



3300 W DC Power Entry Module for the Cisco uBR10012 Universal Broadband Router

Document Revision History

Document Version	Date	Change Summary
OL-24556-01	March, 2011	First version of this document.

Contents

This document includes procedures for installing, replacing, and removing the 3300 W DC power entry module (DC PEM) in the Cisco uBR10012 universal broadband router.

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- [Installing the DC Power Entry Modules in the Chassis, page 13](#)
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Objective

The purpose of this document is to provide installation, removal, and troubleshooting information for the 3300 W DC power entry module (DC PEM) installed in the Cisco uBR10012 universal broadband router.

Audience

This document is intended for service engineers who are familiar with Cisco products and headend cable installation procedures.



Warning

Only trained and qualified personnel should be allowed to install, replace, or service this equipment.
Statement 1030.

Overview

The Cisco uBR10012 router is shipped with two DC power entry modules (DC PEMs) that provide power to the system. One DC PEM can provide sufficient power for a fully configured chassis. However, if one DC PEM fails, the other automatically begins providing power to the entire chassis, without impacting the system operation.

The two DC PEMs provide filtered, redundant, and load shared DC power to the Cisco uBR10012 chassis. The DC PEM modules can be identified by their product part numbers.

The DC PEM modules supported on the Cisco uBR10012 chassis are:

- DC PEM Module (UBR10-PWR-DC=)
- DC PEM Module (UBR10-PWR-DC-PLUS=)

Table 1 summarizes the specifications of the DC PEM modules.

Table 1 Specifications of the DC PEM modules

Component	UBR10-PWR-DC-PLUS=	UBR10-PWR-DC=	
Cisco DC PEM (Part Number) ¹	341-0388-01	34-1651-04 and 34-1651-05	34-1651-05
Power Output	3300 W	2400 W	3000 W
DC-input Voltage	-48 to -60 VDC nominal	-48 to -60 VDC nominal	-55 to -60 VDC nominal
DC-output Voltage (nominal)	-57.5 V	See footnote ²	
DC-input Current Connections	50 A + 50 A	50 A	56 A
Physical Differences			
LEDs	5	3	3
Weight	16 lbs (7.25 kg)	10 lbs (4.54 kg)	10 lbs (4.54 kg)
PRODUCT ID LED/switch	Yes	No	No

1. The 34- part number is listed on compliance label of the DC PEM.
2. For the 34-1651-04 and 34-1651-05 DC PEM modules, the DC-output voltage varies according to the DC-input voltage with a drop in voltage between 1 V and 1.85 V. The allowable DC-input range is -40.5 V to -72 V. The DC-output voltage is not constant for these DC PEM modules. For the 341-0388-01 DC PEM module, the DC-output voltage is regulated and is constant.

This document includes procedures for installing, replacing, and removing the 3300 W DC PEM in the Cisco uBR10012 universal broadband router. For information on migrating from the 2400 W DC PEM to the 3300 W DC PEM, see [“Migrating from the 2400 W DC PEM to the 3300 W DC PEM”](#) section on page 28.

For information on installing, replacing, and removing the 2400 W DC PEM, see [DC Power Entry Module for the Cisco uBR10012 Universal Broadband Router](#).



Note

In the sections that follow, all references to the 2400 W DC PEM also apply to the 3000 W DC PEM. For example, migrating from the 2400 W DC PEM to the 3300 W DC PEM implies that the same procedure is applicable for migrating the 3000 W DC PEM to the 3300 W DC PEM.

If 100-120 VAC is the only available power source at the facility, then use the external AC-input power shelf with the Cisco uBR10012 router. The AC-input power shelf converts AC power from an external AC power supply source into DC power that is suitable for powering on the Cisco uBR10012 router.

We recommend you use the external Lineage AC-DC power shelf in conjunction with the Cisco uBR10012 router chassis. For an overview of the Lineage AC-DC power shelf, and connecting the Lineage AC-DC power shelf with the Cisco uBR10012 router, see [Cisco uBR10012 Universal Broadband Router Hardware Installation Guide](#).

**Note**

The output of the **show inventory** command does not display the serial numbers for the DC PEMs (UBR10-PWR-DC and UBR10-PWR-DC-PLUS). Visually inspect the serial number labels printed on the DC PEMs to locate the serial number.

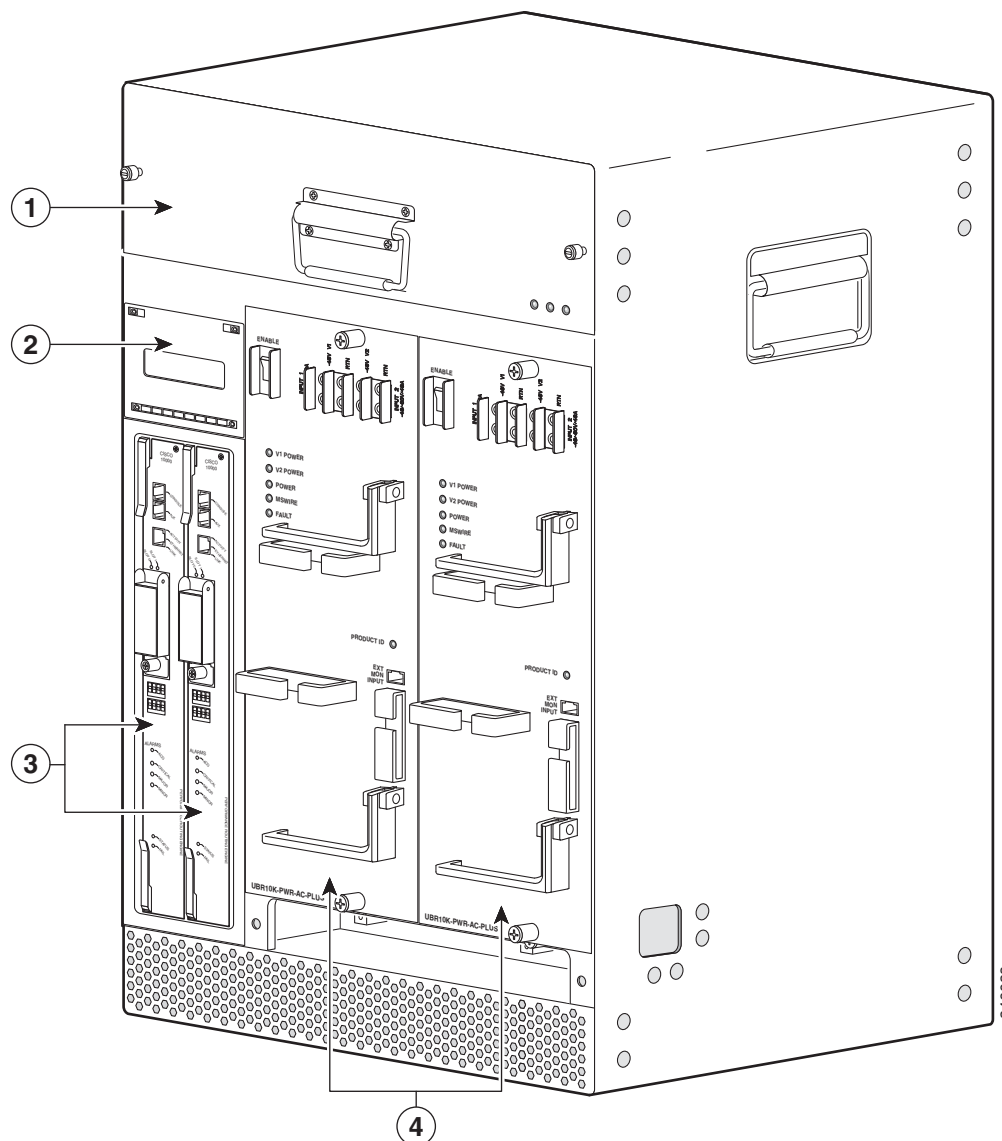
Physical Description

The 3300 W DC PEM module provides a power output of 3300 W with dual DC-input power connections. This DC PEM module provides:

- Increased power to the chassis
- Load shared DC power to the chassis (under normal conditions)

[Figure 1](#) shows a Cisco uBR10012 router with dual 3300 W DC PEMs installed.

Figure 1 Cisco uBR10012 Router with Dual 3300 W DC PEM Modules



1	Fan assembly module	3	PRE modules
2	LCD module	4	3300 W DC PEM modules

Caution

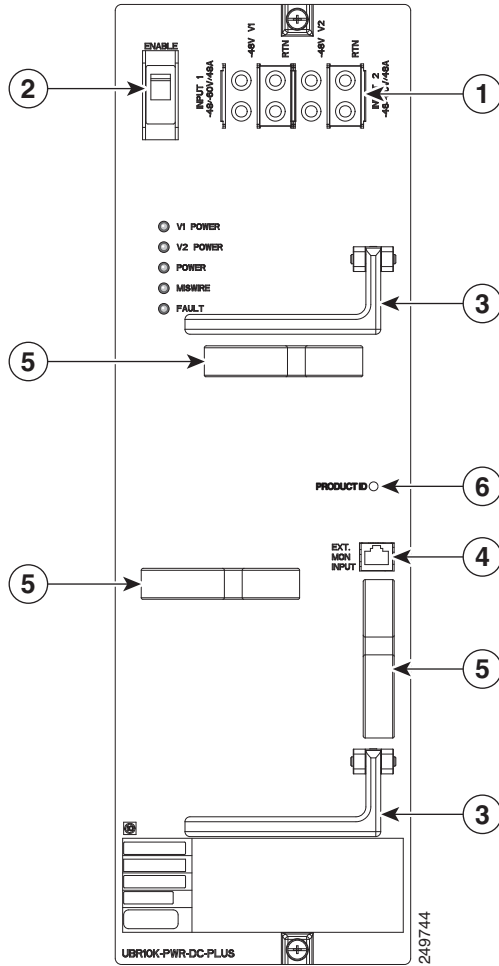
Do not attempt to lift the Cisco uBR10012 chassis by using the two handles on the front of the DC PEM. The handles on the DC PEM are for removing and inserting the PEM into the Cisco uBR10012 chassis.

Figure 2 shows the faceplate of the DC PEM module, which has:

- Two DC power terminal blocks—These connect to the facility power source.
- DC power enable switch—This powers on the DC PEM module.
- Two handles—These help during the removal and installation of the DC PEM module.

- External alarm connector—This is an input connector to monitor the alarms from the external AC-input power shelf.
- DC power cord clips—These help to secure the DC-input power cables.

Figure 2 DC PEM Front Panel (UBR10-PWR-DC-PLUS=)



1	DC power terminal blocks	4	External alarm connector
2	DC power enable switch	5	DC power cord clips
3	Handles on the DC PEM	6	PRODUCT ID LED/switch

LEDs

Five LEDs (V1 POWER, V2 POWER, POWER, MISWIRE, and FAULT) indicate the status of the DC PEM module. In addition, there is a PRODUCT ID LED/switch on the front panel of the DC PEM module.



Tip

Use a small object, such as a paper clip, to press the PRODUCT ID LED/switch inside the cavity on the front panel of the DC PEM module.

Table 2 describes the LEDs on the 3300 W DC PEM.

Table 2 DC PEM LEDs and their Function

LED	Color	Description
V1 POWER	Green	Indicates that the PEM is receiving power from the DC power source. These LEDs only indicate that an input voltage is present on the PEMs and not that the PEM is powered on. Note This LED may illuminate even if the voltage applied is not in the proper range to power on the PEM.
V2 POWER	Green	Indicates that the PEM is receiving power from the DC power source. These LEDs only indicate that an input voltage is present on the PEMs and not that the PEM is powered on. Note This LED may illuminate even if the voltage applied is not in the proper range to power on the PEM.
POWER	Green	Indicates that the power at the output is within the required voltage, and the PEM is providing power to the Cisco uBR10012 chassis.
MISWIRE	Yellow	Indicates that the -48/-60 VDC and RTN (+) wires are reversed.
FAULT	Yellow	Indicates that the external DC-input power is being received by the PEM, but that the PEM is not supplying power to the chassis, typically because the power enable switch on the DC PEM is set to the Standby (0) position. If the power enable switch is in the ENABLE (I) position, and the FAULT LED is illuminated, the PEM is not operating correctly. For more information, see “Troubleshooting the 3300 W DC PEM” section on page 30 .
PRODUCT ID LED/switch	Green	When you press the PRODUCT ID LED/switch it illuminates (green) and the Cisco IOS software identifies the PEM module as UBR10-PWR-DC-PLUS only if you are running a supported Cisco IOS Release on the chassis. Otherwise, the software reports the default UBR10-PWR-DC product part number and the show environment command randomly displays the PEM type as AC instead of DC.

Table 3 lists the default activation status of the PRODUCT ID LED/switch when it is shipped.

Table 3 *PRODUCT ID LED/Switch Default Activation Status*

Ordered Equipment	PRODUCT ID LED/Switch Status
DC PEM module (spare)	Activated
DC PEM module and Cisco uBR10012 chassis running unsupported Cisco IOS Release	Not activated
DC PEM module and Cisco uBR10012 chassis running supported Cisco IOS Release ¹	Activated

1. For information on Cisco IOS Releases that support the PRODUCT ID LED/switch feature, see the [Cisco uBR10012 Router Release Notes for Cisco IOS Release 12.2\(33\)SCE](#).



Note

If you are installing the DC PEM module (spare) in an existing Cisco uBR10012 router chassis, ensure that the Cisco IOS Release running on the chassis supports the PRODUCT ID LED/switch feature before installing the module.



Note

Even if you are using a supported Cisco IOS Release, the software may not identify the PEM module as UBR10-PWR-DC-PLUS. If this occurs, ensure that the PRODUCT ID LED/switch is illuminated and then either reload the software, or physically remove the PEM module for at least 1 minute and then reinsert it.

Preparing to Unpack the DC PEM Module

This section presents the following topics:

- [Safety Guidelines, page 8](#)
- [Electrical Equipment Guidelines, page 9](#)
- [Preventing Electrostatic Discharge Damage, page 10](#)
- [Technical Specifications, page 11](#)
- [Unpacking and Preparing the PEM, page 12](#)

Safety Guidelines

Follow the safety guidelines provided here, when working with any equipment that connects to electrical power.



Note

For Class B emission compliance requirements, one ferrite bead must be installed on the alarm port wire exiting the chassis. Two ferrite beads (part number 36-0219-01) are included in the Cisco uBR10012 router accessory kit, and one ferrite bead is shipped with the spare DC power entry modules. For information on attaching the ferrite beads, see [Cisco uBR10012 Broadband Router - Quick Start Guide](#).



Warning

Connect the unit only to DC power source that complies with the safety extra-low voltage (SELV) requirements in IEC 60950 based safety standards. Statement 1033



Warning

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



Warning

IMPORTANT SAFETY INSTRUCTIONS

This warning symbol means danger. You are in a situation that could cause bodily injury. Before you work on any equipment, be aware of the hazards involved with electrical circuitry and be familiar with standard practices for preventing accidents. Use the statement number provided at the end of each warning to locate its translation in the translated safety warnings that accompanied this device. Statement 1071



Warning

This equipment must be grounded. Never defeat the ground conductor or operate the equipment in the absence of a suitably installed ground conductor. Contact the appropriate electrical inspection authority or an electrician if you are uncertain that suitable grounding is available. Statement 1024



Warning

This equipment must be installed and maintained by service personnel as defined by AS/NZS 3260. Incorrectly connecting this equipment to a general-purpose outlet could be hazardous. The telecommunications lines must be disconnected 1) before unplugging the main power connector or 2) while the housing is open, or both. Statement 1043



Warning

Take care when connecting units to the supply circuit so that wiring is not overloaded. Statement 1018

Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room where you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone when potentially hazardous conditions exist.
- Never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe.
- Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which occurs when electronic cards or components are improperly handled, can result in complete or intermittent failures.

The external AC-input power shelf and its AC power modules contain a printed circuit card that is fixed in a metal carrier. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the cards from ESD, use an antistatic strap each time you handle the modules.

Guidelines for preventing ESD damage:

- Always use an ESD-preventive wrist or ankle strap and ensure that it makes good skin contact. Before removing a card from the chassis, connect the equipment end of the strap to a bare metal, unpainted surface on the chassis, or rack-mount.
- Handle components by the carrier edges only; avoid touching the card components or any connector pins.
- When removing a module, place it on an antistatic surface or in a static-shielding bag. If the module is to be returned to the factory, immediately place it in a static-shielding bag.
- Avoid contact between the modules and clothing. The wrist strap protects the card from ESD voltages on the body only; ESD voltages on clothing can still cause damage.



Caution

For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms (Mohm).

Technical Specifications

Table 4 lists the specifications for the 3300 W DC PEM module:

Table 4 Cisco uBR10012 3300 W DC PEM Specifications

Description	Specifications
Product order number	<ul style="list-style-type: none"> UBR10-PWR-DC-PLUS (Primary) UBR10-PWR-DC-PLUS= (Spare)
Dimensions	<ul style="list-style-type: none"> Height: 19.25 in. (48.894 cm) Width: 6 in. (15.24 cm) Depth: 5 in. (12.4 cm)
Weight	16 lbs. (7.25 kg)
DC-input Voltage	-48 to -60 VDC nominal -40.5 to -72 VDC minimum to maximum
DC-input Current	50 A + 50 A
Power Output	3300 W maximum
Temperature Range	<ul style="list-style-type: none"> Operating: 41°F to 104°F (5°C to 40°C) Storage: -40°F to 158°F (-40°C to 70°C)
Relative Humidity	<ul style="list-style-type: none"> Operating: 5% to 85%, non-condensing Storage: 5% to 95%, non-condensing
Operating Altitude	-197 to 13,693 feet (-60 to 4000 m)

Table 5 shows the pinout of the RJ-45 alarm input connector on the front panel of the 3300 W DC PEM.

Table 5 RJ-45 Power Supply Monitoring Connector Pinouts

RJ-45 Pin	Signal	Description
1	FAULT	This signal is driven to ground (GND) if one or more AC power modules in the external AC-input power supply reports a fault. To determine which power module has the fault, look at the LEDs on the front panel of the power modules.
2	OVER TEMP	This signal is driven to GND if one of the power modules in the external AC-input power supply exceeds its maximum operating temperature.
3	POWER FAIL	This signal is driven to GND if AC power is not being provided to one of the power modules in the external AC-input power supply.
4	ALARM RETURN	Return line for pins 1 to 3.

Table 5 *RJ-45 Power Supply Monitoring Connector Pinouts (continued)*

RJ-45 Pin	Signal	Description
5, 6	-/+AC SUPPLY PRESENT	These pins are shorted together when the external AC-input power supply is being used. If the external power supply is not being used, the pins remain open.
7,8	-/+MODULE MISSING	These pins are shorted together to indicate that all power modules in the external AC-input power supply are present. If a module is removed, the two pins remain open.

Unpacking and Preparing the PEM

Prerequisites

No prerequisites exist for this task.

Required Tools and Equipment

- 3300 W DC PEM module (UBR10-PWR-DC-PLUS=)
- ESD-preventive wrist strap

Steps

To unpack the 3300 W DC PEM:

-
- Step 1** Open the shipping carton by cutting the packing tape along the flaps on the top of the box.
 - Step 2** Remove the PEM from the packaging and place it on an anti-static surface or in a static-shielding bag.
 - Step 3** Retain the packaging and the carton to return the module to the factory if it is found defective. For more information, see [“Obtaining Documentation and Submitting a Service Request”](#) section on page 33.
-

What to do next

After performing this step, install the DC PEM modules, see [“Installing the DC Power Entry Modules”](#) section on page 13.

Installing the DC Power Entry Modules in the Chassis

This section presents the following topics:

- [Installing the DC Power Entry Modules, page 13](#)
- [Connecting the DC-input Power Cables on the DC Power Entry Modules, page 16](#)
- [Powering On the DC Power Entry Module, page 20](#)

Installing the DC Power Entry Modules

Prerequisites

- The DC terminal blocks located beneath the DC PEMs on the midplane of the chassis are not used with the 3300 W DC PEM modules. Ensure that no DC-input power cables are connected to these terminal blocks.
- Ensure that you attach ferrite beads on the alarm cables or the grounding cables before you proceed to install the DC PEM modules in the chassis. You cannot access the alarm cables or grounding cables after the PEMs are installed in the chassis. For information about attaching the ferrite beads, see [Cisco uBR10012 Broadband Router - Quick Start Guide](#).
- If you are installing the DC PEM module (spare) in an existing Cisco uBR10012 router chassis, ensure that the Cisco IOS Release running on the chassis supports the PRODUCT ID LED/switch feature before installing the module (see [Table 3](#)).

Required Tools and Equipment

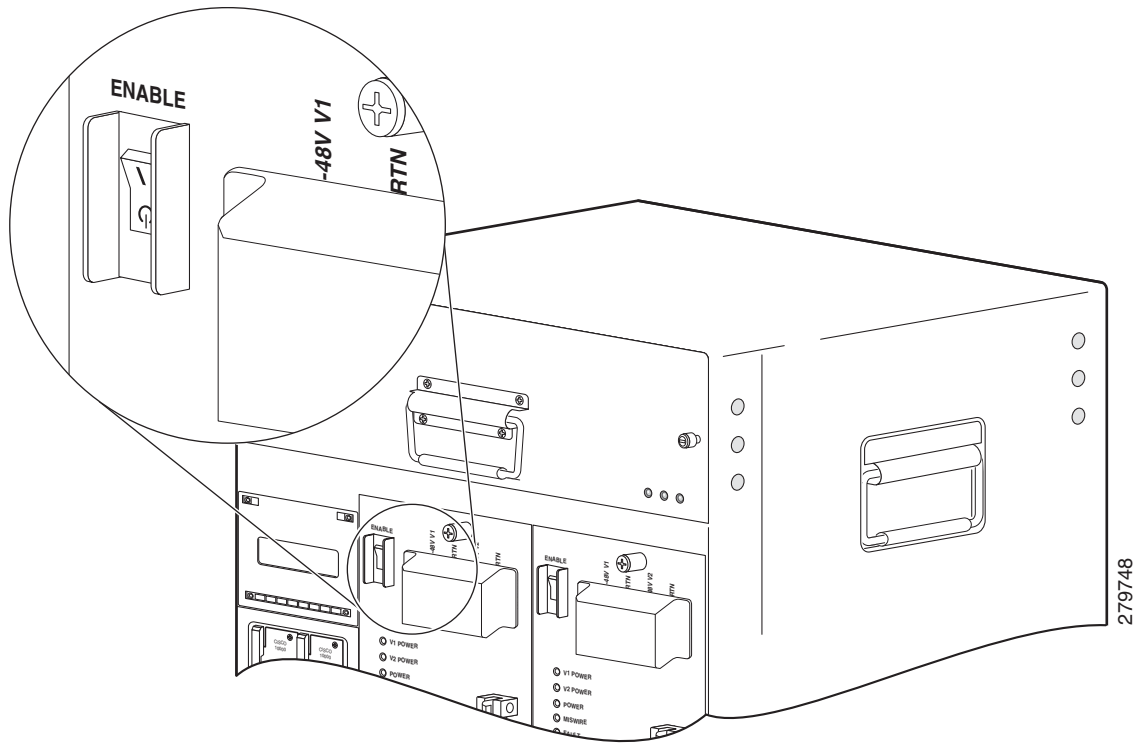
- 3300 W DC PEM module (UBR10-PWR-DC-PLUS=)
- Flat-head screwdriver

Steps

To install the 3300 W DC PEM modules on the Cisco uBR10012 router:

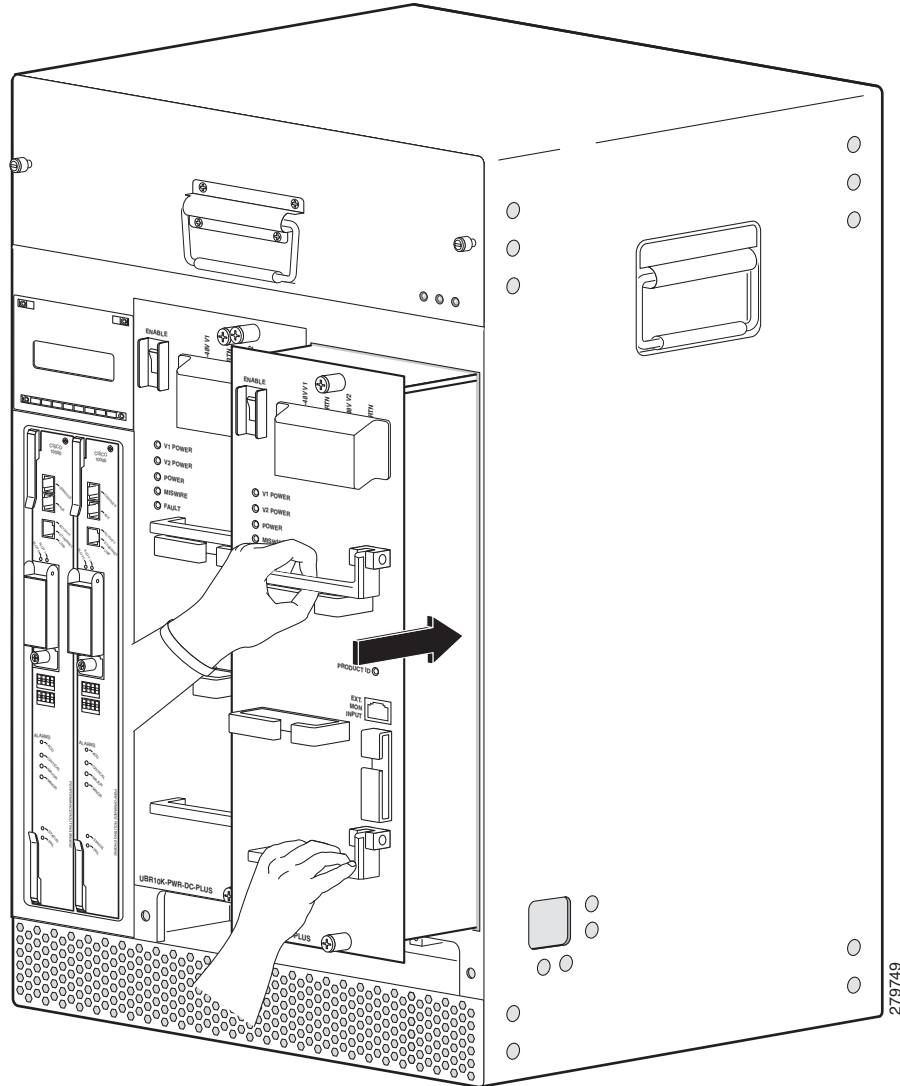
-
- Step 1** Ensure that the Cisco IOS Release running on the Cisco uBR10012 router supports the PRODUCT ID LED/switch feature.
 - Step 2** Remove the front cover by pulling the cover towards you.
 - Step 3** Verify that the DC power enable switch is in the Standby (0) position (see [Figure 3](#)).

Figure 3 DC Power Switch in Standby Position



Step 4 Position the DC PEM in the power bay and slide it all the way in, and ensure that it makes a secure connection with the chassis backplane see (Figure 4).

Figure 4 Installing a DC PEM



Caution

Ensure that the alarm cables and the DC-input power cables are out of the way before you slide the PEMs into the power bay.

Step 5

Tighten the captive screws to secure the DC PEM using a screwdriver.



Note

To tighten the captive screws on the DC PEM modules, the installation torque used should be 8 in-lbs.

- Step 6** If you are using the external AC-input power shelf, plug one of the RJ-45 ends of the alarm monitor cable into the alarm connector on the 3300 W DC PEM. Route the alarm monitor cable to the right side of the chassis so that it fits into the notch on the front cover, when the cover is reinstalled.
- Step 7** Repeat [Step 1](#) to [Step 6](#) to install the second DC PEM module.
-

What to do next

After performing this task, connect the DC-input power cables, see [“Connecting the DC-input Power Cables on the DC Power Entry Modules”](#) section on page 16.

Connecting the DC-input Power Cables on the DC Power Entry Modules

Prerequisites

Before connecting the cables, you must install the DC PEM modules in the chassis. To install the DC PEM modules, see the [“Installing the DC Power Entry Modules”](#) section on page 13.

Required Tools and Equipment

- Flat-head screwdriver
- 10 mm hex socket driver
- DC-input power cables, customer provided
- 0.625-inch dual-hole lugs, customer provided
- DC PEM module (UBR10-PWR-DC-PLUS=)
- Front cover (U-CHAS-COVER-PLUS=)



Note

The 3300 W DC PEM module accepts a maximum of 6 AWG wire or 4 AWG high-flex wire for the DC-input cables. If you are using the 4 AWG wire, use a high-flex high strand count power cable for optimal routing of the cables under the front cover. The 2 AWG wire is not supported on the 3300 W DC PEM module.

Steps

To connect the DC-input power cables on the 3300 W DC PEM modules:

- Step 1** If you are connecting visual or audio alarm indicators to your system, see [Cisco uBR10012 Broadband Router - Quick Start Guide](#) for details.
- Step 2** Verify that the DC power source to the chassis is turned off (tape it in the OFF position, if possible).



Caution

Do not connect power to the DC power sources or apply power to the chassis. This is done as part of the system startup after all connections are made. If you are using the external AC-input power shelf as the DC power source, verify that the AC-input power cords are not plugged into the AC power outlets.

- Step 3** Remove the safety cover from above the DC terminal blocks by loosening the captive screw and rotating the safety cover up and off of the PEM faceplate, to connect the first facility DC power source.
- Step 4** Remove the install nuts from the input studs on the DC terminal blocks of the PEM modules.
- Step 5** Prepare the DC-input power cables by attaching 0.625-inch center to center dual-hole lugs. Attach the DC-input power cables to the DC terminal blocks.
- Step 6** Secure the dual-hole lugs to the input studs on the DC terminal blocks by reinstalling the nuts.



Note Secure the nuts using a 10 mm hex socket driver with an installation torque of 50-in lbs.



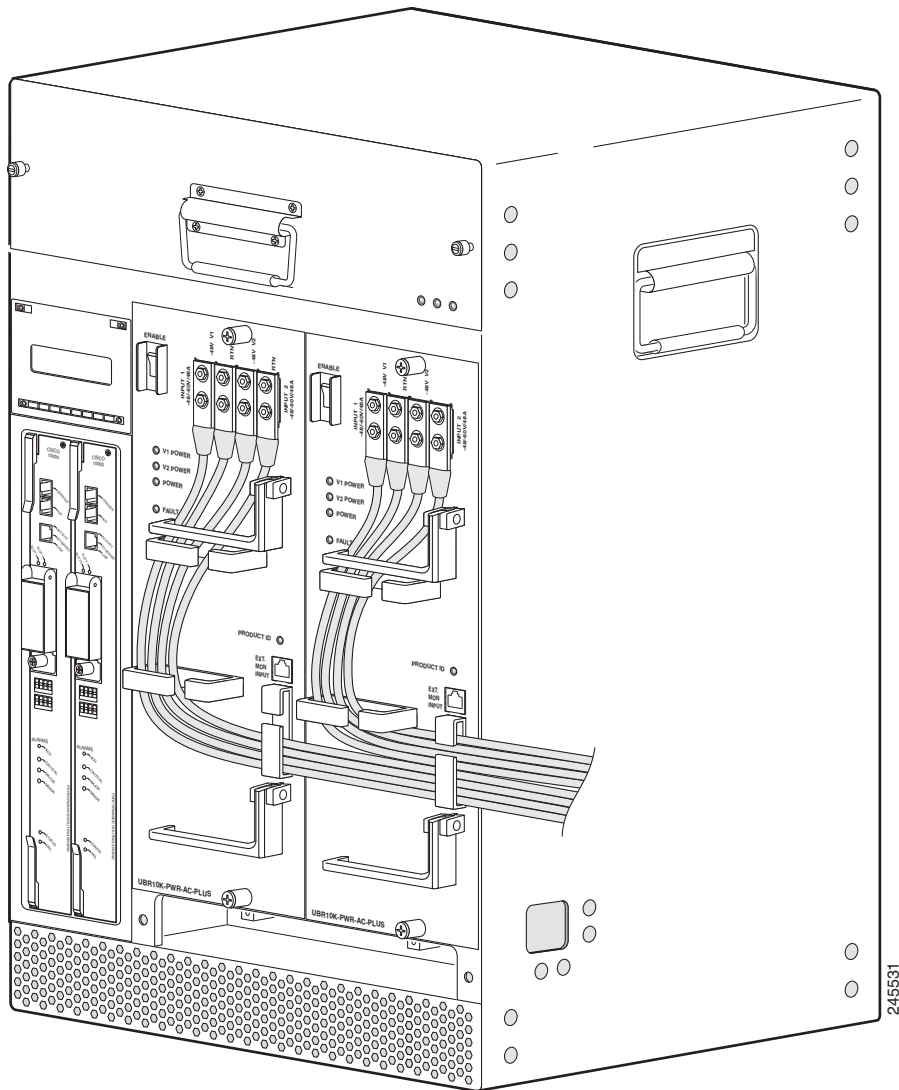
Caution You must attach both pairs of DC-input cables to the DC terminal blocks on each PEM for proper functioning of the PEMs.

- Step 7** Repeat [Step 3](#) to [Step 6](#) to connect the second facility DC power source to the second PEM module.
- Step 8** Route the four pairs of DC-input power cables from the DC power terminal blocks on both the PEMs down through the front of the chassis through the three retaining power cord clips. (See [Figure 5](#).)



Note Ensure that you lift the handles and route the cables underneath the handles and through the power cord clips of the PEM modules as shown in [Figure 5](#) so that the front cover fits on the Cisco uBR10012 chassis.

Figure 5 Routing the DC-input Cables on the UBR10-PWR-DC-PLUS= Module



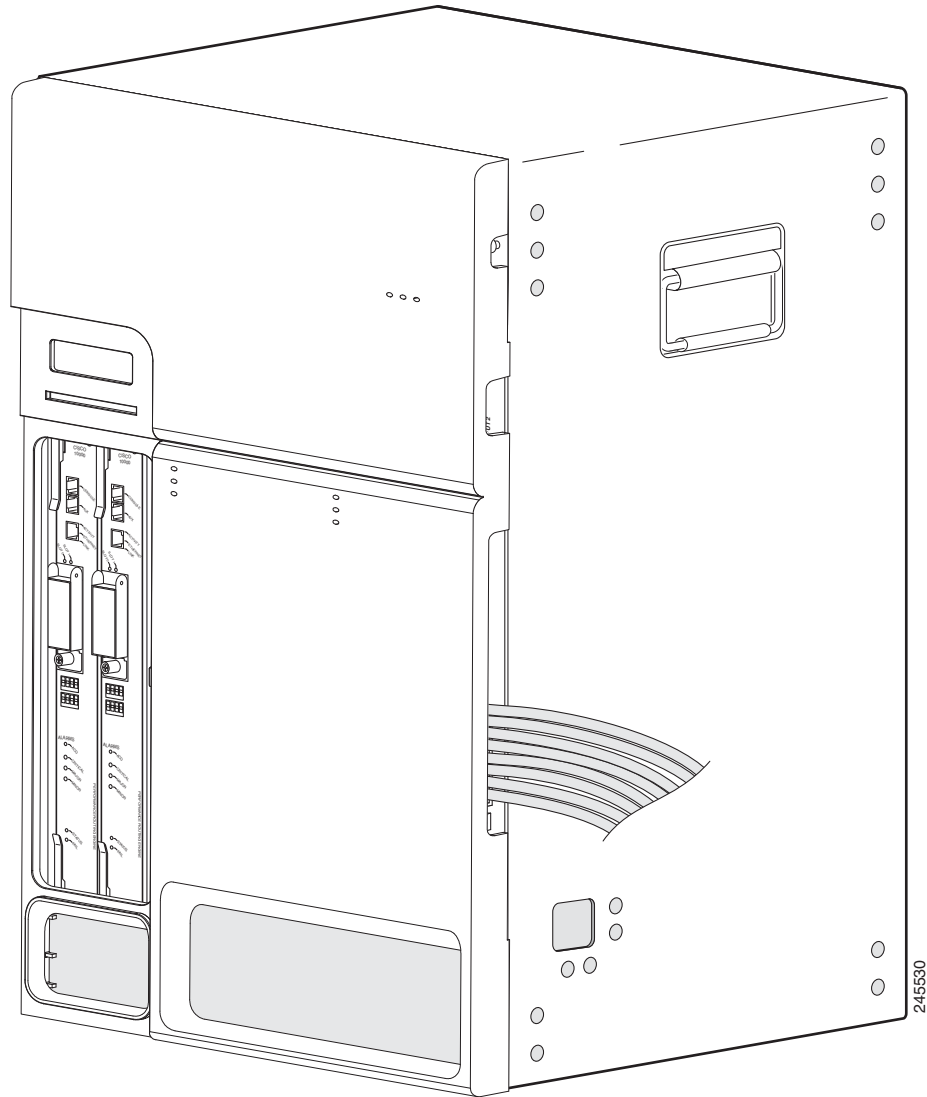
- Step 9** Reinstall the safety cover on the DC power terminal blocks on both the PEM modules.
- Step 10** Install the U-CHAS-COVER-PLUS= front cover on the DC PEM modules for proper routing of the DC-input power cables. If you are using the front cover (UBR10-CHAS-COVER=) that is used with the 2400 W or 3000 W DC PEM modules, note that this front cover will not fit the chassis with the 3300 W DC PEMs installed due to the routing of the DC-input power cables.



Note The front cover (U-CHAS-COVER-PLUS=) is designed for the 3300 W DC PEM modules with notches on the sides such that the DC-input power cables route through it, and the front cover fits the Cisco uBR10012 chassis router.

- Step 11** Route the cables through the notch provided on the right side of the front cover (see [Figure 6](#)).

Figure 6 Routing the DC-input Power Cables Through the Front Cover



What to do next

After performing this task, power on the DC PEM module, see [“Powering On the DC Power Entry Module”](#) section on page 20.

Powering On the DC Power Entry Module

Prerequisites

- Verify if the DC-input power cables are connected, see [“Connecting the DC-input Power Cables on the DC Power Entry Modules”](#) section on page 16.
- Verify if the safety covers are installed on the DC terminal blocks on the PEMs.

Required Tools and Equipment

No tools or equipment is needed.

Steps

To power-on the 3300 W DC PEM module:

Step 1 Verify that DC PEM power switch on each PEM is in Standby(0) position.

Step 2 Connect the DC-input power cables to the facility power source.

Step 3 Power on the power source that is supplying the DC power to the chassis.



Note If you are using the external AC-input power shelf, this step requires plugging in multiple AC power cords into the back of the unit and into the outlets providing the AC power source.



Note The internal fans on the 3300 W DC PEM module start working and are audible as soon as the DC-input power cables are connected to the facility power source and the facility power is turned on, although the DC power enable switch is in Standby (0) position.

Step 4 After powering on the DC power source, verify the LEDs on the DC PEMs.

The V1 POWER and V2 POWER LEDs on each PEM should illuminate (green). These LEDs only indicate that an input voltage is present on the PEMs and not that the PEM is powered on. In addition, the FAULT LED on each PEM illuminates (yellow). If the FAULT LED on the PEMs do not illuminate (yellow), see the [“Troubleshooting the 3300 W DC PEM”](#) section on page 30.

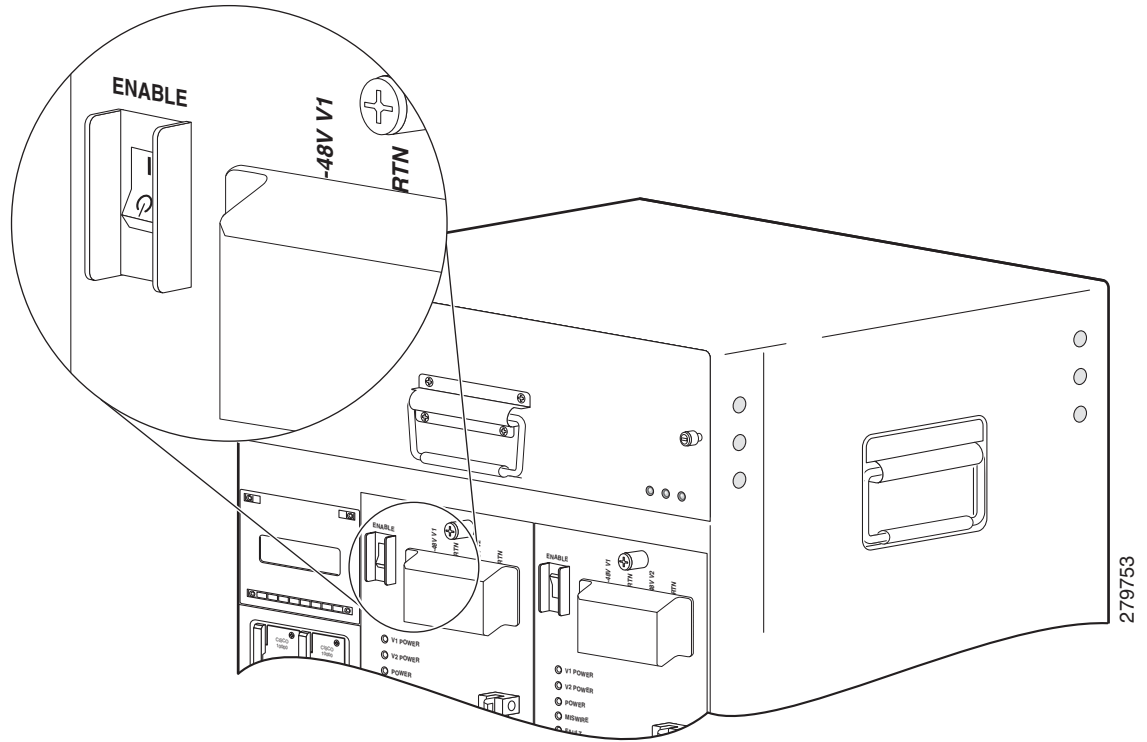
Verify that the MISWIRE LED is not illuminated. If it illuminates (yellow), it indicates that the DC-input power cables are reversed, see the [“Troubleshooting the 3300 W DC PEM”](#) section on page 30.



Tip The label on the chassis indicates the actual provided voltage range.

Step 5 Set the power enable switch on each DC PEM to the ENABLE (I) position (see [Figure 7](#)).

Figure 7 DC Power Switch in ENABLE Position



Step 6 Verify that the following LEDs are illuminated properly:

- The V1 POWER and V2 POWER LEDs on each PEM are illuminated (green). In addition, the POWER LED on each PEM is illuminated (green), indicating that power is being received and is being delivered to the chassis.
- If you are running a Cisco IOS Release that supports the PRODCUT ID LED/switch feature, verify that the PRODUCT ID LED/switch illuminates (green).



Note If you are running a Cisco IOS Release that does not support the PRODUCT ID LED feature, ensure that the PRODUCT ID LED/switch is not illuminated. For information on Cisco IOS Releases that support the PRODUCT ID LED/switch feature, see [Cisco uBR10012 Router Release Notes for Cisco IOS Release 12.2\(33\)SCE](#).



Note If the FAULT LED illuminates (yellow), see the “[Troubleshooting the 3300 W DC PEM](#)” section on page 30.

Removing and Replacing a 3300 W DC PEM



Note

If a 3300 W DC PEM fails, order and install a replacement DC PEM as soon as possible. The product order number for a replacement 3300 W DC PEM is UBR10-PWR-DC-PLUS=. For proper airflow, cooling, and safety, do not remove the failed unit until the replacement unit is available for installation.

This section contains information on removing and replacing 3300 W DC PEM modules in the Cisco uBR10012 router chassis.



Tip

The 3300 W DC PEM is operating correctly when its POWER LED is illuminated (green). When the FAULT LED is illuminated (yellow), the DC PEM is receiving DC-input power but is not providing power to the system. Verify that the DC PEM is fully inserted into the power bay and that its captive screws have been tightened. Then, set the DC power enable switch on the 3300 W DC PEM to the Standby (0) position, wait several seconds, and then switch it to the ENABLE (I) position. If the FAULT LED does not go off and the POWER LED does not illuminate (green), replace the 3300 W DC PEM.

This section represents the following topics:

- [Replacing a Redundant 3300 W DC PEM, page 22](#)
- [Replacing Both 3300 W DC PEMs, page 26](#)

Replacing a Redundant 3300 W DC PEM

This procedure is needed when the FAULT LED is illuminated (yellow) and the troubleshooting steps in the [“Troubleshooting the 3300 W DC PEM” section on page 30](#) do not correct the problem.

Prerequisites

No prerequisites exist for this task.

Required Tools and Equipment

- Replacement DC PEM (the product order number is UBR10-PWR-DC-PLUS=)
- Flat-head screwdriver

Steps

**Tip**

If you want to replace both 3300 W DC PEMs without shutting down the router, repeat this procedure for each DC PEM, one at a time. Do not use this procedure if both 3300 W DC PEMs have failed; instead, use the procedure in the [“Replacing Both 3300 W DC PEMs”](#) section on page 26.

**Warning**

Before performing any of the following procedures, ensure that power is removed from the DC circuit, the PEM is plugged into. To ensure that all power is OFF, locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the OFF position, and tape the switch handle of the circuit breaker in the OFF position. Statement 1003.

To replace and install a redundant 3300 W DC PEM module:

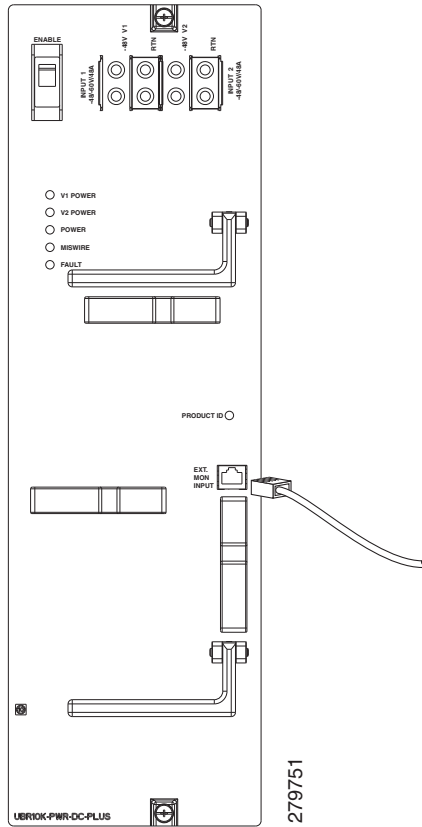
- Step 1** Remove the front cover by lifting it up slightly and then pulling it towards you.
- Step 2** Turn off the 3300 W DC PEM you are replacing by positioning the DC power enable switch to the Standby (0) position.

**Caution**

Do not power off both 3300 W DC PEMs because it will cause the system to shut down and all data traffic to stop. Power off only the 3300 W DC PEM you are replacing.

- Step 3** Disconnect the alarm cable from alarm connector on the 3300 W DC PEM if it is connected to the external AC-input power shelf (see [Figure 8](#)).

Figure 8 Removing the Alarm Connector from the DC PEM



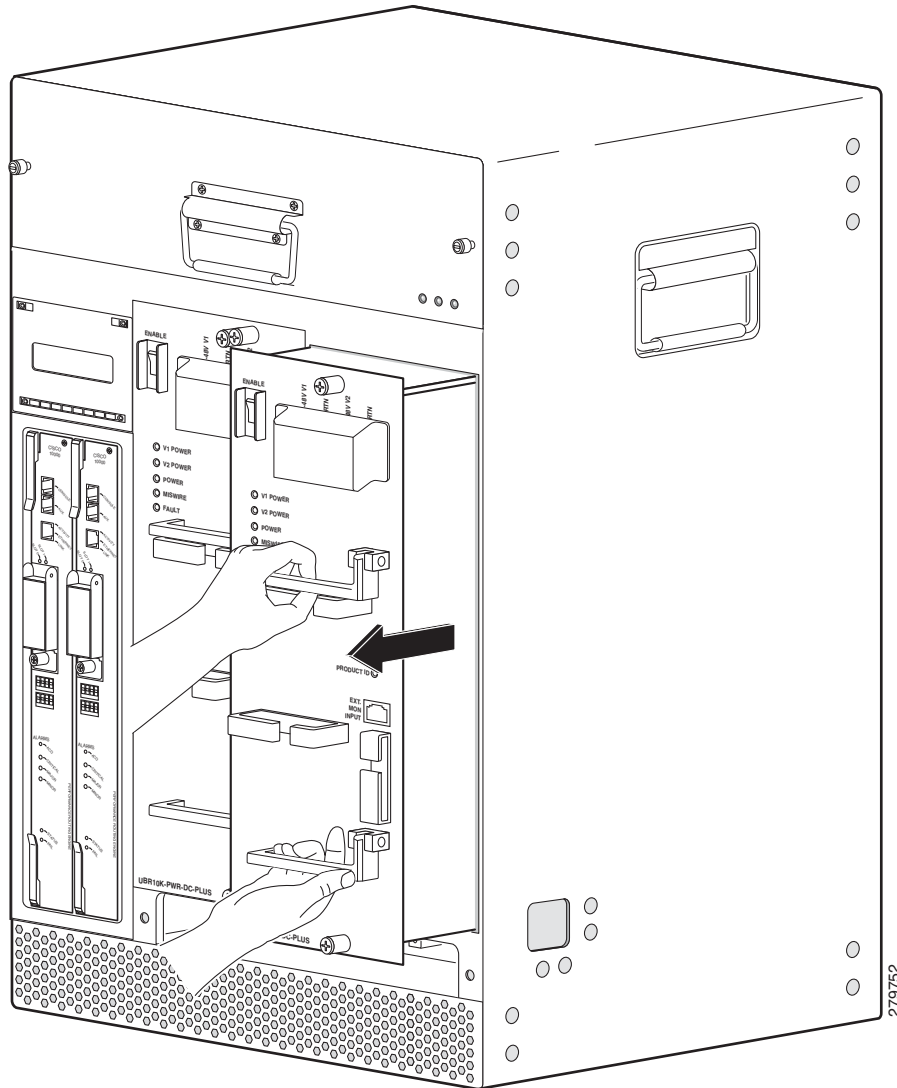
Step 4 Turn off the DC power source that is providing power for the 3300 W DC PEM.



Tip For true redundant power protection, ensure that you are using separate DC power sources for each 3300 W DC PEM.

- Step 5** Verify that the DC power source from the facility to the chassis is turned off (tape it in the OFF position, if possible).
- Step 6** Remove the safety cover from above the DC terminal blocks by loosening the captive screw and rotating the safety cover up and off of the PEM faceplate.
- Step 7** Remove the install nuts from the input studs on the DC terminal blocks of the PEM module.
- Step 8** Remove the dual-hole lugs attached to DC-input power cables from the DC power terminal blocks on the front panel of each 3300 W DC PEM.
- Step 9** Remove the DC-input power cables from the DC power cord clips.
- Step 10** Use a screw driver to loosen the captive screws on the 3300 W DC PEM module you are removing. Then pull the PEM from the chassis by using the handles on the faceplate (see [Figure 9](#)). Set the 3300 W DC PEM aside on an antistatic surface or in a static-shielding bag.

Figure 9 Removing a DC PEM



- Step 11** Verify that the DC power enable switch on the replacement DC PEM is in the Standby (0) position.
- Step 12** Install the replacement 3300 W DC PEM in the power bay, see [“Installing the DC Power Entry Modules”](#) section on page 13.

Step 13 Prepare and attach the DC-input power cables on the PEM, see [“Connecting the DC-input Power Cables on the DC Power Entry Modules”](#) section on page 16.



Note You must attach both pairs of DC-input cables to the DC terminal blocks on each PEM for proper functioning of the PEMs.

Step 14 Power on the replacement 3300 W DC PEM module, see [“Powering On the DC Power Entry Module”](#) section on page 20.

Replacing Both 3300 W DC PEMs



Note The illustrations for this procedure are identical to the illustrations in the [“Replacing a Redundant 3300 W DC PEM”](#) section on page 22 and therefore not repeated.

Prerequisites



Note This procedure requires that you shut down the Cisco uBR10012 router and remove all power to the system. To avoid this, we recommend replacing each DC PEM, one at a time, by following the instructions in [“Replacing a Redundant 3300 W DC PEM”](#) section on page 22.

This procedure is needed only in the following situations:

- When the failure LEDs (MISWIRE or FAULT) on both 3300 W DC PEMs are illuminated, indicating a problem with either the DC power source or the 3300 W DC PEMs.
- A single DC power source is currently being used for both DC PEMs, and you need to rewire the DC power connections so as to use a separate DC power source for each DC PEM (this is the recommended configuration).
- You want to connect the alarm indicators after the initial installation of the Cisco uBR10012 router. For more information on connecting the alarm indicators, see [Cisco uBR10012 Universal Broadband Router - Quick Start Guide](#).
- You need to move the chassis or reinstall it in another location.

Required Tools and Equipment

- 3300 W DC PEM (UBR10-PWR-DC-PLUS=)
- Flat-head screwdriver

Steps

To replace both the 3300 W DC PEM modules:

-
- Step 1** Remove the front cover by lifting it up slightly and then pulling it towards you.
- Step 2** Shut down the system with the following procedure:
- Notify appropriate personnel that you plan to shut down the system and that the shutdown results in total loss of service. Appropriate personnel includes the regional alarm or network monitoring center, central office personnel, and key customers.
 - Before you shut down the router, use the **copy** command to save any configuration changes to the NVRAM, and if you want, to a PCMCIA Flash card. For instructions about using the **copy** command, see the *Cisco uBR10012 Universal Broadband Router Software Configuration Guide*.
 - Set the DC power enable switch on each 3300 W DC PEM to the Standby (0) position.
- Step 3** Verify that the DC power source to the chassis is turned off (tape it in the OFF position, if possible).
- Step 4** Remove the safety cover from above the DC terminal blocks by loosening the captive screw and rotating the safety cover up and off of the PEM faceplate.
- Step 5** Remove the install nuts from the input studs on the DC terminal blocks of the PEM modules.
- Step 6** Remove the dual-hole lugs attached to DC-input power cables from the DC power terminal blocks on the front panel of each 3300 W DC PEM.
- Step 7** Remove the DC-input power cables from the DC power cord clips.
- Step 8** If the DC PEMs have alarm connectors that are connected to the optional AC-input power shelf, remove the cables from the RJ-45 connectors of each DC PEM.



Note If you are using the external AC-input power shelf, disconnect the AC power cord from each of the AC-input power modules.

- Step 9** Use a screwdriver to loosen the captive screws on the 3300 W DC PEMs. Then pull the DC PEMs from the chassis by using the handles on the faceplate. Set the two DC PEMs aside on an antistatic surface or in a static-shielding bag.
- Step 10** Verify that the DC power enable switch on each replacement 3300 W DC PEM is in the Standby (0) position.
- Step 11** Install the first replacement DC PEM in the power bay, see [“Installing the DC Power Entry Modules” section on page 13](#).
- Step 12** Install the second replacement DC PEM in the power, see [“Installing the DC Power Entry Modules” section on page 13](#).
- Step 13** Prepare and attach the DC-input power cables on the PEMs, see [“Connecting the DC-input Power Cables on the DC Power Entry Modules” section on page 16](#).



Note You must attach both pairs of DC-input cables to the DC terminal blocks on each PEM for proper functioning of the PEMs.

- Step 14** Power on 3300 W DC PEM modules, see [“Powering On the DC Power Entry Module” section on page 20](#).
-

Migrating from the 2400 W DC PEM to the 3300 W DC PEM

This section describes the steps for a seamless migration from the 2400 W DC PEM modules to the 3300 W DC PEM modules.



Note

In this section, all references to the 2400 W DC PEM also apply to the 3000 W DC PEM. The same procedure is applicable for migrating the 3000 W DC PEM to the 3300 W DC PEM.

Prerequisites

- The 3300 W DC PEM module requires four DC-input power cables to power-on as against the two DC power cables for the 2400 W DC PEM module. The DC-input power cables are attached to the DC power terminal blocks on the front panel of the 3300 W DC PEM.
- The DC terminal blocks located beneath the DC PEMs on the midplane of the chassis are not used with the 3300 W DC PEM modules.
- If you are using DC power cables from separate DC facility power sources, then you need not shut down both the power sources. If you are using an existing DC power cable that is used for 2400 W or 3000 W DC PEM, the installation should be examined prior to migration for proper cable routing. You must attach the dual-hole lugs to the ends of the DC-input power cables before using them with the 3300 W DC PEM.
- The U-CHAS-COVER-PLUS= front cover must be used with the Cisco uBR10012 chassis for proper routing of the DC-input power cables from the 3300 W DC PEMs through the chassis.



Note

You need not shut down the Cisco uBR10012 router to replace a 2400 W DC PEM module with a 3300 W DC PEM module. To avoid shutting down the Cisco uBR10012 router, you must replace one 2400 W DC PEM at a time; bring the 3300 W DC PEM module online, and then replace the other 2400 W DC PEM module.

Required Tools and Equipment

- 3300 W DC PEM module (UBR10-PWR-DC-PLUS=)
- 2400 W DC PEM module (UBR10-PWR-DC=)
- Four DC-input power cables, customer provided
- 0.625-inch dual-hole lugs, customer provided
- Front cover (U-CHAS-COVER-PLUS=)
- Flat-head screwdriver
- 10 mm hex socket driver



Note

The 3300 W DC PEM module accepts a maximum of 6 AWG wire or 4 AWG high-flex wire for the DC-input cables. If you are using the 4 AWG wire, use a high-flex high strand count power cable for optimal routing of the cables under the front cover. The 2 AWG wire is not supported on the 3300 W DC PEM module.

Steps

To replace the 2400 W DC PEM with the 3300 W DC PEM module:

-
- Step 1** Remove the front cover.
- Step 2** Follow the steps to remove the first 2400 W DC PEM:
- Set the DC power switch to Standby (0) position on one of the 2400 W DC PEM (that is to be removed) modules.
 - Ensure the facility power source going to the 2400 W PEM DC terminal is not energized and the FAULT or MISWIRE LED is not illuminated.
 - Disconnect the other end of the DC power cable, for safety.
 - Use a screwdriver to loosen the captive screws on the 2400 W DC PEM that you are removing. Then pull the 2400 W DC PEM from the chassis by using the handles on the faceplate and set the 2400 W DC PEM aside on an antistatic surface or in a static-shielding bag.
 - Ensure the DC terminal is not energized.
 - Remove the DC-input power cables from the particular DC terminal block located beneath the 2400 W DC PEM module.

Step 3 Verify that the POWER LED on the other 2400 W DC PEM module is illuminated (green) and does not blink.

Step 4 Determine the voltage being delivered to the backplane by the other 2400 W DC PEM.

Use the following methods to measure the voltage delivered to the backplane:

- External AC-input power shelf—Use a hand-held meter at the connector below the 2400 W DC PEMs to measure the voltage. The voltage should be from -42 V to -56 V.



Note The applied voltage on the external AC-input power shelf is normally within the required range unless it is changed to -56 V or more.

- DC power source at facility—Use a hand-held meter at the DC input terminal blocks located beneath the 2400 W DC PEM on the midplane of the chassis to measure the voltage. The voltage should be from -42 V to -56 V.

Ensure that the measured voltage is in the prescribed range before proceeding to the next step.



Caution

The voltage delivered to the backplane cannot be measured directly on a fully populated chassis or an empty DC PEM slot.

Step 5 Install the 3300 W DC PEM in the power bay, see [“Installing the DC Power Entry Modules” section on page 13](#).

Step 6 Attach the power cables to the DC power terminal blocks on the 3300 W DC PEM, see [“Connecting the DC-input Power Cables on the DC Power Entry Modules” section on page 16](#)



Note The 3300 W DC PEM has two DC power terminal blocks on the front panel. Four DC-input power cables must be connected to the two DC power terminal blocks and powered on for the DC PEM to function.

Step 7 Power on 3300 W DC PEM module, see [“Powering On the DC Power Entry Module”](#) section on page 20.



Note Verify that the V1 POWER and V2 POWER LEDs illuminate (green) on the 3300 W AC PEM module.

Step 8 Turn the DC power enable switch on the 3300 W DC PEM module to the ENABLE (I) position.

Step 9 Verify if the POWER LED illuminates (green) within three seconds on the 3300 W DC PEM module. If the POWER LED on the 3300 W DC PEM remains green and does not blink, it indicates that the migration is successful and the 3300 W DC PEM is now enabled and is supplying power to the chassis.



Note The backplane voltage supplied by the 3300 W DC PEM module to the Cisco uBR10012 chassis will be -57.5 V.

Step 10 Repeat [Step 1](#) to [Step 9](#) to replace the second 2400 W DC PEM module with the 3300 W DC PEM module.



Note You need not measure the voltage delivered to the backplane when you replace the second 2400 W DC PEM module with the 3300 W DC PEM module. You can skip [Step 4](#) while replacing the second 2400 W DC PEM with the 3300 W DC PEM.

Step 11 Install the U-CHAS-COVER-PLUS= front cover on the 3300 W DC PEM modules.

Step 12 Route the power cables out through the right side, so that it fits through the notch on the right side of the front cover.

Troubleshooting the 3300 W DC PEM

Check the following to help isolate a problem with the 3300W DC PEM:

- The DC-input power cables are installed into the DC PEM terminal blocks and the facility power source is turned on. The DC power enable switch is set to the Standby (O) position.

Check if the DC PEM is receiving power.

- The MISWIRE LED should not be illuminated. If it is illuminated (yellow), it indicates that the DC-input power cables are reversed, or one DC-input power cable was probably not connected. Correct the situation by reconnecting the power cables see, [“Connecting the DC-input Power Cables on the DC Power Entry Modules”](#) section on page 16.

- The V1 POWER and V2 POWER LEDs should illuminate (green).

If these LEDs are not illuminated, check the external wiring and facility power source. If the fans are working and are audible, it indicates that the DC PEM is receiving power, so there could be a possibility that the LEDs are not working.

- The FAULT LED should illuminate (yellow).

If this LED is not illuminated, there could be a possibility that the LED is not working, therefore the LED cannot indicate a valid fault on the PEM.

If the above LEDs do not illuminate but you are confident that PEM is receiving power, you can proceed to power on the PEM, see [“Powering On the DC Power Entry Module” section on page 20](#). Ensure that the POWER LED is not illuminated (green). If this LED is illuminated, the DC PEM should be replaced. See the [“Obtaining Documentation and Submitting a Service Request” section on page 33](#).

- The DC PEM is powered on, and the V1 POWER and V2 POWER LEDs are illuminated (unless they may not be working, as above). The DC power enable switch on the DC PEM is set to the ENABLE (I) position.
 - The FAULT LED should stop illuminating. If it remains illuminated, the DC PEM should be replaced because this is a valid fault. See the [“Obtaining Documentation and Submitting a Service Request” section on page 33](#).
 - The POWER LED should illuminate (green). If this LED does not illuminate, and the FAULT LED is not illuminated, there might be a possibility that the POWER LED is not working. You may need to verify if the PEM is providing valid power to the system by checking the DC PEM voltage and current using the Cisco IOS Release running on the router. Contact technical support for assistance, see the [“Obtaining Documentation and Submitting a Service Request” section on page 33](#).
- The FAULT LED is illuminated (yellow).
 - The FAULT LED illuminates when the PEM module detects an over-voltage or over-current condition, or when the PRE issues the command to shut down the PEM module (this could occur due to overheating). Ensure that none of these conditions exist in the system, and then try to switch the PEM module off and switch it on again.
 - If another PEM module exists in the system that powers up the chassis, and the FAULT LED is not illuminated on that module, then ensure that the PRE does not issue the command to shut down the PEM module.
 - If the problem persists, try another working unit. Else, see the [“Obtaining Documentation and Submitting a Service Request” section on page 33](#).
- The MISWIRE LED is illuminated (yellow).

If the MISWIRE LED is illuminated, the –48/–60 VDC and return (RTN+) wires are reversed. Ensure that the facility power source is turned off immediately, see [“Connecting the DC-input Power Cables on the DC Power Entry Modules” section on page 16](#) to reconnect the wires correctly before powering on the PEM module.

- The **show environment** command output (shown below) displays AC PEM instead of DC PEM.

```
Router# show environment

Temperature information:
  Temperature normal: Inlet sensor      measured at 31C/87F
  Temperature normal: Outlet sensor    measured at 35C/95F

Voltage information:
RP Voltage readings:
  Channel          Margin          ADC Value
  =====
  2.5v             Normal          2.49v
  1.8v             N/A            1.81v
  1.5v             Normal          1.49v
  1.8vFPGA         Normal          1.79v
  1.2v             Normal          1.20v
  3.3v             Normal          3.29v
```

```

Fan: OK
Power Entry Module 0 type AC status: OK // AC PEM is displayed //
Power Entry Module 1 type DC status: OK

```

Try one of the following:

- Upgrade to a supported Cisco IOS Release and then press the PRODUCT ID LED/switch.
 - Reload the software or physically remove the DC PEM module for at least 1 minute and then reinsert it.
- Use the **show environment** command to display the general health of the power system:

```

Router# show environment

Temperature normal: chassis inlet measured at 29C/84F
Temperature normal: chassis core measured at 42C/107F
Fan: OK
Power Entry Module 0 type DC status: OK
Power Entry Module 1 type DC status: OK
Router#

```

Verify that the temperatures are within the valid operating ranges, and that the fan assembly and both DC PEM modules are present and OK. If this is not the case, check for the following actions:

- Fan is reported MISSING—Insert the fan assembly or shut down the router immediately to avoid running the router beyond its operating temperature range.
- DC PEM is not listed—Verify that both DC PEMs are present, and if so, that each PEM is fully inserted into the chassis.
- An “External AC Supply Fault” message indicates that one of the power modules in the external power supply is reporting either a fault, an over-temperature condition, or is missing. Check the LEDs on the front panels of the power modules on the external power supply to discover which module has the fault.



Note When using the external AC-input power shelf, the **show environment** command provides information on whether a power module in the power shelf is missing, is reporting a fault, is experiencing an over-temperature condition, or is not receiving AC-input power. For information on the external AC-input power shelf and on connecting it to the DC PEM, see [Cisco uBR10012 Universal Broadband Router Hardware Installation Guide](#).

- If none of the above suggestions correct the problem, the 3300 W DC PEM could be faulty. Contact a service representative for further instructions

Related Documentation

Cisco uBR10012 Series Universal Broadband Router Quick Start Guide

http://www.cisco.com/en/US/docs/cable/cmts/ubr10012/quick/start/10kqsg_2.html

Cisco uBR10012 Universal Broadband Router Hardware Installation Guide at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/cable/ubr10k/ubr10012/hig/index.htm>

Cisco uBR10012 Universal Broadband Router Software Configuration Guide at the following URL:

<http://www.cisco.com/univercd/cc/td/doc/product/cable/ubr10k/ubr10012/scg/index.htm>

Obtaining Documentation and Submitting a Service Request

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

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