



# CHAPTER 1

## Overview

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This chapter introduces the Cisco CRS Carrier Routing System 4-Slot Line Card Chassis at the highest level. It contains illustrations of the front and back of the chassis, complete with callouts to each hardware component. For details on each subsystem discussed in this chapter, see *Cisco CRS Carrier Routing System 4-Slot Line Card Chassis System Description*. This chapter also provides the recommended task sequence for installing the major components in the chassis.

This chapter presents the following topics:

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- [Chassis Cable Management, page 1-7](#)
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## Chassis Overview

The Cisco CRS 4-slot routing system can be installed in locations where the 16-slot or 8-slot systems may not fit (for example, colocation facilities, data centers, and many Tier II and Tier III locations). The routing system consists of a single rack-mounted chassis that contains the following system components:

- Switch fabric cards (SFCs) (up to four)
- Route processor (RP) cards (up to two) or performance route processor (PRP) cards (up to two)
- Up to four modular services cards (MSCs), forwarding processor (FP) cards, or label switch processor (LSP) cards (also called line cards)
- Physical layer interface modules, or PLIMs, (up to four, one for each MSC or FP)
- A chassis midplane that connects line cards to their associated PLIMs and to the SFCs

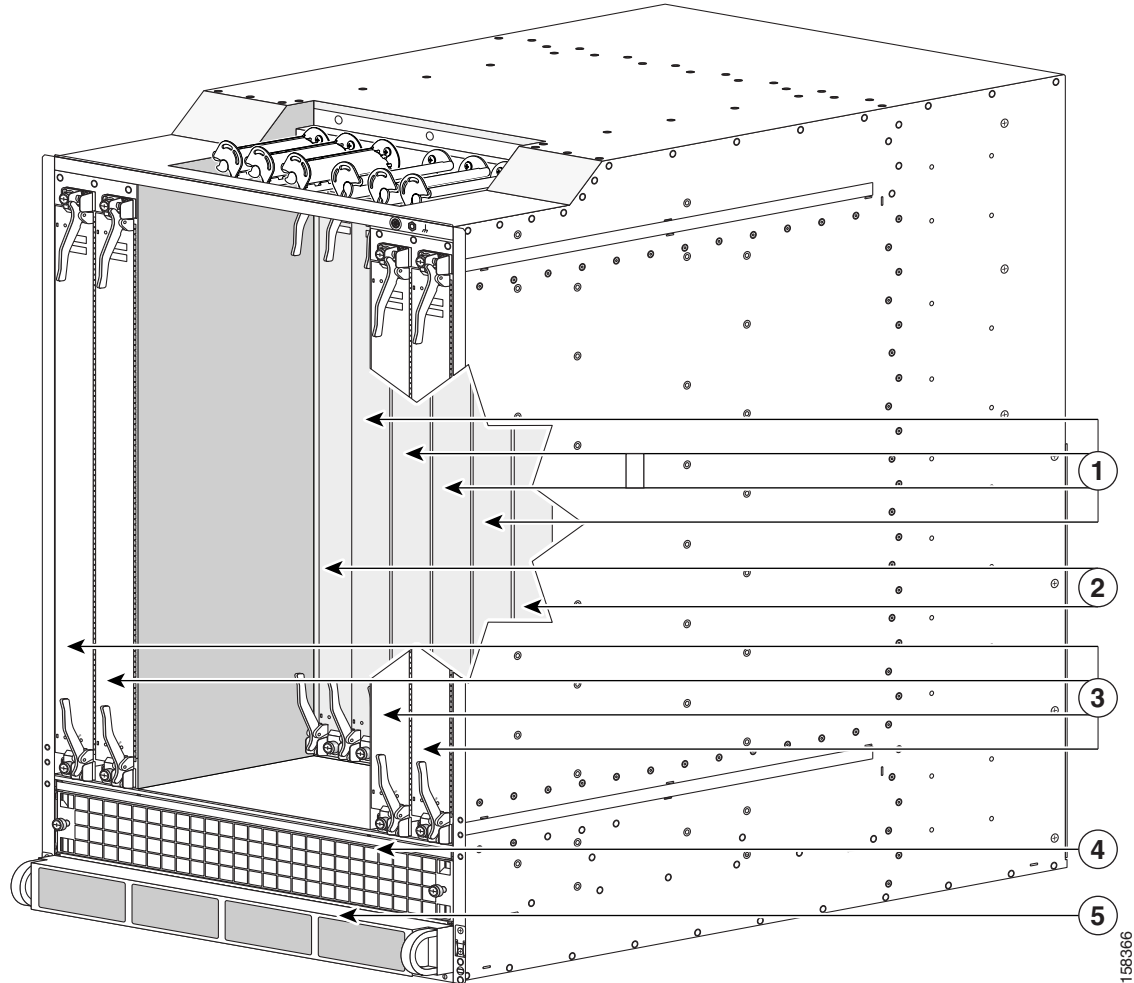
The Cisco CRS 4-slot line card chassis has its own power and cooling subsystems. The power shelf (AC or DC as ordered) is pre-installed in the chassis when you receive the routing system.

# Chassis Components

This section lists the main components of a Cisco CRS 4-slot line card chassis. It primarily identifies the components that are considered field-replaceable units (FRUs), but where additional detail is useful this section identifies subassemblies that are not field replaceable.

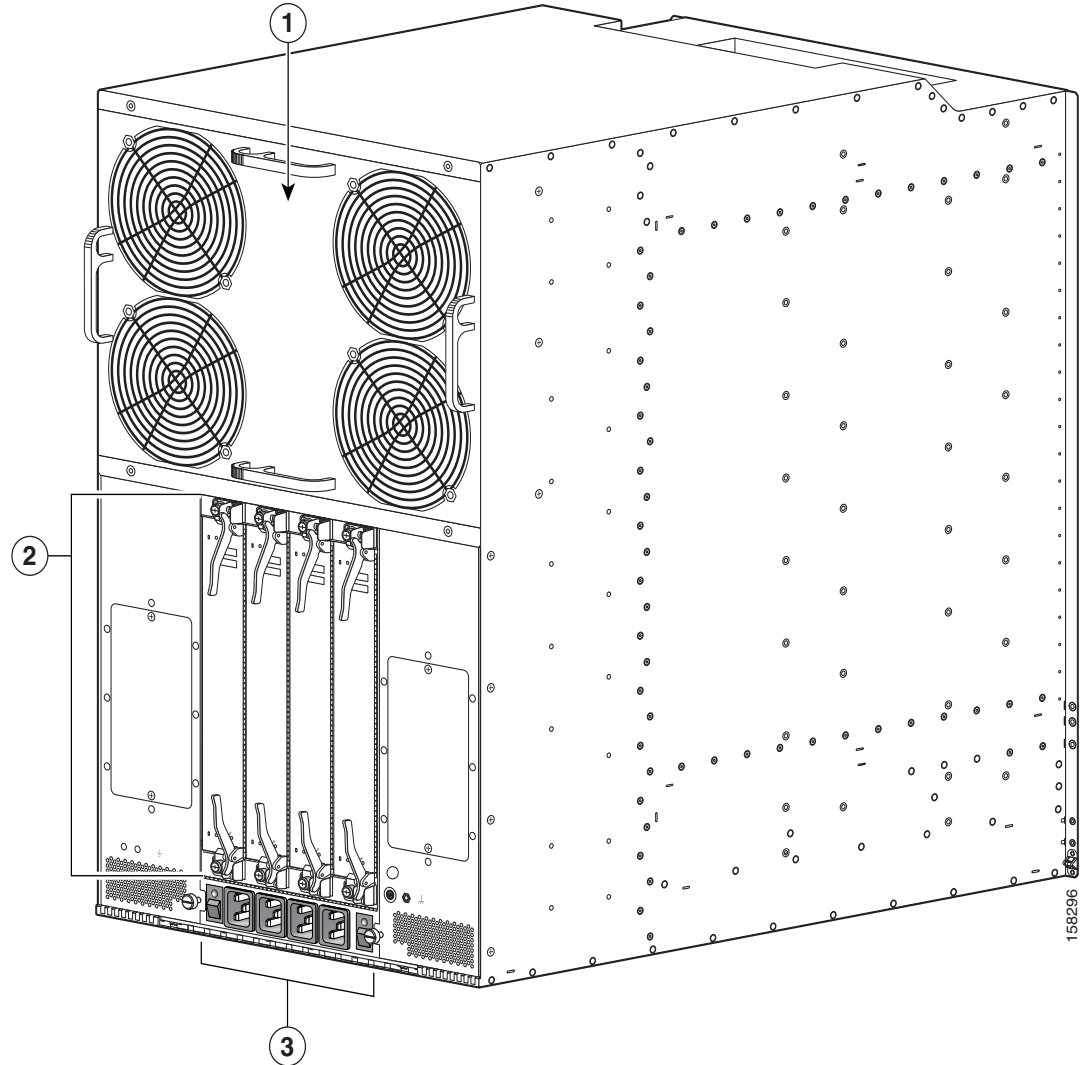
Figure 1-1 and Figure 1-2 show the Cisco CRS 4-slot line card chassis from both the front (PLIM) and rear (SFC) sides.

**Figure 1-1** Front (PLIM) View of Cisco CRS 4-Slot Line Card Chassis



<b>1</b>	PLIM slots	<b>4</b>	Air intake
<b>2</b>	RP slots	<b>5</b>	Power supplies (behind air filter)
<b>3</b>	MSC slots		

**Figure 1-2 Rear (SFC) View of the Cisco CRS 4-Slot Line Card Chassis**



<b>1</b>	Fan tray	<b>3</b>	Switch fabric card slots
<b>2</b>	AC power plug connectors		

The Cisco CRS 4-slot line card chassis contains the following components:

- As many as four MSCs, FPs, or LSPs and four PLIMs. The line card and PLIM are an associated pair of cards that mate through the chassis midplane. The line card provides the forwarding engine for Layer 3 routing of user data, and the PLIM provides the physical interface and connectors for the user data.

Each line card can be associated with several different PLIMs that provide different interface speeds and technologies. For a full list of available PLIMs, please contact your Cisco sales representative.

- A chassis midplane that connects line cards to their associated PLIMs. The midplane design allows a line card to be removed from the chassis without having to disconnect the cables that are attached to the associated PLIM. The midplane distributes power, connects the line cards to the switch fabric cards, and provides control plane interconnections. The midplane is not field replaceable by the customer.
- One or two route processor cards (RPs). The RPs function as the Cisco CRS 4-slot line card chassis system controller and provide route processing.

Only one RP is required for system operation. For redundant operation, you can order a second RP as an option (CRS-4-RP/R). When two RPs are used, only one RP is active at a time. The second RP acts as a “standby” RP, serving as a backup if the active RP fails.

The RP also monitors system alarms and controls the system fans. LEDs on the front panel indicate active alarm conditions.

A Performance Route Processor (PRP) is also available for the Cisco CRS 8-slot line card chassis. Two PRPs perform the same functions as RPs, but provide enhanced performance for both route processing and system controller functionality.




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**Note** A chassis may not be populated with a mix of RP and PRP cards. Both route processor cards should be of the same type (RP or PRP).

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- Fan tray. The fans pull cool air through the chassis. A removable air filter is located below the PLIM card cage at the front of the chassis. The fan tray has four fans that provide n+1 redundancy.
- Four switch fabric cards (SFCs). These cards provide the three-stage Benes switch fabric for the routing system. The switch fabric performs the cross-connect function of the routing system, connecting every line card (and its associated PLIM) with every other line card (and its associated PLIM) in the system.

The switch fabric receives user data from one line card and PLIM pair and performs the switching necessary to route the data to the appropriate egress line card and PLIM pair. The switch fabric is divided into eight logical planes (four physical planes) that are used to evenly distribute the traffic across the switch fabric. Each switch fabric card implements two planes of the switch fabric.

- A power system that provides redundant power to the chassis. The power system consists of an AC power shelf, which contains four AC rectifier modules, or a DC power shelf, which encloses four DC power supplies. The power shelf (AC or DC as ordered) is pre-installed in the chassis when you receive the routing system.

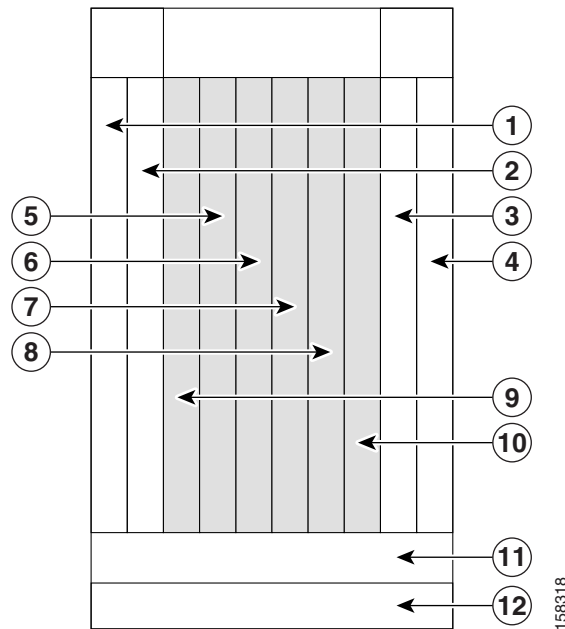
The PLIM side of the chassis is considered the front of the chassis, where user data cables attach to the PLIMs and cool air enters the chassis. The switch fabric card side, which is where warm air is exhausted, is considered to be the rear of the chassis.

# Chassis Slot Numbers

This section identifies the location and slot numbers for major cards and modules (primarily the field-replaceable units) that plug into the Cisco CRS 4-slot line card chassis.

Figure 1-3 shows the slot numbering on the front (PLIM) side of the Cisco CRS 4-slot line card chassis.

**Figure 1-3 Cisco CRS 4-Slot Chassis Slot Numbering—Front (PLIM) Side**



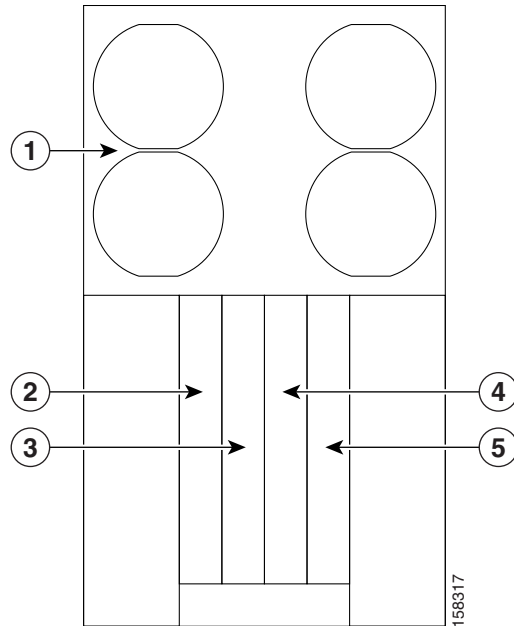
<b>1</b>	MSC slot 0	<b>7</b>	PLIM slot 2
<b>2</b>	MSC slot 1	<b>8</b>	PLIM slot 3
<b>3</b>	MSC slot 2	<b>9</b>	RP slot (RP0)
<b>4</b>	MSC slot 3	<b>10</b>	RP slot (RP1)
<b>5</b>	PLIM slot 0	<b>11</b>	Air intake
<b>6</b>	PLIM slot 1	<b>12</b>	Power shelf (AC or DC)

As shown in Figure 1-3, the Cisco CRS 4-slot line card chassis numbers on the PLIM side of the chassis include the card cage with the following assignments:

- Four MSC slots (left to right, 0, 1, 2, 3) for MSCs and FPs
- Four PLIM slots (left to right, 0, 1, 2, 3)
- Two route processor card slots, RP0 and RP1

Figure 1-4 shows the slot numbers on the rear (Switch Fabric Card) side of the Cisco CRS 4-slot line card chassis.

**Figure 1-4 Cisco CRS 4-Slot Chassis Slot Numbering—Rear (SFC) Side**



<b>1</b>	Fan tray (FT0)	<b>4</b>	Switch fabric card slot (SM1)
<b>2</b>	Switch fabric card slot (SM3)	<b>5</b>	Switch fabric card slot (SM0)
<b>3</b>	Switch fabric card slot (SM2)		

As shown in [Figure 1-4](#), the slot numbers on the SFC side of the chassis include:

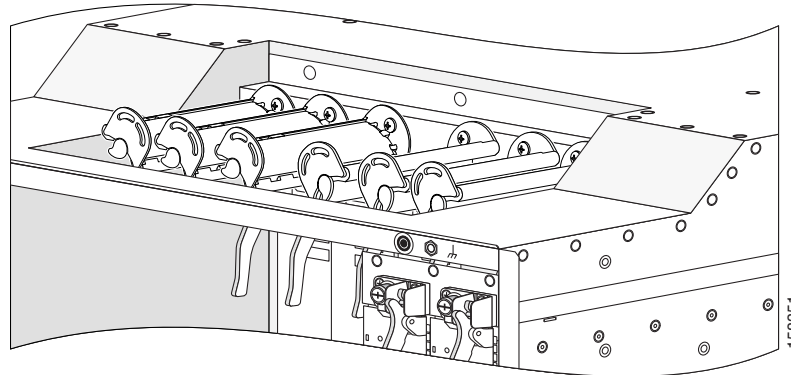
- Fan tray
- Card cage, including four reduced-height SFC slots (SM0 to SM3, right to left)

# Chassis Cable Management

The Cisco CRS 4-slot line card chassis has cable management features for the front (PLIM) side of the chassis, just above the card cage. The horizontal cable management trays have a special telescoping feature that allows them to be extended when the chassis is upgraded with higher-density cards. This extension also helps when installing the cables in the chassis.

Figure 1-5 shows the cable management bracket for the chassis.

**Figure 1-5** Cable Management Bracket



# Chassis Cooling System

The Cisco CRS 4-slot line card chassis has a single fan tray containing four fans that cool the chassis card cage. Cool air flows in at the bottom front of the chassis and flows through the chassis card cage and through the fans in the fan tray before being expelled through the top rear of the chassis (see Figure 1-6).

In addition, each power module at the bottom of the chassis has self-contained fans that pull in cool air from the front of the chassis and exhaust warm air out the rear. Air also flows under the midplane, through the SFCs, and then the fans to be expelled. There are these two parallel paths for air flow.

A replaceable air filter is located inside the chassis below the PLIM card cage at an angle. In addition, there is a removable air filter on the front of the power tray air intake grille on the front (PLIM) side of the chassis.

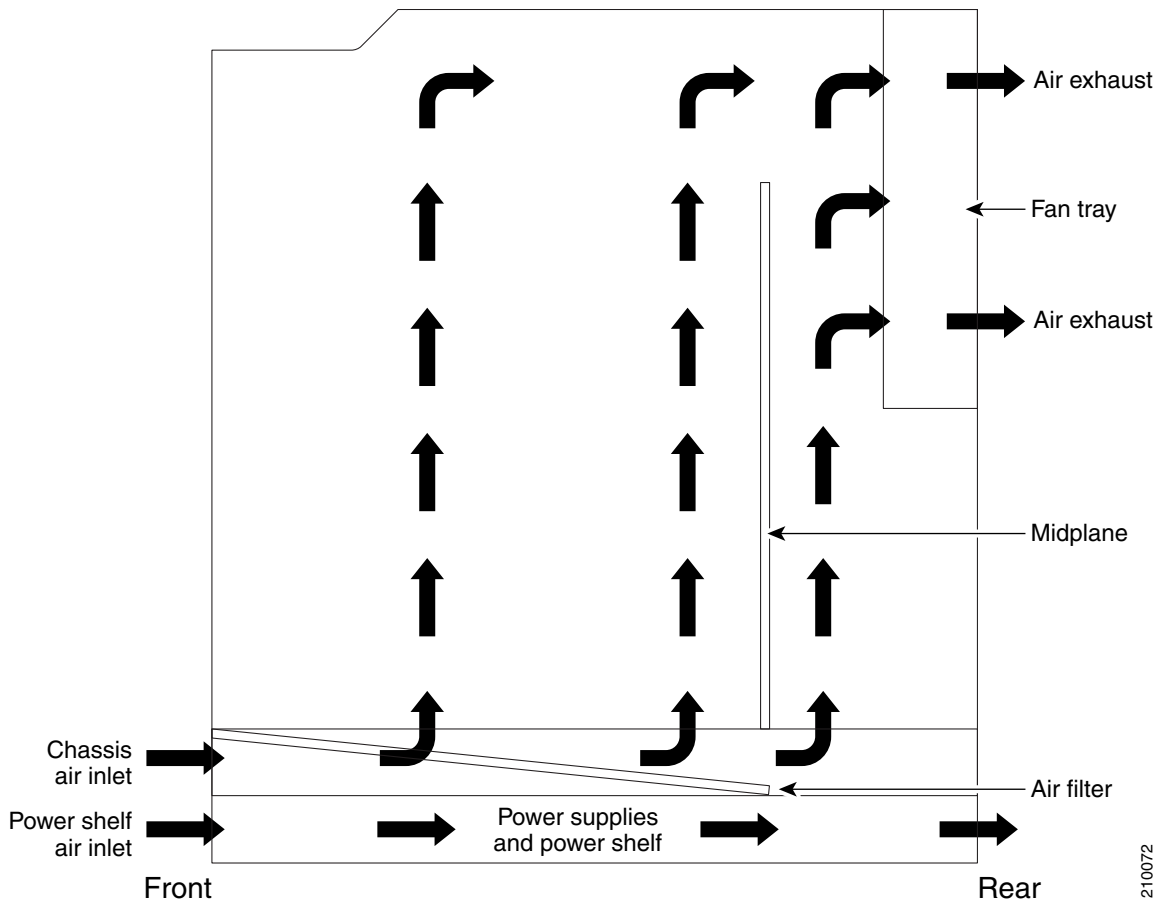
How often the air filters should be replaced depends on the facility environment. In a dirty environment, or when you start getting frequent temperature alarms, you should always check the intake grille for debris, and then check the air filters to see if they need to be replaced.



**Note**

We recommend that you check the air filters once a month. Replace a filter when you notice a significant amount of dust.

**Figure 1-6** *Airflow Through the Cisco CRS 4-Slot Line Card Chassis*



The Cisco CRS 4-slot line card chassis airflow volumes are as follows:

- Chassis airflow: Up to 880 cubic feet (24,919 liters) per minute
- Power system airflow: Up to 60 cubic feet (1,699 liters) per minute

## Chassis Power System

The Cisco CRS Carrier Routing System 4-Slot Line Card Chassis can be configured with either an AC-input power subsystem or a DC-input power subsystem. The AC power trays are configured for single-phase AC power module wiring. The power modules and power trays have separate Cisco part numbers. For additional information, see the appropriate sections in [Chapter 2, “Installing and Removing Power Components.”](#)

## Safety Guidelines

Before you perform any procedure in this document, review the safety guidelines in this section to avoid injuring yourself or damaging the equipment.

The following guidelines are for your safety and to protect equipment. The guidelines do not include all hazards. Be alert.



**Note**

Review the safety warnings listed in *Regulatory Compliance and Safety Information* that are applicable to your router before installing, configuring, or troubleshooting any installed card.

- Keep the work area clear and dust-free during and after installation. Do not allow dirt or debris to enter into any laser-based components.
- Do not wear loose clothing, jewelry, or other items that could get caught in the router while working with line cards, PLIMs, or their associated components.
- Cisco equipment operates safely when used in accordance with its specifications and product-usage instructions.

**Warning**

**This unit is intended for installation in restricted access areas. A restricted access area is where access can only be gained by service personnel through the use of a special tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.** Statement 37

**Warning**

**Only trained and qualified personnel should be allowed to install or replace this equipment.** Statement 49

**Warning**

**High leakage current—earth connection essential before connecting to system power supply.** Statement 342

**Warning**

**The chassis should be mounted on a rack that is permanently affixed to the building.** Statement 1049

## Preventing Electrostatic Discharge

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. We recommend to use an ESD-preventive strap whenever you handle network equipment or one of its components.

Following are guidelines for preventing ESD damage:

- Always use an ESD-preventive wrist or ankle strap and ensure that it makes good skin contact. Connect the equipment end of the connection cord to an ESD connection socket on the router or to a bare metal surface on the chassis.
- Handle a card by its ejector levers, when applicable, or the card's metal carrier only; avoid touching the board or connector pins.
- Place a removed card board-side-up on an antistatic surface or in a static-shielding bag. If you plan to return the component to the factory, immediately place it in a static-shielding bag.
- Avoid contact between the card and clothing. The wrist strap protects the board only from ESD voltage on the body; ESD voltage on clothing can still cause damage.

# Recommended Chassis Installation Task Sequence

This section provides the recommended task sequence for installing a new Cisco CRS 4-slot line card chassis.

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- Step 1** If your system was shipped with AC power, remove the four AC power cords from the box, and do the following:
- Insert all four power cords into the AC power source.
  - Insert the power cords into the AC power plugs at the base of the rear of the chassis.
- Step 2** Turn the power enable switches (for your AC or DC power system) to the ON position. For details, see the [“AC Power Supply Cord Illustrations and Plug Types”](#) section on page 2-4.
- All power should come up properly. The LEDs above the enable switches should be lit green. The fans in the front of the chassis should start operating.
- Step 3** Install the switch fabric cards (SFCs). For the procedure, see the [“How to Install or Remove a Switch Fabric Card”](#) section on page 4-18.
- Step 4** Install the route processors (RPs). For the procedure, see the [“How to Install or Remove a Route Processor Card”](#) section on page 4-24.
- Step 5** Install the MSCs, FPs, and LSP line cards. For the procedure, see the [“How to Install or Remove an MSC, FP, or LSP”](#) section on page 4-32.
- Step 6** Install the physical layer interface modules (PLIMs). For the procedure, see the [“How to Install or Remove a Physical Layer Interface Module”](#) section on page 4-42.
- Step 7** If the system was shipped with the grille and doors, install the inlet grille. See the [“Installing the Inlet Grille”](#) section on page 5-1.
- Step 8** Install the doors. See the [“Installing the Doors”](#) section on page 5-4.
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## CRS Hardware Compatibility

[Table 1-1](#) lists the compatibility of 40G CRS and 140G CRS fabric, forwarding, and line card components for the CRS 4-slot system.

**Note**

A router with a mix of 40G and 140G fabric cards is not a supported mode of operation. Such a mode is temporarily allowed only during the upgrade process.

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Table 1-1 CRS Compatibility Matrix

Switch Fabric	RP/DRP	MSC/FP/LSP	PLIMS	Note
CRS-4-FC/S (40G)	RP-A (CRS-4-RP), DRP-B (CRS-DRP-B)	CRS-MSC-B	10C768-DPSK/C 10C768-ITU/C 10C768-POS-SR 4-10GE-ITU/C 8-10GBE CRS1-SIP-800 14-10GE 42-1GE 20-1GE-FLEX 2-10GE-WL-FLEX 4-10GBE-WL-XFP 8-10GBE-WL-XFP	
	RP-A (CRS-4-RP), DRP-B (CRS-DRP-B)	CRS-FP40	4-10GE 42-1GE 20-1GE-FLEX 2-10GE-WL-FLEX	
CRS-4-FC140/S (140G)	RP-A (CRS-4-RP), DRP-B (CRS-DRP-B)	CRS-MSC-B	10C768-DPSK/C 10C768-ITU/C 10C768-POS-SR 4-10GE-ITU/C 8-10GBE CRS1-SIP-800 4-10GE 42-1GE 20-1GE-FLEX 2-10GE-WL-FLEX 4-10GBE-WL-XFP 8-10GBE-WL-XFP	
	RP-A (CRS-4-RP), DRP-B (CRS-DRP-B)	CRS-FP40	4-10GE 42-1GE 20-1GE-FLEX 2-10GE-WL-FLEX	
	PRP (CRS-4-PRP-6G, CRS-4-PRP-12G)	CRS-MSC-140G	14X10GBE-WL-XFP 20X10GBE-WL-XFP 1x100GBE	
	PRP (CRS-4-PRP-6G, CRS-4-PRP-12G)	CRS-FP140	14X10GBE-WL-XFP 20X10GBE-WL-XFP 1x100GBE	
	PRP (CRS-4-PRP-6G, CRS-4-PRP-12G)	CRS-LSP	14X10GBE-WL-XFP 20X10GBE-WL-XFP 1x100GBE	

