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Cisco 7513 Blower Module Assembly Replacement Instructions

Product Number MAS-7513-FAN=

The blower module assembly for the Cisco 7513 chassis is a spare part that can be replaced in the field.

This document provides recommendations for correct environmental conditions for the chassis and troubleshooting recommendations should you suspect a blower failure in your chassis.

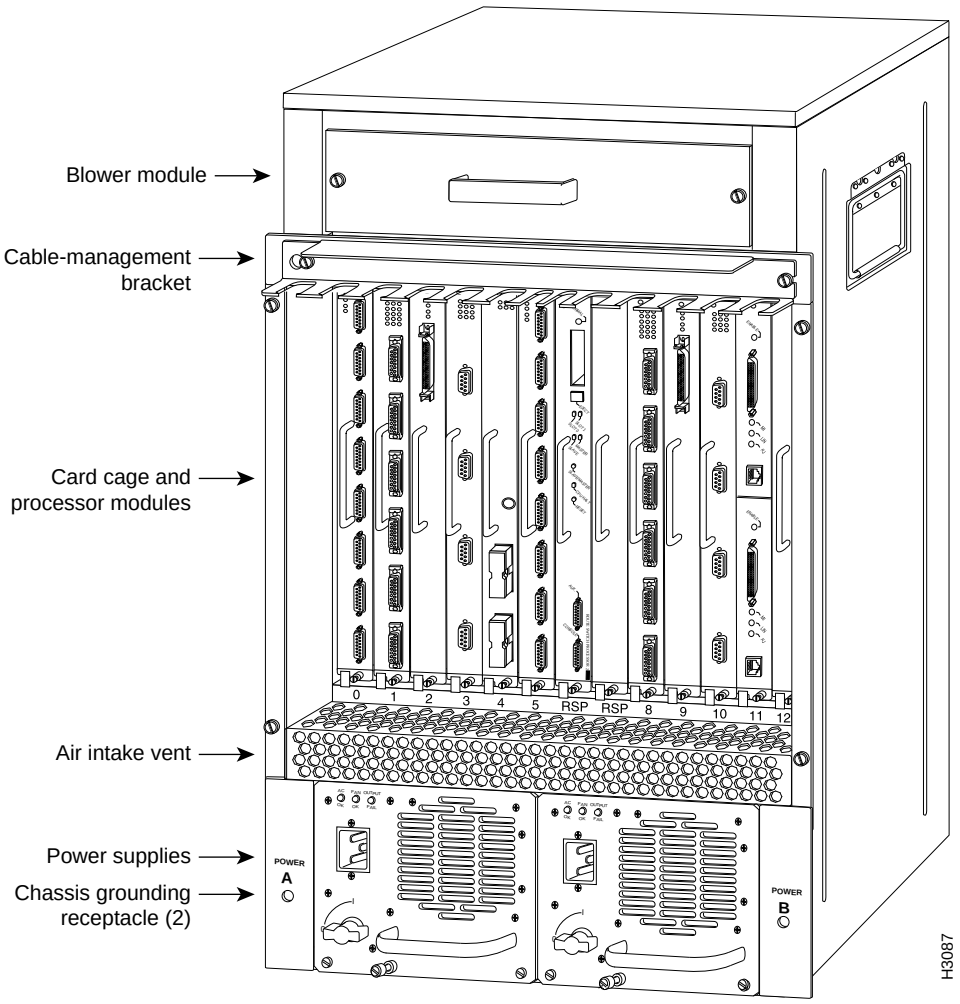
This document discusses the procedures required to replace the blower module assembly.

The following topics are discussed:

Product Overview

The Cisco 7513 system blower is mounted in a module (drawer) located above the card cage on the interface processor end of the chassis. (See Figure 1.) It draws cooling air through the chassis interior to maintain an acceptable operating temperature for the internal components.

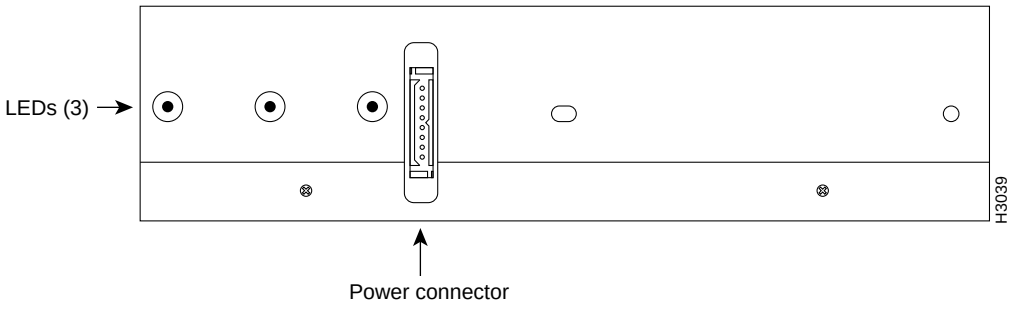
Figure 1 Cisco 7513—Rear-Panel View



The blower module assembly comprises the blower, a printed circuit board (control board) mounted on a metal plate, three front panel LEDs, a power connector, and a metal case with a handle. A view of the end of the blower module (opposite the end with the handle) is shown in Figure 2.

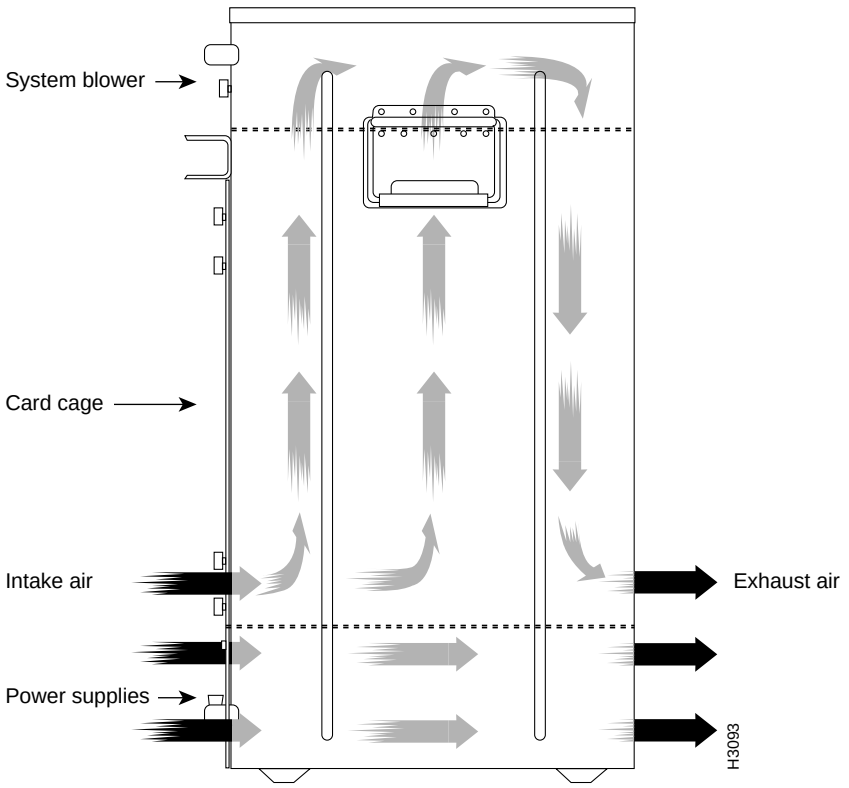
The entire blower module assembly is available as a spare part. If any one of the internal parts fails (blower, control board, or LEDs), the entire assembly must be removed and replaced.

Figure 2 Blower Module—End View



The blower module slides into the top of the Cisco 7513 chassis from the interface processor end of the router. (See Figure 1 and Figure 3.) The blower draws air in through the inlet vents below the chassis card cage, up through the card cage, processor modules, and other internal components, through the blower module, and out through the exhaust vents on the front of the chassis. Figure 3 shows the airflow path.

Figure 3 Internal Air Flow—Side View



The front and back of the chassis must remain unobstructed to ensure adequate airflow and prevent overheating inside the chassis. (See the section “Site Environment.”)

A blower control board on the blower module monitors and controls the operation of the variable-speed blower. The variable-speed feature enables quieter operation by allowing the blower to operate at less than maximum speed when doing so provides adequate cooling air to maintain an acceptable operating temperature inside the chassis.

Temperature sensors on the chassis interface and RSP2 monitor the internal air temperature. When the ambient air temperature is within the normal operating range, the blower operates at the slowest speed, which is 55 percent of the maximum speed.

If the temperature inside the chassis exceeds the normal range, the blower control board increases the blower speed to provide additional cooling air to the internal components. If the temperature continues to rise, the blower control board linearly increases the blower speed until the blower reaches full speed (100 percent). If the internal temperature exceeds the specified threshold, the system environmental monitor shuts down all internal power to prevent equipment damage from excessive heat.

If the system detects that the blower has failed, it will display a warning message on the console screen. If the condition is not corrected within two minutes, the entire system will shut down to avoid an overtemperature condition and shutdown.

Site Environment

The blower operates at 55 percent of capacity when it is possible to do so and maintain an acceptable operating temperature inside the chassis. If the temperature exceeds 23 C, the blower speed increases linearly until it reaches 100 percent. Although the blower supports quieter operation under normal conditions (approximately 62 dBa), the noise level when the blower is operating at 100-percent capacity is approximately 70 dBa. Therefore, the Cisco 7513 router is best suited for unattended or computer room use.

The router requires a dry, clean, well-ventilated, and air-conditioned environment. The internal blower pulls ambient air through the chassis to cool the internal components. To allow sufficient airflow, maintain a minimum of two inches of clearance at both the inlet and exhaust openings on the chassis. If the airflow is blocked or restricted, or if the inlet air is too warm, an overtemperature condition can occur. Under extreme conditions, the environmental monitor will shut down the power to protect the system components.

To help maintain normal operation and avoid unnecessary maintenance, plan your site configuration and prepare your site *before* installation. After installation, make sure that the site maintains an ambient temperature of 32 through 104 F (0through 40 C), and keep the area around the chassis as free from dust as is practical.

If the temperature of the room air drawn into the chassis is higher than desirable, the air temperature inside the chassis may also be too high. This condition can occur when the wiring closet or rack in which the chassis is mounted is not ventilated properly, when the exhaust of one device is placed so it enters the air inlet vent of the chassis, or when the chassis is the top unit in an unventilated rack. Any of these conditions can inhibit air flow and create an overtemperature condition.

Because the inlet air flows into one part of the chassis and out another, other devices can be rack mounted with little or no clearance above and below the chassis. However, when mounting a router in a rack with other equipment, or when placing it on a table with other equipment located close by, ensure that the exhaust from other equipment does not blow into the inlet of the chassis. The inlet air is drawn in and exhausted as shown in Figure 3.

Table 1 lists the operating and nonoperating environmental site requirements. To maintain normal operation and ensure high system availability, maintain an ambient temperature and clean power at your site. The following ranges are those within which the router will continue to operate; however, a measurement that is approaching the minimum or maximum of a range indicates a potential problem. You can maintain normal operation by anticipating and correcting environmental anomalies before they approach the maximum operating range.

- Operating temperature range: 32 through 104 F (0through 40 C).
- Operating humidity range: 10 to 90%, noncondensing.
- Air flow: Cooling air is drawn in through the sides of the chassis. Keep both sides of the chassis clear of obstructions, including dust, and away from the exhaust ports of other equipment.

Table 1 Specifications for Operating and Nonoperating Environments

Specifications	Minimum	Maximum
Temperature, ambient operating	32 F (0 C)	104 F (40 C)
Temperature, ambient nonoperating and storage	-4 F (-20 C)	149 F (65 C)
Humidity, ambient (noncondensing) operating	10%	90%
Humidity, ambient (noncondensing) nonoperating and storage	5%	95%
Altitude, operating and nonoperating	Sea level	10,000' (3050 m)
Vibration, operating	5–200 Hz, 0.5 g (1 oct./min.)	–
Vibration, nonoperating	5–200 Hz, 1 g (1 oct./min.) 200–500 Hz, 2 g (1 oct./min.)	–

Blower Shutdown

When the system power is on, the blower must be operational. If the system detects that the blower has failed or is failing, it will display a warning message on the console screen.

If the condition is not corrected within two minutes, the entire system will shut down to avoid an overtemperature condition and shutdown. The system uses a Hall Effect signal to monitor the blower.

The current to the blower and the magnetic field generated by the blower's rotation generates a voltage, which the system monitors to determine whether or not the blower is operating. If the monitored voltage signal drops below a specified value, the system assumes a blower failure and initiates a shutdown.

In the following example, the system has detected an out-of-tolerance fan, which it interprets as a fan failure. The failure message is displayed for two minutes before the system shuts down.

```
%ENVM-2-FAN: Blower has failed, shutdown in 2 minutes
```

If the system does shut down because of a blower failure, the system will display the following message on the console screen and in the show environment display when the system restarts:

```
Queued messages:
%ENVM-1-SHUTDOWN: Environmental Monitor initiated shutdown
```

For complete command descriptions and instructions, refer to the *Router Products Command Reference* publication.

Troubleshooting Blower Operation

If you suspect your blower has failed, check the following to help isolate the problem:

- When you start up the system, does the blower go on?

  To determine whether the blower is operating, listen for the blower motor. In noisy environments, place your hand next to the front of the chassis to feel for air being forced out the exhaust vent.

  — If yes, the +24 VDC line to the blower is good, but there might be a problem with the software.

  — If no, there is a problem with the blower or the +24 VDC power. If the output fail LED is on, there could be a problem with the +24VDC supply to the blower either at the power supply or the blower control board.

  — If no and the output fail LED is off, ensure that the blower module is seated properly. Refer to the section “Removing and Replacing the Blower Module” to remove and reseat the blower module.Try starting the system again.

- Do the system and blower start up, but shut down after about two minutes?

  — If you have changed the software configuration register boot field settings or altered the configuration file boot instructions, the system could be booting a software image that does not recognize the signals from the blower control board (and therefore assumes that the cooling subsystem is not operating).

  — The following message, if displayed, indicates that the blower has failed or is operating out of tolerance.

  ```
  %ENVM-2-FAN: Fan has failed, shutdown in 2 minutes
  ```

  If the blower or the blower control board fails, you must replace the blower module assembly.

  — The following message, if displayed, indicates that the system has detected an overtemperature condition or out-of-tolerance power inside the chassis.

  ```
  Queued messages:
  %ENVM-1-SHUTDOWN: Environmental Monitor initiated shutdown
  ```

  If an environmental shutdown results from an out-of-tolerance power condition, the output fail LED will go on before the system shuts down.

  Although an overtemperature condition is unlikely at initial startup, ensure that heated exhaust air from other equipment is not entering the inlet vents, and that there is sufficient clearance around the sides of the chassis to allow cooling air to flow. Refer to the section “Site Environment” on page 4 for preventive site configurations.

  The preceding message could also indicate a faulty component or temperature sensor. Before the system shuts down, refer to the section “show environment Commands” and use the **show environment** or **show environment table** commands to display the internal chassis environment.

show environment Commands

The **show environment** command display reports the current environmental status of the system. The report displays parameters that are out of the normal values. No parameters are displayed if the system status is normal. The example that follows shows the display for a system in which all monitored parameters are within Normal range. Following is sample output of the **show env** command:

```
Router# show env

All measured values are normal
```

If the environmental status is *not* normal, the system reports the worst-case status level in the last line of the display.

The **show environment table** command displays the temperature and voltage thresholds for each of the three RSP2 temperature sensors, for each monitored status level: low critical, low warning, high warning, and high critical. The slots in which the RSP2 can be installed are indicated in parentheses (6 and 7). Also listed are the shutdown thresholds for the processor boards and power supplies. Following is sample output of the **show env table** command:

```
Router# show env table

Sample Point    LowCritical    LowWarning     HighWarning    HighCritical

RSP(6) Inlet                                  101C/213F      101C/213F
RSP(6) Hotpoint                               101C/213F      101C/213F
RSP(6) Exhaust                                101C/213F      101C/213F
RSP(7) Inlet                                  101C/213F      101C/213F
RSP(7) Hotpoint                               101C/213F      101C/213F
RSP(7) Exhaust                                101C/213F      101C/213F
+12 Voltage     10.76          11.37          12.64          13.24
+5 Voltage      4.49           4.74           5.25           5.52
-12 Voltage     -10.15         -10.76         -13.25         -13.86
+24 Voltage     19.06          21.51          26.51          28.87
Shutdown boards at           101C/213F
Shutdown power supplies at   101C/213F
```

Note Temperature ranges and values are subject to change.

Installation Safety, ESD Precautions, and Tools Required

Before you begin replacing the blower, review the safety guidelines in this section to avoid injuring yourself or damaging the equipment. This section also lists of the tools and parts you need to perform this procedure.

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*.

- Never try to lift the chassis by yourself; *two people are required* to lift the Cisco 7513.
- 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

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.

- Never install telephone wiring during a lightning storm.
- 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.

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 blower module, connect the equipment end of a ground strap to an unpainted surface of the chassis, such as the chassis frame.
- If you are returning 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 For safety, 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 blower module:

- A 1/4-inch flat-blade screwdriver.
- Spare blower module assembly
- ESD-preventive wrist strap.
- Antistatic bag in which the old blower module assembly should be placed

Removing and Replacing the Blower Module

The blower provides cooling air to the internal system components. If you determined that the blower or its control board has failed, you need to replace the blower module assembly. If you determined that the LED board inside the blower module assembly has failed, you need to replace the blower module assembly. The LED and blower control boards inside the blower module assembly are not separately replacable.

When viewing the chassis from the interface processor end, the blower module is located above the card cage (See Figure 4.) Two slotted captive screws hold the blower module in place.

Warning It is not necessary to turn OFF system power before removing the blower module; however, when the power is ON and the blower module is removed, high current is exposed on the blower module power connector at the backplane.

Follow these steps to replace the blower module.

Step 1 Locate the blower module, which is above the card cage on the noninterface processor end of the chassis. (See Figure 4.)

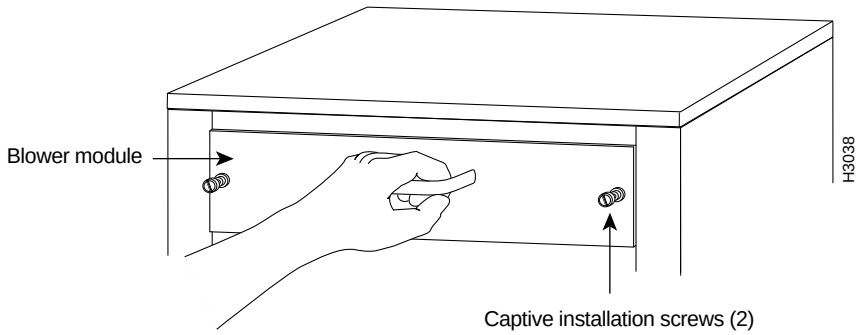
Step 2 Use the flat-blade screwdriver to loosen the captive screws that fasten each end of the blower module. (See Figure 4.)

Warning Although the system should not be operating when you remove the blower module, it is not necessary to turn OFF system power before removing the blower module. However, with the system power ON and the blower module removed, high current is exposed on the blower module power connector at the backplane; do *not* insert conductive items into the empty blower module opening. After an operating blower module is removed, the blower impeller blades will continue to spin for approximately two minutes; do *not* insert anything into the module's vent holes while the impeller is spinning.

Caution With chassis power ON and the blower module removed, no cooling air is circulating through the system. Replace the blower module before the system overheats. The system will shut down approximately two minutes after reaching the shutdown temperature threshold.

Step 3 Grasp the handle on the front of the module and slowly pull the blower module straight out of the chassis. (See Figure 4.)

Figure 4 Removing and Replacing the Blower Module



Step 4 Place the removed blower module in an antistatic bag for storage or return to the factory.

Step 5 Hold the handle of the new module with either your right or left hand (as long as you use both hands to handle the module) and with the intake vents on the blower module facing down and the "Insert This Side Up" label facing up, insert the new blower module into the chassis. Keep the module as straight as possible as you guide it into the chassis.

Step 6 When the blower is all the way into the chassis opening, tighten the captive installation screws on the front of the blower module.

This completes the blower module removal and replacement procedure.

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