Overview

This chapter provides a brief description of the Cisco CRS Fabric Card Chassis (FCC) from the highest level. This chapter contains illustrations of the front and rear of the chassis, complete with callouts to each hardware component. For details on each subsystem discussed in this chapter, see *Cisco CRS Series Carrier Routing System Multishelf System Description*.

Chassis Overview

Two major building blocks combine to form multishelf systems:

- LCC—As part of the multishelf system, the LCC is a chassis that has 16 slots for modular services cards (MSCs) or forwarding processor (FPs) cards; associated physical layer interface modules (PLIMs) and SPA Interface Processors (SIPs).
- The FCC is the centerpiece of the multishelf system. See the Fabric Card Chassis Components for more information.

Note The multishelf system consists of LCCs and FCCs. This installation guide describes the FCC installation procedures. See the Cisco CRS Carrier Routing System 16-Slot Line Card Chassis Installation Guide for specific LCC installation procedures.

Note Throughout this document, the generic term Cisco CRS Carrier Routing system refers to the Cisco CRS-1, Cisco CRS-3, and Cisco CRS-X Carrier Routing Systems, unless otherwise specified.

Note For safety, the FCC must be secured following the installation procedures for the site. Use of the unistrut is optional for overhead securing.

Fabric Card Chassis Components

This section lists the main components of the FCC. It primarily identifies the components that are considered field-replaceable units (FRUs).

The FCC contains:

- Switch fabric cards (SFCs). The SFCs are the main component of the multishelf system that enables packets to be switched from source to destination. The SFCs on the FCC provide Stage 2 of the three-stage Benes switch fabric for the multishelf system. The S13 SFCs in the LCC provide Stage 1 and Stage 3 of the switch fabric. Three types of SFCs are supported: CRS-FCC-SFC for the 40 G CRS-1 system, CRS-FCC-SFC-140 for the 140 G CRS-3 system, CRS-FCC-SFC-400/CRS-FCC-SFC-400-B for the CRS-X system. Either eight or twenty-four SFCs are needed, depending on vertical or horizontal cabling. SFCs are located at the front of the FCC.

Caution The FCC supports either 40 GB switch fabric cards (CRS-FCC-SFC), 140 GB switch fabric cards (CRS-FCC-SFC-140), or 400 GB switch fabric cards (CRS-FCC-SFC-400/CRS-FCC-SFC-400-B) for the 400 G CRS-X system. An FCC with a mix of 40 GB,140 GB and 400 GB SFCs is not a supported mode of operation. Such a mode is temporarily allowed only during the upgrade process.

- Optical Interface Modules (OIMs). The OIMs are passive devices that provide the fiber cross-connect function. The OIMs distribute the fibers within each cable bundle to the SFCs. Each OIM is matted to an SFC. The OIMs are monitored by the OIM-LED card. Each OIM has 9 interfaces and either 8 or 24 OIMs are needed, depending on vertical or horizontal cabling. The OIMs and cables are located at the rear of the FCC.
- Integrated Shelf Controller Gigabit Ethernet (SCGE) cards. The 22-port SCGE card (CRS-FCC-SC-22GE or CRS-FCC-SC-22GE-B) serves as a shelf controller for the FCC, providing the control function similar to the RP for LCC. The 22-port integrated GE switch provides the connectivity for control protocol between the FCC and LCC. Two 22-port SCGE card is included in each FCC for redundancy. Only one shelf controller card is active at a time. The second acts as a “standby” shelf controller, serving as a backup if the active card fails. SCGE cards located at the front of the chassis.

- Two types of power systems are available: fixed configuration power and modular configuration power. Both power configurations use either AC or DC power. Both configurations of the AC and DC power systems are fully redundant.
- Upper and lower fan trays. The fan trays contain fans that push and pull air through the chassis. A removable air filter is also located above the lower fan tray.

Figure 1: Front (SFC) and Rear (OIM) View of FCC—Fixed Configuration AC Power, on page 3 shows the front (SFC) side and rear (OIM) side view of an FCC with a fixed configuration AC power system installed.

Figure 1: Front (SFC) and Rear (OIM) View of FCC—Fixed Configuration AC Power

1	Power shelves	4	Lower card cage
2	Upper fan tray	5	Chassis air filter (accessible from front)
3	Upper card cage	6	Lower fan tray (accessible form front)

Figure 2: Front (SFC) View of Fixed Configuration Power Shelves Installed in FCC, on page 3 shows the front (SFC) side view of a fixed configuration AC and DC power system installed at the top of the FCC

Figure 2: Front (SFC) View of Fixed Configuration Power Shelves Installed in FCC

Figure 3: Rear (OIM) View of Fixed Configuration Power Shelves Installed in FCC, on page 3 shows the rear (OIM) side view of a fixed configuration AC and DC power system installed at the top of the FCC.

Figure 3: Rear (OIM) View of Fixed Configuration Power Shelves Installed in FCC

Figure 4: Front (SFC) View of Modular Configuration Power Shelves Installed in FCC, on page 3 shows the front (SFC) side view of a modular configuration AC and DC power system installed at the top of the FCC.

Figure 4: Front (SFC) View of Modular Configuration Power Shelves Installed in FCC

Figure 5: Rear (OIM) View of Modular Configuration Power Shelves Installed in FCC, on page 4 shows the rear (OIM) side view of an AC and DC modular configuration power system installed at the top of the FCC.

Figure 5: Rear (OIM) View of Modular Configuration Power Shelves Installed in FCC

Chassis Slot Numbers

This section identifies the locations and slot numbers for major cards that plug into the chassis.

Figure 6: FCC Front (SFC) Side Slot Numbers , on page 4 shows the chassis slot numbers on the front (SFC) side of the FCC.

Figure 6: FCC Front (SFC) Side Slot Numbers

1	Upper card cage
2	Lower card cage

As shown in Figure 6: FCC Front (SFC) Side Slot Numbers , on page 4, the components on the front (SFC) side of the FCC include:

- Upper card cage with 12 switch fabric slots (left to right: 0, 1, 2, 3 . . . 10, 11) followed by one 22-port SCGE card slot (SCGE0) on the far right.
- Lower card cage with 12 switch fabric slots (left to right: 12, 13, 14 . . . 21, 22, 23) followed by one 22-port SCGE card slot (SCGE1) on the far right.

Figure 7: FCC Rear (OIM) Side Slot Numbers and Module Locations, on page 4 shows the chassis slot numbers on the rear (OIM) side of the FCC.

Figure 7: FCC Rear (OIM) Side Slot Numbers and Module Locations

1	Upper card cage
2	Lower card cage

As shown in Figure 7: FCC Rear (OIM) Side Slot Numbers and Module Locations, on page 4, slot numbers on the OIM side of the chassis include:

- OIM side of upper card cage, with one OIM LED panel (LM0) on the far left, followed by 12 OIM slots (left to right: 11, 10, 9 . . . 2, 1, 0).
- OIM side of lower card cage, with one OIM LED panel (LM1) on the far left, followed by 12 OIM slots (left to right: 23, 22, 21 . . . 14, 13, 12).

The OIM slot numbers are reversed from the SFC slot numbers on the other side of the chassis. The SFC slot numbers match their corresponding OIM slot numbers on the rear side of the chassis. OIM slot 0 is on the far right side of the of the chassis looking at it from the rear (OIM) side; SFC slot 0 is on the far left side of chassis looking at it from the front (SFC) side.

Chassis Footprint

For each installation site, Cisco provides one aluminum drill template of an FCC footprint, showing the location of the hole pattern needed to be drilled into the floor.

Cisco can also provide a mylar template of the FCC footprint, including its door swings and the clearance needed to remove and replace components, that can be used for planning the aisle space required for the installation and maintenance of an FCC.

Figure 8: Top View of FCC, on page 5 is a top view of the FCC footprint (with optional front and rear cosmetics installed).

Figure 8: Top View of FCC

1	23.6 in. (60 cm), width of chassis
2	41 in. (104 cm), depth of chassis (with doors attached and closed)

Chassis Cable Management

The FCC has cable management features for both the front (SFC) side of the chassis and the rear (OIM) side of the chassis. Both the front (SFC) and rear (OIM) sides have vertical cable troughs on the left and right sides of the chassis. In addition, the rear (OIM) side of the chassis has three horizontal cable management brackets close to the card cages.

For further details, see Chapter 5, “Installing and Removing Exterior Cosmetic Components.”

Chassis Exterior Cosmetic Components

The FCC also includes front and rear locking doors, bezels, and side panels. The exterior cosmetic components are shipped in a separate package and must be installed on the FCC during system installation.

Chassis Cooling System

The FCC cooling system includes the components and controls that draw ambient air through the system to dissipate heat and keep the system operating in a desired temperature range. The complete FCC cooling system includes:

- Two fan trays
- Temperature sensors distributed on cards and modules in the chassis
- Operating software that controls the cooling system
- Air filter
- Inlet and outlet air vents and bezels
- Impedance carriers for empty chassis slots
- Power module cooling fans

The airflow through the FCC is controlled by a push-pull configuration. As shown in Figure 9: Airflow Through FCC, on page 6, ambient air flows in at the bottom front (SFC) side and up through the card cages until it exhausts at the top rear (OIM) side of the FCC. The bottom fan tray pulls ambient air in from the bottom front of the chassis; the top fan tray pushes warm air out the back of the chassis. The power modules in the power shelves have their own self-contained cooling fans.

A replaceable air filter is positioned above the lower fan tray. How often the air filter 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 grills for debris, and then check the air filter to see if it needs replacement.

Before removing the air filter for replacement, you should have a spare filter on hand; then, when you remove the dirty filter, install the spare filter in the chassis.

Figure 9: Airflow Through FCC

1	Front (SFC) side of chassis	6	Power shelves (two)
2	Air intake	7	Air exhaust
3	Lower fan tray	8	Upper card cage
4	Air filter	9	Lower card cage
5	Upper fan tray	10	Rear (OIM) side of chassis

Chassis Power System

Two types of power systems are available for the FCC: fixed configuration power and modular configuration power. Both power systems can be powered by either AC or DC power.

The chassis power system takes the facility power and converts it to the DC voltage necessary to power chassis components.

See Chapter 2, "Installing and Removing Power Components," for detailed information.

Safety Guidelines

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

Note Although power shelves can be installed or removed without powering down the system, for safety purposes we recommend that you power down the system before you install or remove a power shelf.

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 for the Cisco CRS Carrier Routing System* before installing, configuring, or troubleshooting any installed card.

- Never attempt to lift an object that might be too heavy for you to lift by yourself.
- 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.
- Keep tools and router components away from walk areas.
- Do not wear loose clothing, jewelry, and other items that could get caught in the router while working with OIMs, SFCs, and their associated components.
- Use Cisco equipment in accordance with its specifications and product-usage instructions.
- Do not work alone if potentially hazardous conditions exist.
- Make sure your installation complies with national and local electrical codes: in the United States, National Fire Protection Association (NFPA) 70, United States National Electrical Code; in Canada, Canadian Electrical Code, part I, CSA C22.1; in other countries, International Electrotechnical Commission (IEC) 60364, part 1 through part 7.
- Connect only a DC power source that complies with the safety extra-low voltage (SELV) requirements in UL/CSA/IEC/EN 60950-1 and AS/NZS 60590 to the FCC DC-input power system.
- Make sure that you have a readily accessible two-poled disconnect device incorporated in the fixed wiring of an FCC configured with the DC-input power system.
- Make sure that you provide short-circuit (overcurrent) protection as part of the building installation for the FCC.

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 use of 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 its 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 from only ESD voltage on the body; ESD voltage on clothing can still cause damage.