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1200-Watt DC-Input Power Supply Replacement Instructions

Product Numbers: PWR-7513-DC= (Cisco 7513), PWR-7576-DC= (Cisco 7576)

Customer Order Number: DOC-781899=

This document contains instructions for installing or replacing a 1200-watt (W), DC-input power supply in the Cisco 7513 and Cisco 7576 routers.

Note If you are upgrading a Cisco 7513 to a Cisco 7576, use this document as a reference for transferring power supplies from the Cisco 7513 to the Cisco 7576.

A single power supply is standard equipment in the Cisco 7513. A dual power supply is standard equipment in the Cisco 7576. A second power supply, if installed, provides redundant power.

In systems with redundant power, the power supplies are load sharing and fully hot swappable. You can remove and replace one power supply, while the remaining power supply immediately powers up to provide full power and to maintain uninterrupted system operation.

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Product Overview

The DC-input power supply is a modular power supply for the Cisco 7513 and Cisco 7576 multiprotocol, multimedia routers. The DC-input power supply is optional equipment in the Cisco 7513 and Cisco 7576. A second power supply, if installed, provides redundant power. Power supplies reside in power supply bays (labeled Power A and Power B) in the rear of the router chassis, as shown in Figure 1.

Figure 1 Cisco 7513 and Cisco 7576—Rear-Panel View



Caution To prevent problems with the Cisco 7513 and Cisco 7576, *do not mix DC-input and AC-input power supplies in the same chassis*. Your Cisco 7513 or Cisco 7576 must have *either* DC-input or AC-input power supplies.

Power bay A contains the first (or standard) power supply, and power bay B contains the second (optional) supply in systems with redundant power.

Note The Cisco 7576 features two routers on one backplane. These are identified as router A and router B. These designations have no relationship to the power bays, which are identified as power A and power B.

DC-Input Power Supply Specifications

Table 1 lists the DC-input power supply specifications.

Table 1 Cisco 7513 and Cisco 7576 DC-Input Power Supply Specifications

Specification	Rating
DC-input voltage	–40 VDC ¹ minimum in North America (–56 VDC in the European Community [E.C.]) –48 VDC nominal, at 33 amps (A) in North America (–60 VDC at 26A in the E.C.) –52 VDC maximum in North America (–72 VDC in the E.C.)
Internal DC voltages supplied and steady-state maximum current ratings	+5.2 VDC @ 200A +12 VDC @ 35A –12 VDC @ 3A +24 VDC @ 8A
Input power requirement	1600W
Power output	1200W with a maximum configuration and one DC-input power supply
Heat dissipation	5465 Btu/hr
Weight	25 pounds (11.34 kilograms)
Wire gauge	8 American Wire Gauge (AWG), rated minimum 90

¹ VDC = volts direct current.

Dual power supplies are automatically load sharing and redundant, which means that you can install or replace a second power supply on line. During normal operation, dual power supplies provide system power simultaneously (load share). When you remove one power supply, the remaining power supply immediately powers up to provide full power and to maintain uninterrupted power to the system. Whenever possible, connect each power supply to a separate DC source.

LED Indications and the Safety Interlock Mechanism

On the Cisco 7513 and Cisco 7576 chassis front panels, the power A and power B LEDs go on when the power supply in the corresponding bay is installed and is supplying power to the system. Both power LEDs should be on in systems with redundant power.

LED Indications

The power supply LEDs include the DC OK LED, the FAN OK LED, and the OUTPUT FAIL LED. (See Figure 2.) The DC OK LED is on when the input power is on. The FAN OK LED is normally on; however, it is off if the power supply fan fails. The OUTPUT FAIL LED is normally off, but flashes for a lamp test when you power on.

Figure 2 **Power Supply LEDs**

The OUTPUT FAIL LED lights for either of the following reasons:

- Power supply DC-output failure, which might be caused by an overload by the system or an actual failure in the DC-input power.
- Power shutdown that is initiated by the power supply because it detected an out-of-tolerance voltage condition in the power supply.

In systems with a single power supply, and in systems with redundant power when both power supplies are shutting down, the OUTPUT FAIL LED lights momentarily as the system powers down, but goes out when the power supply has completely shut down.

Safety Interlock Mechanism

The power supplies feature the following three safety interlock features:

- An on/off switch with a locking mechanism (see Figure 3) that prevents the power supply from being removed from the chassis when the power supply switch is in the on (I) position. When the switch is on, a metal tab extends into a slot in the chassis. When the switch is in the off (O) position, the tab is raised and clears the slot.

Figure 3 On/Off Switch Locking Mechanism

- A captive installation screw at the bottom of the power supply front panel provides electrical grounding and prevents the power supply from vibrating or sliding out of the bay and dislodging from the power connectors in the backplane. (See Figure 2.)

The power supplies are self-monitoring. Each supply monitors its own temperature and internal voltages. An internal fan in each power supply draws cooling air from the back of the chassis, through the power supply, and out the front of the chassis. The power supply airflow is separate from that of the rest of the chassis.

Installation Safety, ESD Precautions, and Tools Required

Before you begin this installation, review the safety guidelines in this section to avoid injuring yourself or damaging the equipment. This section also provides power requirements to consider if you are adding a second power supply to your system for redundant power, and lists of the tools and parts you need to perform this installation.

Safety Warnings

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



Warning 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. To see translations of the warnings that appear in this publication, refer to the *Regulatory Compliance and Safety Information* document that accompanied this device.

Waarschuwing Dit waarschuwingssymbool betekent gevaar. U verkeert in een situatie die lichamelijk letsel kan veroorzaken. Voordat u aan enige apparatuur gaat werken, dient u zich bewust te zijn van de bij elektrische schakelingen betrokken risico's en dient u op de hoogte te zijn van standaard maatregelen om ongelukken te voorkomen. Voor vertalingen van de waarschuwingen die in deze publicatie verschijnen, kunt u het document *Regulatory Compliance and Safety Information* (Informatie over naleving van veiligheids- en andere voorschriften) raadplegen dat bij dit toestel is ingesloten.

Varoitus Tämä varoitusmerkki merkitsee vaaraa. Olet tilanteessa, joka voi johtaa ruumiinvammaan. Ennen kuin työskentelet minkään laitteiston parissa, ota selvää sähkökytkentöihin liittyvistä vaaroista ja tavanomaisista onnettomuuksien ehkäisykeinoista. Tässä julkaisussa esiintyvien varoitusten käännökset löydät laitteen mukana olevasta *Regulatory Compliance and Safety Information* -kirjasesta (määräysten noudattaminen ja tietoa turvallisuudesta).

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Warnung Dieses Warnsymbol bedeutet Gefahr. Sie befinden sich in einer Situation, die zu einer Körperverletzung führen könnte. Bevor Sie mit der Arbeit an irgendeinem Gerät beginnen, seien Sie sich der mit elektrischen Stromkreisen verbundenen Gefahren und der Standardpraktiken zur Vermeidung von Unfällen bewußt. Übersetzungen der in dieser Veröffentlichung enthaltenen Warnhinweise finden Sie im Dokument *Regulatory Compliance and Safety Information* (Informationen zu behördlichen Vorschriften und Sicherheit), das zusammen mit diesem Gerät geliefert wurde.

Avvertenza Questo simbolo di avvertenza indica un pericolo. La situazione potrebbe causare infortuni alle persone. Prima di lavorare su qualsiasi apparecchiatura, occorre conoscere i pericoli relativi ai circuiti elettrici ed essere al corrente delle pratiche standard per la prevenzione di incidenti. La traduzione delle avvertenze riportate in questa pubblicazione si trova nel documento *Regulatory Compliance and Safety Information* (Conformità alle norme e informazioni sulla sicurezza) che accompagna questo dispositivo.

Advarsel Dette varselsymboler betyr fare. Du befinner deg i en situasjon som kan føre til personskade. Før du utfører arbeid på utstyr, må du være oppmerksom på de faremomentene som elektriske kretser innebærer, samt gjøre deg kjent med vanlig praksis når det gjelder å unngå ulykker. Hvis du vil se oversettelser av de advarslene som finnes i denne publikasjonen, kan du se i dokumentet *Regulatory Compliance and Safety Information* (Overholdelse av forskrifter og sikkerhetsinformasjon) som ble levert med denne enheten.

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Warning! Denna varningssymbol signalerar fara. Du befinner dig i en situation som kan leda till personskada. Innan du utför arbete på någon utrustning måste du vara medveten om farorna med elkretsar och känna till vanligt förfarande för att förebygga skador. Se förklaringar av de varningar som förekommer i denna publikation i dokumentet *Regulatory Compliance and Safety Information* (Efterrättelse av föreskrifter och säkerhetsinformation), vilket medföljer denna anordning.

Safety Guidelines

The following guidelines will help to ensure your safety and protect the equipment. This list is not inclusive of all potentially hazardous situations, so *be alert*.



Warning Two people are required to lift the chassis. Grasp the chassis underneath the lower edge and lift with both hands. To prevent injury, keep your back straight and lift with your legs, not your back. To prevent damage to the chassis and components, never attempt to lift the chassis with the handles on the power supplies or on the interface processors, or by the plastic panels on the front of the chassis. These handles were not designed to support the weight of the chassis.

- Always disconnect all power cords and interface cables before moving the chassis.
- Keep tools and chassis components away from walk areas.
- Do not work alone if potentially hazardous conditions exist.
- 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.

Safety with Electricity

You can remove or install a redundant (second) power supply without turning off the other supply. Before removing a redundant power supply, ensure that the first power supply is powered on to ensure uninterrupted operation.

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 in which you are working.
- Disconnect all power and external cables before moving a chassis.
- Do not work alone if potentially hazardous conditions exist.
- Never assume that power is 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.

In addition, use the guidelines that follow when working with any equipment that is connected to telephone wiring or other network cabling:



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

- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line is disconnected at the network interface.
- Use caution when installing or modifying telephone lines.



Warning Before opening the chassis, disconnect the telephone-network cables to avoid contact with telephone-network voltages.

Circuit Protection Requirements



Warning This product relies on the building's installation for short-circuit (overcurrent) protection. Ensure that a fuse or circuit breaker no larger than 120 VAC, 50A U.S. (240 VAC, 30A international) is used on the phase conductors (all current-carrying conductors).

Preventing Electrostatic Discharge Damage

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

Following are guidelines for preventing ESD damage:

- Always use an ESD-preventive wrist strap or ankle strap and ensure that it makes good skin contact.
- When removing or installing a power supply, connect the equipment end of a ground strap to the chassis ground screw on the interface processor end of the chassis, or to an unpainted surface inside the noninterface processor end of the chassis, such as the chassis frame.
- If you plan to return a replaced part to the factory, immediately place it in a static shielding bag to avoid ESD damage to the board.
- The wrist strap only protects the board from ESD voltages on the body; ESD voltages on clothing can still cause damage.



Warning Periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms.

Tools Required

You need the following tools to install or replace a power supply:

- A 1/4-inch flat-blade screwdriver and a number 2 phillips screwdriver.
- Small, wire cutter.
- Appropriate length and diameter of conduit through which the DC-input cable will pass. The opening on the terminal block cover is one inch in diameter. Installation of this conduit depends on your site and is beyond the scope of this publication.
- If the chassis is mounted in an equipment rack, and cables from other equipment fall in front of the power supply bays, you will need cable ties to temporarily anchor the cables out of the way.
- If access to the power supply bays is partially blocked by a power strip or other permanent rack fixture, you will need a 1/4-inch flat-blade screwdriver to temporarily detach the ears from the equipment rack-mounting strips.
- ESD-preventive wrist strap.

Before beginning the power supply installation, check the installation screws on all power supplies and check the area around the power supply bays to determine which tools you will need.

The new or replacement power supply and the power cable that you supply are the only parts you need to complete this installation.

If you remove a power supply and leave the bay empty, install a cover plate over the empty bay. The chassis is shipped with a cover plate installed over the empty bay.

Removing and Replacing a Power Supply

The power supplies are located on the floor of the chassis under the card cage.

The following sections describe the procedures for removing an existing power supply and installing a new one. The DC-input cable must be routed through conduit from your power source to the power supply.

Note You provide conduit through which you must route the DC-input power cable. If cables from other equipment are in front of the bay, move them aside and temporarily secure them with cable ties. You must disconnect the conduit from the conduit bracket before you can remove a power supply from the chassis. Route and attach the conduit to make each power supply accessible for replacement and maintenance.

In systems with redundant power, you can install, remove, or replace one of the power supplies without affecting system operation. When power is removed from one power supply, the redundant power feature causes the second power supply to power up to full power and to maintain uninterrupted system operation.

Note This procedure is not for new system installation; perform this procedure *only* if you have already connected the system to network interfaces and performed the first-time startup procedures described in the *Cisco 7500 Series Installation and Configuration Guide*.



Warning Although it is not necessary to turn off both power supplies to remove one of two power supplies, you must turn off the power to the power supply you plan to remove. When the power is on with one of two power supplies removed, high current is exposed on the power connector inside the chassis. If you have only one power supply, you must turn off the power to this power supply.

Removing a Power Supply

To remove a power supply, follow these steps:

Step 1 Turn off (O) the system power switch on the power supply you are going to remove.



Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. 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.



Warning Before working on a chassis or working near power supplies, unplug the power cord on AC units or disconnect the power at the circuit breaker on DC units.



Warning This unit might have more than one power cord. To reduce the risk of electric shock, disconnect the two power supply cords before servicing the unit.

Removing and Replacing a Power Supply

Step 2 Remove the 8-mm screws on the terminal block cover so the cover is free of the terminal block. (See Figure 4.)



Warning When installing the unit, the ground connection must always be connected first and disconnected last.

Figure 4 **Removing and Replacing the Terminal Block Cover**

Step 3 When the cover is free of the terminal block, replace the terminal block cover so it remains with the power supply.

Step 4 Use the large slotted screwdriver to loosen the captive screw that secures the power supply to the chassis frame. (See Figure 5.)

Figure 5 **Removing a Power Supply**

Step 5 Grasp the power supply handle and pull the power supply approximately halfway out of the bay. Then with your other hand under the power supply, pull it completely out of the bay. (See Figure 6.)

Figure 6 Supporting the Power Supply

Caution To maintain agency compliance requirements and meet EMI emissions standards in Cisco 7513 and Cisco 7576 chassis with a single power supply, the power supply blank must remain in the power supply bay adjacent to the power supply. (See Figure 7.) *Do not* remove this blank from the chassis unless you need to install a redundant power supply. To prevent system problems, do not mix AC-input and DC-input power supplies in the same chassis.

Figure 7 Power Supply Blank

Replacing a Power Supply

To replace the power supply, follow these steps:



Warning Before performing any of the following procedures, ensure that power is removed from the DC circuit. 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.

Step 1 Hold the power supply as shown in Figure 6 and slide it into the power supply bay. Push the power supply all the way into the chassis until the sides are flush against the chassis frame. To prevent damaging the backplane connector, do not jam the power supply into the bay.

Step 2 Use the slotted screwdriver to tighten the captive screw that secures the power supply to the chassis frame. (See Figure 5.)



Warning When stranded wiring is required, use approved wiring terminations, such as closed-loop or spade-type with upturned lugs. These terminations should be the appropriate size for the wires and should clamp both the insulation and conductor.

Step 3 If not already done, route the DC-input power cable through the conduit from your power source, through the conduit bracket on the power supply (see Figure 8), and make a sufficient length of wire available to attach to the three terminal block connections.

Step 4 Attach and tighten the conduit to the conduit bracket. How this conduit is attached depends on your site; its attachment is beyond the scope of this documentation.

Step 5 Use the 8-mm nut driver to attach the ground wire to the ground terminal. (See Figure 8.)



Warning The illustration shows the DC power supply terminal block. Wire the DC power supply using the appropriate lugs at the wiring end, as illustrated. The proper wiring sequence is ground to ground, positive to positive (line to L), and negative to negative (neutral to N). Note that the ground wire should always be connected first and disconnected last.

Step 6 Check the power supply's wiring and color code to verify that it matches the wiring and color code at the DC source.



Caution Incorrectly wiring the terminal block could create a shock hazard and could damage the power supply, power source, and the chassis components.

Step 7 Replace the terminal block cover. (See Figure 4 on page 10.)

Step 8 After the DC power cable leads are reconnected, reconnect the power cable at the power source.

Step 9 If you are replacing both power supplies, repeat Steps 1 through 5 for the second power supply.

Figure 8 Removing and Replacing the DC-Input Power Cable

Note When you turn the power on to the new power supply, the DC OK LED and the FAN OK LED will light and stay lit. No other LEDs should light.

This completes the power supply replacement procedure.

Proceed to the following section “Checking the Installation” to apply power and check the installation.

Checking the Installation

To complete the installation, turn on the power supply and observe the LEDs on the power supply to verify that the new supply is operating properly.

Step 1 Review the descriptions of the power supply LEDs on page 3.

Step 2 Check the following components to make sure that they are secure:

- Each power supply is inserted all the way into its bay, and the captive installation screw is tightened.
- At the DC power-source end of the power cable, the leads are securely attached to the DC power, the source power is within the range indicated on the power supply.
- When two power supplies are present, the second cable is connected to a separate DC power source if possible.



Warning After wiring the DC power supply, remove the tape from the circuit breaker switch handle and reinstate power by moving the handle of the circuit breaker to the on position.

Step 3 Turn the power supply on (I) by turning the switch clockwise one-quarter turn. The DC OK LED and the FAN OK LED will light and stay lit. No other LEDs should light.

If the power supply switch resists, it is probably not fully inserted into the bay. Turn the power switch fully counterclockwise to off (O), pull the power supply out of the bay about two inches, and then push the power supply firmly back into the slot. Do not force the supply into the slot; doing so can damage the connectors on the supply and the backplane. Tighten the captive installation screw before proceeding.

Step 4 Verify that the OUTPUT FAIL LED stays off.

- If the OUTPUT FAIL LED lights, move the power supply to the other bay if possible and turn the power switch on (I). If the LEDs light properly when the supply is installed in the other bay, suspect a faulty backplane power connector.
- If the OUTPUT FAIL LED lights when the power supply is installed in the other bay, suspect a power supply failure or an adverse environmental condition (the power supply has detected an overvoltage or overtemperature condition and has shut down).
- If two power supplies are installed, and the OUTPUT FAIL LED lights only on one power supply, assume that the power supply or DC source (for that supply) is faulty.
- If the OUTPUT FAIL LED lights on two supplies that are connected to the same DC source, suspect that the DC source is faulty, or that an overvoltage or overtemperature condition is causing the power supplies to shut down.
- If the OUTPUT FAIL LED lights on two supplies that are connected to separate DC sources, assume that an overvoltage or overtemperature condition is causing the power supplies to shut down.

If the power supply fails to operate properly after several attempts to initialize it, contact a service representative for assistance. If the power supply fails (and you need to order a replacement) and you did not record the type of power supply in your chassis, you will have to check the chassis in order to make this determination.



Timesaver The system can identify which type of power supplies are in your chassis: DC-input or AC-input. As a general precaution, use the **show environment all** command and note the type of power supply indicated in each of your chassis (indicated as either 1200W DC or 1200W AC). Record and save this information in a secure place.

This completes the power supply installation. Refer to the *Cisco 7500 Series Installation and Configuration Guide* for installation troubleshooting procedures.

Cisco Connection Online

Cisco Connection Online (CCO) is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services.

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- WWW: <http://www-europe.cisco.com>
- WWW: <http://www-china.cisco.com>
- Telnet: cco.cisco.com
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

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This document is to be used in conjunction with the *Cisco 7500 Series Installation and Configuration Guide* publication.

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