



Installing and Removing Power Components

This chapter provides instructions on how to install and remove Cisco CRS Carrier Routing System 16-Slot line card chassis power components.

This chapter presents the following topics:

- [Power Component Information Common to the Two Types of Power Systems](#)
- [Installing and Remove Fixed Configuration Power Components](#)
- [Installing and Removing Modular Configuration Power Components](#)
- [Converting a Chassis from Fixed Configuration Power to Modular Configuration Power](#)

- [Power Systems Overview, on page 1](#)
- [Power Component Information Common to the Two Types of Power Systems, on page 2](#)
- [Installing and Remove Fixed Configuration Power Components , on page 15](#)
- [Installing and Removing Modular Configuration Power Components, on page 43](#)
- [Converting a Chassis from Fixed Configuration Power to Modular Configuration Power , on page 82](#)

Power Systems Overview

There are two options for power systems: the fixed configuration power system and the modular configuration power system. Power components are not interchangeable between the fixed and modular configuration power system.

- *Fixed configuration power system*

Consists of two power shelves, DC power entry modules (PEMs) or AC rectifiers, and alarm modules. It is available in versions for DC and AC power supplies. The AC version requires either 3-phase AC-Delta or 3-phase AC-Wye input power to the power shelves. It provides power sharing across power zones. The fixed configuration power system includes SNMP MIBS and XML support.

- *Modular configuration power system*

Consists of two power shelves, AC or DC power modules (PMs), and alarm modules. It is available in versions for DC and AC power supplies. However, unlike the fixed configuration power system, the AC version of the modular configuration power system requires single-phase AC input power to the power shelves; there is no 3-phase AC-Wye or AC-Delta. If you have 3-phase AC Delta or AC Wye at your equipment, a *Cisco CRS power distribution unit (PDU)* will be required to convert 3-phase AC input power to single-phase AC input power for the power shelf. At the shelf level, the power system provides 2N redundancy; the PMs themselves

provide load-share redundancy. The modular configuration power system also includes SNMP MIBS and XML support.



Note In a modular configuration AC power system, PDU refers to the *Cisco CRS PDU* which is required to convert 3-phase AC-Wye or AC-Delta input power to single-phase AC input power for the modular configuration AC power shelf. For further information, see the [Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide](#).

Power Component Information Common to the Two Types of Power Systems

This section introduces information shared by the fixed configuration power components and the modular configuration power components in the following topics:

- Basic Chassis Power Details
- Bonding and Grounding Guidelines
- DC Power Systems
- AC Power Systems

Basic Chassis Power Details

The LCC can be configured with either an AC-input power subsystem or a DC-input power subsystem. Site power requirements differ, depending on the source voltage used. Follow these precautions and recommendations when planning power connections to the router:

- 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.
- Install proper grounding to avoid damage from lightning and power surges.

The LCC requires that at least one power shelf and its components be installed to operate properly; however, if you install only one power shelf and its components, your system will not be 2N redundant.

Two types of power shelves exist: an AC shelf and a DC shelf. A fixed configuration AC power shelf houses the AC rectifiers, while a fixed configuration DC power shelf houses the DC PEMs. A modular configuration AC power shelf houses the AC PMs, while a modular configuration DC power shelf houses the DC PMs. It is required that you use only one type of power shelf in a chassis at a time.



Note In a modular configuration power system, both AC and DC power supplies are referred to as power modules (PMs).



Caution The chassis might have more than one power connection. All connections must be removed to de-energize the chassis. *Statement 1028*

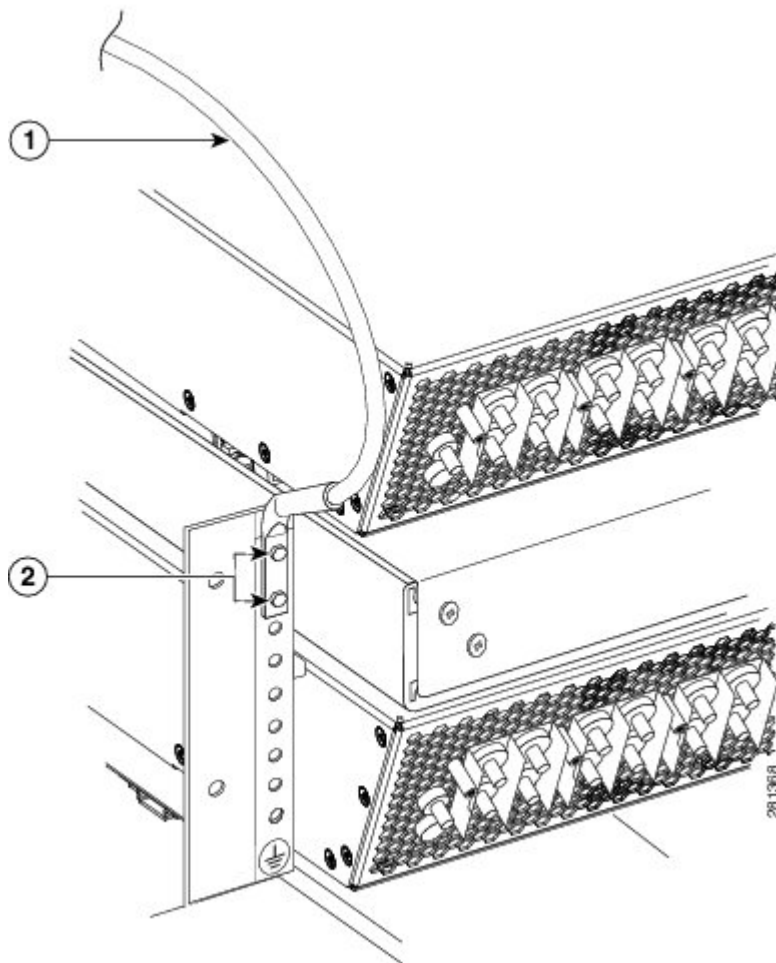
Bonding and Grounding Guidelines

The router chassis has a safety earth ground connection in conjunction with power cabling to the fixed configuration power shelves. The chassis allows you to connect the central office ground system or interior equipment grounding system to the bonding and grounding receptacles on the router chassis, when either a fixed or modular configuration power system is installed. Two threaded ground inserts are located on top of the chassis rear (MSC) side panel to the left of the lower power shelf. The following figure shows the NEBS and grounding points on the rear (MSC) side of the chassis with a modular configuration DC power shelf installed. This grounding point is also referred to as the network equipment building system (NEBS) bonding and grounding stud. The location of the grounding points on the LCC is the same for both fixed and modular configuration power systems.



Note These bonding and grounding receptacles are provided to satisfy the Telcordia NEBS requirements for bonding and grounding connections.

Figure 1: NEBS Bonding and Grounding Points—Modular Configuration DC Power Shown



1	Chassis ground cable	2	NEBS bonding and grounding points
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Note The previous figure shows a 45-degree grounding. A 180-degree (straight) grounding lug can also be used.

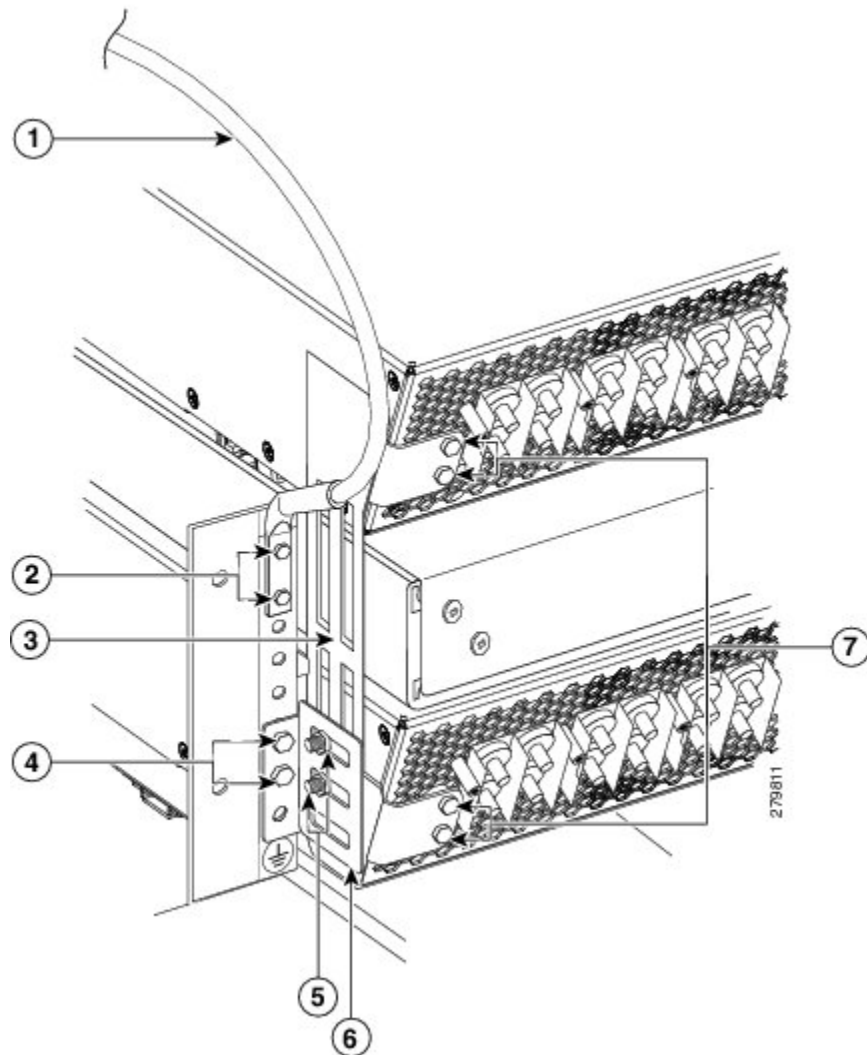


Caution Do not remove the chassis ground cable unless the chassis is being replaced.

The grounding points are hidden by a cover plate. When the cover plate is removed, you can easily see the labels indicating the location of the grounding points. Two grounding points are provided; use the top grounding point for NEBS grounding purposes.

Modular configuration power shelf grounding is accomplished by installing an external ground bracket between the power shelves and attached to the chassis, as shown in the next figure. The bolts that connect the external grounding brackets to the chassis and the power shelf have a torque value of 30 in.-lb (3.39 N-m). See [Installing Power Shelf Grounding Brackets](#) for more information about installing power shelf grounding brackets.

Figure 2: Power Shelf Grounding Brackets—Modular Configuration DC Power Shown



1	Chassis ground cable	5	Two M6 hex nuts attaching grounding L-bracket to shelf grounding bracket
2	Two M6 hex bolts attaching ground lug to chassis	6	Grounding L-bracket
3	Shelf grounding bracket	7	Four M6 hex bolts attaching shelf grounding bracket to power shelves
4	Two M6 hex bolts attaching grounding L-bracket to chassis		

Installing the Chassis Ground Cable

This section describes how to install the ground cable on the LCC.

Prerequisites

To ensure a satisfactory ground connection, you need the following parts:

- One grounding lug that has two M6 bolt holes with 0.63 inches (5/8 inch) (1.60 cm) of spacing center to center between them and a 6 AWG or larger multi strand copper wire. The grounding lug used can be either a 180 degree (straight) lug or a 45-degree lug.

Figure 3: 180-Degree (Straight) Chassis Ground Lug

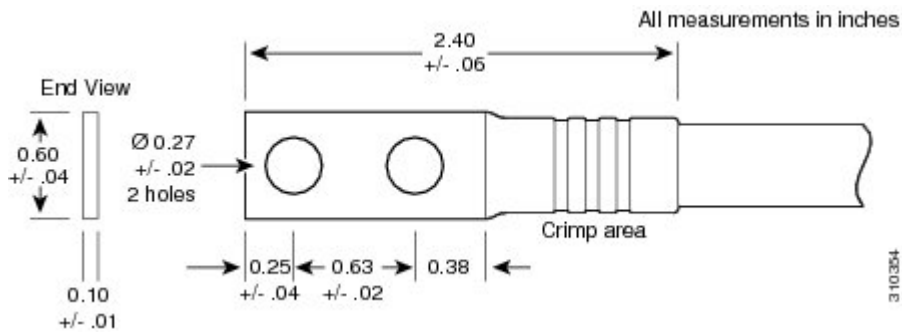
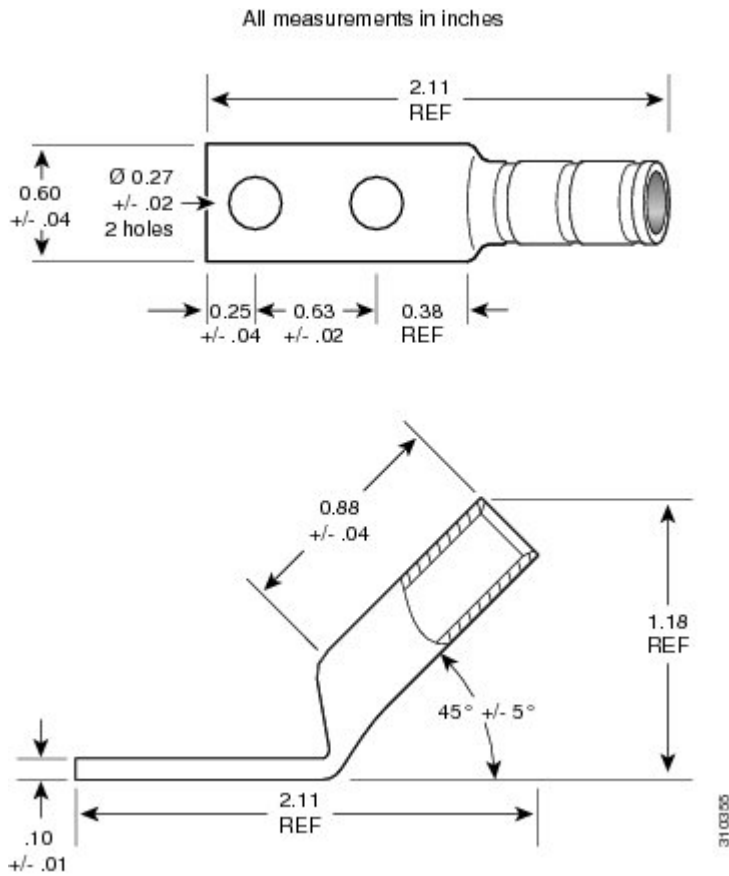


Figure 4: 45-Degree Chassis Ground Lug



- Two M6 hex head bolts and integrated locking washers are pre-installed on the chassis.

- Although we recommend at least 6 AWG multistrand copper ground cable, the actual cable diameter and length depends on the router location and site environment. This cable is not available from Cisco Systems; it is available from any commercial cable vendor. The cable should be sized according to local and national installation requirements.



Note The DC return of this system should remain isolated from the system frame and chassis (DC-I: Isolated DC Return).

Required Tools and Equipment

- Ground lug
- Ground cable
- Crimping tool and lug specific die
- 10-mm 6 pt. combination wrench
- Torque wrench with 10-mm 6 pt. socket and rated accuracy at 30 in.-lb (3.39 N-m)

Steps

To attach the ground cable to the chassis, follow these steps:

SUMMARY STEPS

1. Use the crimping tool mandated by the lug manufacturer to crimp the lug to the ground cable.
2. Using the 10-mm wrench, attach the ground cable to the grounding point on top of the chassis rear (MSC) side panel, as shown [Figure 1: NEBS Bonding and Grounding Points—Modular Configuration DC Power Shown](#). Then use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m).

DETAILED STEPS

Step 1 Use the crimping tool mandated by the lug manufacturer to crimp the lug to the ground cable.

Step 2 Using the 10-mm wrench, attach the ground cable to the grounding point on top of the chassis rear (MSC) side panel, as shown [Figure 1: NEBS Bonding and Grounding Points—Modular Configuration DC Power Shown](#). Then use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m).

DC Power Systems

Each DC powered chassis contains two DC power shelves for 2N redundancy. The shelves contain the input power connectors.

- In the fixed configuration power system, each power shelf contains three DC PEMs. The power shelves and DC PEMs are field replaceable. Each DC PEM has its own circuit breaker.
- In the modular configuration power system, each shelf can accept up to eight DC PMs. The power shelves and DC PMs are field replaceable.



Note Depending on the hardware deployed at your site, your system may not consume the maximum power supplied by the power system.

Fixed Configuration DC Power

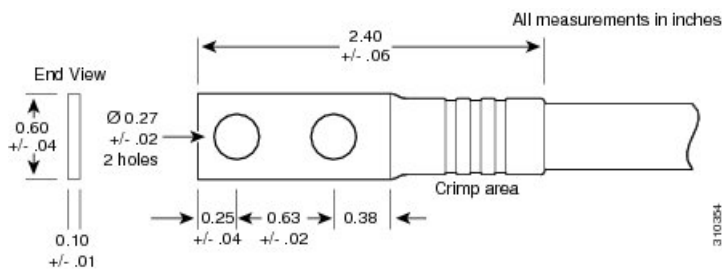
The LCC fixed configuration DC power system provides 13,200 watts to power the chassis.

Due to its power zones, the LCC using fixed configuration power requires a total of twelve dedicated 60 Amp DC input power connections, two for each DC PEM, to provide redundant DC power to all six power zones. We recommend that you have two separate, redundant –48 VDC power battery sources to provide power to the LCC. Connect the six “A” 60 Amp DC inputs to the upper power shelf (PS0 in Figure 1-4) to one battery, and the six “B” 60 Amp inputs to the lower power shelf (PS1 in Figure 1-4) to the other battery.

At sites where the LCC is equipped with a DC-input power supply shelf and DC PEMs, observe the following guidelines:

- All power connection wiring should follow the rules and regulations in the National Electrical Code (NEC) and any local codes.
- Each DC-input PEM connection is rated at 60 A maximum. A dedicated, commensurately rated DC power source is required for each PEM connection.
- For DC power cables, we recommend that you use commensurately rated, high-strand-count copper cable. Each DC PEM requires two DC inputs of nominal –48/–60 VDC, 60 A service. Each DC input consists of one pair of cable leads, source DC (–) and source DC return (+). Each power shelf requires one grounding cable. The length of the cables depends on the router location. These cables are not available from Cisco Systems; they are available from any commercial vendor.
- DC power cables must be terminated by cable lugs at the power shelf end. The lugs should be dual hole and able to fit over M6 terminal studs at 0.63 in. (5/8 in.) (1.60 cm) centers (for example, Panduit part number LCD2-14A-Q), as shown in the next figure.
- Maximum wire size at the DC input terminal block is 2 AWG.

Figure 5: DC Power Cable Lug



The next figure shows a typical source DC power distribution scheme. The ground cable is to the far left on the shelf. The DC terminal block cable connector screws have a 20 in.-lb (2.26 N-m) value; the power shelf ground cable connector screws have a 30 in.-lb (3.39 N-m) torque value.

The color coding of the source DC power cable leads depends on the color coding of the site DC power source. Typically, green or green and yellow indicates that the cable is a ground cable. Follow your local practices for cable color code and markings. Ensure that the power cables are connected to the DC input power shelf terminal studs in the proper positive (+) polarity and negative (–) polarity.

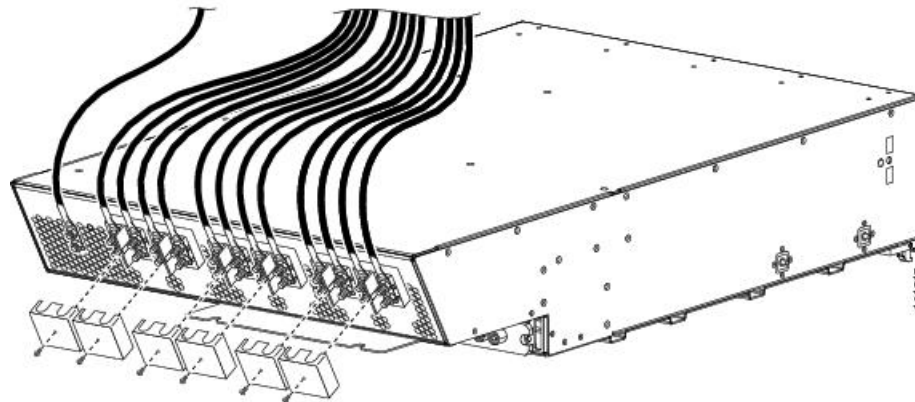
Sometimes, the source DC cable leads might have a positive (+) or a negative (–) label, but you must verify the polarity by measuring the voltage between the DC cable leads. When making the measurement, the positive (+) lead and the negative (–) lead must always match the (+) and (–) labels on the power shelf.



Caution The DC input PEM contains circuitry to trip the breaker on the PEM if it detects a reverse polarity condition. When installing DC power cables, make sure that the polarity of the DC input wiring is correct.

This figure shows the cable wiring for the fixed configuration power shelf.

Figure 6: DC Power Shelf Cable Wiring for Fixed Configuration Power Shelf



The table lists the fixed configuration DC input current and voltage specifications.

Table 1: DC Input Current and Voltage Information

Nominal input voltage	–48 VDC North America–60 VDC European Community(range: –42 VDC to –75 VDC)
Input line current	50 A maximum at –48 VDC40 A maximum at –60 VDC
Inrush current	168 A peak at –75 VDC(maximum for 1 ms)

Each wiring block on the fixed configuration power shelf contains two sets of terminals, one positive and one negative, and is covered by a plastic block cover that snaps onto the power shelf and is secured by a screw to a torque value of 4 to 5 in.-lb (0.46 to 0.58 N-m). You must remove the block cover or rotate it out of the way before you work with the cables. The block covers are slotted in such a way that the cables can exit only one end. For the cables to point in a different direction, remove the block cover, rotate it, and snap it back on.

Modular Configuration DC Power

The LCC modular configuration DC power system can provide up to 16,800 watts to power the chassis. However, by default, the power capability of a system when shipped, with six DC PMs per power shelf, is 12,600 watts.



Note Depending on the hardware deployed at your site, your system may not consume the maximum power supplied by the power system.

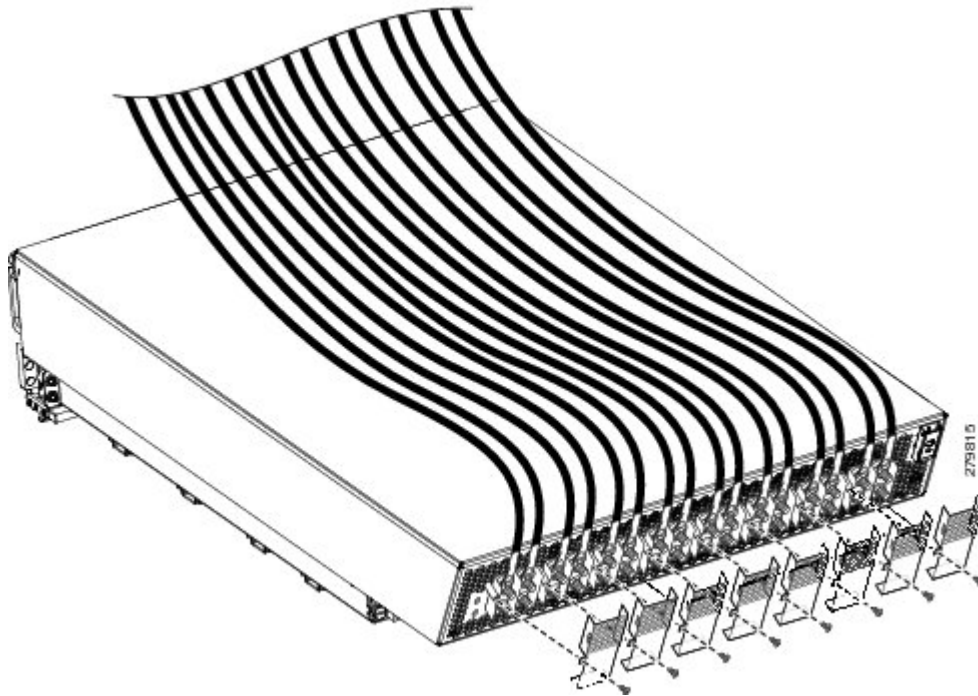
Each modular configuration DC power shelf supports up to eight DC PMs. The power shelves and DC PMs are field replaceable.



Note Although each modular configuration DC power shelf can support up to eight DC PMs, the modular configuration DC power shelf is shipped with six DC PMs per shelf.

This figure shows the cable wiring for the modular configuration power shelf.

Figure 7: DC Power Shelf Cable Wiring for Modular Configuration Power Shelf



Each power shelf operates with up to eight DC inputs of $-48/-60$ VDC (nominal), 60A. The power shelf accepts input DC power in the range -40 to -72 VDC.

This table lists the modular configuration DC input current and voltage specifications.

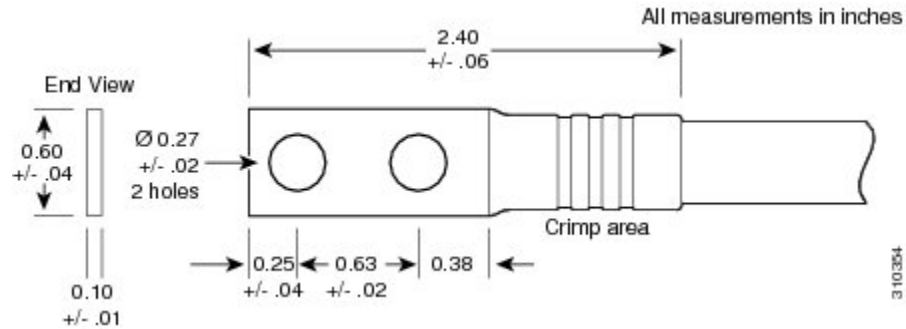
Table 2: DC Input Current and Voltage Information

Nominal input voltage	-48 VDC North America -60 VDC European Community (range: -40 VDC to -72 VDC)
Input line current	50 A maximum at -48 VDC 40 A maximum at -60 VDC 60 A maximum at -40 VDC

Each wiring block on the modular configuration DC power shelf contains two sets of terminals, one positive and one negative, and is covered by a plastic terminal block cover that is secured by a screw to a torque of 5 to 7 in.-lb (0.56 to 0.79 N-m). Each DC power cable is connected to the power shelf with a torque of 20 in.-lb (2.26 N-m). Maximum wire size at the DC input terminal block is 2 AWG.

The power supply terminal posts are centered 0.63 inches (5/8 inch) (1.60 cm) apart and are M6-threaded. We recommend that you use an appropriately sized 180-degree angle (straight) industry standard 2-hole, standard barrel compression lug, as shown in this figure.

Figure 8: DC Power Cable Lug



The power shelf grounding is accomplished by installing an external ground bracket between the power shelves and attached to the chassis. The bolts that connect the external grounding brackets to the chassis and the power shelf have a torque value of 30 in.-lb (3.39 N-m).

Input-Power-Present LEDs

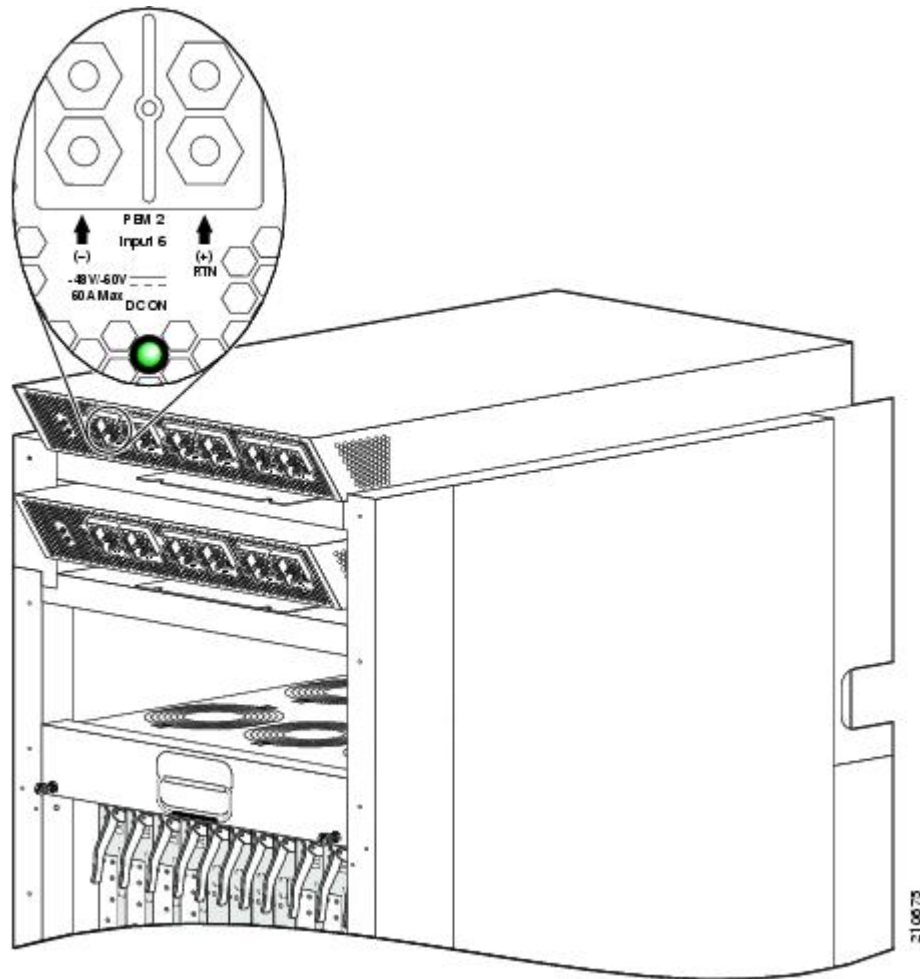
In both power configurations, the DC input-power-present LEDs provide a visual indication to service personnel that there is voltage present across the input terminal connection. The LED provides a warning to the service person that there is power present.



Note Power should be disconnected before servicing the input power connection.

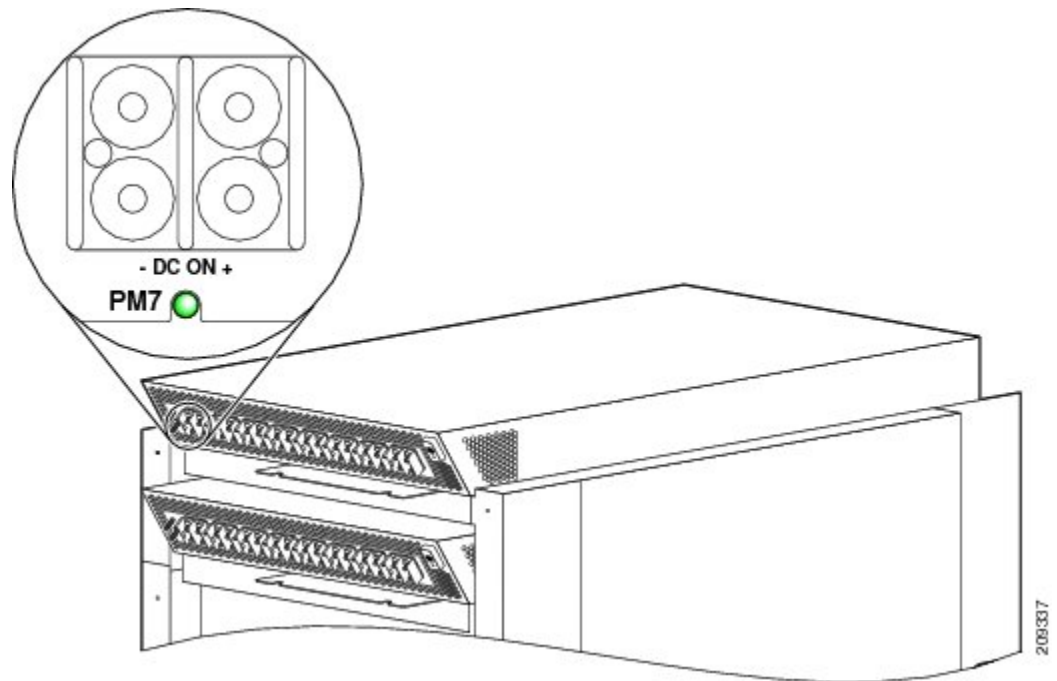
This figure shows the input-power-present LEDs on the rear of the fixed configuration DC power shelf.

Figure 9: Input-Power-Present LEDs—Fixed Configuration DC Power Shelf



This figure shows the input-power-present LEDs on the rear of the modular configuration DC power shelf.

Figure 10: Input-Power-Present LEDs—Modular Configuration DC Power Shown



The input-power-present LED starts to light up when the input voltage reaches -20 VDC and the LED gets brighter as voltage increases; the input-power-present LED is fully lit when the input voltage reaches -38 VDC.



Caution

If the input voltage polarity is reversed, or if the LED circuit fails, the LED will not light. When this is the case, service personnel should check for hazardous voltages before working on the unit.

AC Power Systems

Each AC powered chassis contains two AC power shelves for 2N redundancy. The shelves contain the input power connectors.

- In the fixed configuration power system, each shelf contains three AC power rectifiers. The power shelves and AC power rectifiers are field replaceable. Each shelf and AC power rectifier has its own circuit breaker.
- In the modular configuration power system, each shelf can contain up to six AC PMs. The power shelves and the AC PMs are field replaceable.



Note

Depending on the hardware deployed at your site, your system may not consume the maximum power supplied by the power system.

Fixed Configuration AC Power

The LCC fixed configuration AC power system provides 13,200 watts to power the chassis. Two versions of the 3-phase AC power shelf are available to provide either an AC Delta or an AC Wye input configuration. Each of the AC power shelf versions has a different Cisco part number to distinguish the Wye from the Delta configuration. The AC connections to the LCC are made to terminal blocks on the AC power shelves that have been hard wired for a Wye or Delta configuration. All chassis should have two power shelves of the same type, that is, two Delta or two Wye AC power shelves.

In the fixed configuration power system, each shelf supports three AC-to-DC rectifiers that are field replaceable. The AC-to-DC rectifiers convert 200-to-240 VAC power to –54 VDC used by the LCC.

The AC Wye power shelf has a Wye 3-phase, 5-wire connection: 200 to 240 (L-N)/346 to 415 (L-L) VAC, 3W+N+PE, 50 to 60 Hz, 25 A. For redundant operation, two 3-phase Wye branch circuits are required: 40 A (North America) or 32 A (International). One power connection is required for each power shelf.

The AC Delta power shelf has a Delta 3-phase, 4-wire connection: 200 to 240 VAC, 3-phase, 3W+PE, 50 to 60 Hz, 42 A. For redundant operation, two 3-phase Delta 60-A branch circuits are required. One power connection is required for each power shelf.



Note The power cord for the fixed configuration AC power shelf does not arrive preattached and needs to be installed.

Modular Configuration AC Power

The LCC modular configuration AC power system can provide up to 18,000 watts to power the chassis. However, by default, the power capability of a system when shipped, with 5 AC PMs per power shelf, is 15,000 watts.

Each modular configuration power shelf supports up to six PMs. The power shelves and PMs are field replaceable.



Note Depending on the hardware deployed at your site, your system may not consume the maximum power supplied by the power system.

Unlike the fixed configuration AC power system, which requires 3-phase AC Delta or AC Wye input power, the modular configuration AC power system requires single-phase AC input power. If you have 3-phase AC Delta or AC Wye at your equipment, a *Cisco CRS PDU* will be required to convert 3-phase AC input power to single-phase AC input power for the power shelf. For more information, see the [Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide](#).

The modular configuration AC power shelf has the following input VAC power requirements:

- Single-phase, 200 to 240 VAC nominal, 50 to 60 Hz, 16 A.

Each power shelf contains six IEC-320-C22 receptacles which can accept up to six IEC-320-C21 connector female cords.



Note If you have a Cisco CRS 3-Phase AC PDU installed, six AC PMs are required to be installed in each LCC AC modular configuration power shelf to maintain a balanced 3-phase power load,.



Note We recommend that you use appropriate short-circuit protection in compliance with national and local electrical codes.

Installing and Remove Fixed Configuration Power Components

This section contains the following procedures:

- Installing a Fixed Configuration Power Shelf
- Removing a Fixed Configuration Power Shelf
- Installing Fixed Configuration AC Power Cords
- Removing Fixed Configuration AC Power Cords
- Installing Fixed Configuration DC Power Shelf Wiring
- Removing Fixed Configuration DC Power Shelf Wiring
- Installing an AC Rectifier or DC PEM
- Removing an AC rectifier or DC PEM
- Installing a Fixed Configuration Alarm Module
- Removing a Fixed Configuration Alarm Module
- Powering Up and Down a Chassis with Fixed Configuration AC Power
- Power Up and Power Down a Chassis with Fixed Configuration DC Power
- Converting from One Fixed Configuration Power System to Another



Note For complete information on regulatory compliance and safety, see [Cisco CRS Carrier Routing System Regulatory Compliance and Safety Information](#).

Installing a Fixed Configuration Power Shelf

This section describes how to install a fixed configuration power shelf in the LCC. For information on the differences between the power types, see [DC Power Systems](#) and [AC Power Systems](#).

The power shelf encloses:

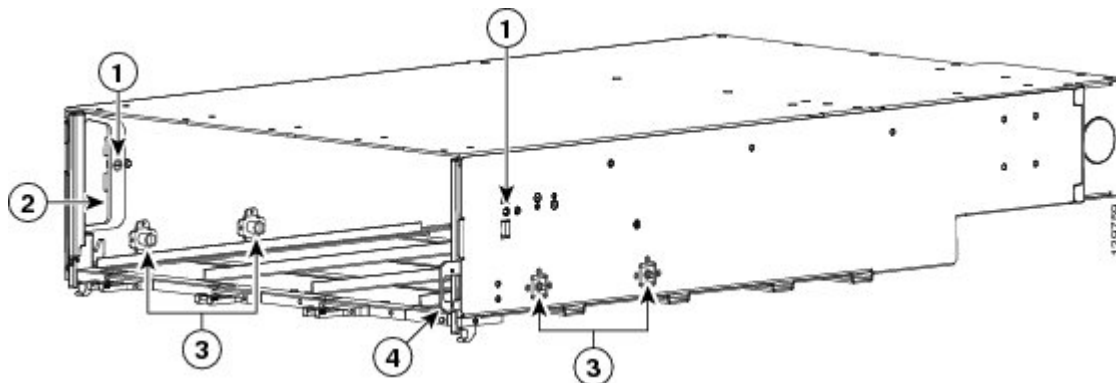
- The power modules: three AC rectifiers for an AC power shelf or three DC PEMs for a DC power shelf

Prerequisites

- An alarm module
- Power distribution connections and wiring.

The power shelf is installed in the LCC from the front (PLIM) side. Although differences exist among the different power shelf types (AC Wye, AC Delta, and DC), they are installed in the same manner. This figure shows a fixed configuration AC power shelf. The fixed configuration DC power shelf is similar.

Figure 11: AC Wye Power Shelf with AC Rectifiers Installed



1	Lever handle captive screws	3	Power shelf captive screws
2	Lever handle (left handle shown)	4	Power shelf I/O switch

Prerequisites

Before performing this task, remove the upper grille on the front (PLIM) side of the chassis (if installed).

**Note**

Do not install the power shelf in the chassis with DC PEMs, AC rectifiers, or alarm module installed in the power shelf.

Required Tools and Equipment

You need the following tools and part to perform this task:

- ESD-preventive wrist strap
- 1/4-in. x 6-in. long slotted screwdriver
- Fixed configuration AC or DC power shelf
 - AC Delta power shelf (Cisco product number CRS-16-LCC-PS-ACD=), or
 - AC Wye power shelf (Cisco product number CRS-16-LCC-PS-ACW=), or
 - DC power shelf (Cisco product number CRS-16-LCC-PS-DC=)

Steps

To install a fixed configuration power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Make sure that the power shelf I/O switch, located on the front (PLIM) side of the chassis, is in the OFF position.
3. The lever handles are fastened down for shipment. Use the screwdriver to turn the two captive screws, one on each lever handle, to unfasten them.
4. Supporting the unit by the bottom and grasping one side for balance, lift the power shelf up and slide it into one of the power shelf slots on the chassis.
5. Slide the power shelf fully into the chassis and lift the lever handles up to lock the tray into position.
6. Use the screwdriver to turn the two lever screws on the front panel of the power shelf clockwise to seat the power shelf firmly in the slot.
7. Use the screwdriver to turn the four captive screws on the interior of the power shelf clockwise to firmly anchor the shelf to the sides of the chassis.

DETAILED STEPS

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- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Make sure that the power shelf I/O switch, located on the front (PLIM) side of the chassis, is in the OFF position.
- Step 3** The lever handles are fastened down for shipment. Use the screwdriver to turn the two captive screws, one on each lever handle, to unfasten them.
- Step 4** Supporting the unit by the bottom and grasping one side for balance, lift the power shelf up and slide it into one of the power shelf slots on the chassis.
- Caution** An empty power shelf weighs approximately 36 lb (16.3 kg). Because of the rack-mounted height of the chassis, you should be especially careful while lifting and removing the power shelf. To prevent injury, keep your back straight and lift with your legs, not your back. Avoid sudden twists or lateral moves. It is safer to use two people and a ladder to install or remove the power shelf rather than a single person.
- Step 5** Slide the power shelf fully into the chassis and lift the lever handles up to lock the tray into position.
- Step 6** Use the screwdriver to turn the two lever screws on the front panel of the power shelf clockwise to seat the power shelf firmly in the slot.
- Step 7** Use the screwdriver to turn the four captive screws on the interior of the power shelf clockwise to firmly anchor the shelf to the sides of the chassis.
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What to do next

After performing this task, wire the power shelf ([Installing Fixed Configuration AC Power Cords](#) and [Installing Fixed Configuration DC Power Shelf Wiring](#)), install the power modules ([Installing an AC Rectifier or DC PEM](#)) and install the alarm module ([Installing a Fixed Configuration Alarm Module](#)).

Removing a Fixed Configuration Power Shelf

This section describes how to remove a power shelf from the 16-slot LCC. For information on the differences between the power types, see [DC Power Systems](#) and [AC Power Systems](#).

The power shelf is installed and removed from the front (PLIM) side and plugs into the chassis power interface connector panel. Although differences exist among the different power shelf types (AC Wye, AC Delta, and DC), they are installed and removed in the same manner. [Figure 11: AC Wye Power Shelf with AC Rectifiers Installed](#) shows a fixed configuration AC power shelf.

Prerequisites

Before performing this task, remove the upper grille on the front (PLIM) side of the chassis (if installed), and power down and remove AC rectifiers (or DC PEMs) and the alarm module in the shelf you want to remove. Remove the AC or DC power shelf wiring. See [Removing an AC rectifier or DC PEM](#), [Removing a Fixed Configuration Alarm Module](#), [Removing Fixed Configuration AC Power Cords](#) and [Removing Fixed Configuration DC Power Shelf Wiring](#).

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 1/4-in. x 6-in. long slotted screwdriver

Steps

To remove a fixed configuration AC or DC power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Turn the shelf power switch, located on the front (PLIM) side of the chassis, to the OFF position.
3. For AC, at the AC service circuit breaker box open all associated equipment circuit breakers for shelf(s) to be removed. Use the lockout and tag procedures per your local practices. Unplug the power cords from the associated power shelves and remove. See [Removing Fixed Configuration AC Power Cords](#) for more information.
4. Remove all power modules (three AC power rectifiers in an AC power shelf or three DC PEMs in a DC power shelf) from the shelf you are removing.
5. Remove the alarm module.
6. Use the screwdriver to loosen the four captive screws (two on each side) on the interior of the power shelf by turning them counterclockwise.
7. Use the screwdriver to loosen the two lever screws on the front panel of the power shelf by turning them counterclockwise.
8. Pull the lever handles down with both hands and slide the power shelf slowly from the slot in the chassis. After partially removing the power shelf from the chassis using the handles, grab both side of the power shelf and slide the shelf completely from the chassis.
9. Set the power shelf carefully aside.

DETAILED STEPS

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- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Turn the shelf power switch, located on the front (PLIM) side of the chassis, to the OFF position.

- Step 3** For AC, at the AC service circuit breaker box open all associated equipment circuit breakers for shelf(s) to be removed. Use the lockout and tag procedures per your local practices. Unplug the power cords from the associated power shelves and remove. See [Removing Fixed Configuration AC Power Cords](#) for more information.
- For DC, at the BDFB or power plant, remove the associated fuses / circuit breakers for shelf(s) to be removed. Use the lockout and tag procedures per your local practices. Remove DC distribution cables from the rear of the associated power shelf and tape the bare lugs for protection. See [Removing Fixed Configuration DC Power Shelf Wiring](#) for more information.
- Step 4** Remove all power modules (three AC power rectifiers in an AC power shelf or three DC PEMs in a DC power shelf) from the shelf you are removing.
- Step 5** Remove the alarm module.
- Step 6** Use the screwdriver to loosen the four captive screws (two on each side) on the interior of the power shelf by turning them counterclockwise.
- Step 7** Use the screwdriver to loosen the two lever screws on the front panel of the power shelf by turning them counterclockwise.
- Step 8** Pull the lever handles down with both hands and slide the power shelf slowly from the slot in the chassis. After partially removing the power shelf from the chassis using the handles, grab both side of the power shelf and slide the shelf completely from the chassis.
- Caution** An empty power shelf weighs approximately 36 lb (16.3 kg). Because of the rack-mounted height of the chassis, you should be especially careful while lifting and removing the power shelf. To prevent injury to your back, keep your back straight while lifting the shelf and lift the equipment as you stand up. Avoid sudden twists or lateral moves. It is safer to have two people use a ladder to install or remove the power shelf rather than do it yourself.
- Step 9** Set the power shelf carefully aside.

What to do next

After performing this task, you can install a replacement power shelf ([Installing a Fixed Configuration Power Shelf](#)).

Installing Fixed Configuration AC Power Cords

This section describes how to install the AC Wye and AC Delta power cord in the fixed configuration power system.

Prerequisites

Before performing this task, ensure that both power shelves are installed in the chassis. Remove the upper air grille on the rear [MSC] side of the chassis (if installed).



Note Before installing the AC power cord on the power shelf, make sure that the AC power cord is not plugged into the facility power.

Required Tools and Equipment

You need the following tools to perform this task:

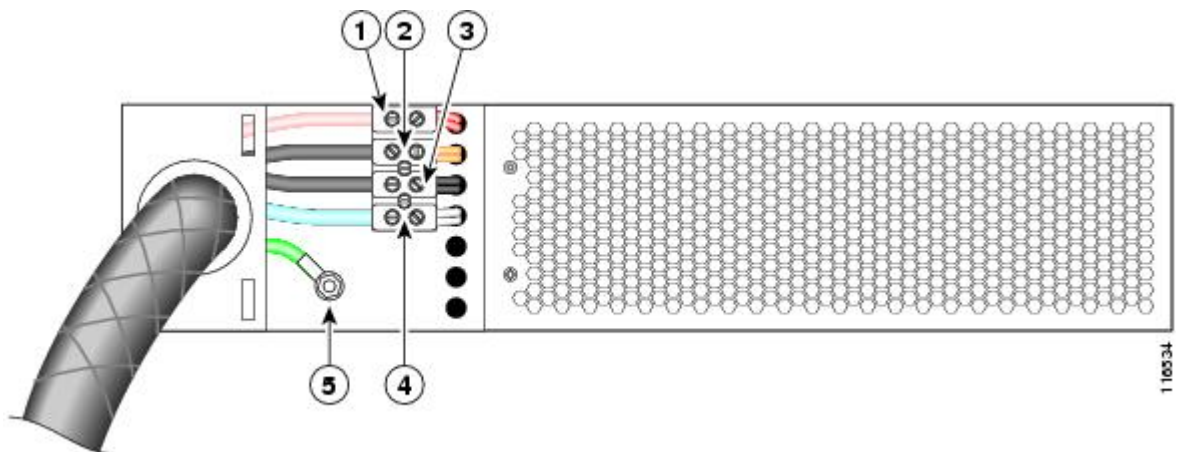
- ESD-preventive wrist strap
- 10-mm socket wrench
- Stripping tool to remove power cable conductor insulation
- 1/4-in. x 6-in. long slotted screwdriver
- Torque screwdriver with 1/4-in. slotted head and rated accuracy at 9 in-lb (1.04 N-m)
- Torque wrench with 10-mm pt. socket and rated accuracy at 20 in.-lb (2.26 N-m)

AC Wye Power Shelf

The AC Wye power shelf arrives with a 5-wire Wye cord and an IEC 60309 plug rated 415 V/32 A, IP44, 3W+N+PE; it is 4 meters long. The power shelf has five corresponding terminations: three active (hot), one neutral, and one ground. The ground lug and terminal block are located behind a removable cover on the rear of the power shelf. The terminal block contains four terminations to attach the three active cable conductors and one neutral cable conductor from the input power cord. The ground cable conductor from the input power cord is attached to the ground lug.

The rear of the AC Wye power shelf with the rear cover removed is shown in this figure.

Figure 12: AC Wye Power Shelf Rear



1	Lead 1 (L1)	4	Lead 4 (L4, neutral)
2	Lead 2 (L2)	5	Ground
3	Lead 3 (L3)		



Note Leads 1, 2, and 3 (L1, L2, and L3) are not associated with any particular color of cable conductor because they are not connected to neutral (L4) or the safety ground (L5).



Note We recommend that you rotate the L1, L2, and L3 cable conductor connection for the two power shelves to improve system availability due to common phase outage.



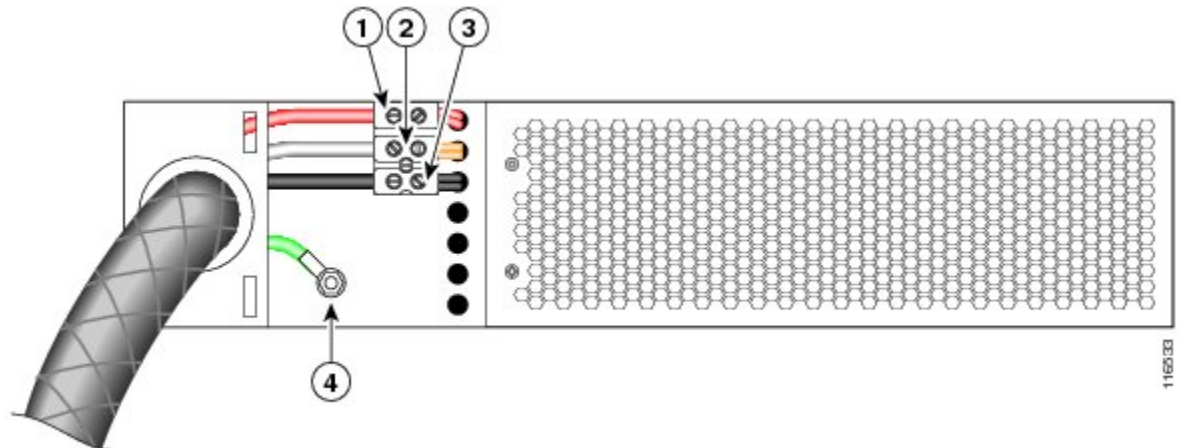
Note The ground cable conductor connector nuts have a 20 in.-lb (2.26 N-m) torque value, and the power cable conductor connector screws on the terminal block have a 9 in.-lb (1.04 N-m) torque value.

AC Delta Power Shelf

The AC Delta power shelf arrives with a 4-wire Delta cord and an IEC 60309 plug rated 250 V/60 A, IP67, 3W+PE; it is 4 meters long. The power shelf has four corresponding terminations: three active (“hot”) and one ground. The ground lug and terminal block are located behind a removable cover on the rear of the power shelf. The terminal block contains three terminations to attach the three active cable conductors from the input power cord. The ground cable conductor from the input power cord is attached to the ground lug.

The rear of the AC Delta power shelf with the rear cover removed is shown in this figure.

Figure 13: AC Delta Power Shelf Rear



1	Lead 1 (L1)	3	Lead 3 (L3)
2	Lead 2 (L2)	4	Ground



Note Leads 1, 2, and 3 (L1, L2, and L3) are not associated with any particular color of cable conductor because they are not connected to neutral or the safety ground (4).



Note We recommend that you rotate the L1, L2, and L3 cable conductor connection for the two power shelves to improve system availability due to common phase outage.



Note The ground cable conductor connector screws have a 20 in.-lb (2.26 N-m) torque value, and the power cable conductor connector screws on the terminal block have a 9 in.-lb (1.04 N-m) torque value.

Steps

To wire a fixed configuration AC power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. For AC Wye only, choose the neutral cable conductor; white is usually neutral. Be sure to perform a continuity check with a volt meter to verify that the neutral pin (labeled N on the plug) is connected to the neutral cable conductor.
3. Perform a continuity check with a volt meter to verify that the pins on the plug (L1, L2 and L3) are correctly connected to the corresponding cable conductor(L1, L2 and L3). Perform a continuity check with a volt meter to verify that the ground pin is connected to the ground cable conductor.
4. Remove the rear cover from the power shelf.
5. The shelf arrives with two wiring holes for the power cord. Choose the wiring hole for the cord and remove the knock-out plug, if needed.
6. Ensure that the insulating layer has been removed from the cable conductor ends.
7. Insert the AC power cord and tighten the cable bushing lock nut.
8. Remove the M6 nut from the ground connection (green cable conductor is typically ground), attach the ground cable conductor, and tighten the nut (ground cable conductor has a closed-ring connector) to a torque value of 20 in.-lb (2.26 N-m).
9. For AC Wye only, connect the neutral cable conductor to the terminal block by backing out the left-side terminal block screw, inserting the cable conductor, and tightening the screw to a torque value of 9 in.-lbs (1.04 N-m). Do not loosen the screw on the right side of the terminal block.
10. For AC Delta and AC Wye, connect the three active cable conductors by backing out the left-side terminal block screw, inserting the cable conductor, and tightening the screw to a torque value of 9 in.-lbs (1.04 N-m). Do not loosen the screw on the right side of the terminal block.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** For AC Wye only, choose the neutral cable conductor; white is usually neutral. Be sure to perform a continuity check with a volt meter to verify that the neutral pin (labeled N on the plug) is connected to the neutral cable conductor.
- Step 3** Perform a continuity check with a volt meter to verify that the pins on the plug (L1, L2 and L3) are correctly connected to the corresponding cable conductor(L1, L2 and L3). Perform a continuity check with a volt meter to verify that the ground pin is connected to the ground cable conductor.
- Step 4** Remove the rear cover from the power shelf.
- Step 5** The shelf arrives with two wiring holes for the power cord. Choose the wiring hole for the cord and remove the knock-out plug, if needed.
- Step 6** Ensure that the insulating layer has been removed from the cable conductor ends.

- Step 7** Insert the AC power cord and tighten the cable bushing lock nut.
- Step 8** Remove the M6 nut from the ground connection (green cable conductor is typically ground), attach the ground cable conductor, and tighten the nut (ground cable conductor has a closed-ring connector) to a torque value of 20 in.-lb (2.26 N-m).
- Step 9** For AC Wye only, connect the neutral cable conductor to the terminal block by backing out the left-side terminal block screw, inserting the cable conductor, and tightening the screw to a torque value of 9 in.-lbs (1.04 N-m). Do not loosen the screw on the right side of the terminal block.
- Note** Be careful not to back the connection screws too far or they fall out.
- Step 10** For AC Delta and AC Wye, connect the three active cable conductors by backing out the left-side terminal block screw, inserting the cable conductor, and tightening the screw to a torque value of 9 in.-lbs (1.04 N-m). Do not loosen the screw on the right side of the terminal block.

What to do next

After performing this task, the AC rectifiers can be installed. For more information, see [Installing an AC Rectifier or DC PEM](#).

Removing Fixed Configuration AC Power Cords

This section describes how to remove the AC Wye and AC Delta power cords from the fixed configuration power shelf.

Prerequisites

Before performing this task, power down and remove AC rectifiers and the alarm module in the shelf you want to disconnect. Remove the upper grille from the rear (MSC) side of the chassis, if installed.



Note Before removing AC power cord from the power shelf, make sure that the AC power cord is not plugged into the facility power.

Required Tools and Equipment

- ESD-preventive wrist strap
- 3/8-in. ratchet wrench with 10-mm socket
- 1/4-in. x 6-in. long slotted screwdriver

AC Wye Power Shelf

The rear of the AC Wye power shelf with the rear cover removed is shown in [Figure 12: AC Wye Power Shelf Rear, on page 20](#). For more information on AC Wye power shelf, see [AC Wye Power Shelf, on page 20](#) section.



Note When removing AC wiring from the fixed configuration power shelf, be sure to remove the ground cable conductor last.

AC Delta Power Shelf

The rear of the AC Delta power shelf with the rear cover removed is shown in [Figure 13: AC Delta Power Shelf Rear, on page 21](#). For more information on AC Wye power shelf, see [AC Delta Power Shelf, on page 21](#) section.



Note When removing AC wiring from the fixed configuration power shelf, be sure to remove the ground cable conductor last.

Steps

To disconnect the AC power cord from the fixed configuration AC power shelf, perform the following:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. For AC Delta and AC Wye, disconnect the three active cable conductors by loosening the screw on the left side of the terminal block for each cable conductor and removing the cable conductor.
3. For AC Wye only, disconnect the neutral cable conductor by backing out the left side terminal block screw and removing the cable conductor. White is usually neutral.
4. Remove the M6 nut from the ground connection (green is typically the ground cable conductor) and remove the ground cable conductor.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** For AC Delta and AC Wye, disconnect the three active cable conductors by loosening the screw on the left side of the terminal block for each cable conductor and removing the cable conductor.
- Step 3** For AC Wye only, disconnect the neutral cable conductor by backing out the left side terminal block screw and removing the cable conductor. White is usually neutral.
- Note** Be careful not to back the connection screws too far or they fall out.
- Step 4** Remove the M6 nut from the ground connection (green is typically the ground cable conductor) and remove the ground cable conductor.
-

What to do next

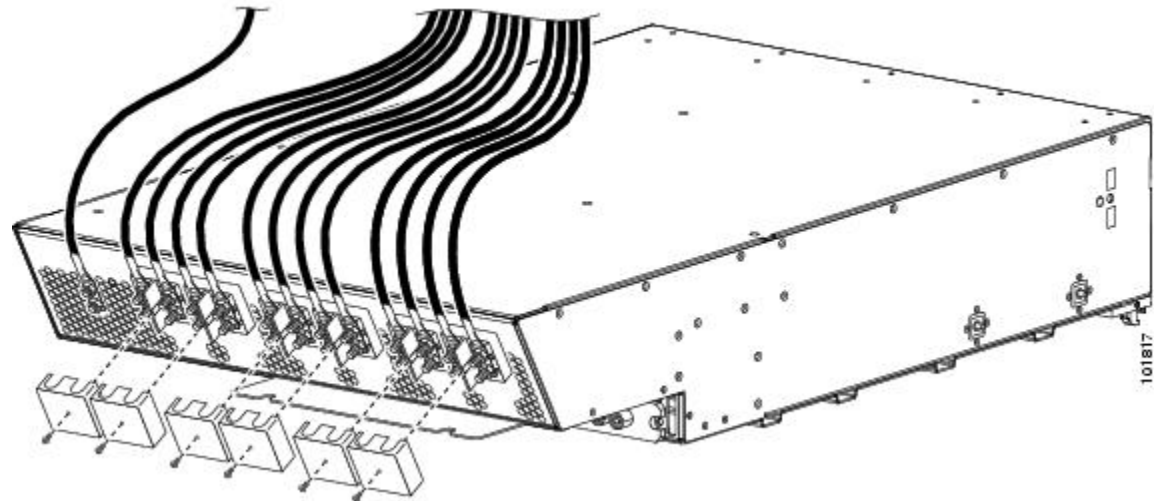
After performing this task, the power shelf can be removed. For more information, see [Removing a Fixed Configuration Power Shelf](#).

Installing Fixed Configuration DC Power Shelf Wiring

This section describes how to install the DC power shelf wiring on the fixed configuration power shelf.

The figure shows the cable wiring for the fixed configuration power shelf.

Figure 14: DC Power Shelf Cable Wiring for Fixed Configuration Power Shelf



Note When wiring the power shelf, be sure to connect the ground cable first.

Prerequisites

Before performing this task, ensure that both power shelves are installed in the chassis. Remove the upper air grille on the rear [MSC] side of the chassis, if installed.



Note Before installing wiring on the power shelf, make sure that the input power cables are not energized.



Note If cables are wrapped with black electrical tape, be sure to remove tape from cables before installing wiring on the power shelf.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 3/8 in. ratchet wrench with 10-mm socket
- Crimping tool and lug specific die
- Multimeter
- Torque wrench with 10-mm 6 pt. socket and rated accuracy at 30 in.-lb (3.39 N-m)
- Torque wrench with 10-mm 6 pt. socket and rated accuracy at 20 in.-lb (2.26 N-m)

Steps

To wire the fixed configuration DC power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Remove the terminal block cover
3. Verify the following resistance values:
4. Use the crimping tool mandated by the lug manufacturer to crimp the lugs to the DC-input cables and the power shelf ground cable. For details on lugs, see [DC Power Systems](#).
5. Using a 10-mm socket wrench, attach the ground cable to the ground cable terminal on the power shelf. Then use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m).
6. Using a 10-mm socket wrench, attach the positive and negative cables to each terminal block. Then use the torque wrench to tighten to a torque of 20 in.-lb (2.26 N-m).
7. Reattach the terminal cover with a Phillips screwdriver. Insert and tighten the screw holding the cover to the wiring terminal block.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Remove the terminal block cover
- Step 3** Verify the following resistance values:
- The resistance between the positive and negative power terminal studs of each input must be greater than 90 KOhm.
 - The resistance between each positive terminal stud and bare metal surface on the power shelf must be greater than 10 MOhm.
 - The resistance between each negative terminal stud and bare metal surface on the power shelf must be greater than 10 MOhm.
- Step 4** Use the crimping tool mandated by the lug manufacturer to crimp the lugs to the DC-input cables and the power shelf ground cable. For details on lugs, see [DC Power Systems](#).
- The cable should be sized according to local and national installation requirements. Use only copper cable.
- Note** The terminal posts are centered 0.63 inches (5/8 inch)(1.60 cm) apart and are M6-threaded. We recommend that you use an appropriately sized 180-degree (straight) industry standard 2-hole, standard barrel compression lug.
- Step 5** Using a 10-mm socket wrench, attach the ground cable to the ground cable terminal on the power shelf. Then use the torque wrench to tighten to a torque of 30 in.-lb (3.39 N-m).
- Step 6** Using a 10-mm socket wrench, attach the positive and negative cables to each terminal block. Then use the torque wrench to tighten to a torque of 20 in.-lb (2.26 N-m).
- Step 7** Reattach the terminal cover with a Phillips screwdriver. Insert and tighten the screw holding the cover to the wiring terminal block.
-

What to do next

After the power shelf wiring has been connected, the DC PEMs can be installed. For more information, see [Installing an AC Rectifier or DC PEM](#).

Removing Fixed Configuration DC Power Shelf Wiring

This section describes how to remove the DC power shelf wiring from the fixed configuration power shelf.



Note When removing DC wiring from the fixed configuration power shelf, be sure to remove the ground cable last.

Prerequisites

Before performing this task, power down and remove DC PEMs and the alarm module in the shelf you want to disconnect. Remove the upper air grille from the rear (MSC) side of the chassis, if installed



Note Before removing wiring from the power shelf, make sure that the input power cables are not energized.

Required Tools and Equipment

- ESD-preventive wrist strap
- 3/8-in. ratchet wrench with 10-mm socket

Steps

To disconnect wiring from the fixed configuration DC power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Remove the terminal block cover
3. Using the 10-mm socket wrench, remove the positive and negative cables from each terminal block.
4. Using the wrench, remove the ground cable from the ground cable terminal.
5. Replace the terminal block cover.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Remove the terminal block cover
- Step 3** Using the 10-mm socket wrench, remove the positive and negative cables from each terminal block.
- Step 4** Using the wrench, remove the ground cable from the ground cable terminal.

Note When a cable is removed from the rear of the fixed configuration DC power shelf, we recommend that it should be wrapped with standard black electrical tape.

Step 5 Replace the terminal block cover.

What to do next

After the power shelf wiring has been disconnected, the power shelf can be removed. For more information, see [Removing a Fixed Configuration Power Shelf](#).

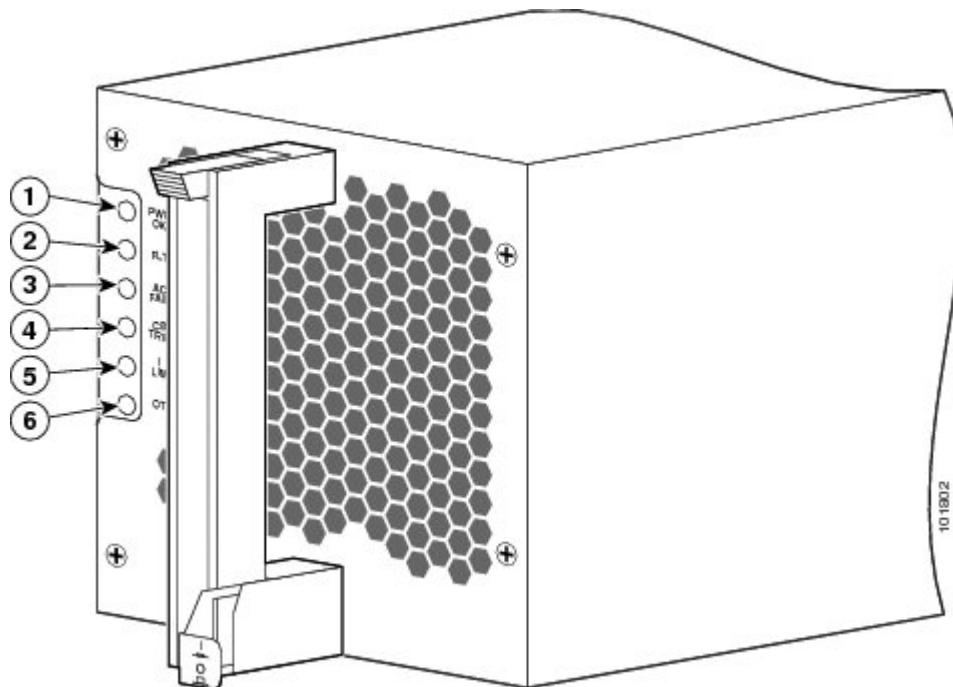
Installing an AC Rectifier or DC PEM

This section describes how to install an AC rectifier or DC PEM in the LCC. For information on the differences between the power types, see [DC Power Systems](#) and [AC Power Systems](#).

The power module is installed into the power shelf on the front (PLIM) side of the chassis. Although differences exist among the DC PEMs and AC rectifiers (AC Wye, AC Delta, and DC), they are installed in the same manner.

The figure shows an AC rectifier for reference. The fixed configuration DC PEM is similar.

Figure 15: AC Rectifier



1	PWR OK	4	CBREAKER TRIP
2	FLT	5	ILIM
3	AC INPUT FAIL	6	OT

Prerequisites

Before performing this task, remove the upper grille on the front (PLIM) side of the chassis, if installed.

Required Tools and Equipment

You need the following tool and parts to perform this task:

- ESD-preventive wrist strap
- Fixed configuration DC PEM or AC power rectifier
 - DC PEM (Cisco product number CRS-16-DC-PEM=), or
 - AC rectifier (Cisco product number CRS-16-AC-RECT=)

Steps

To install a DC PEM or AC rectifier in a fixed configuration power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Turn the AC rectifier or DC PEM power switch to the OFF position.
3. While facing the front (PLIM) side of the chassis, press the ejector lever release button at the top of the AC rectifier or DC PEM to release the ejector lever.
4. Pivot the ejector lever away from the module faceplate.
5. Using two hands to support and guide the DC PEM or AC rectifier, slide it into the power supply shelf until the connector on the back of the module just makes contact with the connector on the backplane of the power shelf.
6. Seat the module in the power shelf backplane by pivoting the ejector lever to hook the slot on the floor of the power shelf and then pushing the ejector lever until it is flush with the module faceplate. You hear a click when the ejector lever locks into place.
7. Push the power tab at the bottom front of the AC rectifier or DC PEM to the ON position.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Turn the AC rectifier or DC PEM power switch to the OFF position.
- Step 3** While facing the front (PLIM) side of the chassis, press the ejector lever release button at the top of the AC rectifier or DC PEM to release the ejector lever.
- Step 4** Pivot the ejector lever away from the module faceplate.
- Step 5** Using two hands to support and guide the DC PEM or AC rectifier, slide it into the power supply shelf until the connector on the back of the module just makes contact with the connector on the backplane of the power shelf.

Caution To prevent damage to the power shelf backplane connector, do not use excessive force when inserting a module into its power shelf bay.

Caution Each module weighs about 19 lb (8.6 kg). Because of the weight of the module and the elevated position of the power shelf, you should use two hands when handling the module. It is safer to use two people and a ladder to install or remove the module rather than a single person.

Step 6 Seat the module in the power shelf backplane by pivoting the ejector lever to hook the slot on the floor of the power shelf and then pushing the ejector lever until it is flush with the module faceplate. You hear a click when the ejector lever locks into place.

Step 7 Push the power tab at the bottom front of the AC rectifier or DC PEM to the ON position.

What to do next

After performing this task, re-install the upper grille on the front (PLIM) side of the chassis.

Removing an AC rectifier or DC PEM

This section describes how to remove a DC PEM or AC rectifier from the Cisco CRS 16-slot LCC.

Although differences exist among the DC PEMs and AC rectifiers (AC Wye, AC Delta, and DC), they are removed in the same manner. [Figure 15: AC Rectifier](#) shows an AC rectifier for reference.

Prerequisites

Before performing this task, remove the upper grille on the front (PLIM) side of the chassis

Required Tools and Equipment

You need the following tool to perform this task:

- ESD-preventive wrist strap

Steps

To remove an AC rectifier or DC PEM, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. While facing the front (PLIM) side of the chassis, pull the power tab on the bottom front of the module out to the OFF position.
3. Press the ejector lever release button at the top of the module to release the ejector lever.
4. Pivot the ejector lever away from the module faceplate to eject the module from the power shelf backplane connector.
5. Grasp the module handle and pull the module halfway from the bay. Be sure not to pull the module by the ejector lever but rather by the handle only.
6. Be sure to support the module while you slide the module completely from the bay, then set the module carefully aside.

DETAILED STEPS

- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** While facing the front (PLIM) side of the chassis, pull the power tab on the bottom front of the module out to the OFF position.
- Step 3** Press the ejector lever release button at the top of the module to release the ejector lever.
- Step 4** Pivot the ejector lever away from the module faceplate to eject the module from the power shelf backplane connector.
- Note** Pulling out the ejector lever not only physically ejects the module from the power shelf backplane connector, but also toggles an internal microswitch, shutting off power within the module.
- Step 5** Grasp the module handle and pull the module halfway from the bay. Be sure not to pull the module by the ejector lever but rather by the handle only.
- Caution** A module weighs about 19 lb (8.6 kg). Because of the weight of the module and the elevated position of the power shelf, you should use two hands when handling the module. It is safer to use two people and a ladder to install or remove the module rather than a single person.
- Step 6** Be sure to support the module while you slide the module completely from the bay, then set the module carefully aside.
-

What to do next

After performing this task, install a replacement AC rectifier or DC PEM if necessary (see Installing an AC Rectifier or DC PEM, page 2-29) and replace the upper grille on the front (PLIM) side of the chassis.

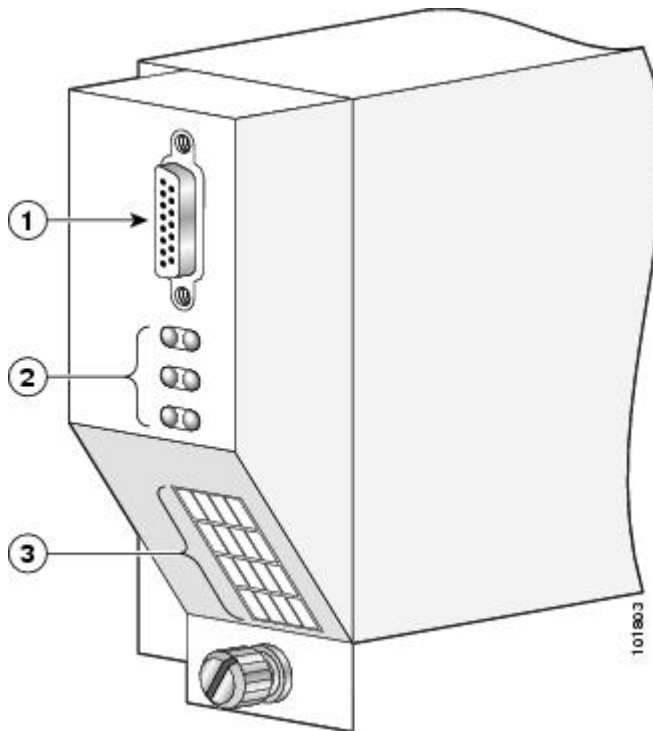
Installing a Fixed Configuration Alarm Module

This section describes how to install an alarm module in a fixed configuration power supply in the LCC. An alarm module can be installed only in the far right slot of the power shelf (as you are facing the front [PLIM] side of the chassis).

Each AC or DC power shelf contains an alarm module, which monitors the status of the power shelf and provides an external interface for system alarms. A dedicated alarm module slot exists on the right side of every power shelf. The same alarm module is used in all power shelves.

This figure shows a fixed configuration alarm module.

Figure 16: Fixed Configuration Alarm Module



1	External alarm connector	3	LED display
2	Alarm LEDs		

Prerequisites

Before performing this task, remove the upper grille on the front (PLIM) side of the chassis, if installed.

Required Tools and Equipment

- ESD-preventive wrist strap
- 6-in long number 1 Phillips screwdriver
- Fixed configuration alarm module (Cisco product number CRS-16-ALARM=)

Steps

To install a fixed configuration alarm module, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Using two hands to support and guide the alarm module, slide it into the far right bay on the power supply shelf until the connector on the back of the alarm module makes contact with the connector on the backplane of the shelf. Verify that the guide pin on the chassis front panel is correctly aligned with the hole on the front of the alarm module.

3. Seat the alarm module in the power shelf backplane by pressing it firmly into the chassis backplane connector.
4. Use the screwdriver to turn the captive screw at the bottom of the alarm module clockwise to seat the alarm module connectors in the connectors on the power shelf interface panel.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Caution** To prevent damage to the backplane connector on the alarm module, do not use excessive force when inserting the alarm module into its power shelf bay.
- Step 2** Using two hands to support and guide the alarm module, slide it into the far right bay on the power supply shelf until the connector on the back of the alarm module makes contact with the connector on the backplane of the shelf. Verify that the guide pin on the chassis front panel is correctly aligned with the hole on the front of the alarm module.
- Caution** The alarm module weighs approximately 4.2 lb (2 kg). Because of the rack-mounted height of the chassis, you should be especially careful while lifting and removing the alarm module. Use two hands when handling the alarm module. It is safer to use a ladder to install or remove the alarm module.
- Step 3** Seat the alarm module in the power shelf backplane by pressing it firmly into the chassis backplane connector.
- Step 4** Use the screwdriver to turn the captive screw at the bottom of the alarm module clockwise to seat the alarm module connectors in the connectors on the power shelf interface panel.
-

What to do next

After performing this task, replace the upper grille on the front (PLIM) side of the chassis.

Removing a Fixed Configuration Alarm Module

This section describes how to remove the alarm module from a fixed configuration power supply in the LCC. The alarm module is installed only in the far right slot of the power shelf (as you are facing the front [PLIM] side of the chassis). This [Figure 16: Fixed Configuration Alarm Module](#) shows a fixed configuration alarm module.

Prerequisites

Before performing this task, remove any the upper air grille on the front (PLIM) side of the chassis.

Required Tools and Equipment:

- ESD-preventive wrist strap
- 6-in long number 1 Phillips screwdriver

Steps

To remove an alarm module, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Use the screwdriver to loosen the captive screw that fastens the alarm module to the front (PLIM) side of the chassis.
3. Grasp the alarm module and pull it halfway from the bay.
4. Use your free hand to support the alarm module while you slide the alarm module completely from the bay, then set it carefully aside.

DETAILED STEPS

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

Step 2 Use the screwdriver to loosen the captive screw that fastens the alarm module to the front (PLIM) side of the chassis.

Step 3 Grasp the alarm module and pull it halfway from the bay.

Caution The alarm module weighs about 4.2 lb (2 kg). Because of the weight of the alarm module and the elevated position of the power shelf, you should use two hands when handling the alarm module. It is safer to use a ladder to install or remove the alarm module.

Step 4 Use your free hand to support the alarm module while you slide the alarm module completely from the bay, then set it carefully aside.

What to do next

After performing this task, install a replacement alarm module (if necessary) and replace the upper grille on the front (PLIM) side of the chassis.

Powering Up and Down a Chassis with Fixed Configuration AC Power

This section describes how to power up and power down an LCC with fixed configuration AC power shelves installed. For details on the fixed configuration chassis AC power system, see [AC Power Systems](#).

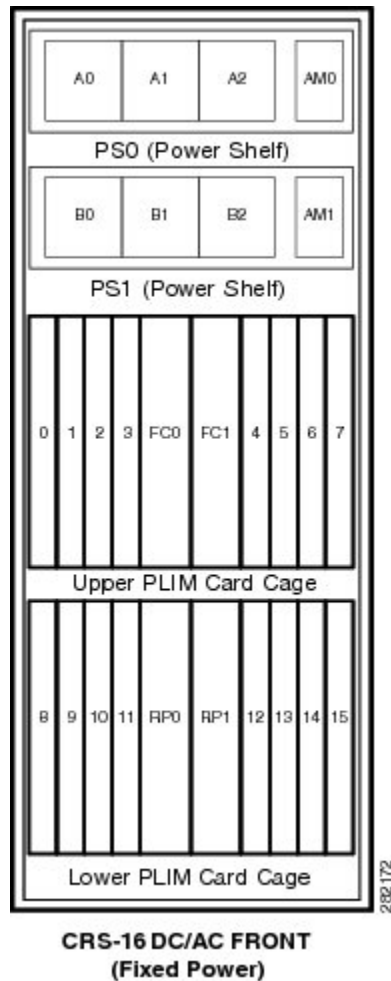
Each power shelf in the LCC has its own I/O switch for shelf power cutoff. Power shelf linkage cuts power to the chassis as a whole when both power shelves are turned off. Most components on the chassis, such as the power shelves, PEMs, alarm modules, and fan trays, can be removed or installed in the chassis while it is running. Although it is possible to install or remove a power shelf while the chassis is running, it is recommended to remove power from the chassis completely, if possible, for service protection and safety.



Note Although the chassis can be powered on by switching on the power shelf I/O switch (if all individual power rectifier I/O switches are in the ON position), this method draws a large power surge on start-up. We recommend following the procedure outlined below to power the chassis on and off.

This figure shows the front (PLIM) side of the LCC with fixed configuration power installed.

Figure 17: LCC Front (PLIM) Side Slot Numbers



Prerequisites

Before performing this task, you must install and wire the power shelves, and install the power modules (AC rectifiers or DC PEMS), and alarm modules. See [Installing a Fixed Configuration Power Shelf](#), [Installing an AC Rectifier or DC PEM](#), and [Installing a Fixed Configuration Alarm Module](#).

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- Multimeter
- 1/4-in. x 6-in. long slotted screwdriver

Steps

To power on the chassis, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Make sure that the safety ground wiring is connected.
3. Make sure that the facility power breakers for the upper (PS0) and lower (PS1) power shelves are in the OFF position.
4. Make sure that all the I/O switches are in an OFF position. That is, make sure all I/O levers are pulled out. There are total of six power levers for the six AC power rectifiers and two power levers for the two AC power shelves.
5. Make sure all boards (RPs, PLIMs, SFCs, and FPs) are pulled-out and disconnected from the backplane.
6. Remove the cover plate from the rear of each fixed configuration AC power shelf.
7. Plug in AC power cords for the upper (PS0) and lower (PS1) power shelf.
8. For AC Delta and AC Wye, verify the following resistance values, as shown in [Figure 12: AC Wye Power Shelf Rear, on page 20](#) and [Figure 13: AC Delta Power Shelf Rear](#), for the upper (PS0) and lower (PS1) power shelf:
9. Make sure that each input power cable one is connected, and energize the facility breaker to each input.
10. Measure the voltage between the following, for the upper (PS0) and lower (PS1) power shelf:
11. Turn the facility breaker for the upper (PS0) and lower (PS1) power shelf to the OFF position.
12. Turn the facility breaker for the upper (PS0) and lower power shelf (PS1) to the ON position.
13. Turn the power shelf I/O switches on both power shelves (PS0 and PS1) to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of each power rectifier is yellow and that no other LEDs are active.
14. Turn the first power rectifier (A0) I/O switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the power rectifier front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (A1 and A2).
15. Turn the first power rectifier (B0) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “Power OK” LED on the power rectifier front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (B1 and B2).
16. Turn the I/O switches on all power rectifiers and both power shelves to the OFF position. Verify that no LEDs on the power rectifiers are active.
17. Insert all boards (RPs, PLIMs, SFCs, and FPs) into the chassis (See *Installing and Removing Line Cards, PLIMs, and Associated Components* chapter for more information).
18. Turn the power shelf I/O switches (PS0 and PS1) to the ON position.
19. Turn all power rectifier I/O switches to the ON position.
20. Measure the input voltage of each input and compare this value to the voltage measurement noted in Step10. Verify that the voltage is between 200 and 240 VAC, ensure that the voltage drop is in the acceptable limits for your site.
21. Turn the I/O switches on all power rectifiers and both power shelves to the OFF position. Turn the facility breaker for the upper (PS0) and lower (PS1) power shelf to the OFF position.
22. Replace the cover plate on the rear of both AC power shelves.
23. Turn the facility breaker for the upper (PS0) and lower (PS1) power shelf to the ON position.
24. Turn both power shelf I/O switches (PS0 and PS1) to the ON position. Turn all power rectifier I/O switches to the ON position.

DETAILED STEPS

- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Make sure that the safety ground wiring is connected.
- Step 3** Make sure that the facility power breakers for the upper (PS0) and lower (PS1) power shelves are in the OFF position.
- Step 4** Make sure that all the I/O switches are in an OFF position. That is, make sure all I/O levers are pulled out. There are total of six power levers for the six AC power rectifiers and two power levers for the two AC power shelves.
- Step 5** Make sure all boards (RPs, PLIMs, SFCs, and FPs) are pulled-out and disconnected from the backplane.
- Step 6** Remove the cover plate from the rear of each fixed configuration AC power shelf.
- Step 7** Plug in AC power cords for the upper (PS0) and lower (PS1) power shelf.
- Step 8** For AC Delta and AC Wye, verify the following resistance values, as shown in [Figure 12: AC Wye Power Shelf Rear, on page 20](#) and [Figure 13: AC Delta Power Shelf Rear](#), for the upper (PS0) and lower (PS1) power shelf:
- From L1 to GND should be greater than 1 MOhms
 - From L2 to GND should be greater than 1 MOhms
 - From L3 to GND should be greater than 1 MOhms
- For AC Wye only, verify the following resistance values:
- From L1 to L4 (Neutral) should be greater than 1 MOhms
 - From L2 to L4 (Neutral) should be greater than 1 MOhms
 - From L3 to L4 (Neutral) should be greater than 1 MOhms
- Step 9** Make sure that each input power cable one is connected, and energize the facility breaker to each input.
- Step 10** Measure the voltage between the following, for the upper (PS0) and lower (PS1) power shelf:
- Between L1 and L2 (AC Delta only)
 - Between L2 and L3 (AC Delta only)
 - Between L3 and L1 (AC Delta only)
 - Between L1 and L4 (AC Wye only)
 - Between L2 and L4 (AC Wye only)
 - Between L3 and L4 (AC Wye only)
- Verify that the AC voltage is between 200 and 240 VAC. Make a note of this voltage measurement.
- Step 11** Turn the facility breaker for the upper (PS0) and lower (PS1) power shelf to the OFF position.
- Step 12** Turn the facility breaker for the upper (PS0) and lower power shelf (PS1) to the ON position.
- Step 13** Turn the power shelf I/O switches on both power shelves (PS0 and PS1) to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of each power rectifier is yellow and that no other LEDs are active.
- Step 14** Turn the first power rectifier (A0) I/O switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the power rectifier front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (A1 and A2).
- Step 15** Turn the first power rectifier (B0) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “Power OK” LED on the power rectifier front panel is green and that no other LEDs are active. Repeat for the other two rectifiers (B1 and B2).

See [Figure 17: LCC Front \(PLIM\) Side Slot Numbers, on page 35](#) figure for reference.

- Step 16** Turn the I/O switches on all power rectifiers and both power shelves to the OFF position. Verify that no LEDs on the power rectifiers are active.
- Step 17** Insert all boards (RPs, PLIMs, SFCs, and FPs) into the chassis (See *Installing and Removing Line Cards, PLIMs, and Associated Components* chapter for more information).
- Step 18** Turn the power shelf I/O switches (PS0 and PS1) to the ON position.
- Step 19** Turn all power rectifier I/O switches to the ON position.
- Step 20** Measure the input voltage of each input and compare this value to the voltage measurement noted in Step 10. Verify that the voltage is between 200 and 240 VAC, ensure that the voltage drop is in the acceptable limits for your site.
- Step 21** Turn the I/O switches on all power rectifiers and both power shelves to the OFF position. Turn the facility breaker for the upper (PS0) and lower (PS1) power shelf to the OFF position.
- Step 22** Replace the cover plate on the rear of both AC power shelves.
- Step 23** Turn the facility breaker for the upper (PS0) and lower (PS1) power shelf to the ON position.
- Step 24** Turn both power shelf I/O switches (PS0 and PS1) to the ON position. Turn all power rectifier I/O switches to the ON position.

What to do next



Note For appropriate MSC, RP, or PLIM LED information, see the appropriate section in [Installing and Removing Line Cards, PLIMs, and Associated Components](#) or the specific documentation for the card.

To power down the chassis entirely, you must power down both power shelves by moving the power shelf I/O switch to the OFF position by lifting up on the lever and pulling it out. Both power shelves must be disconnected to de-energize the chassis completely.

This table shows the meaning of the LED status lights on the AC power rectifiers in the fixed configuration power system.

Table 3: AC Power Rectifier LED Status Indicator Lights—Fixed Configuration Power

LED Name	Color	Function or Meaning
PWR OK	Green	Rectifier module is operating normally in a powered-up condition.
FAULT	Yellow	Fault has been detected in the rectifier.
AC FAIL	Yellow	AC is out of range or the rectifier is not receiving AC power input.
BREAKER TRIP	Yellow	Rectifier power switch is in the OFF position.
OT	Yellow	Rectifier is in an over-temperature condition and a shutdown has occurred.
ILIM	Yellow	Rectifier is operating in a current limit condition.

Power Up and Power Down a Chassis with Fixed Configuration DC Power

This section describes how to power up and power down an LCC with fixed configuration DC power shelves installed. For details on the chassis power systems, see [Basic Chassis Power Details](#) and [DC Power Systems](#).

Each power shelf in the LCC has its own I/O switch for shelf power cutoff. The LCC as a whole does not have a single power switch that powers the entire chassis and all its components up and down. Power shelf linkage cuts power to the chassis as a whole when both power shelves are turned off.

Most components on the chassis, such as the power shelves, power modules, alarm modules, and fan trays, can be removed or installed in the chassis while it is running. Although it is possible to install or remove a power shelf while the chassis is running, it is recommended to remove power from the chassis completely, if possible, for service protection and safety.



Note Although the chassis can be powered on by switching on the two power shelf I/O switches (if all individual power rectifier I/O switches are in the ON position), this method draws a large power surge on start-up. We recommend following the procedure outlined below to power the chassis on and off.

Prerequisites

Before performing this task, you must install and wire the power shelves, install the DC PEMs and alarm modules. See [Installing a Fixed Configuration Power Shelf](#), [Installing an AC Rectifier or DC PEM](#), and [Installing a Fixed Configuration Alarm Module](#). Wiring at the BDFB or at the power plant should be complete.



Note Make sure all PEM, power shelf, and power source circuit breakers and switches are turned off (or open) before you wire the power shelves.

Required Tools and Equipment

- ESD-preventive wrist strap
- Multimeter

Steps

To power on the chassis, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Verify that the safety ground wiring is connected to the upper (PS0) and lower (PS1) power shelves.
3. Make sure that the facility power breakers for the upper (PS0) and lower (PS1) power shelves are in the OFF position.
4. Make sure all the I/O switches are in an OFF position. That is, make sure all power levers are pulled out. There are total of six power levers for the DC PEMs (one for each of the six DC PEMs) and two power levers for the DC power shelves (one for each power shelf).

5. Make sure all boards (RPs, PLIMs, Line Cards, and FCs) are pulled-out and disconnected from the backplane.
6. Energize the facility breaker to PEM 0, input 1 on the upper power shelf, PS0.
7. Measure the voltage at the input terminal block and verify that the DC voltage between the positive and negative terminals is between 42 VDC and 72 VDC. Make a note of this voltage measurement.
8. Turn the facility breaker to the OFF position.
9. Repeat Step 7 and 8 and for each of the remaining five DC inputs on the upper power shelf (PS0).
10. Repeat Step 7 and 8 for each of the six DC inputs on the lower power shelf (PS1).
11. Turn the facility power breakers for the upper (PS0) and lower (PS1) power shelf to the ON position.
12. Turn the upper power shelf (PS0) I/O switch to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of each DC PEM is yellow and that no other LEDs are active.
13. Turn the first PEM (A0) I/O switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the DC PEM front panel is green and that no other LEDs are active. Repeat for the other two PEMs (A1 and A2).
14. Turn the lower power shelf (PS1) circuit breaker to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of each DC PEM is yellow and that no other LEDs are active.
15. Turn the first PEM (B0) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “PWR OK” LED on the DC PEM front panel is green and that no other LEDs are active. Repeat for the other two PEMs (A1 and A2).
16. Turn the I/O switches on all PEMs and both power shelves to the OFF position. Verify that no LEDs on the PEMs are active.
17. Insert all boards into the chassis (For more information, *Installing and Removing Line Cards, PLIMs, and Associated Components* chapter).
18. Turn the power shelf I/O switches (PS0 and PS1) to the ON position.
19. Turn all DC PEM I/O switches to the ON position.
20. Measure the input voltage of each input and compare this value to the voltage measurement noted in Step 7. Verify that the equipment is still receiving the correct input voltage measured in Step 7.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Verify that the safety ground wiring is connected to the upper (PS0) and lower (PS1) power shelves.
- Step 3** Make sure that the facility power breakers for the upper (PS0) and lower (PS1) power shelves are in the OFF position.
- Step 4** Make sure all the I/O switches are in an OFF position. That is, make sure all power levers are pulled out. There are total of six power levers for the DC PEMs (one for each of the six DC PEMs) and two power levers for the DC power shelves (one for each power shelf).
- Step 5** Make sure all boards (RPs, PLIMs, Line Cards, and FCs) are pulled-out and disconnected from the backplane.
- Step 6** Energize the facility breaker to PEM 0, input 1 on the upper power shelf, PS0.
- Caution** Make sure that the polarity of the DC input wiring is correct.
- Caution** This is a positive ground system; make sure to connect the positive lead to the +RTN terminal and the negative lead to the -48V terminal.
- Step 7** Measure the voltage at the input terminal block and verify that the DC voltage between the positive and negative terminals is between 42 VDC and 72 VDC. Make a note of this voltage measurement.

- Step 8** Turn the facility breaker to the OFF position.
- Step 9** Repeat Step 7 and 8 and for each of the remaining five DC inputs on the upper power shelf (PS0).
- Step 10** Repeat Step 7 and 8 for each of the six DC inputs on the lower power shelf (PS1).
- Step 11** Turn the facility power breakers for the upper (PS0) and lower (PS1) power shelf to the ON position.
- Step 12** Turn the upper power shelf (PS0) I/O switch to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of each DC PEM is yellow and that no other LEDs are active.
- Step 13** Turn the first PEM (A0) I/O switch on the upper power shelf (PS0) to the ON position. Verify that the “PWR OK” LED on the DC PEM front panel is green and that no other LEDs are active. Repeat for the other two PEMs (A1 and A2).
- Step 14** Turn the lower power shelf (PS1) circuit breaker to the ON position. Verify that the “CBREAKER TRIP” LED on the front panel of each DC PEM is yellow and that no other LEDs are active.
- Step 15** Turn the first PEM (B0) I/O switch on the lower power shelf (PS1) to the ON position. Verify that the “PWR OK” LED on the DC PEM front panel is green and that no other LEDs are active. Repeat for the other two PEMs (A1 and A2).
- See [Figure 17: LCC Front \(PLIM\) Side Slot Numbers, on page 35](#) figure for reference.
- Step 16** Turn the I/O switches on all PEMs and both power shelves to the OFF position. Verify that no LEDs on the PEMs are active.
- Step 17** Insert all boards into the chassis (For more information, *Installing and Removing Line Cards, PLIMs, and Associated Components* chapter).
- Step 18** Turn the power shelf I/O switches (PS0 and PS1) to the ON position.
- Step 19** Turn all DC PEM I/O switches to the ON position.
- Step 20** Measure the input voltage of each input and compare this value to the voltage measurement noted in Step 7. Verify that the equipment is still receiving the correct input voltage measured in Step 7.

What to do next



Note For appropriate MSC, RP, or PLIM LED information, see the appropriate section in *Installing and Removing Line Cards, PLIMs, and Associated Components* or the specific documentation for the card.

To power down the chassis entirely, you must power down both of the power shelves by moving the power shelf power switch to the OFF position by lifting **up** on the lever and pulling it out. Both power shelves must be disconnected to de-energize the chassis completely.

This table shows the meaning of the LED status lights on the DC PEMs.

Table 4: Fixed Configuration DC PEM LED Status Indicator Lights

LED Name	Color	Function or Meaning
PWR OK	Green	PEM is operating normally in a powered up condition.
FAULT	Yellow	Fault has been detected within the PEM.
DC INPUT FAIL	Yellow	DC input is out of range or is not being provided to the PEM.

LED Name	Color	Function or Meaning
OT	Yellow	PEM is in an over temperature condition and shutdown has occurred.
CBREAKER TRIP	Yellow	PEM I/O switch is in the OFF position.

Converting from One Fixed Configuration Power System to Another

This section describes how to convert from one fixed configuration power system to another (either from fixed AC to fixed DC or from fixed DC to fixed AC).

Steps

To convert an LCC with a fixed configuration power system from AC to DC power, or from DC to AC power, perform the following steps:

SUMMARY STEPS

1. Power down the chassis completely. See [Powering Up and Down a Chassis with Fixed Configuration AC Power](#) or [Power Up and Power Down a Chassis with Fixed Configuration DC Power](#).
2. Remove the alarm modules. See [Removing a Fixed Configuration Alarm Module](#).
3. Remove the DC PEMs or AC rectifiers. See [Removing an AC rectifier or DC PEM](#).
4. Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the rear of the fixed configuration power shelf. Remove the AC power cords or DC wiring and ground wire from the rear of the fixed configuration power shelves. See [Removing Fixed Configuration AC Power Cords](#) and [Removing Fixed Configuration DC Power Shelf Wiring](#).
5. Remove both power shelves. See [Removing a Fixed Configuration Power Shelf](#).
6. Install the new power shelves. See [Installing a Fixed Configuration Power Shelf](#).
7. Install the wiring on the rear of the power shelf. See [Installing Fixed Configuration AC Power Cords](#) section on page 2-20 or [Installing Fixed Configuration DC Power Shelf Wiring](#).
8. Install the DC PEMs or AC rectifiers. See [Installing an AC Rectifier or DC PEM](#).
9. Install the alarm module. See [Installing a Fixed Configuration Alarm Module](#).
10. Replace the DC fuses or restore AC service.
11. Power the chassis back up. See [Powering Up and Down a Chassis with Fixed Configuration AC Power](#) or [Power Up and Power Down a Chassis with Fixed Configuration DC Power](#).

DETAILED STEPS

-
- Step 1** Power down the chassis completely. See [Powering Up and Down a Chassis with Fixed Configuration AC Power](#) or [Power Up and Power Down a Chassis with Fixed Configuration DC Power](#).
- Step 2** Remove the alarm modules. See [Removing a Fixed Configuration Alarm Module](#).
- Step 3** Remove the DC PEMs or AC rectifiers. See [Removing an AC rectifier or DC PEM](#).
- Step 4** Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the rear of the fixed configuration power shelf. Remove the AC power cords or DC wiring and ground wire from the rear of the fixed configuration power shelves. See [Removing Fixed Configuration AC Power Cords](#) and [Removing Fixed Configuration DC Power Shelf Wiring](#).
- Step 5** Remove both power shelves. See [Removing a Fixed Configuration Power Shelf](#).

- Step 6** Install the new power shelves. See [Installing a Fixed Configuration Power Shelf](#).
- Step 7** Install the wiring on the rear of the power shelf. See [Installing Fixed Configuration AC Power Cords](#) section on page 2-20 or [Installing Fixed Configuration DC Power Shelf Wiring](#).
- Step 8** Install the DC PEMs or AC rectifiers. See [Installing an AC Rectifier or DC PEM](#).
- Step 9** Install the alarm module. See [Installing a Fixed Configuration Alarm Module](#).
- Step 10** Replace the DC fuses or restore AC service.
- Step 11** Power the chassis back up. See [Powering Up and Down a Chassis with Fixed Configuration AC Power](#) or [Power Up and Power Down a Chassis with Fixed Configuration DC Power](#).

What to do next



Caution Use only one type of fixed configuration power shelf—AC Wye, AC Delta, or DC—and its mating AC rectifier or DC PEM in a chassis at one time.

Installing and Removing Modular Configuration Power Components

This section describes how to install and remove modular configuration power components in the LCC.

Before you can install the modular configuration power components, you must install the modular configuration power shelf into the chassis. After installing the power shelf, you can install the power self wiring, install the PMs and install the alarm module into the power shelf.



Note Although there are differences between the different types of power shelves and PMs (AC and DC), they are installed and removed using the same procedures.

If you are replacing a fixed configuration power system with a modular configuration power system, see [Converting a Chassis from Fixed Configuration Power to Modular Configuration Power](#).

Installing a Modular Configuration Power Shelf

This section describes how to install the modular configuration AC or DC power shelves in the LCC. For complete information on regulatory compliance and safety, see *Regulatory Compliance and Safety Information for the Cisco CRS*.



Caution Do not use the handles for lifting or supporting the power shelf, because this could severely damage the handles.



Caution Do not bend the handles sideways during any part of the installation process.

Although there are differences between the AC and DC power shelves, they are installed and removed using the same procedures.

The front and rear views of the modular configuration DC power shelves are shown in the following figures.

Figure 18: DC Modular Configuration Power Shelf, Front View

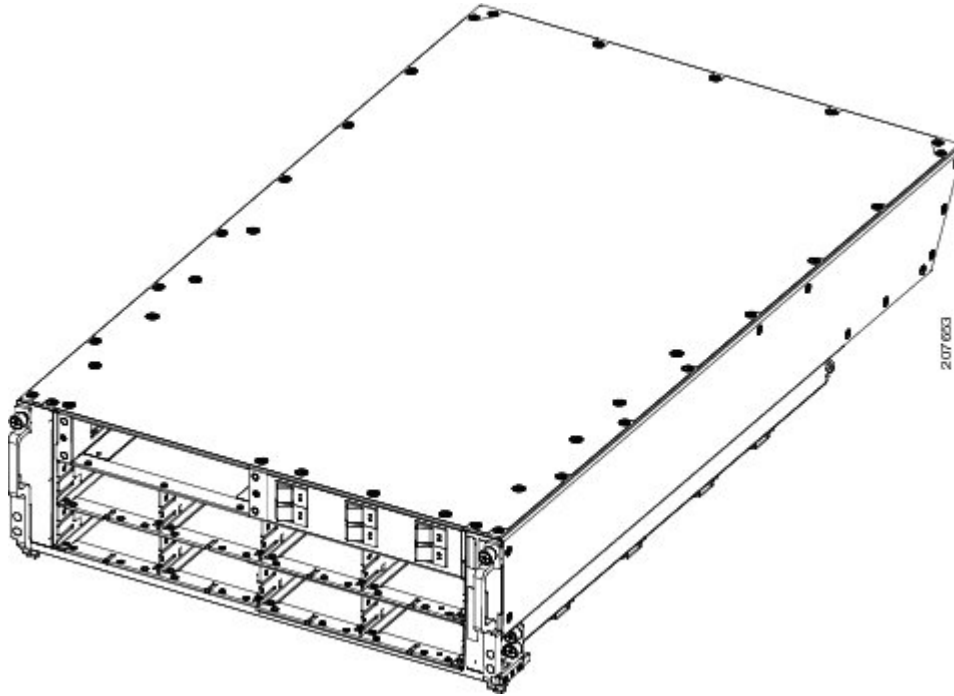
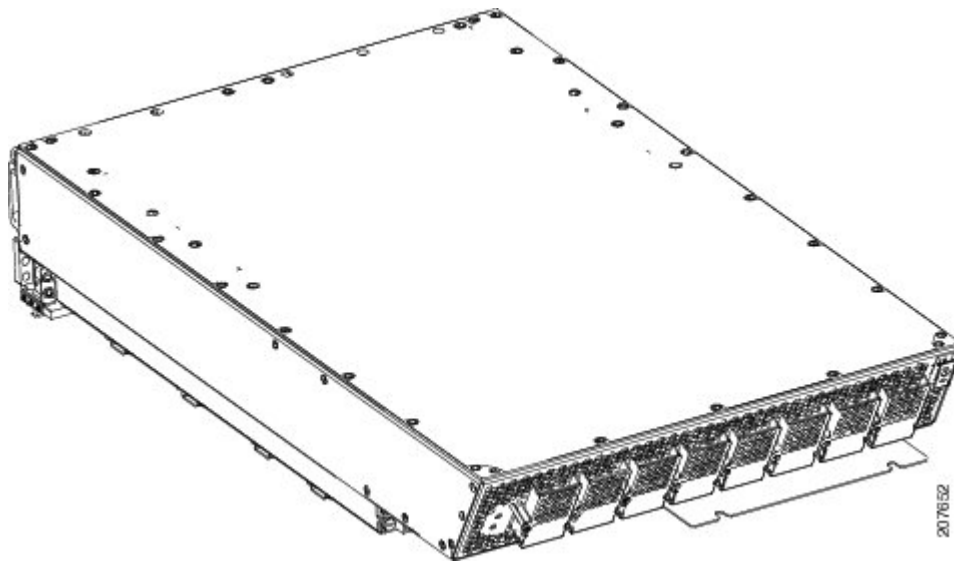


Figure 19: DC Modular Configuration Power Shelf, Rear View



The front and rear views of the modular configuration AC power shelf are shown in the next figures.

Figure 20: AC Modular Configuration Power Shelf—Front View

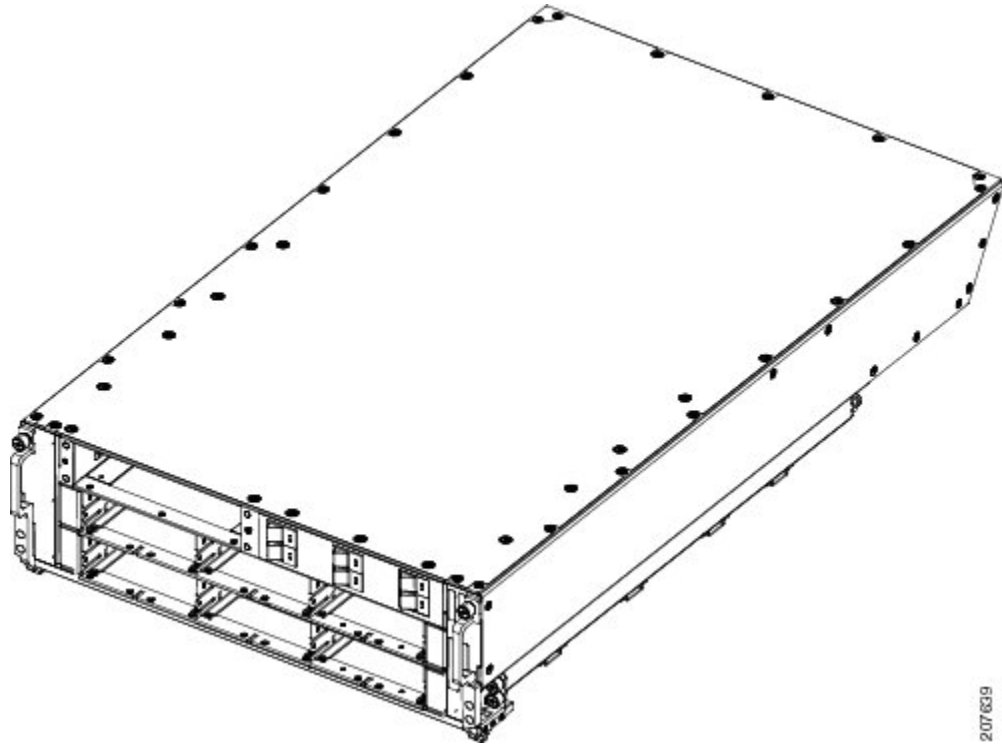
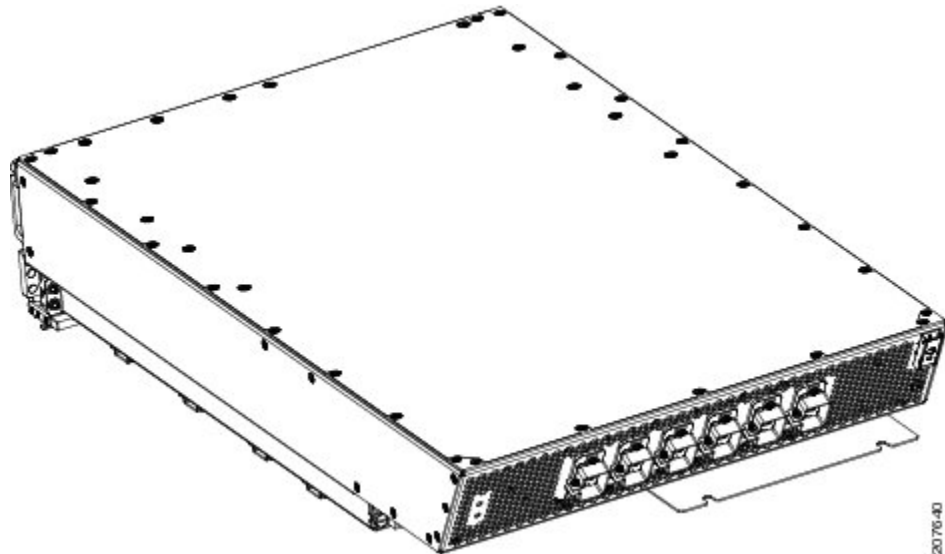


Figure 21: AC Modular Configuration Power Shelf, Rear View



Prerequisites

Remove the upper grilles from both the front (PLIM) and rear (MSC) sides of the chassis, if installed. Verify that the power shelf that you are about to install is the correct power shelf.



Note Do not install the power shelf in the chassis with AC or DC PMs, or alarm module installed in the power shelf.

Required Tools and Equipment

- 6-in. long number 1 Phillips screwdriver
- 10-mm 6 pt. combination wrench
- Modular configuration AC or DC power shelf
 - AC power shelf (Cisco product number CRS-16LCC-PSH-AC=), or
 - DC power shelf (Cisco product number CRS-16LCC-PSH-DC=)

Steps

To install the modular configuration power shelf, perform the following steps:

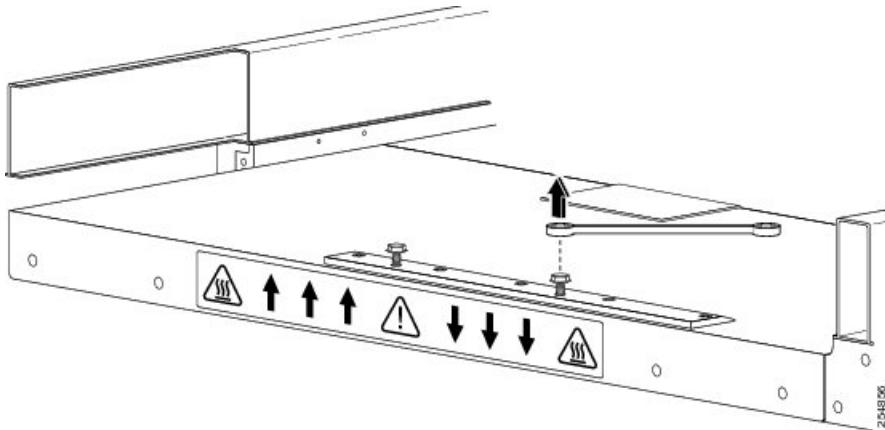
SUMMARY STEPS

1. Using the 10-mm wrench, loosen the two bolts on the rear of the chassis that clamp the rear of the power shelf to the chassis, as shown in this figure.
2. Install the mounting blocks on the left and right sides of the chassis. The left side is shown in the next figure. A second mounting block is located on the right side.
3. Unscrew the ejector handles from the front face of the shelf, one on each side.
4. Holding the power shelf underneath with one hand and steadying it with the other, lift the shelf up and slide it partway into the power shelf slot on the front (PLIM) side of the chassis.
5. Grasping both handles simultaneously, push both the left and right handles up in at the same time to push the shelf into the chassis. Slide the shelf all the way into the chassis, pushing in the shelf until both handles hook around the pins.
6. Using the wrench, tighten the two bolts that attach the rear of the power shelf to the rear of the chassis.
7. Using the screwdriver, turn the captive screws at the top of the left and right handles.
8. Use the screwdriver to screw the shelf to the left and right mounting blocks through the handle holes. There are four holes, two on each handle.

DETAILED STEPS

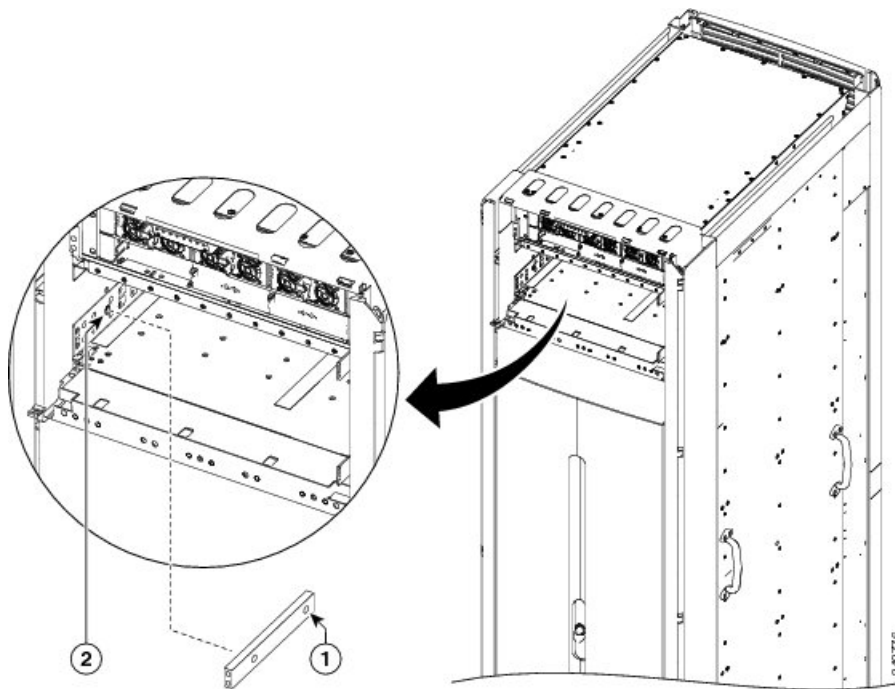
-
- Step 1** Using the 10-mm wrench, loosen the two bolts on the rear of the chassis that clamp the rear of the power shelf to the chassis, as shown in this figure.

Figure 22: Loosening Bolts on Rear of Chassis



- Step 2** Install the mounting blocks on the left and right sides of the chassis. The left side is shown in the next figure. A second mounting block is located on the right side.

Figure 23: Mounting Block Position in Chassis, One per Side



1	Mounting block with two screw holes
2	Holes in chassis to be aligned with the mounting block

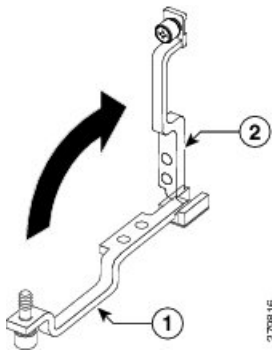
- Step 3** Unscrew the ejector handles from the front face of the shelf, one on each side.
- Step 4** Holding the power shelf underneath with one hand and steadying it with the other, lift the shelf up and slide it partway into the power shelf slot on the front (PLIM) side of the chassis.

Caution Because of the weight of the power shelf and the rack-mounted height of the chassis, you should be especially careful while lifting and removing the power shelf. To prevent injury, keep your back straight and lift with your legs, not your back. Avoid sudden twists or lateral moves. It is safer to use two people and a ladder to install or remove the power shelf rather than a single person. After two people have placed the power shelf in position, one person can slide it into place.

Step 5 Grasping both handles simultaneously, push both the left and right handles up in at the same time to push the shelf into the chassis. Slide the shelf all the way into the chassis, pushing in the shelf until both handles hook around the pins.

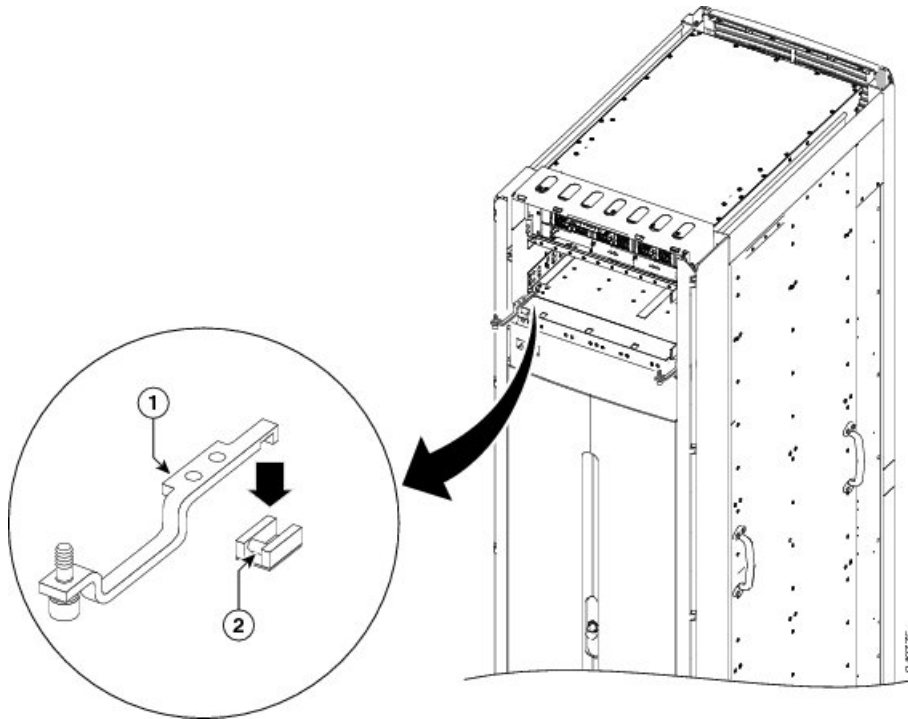
Caution Make sure both handles swing straight up. Use care not to bend the handles sideways.

Figure 24: Ejector Handle



1	Ejector handle pulled away from the shelf
2	Ejector handle pushed up to slide in the shelf

Figure 25: Shelf Handles Hooked Around Pins



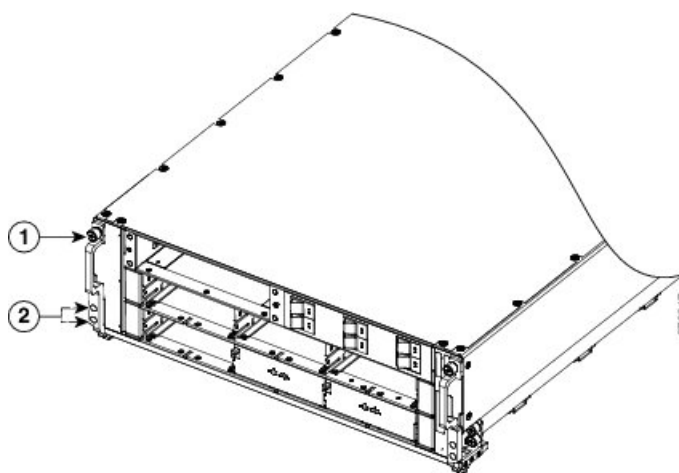
1	Ejector handles section that fits around mounting pins
2	Mounting pins that are permanently installed in the chassis and cannot be moved or removed

Step 6 Using the wrench, tighten the two bolts that attach the rear of the power shelf to the rear of the chassis.

Step 7 Using the screwdriver, turn the captive screws at the top of the left and right handles.

Step 8 Use the screwdriver to screw the shelf to the left and right mounting blocks through the handle holes. There are four holes, two on each handle.

Figure 26: Securing the Power Shelf Ejector Handle



1	Top mounting screw in handle.
2	Holes for the screw that attaches the power shelf to the mounting block through the handle.

What to do next

After the modular configuration power shelves are installed in the chassis, install the grounding lug and brackets, and AC or DC power shelf wiring. Continue to *Installing Power Shelf Grounding Brackets* and *Installing AC or DC Power Shelf Wiring* for instructions.

Removing a Modular Configuration Power Shelf

This section describes how to remove the modular configuration power shelf from the LCC.

Prerequisites

Before performing this task, remove the upper grilles from the front (PLIM) and rear (MSC) sides of the chassis (if installed), the AC or DC PMs, alarm module, AC or DC input power wiring from the shelf that you want to disconnect, and power shelf grounding brackets. For more information, see [Removing a Modular Configuration Power Module](#), [Removing a Modular Configuration Alarm Module](#), [Removing AC or DC Power Shelf Wiring](#), and [Removing Power Shelf Grounding Brackets](#).

Required Tools and Equipment

- 6 in. long number 1 Phillips screwdriver
- 10-mm 6 pt. combination wrench



Caution

Do not use the handles for lifting or supporting the power shelf, because this could severely damage the handles.



Caution

Do not bend the handles sideways during any part of the removal process.

Steps

To remove a modular configuration power shelf, perform the following steps:

SUMMARY STEPS

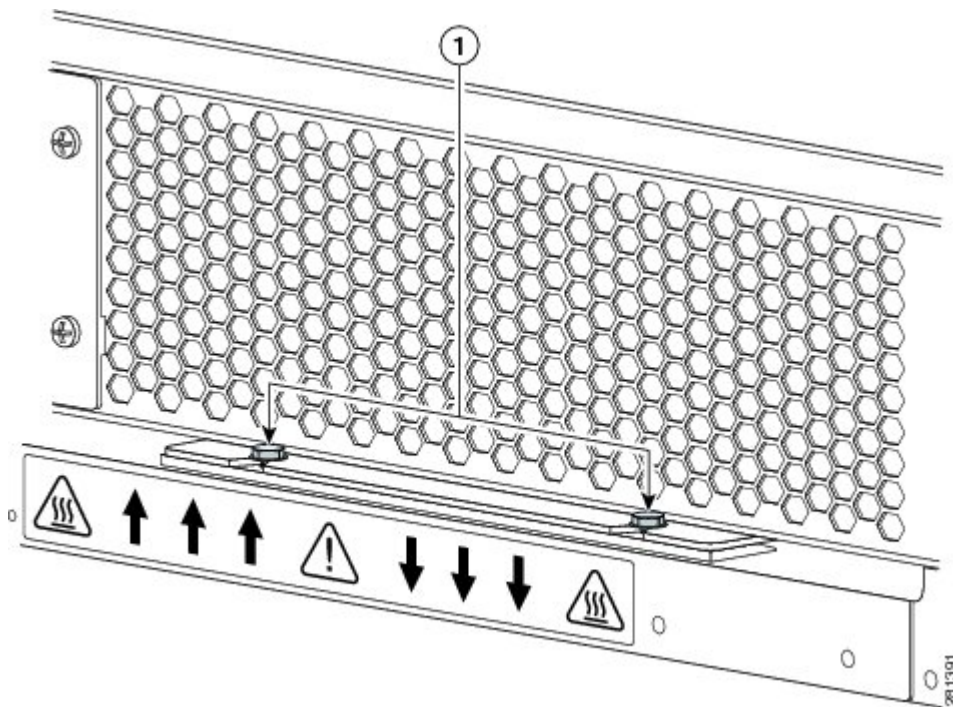
1. Using the wrench, loosen the two bolts on the rear of the chassis that clamp the rear of the power shelf to the chassis.
2. Insert the screwdriver through the hole in the mounting handles, and unscrew the shelf from the right and left side of the mounting blocks.
3. Using the screwdriver, unscrew captive screw on the left and right handles (see previous figure).

4. Grasping both handles simultaneously, pull both the left and right handles down at the same time to pull the shelf partially out of the chassis.
5. When the shelf is partially out of the chassis and the ejector handles are away from the pins, hand-tighten the handle screws back into the shelf.
6. Slide out the shelf out so that two people can safely remove it and carefully set it down on a flat surface.

DETAILED STEPS

Step 1 Using the wrench, loosen the two bolts on the rear of the chassis that clamp the rear of the power shelf to the chassis.

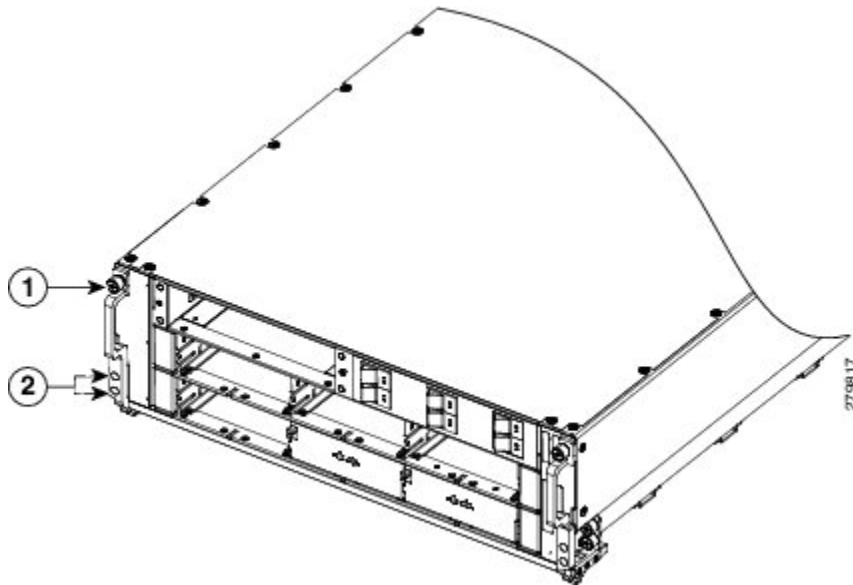
Figure 27: Remove Bolts that Secure Rear of Power Shelf to Chassis



1 Bolts to be loosened that secure rear of power shelf to chassis

Step 2 Insert the screwdriver through the hole in the mounting handles, and unscrew the shelf from the right and left side of the mounting blocks.

Figure 28: Unscrewing Power Shelf Ejector Handle

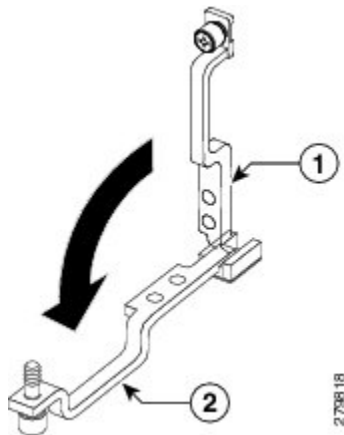


1	Top mounting screw in handle.
2	Holes for the screw that attaches the power shelf to the mounting block through the handle.

Step 3 Using the screwdriver, unscrew captive screw on the left and right handles (see previous figure).

Note The handles will fall down and slightly away from the shelf.

Figure 29: Mounting Handle Fallen Away from the Shelf



1	Initial position, with handle in place against power shelf
2	Handle pulled down for removal of power shelf

Step 4 Grasping both handles simultaneously, pull both the left and right handles down at the same time to pull the shelf partially out of the chassis.

Step 5 When the shelf is partially out of the chassis and the ejector handles are away from the pins, hand-tighten the handle screws back into the shelf.

Step 6 Slide out the shelf out so that two people can safely remove it and carefully set it down on a flat surface.

Caution Because of the weight of the power shelf and the rack-mounted height of the chassis, you should be especially careful while lifting and removing the power shelf. To prevent injury, keep your back straight and lift with your legs, not your back. Avoid sudden twists or lateral moves. It is safer to use two people and a ladder to install or remove the power shelf rather than a single person. After two people have placed the power shelf in position, one person can slide it into place.

What to do next

After performing this task, replace the upper grille on the front (PLIM) and rear (MSC) sides of the chassis.

Installing Power Shelf Grounding Brackets

This section describes how to install the external grounding brackets on the LCC modular configuration power shelf. The installation procedure for installing the power shelf grounding brackets is the same for both the AC and DC modular configuration power shelves.



Caution Verify that the chassis is connected to a reliable earth ground; the chassis ground cable must be installed in accordance with local electrical safety standards. For more information, see [Bonding and Grounding Guidelines](#).

Prerequisites

Before performing this task, ensure that the chassis grounding cable and both power shelves are installed in the chassis. See [Installing Power Shelf Grounding Brackets](#) and [Installing a Modular Configuration Power Shelf](#).

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 3/8-in. ratchet wrench with 10-mm socket
- Torque wrench with 10-mm socket and rated accuracy at 20 in.-lb (2.26 N-m)

Steps

To install the power shelf grounding brackets, go to the rear (MSC) of the chassis and perform the following steps:

SUMMARY STEPS

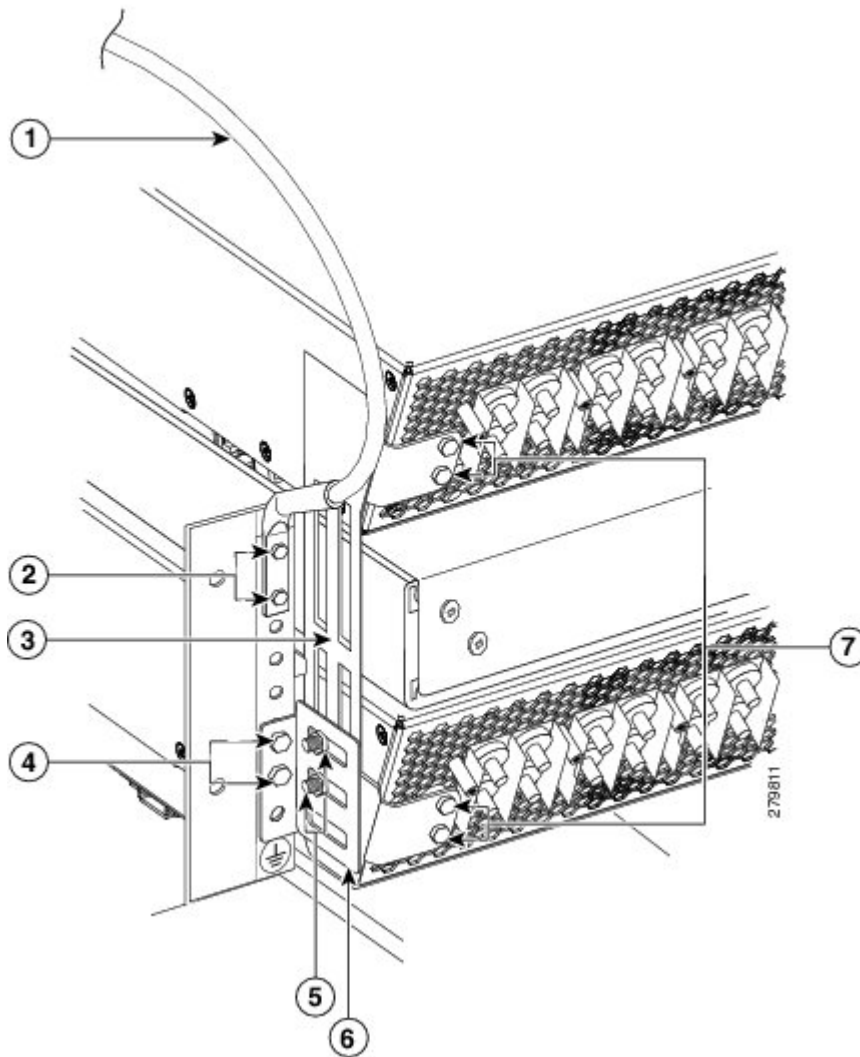
1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Align the shelf grounding bracket with the power shelves.

3. Attach the shelf grounding bracket to both power shelves using the four M6 hex head bolts provided. Do not tighten (see the next figure).
4. Attach the grounding L-bracket to the shelf grounding bracket using the two M6 hex nuts provided. Do not tighten (see the next figure).
5. Attach the grounding L-bracket to the chassis using the two M6 hex bolts provided. Using the torque wrench, tighten the M6 hex bolts to a torque of 20 in.-lb (2.26 N-m).
6. Using the torque wrench, tighten the four M6 hex bolts attaching the grounding bracket to the power shelves to a torque of 20 in.-lb (2.26 N-m).
7. Using the torque wrench, tighten the two M6 hex nuts attaching the grounding L-bracket to the power shelf to a torque of 20 in.-lb (2.26 N-m).

DETAILED STEPS

- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Align the shelf grounding bracket with the power shelves.
- Step 3** Attach the shelf grounding bracket to both power shelves using the four M6 hex head bolts provided. Do not tighten (see the next figure).
- Step 4** Attach the grounding L-bracket to the shelf grounding bracket using the two M6 hex nuts provided. Do not tighten (see the next figure).

Figure 30: Grounding Brackets



1	Chassis ground cable	5	Two M6 hex nuts attaching grounding L-bracket to shelf grounding bracket (Step 4)
2	Two M6 hex bolts attaching ground lug to chassis	6	Grounding L-bracket (Step 5)
3	Shelf grounding bracket (Step 3)	7	Four M6 hex bolts attaching shelf grounding bracket to power shelves (Step 3)
4	Two M6 hex bolts attaching grounding L-bracket to chassis (Step 5)		

Note A 45-degree grounding lug is shown in previous figure. A 180-degree (straight) grounding lug can also be used.

Step 5 Attach the grounding L-bracket to the chassis using the two M6 hex bolts provided. Using the torque wrench, tighten the M6 hex bolts to a torque of 20 in.-lb (2.26 N-m).

- Step 6** Using the torque wrench, tighten the four M6 hex bolts attaching the grounding bracket to the power shelves to a torque of 20 in.-lb (2.26 N-m).
- Step 7** Using the torque wrench, tighten the two M6 hex nuts attaching the grounding L-bracket to the power shelf to a torque of 20 in.-lb (2.26 N-m).

What to do next

After the power shelf grounding brackets have been installed in the chassis, install the input wiring for the power shelf ([Installing AC or DC Power Shelf Wiring](#)), install the alarm module ([Installing a Modular Configuration Alarm Module](#)), and install the PMs ([Installing a Modular Configuration Power Module](#)).

Removing Power Shelf Grounding Brackets

This section describes how to remove the power shelf grounding brackets for the LCC modular configuration power supply. The procedure for removing the power shelf grounding brackets is the same for both the AC and DC modular configuration power supplies.

Prerequisites

Before performing this task, power down and remove any PMs and the alarm module in the shelf you want to remove, and remove the power wiring. See [Power Up and Power Down a Chassis with Modular Configuration Power](#), [Removing a Modular Configuration Power Module](#), [Removing a Modular Configuration Alarm Module](#), and [Removing AC or DC Power Shelf Wiring](#).

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 3/8-in. ratchet wrench with 10-mm socket

Steps

To remove the power shelf grounding brackets, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (MSC) side of the chassis or a bare metal surface on the chassis.
2. Using a 10 mm socket wrench, loosen the two M6 hex nuts that attach the grounding L-bracket to the power shelf. Do not fully remove.
3. Using a 10 mm socket wrench, loosen the four M6 hex bolts that attach the grounding bracket to the power shelves. Do not fully remove.
4. Use a 10 mm socket wrench to remove the two M6 hex bolts that attach the grounding L-bracket to the chassis.
5. Remove the two M6 hex nuts that attach the grounding L-bracket to the shelf grounding bracket.
6. Remove the grounding L-bracket.
7. Remove the four M6 hex bolts that attach the shelf grounding bracket to the power shelves.
8. Remove the shelf grounding bracket from the power shelves.

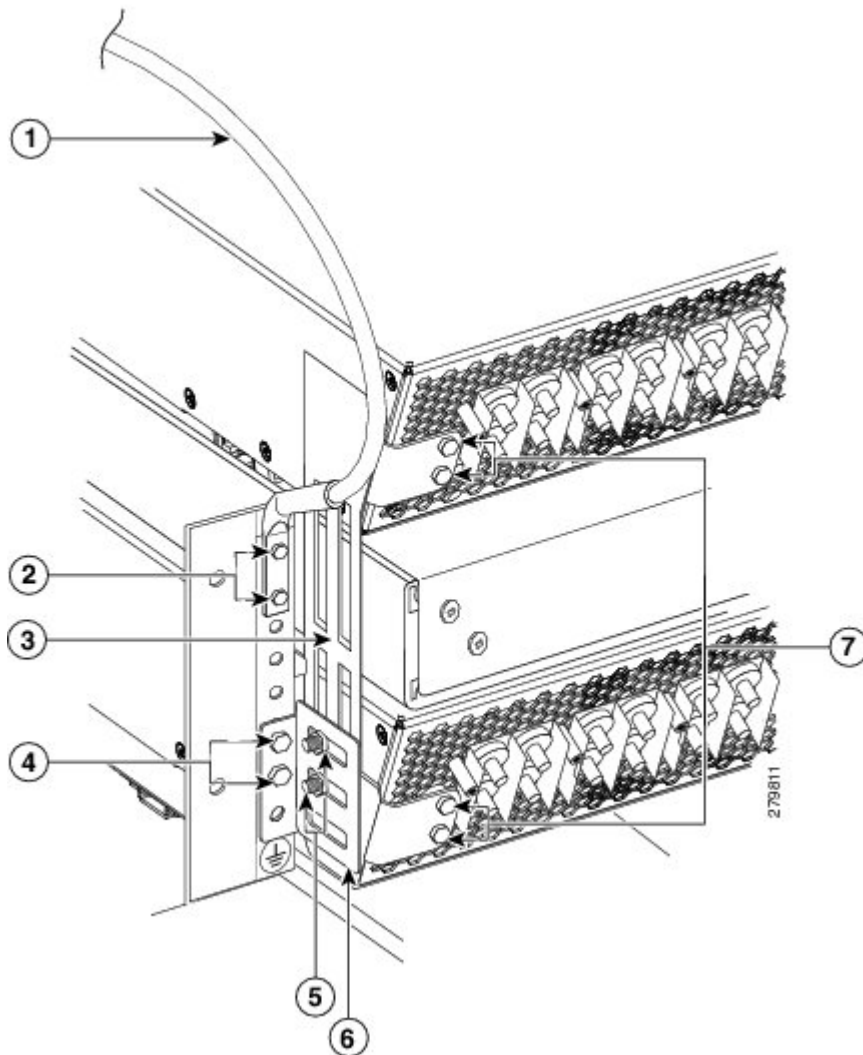
9. If the chassis is being replaced, use the 10-mm socket wrench to remove the ground cable from the grounding point on top of the chassis rear (MSC) side panel.

DETAILED STEPS

Step 1 Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the rear (MSC) side of the chassis or a bare metal surface on the chassis.

Step 2 Using a 10 mm socket wrench, loosen the two M6 hex nuts that attach the grounding L-bracket to the power shelf. Do not fully remove.

Figure 31: Grounding Brackets



1	Chassis ground cable	5	Two M6 hex nuts attaching grounding L-bracket to shelf grounding bracket (Step 4)
2	Two M6 hex bolts attaching ground lug to chassis	6	Grounding L-bracket (Step 5)

3	Shelf grounding bracket (Step 3)	7	Four M6 hex bolts attaching shelf grounding bracket to power shelves (Step 3)
4	Two M6 hex bolts attaching grounding L-bracket to chassis (Step 5)		

Note A 45-degree grounding lug is shown in the previous figure. A 180-degree (straight) grounding lug can also be used.

- Step 3** Using a 10 mm socket wrench, loosen the four M6 hex bolts that attach the grounding bracket to the power shelves. Do not fully remove.
- Step 4** Use a 10 mm socket wrench to remove the two M6 hex bolts that attach the grounding L-bracket to the chassis.
- Step 5** Remove the two M6 hex nuts that attach the grounding L-bracket to the shelf grounding bracket.
- Step 6** Remove the grounding L-bracket.
- Step 7** Remove the four M6 hex bolts that attach the shelf grounding bracket to the power shelves.
- Step 8** Remove the shelf grounding bracket from the power shelves.
- Step 9** If the chassis is being replaced, use the 10-mm socket wrench to remove the ground cable from the grounding point on top of the chassis rear (MSC) side panel.

Caution Do not remove the chassis ground cable unless the chassis is being replaced.

What to do next

After the power shelf grounding brackets have been removed, the power shelf can be removed from the chassis. See [Removing a Modular Configuration Power Shelf](#).

Installing AC or DC Power Shelf Wiring

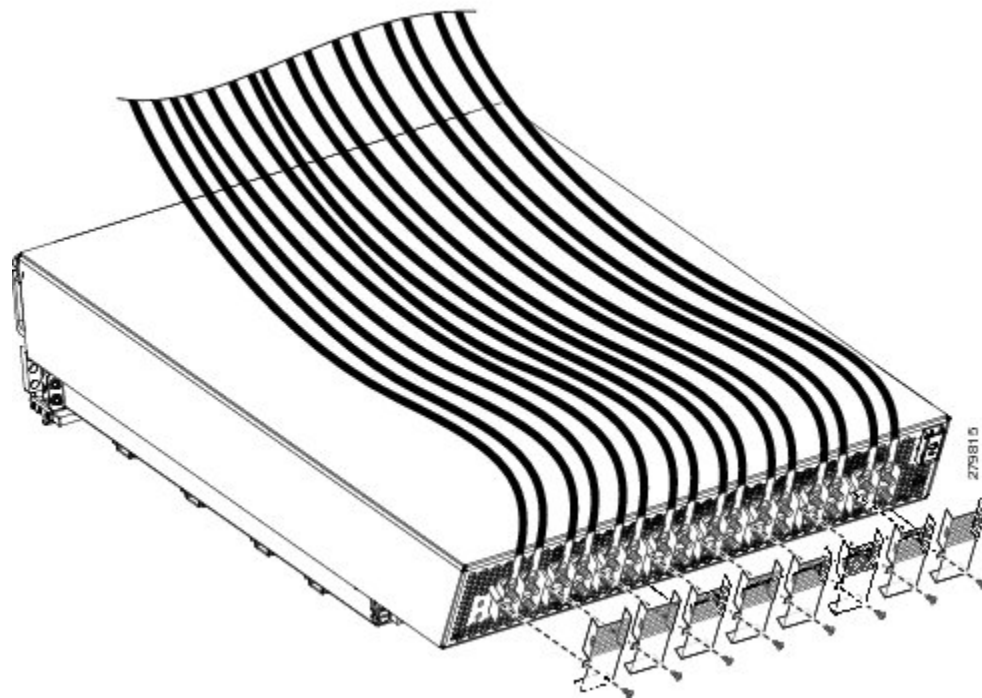
This section describes how to connect the DC input wiring to the rear of the power shelf and install the DC terminal block covers and AC cords on the LCC. For complete information on regulatory compliance and safety, see *Regulatory Compliance and Safety Information for the Cisco CRS Carrier Routing System*.

Installing Modular Configuration DC Power Shelf Wiring

This section describes how to connect the DC input wiring to the rear of the power shelf and install the DC terminal block covers on the LCC.

This figure shows the cable wiring for the modular configuration power shelf.

Figure 32: DC Power Shelf Cable Wiring for Modular Configuration Power Shelf



Note When wiring the power shelf, be sure to connect the chassis ground cable and install auxiliary grounding brackets first. For more information, see [Bonding and Grounding Guidelines](#) and [Installing Power Shelf Grounding Brackets](#).



Caution Do not connect the ground cables directly to the modular configuration power shelf. For more information, see [Installing Power Shelf Grounding Brackets](#).

Prerequisites

Before performing this task, ensure that both power shelves are installed in the chassis. Remove the upper grille from the rear (MSC) side of the chassis, if installed.



Note Before installing wiring on the power shelf, make sure that the input power cables are not energized.

Required Tools and Equipment

- ESD-preventive wrist strap
- Crimping tool and lug specific die
- 3/8 in. ratchet wrench with 10-mm socket

- Torque wrench with 10-mm 6 pt. socket and rated accuracy at 20 in.-lb (2.26 N-m)

Steps

To wire the modular configuration DC power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Remove the terminal block cover.
3. Verify the following resistance values:
4. Use the crimping tool mandated by the lug manufacturer to crimp the lugs to the DC-input cables. For details on lugs, see [DC Power Systems](#).
5. Using the wrench, attach the positive and negative cable pairs to each terminal block for both power shelves. Use the torque wrench to tighten to a torque of 20 in.-lb (2.26 N-m).
6. Reattach the terminal cover. For more information, see [Installing DC Terminal Block Covers](#).

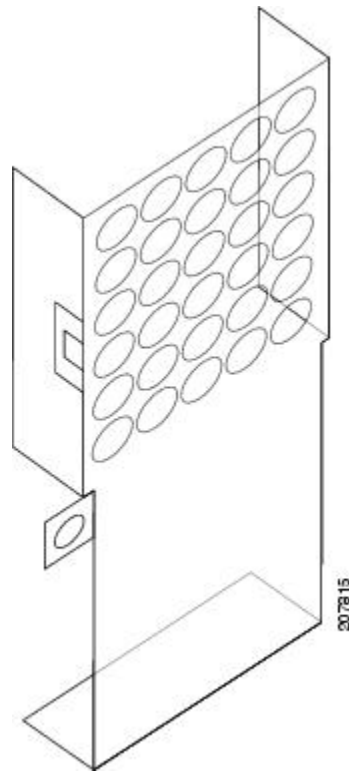
DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Remove the terminal block cover.
- Step 3** Verify the following resistance values:
- The resistance between the positive and negative power terminal studs of each input must be greater than 90 KOhm.
 - The resistance between each positive terminal stud and bare metal surface on the power shelf must be greater than 10 MOhm.
 - The resistance between each negative terminal stud and bare metal surface on the power shelf must be greater than 10 MOhm.
- Step 4** Use the crimping tool mandated by the lug manufacturer to crimp the lugs to the DC-input cables. For details on lugs, see [DC Power Systems](#).
- The cable should be sized according to local and national installation requirements. Use only copper cable.
- Note** The power supply terminal block lug opening width is 0.63 inch (1.60 cm). The terminal posts are centered 0.63 inches (5/8 inch) (1.60 cm) apart and are M6-threaded. We recommend that you use an appropriately sized 180-degree (straight) industry standard 2-hole, standard barrel compression lug.
- Step 5** Using the wrench, attach the positive and negative cable pairs to each terminal block for both power shelves. Use the torque wrench to tighten to a torque of 20 in.-lb (2.26 N-m).
- Step 6** Reattach the terminal cover. For more information, see [Installing DC Terminal Block Covers](#).
-

Installing DC Terminal Block Covers

This figure shows the DC terminal block cover.

Figure 33: DC Terminal Block Cover



Caution Install the terminal block cover after the input wiring is installed, but before power has been energized.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 6-in. long Number 1 Phillips screwdriver

Steps

To install the DC terminal block covers, go to the rear (MSC) side of the chassis and perform the following steps:

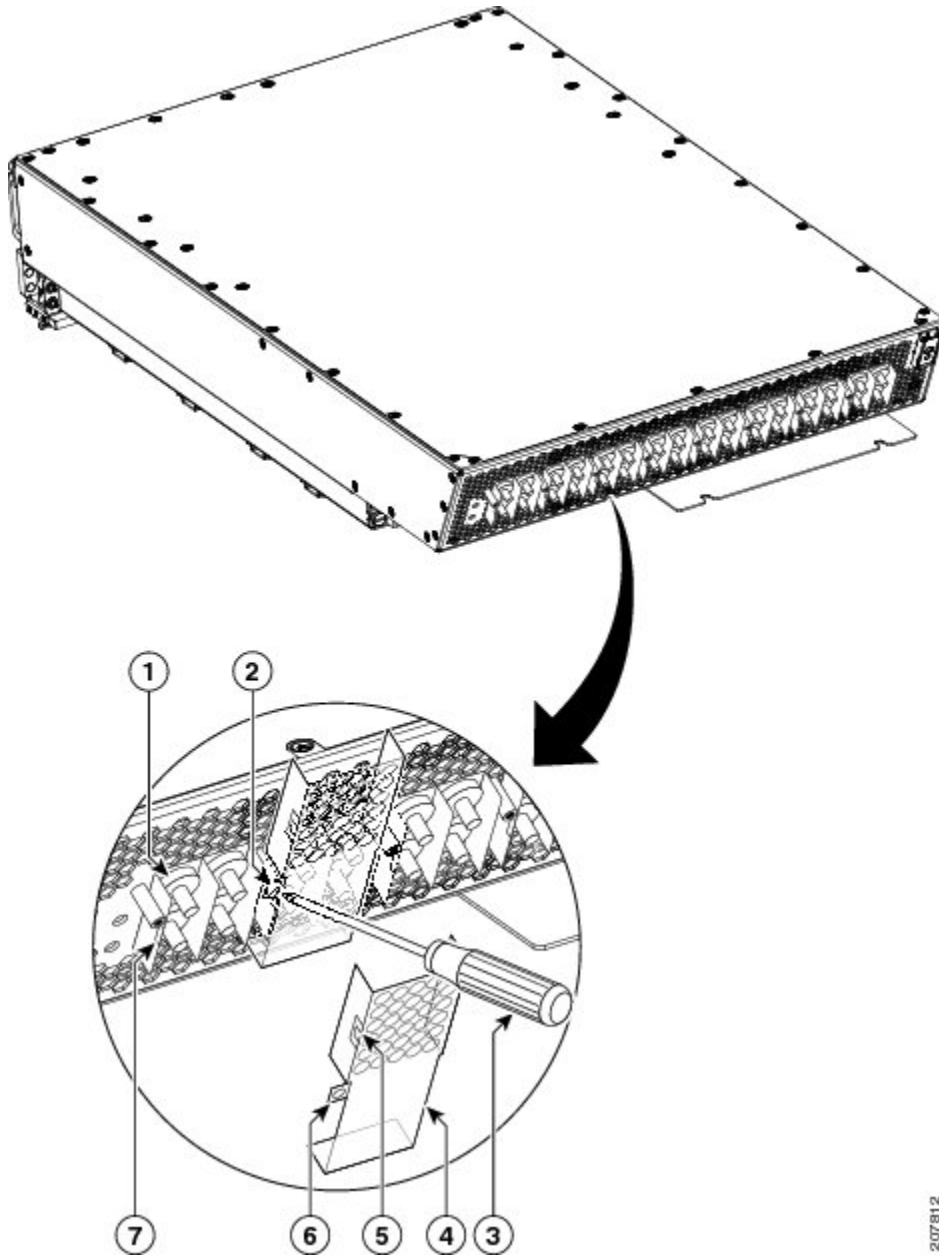
SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Align the DC terminal block cover with the cover latch tab.
3. Use the screwdriver to secure the screw into the mounting standoff.

DETAILED STEPS

- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Align the DC terminal block cover with the cover latch tab.
- Step 3** Use the screwdriver to secure the screw into the mounting standoff.

Figure 34: Securing the Terminal Block Cover



1 DC terminal block.

5 Opening to align over mounting pins

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2	Screw to tighten (pre-installed on terminal block)	6	Opening to align over mounting pins
3	Screwdriver securing the cover	7	Cover latch tab
4	Terminal block cover		

Installing Modular Configuration AC Power Cords

This section describes how to install input AC cords on the rear of the modular configuration power shelf.



Note When installing AC power cords on the power shelf, be sure to connect the chassis ground cable and install auxiliary grounding brackets first. For more information, see [Bonding and Grounding Guidelines](#) and [Installing Power Shelf Grounding Brackets](#).



Caution Do not connect the ground cables directly to the modular configuration power shelf. For more information, see [Installing Power Shelf Grounding Brackets](#).

Prerequisites

Before performing this task, ensure that both power shelves are installed in the chassis. Remove the upper grille from the rear (MSC) side of the chassis, if installed.

If you have AC Delta or AC Wye at your equipment, ensure that two *Cisco CRS PDUs* are installed to convert 3-phase AC input power to single-phase AC input power for the power shelves. For more information, see the *Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide*.



Note Before installing input AC power cords on the power shelf, make sure that the input power cords are not energized.

Required Tools and Equipment

You need the following tools to perform this task:

- 6-in. long number 1 Phillips screwdriver

Steps

To install the input AC cord, go to the rear of the chassis and perform the following steps:

SUMMARY STEPS

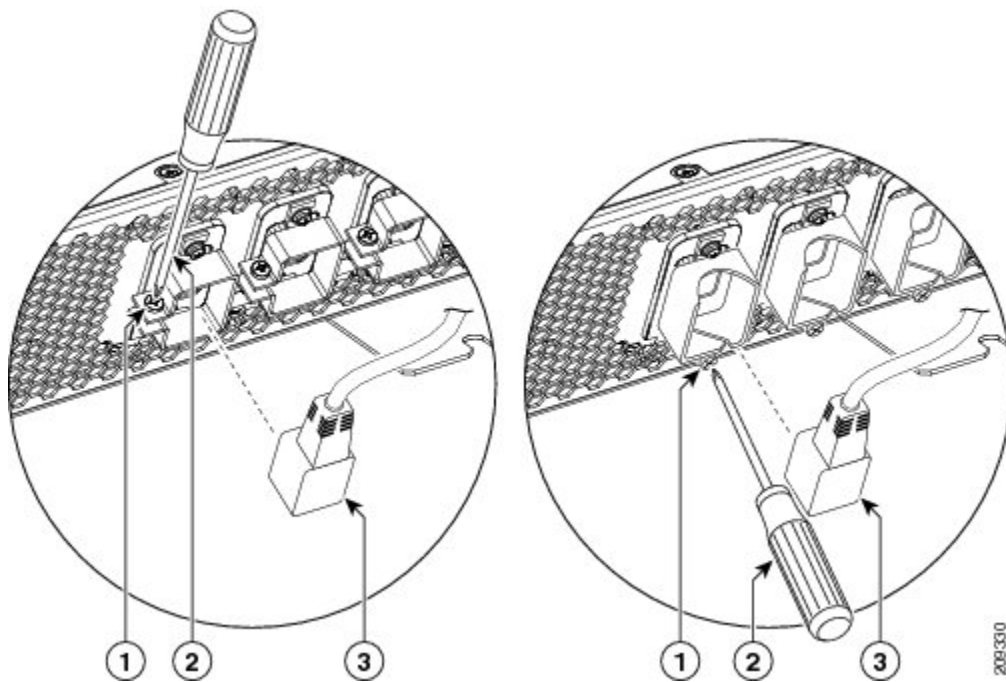
1. Insert the cord into the cord clamp.
2. Use the screwdriver to tighten the screw that clamps the cord in place.

DETAILED STEPS

Step 1 Insert the cord into the cord clamp.

Note If you have a Cisco CRS PDU installed, the AC power cords must be installed as labeled. For further information, see *Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide*.

Figure 35: Cord Being Inserted into Cord Clamp



1	Screw that secures the cord clamp	3	Cord to be inserted into clamp
2	Screwdriver tightening screw		

Note In the figure, the AC cord clamp shown on the left was available until June 2011, and the AC cord clamp shown on the right is available from June 2011 onwards. The location of the screw that secures the cord in the cord clamp is different.

Step 2 Use the screwdriver to tighten the screw that clamps the cord in place.

What to do next

After you install the DC input cables and DC terminal block covers, or AC input cords, install the alarm module (see [Installing a Modular Configuration Alarm Module](#)).

Removing AC or DC Power Shelf Wiring

This section describes how to remove the DC input wiring, DC terminal blocks and AC cords from the rear of the power shelf on the LCC.

Removing Modular Configuration DC Power Shelf Wiring

This section describes how to remove the DC power shelf wiring from the rear of the modular configuration DC power shelf.

Prerequisites

Before performing this task, power down and remove DC PMs and the alarm module in the shelf you want to disconnect. Remove the upper grille from the rear (MSC) side of the chassis, if installed.



Note Before removing wiring from the power shelf, make sure that the input power cables are not energized.

Required Tools and Equipment

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- 3/8-in. ratchet wrench with 10-mm socket

Steps

To disconnect wiring from the fixed configuration DC power shelf, perform the following steps:

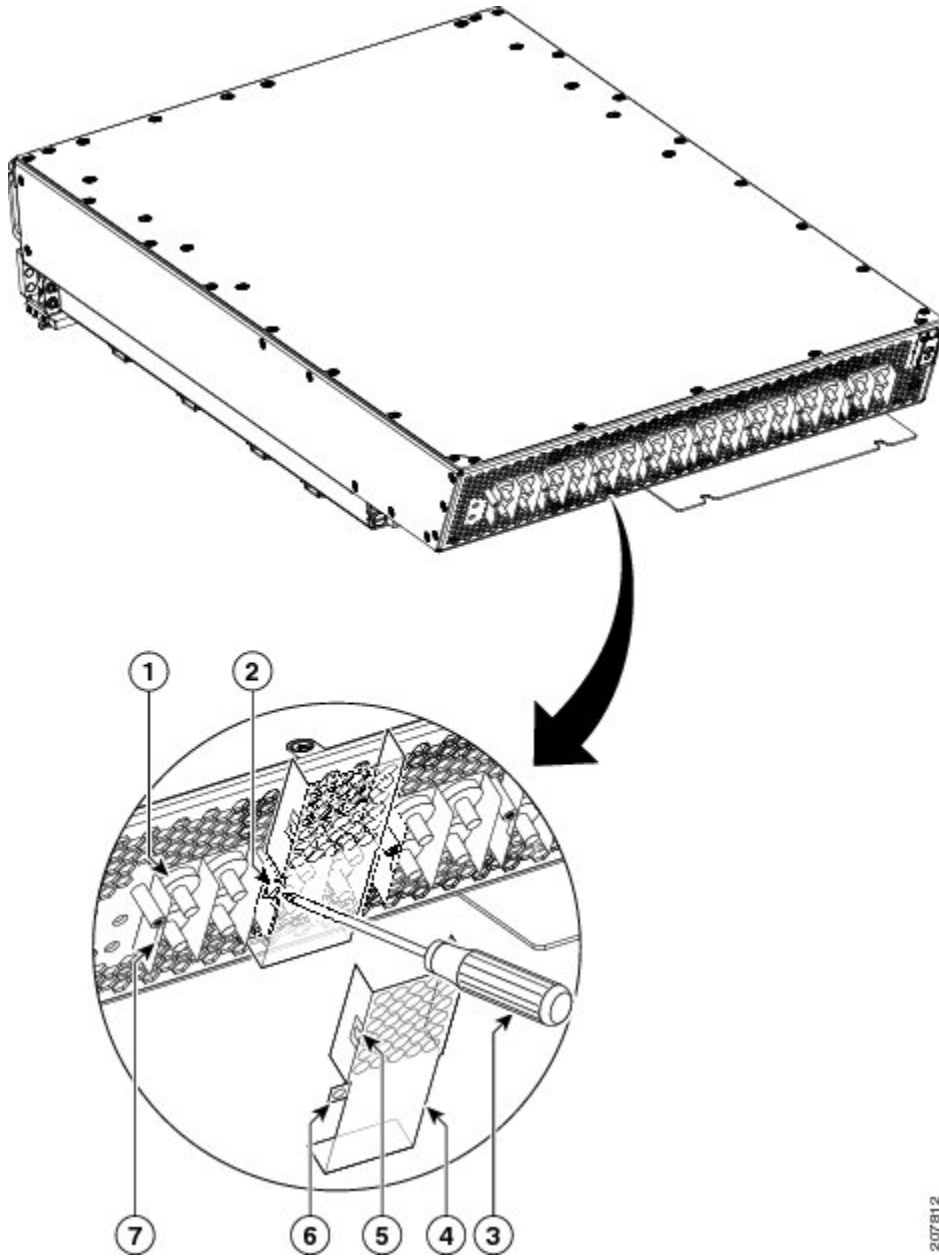
SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Use the screwdriver to remove the screw that secures the terminal block cover into the mounting standoff.
3. Remove the terminal block cover.
4. Using the 10-mm socket wrench, remove the positive and negative cable pairs from each terminal block.
5. Replace the terminal block cover.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Use the screwdriver to remove the screw that secures the terminal block cover into the mounting standoff.

Figure 36: Removing the Terminal Block Cover



1	DC terminal block.	5	Opening to align over mounting pins
2	Screw to tighten (pre-installed on terminal block)	6	Opening to align over mounting pins
3	Screwdriver securing the cover	7	Cover latch tab
4	Terminal block cover		

Step 3 Remove the terminal block cover.

Step 4 Using the 10-mm socket wrench, remove the positive and negative cable pairs from each terminal block.

Note When a cable is removed from the rear of the DC modular configuration power shelf, we recommend that it should be wrapped with standard black electrical tape.

Step 5 Replace the terminal block cover.

Removing Modular Configuration AC Power Shelf Wiring

This section describes how to remove input AC cords from the rear of the modular configuration DC power shelf.

Prerequisites

Before performing this task, power down and remove AC PMs and the alarm module in the shelf you want to disconnect. Remove the upper grille from the rear (MSC) side of the chassis, if installed.



Note Before removing wiring from the power shelf, make sure that the input power cables are not energized.

Required Tools and Equipment

- 6-in. long number 1 Phillips screwdriver

Steps

To remove the input AC cords, go to the rear of the chassis and perform the following steps:

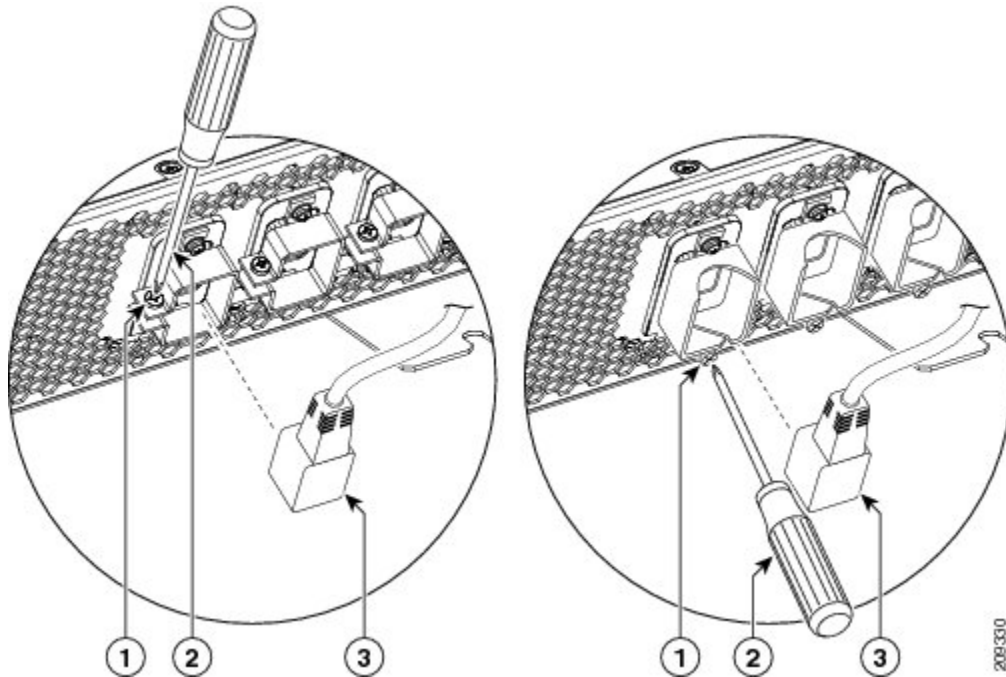
SUMMARY STEPS

1. Use the screwdriver to loosen the screws that clamp the cords in place.
2. Remove the cords from the cord clamps.

DETAILED STEPS

Step 1 Use the screwdriver to loosen the screws that clamp the cords in place.

Figure 37: Cord Being Removed from Cord Clamp



1	Screw that secures the cord clamp
2	Cord to be inserted into clamp

Note In the figure, the AC cord clamp shown on the left was available until June 2011, and the AC cord clamp shown on the right is available from June 2011 onwards. The location of the screw that secures the cord in the cord clamp is different.

Step 2 Remove the cords from the cord clamps.

What to do next

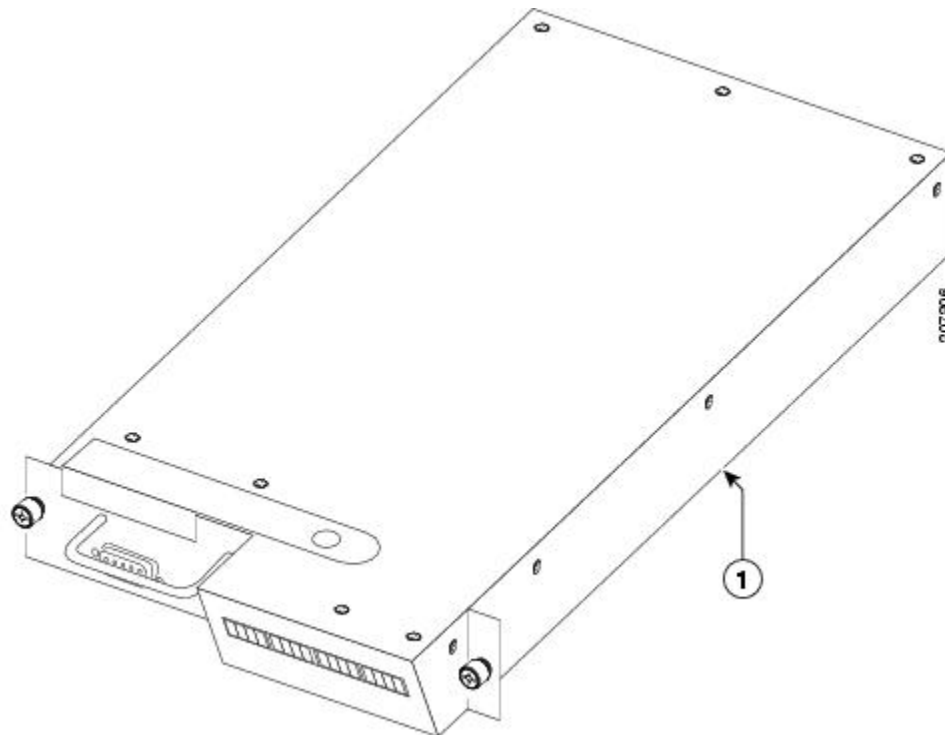
After you remove the DC wiring and DC terminal block covers or AC cords, remove the power shelf. See [Removing a Modular Configuration Power Shelf](#).

Installing a Modular Configuration Alarm Module

This section describes how to install the alarm modules in a modular configuration power shelf in the LCC.

This figure shows a modular configuration alarm module.

Figure 38: Modular Configuration Alarm Module



1 Side of alarm module to be installed on the right side of the opening.

Prerequisites

Before performing this task, you must first remove the upper grille on the front (PLIM) side of the chassis, if installed.



Caution

Do not attempt to install the alarm module until the modular configuration power shelf is in place and screwed into the chassis.

Required Tools and Equipment

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- Modular configuration alarm module (Cisco product number CRS-16-ALARM-C=)

Steps

To install the alarm module, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.

2. Slide the alarm module into the top left bay on the power shelf, with the display on the right side and the handle on the left side.
3. Hand tighten the two captive screws on the alarm module.
4. Use the screwdriver to securely fasten the alarm module to the power shelf.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Slide the alarm module into the top left bay on the power shelf, with the display on the right side and the handle on the left side.
- Step 3** Hand tighten the two captive screws on the alarm module.
- Step 4** Use the screwdriver to securely fasten the alarm module to the power shelf.
-

What to do next

After performing this task, install the modular configuration power modules and power module slot covers (if required) and re-install the upper grille on the front (PLIM) side of the chassis. See [Installing a Modular Configuration Power Module](#) and [Installing a Power Module Slot Cover](#).

Removing a Modular Configuration Alarm Module

This section describes how to remove the alarm modules, shown in the previous figure, from the modular configuration power shelf installed in the LCC.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver

Steps

To remove the alarm module, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Remove the upper grille on the front (PLIM) side of the chassis. For detailed instructions, see *Installing and Removing Exterior Cosmetic Components*.
3. Use the screwdriver to loosen the two captive screws securing the alarm module to the power shelf.
4. Loosen by hand the panel fasteners on the alarm module.
5. Carefully slide the alarm module out of the power shelf.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Remove the upper grille on the front (PLIM) side of the chassis. For detailed instructions, see *Installing and Removing Exterior Cosmetic Components*.
- Step 3** Use the screwdriver to loosen the two captive screws securing the alarm module to the power shelf.
- Step 4** Loosen by hand the panel fasteners on the alarm module.
- Step 5** Carefully slide the alarm module out of the power shelf.
-

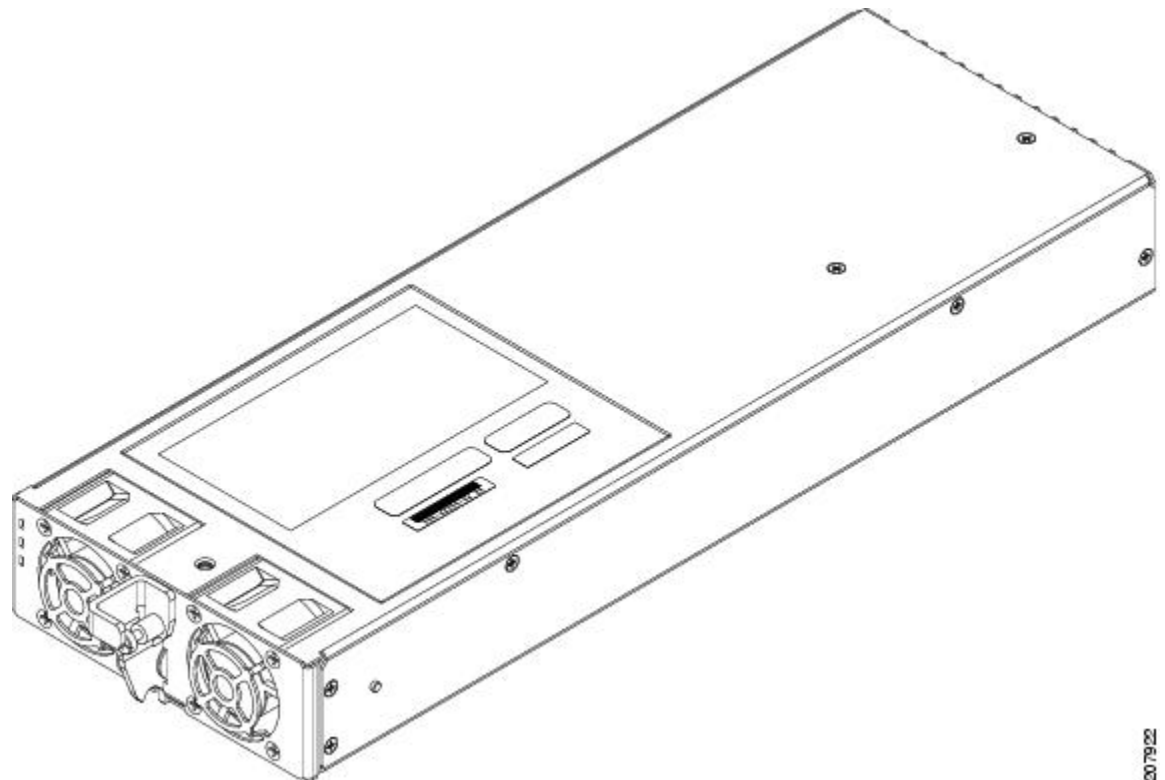
What to do next

After performing this task, install a replacement alarm module (if necessary) and re-install the upper grille on the front (PLIM) side of the chassis.

Installing a Modular Configuration Power Module

This section describes how to install the AC or DC PMs in the LCC.

Figure 39: Modular Configuration PM



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Prerequisites

Before performing this task, you must first remove the upper grille on the front (PLIM) side of the chassis, if installed.



Caution

Do not attempt to install the PM until the modular configuration power shelf is in place and screwed into the chassis.

Required Tools and Equipment

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver
- Torque screwdriver with number 1 Phillips bit and rated accuracy at 5.5 in.-lb (0.62 N-m)
- Modular configuration AC or DC PM
 - AC PM (Cisco product number CRS-PM-AC=), or
 - DC PM (Cisco product number CRS-PM-DC=)

Steps

To install the PM in a modular configuration power shelf, perform the following steps:

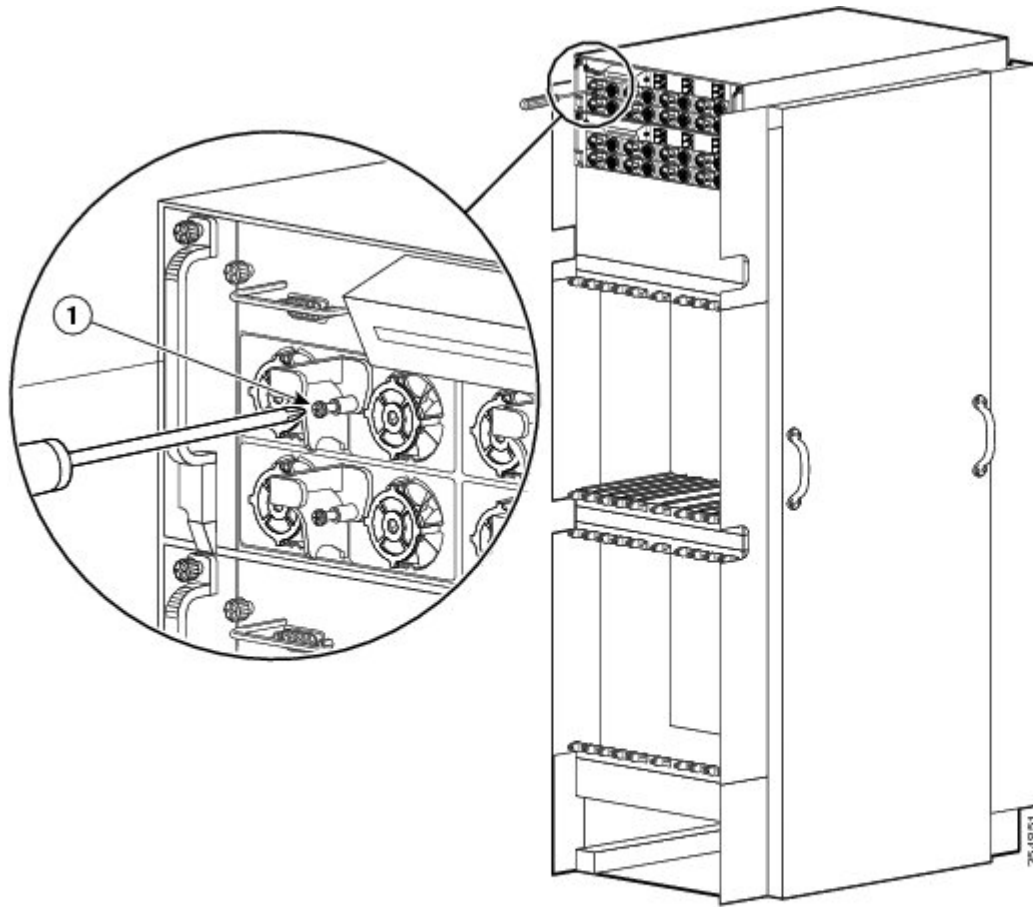
SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Using two hands to support and guide the PM, slide it into the power shelf.
3. Flip up the ejector and with nominal install torque of 5.5 in.-lb (0.62 N m), screw the PM into the shelf. Do not exceed an install torque of 10 in.-lb (1.13 N-m).
4. Fill the power shelf to the required configuration.

DETAILED STEPS

-
- Step 1** Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
- Step 2** Using two hands to support and guide the PM, slide it into the power shelf.
- Step 3** Flip up the ejector and with nominal install torque of 5.5 in.-lb (0.62 N m), screw the PM into the shelf. Do not exceed an install torque of 10 in.-lb (1.13 N-m).

Figure 40: Securing the PM to the Shelf



Step 4 Fill the power shelf to the required configuration.

What to do next

After the modular configuration PMs are installed in the chassis, install power module slot covers in empty PM slots, if any. For more information, see [Installing a Power Module Slot Cover](#).

Removing a Modular Configuration Power Module

This section describes how to remove a PM from a modular configuration power shelf.

Prerequisites

Before performing this task, you must first remove the upper grille on the front (PLIM) side of the chassis, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- 6-in. long number 1 Phillips screwdriver

Steps

To remove a PM from a modular configuration power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Remove the upper grille on the front (PLIM) side of the chassis. For detailed instructions, go to *Installing and Removing Exterior Cosmetic Components*.
3. Using the screwdriver, unscrew the ejector from the PM.
4. Flip down the ejector, slide the PM out of the power shelf, and carefully place it down on a flat surface.

DETAILED STEPS

-
- | | |
|---------------|--|
| Step 1 | Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis. |
| Step 2 | Remove the upper grille on the front (PLIM) side of the chassis. For detailed instructions, go to <i>Installing and Removing Exterior Cosmetic Components</i> . |
| Step 3 | Using the screwdriver, unscrew the ejector from the PM. |
| Step 4 | Flip down the ejector, slide the PM out of the power shelf, and carefully place it down on a flat surface. |
-

What to do next

After performing this task, install a replacement AC or DC PM if necessary (see [Removing a Modular Configuration Power Module](#)) and re-install the upper grille on the front (PLIM) side of the chassis.

Installing a Power Module Slot Cover

This section describes how to install power module slot covers, in empty power module slots in the power shelves installed in the LCC.

Although the AC and DC power module slot covers differ slightly in size, they are installed using the same procedures.

Prerequisites

Before performing this task, you must first remove the upper grille on the front (PLIM) side of the chassis, if installed, and install the alarm module and power modules to the required configuration in each power shelf.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap
- AC or DC PM Slot Cover
 - AC PM slot cover (Cisco product number 700–29097–xx), or
 - DC PM slot cover (Cisco product number 700–29098–xx)

Steps

To install a PM slot cover in a modular configuration power shelf, perform the following steps:

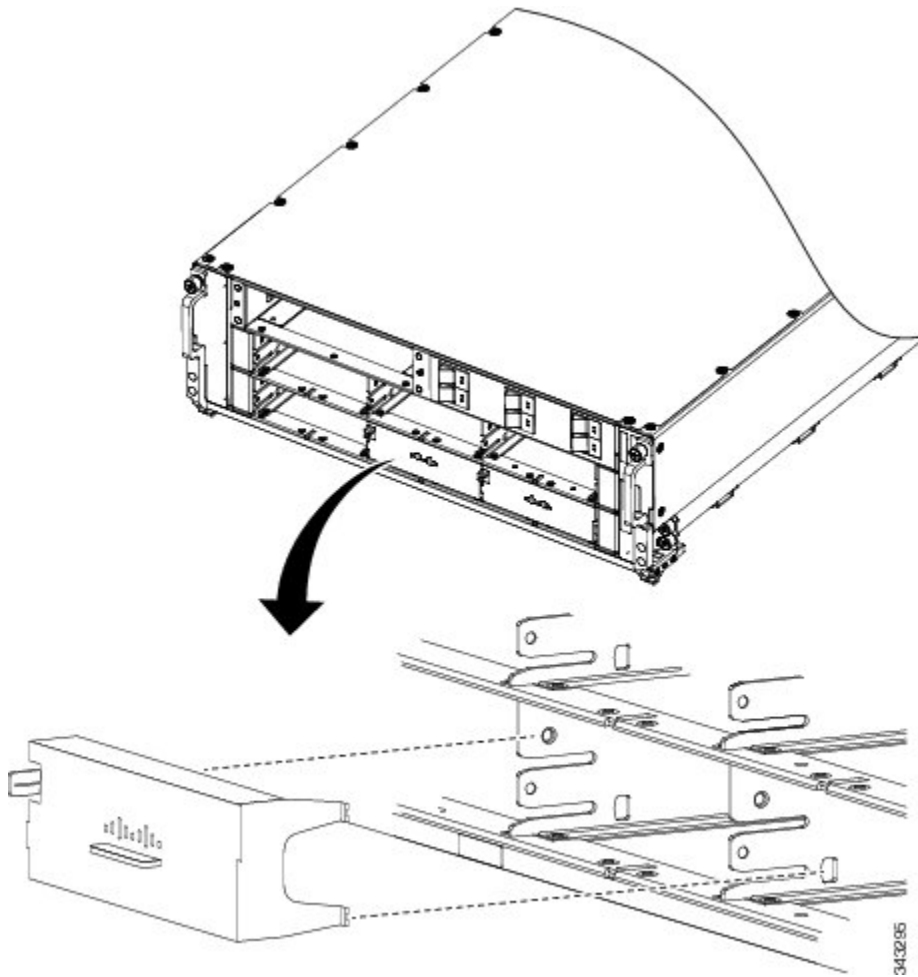
SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Align the PM slot cover with the empty PM slot in the power shelf.
3. Insert the two tabs on the right side of the PM slot cover into the two holes on the right side of the PM slot.
4. Push the left side of the PM slot cover gently until it clicks into place.

DETAILED STEPS

-
- | | |
|---------------|--|
| Step 1 | Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis. |
| Step 2 | Align the PM slot cover with the empty PM slot in the power shelf. |
| Step 3 | Insert the two tabs on the right side of the PM slot cover into the two holes on the right side of the PM slot. |
| Step 4 | Push the left side of the PM slot cover gently until it clicks into place. |

Figure 41: Installing PM Slot Cover

**What to do next**

After the PM slot covers are installed in the chassis, install the upper grille on the front (PLIM) side of the chassis.

Removing a Power Module Slot Cover

This section describes how to remove a PM slot cover from a PM slot in a modular configuration AC or DC power shelf.

Prerequisites

Before performing this task, you must first remove the upper grille on the front (PLIM) side of the chassis, if installed.

Required Tools and Equipment

You need the following tools to perform this task:

- ESD-preventive wrist strap

Steps

To remove a PM slot cover from a power shelf, perform the following steps:

SUMMARY STEPS

1. Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis.
2. Gently pinch the tab on the left side of the PM slot cover to detach the PM slot cover from the PM slot, as shown in the previous figure.
3. Remove the two tabs on the right side of the PM slot cover from the two holes on the right side of the PM slot, as shown in the previous figure.
4. Set the PM slot cover aside.

DETAILED STEPS

-
- | | |
|---------------|--|
| Step 1 | Attach the ESD-preventive wrist strap to your wrist and connect its leash to one of the ESD connection sockets on the front (PLIM) side of the chassis or a bare metal surface on the chassis. |
| Step 2 | Gently pinch the tab on the left side of the PM slot cover to detach the PM slot cover from the PM slot, as shown in the previous figure. |
| Step 3 | Remove the two tabs on the right side of the PM slot cover from the two holes on the right side of the PM slot, as shown in the previous figure. |
| Step 4 | Set the PM slot cover aside. |
-

What to do next

After performing this task, install an AC or DC PM, if necessary ([Installing a Modular Configuration Power Module](#)) and re-install the upper grille on the front (PLIM) side of the chassis. If you plan to remove the power shelf completely, you must first remove all of the PM slot covers, PMs, and the alarm module from the power shelf. See [Removing a Modular Configuration Power Module](#) and [Removing a Modular Configuration Alarm Module](#).

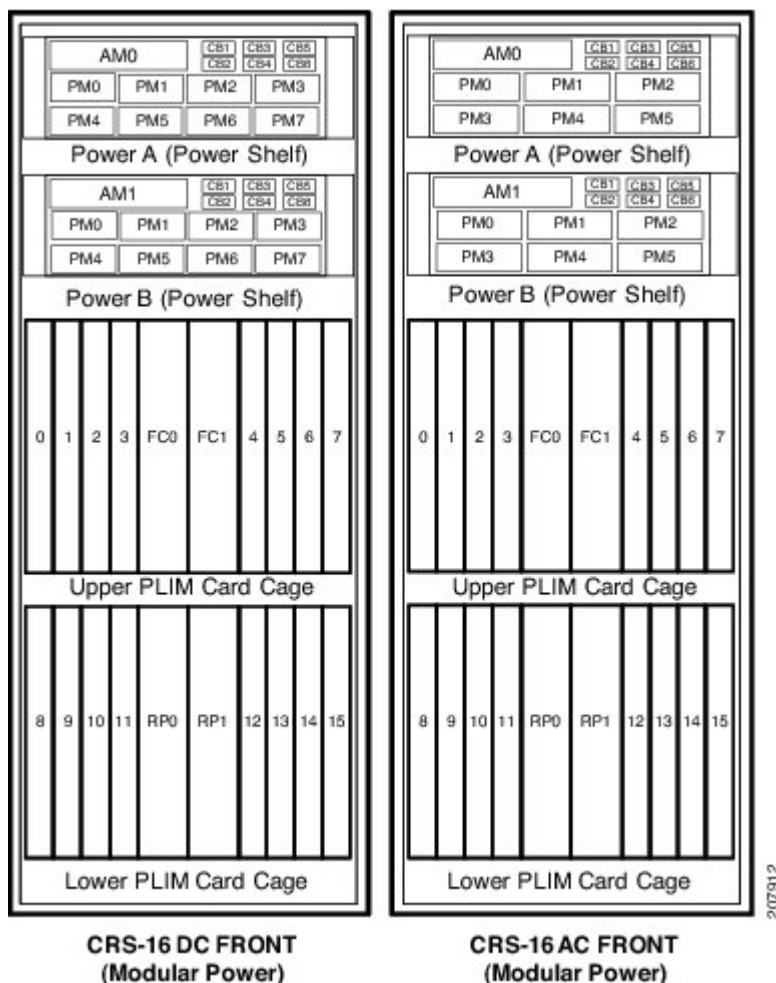
Power Up and Power Down a Chassis with Modular Configuration Power

This section describes how to power up and power down a chassis with a modular configuration AC or DC power shelf. For details on the chassis power systems, see [Basic Chassis Power Details](#), [AC Power Systems](#), and [DC Power Systems](#).

Most components on the chassis, such as the PMs, alarm modules, and fan trays, can be removed or installed in the chassis while it is running. Although it is possible to install or remove a power shelf while the chassis is running, it is recommended to remove power from the chassis completely, if possible, for service protection and safety.

The figure shows the front (PLIM) side of the LCC with a modular configuration power system installed.

Figure 42: LCC Front (PLIM) Side Slot Numbers



Power Up a Chassis with Modular Configuration Power

This section describes how to power up a chassis with modular configuration AC or DC power shelves installed.

Prerequisites

Before performing this task, you must install and wire the power shelves, install the PMs and alarm modules, and install the route processor (RP) card. See [Installing a Modular Configuration Power Shelf](#), [Installing a Modular Configuration Power Module](#), [Installing a Modular Configuration Alarm Module](#), and [Installing an RP, PRP, or DRP Card](#). If you have a modular configuration DC power system installed, wiring at the BDFB or at the power plant should be complete.

Steps

To power on the chassis, perform the following steps:

SUMMARY STEPS

1. Make sure that the facility power breakers for the upper (Power A) and lower (Power B) power shelves are in the OFF position.
2. Make sure that I/O switches on the rear of the upper (Power A) and lower (Power B) power shelves are in the OFF position.
3. Make sure all boards (RPs, PLIMs, SFCs, and FPs) are pulled-out and disconnected from the backplane.
4. If you have a modular configuration DC power system installed:
5. Turn the facility breakers for the upper power shelf (Power A) to the ON position. Verify that the Input_OK LED on all of the PMs installed in the upper shelf are green.
6. Turn the I/O switch at the rear of the upper power shelf (Power A) to the ON position. Verify that the Output_OK LED on all of the PMs installed in the upper shelf are green.
7. Repeat Step 5 and Step 6 for the lower power shelf (Power B).
8. Turn the I/O switch at the rear of both upper power shelves (Power A and Power B) to the OFF position. Verify that none of the Output_OK LEDs on the PMs installed in the shelf are green.
9. Install all boards (RPs, PLIMs, SFCs, and FPs) in the chassis. For more information, see *Installing and Removing Line Cards, PLIMs, and Associated Components*.
10. Turn the I/O switch at the rear of both power shelves (Power A and Power B) to the ON position.
11. If you have a modular configuration DC power system installed, measure the input voltage of each DC input and compare this value to the voltage measurement noted in Step 4. Verify that the equipment is still receiving the correct input voltage measured in Step 4.

DETAILED STEPS

-
- Step 1** Make sure that the facility power breakers for the upper (Power A) and lower (Power B) power shelves are in the OFF position.
- Step 2** Make sure that I/O switches on the rear of the upper (Power A) and lower (Power B) power shelves are in the OFF position.
- Step 3** Make sure all boards (RPs, PLIMs, SFCs, and FPs) are pulled-out and disconnected from the backplane.
- Step 4** If you have a modular configuration DC power system installed:
- a) Energize the facility breaker to PM 0, on the upper power shelf, Power A.
 - b) Measure the voltage at the input terminal block and verify that the DC voltage between the positive and negative terminals is between 48 VDC and 60 VDC. Make a note of this voltage measurement.
 - c) Turn the facility breaker to the OFF position.
- Caution** Make sure that the polarity of the DC input wiring is correct.
- Caution** This is a positive ground system; make sure to connect the positive lead to the +RTN terminal and the negative lead to the -48V terminal.
- d) Repeat 4a through 4c for each of the remaining DC inputs on the upper power shelf, Power A.
 - e) Repeat 4a through 4d for each of the DC inputs on the lower power shelf, Power B.
- Step 5** Turn the facility breakers for the upper power shelf (Power A) to the ON position. Verify that the Input_OK LED on all of the PMs installed in the upper shelf are green.
- Step 6** Turn the I/O switch at the rear of the upper power shelf (Power A) to the ON position. Verify that the Output_OK LED on all of the PMs installed in the upper shelf are green.
- Step 7** Repeat Step 5 and Step 6 for the lower power shelf (Power B).

- Step 8** Turn the I/O switch at the rear of both upper power shelves (Power A and Power B) to the OFF position. Verify that none of the Output_OK LEDs on the PMs installed in the shelf are green.
- Step 9** Install all boards (RPs, PLIMs, SFCs, and FPs) in the chassis. For more information, see *Installing and Removing Line Cards, PLIMs, and Associated Components*.
- Step 10** Turn the I/O switch at the rear of both power shelves (Power A and Power B) to the ON position.
- Step 11** If you have a modular configuration DC power system installed, measure the input voltage of each DC input and compare this value to the voltage measurement noted in Step 4. Verify that the equipment is still receiving the correct input voltage measured in Step 4.

What to do next



Note For appropriate line card LED information, see the appropriate section in [Installing and Removing Line Cards, PLIMs, and Associated Components](#) or the specific documentation for the card.

Power Down a Chassis with Modular Configuration Power

This section describes how to power down a chassis with a modular configuration AC or DC power shelf.

Steps

To power down the chassis, perform the following steps:

SUMMARY STEPS

1. Turn the I/O switches at the rear of both power shelves, Power A and Power B, to the OFF position.
2. Turn off all facility power breakers (AC or DC) for the upper power shelf (Power A) to the OFF position. Repeat for the facility power breaker for the lower power shelf (Power B).

DETAILED STEPS

-
- Step 1** Turn the I/O switches at the rear of both power shelves, Power A and Power B, to the OFF position.
- Note** There is no required order in which you must turn off the power shelves.
- Step 2** Turn off all facility power breakers (AC or DC) for the upper power shelf (Power A) to the OFF position. Repeat for the facility power breaker for the lower power shelf (Power B).
- Note** All DC power cables or AC power cords must be de-energized to fully remove power from the chassis.
-

What to do next

This table shows the LED status indicator lights for the AC and DC PMs in a modular configuration power supply.

Table 5: PM LED Status Indicator Lights—Modular Configuration Power

LED Name	Color	Function or Meaning
Input_OK	Green	On: The input voltage is present and within regulation range. Blinking: The input voltage is present but out of regulation range. Off: The input voltage is not present.
Output_OK	Green	On: The output voltage is on. Blinking: The PM is in a power limit or an OC condition. Off: The output voltage is off.
Internal Fault	Red	On: An internal fault is detected within the PM. Off: The PM has no internal fault.

Converting from One Modular Configuration Power System to Another

This section describes how to convert from one modular configuration power system to another (either from modular AC to modular DC, or from modular DC to modular AC).

Steps

To convert an LCC with a modular configuration power system from AC to DC power, or from DC to AC power, perform the following steps:

SUMMARY STEPS

1. Power down the chassis completely and turn the facility power breakers to the OFF position.
2. Remove the AC or DC PMs.
3. Remove the alarm modules.
4. Remove the power shelves.
5. Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the rear of the power shelf.
6. Install the new power shelves.
7. Install the power shelf wiring.
8. Install the alarm modules.
9. Install the AC or DC PMs.
10. Power the chassis back up.

DETAILED STEPS

-
- Step 1** Power down the chassis completely and turn the facility power breakers to the OFF position.
- Step 2** Remove the AC or DC PMs.
- Step 3** Remove the alarm modules.
- Step 4** Remove the power shelves.

- Step 5** Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the rear of the power shelf.
- Step 6** Install the new power shelves.
- Step 7** Install the power shelf wiring.
- Note** If you are converting from DC to AC power, and if you have AC Delta or AC Wye at your equipment, a *Cisco CRS PDU* will be required to convert 3-phase AC input power to single-phase AC input power for the power shelf. For more information, see the *Cisco CRS 3-Phase AC Power Distribution Unit Installation Guide*.
- Step 8** Install the alarm modules.
- Step 9** Install the AC or DC PMs.
- Step 10** Power the chassis back up.

What to do next



- Note** Use only one type of modular configuration power shelf—AC or DC—and its mating AC or DC PM in a chassis at one time.
-

Converting a Chassis from Fixed Configuration Power to Modular Configuration Power



- Caution** Do not attempt to convert from fixed configuration power to modular configuration power while the LCC is powered up and running. Ensure that you have powered down the system and all power is disconnected from the system.
-

This section lists the steps to be performed to convert the LCC from fixed configuration power to modular configuration power.

Prerequisites

Before performing this task, you must completely power down the system and ensure that all power is disconnected from the system. See [Power Up and Power Down a Chassis with Modular Configuration Power](#) for more information.

Steps

To convert a chassis from fixed to modular configuration power, perform the following steps

SUMMARY STEPS

1. Remove the alarm modules.
2. Remove the AC rectifiers or DC PEMs.
3. Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the fixed configuration power shelf.
4. For fixed configuration DC only, remove the ground cable connected to the rear of the power shelf. This ground cable will not be used when installing a modular configuration power shelf. Remove the fixed configuration power shelves.
5. Install the modular configuration power shelves.
6. Install the AC or DC wiring on the rear of the power shelf.
7. Install the PMs.
8. Install the alarm modules.
9. Replace the DC fuses or restore AC service. Power the chassis back up.

DETAILED STEPS

-
- Step 1** Remove the alarm modules.
- Step 2** Remove the AC rectifiers or DC PEMs.
- Step 3** Unplug the AC power cords or remove the DC fusing from the power source. Remove the AC or DC wiring from the fixed configuration power shelf.
- Step 4** For fixed configuration DC only, remove the ground cable connected to the rear of the power shelf. This ground cable will not be used when installing a modular configuration power shelf. Remove the fixed configuration power shelves.
- Step 5** Install the modular configuration power shelves.
- Note** Do not connect ground cables directly to a modular configuration power shelf.
- Step 6** Install the AC or DC wiring on the rear of the power shelf.
- Step 7** Install the PMs.
- Step 8** Install the alarm modules.
- Step 9** Replace the DC fuses or restore AC service. Power the chassis back up.
-

