C I S C O S Y S T E M S

Catalyst 5000 Series Power Supply Configuration Note

Product Numbers: WS-X5008

This document contains instructions for installing and configuring the Catalyst 5000 series power supplies. For a complete description of commands used to configure and maintain the Catalyst 5000 series switch, refer to the *Catalyst 5000 Series Configuration Guide and Command Reference* publication. And for complete hardware configuration and maintenance procedures, refer to the *Catalyst 5000 Series Hardware Installation and Maintenance* publication. These documents are available on UniverCD or in print.

Sections in this document include the following:

- What is the Catalyst 5000 Series Switch?

- Power Supplies

- Specifications

- Environmental Monitoring

- Power Supply LEDs

- Connecting Power

- Safety Recommendations

- Installing and Replacing Power Supplies

- Using the show system Command

Warning Only trained and qualified personnel should install or replace the Catalyst 5000 series switch, chassis, power supplies, fan assembly, or switching modules.
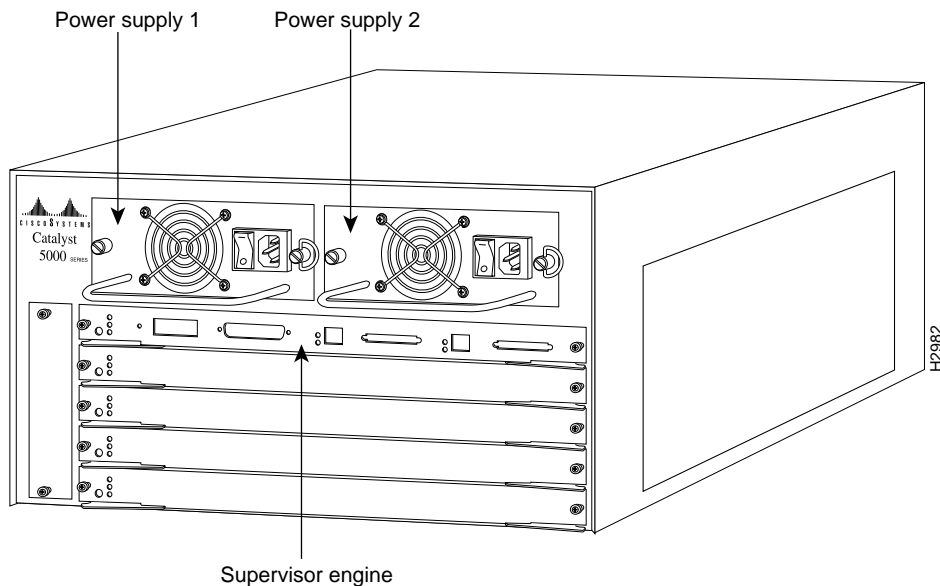
What is the Catalyst 5000 Series Switch?

The Catalyst 5000 series switch provides high-density switched Ethernet for both wiring closet and data center applications. The switch includes a single integrated 1.2 gigabit-per-second (Gbps) multiple-LAN-switching backplane, called the switching backplane, which supports switched 10-megabit-per-second (Mbps) and 100-Mbps Fast Ethernet with backbone connections to Fast Ethernet, Fiber Distributed Data Interface (FDDI), Copper Distributed Data Interface (CDDI), and Asynchronous Transfer Mode (ATM) networks. Figure 1 is an example of a configuration using the Catalyst 5000 series switch.

Figure 1   Cascaded Switches Using Fast Ethernet Interfaces on the Supervisor Engine Module
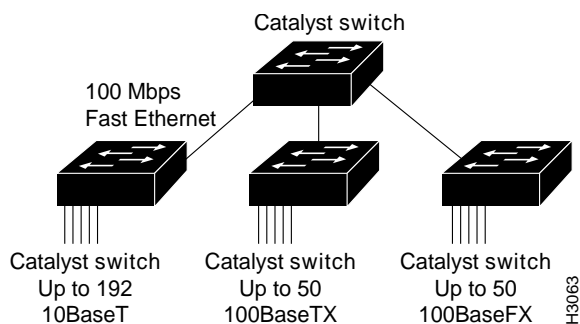
The Catalyst 5000 series switch chassis has five slots. The first slot is used for the supervisor engine module, which provides Layer 2 switching, local and remote management, and dual Fast Ethernet interfaces. The remaining four slots can be used for any combination of modules for additional 10- and 100-Mbps Ethernet, CDDI/FDDI, and ATM connections. Figure 2 shows the rear view of the Catalyst 5000 series switch, which provides access to the supervisor engine and switching modules, power supplies, and fan assembly.

Figure 2   Catalyst 5000 Series Switch Chassis Rear View

Power Supplies

The Catalyst 5000 series switch comes equipped with one 376W, AC-input power supply. An optional second identical power supply is also available for fault-tolerant power. Dual power supplies are automatically load sharing and redundant, which means that a second power supply can be installed or replaced without interrupting system operation. (See Figure 2.)

Specifications

Following are the Catalyst 5000 series switch power supply specifications:

Table 1   Power Supply Specifications

Description	Specification
Dimensions (H x W x D)	1.2 x 14.4 x 16 in (3 x 35.6 x 40.6 cm)
Weight	11 lb (4.73 kg)

Environmental Conditions:
  Operating temperature
  Nonoperating temperature
  Humidity
	32 to 104 F (0 to 40 C)
	-40 to 167 F (-40 to 75 C)
	10 to 90%, noncondensing

DC voltages supplied and steady-state maximum current ratings	+5V @ 70A +12V @ 2A +24V @ 0.2A
Power supply	376W maximum (AC-input power supplies)
Power dissipation	350W maximum configuration, 110W typical with maximum configuration
Heat dissipation	563W (1919 Btu[1]/hr)
Input voltage	100–240VAC wide input with power factor corrector

Description	Specification
Frequency	47–63 Hz autoranging
AC current rating	2.5A maximum at 90–132VAC, 1.6A maximum at 175–264VAC with the chassis fully configured
Airflow	95 cfm^2 through the system fan assembly
Operating temperature	32–104 F (0–40 C)
Nonoperating temperature	-40–167 F (-40–75 C)
Humidity	10–90%, noncondensing

Agency approvals:
  Safety
  EMI[3]
	
	UL[4] 1950, CSA[5]-C22.2 No. 950-93, and EN60950
	FCC Class A (47 CFR, Part 15), EN55022 Class B and
	  VCCI Class 2 with shielded cables

1. Btu = British thermal units
2. cfm = cubic feet per minute
3. EMI = electromagnetic interference
4. UL = Underwriters Laboratory
5. CSA = Canadian Standards Association

Environmental Monitoring

The environmental monitoring functions use three levels of status conditions to monitor the system. These levels are normal, alarm, and power supply shutdown. The processor monitors the temperature inside the switching module compartment, and the power supplies use the normal and critical levels to monitor DC voltages. Table 2 lists temperature thresholds for the (processor-monitored) levels. Table 3 lists the DC power thresholds for the normal and alarm (power-supply-monitored) levels.

Table 2   Processor-Monitored Temperature Thresholds

Parameter	Normal	Alarm
Airflow	10–55 C	> 55 C

Table 3   Power-Supply-Monitored Voltage Thresholds

Parameter	Alarm	Normal	Alarm
+5V	< 4.74V	4.74–5.26V	> 5.26V
+12V	< 11.40V	11.40–12.60V	> 12.60V
+24V	< 20.00V	20.00–30.00V	> 30.00V

The three levels of status condition are as follows:

- Normal—All monitored parameters are within normal tolerances.

- Alarm—An out-of-tolerance temperature or voltage condition exists. The system may not continue operation. If a voltage measurement reaches this level, the power supply can shut down the system. Immediate action is required. The +24 VDC line remains enabled to allow the fan assembly to continue operation.

- Power supply shutdown—The power supply has detected an out-of-tolerance voltage, current, or temperature condition within the power supply and has shut down. The PS1 and PS2 LEDs on the supervisor engine module stay on as the power ramps down and, if a second power supply is still providing power, the LEDs remain red after shutdown. When both power supplies shut down in a system with redundant power, all DC power, including the fan assembly, is disabled. The DC power remains off until you toggle the AC power and correct the problem that caused the shutdown (if any). This status condition is typically caused by one of the following conditions:

  — Loss of AC power (you turned off the system power, or the AC source failed).

  — Power supply detected an overvoltage, overcurrent, undervoltage, or overtemperature condition within the power supply.

The processor uses the two levels of status conditions (normal, alarm) to monitor the air temperature in the switching-module compartment. Sensors on the supervisor engine module monitor the temperature of the cooling air that flows through the switching-module compartment. If the air temperature exceeds a defined threshold, the system processor displays warning messages on the console terminal. The processor stores the present parameter measurements for both temperature and DC voltage in NVRAM. These measurements can be retrieved later as a report of the last shutdown parameters.

The power supply monitors its own internal temperature and voltages. The power supply is either within tolerance (normal) or out of tolerance (alarm level), as shown in Table 3. If an internal power supply temperature or voltage reaches a critical level, the power supply shuts down without any interaction with the processor.

If the processor detects that AC input power is dropping but it can recover before the power supply shuts down, it logs the event as an intermittent power failure. The reporting functions display the cumulative number of intermittent power failures logged since the last power up.

Fault-Tolerant Power

When two power supplies are installed and both are turned on, each provides concurrently about half of the required power to the system. If one of the power supplies fails, the second power supply immediately ramps up to full power to maintain uninterrupted system operation. Load sharing and fault tolerance are automatically enabled when the second power supply is installed; no software configuration is required.

Each power supply should be connected to a separate AC source so that, in case of an input power line or power supply failure, the second power supply maintains uninterrupted system power.

Power Supply LEDs

On the supervisor engine module faceplate, the PS1 LED goes on when the power supply in the left bay, labeled power supply 1, is installed and supplying power to the system. The PS2 LED goes on when the power supply in the right bay, labeled power supply 2, is installed and supplying power to the system. Both the LEDs should go on in systems with redundant power. The supervisor engine module LEDs are shown in Figure 3 and described in Table 4.

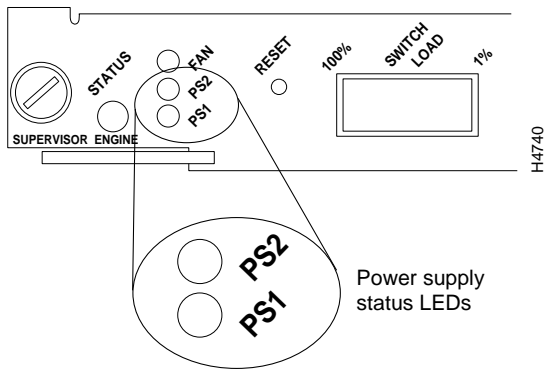**Figure 3   Supervisor Engine Module Power Supply LEDs**

Table 4   Supervisor Engine Module Power Supply LEDs

LED	Description
PS1	If the left bay power supply is operational, the PS1 LED is green. If the left bay power supply is not operational, the PS1 LED is red. If the left bay power supply is off or not installed, the PS1 LED is off.
PS2	If the right bay power supply is operational, the PS2 LED is green. If the right bay power supply is not operational, the PS2 LED is red. If the right bay power supply is off or not installed, the PS2 LED is off.

Connecting Power

To connect an AC-input power supply, follow these steps:

Step 1   On one power supply, plug in the power cord. (See Figure 4.)

Step 2   Connect the power supply cord to an input line.

Figure 4   Power Cord Connection

Power cord connections
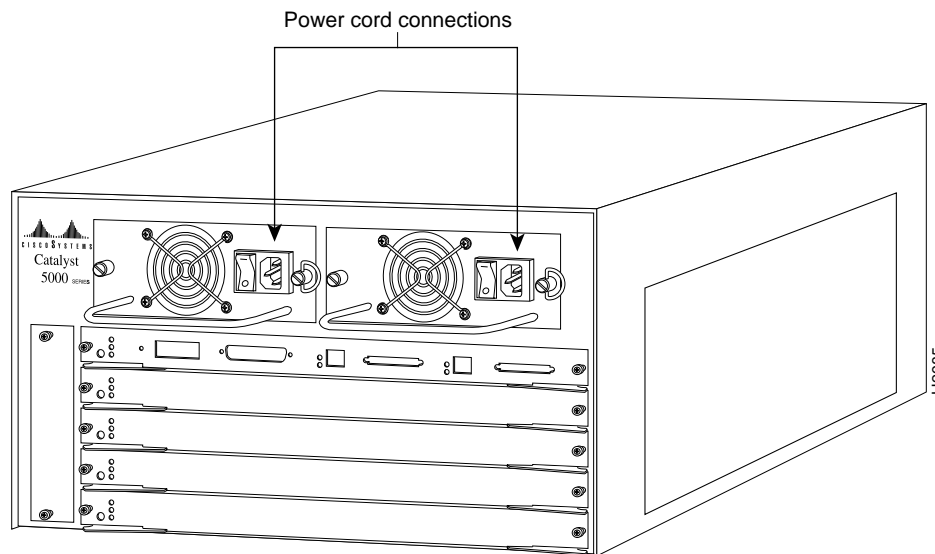
Connecting Redundant Power

Connect the redundant power supply to a separate input line. Connect the redundant AC-input power supply as follows:

Step 1   On the redundant power supply, plug in the power cord. (See Figure 4.)

Step 2   Connect the redundant power supply cord to a separate input line than the initial power supply.

Safety Recommendations

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

- Never try to lift the chassis by yourself; *two people are required* to lift the switch.

- Always turn off all power supplies and unplug all power cords before removing the chassis front panel.

- Always unplug all power cords before installing or removing a chassis.

- Keep the chassis area clear and dust free during and after installation.

- Keep tools and chassis components away from walk areas.

- Do not wear loose clothing, jewelry (including rings and chains), or other items that could get caught in the chassis. Fasten your tie or scarf and sleeves.

Warning   Metal objects heat up when connected to power and ground, and can cause serious burns.

Safety with Electricity

The supervisor engine, switching modules, and redundant (second) power supplies are designed to be removed and replaced while the system is operating without presenting an electrical hazard or damage to the system. Before removing a redundant power supply, ensure that the first supply is powered on. However, you must shut down the system before removing or replacing any of the replaceable components inside the front panel; for example, the backplane. Never install equipment that appears damaged.

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 installing or removing 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.

In addition, use the guidelines that follow when working with any equipment that is disconnected from a power source but still 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 has been disconnected at the network interface.

- Use caution when installing or modifying telephone lines.

Installing and Replacing Power Supplies

The Catalyst 5000 switch is configured to your order and is ready for installation and startup when it leaves the factory. As your communication requirements change, you may want to upgrade your system and add or replace a power supply. This section describes the procedures for installing, replacing, and reconfiguring power supplies.

The 376W power supplies (AC-input) used in the switch support redundant hot swapping. When two power supplies are installed, you can install, remove, or replace one of the supplies without affecting system operation. When power is removed from one supply, the redundant power feature causes the second supply to ramp up to full power and maintain uninterrupted system operation. In systems with dual power supplies, connect each power supply to separate input lines to maximize the likelihood that in case of a line failure, the second source will still be available and can maintain maximum overcurrent protection for each power connection.

A modular power cord connects each power supply to the separate site power sources.

> ⚡ **Warning** Use both hands to remove and install power supplies.

Note Each power supply weighs 11 pounds.

> ⚡ **Warning** Keep hands and fingers out of the power supply bays. High voltage is present on the power backplane when the system is operating.

Tools Required

You will need a 1/4-inch flat-blade screwdriver to remove and install filler plates and to loosen or tighten the captive installation screws on the power supply.

Removing Power Supplies

Always install a filler plate over an empty power supply bay to protect the connectors from contamination.

Take the following steps to remove a power supply:

Step 1 Turn OFF the power switch on the power supply you are removing. (See Figure 5.)

> ⚠ **Caution** Failure to turn off the power supply could result in equipment damage.

Figure 5   Power Supply Switch and AC Connection
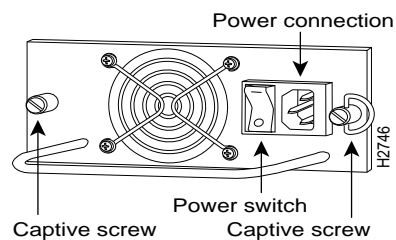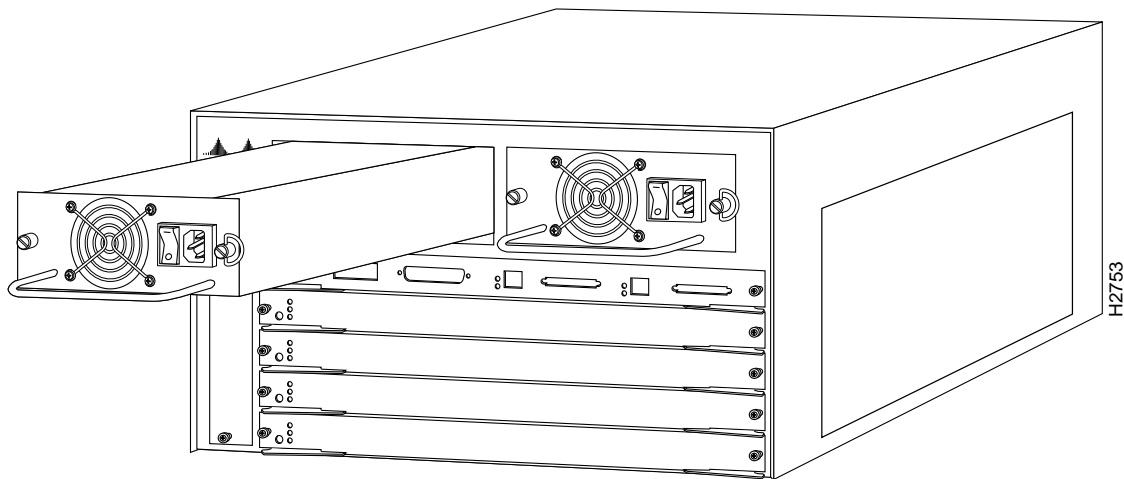

Step 2 Disconnect the power cord from the power source.

Step 3 Remove the power cord from the power inlet on the power supply.
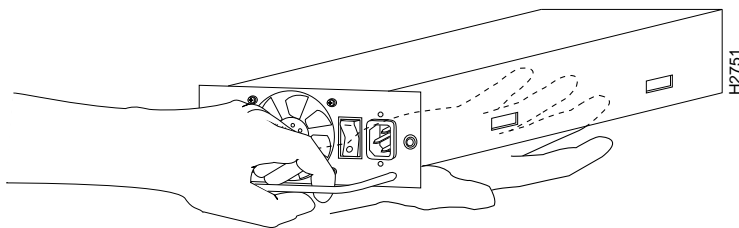
Step 4 Use a screwdriver to loosen and remove the captive installation screw on the sides of the power supply. (See Figure 6.)

Figure 6   Power Supply Installation

Step 5   Grasp the power supply handle with one hand and place your other hand underneath to
support the bottom of the supply, as shown in Figure 7.

Figure 7   Handling a Power Supply

Step 6   Pull the supply out of the bay and put it aside.

Step 7   If the power supply bay is to remain empty, install a blank power-supply filler plate
(part number 700-00177-01) over the opening and secure it with the mounting screws. This
not only protects the inner chassis from dust, but also the connectors in the rear of the bay,
which expose current levels when the chassis is powered on.

Note   To install a new power supply, follow Step 1 through Step 6 in reverse.

Using the show system Command

Enter the **show system** command to display the power supply and Catalyst 5000 series switch status.
The power supply status is listed in the PS-Status field of the **show system** command screen.

Example

In the following example, the system status and other information is displayed:

```
Console> show system
PS-Status Fan-Status Temp-Alarm Sys-Status Uptime d,h:m:s
--------- ---------- ---------- ---------- --------------
ok        ok         off        ok         27,17:05:50

Modem    Baud  MAC-Address-Range
-------- ----- ------------------------------------
disabled 9600 00-04-0b-a0-04-1f to 00-04-0b-a0-05-56

System Name            System Location         System Contact
---------------------- ----------------------- ----------------------
WBU-Catalyst-5000 5    Closet 202 1/F          Luis x5529
Console>
```

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