: 0/0  (In-use/Violation)
        License Priority: Low
StoreIndex: 17  Feature: interface_1g                     Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 2  days
            Period used: 1  day  2  hours
            Transition date: Apr 23 2016 22:33:22
        License Count: 1/0  (In-use/Violation)
        License Priority: Low

router#
```

When license is requested for OC3 SPA, any two ports are free to use and license is requested when the third port is unshut:

1. Unshut Port0-No license would be requested
2. Unshut Port2-No license would be requested
3. Unshut Port1-One unit of license would be requested
4. Unshut Port3-No additional license is required

**Note** For OC12 SPA, if any one port is free to use, license is requested when 2nd port is unshut.

- Unshut Port1-No license would be requested
- Unshut Port0-One unit of license would be requested

When license is released for OC3 SPA, consider that all the ports are unshut (Only one unit of license is consumed)

When 2 ports are shut, one unit of license is released.

1. Shut Port0-No license would be released. Ports1, 2 and 3 are in unshut state and only onne unit of license is consumed.

2. Shut Port3-One license is released. Port 1 and Port 2 are in unshut state and no units of licenses are consumed.

Similarly, when license is released for OC12 SPA, consider that all the ports are unshut (Only one unit of license is consumed)

**Note** When 1 port is shut, one unit of license is released.

1. Shut Port0-One license is released, Port1 is in unshut state and no units of license is consumed.

The following example displays sample output from the **show license summary** command for both the cards:

```
Router# show lice summary
Smart Licensing is ENABLED
Registration:
  Status: REGISTERED
  Smart Account: BU Production Test
  Virtual Account: ASR1k_Dheeraj
  Export-Controlled Functionality: Allowed
  Last Renewal Attempt: None
  Next Renewal Attempt: Feb 19 14:01:25 2018 IST

License Authorization:
  Status: AUTHORIZED
  Last Communication Attempt: SUCCESS
  Next Communication Attempt: Sep 22 14:01:32 2017 IST

License Usage:
  License                 Entitlement tag               Count Status
  -----------------------------------------------------------------------------
  ASR_1000_OC3-2-4        (ASR_1000_OC3-2-4)                1 AUTHORIZED
  ASR_1000_OC12-1-2       (ASR_1000_OC12-1-2)               1 AUTHORIZED
```

The following is an example, which shows both the cards with **no shut** to all ports:

```
Router# show version | i image

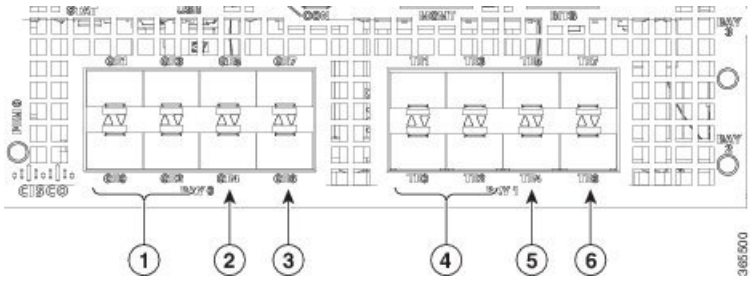
System image file is
"bootflash:asr1002x-universalk9.BLD_POLARIS_DEV_LATEST_20170813_081321_V16_7_0_139.SSA.bin
```

# Port Licensing

## Port Licensing for the

The has eight 1GE ports in Bay 0 and eight 10GE ports in Bay 1. By default, four ports in Bay 0 and four ports in Bay 1 can be enabled without a license (ports 0 through 3). The remaining ports can be enabled in pairs (ports 4 and 5, and ports 6 and 7) through licenses.

*Figure 17: Ports*




| | | | |
|---|---|---|---|
| 1 | 1GE ports 0–3 can be enabled by default. | 4 | 10GE ports 0–3 can be enabled by default. |
| 2 | 1GE ports 4 and 5 require a port license. Enabling either port will use one port license. | 5 | 10GE ports 4 and 5 require a port license. Enabling either port will use one port license. |
| 3 | 1GE ports 6 and 7 require a port license. Enabling either port will use one port license. | 6 | 10GE ports 6 and 7 require a port license. Enabling either port will use one port license. |

Enabling one of the ports in a port pair using the **no shut** command consumes one count of the license, and the In-use count increases by 1.

Disabling the ports in the port pair using the **shut** command releases one count of the license, and the In-use count decreases by 1.

An End-User License Agreement (EULA) is displayed for each port pair if there is no permanent license present to support these ports.

### Licensing

The image carries two 1GE and two 10GE port EvalRTU (Evaluation) licenses. If the EvalRTU license expires, it becomes a Right-To-Use (RTU) license.

- Licensed ports in Bay 0 use a 1GE port license.
- Licensed ports in Bay 1 use a 10GE port license.

For all possible port licensing scenarios, see Licensing Scenarios for Cisco ASR 1002-HX Router , on page 84.

### Example

The following EvalRTU license example displays the EvalRTU licenses used on the 10GE ports. A Permanent license works similarly:

```
StoreIndex: 16  Feature: interface_10g                    Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 3  days
            Period used: 3  hours 13 minutes
            Transition date: Aug 16 2013 19:05:26
        License Count: 0/0  (In-use/Violation)
        License Priority: Low

...
```

```
StoreIndex: 16  Feature: interface_10g                    Version: 1.0
        License Type: EvalRightToUse
        License State: Active, In Use
            Evaluation total period: 8  weeks 4  days
            Evaluation period left: 8  weeks 3  days
            Period used: 3  hours 13 minutes
            Transition date: Aug 16 2013 19:05:26
        License Count: 2/0  (In-use/Violation)
        License Priority: Low
```

*Table 15: show license all Command Output Description*

| Field Name | Description |
|---|---|
| License Count: 0/0 (In-use/Violation) | No ports in use for the evaluation license. |
| License Count: 2/0 (In-use/Violation) | Two port pairs in use for the evaluation license (an EULA was accepted for each prior to use). |

## Licensing Scenarios for Cisco ASR 1002-HX Router

The following table provides all possible licensing scenarios for the Cisco ASR 1002-HX Router.

**Note** In the Cisco ASR 1002-HX Router, Bay 0 can only support 1GE SFP and Bay 1 can only support 10GE SFP+ speed.

*Table 16: Cisco ASR 1002-HX Router—BAY 0 (1GE Port)*

| Port 4 or Port 6 | Port 5 or Port 7 | License Consumption |
|---|---|---|
| SHUT | SHUT | No License |
| SHUT | NO_SHUT | 1GE License |
| NO_SHUT | SHUT | 1GE License |
| NO_SHUT | NO_SHUT | 1GE License |

*Table 17: Cisco ASR 1002-HX Router—BAY 1 (10GE Port)*

| Port 4 or Port 6 | Port 5 or Port 7 | License Consumption |
|---|---|---|
| SHUT | SHUT | No License |
| SHUT | NO_SHUT | 10GE License |

| Port 4 or Port 6 | Port 5 or Port 7 | License Consumption |
|---|---|---|
| NO_SHUT | SHUT | 10GE License |
| NO_SHUT | NO_SHUT | 10GE License |

# Evaluation License Features

The following are the features of the 1GE and 10GE Interface Evaluation license:

- There is only one 60-Day Evaluation Period countdown timer for the 1GE port pairs and 10GE port pairs. The timer is initiated as soon as the first of the port pairs is enabled.
- A EULA will be presented, and must be accepted, the first time you enable any of the ports in order to utilize the requested port.
- When the 60-Day Evaluation Period expires, the license automatically changes to an RTU license. As with all other RTU licenses, there is no functionality disruption or accessibility concerns following this transition.
- There can be only one active interface_1g license and one active interface_10g license. Either the Permanent License or the EvalRTU License can be Active, but not both.
- As with past license implementations, the Permanent license is of higher precedence than the built-in EvalRTU license. However, when the Permanent license does not have enough port-count (that is, when the user requests both port pairs but the Permanent License only allows for one port pair), the license priority changes between the Permanent and Evaluation licenses. In this case, the Evaluation License becomes Active since it can accommodate both port pairs. The Permanent License will automatically become Active if and when its port-count meets the user's desired configuration.

# Configuring the Crypto Throughput Level

The field-upgradable crypto module has no default throughput. You can upgrade the throughput by applying a crypto throughput upgrade license.

The following two types of crypto throughput licenses are available on the and the :

- Right-to-Use (RTU) license, which is honor-based
- Permanent license

When you use a Permanent license for crypto-throughput and want to upgrade it, you must download the appropriate Permanent license to upgrade it .

When you have an RTU license, you do not need to download a separate license (for example, a Permanent license). The license is already provided with the Cisco IOS. Therefore, to upgrade the RTU license, all you need to do is configure the crypto to a higher-level license.

**Note** To install permanent IPSec license, you do not have to use license install commands. License related for example **show license feature** and **show license** commands do not have any IPSec related references.

To determine the current throughput level of the crypto module, enter the **show platform hardware crypto-throughput level** command. The following example shows the output from this command before you apply a crypto throughput upgrade license:

```
Router# show platform hardware crypto-throughput level
*Jun 17 22:04:56.711: %SYS-5-CONFIG_I: Configured from console by console
The current crypto throughput level is 0000000 kbps
```

The following example shows the output of the **show platform hardware crypto-throughput level** command after you apply an 8-Gbps crypto-throughput upgrade license:

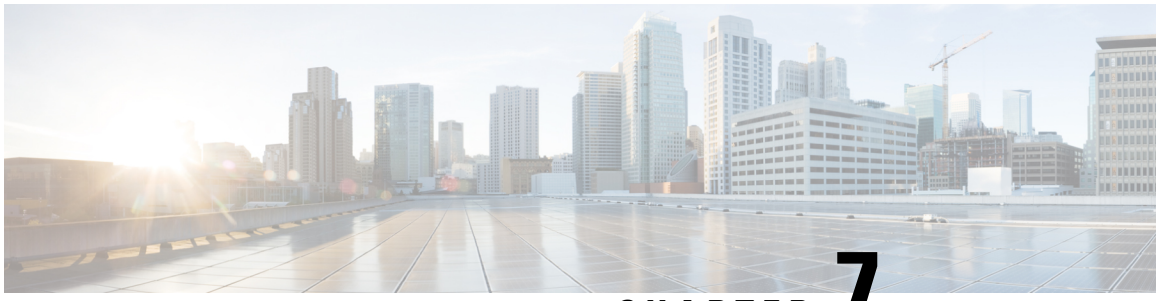
```
Router# show platform hardware crypto-throughput level
*Jun 17 22:07:07.078: %SYS-5-CONFIG_I: Configured from console by console
The current crypto throughput level is 8000000 kbps
```

To remove the configuration, enter the following command:

```
Router(config)# no platform hardware crypto-throughput level 8g
% Crypto Bandwidth reset to default 0g bps.
```

**Note** Configuring a higher-level license automatically enables the lower-level licenses as Right to Use (RTU) if the corresponding permanent licenses are not installed yet. For example, configuring 16-25g automatically enables 8g and 8-16g as RTU.

For more information about the software-activated performance upgrade license, see the Software Activation Guide .



CHAPTER 7

# Removing and Replacing FRUs

This chapter describes procedures for removing and replacing field-replaceable units (FRUs) from Cisco 1002-HX Routers.


- Removing and Replacing the Crypto Modules, on page 87
- Removing AC Power Supplies, on page 91
- Installing AC Power Supplies, on page 91
- Removing DC Input Power Supplies, on page 92
- Installing DC Input Power Supplies, on page 92
- Removing and Replacing USB Flash Memory Stick, on page 95
- Removing and Replacing a DIMM, on page 95
- Removing and Replacing an EPA, on page 104
- Removing and Replacing a NIM, on page 107
- Removing and Replacing Fans, on page 109
- Repacking the Router, on page 116


# Removing and Replacing the Crypto Modules

The following sections describe the procedures for removing and replacing the Cisco ASR 1001-HX Router and Cisco ASR 1002-HX Router crypto modules.

**Note** The crypto modules in Cisco ASR 1001-HX Router and Cisco ASR 1002-HX Router are optional and field-upgradeable components

## Removing and Replacing the Crypto Module in a Cisco ASR 1001-HX Router

### Before you begin

Perform the following steps before you begin the process of installing the crypto module in a Cisco ASR 1001-HX Router:

- Shut down the router. Enter the **copy running-config startup-config** command to save the configuration to NVRAM.

- Use an ESD-preventive wrist strap.
- Remove the power supplies before you remove the chassis top cover.

**Caution** The top cover cannot be removed until the power supplies are removed from the chassis. The chassis has a safety mechanism built in to prevent the removal of the top cover until the power supplies are removed.

## Procedure

**Step 1** With an ESD wrist strap on, remove the power supplies from the chassis.

**Note**
The chassis cover cannot be removed until the power supplies are removed from the chassis.

For instructions about how to remove the AC and DC power supplies, see:

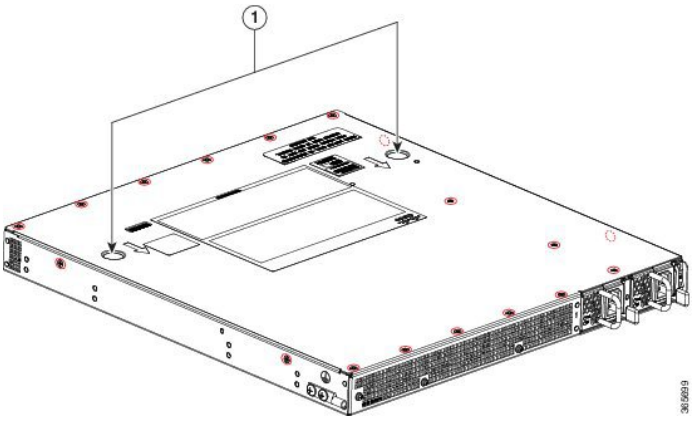
- Removing AC Power Supplies
- Removing DC Input Power Supplies

**Step 2** Remove the router from the rack.

**Step 3** Remove the chassis top cover by performing the following steps:

a) Remove the fourteen top surface screws on the chassis cover.
b) Remove the two screws from the left side of the chassis and the two screws from the right side of the chassis.
c) Putting your thumbs in the thumb depression shown in the following figure, slide the cover slightly backward and lift it off of the chassis.

*Figure 18: Cisco ASR 1001-HX Router Top Cover Screw Locations*



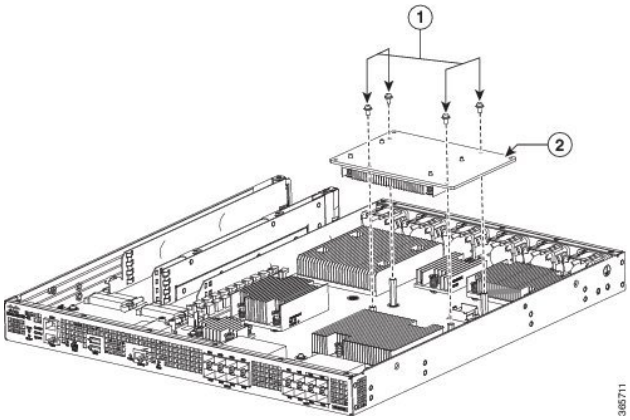

| | |
|---|---|
| 1 | Thumb depression location |

**Step 4** Remove the crypto module from its ESD bag.

**Step 5** Carefully align the crypto module with its connector on the mother board and snap into place.

**Step 6** Install the four M3 x 8 mm long pan heads with a Phillips drive, screws into the location shown below and torque it to 5 in-lbs.

***Figure 19: Cisco ASR 1001-HX Router Crypto Module***




| | | | |
|---|---|---|---|
| 1 | Screws | 2 | Crypto module |

**Step 7** Install the cover.

**Step 8** Install the chassis in the rack.

**Step 9** Power up the router by plugging in the power supplies and placing the chassis power switch to the On position.

**Step 10** Use the **show platform hardware crypto-device 0 status** command to verify successful installation:

```
Router# show platform hardware crypto-device 0 status

Encryption processor is functional
```

# Removing and Replacing the Crypto Module in a Cisco ASR 1002-HX Router

### Before you begin

To install the crypto module, you must shut down the router and remove it from the rack. Enter the **copy running-config startup-config** command to save the configuration to NVRAM.

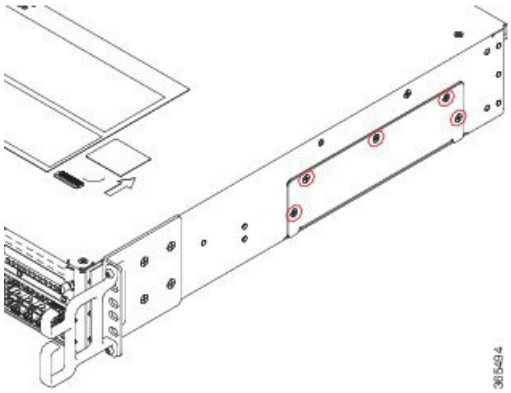
### Procedure

**Step 1** Power down the router by placing the chassis power switch in the Standby position and unplug the power supplies.

**Step 2** Remove the router from the rack.

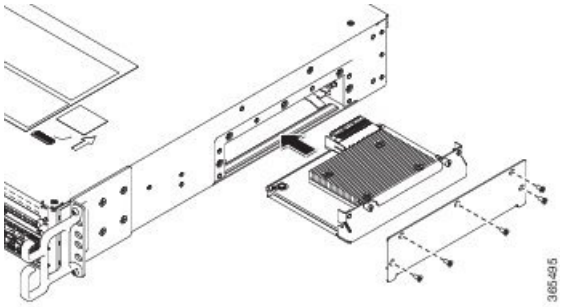
**Step 3** Open the access panel on the right side of the chassis by removing the 5 screws, as shown in the following figure.

*Figure 20: Access Panel Screws*




**Step 4** Align the crypto module with the guide rails and carefully slide the crypto module into the slot until it is fully seated.

*Figure 21: Installing the Crypto Module*




**Step 5** Tighten the captive installation screws on the crypto module.

**Step 6** Replace the access panel and screws. The types of screws are M3 x 8 mm long pan heads with a Phillips drive, and 4 screws are required per board.

**Step 7** Install the chassis in the rack.

**Step 8** Power up the router by plugging in the power supplies and placing the chassis power switch to the On position.

**Step 9** Use the **show platform hardware crypto-device 0 status** command to verify successful installation:

```
Router# show platform hardware crypto-device 0 status

Encryption processor is functional
```

# Removing AC Power Supplies

**Procedure**

**Step 1** Ensure that the chassis power switch is in the Standby position.

**Note**
It is not required to place the chassis power switch in the Standby position if you want to hot-swap a single power supply.

**Step 2** Unplug the power cable from the power supply.

**Step 3** Press the retaining latch towards the pull handle, grasp the handle with one hand, and pull the power supply out of the slot while supporting the weight of the power supply with the other hand.

**Step 4** Repeat these steps if it is required to remove the other AC power supply.

# Installing AC Power Supplies



**Note** Do not install the power supplies with the chassis cover off.

**Procedure**

**Step 1** Ensure that the chassis power switch on the chassis is in the Standby position.

**Note**
It is not required to place the chassis power switch in the Standby position if you want to hot-swap a single power supply.

**Step 2** Insert the power supply module into the appropriate slot(s), making sure that the retention latch is firmly placed. You can verify that the power supply module is firmly latched by gently pulling the power supply handle.

**Step 3** Insert the power supply cables firmly into the power supplies.

**Note**
Ensure that both power supplies are inserted firmly and the power cords are in place.

**Step 4** If you have changed the chassis power switch to the Standby position in Step 1, press the power switch to the On position.

The power supply LEDs are illuminated (green).

# Removing DC Input Power Supplies

The DC power supply has a terminal block that is installed into the power supply terminal block header.

**Procedure**

**Step 1** Turn off the circuit breaker from the power source.

**Step 2** Ensure that the chassis power switch is in the Standby position.

**Note**
It is not required to place the chassis power switch in the Standby position if you want to hot-swap a single power supply.

**Step 3** Remove the plastic cover from the terminal block.

**Step 4** Unscrew the two terminal block screws on the unit and remove the wires from the power supply.

**Step 5** Press the power supply retaining latch towards the pull handle, grasp the handle with one hand, and pull the power supply out of the slot while supporting the weight of the power supply with the other hand.

# Installing DC Input Power Supplies



**Warning** To reduce risk of electric shock or personal injury, disconnect DC power before removing or replacing components or performing upgrades.



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



**Note** Do not install the power supplies with the chassis cover off.

This section describes how to install the DC power supply input power leads to the DC input power supply. Before you begin, read these important notices:

- The color coding of the DC input power supply leads depends on the color coding of the DC power source at your site. Ensure that the lead color coding you choose for the DC input power supply matches

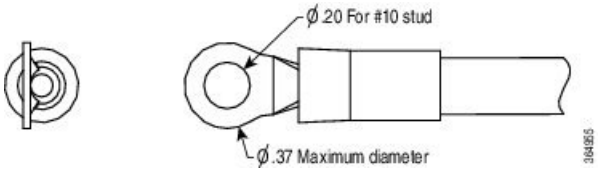
the lead color coding used at the DC power source and verify that the power source is connected to the negative (–) terminal and to the positive (+) terminal on the power supply.

- Ensure that the chassis ground is connected on the chassis before you begin installing the DC power supply. Follow the steps provided in the "Chassis Ground Connection" section.
- For DC input power cables, the wire gauge is based on the National Electrical Code (NEC) and local codes for 26 amp service at nominal DC input voltage (–40/–72 VDC). One pair of cable leads, source DC (–) and source DC return (+), are required for each power distribution unit (PDU). These cables are available from any commercial cable vendor. All DC input power cables for the chassis should be 10 gauge wire and cable lengths should match within 10 percent of deviation.

Each DC input power cable is terminated at the PDU by a cable lug, as shown in the following figure.

**Note** DC input power cables must be connected to the PDU terminal studs in the proper positive (+) and negative (–) polarity. In some cases, the DC cable leads are labeled, which is a relatively safe indication of the polarity. However, you must verify the polarity by measuring the voltage between the DC cable leads. When making the measurement, the positive (+) lead and the negative (–) lead must always match the (+) and (–) labels on the power distribution unit.

*Figure 22: DC Input Power Cable Lug*




**Note** To avoid hazardous conditions, all components in the area where DC input power is accessible must be properly insulated. Therefore, before installing the DC cable lugs, be sure to insulate the lugs according to the manufacturer's instructions.

# Wiring the DC Input Power Source

**Warning** To reduce risk of electric shock, when installing or replacing the unit, the ground connection must always be made first and disconnected last.

If your unit has modules, secure them with the provided screws.

### Procedure

**Step 1** Turn off the circuit breaker from the power source.

**Step 2** Ensure that the chassis power switch is in the Standby position.

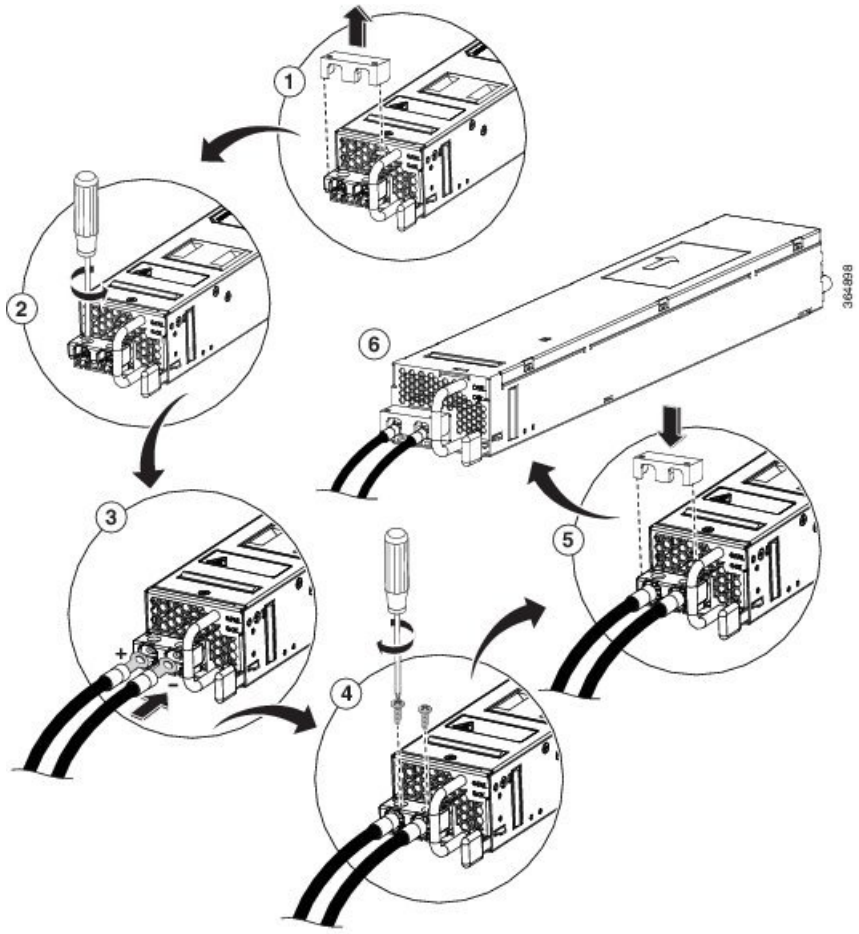
**Note**
It is not required to place the power switch in the Standby position if you want to hot-swap a single power supply.

**Step 3** Remove the plastic cover from the terminal block.

**Caution**
Before you continue to install the terminal block ground wires, stop and perform Step 4.

**Step 4** To prevent any contact with metal lead on the ground wire and the plastic cover, you must wrap the positive and negative lead cables with sleeving. Insulate the lug with shrink sleeving for each lead wire if using non-insulated crimp terminals. Sleeving is not required for insulated terminals.

***Figure 23: DC Power Supply Terminal Block Ground Cable Lugs***




**Note**
This illustration shows the DC power supply for the Cisco ASR 1002-HX Router. The airflow for the Cisco ASR 1002-HX Router is reverse of what is shown in this illustration.

**Step 5** For easier cable-management, insert the negative lead cable first. Replace the ground lug with cable in the following order:

a) Wire terminal
b) Screw with captive washer

**Step 6** Tighten the M3 Screw with captive washer to recommended torque of 5 in-lbs for the positive stud and wire.

**Note**
Secure the wires coming in from the terminal block so that they cannot be disturbed by casual contact.

**Step 7** Replace the terminal block plastic cover. The plastic cover is slotted and keyed to fit correctly over the terminal block.

**Step 8** Turn on the circuit breaker at the power source.

**Step 9** If you have changed the chassis power switch to the Standby position in step 2, turn the power switch to the On position.

The power supply LEDs illuminate green.

# Removing and Replacing USB Flash Memory Stick

The  contains USB ports for a flash memory stick to store configurations or Cisco IOS XE consolidated packages.



**Caution** Do not remove a USB Flash memory stick when issuing a file access command or a read/write operation to the Flash memory stick when it is processing. The router might reload or the USB Flash memory stick may get damaged. Prior to the removal of the USB device, check to see if the USB activity LED on the front panel is flashing.

To remove and then replace a USB flash memory stick, follow these steps:

**Procedure**

**Step 1** Pull the flash memory stick from the USB port.

**Step 2** To replace a Cisco USB Flash memory stick, insert the module into USB port 0 or 1. The Flash memory stick can be inserted only in one way, and can be inserted or removed regardless of whether the router is powered up or not.

# Removing and Replacing a DIMM

This section describes how to replace the DIMMs on the .

You might have to upgrade a DIMM for the following reasons:

- You have upgraded to a new Cisco IOS feature set or release that requires more memory.
- You are using very large routing tables or many protocols.

The DIMM component is keyed and slotted for easier connection.

# Removing a DIMM from a Cisco ASR 1001-HX Router

### Before you begin

Perform the following steps before you begin the process of removing and replacing a DIMM from a Cisco ASR 1001-HX Router:

- Use an ESD-preventive wrist strap.
- Back up the data that you want to save.
- Remove the power supplies before you remove the chassis top cover.

**Caution** The top cover cannot be removed until the power supplies are removed from the chassis. The chassis has a safety mechanism built in to prevent the removal of the top cover until the power supplies are removed.

### Procedure

**Step 1** With an ESD wrist strap on, remove the power supplies from the chassis.

**Note**
The chassis cover cannot be removed until the power supplies are removed from the chassis.

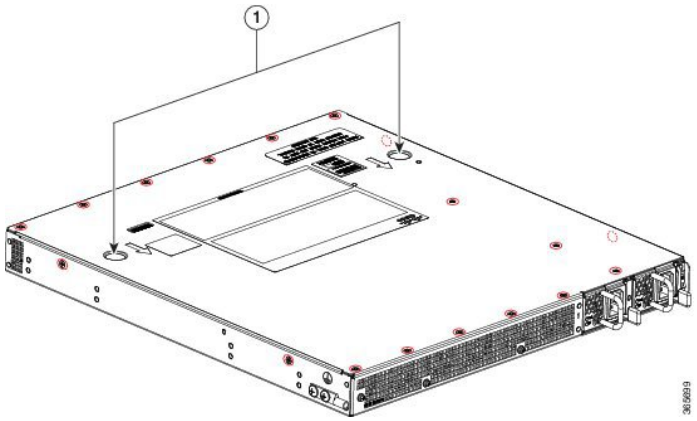
For instructions about how to remove the AC and DC power supplies, see:

- Removing AC Power Supplies
- Removing DC Input Power Supplies

**Step 2** Remove the chassis top cover by performing the following steps:

a) Remove the fourteen top surface screws on the chassis cover.
b) Remove the two screws from the left side of the chassis and the two screws from the right side of the chassis.
c) Putting your thumbs in the thumb depression shown in the following figure, slide the cover slightly backward and lift it off of the chassis.

*Figure 24: Cisco ASR 1001-HX Router Top Cover Screw Locations*

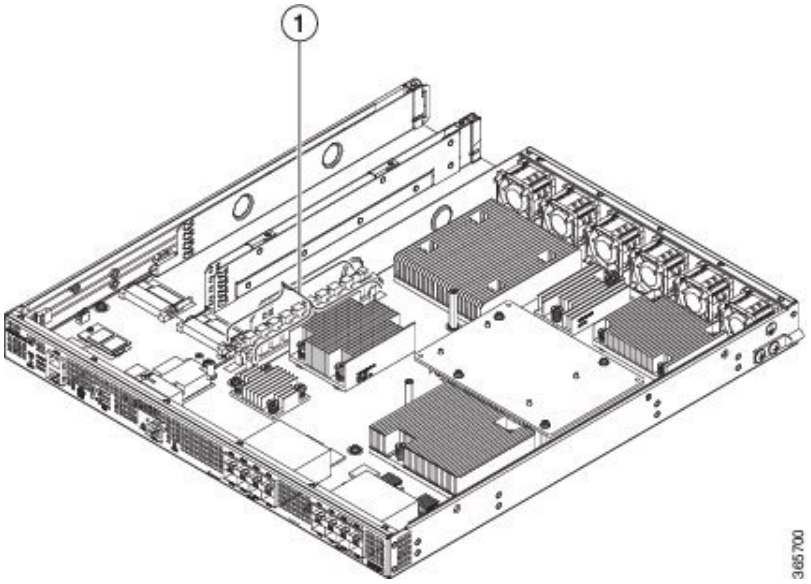



| | |
|---|---|
| 1 | Thumb depression location |

**Step 3** Locate the DIMMs on the router.

The following figure shows the location of the DIMM slots in the Cisco ASR 1001-HX Router.

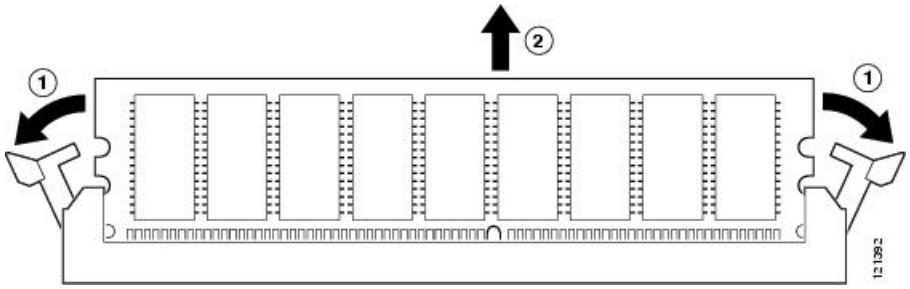
*Figure 25: DIMM Location*




| | |
|---|---|
| 1 | DIMM location (two slots) |

**Step 4** Pull down the DIMM module spring latches to release the corresponding DIMM from the socket.

*Figure 26: DIMM Module Spring Latches to Remove the DIMMs*




**Step 5** When both ends of the DIMM are released from the socket, grasp each end of the DIMM with your thumb and forefinger and pull the DIMM completely out of the socket. Handle only the edges of the DIMM; avoid touching the memory module, pins, and the metal traces (the metal fingers along the connector edge of the DIMM) along the socket edge.

**Step 6** If you are upgrading the DIMM configuration from 8 GB to 16 GB using M-ASR1001HX-16GB, proceed to the "Replacing a DIMM in a Cisco ASR 1001-HX Router, on page 98" section. Otherwise, place the DIMM in an antistatic bag to protect it from ESD damage.

## Replacing a DIMM in a Cisco ASR 1001-HX Router

### Procedure

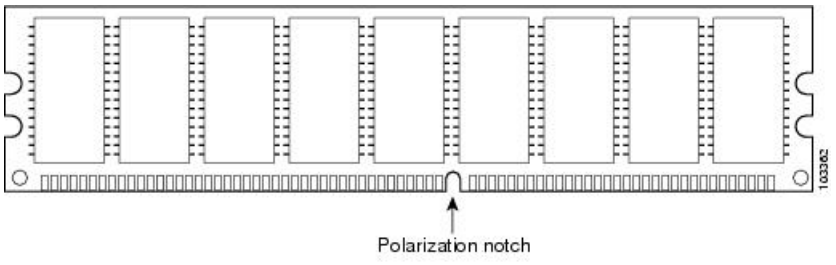
**Step 1** Place the DIMM on an antistatic mat or pad while wearing an antistatic device, such as a wrist strap.

**Caution**
DIMMs are sensitive components that can be shorted by mishandling; they are susceptible to ESD damage. Handle the DIMM by the edges only, and avoid touching the pins.

**Step 2** Remove the new DIMM from the antistatic bag.

**Step 3** Locate the polarization notch and align the DIMM with the socket before inserting it.

*Figure 27: DIMM Polarization Notch*

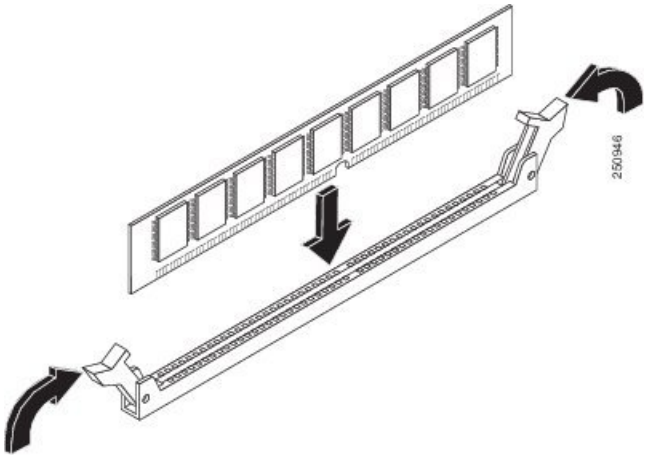



**Step 4** Gently insert the new DIMM, taking care not to damage the pins on the edge of the DIMM. Using two hands, hold both sides of DIMM's top edges with your index fingers and thumbs and gently slide the DIMM straight in to the socket. Press the top of the DIMM towards the socket, being careful to apply force only on the DIMM that is parallel with the plane of the DIMM.

**Caution**
When inserting DIMMs, use firm but not excessive pressure. If you damage a socket, you will have to return the router to the factory for repair.

**Step 5** Use light insertion force and insert smoothly, but ensure that the DIMM is inserted straight. If necessary, rock the DIMM gently back and forth to seat it properly. The following figure shows how to install the DIMM in the DIMM socket.

***Figure 28: Installing a DIMM in the Socket***




**Step 6** After the DIMM is installed, check whether the release levers are flush against the sides of the DIMM socket. If they are not, the DIMM might not be seated properly. If the DIMM appears misaligned, carefully remove it according to the removal procedure and then reseat it in the socket. Push the DIMM firmly back into the socket until the release levers are flush against the sides of the DIMM socket.

**Step 7** Replace the chassis top cover:

a) Slide the cover onto the chassis ensuring that the interlock hook feature fits on the chassis cover and base.
b) Install the top surface screws and the side screws and tighten them slightly.

**Step 8** Install the power supplies into the chassis and power up the router. See:

- Installing AC Power Supplies
- Installing DC Input Power Supplies

### What to do next

After you have correctly installed the DIMMs, the system should reboot properly.

If the system fails to reboot properly or if the console terminal displays a checksum or memory error after you have installed the new DIMMs, ensure that all DIMMs are installed correctly. If necessary, shut down the system and remove the chassis cover. Check the DIMMs by looking straight down on them to inspect them at eye level. The DIMMs should be aligned at the same angle and the same height when properly installed. If a DIMM appears to stick out or rest in the socket at a different angle from the other, remove the DIMM and reinsert it. Replace the top chassis cover, and reboot the system for another installation check.

**Note** After several attempts, if the system fails to restart properly, contact a Cisco service representative for assistance. Before you call, make note of any error messages, unusual LED states, or other indications that might help solve the problem.

# Removing a DIMM from a Cisco ASR 1002-HX Router

### Before you begin

Perform the following steps before you begin the process of removing and replacing a DIMM from a Cisco ASR 1002-HX Router:

- Use an ESD-preventive wrist strap.
- Back up the data that you want to save.
- Remove the power supplies before you remove the chassis top cover.

**Caution** The top cover cannot be removed until the power supplies are removed from the chassis. The chassis has a safety mechanism built in to prevent the removal of the top cover until the power supplies are removed.

### Procedure

**Step 1** With an ESD wrist strap on, remove the power supplies from the chassis.

**Note**
The chassis cover cannot be removed until the power supplies are removed from the chassis.

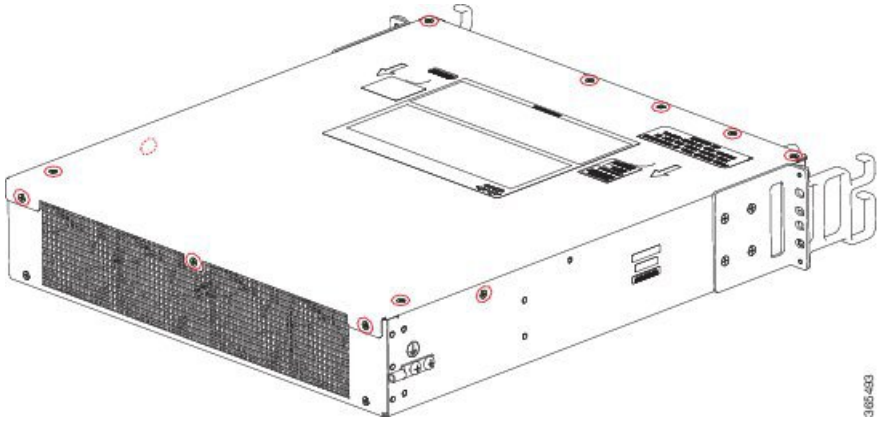
For instructions about how to remove the AC and DC power supplies, see:

- Removing AC Power Supplies
- Removing DC Input Power Supplies

**Step 2** After the power supplies are removed, remove the chassis top cover by performing the following steps:

a) Remove the seven top surface screws on the chassis cover.
b) Remove the three screws from the rear of the chassis cover.
c) Remove one screw from the left side of the chassis and one screw from the right side of the chassis.

*Figure 29: Cisco ASR 1002-HX Router Top Cover Screw Locations*



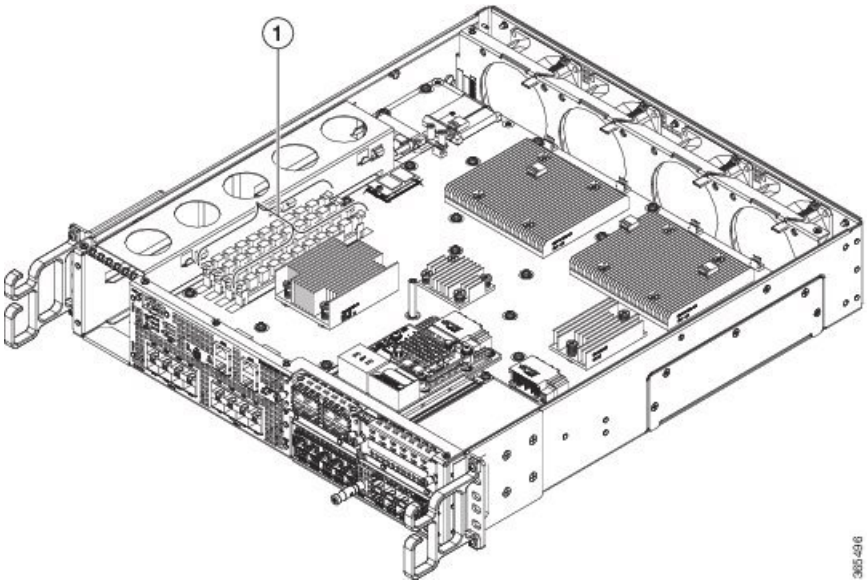
d) Using both hands, gently slide the cover slightly backward and lift it off of the chassis.

**Step 3** Position the chassis so that you have the most comfortable access to the chassis to remove the DIMM.

**Step 4** Locate the DIMMs on the router.

The following figure shows the location of the DIMM slots in the .

*Figure 30: Cisco ASR 1002-HX Router DIMM Location*



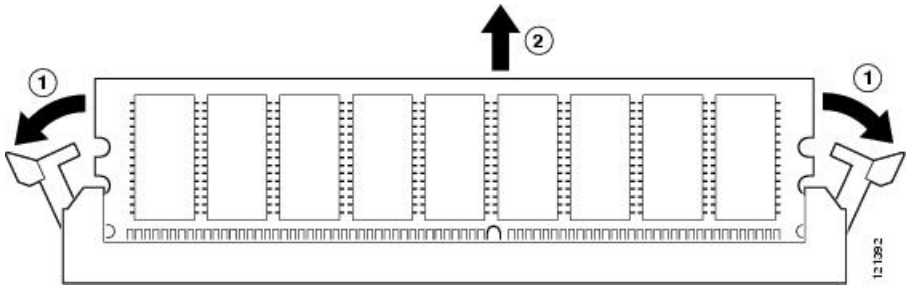

| | |
|---|---|
| 1 | Cisco ASR 1002-HX Router DIMM location (four slots) |

**Step 5**

**Note**
If you are upgrading the DIMM configuration from 16 GB to 32 GB using M-ASR1002HX-32GB, perform the next step on the DIMM in Channel A, Slot 1.

Pull down the DIMM module spring latches to release the corresponding DIMM from the socket.

*Figure 31: DIMM Module Spring Latches to Remove the DIMMs*




**Step 6** When both ends of the DIMM are released from the socket, grasp each end of the DIMM with your thumb and forefinger and pull the DIMM completely out of the socket. Handle only the edges of the DIMM; avoid touching the memory module, pins, and the metal traces (the metal fingers along the connector edge of the DIMM) along the socket edge.

**Step 7** If you are upgrading the DIMM configuration from 16 GB to 32 GB using M-ASR1002HX-32GB, proceed to the "Replacing a DIMM in a Cisco ASR 1002-HX Router, on page 102" section. Otherwise, place the DIMM in an antistatic bag to protect it from ESD damage.

If you are removing the DIMMs without upgrading the system memory, repeat Steps 5 and 6 on the remaining DIMM.

## Replacing a DIMM in a Cisco ASR 1002-HX Router

### Procedure

**Step 1** Place the DIMM on an antistatic mat or pad while wearing an antistatic device, such as a wrist strap.

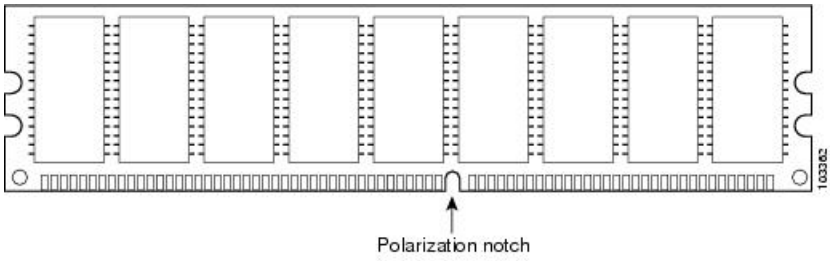
**Caution**
DIMMs are sensitive components that can be shorted by mishandling; they are susceptible to ESD damage. Handle the DIMM by the edges only, and avoid touching the pins.

**Step 2** **Note**
If you are upgrading the DIMM configuration from 16 GB to 32 GB using M-ASR1002HX-32GB, you must move the DIMM from Channel A, Slot 1, to Channel B, Slot 2. See the "Removing a DIMM" or "Removing a DIMM"section for removal instructions, then proceed to Step 3.

Remove the new DIMM from the antistatic bag.

**Step 3** Locate the polarization notch and align the DIMM with the socket before inserting it.

*Figure 32: DIMM Polarization Notch*

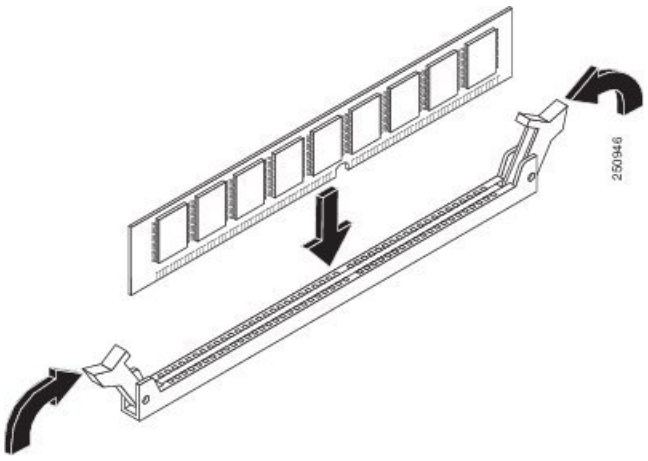



**Step 4** Gently insert the new DIMM, taking care not to damage the pins on the edge of the DIMM. Using two hands, hold both sides of DIMM's top edges with your index fingers and thumbs and gently slide the DIMM straight in to the socket. Press the top of the DIMM towards the socket, being careful to apply force only on the DIMM that is parallel with the plane of the DIMM.

**Caution**
When inserting DIMMs, use firm but not excessive pressure. If you damage a socket, you will have to return the router to the factory for repair.

**Step 5** Use light insertion force and insert smoothly, but ensure that the DIMM is inserted straight. If necessary, rock the DIMM gently back and forth to seat it properly. The following figure shows how to install the DIMM in the socket for the Cisco ASR 1002-HX Router.

*Figure 33: Installing a DIMM in the Socket*




**Step 6** After the DIMM is installed, check whether the release levers are flush against the sides of the DIMM socket. If they are not, the DIMM might not be seated properly. If the DIMM appears misaligned, carefully remove it according to the removal procedure and then reseat it in the socket. Push the DIMM firmly back into the socket until the release levers are flush against the sides of the DIMM socket.

**Step 7** If you are upgrading the DIMM configuration from 16 GB to 32 GB using M-ASR1002HX-32GB, repeat Steps 2 through 6 to install the upgrade DIMMs in Channel A, Slots 0 and 1.

**Step 8** Replace the Cisco ASR 1002-HX Router top cover:

a) Slide the cover onto the chassis ensuring that the interlock hook feature fits on the chassis cover and base.
b) Install the top surface screws, the rear screws, and the side screws and tighten them slightly.

**Step 9** Install the power supplies into the chassis and power up the router. See:

- Installing AC Power Supplies
- Installing DC Input Power Supplies

### What to do next

After you have correctly installed the Cisco ASR 1002-HX Router DIMMs, the system should reboot properly.

If the system fails to reboot properly or if the console terminal displays a checksum or memory error after you have installed the new DIMMs, ensure that all DIMMs are installed correctly. If necessary, shut down the system and remove the chassis cover. Check the DIMMs by looking straight down on them to inspect them at eye level. The DIMMs should be aligned at the same angle and the same height when properly installed. If a DIMM appears to stick out or rest in the socket at a different angle from the other, remove the DIMM and reinsert it. Replace the top chassis cover, and reboot the system for another installation check.

**Note** After several attempts, if the system fails to restart properly, contact a Cisco service representative for assistance. Before you call, make note of any error messages, unusual LED states, or other indications that might help solve the problem.

# Removing and Replacing an EPA

The online insertion and removal (OIR) feature allows you to install and replace an Ethernet port adapter (EPA) while the router is operating. You do not have to shut down the system's power, although you should not run traffic through the EPA while it is being removed. OIR is a method that is seamless to end users on the network, maintains all routing information, and preserves sessions.

**Note** As you disengage the EPA from the router, OIR shuts down all the active interfaces in the EPA.

**Note** For detailed information about EPA software commands, such as preparing for OIR of EPAs, and activating and deactivating configuration examples, see the *Cisco ASR 1000 Series Modular Interface Processor Installation Guide*.

We suggest you have the following tools and parts readily available for installing an EPA:

- Number 2 Phillips or a 3/16-inch flat-blade screwdriver
- EPA or blank filler plate (EPA-BLANK=)
- Any SFP modules that you have to install (and have not already installed)
- Cables

- Your own ESD-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, field-replaceable units (FRUs), and spares
- Antistatic mat or surface, or static shielding bag

If you need additional equipment, contact a service representative for ordering information.

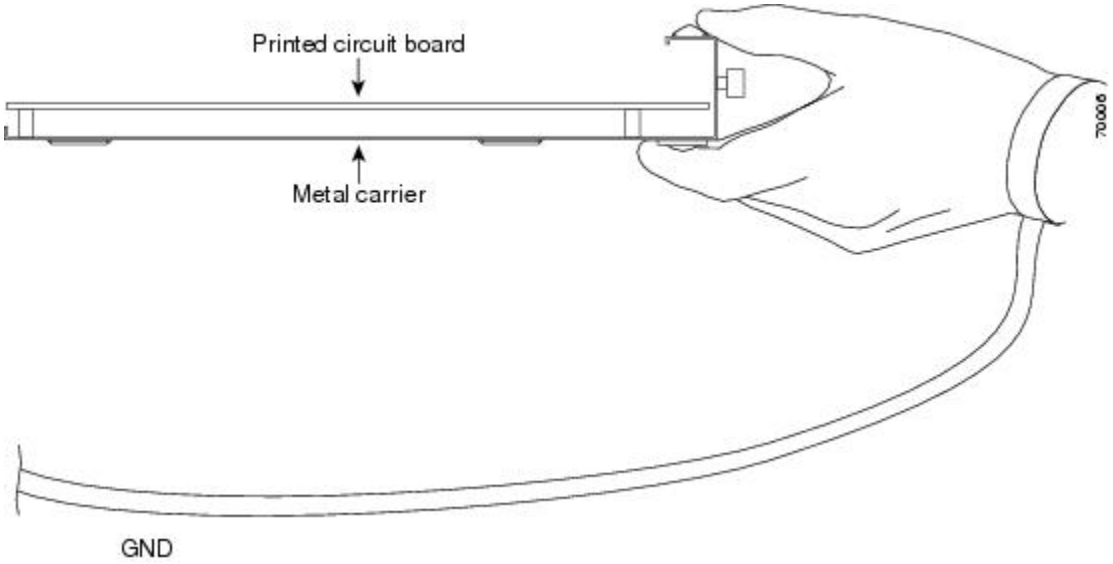
# Electrostatic Discharge Prevention

Electrostatic discharge (ESD) damages equipment and impairs electrical circuitry. ESD occurs when printed circuit boards are improperly handled and results in complete or intermittent failures.

Each EPA circuit board is mounted to a metal carrier and is sensitive to ESD damage. an EPA consists of a printed circuit board that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding, connectors, and a handle are integral components of the carrier.

When the subslot is not in use, an EPA blank filler plate must fill the empty subslot to allow the router to conform to EMI emission requirements and to allow proper airflow across the installed modules. If you plan to install the EPA in the subslot that is not in use, you must first remove the EPA blank filler plate.

***Figure 34: Handling an EPA***




Although the metal carrier helps to protect the EPA from ESD, wear a preventive antistatic strap whenever you handle the EPA. Ensure that the strap makes good skin contact and connect the strap's clip to an unpainted chassis surface to safely channel unwanted ESD voltages to ground.

If no wrist strap is available, ground yourself by touching the metal part of the chassis.

The following are the guidelines for preventing ESD damage:

- Always use an ESD wrist strap or ankle strap when installing or replacing an EPA. Ensure that the ESD strap makes contact with your skin.
- Handle the EPA by its metal carrier edges and handles; avoid touching the printed circuit board or any connector pins.

- When removing the EPA, place it on an antistatic surface with the printed circuit board components facing upward, or in a static shielding bag.

# Removing an EPA

**Procedure**

**Step 1** Attach an ESD wrist strap between you and an unpainted chassis surface.

**Step 2** Stop the EPA so that there is no traffic running through the EPA when it is removed.

**Caution**
Removing an EPA while traffic is flowing through the ports may cause system disruption.

a) At the `router#` prompt, enter **hw-module subslot 0/2 stop** and press **Enter**.
b) At the `router#` prompt, enter **end** and press **Enter**.

**Step 3** Disconnect all the cables from the EPA.

**Step 4** Loosen the captive screw in the center of the EPA by turning it counterclockwise.

**Step 5** Slide the EPA out of the EPA slot.

# Replacing an EPA

**Procedure**

**Step 1** Locate the guide rails that hold the EPA in place.

**Step 2** Align the EPA with the guide rails and carefully slide the EPA all the way all the way into the 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 router faceplate.

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

**Step 4** Restart the EPA using the following steps:

a) At the `router#` prompt, enter **hw-module subslot 0/2 start** and press **Enter**.
b) At the `router#` prompt, enter **end** and press **Enter**.

**Step 5** Use the **show platform** command to verify whether the status of subslot 0/2 is OK.

```
Router# show platform

Chassis type: ASR1002-HX
```

```
Slot      Type                State                 Insert time (ago)
--------- ------------------- --------------------- -----------------
0         ASR1002-HX          ok                    00:07:52
 0/0      BUILT-IN-EPA-8x1G   ok                    00:07:00
 0/1      BUILT-IN-EPA-8x10G  ok                    00:07:00
 0/2      EPA-18X1GE          ok                    00:07:01
.
.
.
```

# Removing and Replacing a NIM

The OIR feature allows you to install and replace a NIM while the router is operating. You do not have to shut down the system's power although you should not run traffic through the NIM while it is being removed. OIR is a method that is seamless to end users on the network, and maintains all routing information and preserves sessions.

**Note** As you disengage the NIM from the router, OIR shuts down all the active interfaces in the NIM.

We recommend that you have the following tools and parts readily available for installing a NIM:

- Number 2 Phillips or a 3/16-inch flat-blade screwdriver
- NIM
- Cables
- Your own ESD-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, FRUs, and spares
- Antistatic mat or surface, or static shielding bag

If you need additional equipment, contact a Cisco service representative for ordering information.

For information about electrostatic discharge prevention, see the "Electrostatic Discharge Prevention" section on page 7-15.

## Removing a NIM

### Procedure

**Step 1** Attach an ESD wrist strap between you and an unpainted chassis surface.

**Step 2** Stop the NIM so that there is no traffic running through the NIM when it is removed, using the following steps:

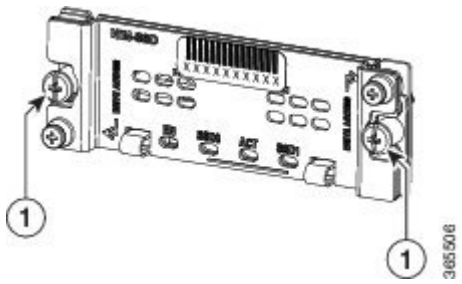
**Note**
Removing a NIM while traffic is flowing through the ports may cause system disruption.

a) At the `router#` prompt, enter **hw-module subslot 0/3 stop** and press **Enter**.
b) At the `router#` prompt, enter **end** and press **Enter**.

**Step 3** Disconnect all the cables from the NIM.

**Step 4** Unscrew the captive installation screws on either side of the NIM.

***Figure 35: Captive Installation Screws Location***




| | |
|---|---|
| 1 | Captive screws on the NIM |

**Step 5** Pull out the NIM out of the chassis.

**Step 6** Place the NIM in an antistatic bag to protect it from electrostatic discharge (ESD) damage.

# Replacing a NIM

**Procedure**

**Step 1** To insert a NIM, locate the guide rails that hold the NIM in place. They are at the top left and top right of the NIM slot and are recessed about an inch.

**Step 2** Carefully slide the NIM all the way in using both hands until the NIM is firmly seated in the NIM interface connector. When fully seated, the NIM might be slightly behind the faceplate.

**Step 3** After the NIM is properly seated, fasten the NIM in place with the captive installation screws on either side of the NIM.

**Note**
Ensure that you screw down the captive installation screws to provide appropriate connectivity.

The NIM should power up after installation.

**Step 4** Use the **show platform** command to verify whether the status of subslot 0/3 is OK.

# Removing and Replacing Fans

## Removing the Fans from a Cisco ASR 1001-HX Router

### Before you begin

Perform the following steps before you begin the process of removing the fans from a Cisco ASR 1001-HX Router:

- Use an ESD-preventive wrist strap.
- Back up the data that you want to save.
- Remove the power supplies before you remove the chassis top cover.

**Caution** The top cover cannot be removed until the power supplies are removed from the chassis. The chassis has a safety mechanism built in to prevent the removal of the top cover until the power supplies are removed.

### Procedure

**Step 1** With an ESD wrist strap on, remove the power supplies from the chassis.

**Note**
The chassis cover cannot be removed until the power supplies are removed from the chassis.

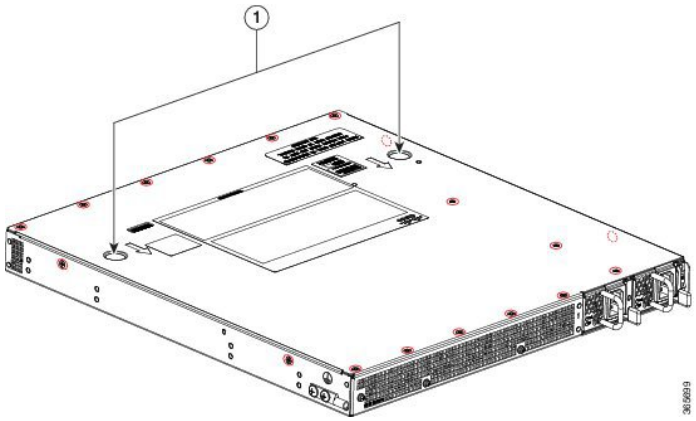
For instructions about how to remove the AC and DC power supplies, see:

- Removing AC Power Supplies
- Removing DC Input Power Supplies

**Step 2** Remove the chassis top cover by performing the following steps:

a) Remove the fourteen top surface screws on the chassis cover.
b) Remove the two screws from the left side of the chassis and the two screws from the right side of the chassis.
c) Putting your thumbs in the thumb depression shown in the following figure, slide the cover slightly backward and lift it off of the chassis.

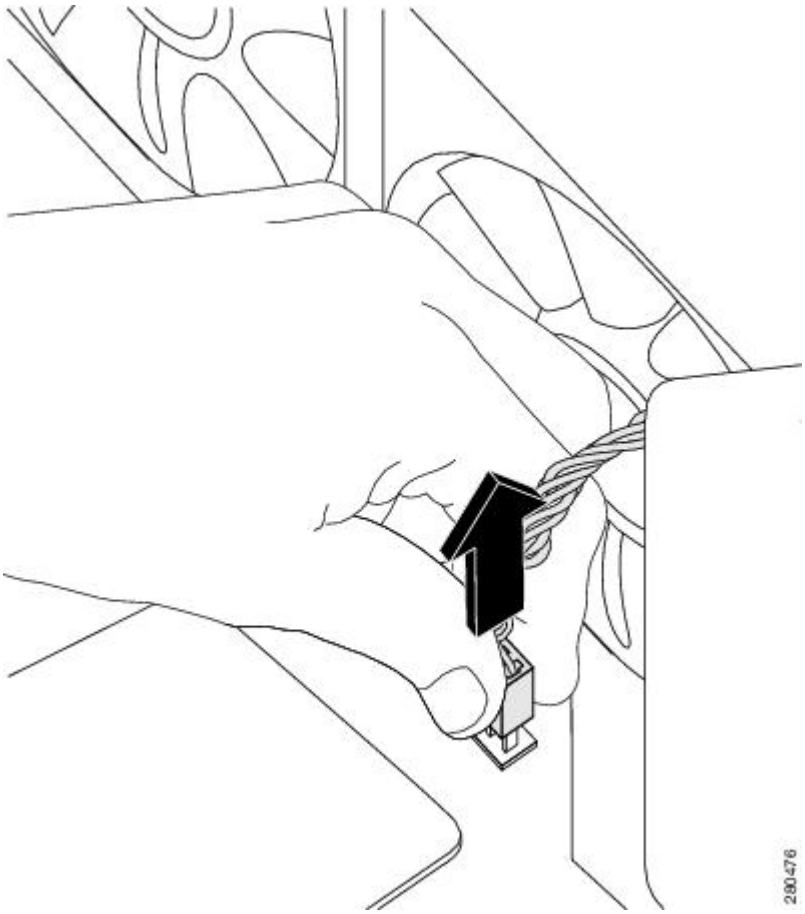
*Figure 36: Cisco ASR 1001-HX Router Top Cover Screw Locations*



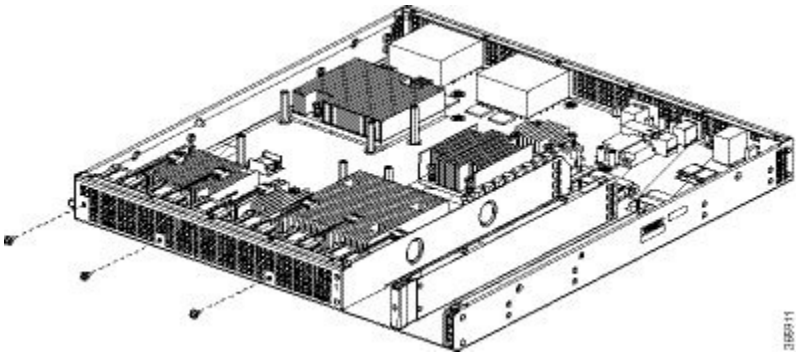

| | |
|---|---|
| 1 | Thumb depression location |

**Step 3** Position the chassis so that you have the most comfortable access to the chassis to remove the fans. The fans are located at the rear of the chassis.

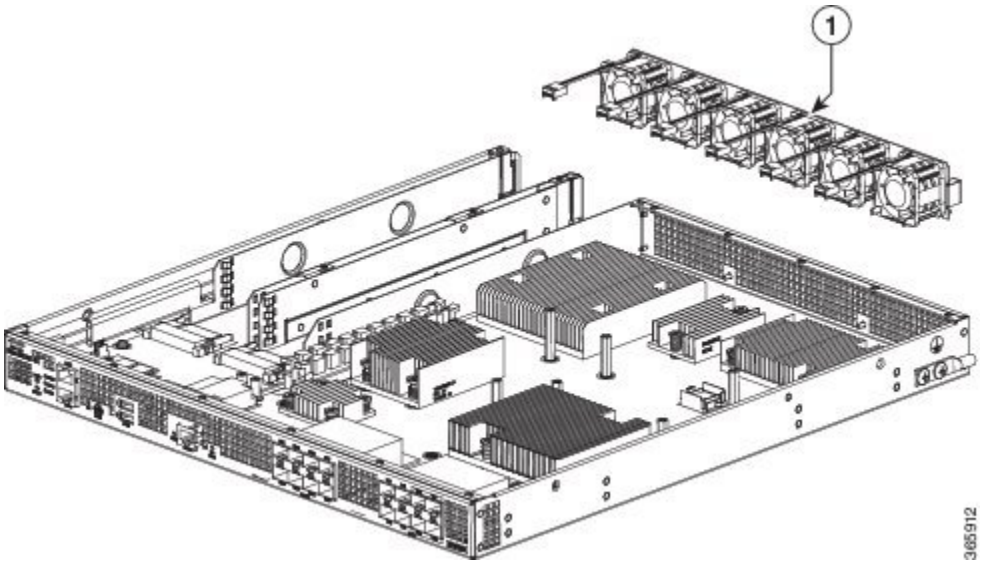
**Step 4** Unplug the six fan connectors from the motherboard.



**Step 5** Remove the three screws from the rear of the chassis as shown in the following figure.



**Step 6** Rotate the fan tray slightly forward, and then lift it out of the chassis as shown in the following figure.

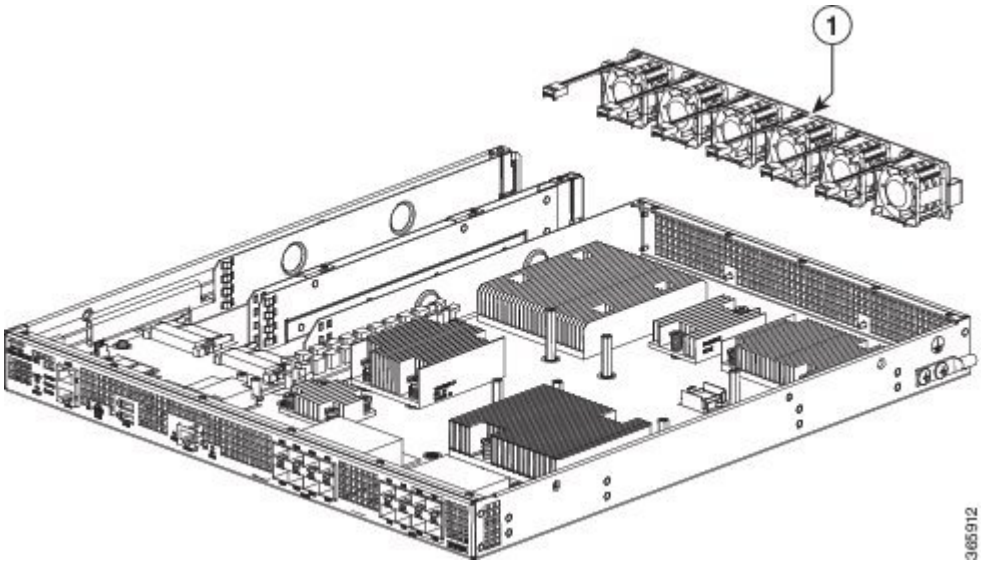



| | |
|---|---|
| 1 | Fan tray |

# Replacing the Fans in a Cisco ASR 1001-HX Router

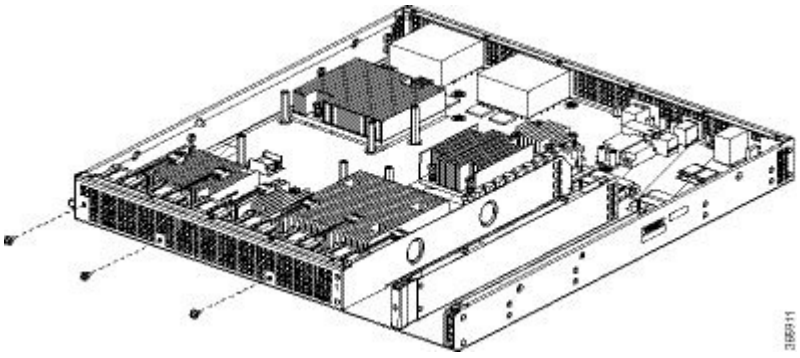
**Procedure**

**Step 1** Gently insert the fan tray into the rear of the chassis.




| | |
|---|---|
| 1 | Fan tray |

**Step 2** Use three screws to attach the fan trays to the chassis.




**Step 3** Plug the six fan connectors into the motherboard.

**Step 4** Replace the chassis top cover:

a) Slide the cover onto the chassis ensuring that the interlock hook feature fits on the chassis cover and base.

b) Install the top surface screws and the side screws and tighten them slightly.

**Step 5** Install the power supplies into the chassis and power up the router. See:

- Installing AC Power Supplies
- Installing DC Input Power Supplies

# Removing the Fans from a Cisco ASR 1002-HX Router

### Before you begin

Perform the following steps before you begin the process of removing the fans from a Cisco ASR 1002-HX Router:

- Use an ESD-preventive wrist strap.
- Back up the data that you want to save.
- Remove the power supplies before you remove the chassis top cover.

**Caution** The top cover cannot be removed until the power supplies are removed from the chassis. The chassis has a safety mechanism built in to prevent the removal of the top cover until the power supplies are removed.

### Procedure

**Step 1** With an ESD wrist strap on, remove the power supplies from the chassis.

**Note**
The chassis cover cannot be removed until the power supplies are removed from the chassis.

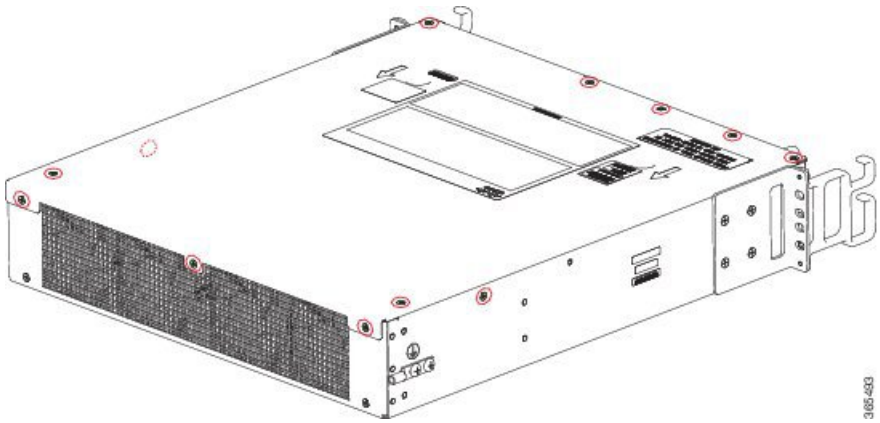
For instructions about how to remove the AC and DC power supplies, see:

- Removing AC Power Supplies
- Removing DC Input Power Supplies

**Step 2** After the power supplies are removed, remove the chassis top cover by performing the following steps:

a) Remove the seven top surface screws on the chassis cover.
b) Remove the three screws from the rear of the chassis cover.
c) Remove one screw from the left side of the chassis and one screw from the right side of the chassis.

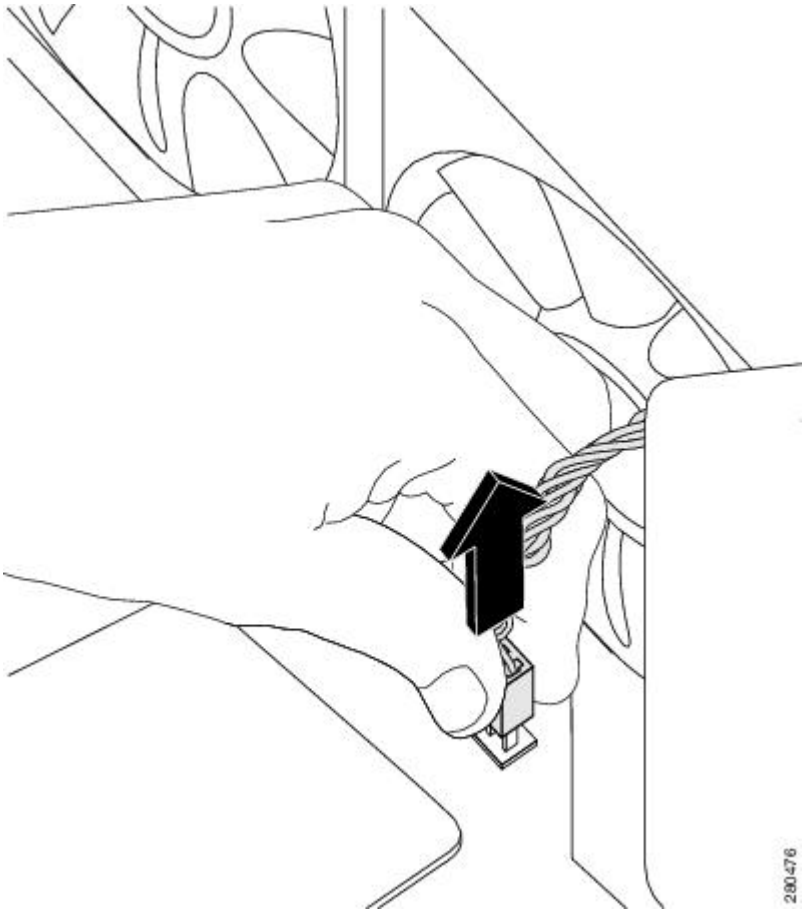
*Figure 37: Cisco ASR 1002-HX RouterTop Cover Screw Locations*



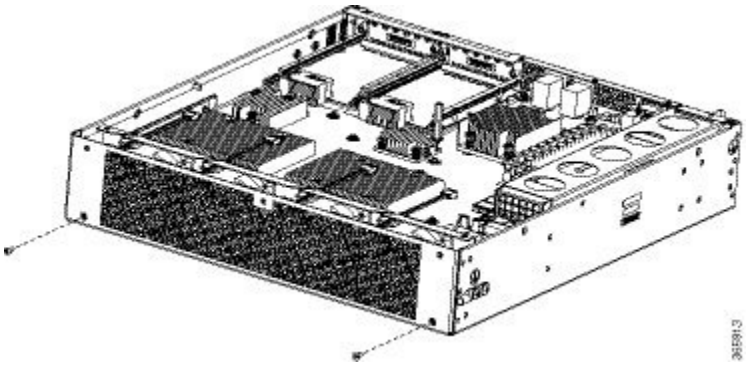
d) Using both hands, gently slide the cover slightly backward and lift it off of the chassis.

**Step 3** Position the chassis so that you have the most comfortable access to the chassis to remove the fans. The fans are located at the rear of the chassis.

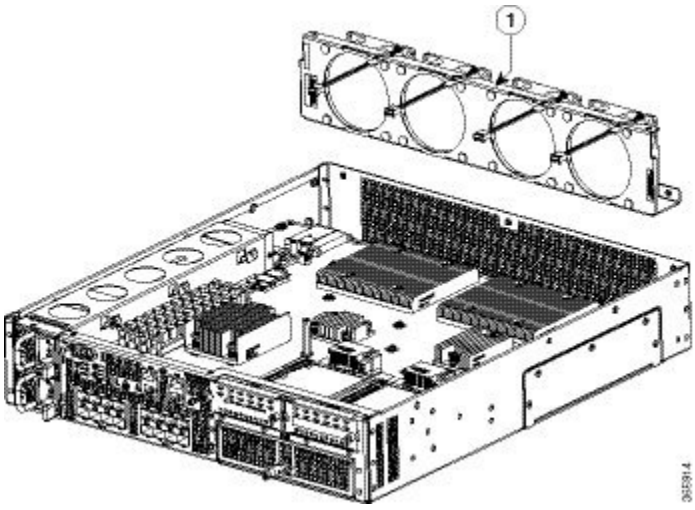
**Step 4** Unplug the four fan connectors from the motherboard.



**Step 5** Remove the two screws from the rear of the chassis as shown in the following figure.



**Step 6** Lift the fan tray up and out of the chassis as shown in the following figure.

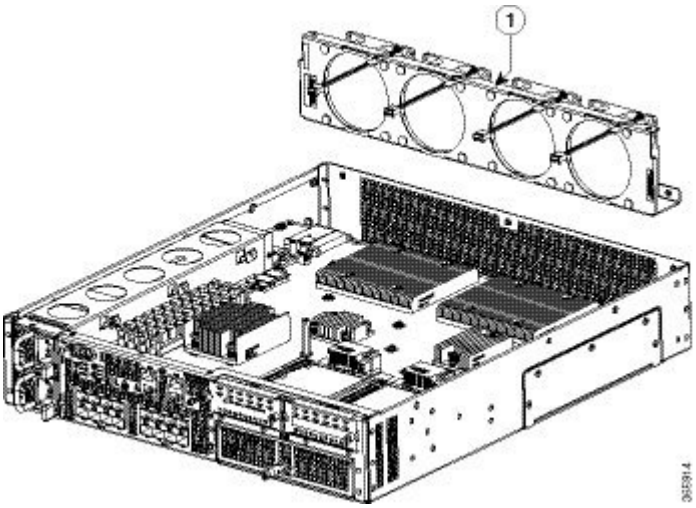



| | |
|---|---|
| 1 | Fan tray |

# Replacing the Fans in a Cisco ASR 1002-HX Router

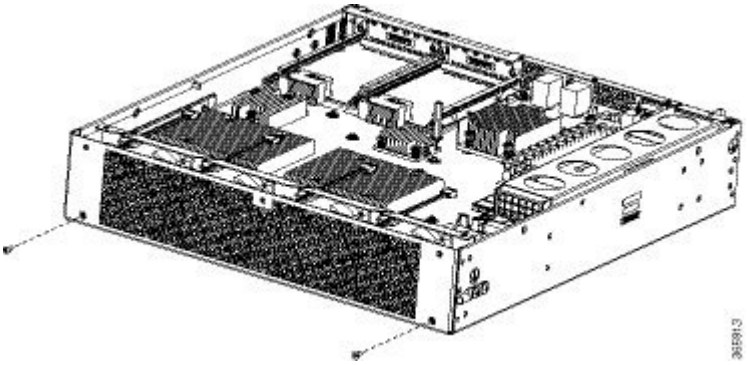
**Procedure**

**Step 1** Gently insert the fan tray into the rear of the chassis.




| | |
|---|---|
| 1 | Fan tray |

**Step 2** Use two screws to attach the fan trays to the chassis.



**Step 3** Plug the four fan connectors into the motherboard.

**Step 4** Replace the Cisco ASR 1002-HX Router top cover:

a) Slide the cover onto the chassis ensuring that the interlock hook feature fits on the chassis cover and base.

b) Install the top surface screws, the rear screws, and the side screws and tighten them slightly.

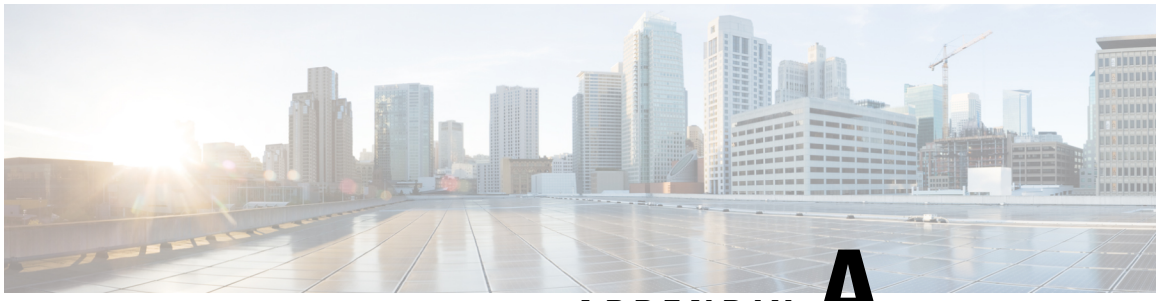
**Step 5** Install the power supplies into the chassis and power up the router. See:

- Installing AC Power Supplies
- Installing DC Input Power Supplies

# Repacking the Router

If your system is damaged, you must repack it for return shipment.

Before you return the router or move the router to a different location, repack the system using the original packaging material.



APPENDIX A

# Technical Specifications

This appendix provides technical specifications for the Cisco ASR 1002-HX Router.

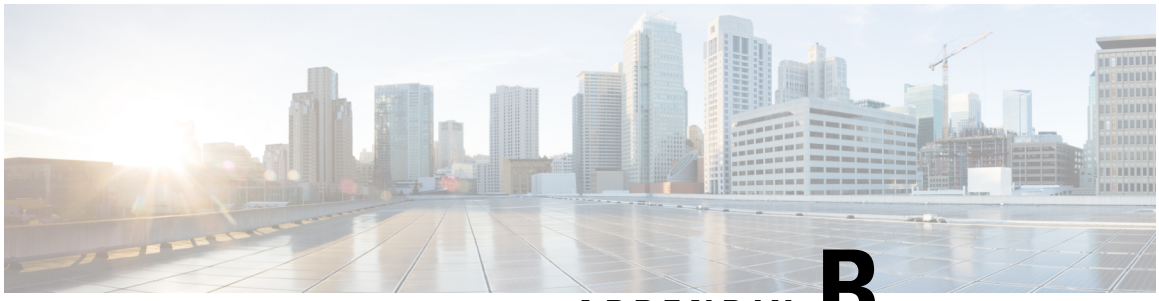

- Cisco ASR 1001-HX Router Specifications, on page 119
- Cisco ASR 1002-HX Router Specifications, on page 120


## Cisco ASR 1001-HX Router Specifications

| Description | Specification |
|---|---|
| Dimensions (H x W x D) | Height—1.72 in. (43.69 mm)<br>Width—17.3 in. (439.42 mm)<br>Depth—21.78 in. (553.2 mm) including card handles, cable-management brackets, and power supply handles |
| Weight | 23 lb (10.43 kg) fully loaded |
| Nominal operating temperature | 32° to 104° F (0° to 40° C) |
| Short-term operating temperature | 32° to 122° F (0° to 50° C) |
| Nominal operating humidity | 10 to 90% relative humidity |
| Short-term operating humidity | 5 to 90% |
| Storage temperature | –4° to 158° F (–20° to +70° C) |
| Power consumption | • Maximum (DC): 400 W<br>• Maximum (AC): 400 W |

# Cisco ASR 1002-HX Router Specifications

| Description | Specification |
|---|---|
| Dimensions (H x W x D) | Height—3.5 in. (88.9 mm)<br>Width—17.3 in. (439.42 mm)<br>Depth—22.0 in. (558.8 mm) including card handles, cable-management brackets, and power supply handles |
| Weight | 34 lb (15.42 kg) fully loaded |
| Nominal operating temperature | 32° to 104° F (0° to 40° C) |
| Short-term operating temperature | 32° to 122° F (0° to 50° C) |
| Nominal operating humidity | 10 to 90% relative humidity |
| Short-term operating humidity | 5 to 90% |
| Storage temperature | –4° to 158° F (–20° to +70° C) |
| Power consumption | • Maximum (DC): 750 W<br>• Maximum (AC): 750 W<br>• Maximum (Out): 450 W |



APPENDIX B

# Port Signals and Pinouts

This appendix provides the port signals and pinout specifications.


- Management Ethernet Port Signals and Pinouts, on page 121
- Console Port Signals and Pinouts, on page 121
- Auxiliary Port Signals and Pinouts, on page 122


## Management Ethernet Port Signals and Pinouts

The following table lists the Management Ethernet 10/100 RJ-45 port pinouts.

| Pin | Signal | Direction | Description |
|---|---|---|---|
| 1 | TX/RX AData + | I/O | T/R data + |
| 2 | TX/RX AData - | I/O | T/R data - |
| 3 | TX/RX BData + | I/O | T/R Data + |
| 4 | TX/RX CData + | I/O | T/R Data + (Unused for 10/100) |
| 5 | TX/RX CData - | I/O | T/R Data - (Unused for 10/100) |
| 6 | TX/RX BData - | I/O | T/R Data - |
| 7 | TX/RX DData + | I/O | T/R Data + (Unused for 10/100) |
| 8 | TX/RX DData - | I/O | T/R Data - (Unused for 10/100) |

## Console Port Signals and Pinouts

The following table lists the pinouts of the RJ-45 console port.

| Pin | Signal | Direction | Description |
|---|---|---|---|
| 1 | RTS | Output | Request to Send (tied to pin 8, CTS) |
| 2 | DTR | Output | Data Terminal Ready (always On) |

| Pin | Signal | Direction | Description |
|---|---|---|---|
| 3 | TXD | Output | Transmit Data |
| 4 | GND | — | Ring Indicator |
| 5 | GND | — | — |
| 6 | RXD | Input | Receive Data |
| 7 | DSR | Input | Unused |
| 8 | CTS | Input | Clear to Send (tied to pin 1, RTS) |

# Auxiliary Port Signals and Pinouts

The following table lists the pinouts of the RJ-45 auxiliary port.

| Pin | Signal | Direction | Description |
|---|---|---|---|
| 1 | RTS | Output | Request to Send |
| 2 | DTR | Output | Data Terminal Ready (always On) |
| 3 | TXD | Output | Transmit Data |
| 4 | RI | Input | Ring Indicator |
| 5 | GND | — | — |
| 6 | RXD | Input | Receive Data |
| 7 | DSR/DCD | Input | Data Set Ready/Data Carrier Detect |
| 8 | CTS | Input | Clear to Send |