

CHAPTER 4

Troubleshooting the Installation

This chapter provides troubleshooting guidelines for Cisco 12006 and Cisco 12406 Routers. If the solutions provided in this chapter do not make the router fully functional, contact your Cisco service representative for assistance.

- [Performing Other Configuration Tasks, page 4-1](#)
- [Problem Solving with Subsystems, page 4-14](#)

Performing Other Configuration Tasks

This section describes the following additional configuration tasks.

- [Configuring the Software Configuration Register, page 4-1](#)
- [Recovering a Lost Password, page 4-11](#)

Configuring the Software Configuration Register

The software configuration register is a 16-bit register in NVRAM that you use to define specific system parameters. You can set or change the contents of this register to accomplish the following tasks:

- Define boot sources for the default Cisco IOS software, assigning them in the following order of precedence:
 - Flash memory card inserted in PCMCIA slot 0
 - TFTP server on the network

- Flash memory SIMM (NVRAM) on the RP
- Boot image stored within the operating environment, which you access by using an appropriate form of the **boot** command entered at the ROM monitor prompt (`rommon>`)
- Define a default boot filename.
- Enable or disable the Break function.
- Control broadcast addresses.
- Set the console terminal baud rate.
- Force an automatic boot using a boot image.

When you first power on the router, a boot image called the RP ROM monitor is executed, and the ROM monitor prompt (`rommon>`) is displayed. At this prompt, you have access to a limited set of commands that enable you to set values in the software configuration register and to perform other tasks.

The RP ROM monitor is loaded into the RP Flash ROM when the RP is manufactured. You can use it to boot the system from local Flash memory devices. The RP ROM monitor software can be upgraded in the field, if necessary.

- Read **boot system** commands from the configuration file stored in NVRAM. [Table 4-1](#) defines the bits in the software configuration register.



Caution

To avoid confusion and possibly halting the system, remember that valid software configuration register values may be combinations of settings, rather than the individual settings listed in [Table 4-1](#). For example, the factory default value 0x0102 for the software configuration register is a composite of several settings.

Table 4-1 Software Configuration Register Bit Meanings

Bit Number ¹	Hexadecimal Value	Definition/Function
00 to 03	0x0000 to 0x000F	Comprises the boot field for defining the source of a default Cisco IOS software image required to run the router
06	0x0040	Causes system software to ignore the contents of NVRAM

Table 4-1 Software Configuration Register Bit Meanings (continued)

Bit Number ¹	Hexadecimal Value	Definition/Function
07	0x0080	Enables the OEM ² bit
08	0x0100	Disables the Break function
09	0x0200	Uses a secondary bootstrap
10	0x0400	Broadcasts Internet Protocol (IP) with all zeros
11 and 12	0x0800 to 0x1000	Defines the console baud rate (the default setting is 9600 bps)
13	0x2000	Boots the default Flash memory software if the network boot fails
14	0x4000	Excludes network numbers from IP broadcasts
15	0x8000	Enables diagnostic messages and ignores the contents of NVRAM

1. The factory default value for the software configuration register is 0x0102. This value is a combination of binary bit 8 = 0x0100 and binary bits 00 through 03 = 0x0002.
2. OEM = original equipment manufacturer.

[Table 4-2](#) specifies the content of the *boot field*, which defines a source for booting the default Cisco IOS software image required to run the router. The content of the boot field is specified as a binary number.

Table 4-2 Boot Field and Meanings

Boot Field	Definition
00	On power up, the system remains at the ROM monitor prompt (<code>rcommon></code>) awaiting a user command to boot the system manually.
01	On power up, the system automatically boots the first system image found in the onboard Flash memory SIMM on the RP.

Table 4-2 *Boot Field and Meanings (continued)*

Boot Field	Definition
02 to 0F	On power up, the system boots automatically from a default Cisco IOS software image stored on a TFTP server in the network. For this setting, it is assumed that the Ethernet port on the RP is configured and operational. This setting also enables boot system commands that override the default filename.
Note	Note: A Cisco 12006 or Cisco 12406 Router is typically delivered from the factory with a boot image in the boot flash and a Flash card containing a suitable working Cisco IOS image. If you need a Cisco IOS upgrade, you should FTP the appropriate Cisco IOS image from CCO.

Boot Field Settings

The four low-order bits of the software configuration register (bits 3, 2, 1, and 0) form a *boot field* that defines the source of a Cisco IOS software image for booting the router. You can set or change the contents of the boot field by issuing the **config-register** command at the global configuration mode prompt `[router(config)#]`.



Note

The factory default configuration register setting for an RP shipped in a router or an RP shipped as a field-replaceable unit is 0x0102.

When the boot field is set to either 0 or 1 (0000 or 0001), the system ignores any boot instructions in the system configuration file and one of the following occurs, depending on the boot field setting:

- When the boot field is set to 0, you must boot the operating system manually by entering the **boot** command at the ROM monitor prompt (`rommon>`). You can enter the **boot** command with or without arguments.

If you enter the **boot** command *without* an argument (that is, without specifying a file or any other boot instructions), the system automatically boots using the default image in the Flash memory SIMM on the RP.

If you enter the **boot** command *with* arguments (that is, by instructing the system to boot from a specific source), you have these options:

- You can instruct the system to boot from a specific Flash SIMM image by entering the **boot bootflash:filename** command, or from a specific image stored on a PCMCIA Flash memory card by entering the **boot slot #: imagename** command.
- You can instruct the system to boot from a network TFTP server either by sending broadcast TFTP requests by entering a **boot filename** command, or by sending a direct request to a specific network TFTP server by issuing a **boot filename ip-address** command.
- When the boot field is set to 1, the system automatically boots using the first image found in the onboard Flash SIMM on the RP.
- When the boot field is set to a bit pattern other than 0 or 1, the router uses the software configuration register settings to compute the filename of a default system image stored on a network TFTP server. It then uses that system image to boot the router. But if the configuration file contains boot instructions, the system uses these instructions to boot the system, rather than using the filename it computed from the software configuration register settings.

To form this filename, the system starts with *cisco* and links the octal equivalent of the boot field value and the processor type in this format:

```
cisco<bootfieldvalue>-<processorname>
```

For example, the filename formation process would yield a range of filenames such as the following:

```
cisco2-grp
.
.
.
cisco17-grp
```

or

```
cisco2-prp
.
.
.
cisco17-prp
```

The system would use one of the filenames in this range to boot a default system image stored on a network TFTP server.



Note If a bootable Cisco IOS software image exists in a Flash memory card inserted in PCMCIA slot 0 or slot 1, the software configuration register boot field setting is overridden. The system then boots from the Cisco IOS software image in the Flash memory card, rather than from a network TFTP image (that is, from a computed filename in the range from *cisco2-grp* through *cisco17-grp* or *cisco2-prp* through *cisco17-prp*).

Configuration Register Settings

To change the software configuration register settings while running system software, follow these steps:

Step 1 Enter the **enable** command and your password at the user EXEC mode prompt to enter privileged EXEC mode:

```
Router> enable
Password: <password>
Router#
```

Step 2 Enter the **configure terminal** command at the privileged EXEC mode prompt on the system console to enter global configuration mode, as shown in the following example:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
```

Step 3 Set the contents of the software configuration register by entering the **config-register** *value* command at the global configuration mode prompt, where *value* is a hexadecimal number preceded by 0x, as in the following:

```
Router(config)# config-register 0xvalue
```

Consult the hexadecimal column in [Table 4-1 on page 4-2](#) for the possible settings to enter as the four-bit *value* parameter.

Step 4 Exit global configuration mode by entering **Ctrl-Z**.

```
Router(config)# config-register 0xvalue
Router(config)# Ctrl-Z
Router#
```

This command sequence saves the new contents of the software configuration register to NVRAM, but these new settings do not take effect until you reload or reboot the router.

- Step 5** Enter the **show version** privileged EXEC command to display the software configuration register value currently in effect. This value will be used the next time the router reloads. The value is displayed on the last line of the screen display, as in the following example:

```
Router# show version
```

```
.  
. .  
. .
```

```
Configuration register is 0x141 (will be 0x102 at next reload)
```

- Step 6** Save the software configuration register settings as described in the [“Problem Solving with Subsystems”](#) section on page 4-14.



Note Configuration register changes take effect only after the system reloads, such as when you enter a **reload** command from the console.

- Step 7** Reboot the router.
-

Bits in the Software Configuration Register

This section provides more detailed descriptions of the significance of the bits in the software configuration register and how they interact during the boot process.

As described in the “[Boot Field Settings](#)” section on page 4-4, the boot field setting determines the source of the Cisco IOS software image that is used to boot the router. If you set the boot field value to 0 (0x0000), you must boot the operating system manually by entering the **boot** command at the ROM monitor prompt (`rcommon>`) on the system console.

If you set the boot field value to 0x2 through 0xF and a valid **boot system** command is stored in the configuration file, the router boots the Cisco IOS software image as directed by that value. If no **boot system** command is present in the configuration file, the router forms a default boot filename and attempts to acquire that file from a network TFTP server.

In the following example, the software configuration register is set to boot the router from the Flash memory SIMM on the RP and to ignore the Break function at the next reboot of the system:

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# config-register 0x0102
Router(config)# boot system flash filename
Ctrl-Z
Router#
```

With the configuration register set to 0x0102, the system computes a default boot filename. In forming this filename, the system starts with *cisco* and appends the octal equivalent of the boot field number, a hyphen, and the processor type (*grp* or *prp*).

[Table 4-3](#) lists the range of possible computed default filenames for booting over the network. However, a valid **boot system** configuration command stored in the NVRAM configuration file overrides any computed default filename for booting over the network.

**Note**

If a bootable Cisco IOS software image exists in a Flash memory card installed in PCMCIA slot 0 or 1, the configuration register setting is overridden, and the bootable Cisco IOS software image will be booted instead of the default TFTP-bootable Cisco IOS software image (*cisco2-grp* through *cisco17-grp* or *cisco2-prp* through *cisco17-prp*).

Table 4-3 Default Boot Filenames

Action/File name	Bit 3	Bit 2	Bit 1	Bit 0
Bootstrap mode	0	0	0	0
Default software	0	0	0	1
<i>cisco2-grp</i> or <i>cisco2-prp</i>	0	0	1	0
<i>cisco3-grp</i> or <i>cisco3-prp</i>	0	0	1	1
<i>cisco4-grp</i> or <i>cisco4-prp</i>	0	1	0	0
<i>cisco5-grp</i> or <i>cisco5-prp</i>	0	1	0	1
<i>cisco6-grp</i> or <i>cisco6-prp</i>	0	1	1	0
<i>cisco7-grp</i> or <i>cisco7-prp</i>	0	1	1	1
<i>cisco10-grp</i> or <i>cisco10-prp</i>	1	0	0	0
<i>cisco11-grp</i> or <i>cisco11-prp</i>	1	0	0	1
<i>cisco12-grp</i> or <i>cisco12-prp</i>	1	0	1	0
<i>cisco13-grp</i> or <i>cisco13-prp</i>	1	0	1	1
<i>cisco14-grp</i> or <i>cisco14-prp</i>	1	1	0	0
<i>cisco15-grp</i> or <i>cisco15-prp</i>	1	1	0	1
<i>cisco16-grp</i> or <i>cisco16-prp</i>	1	1	1	0
<i>cisco17-grp</i> or <i>cisco17-prp</i>	1	1	1	1

The significance of bits 8 through 14 in the software configuration register follows.

Bit 8—Bit 8 of the software configuration register controls the console Break key. Setting bit 8 causes the system to ignore the console Break key. This is the factory default. Conversely, clearing bit 8 causes the system to interpret a Break keystroke as a command to halt normal system operation and force the system into ROM monitor mode. Regardless of the setting of the Break enable bit in the software configuration register, pressing the Break key during approximately the first 5 seconds of booting causes a return to the ROM monitor.

Bit 9—Bit 9 is not used.

Bits 10 and 14—Bit 10 of the software configuration register controls the host portion of the IP broadcast address. Setting bit 10 causes the processor to use all zeros in the host portion of the IP broadcast address; clearing bit 10 (the factory default) causes the processor to use all ones. Bit 10 interacts with bit 14, which controls the network and subnet portions of the IP broadcast address. [Table 4-4](#) shows the combined effect of bits 10 and 14.

Table 4-4 Configuration Register Settings for Broadcast Address Destination

Bit 10	Bit 14	Address (<net> <host>)
Off	Off	<ones> <ones>
On	Off	<zeros> <zeros>
On	On	<net> <zeros>
Off	On	<net> <ones>

Bits 11 and 12—Bits 11 and 12 of the software configuration register determine the data transmission rate of the console terminal. [Table 4-5](#) shows the bit settings for the four available data transmission rates. The factory-set default data transmission rate is 9600 bps.

Table 4-5 System Console Terminal Data Transmission Rate Settings

Bit 12	Bit 11	Data Transmission Rate (bps)
0	0	9600
0	1	4800
1	0	1200
1	1	2400

Bit 13—Bit 13 of the software configuration register determines the system response to a bootload failure. Setting bit 13 causes the system to load Cisco IOS software from Flash memory after five unsuccessful attempts to load a boot file from the network TFTP server. Clearing bit 13 causes the system to continue attempting to load a boot file from the network TFTP server indefinitely. Bit 13 is set to 0 as the default at the factory.

Recovering a Lost Password

This section provides information on how to recover a lost password.



Note

If the enable password is encrypted, the following procedure will not work for password recovery, and you will have to reconfigure the system before attempting a reboot. To reconfigure the system, use the displayed configuration, which is shown using the **show startup-config** command in privileged EXEC mode, shown in Step 11.

To recover a lost password, follow these steps:

-
- Step 1** Attach an ASCII terminal to the RP console port.
 - Step 2** Configure the terminal to operate at 9600 bps, 8 data bits, no parity, 2 stop bits (or whatever settings the console port is set to).
 - Step 3** Enter the **show version** command at the privileged EXEC mode prompt to display the existing software configuration register value.

```
Router# show version
```

```
.  
. .  
. .
```

The current configuration setting appears in the last line of the **show version** command output. Write this value on paper for use in Step 13.

- Step 4** If the Break function is disabled, turn off power to the power supplies, wait 5 seconds, then restore power.

If the Break function is enabled, press the Break key or send a break by holding down the Control key and pressing the right square bracket key (Ctrl-]).

- Step 5** Within 5 seconds of turning on the router, press the Break key. This action causes the terminal to display the ROM monitor prompt, as follows:

```
rommon 1>
```

- Step 6** Set the software configuration register to ignore the configuration file information, as indicated in the following sample display:

```
rommon 1> config-register

Configuration Summary
enabled are:
console baud: 9600
boot: image specified by the boot system command
or default to: cisco2-grp

do you wish to change the configuration? y/n [n]: y
enable "diagnostic mode"? y/n [n]:
enable "use net in IP bcast address"? y/n [n]:
enable "load rom after netbootfails"? y/n [n]:
enable "use all zero broadcast"? y/n [n]:
enable "break/abort has effect?" y/n [n]:
enable "ignore system config info?" [n]: y
change console baud rate? y/n [n]:
change boot characteristics? y/n [n]

Configuration Summary
enabled are:
console baud: 9600
boot: image specified by the boot system command
or default to: cisco2-grp

do you wish to change the configuration? y/n [n]

You must reset or power cycle for the new config to take effect
rommon 1>
```

- Step 7** Initialize the router by entering the **initialize** command at the ROM monitor prompt:

```
rommon 1> initialize
```

The router goes through a power cycle. The software configuration register is set to ignore the configuration file.

- Step 8** Enter **no** in response to the system configuration dialog prompts until the following instruction is displayed:

```
Press RETURN to get started!
```

- Step 9** Press **Return**.

After some interface configuration information is displayed, the user EXEC mode prompt appears:

```
router>
```

- Step 10** Enter the **enable** command at the user EXEC mode prompt to enter privileged EXEC mode:

```
router> enable
Password: <password>
Router#
```

The prompt changes from `router>` to `router#` (> to #) indicates the change in command mode.

- Step 11** Enter the **show startup-config** command at the privileged EXEC mode prompt to display the **enable** password in the configuration file.

```
router# show startup-config
```

```
.
.
.
```

- Step 12** Enter the **configure terminal** command at the privileged EXEC mode prompt to enter global configuration mode:

```
router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
router(config)#
```

- Step 13** Change the software configuration register value back to its original value (noted in Step 3). Alternatively, change this value to 0x0102 (the factory default) by using the **config-register 0xvalue** command:

```
router(config)# config-register 0xvalue
router(config)#
```

Value is a hexadecimal number preceded by **0x**, as in the following example:

```
router(config)# config-register 0x0102
```

Step 14 Exit global configuration mode by entering **Ctrl-Z**.

```
router(config)# Ctrl-Z  
router#
```

Step 15 Reboot the router and use the recovered password with the **enable** command to gain access to the router.

Problem Solving with Subsystems

The key to solving problems in the system is to try to isolate the problem to a specific subsystem. The first step in solving startup problems is to compare what the system *is doing* to what it *should be doing*. Because a startup problem is usually attributable to a single component, it is more efficient to first isolate the problem to a subsystem rather than troubleshoot each component in the system.

For troubleshooting purposes, Cisco 12006 and Cisco 12406 Routers consist of the following subsystems:

- Power subsystem—Includes the following components:
 - AC-input or DC-input power distribution unit (PDU)
 - AC-input power supplies or DC-input power entry modules (PEMs).
Cisco 12006 and Cisco 12406 Routers can be configured for source AC or source DC power. (You can not mix and match AC and DC power.)
 - Chassis backplane power distribution. The –48 VDC power from the power supplies is transferred to the chassis backplane, which distributes –48 VDC power to the cards in the card cages through the backplane connectors. The blower module receives power from the chassis backplane and passes MBus data back to the chassis backplane through a PDU connector.

DC-to-DC converters on the two alarm cards convert –48 VDC to +5 VDC and put it back on the chassis backplane, where it is picked up to power the MBus modules on other cards and the blower module.
 - DC-to-DC converters. Each card in the router is equipped with DC-to-DC converters. These converters are controlled by the MBus module on each card. The DC-to-DC converters take –48 VDC and convert it into the voltages required by the card circuitry.

- Cooling subsystem—Consists of the blower module, which circulates air through the card cages to cool the cards, and the fan in each of the power modules, which circulates cooling air through the power module bays.
- Processor subsystem—Includes the RP, up to five line cards (when no optional, redundant RP is installed), and two alarm cards, which are located in the alarm card cage directly below the CSC card cage. The RP and the line cards are equipped with onboard processors. The RP downloads a copy of the Cisco IOS image to each line card processor. A line card or RP that is partially installed in the backplane might cause the system to hang and crash. The system uses two four-character alphanumeric LED displays (at one end of the faceplate on each line card and RP) to display status and error messages, which can help in troubleshooting.

Identifying Startup Problems

Startup problems are commonly caused by the power source or by a card that is not seated properly in the backplane. Although an overtemperature condition is unlikely at initial startup, the environmental monitoring functions are included here because they also monitor internal voltages.

When you start up the router for the first time, you should observe the startup sequence. The normal startup sequence is as follows:

- Each card in the system has an MBus module and at least one DC-DC converter. Each MBus module controls the DC-DC converter for its card. The MBus module receives direct current voltage directly from the power supplies through the backplane. When the power supply power switches are turned on, each MBus module boots from an onboard electrically erasable programmable read-only memory (EEPROM) device. Each MBus module processor reads a set of identification pins on the card to the backplane connector. These pins tell the MBus module processor what kind of card it is mounted on, which determines how the MBus module will function.
- The clock and scheduler card (CSC), containing the system clock, immediately powers up.
- The MBus module on the RP monitors the progress of the CSC power up. When the CSC has powered up, the MBus module on the RP turns on its DC-DC converter, powering up the RP.

- The RP sends the instructions to each line card to power up. Each line card processor begins to perform its own boot process. Each line card, through its MBus module, notifies the RP when the boot process is complete.
- The RP sends a command to each switch fabric card to power up. As each switch fabric card powers up, its progress is monitored by its MBus module processor. When the power-up process is complete, the switch fabric card MBus module notifies the RP that the switch fabric card is online.
- As the boot process progresses for each card, the status of the card is displayed in the alphanumeric LED displays. The left display is powered by the DC-DC converter on the card; the right display is powered by the DC voltage that powers the MBus module.

Using LEDs to Gather Information

By checking the state of the LEDs on the power modules and the alphanumeric displays on the RP and line cards, you can determine when and where the system failed in the startup sequence.



Note

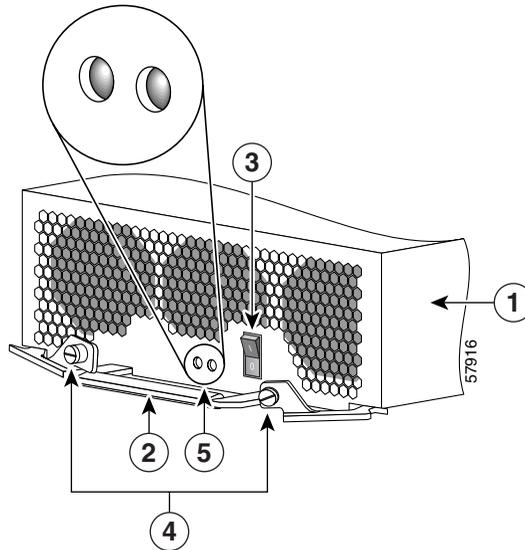
You can use the **test gsr led** IOS software command to perform an LED lamp test, which turns on all of the system LEDs at the same time for a specified period. This test allows you to verify that there are no failed LEDs.

The following sections describe what you should expect to see in the power module LEDs on router startup.

AC-Input Power Supply LEDs

Figure 4-1 shows the location of the LEDs on the power supply faceplate.

Figure 4-1 AC-Input Power Supply LEDs



1	AC-input power supply	4	Captive screws on release levers
2	Handle	5	LEDs
3	Power standby switch	–	–

Table 4-6 summarizes the function of these indicators.

Table 4-6 AC-Input Power Supply LED indicators

LED Label	Function	State	Description
AC (Left LED)	Input power	On	AC power source is present and is within specified limits.
		Off	Power source is not within specified limits.
DC (Right LED)	Output Power	On	Power supply is operating normally in a power-on condition.
		Off	Power supply is operating in a fault condition and shutdown has occurred.

DC-Input Power Entry Module LEDs

Figure 4-2 shows the location of the LEDs on the DC-input PEM.

Figure 4-2 *DC-Input Power Entry Module LEDs*

1	DC-input PEM	4	Captive screws on release levers
2	Handle	5	Air inlet for cooling fan
3	ON/OFF switch	–	–

Table 4-7 summarizes the function of these indicators.

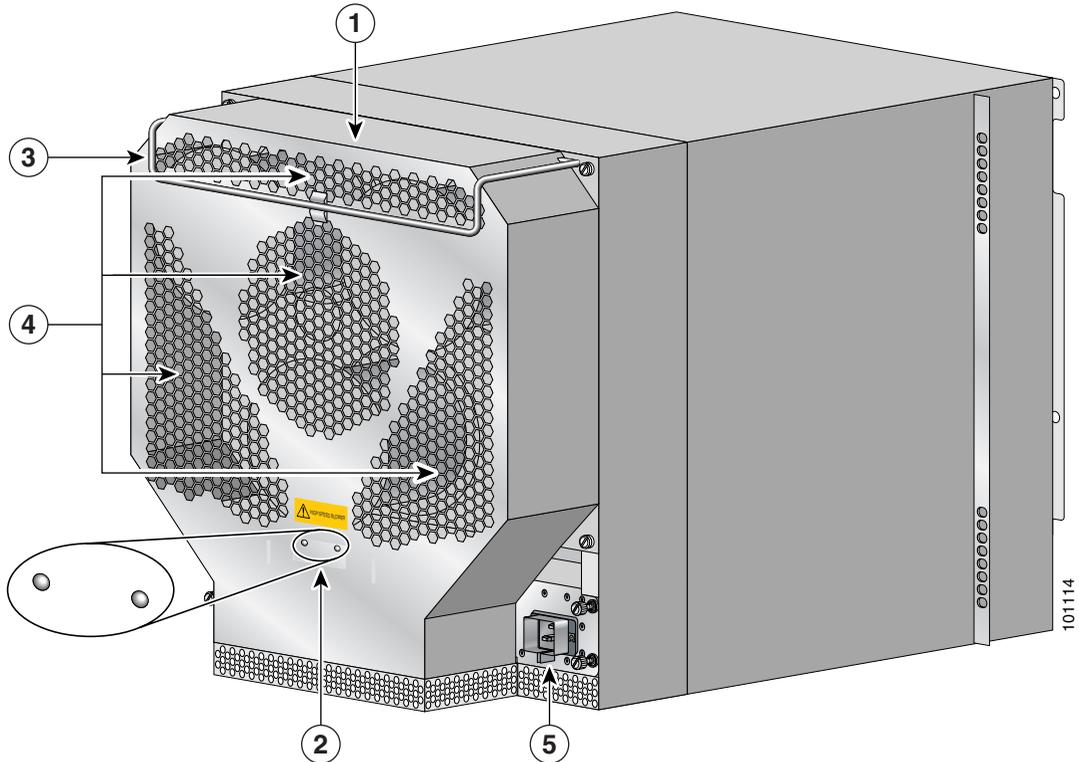
Table 4-7 *DC-Input PEM LED Indicators*

LED Label	Color	Function
OUTPUT OK	Green	PEM is operating normally in a powered-on condition.
INPUT OK	Green	DC power is present at the PEM input and within the specified limits.
MISWIRE	Amber	Indicates input is wired backward at the PDU input.

Blower Module LEDs

Figure 4-3 shows the location of the LEDs on the blower module.

Figure 4-3 Blower Module Location and Features



1	Blower module	4	Air exhaust vents
2	Blower module LEDs	5	Power distribution unit (PDU)
3	Blower module handle		

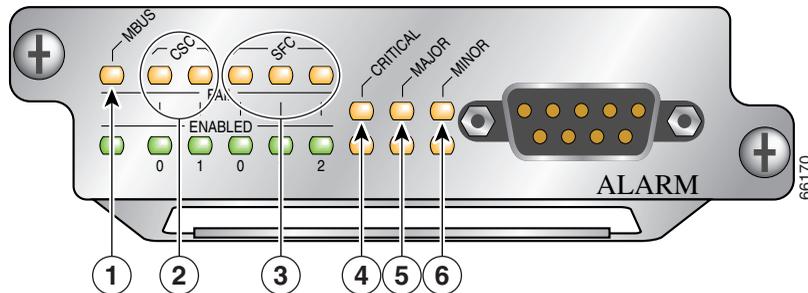
When the system is operating correctly, you should see these LED states:

- OK—Green. When on, the green OK LED indicates normal operation.
- FAIL—Off. When on, the red FAIL LED indicates the system has detected a fan failure or other fault in the blower module. The red LED should remain off during normal operation.

Alarm Card LEDs

Figure 4-4 shows the location of the LEDs on the faceplate of the alarm card.

Figure 4-4 Alarm Card LEDs



1	MBus status LED	4	Critical alarm LED
2	CSC status LEDs (two)	5	Major alarm LED
3	SFC status LEDs (three)	6	Minor alarm LED

When the system is operating correctly, the following LED conditions should be true.

LEDs that normally should be off:

- One MBUS status LED labeled FAIL
- Two CSC status LEDs labeled FAIL
- Three SFC status LEDs labeled FAIL
- Three router alarm LEDs labeled CRITICAL, MAJOR, MINOR

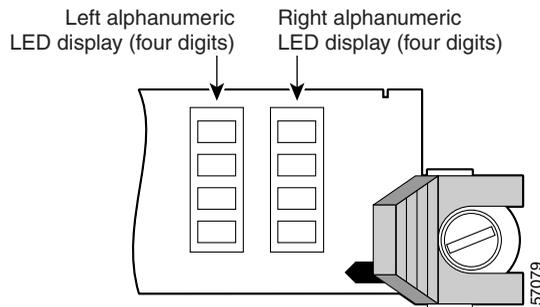
LEDs that normally should be on:

- One MBUS status LED labeled ENABLED
- Two CSC status LEDs labeled ENABLED
- Three SFC status LEDs labeled ENABLED

RP Alphanumeric LED Displays

Figure 4-5 shows the location of the alphanumeric LEDs on the RP faceplate.

Figure 4-5 *RP Alphanumeric LED Displays (Partial Faceplate View)*



When the router is powered on, the four-character alphanumeric displays on the RP indicate the following:

- Top display—Indicates which RP software component is running.
- Bottom display—Indicates the current phase of the boot process.

Status messages are displayed as the boot process continues. (See [Table 4-8](#) on [page 4-30](#).)

Troubleshooting the Power Subsystem

The power subsystem in the Cisco 12006 and Cisco 12406 Routers consists of the following components:

- An AC PDU or a DC PDU
- One or two AC-DC power supplies, or one or two DC-input PEMs
- Backplane
- DC-DC converters
- MBus modules

The power modules provide DC output to the system via the backplane. DC output from the alarm card powers the MBus modules on each card in the system. The MBus modules, in turn, control the DC-DC converters also present on each card in the system. The DC-DC converter takes DC power from the backplane and converts it into +2.5, +3.3, and +5 VDC, which is distributed to the card circuitry.

Begin checking the power subsystem by looking at the power module LEDs:

- For DC-input PEMs, see the [“Troubleshooting the DC-Input Power Entry Module” section on page 4-26](#).
- For AC-input power supplies, see the following section.

Troubleshooting the AC-Input Power Subsystem

Begin checking the AC-input power subsystem by first looking at the LEDs on the AC-input power supplies (see the [“AC-Input Power Supply LEDs” section on page 4-17](#)). When you start up the system by turning on facility power to the system, the following should occur:

- The green LED labeled AC should go on immediately. It should remain on as long as the system is receiving satisfactory AC power levels from the facility AC power source.
- The green LED labeled DC indicates the status of the power module DC output power and internal DC voltages. This LED stays on when all the following conditions are met:
 - The power supply is fully seated in its bay.
 - The power supply power standby switch is on.

- For installations in North America, the AC input power range is between 100 and 240 VAC, with a 20A service. For international environments, the AC input power range is between 185 and 264 VAC, with a 16A service.
- Power supplies are providing –48 VDC to internal components.
- All internal DC voltages are within tolerance.

If the AC power source or any of the power supply internal DC voltages exceed allowable tolerances, the DC LED will not go on, or will go off shortly after you turn on the power standby switch.

The power supplies are monitored by the MBus module and the RP for over- or undervoltage and over- or undercurrent conditions.

To help isolate a problem with an AC-input power supply, follow these steps:

-
- Step 1** If the AC LED is off, verify that the power supply is fully seated in its bay, the ejector levers are flush with the power supply faceplate, and the captive screws are secured.
- If the AC LED goes on, go to Step 6.
 - If the AC LED remains off, go to Step 2
- Step 2** Check the AC power source.
- a. Check the AC power cord from the power source to the router.
 - Verify that the power cord is seated securely in the PDU and the AC outlet.
 - Verify that the power cord is not worn or damaged. If the insulation appears cracked or broken, or the plugs appear loose, replace the power cord with a new power cord.
 - b. Verify that the AC power source circuit breaker is on and has not tripped, and that the circuit breaker has the proper current rating.
 - c. Verify that each power supply in the router is attached to a separate AC power source.
 - d. If the router is connected to an uninterruptable power supply (UPS), verify that the UPS is functioning correctly. Note that there might be a UPS for each power supply in the system.

If the AC power source wiring appears to be okay, but the power supply AC LED remains off, go to Step 3.

- Step 3** Plug the power cord into a different, but compatible AC outlet.
- If the power supply AC LED goes on, the original AC outlet is faulty and cannot be used. Notify the appropriate facilities personnel and go to Step 6.
 - If the power supply AC LED remains off, go to Step 4.
- Step 4** Exchange the existing power cord for another power cord.
- If the power supply AC LED goes on, the original power cord is faulty and must be replaced. The AC portion of the power supply is working normally, go to Step 6.
 - If the AC LED still fails to go on when connected to a different power source with a new power cord, the power supply is probably faulty. Go to Step 5.
- Step 5** If a spare power supply is available, replace the existing module with the spare and restart the system.
- If the AC LED on the spare power supply goes on, the power supply is working normally, go to Step 6. The original power supply is faulty and should be returned for replacement.
- Step 6** Is the power supply DC LED on?
- If Yes, the power supply is functioning normally. This is the end of the procedure.

**Note**

In a Cisco 12006 or Cisco 12406 Router with two power supplies, the output power from the second power supply is adequate to maintain router operation, so the following check conditions only apply in a router with one power supply—or in a case where the second power supply is temporarily disabled by switching it off.

- If No, and there is no other system activity (blower module is off; line cards are unpowered), the power supply is faulty and must be replaced. Go to Step 7.
- If No, but the blower module is operating, suspect a faulty power supply DC LED. If the blower module is operating, all internal DC voltages are within tolerance. Use the **show environment** command to check the voltages on each card. The blower module uses -48 VDC.

- Step 7** If a spare power supply is available, replace the existing module with the spare. If the DC LED then goes on, the power supply is working normally.
-

Return the faulty power supply for replacement.

If you are unable to resolve the problem or if you determine that either the power supply or power cable is faulty, contact a service representative for assistance.

Troubleshooting the DC-Input Power Entry Module

Begin checking the DC-input PEM by first looking at the LEDs on the PEM (see the [“DC-Input Power Entry Module LEDs”](#) section on page 4-19).

For a DC-input PEM to operate normally, the following conditions must be true:

- The PEM is fully seated in its bay and the ejector levers are secured.
- DC-input power within the required range is correctly connected to the chassis PDU terminal connector blocks.
- The circuit breaker on the faceplate of the PEM is switched on.
- The green LEDs labeled OUTPUT OK and INPUT OK on the PEM faceplate are on, and the yellow LED labeled MISWIRE is off.

To help isolate a problem with a DC-input PEM, follow these steps:

- Step 1** Is the MISWIRE LED on?
- If Yes, the source DC positive and negative cable leads are connected in reverse order to the terminal connector block on the PDU.
 - If No, go to Step 2.
- Step 2** If the INPUT OK LED is off, verify that the PEM is fully seated in its bay, the ejector levers are flush with the PEM faceplate, and the captive screws are secured.
- If the INPUT OK LED goes on, go to Step 6.
 - If the INPUT OK LED remains off, go to Step 3.
- Step 3** Verify that the PEM circuit breaker switch is on.
- If No, switch it on. If the INPUT OK LED goes on, go to Step 6.

- If Yes, go to Step 4.

Step 4 Turn off the PEM circuit breaker switch and check the DC power source:

- a. Check the DC power wires from the power source to the router.
 - Verify that the power wires are fastened securely at the PDU and the DC source.
 - Verify that the power wires are not worn or damaged. If the insulation appears cracked or broken, have the power wires replaced.
- b. Verify that the DC power source circuit breaker is on, and that the circuit breaker has the proper current rating.
- c. Verify that each PEM in the router is attached to a separate DC power source.
 - If the DC power source wiring appears to be okay, and the PEM INPUT OK LED goes on when you switch on the PEM, go to Step 6.
 - If the DC power source wiring appears to be okay, but the power supply INPUT OK LED remains off when you switch on the PEM, go to Step 5.

Step 5 Remove the PEM and insert it in the second bay in the router, or into a bay on another Cisco 12006 or Cisco 12406 Router.

- If the INPUT OK LED remains off, the PEM is faulty and must be replaced.
- If the INPUT OK LED goes on, the input portion of the PEM is working normally, go to Step 6.

Step 6 Is the OUTPUT OK LED on?

- If Yes, the power source is good and the PEM is operating normally. This is the end of the procedure.



Note

In a Cisco 12006 or Cisco 12406 Router with two PEMs, the output power from the second PEM is adequate to maintain router operation, so the following check conditions only apply in a router with one PEM—or in a case where the second PEM is temporarily disabled by switching it off.

- If No, and there is no other system activity (blower module is off; line cards are unpowered), the PEM is faulty and must be replaced. Go to Step 7.
- If No, but the blower module is operating, suspect a faulty OUTPUT OK LED. If the blower module is operating, all internal DC voltages are within tolerance. Use the **show environment** command to check the voltages on each card. The blower module uses -48 VDC.

- Step 7** If a spare PEM is available, replace the existing module with the spare. If the OUTPUT OK LED then goes on, the PEM is working normally.
-

Return the faulty PEM for replacement.

If you are unable to resolve the problem or if you determine that either the PEM or power wiring is faulty, contact a service representative for assistance.

Troubleshooting the Processor Subsystem

The Cisco 12006 and Cisco 12406 Router processor subsystem consists of the RP, the line cards, and the alarm cards. The RP and the line cards each have two processors. One processor is the main processor; the other processor is a component in the MBus module. The MBus module begins operation as soon as power is applied to the system. The MBus module determines the type of card it is mounted on and whether it should turn on the DC-DC converter. The RP MBus module turns on card power after a brief delay; the line card MBus modules delay turning on power until they receive a command from the RP.

A Cisco 12006 and Cisco 12406 Router requires that one RP be installed, or the system cannot operate. A line card that is partially connected to the backplane will send incomplete signals to the RP, which could cause the system to hang. Line cards should be completely installed and seated in the backplane connector, or fully removed and placed in a protective ESD device. If necessary, you can troubleshoot individual line cards, but first ensure that the RP is installed properly and the system software has initialized successfully.

A power-on self-test (POST) runs immediately at power-on to determine the condition of the RP memory. Results are displayed in the alphanumeric LED display as a pass/fail message.

Troubleshooting the RP

Check the following to help isolate a problem with the RP:

- Both the alphanumeric LED displays are on.

The two displays are powered separately. The left display receives power from the DC-DC converter on the RP. The right display is powered directly from the power supply. If the RP is not powered up, its right display may be

on. If both displays are off, the RP may not be properly seated in the backplane connector. There also might be a problem with the MBus module on the RP, or the system power supply might be off.

- If both displays are on, check the message being displayed. As soon as the DC-DC converter is turned on by the MBus module, the processor on the RP begins the boot process. Status messages are displayed as the boot process continues. [Table 4-8](#) provides a list of messages that can be displayed by the RP alphanumeric LED display. If one of the messages appears frozen, the boot process could be halted. Make a note of the message being displayed. Turn off the system power supply power switches, then turn them back on to reset the system. This starts the boot process again. If the system halts again, the RP could be faulty and might need to be replaced.
 - If the power modules and blower module appear operational, but none of the RP LEDs or displays are on, suspect that the RP has not been properly installed or that the +5 VDC output from the alarm card is faulty.
 - Turn the power switch to each power module to the OFF position.
 - Loosen the two captive screws on the left and right sides of the RP faceplate, and use the ejector levers to eject and reseal the RP. Tighten the captive screws, then power up the system by turning the power module power switches on.
- Is a critical, major, or minor alarm LED on the alarm card on?
 - If any of the three alarm card alarm LED pairs is on, a fault has been detected in the system. Check the console for messages indicating the source of the problem.
 - There could be a false error indication originating from the RP. You might want to reseal or replace the RP.

**Caution**

The RP reset switch resets the RP and the entire system. To prevent system errors and problems, use it only at the direction of a Cisco-certified service representative.

Table 4-8 *RP Alphanumeric LED Display Messages*

LED Display¹	Indications²
LMEM TEST	Low-memory test running
LCAH INIT	Lower 15k cache initialization
BSS INIT	Initialize main memory for ROM
NVRAM INIT	Initialize NVRAM
EXPT INIT	Initialize interrupt handlers
TLB INIT	Initialize TLB
CACH INIT	Initialize CPU data and instruction cache
CACH PARY	Enable CPU cache parity
MEM INIT	Initialize main memory
NVRAM SIZE	Size of the NVRAM
PCMC INIT	Initialize the PCMCIA
EXIT INIT	Exit the initialization sequence
IOS UP	The Cisco IOS software is up and running
MSTR RP	The RP is enabled and recognized by the system

1. The messages shown do not indicate a specific sequence.
2. Some messages appear for a fraction of a second; others last several seconds.

Troubleshooting the Line Cards

Line cards can be installed in slots in the card cage. As each line card powers up, a power-on self-test (POST) is performed on the line card memory. A full set of field diagnostics can also be run on a line card from the system console, providing a pass/fail message both in the line card alphanumeric LED display and on the system console.

To help isolate a problem with the line cards, visually check the two alphanumeric LED displays to determine whether both display banks are on.

The two displays are powered separately. The left display receives power from the DC-DC converter on the line card. The right display is powered directly from the backplane. Therefore, even if the line card has not powered up, the right display could be on. If both displays are off, the line card might not be fully plugged into the backplane connector, there might be a problem with the MBus module on the line card, or system power might be off.

If both displays are on, check the message being displayed. As soon as the DC-DC converter is turned on by the MBus module, the processor on the line card begins the boot process. Status messages are displayed in the alphanumeric displays as the boot process continues on the line card.

[Table 4-9](#) provides a list of messages that can be displayed by the line card alphanumeric LED display. Some of these messages are displayed only for a fraction of a second; others last for several seconds.

Table 4-9 Line Card Alphanumeric LED Display Messages

LED Display ¹	Indications ²
MEM TEST	POST memory test running
LROM RUN	POST memory test has finished running
BSS INIT	Initialize main memory for ROM
RST SAVE	Save reset reason register
IO RST	Reset the I/O system on the card

Table 4-9 *Line Card Alphanumeric LED Display Messages (continued)*

LED Display¹	Indications²
EXPT INIT	Initialize interrupt handlers
TLB INIT	Initialize TLB
CACH INIT	Initialize CPU data and instruction cache
MEM INIT	Initialize main memory
LROM RDY	Ready to access download
ROMI GET	Getting ROM images
FABL WAIT	Wait for load of fabric downloader
FABL DNLD	The fabric downloader loads
FABL STRT	The fabric downloader launches
FABL RUN	The fabric downloader launch is complete
IOS DNLD	The Cisco IOS software downloads
IOS STRT	The Cisco IOS software launches
IOS UP	The Cisco IOS software runs in DRAM
IOS RUN	The line card is enabled and ready for use

1. The messages shown do not indicate a specific sequence.
2. Some messages appear only for a fraction of a second; others last several seconds.

Troubleshooting by Using the Alarm Cards

The alarm cards are installed in the alarm card slots immediately beneath the clock and scheduler card slots. The alarm card has four primary functions:

- Redundant generation of the DC MBus supply voltage for the line cards
- Power system monitoring functions
- OK/FAIL status indication of the CSCs and SFCs
- Hardware implementation of the alarm system relay outputs and indicators

The status of these functions is displayed in the LEDs on the faceplate of the alarm card. (See [Figure 4-4](#).)

Monitoring Alarm Card Status

The alarm card faceplate has one pair of LEDs, labeled MBUS, that indicate the operational status of the alarm card.

A green MBUS LED labeled ENABLED indicates that the card has been detected by the system and is okay. A yellow MBUS LED labeled FAIL indicates that the system has detected a fault in the alarm card.

If no faults have been detected on an alarm card, the green MBUS LED labeled ENABLED should be on, and the yellow LED labeled FAIL should be off.

Monitoring Switch Fabric Status

If there are no faults on either CSC 0 or CSC 1, the green LED labeled ENABLED for each CSC should be on, and the yellow LED labeled FAIL for each CSC should be off. If the system detects a CSC fault, it turns off the green ENABLED LED for the faulty card, turns on the yellow FAIL LED, logs a warning message on the system console, and continues operating.

**Note**

If the yellow LED labeled FAIL for a CSF or SFC is on, check the system console for messages describing the fault.

If there are no faults on the SFCs (SFC 0, SFC 1, or SFC 2), the green LED labeled ENABLED for each SFC should be on, and the yellow LED labeled FAIL for each SFC should be off. If the system detects an SFC fault, it turns off the green ENABLED LED for the faulty card, turns on the yellow FAIL LED, logs a warning message on the system console, and continues operating.

Monitoring Critical, Major, and Minor Alarm Status

The alarm card faceplate is equipped with three pairs of alarm status LEDs that are used to identify system alarm conditions detected through the MBus:

- Critical
- Major
- Minor



Note

The LEDs are paired for redundancy to protect against a single failed LED. If any of the six LEDs is on, check the system console for messages describing the fault.

Because there are two alarm cards in a Cisco 12006 or Cisco 12406 Router, a system alarm condition detected through the MBus causes the same LEDs to be illuminated on both alarm cards.

The alarms can warn of an overtemperature condition on a component in one of the card cages, a fan failure in a blower module, an overcurrent condition in a power supply, or an out-of-tolerance voltage on one of the cards in one of the card cages. The LEDs are driven by MBus software, which sets the threshold levels for triggering the different stages of alarms.

The RP continuously polls the system for temperature, voltage, current, and fan speed values. If an over-threshold value is detected, the RP sets the appropriate alarm severity level on the alarm card, which lights one of the LED pairs on the alarm display and energizes the appropriate alarm display relays, activating any external audible or visual alarms wired to the alarm display. The RP also logs a message about the threshold violation on the system console.

Troubleshooting the Cooling Subsystem

Cisco 12006 and Cisco 12406 Routers have a blower module located on the rear of the chassis, which provides cooling air for the router components. (See [Figure 4-3](#).)

The blower module receives power and signals through a connector recessed in the blower module. This connector mates with a connector mounted on the PDU. The blower module contains three fans, one connector, and one controller card. There are two LEDs on the blower module faceplate visible at the rear of the chassis.

- Green LED labeled OK—When on, this LED indicates that the blower module is functioning normally.
- Red LED labeled FAIL—When on, this LED indicates that the blower module is not functioning normally.

If the green LED is off and/or the red LED is on, check the following to help isolate a problem with the cooling system:

- Listen for the blower fans. In noisy environments, place your hand behind the blower module to feel for air being forced out the exhaust vents. If the blower module fans are on, the DC voltage from the power modules to the blower module is good.
- If the blower module fans are not on, there could be a problem with either the blower module or the DC power from the power modules.
 - Check the output power LED on each power module (DC LED on the AC-input power supply; OUTPUT OK LED on a DC-input PEM). If the output power LED on a power module is off, but the input power LED is on, the power module might be faulty and should be checked or replaced.
 - If the output power LED on the power module is on (DC output is OK), but the blower module remains off, verify that the blower module is seated properly in the chassis.

Remove the blower module by loosening the four captive screws holding it to the chassis, pull the blower module away from the chassis, then firmly push the blower module against the chassis to reseat the blower module. Tighten the four captive screws.

- If the blower module remains off, there could be a problem with the blower module controller card.

- The following console monitor message indicates that the system has detected an overtemperature or out-of-tolerance power condition in the router:

```
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 on the power module will go on before the system shuts down. Refer to the [“Troubleshooting the Power Subsystem” section on page 4-23.](#)”

- Although overheating is unlikely at initial startup, be sure that heated exhaust air from other equipment is not entering the air filter, and that there is sufficient clearance—at least 6 inches (15.24 cm)—around the front and rear of the chassis to allow cooling air to enter and hot air to exhaust.
- Check the condition of the two air filters located in slots on the right side of the chassis. If the air filters appear dirty, remove the filters and either vacuum them or replace them.
- The preceding message could also indicate a faulty component or temperature sensor. Before the system shuts down, use the **show environment all** or **show environment table** command to display the internal system environment, including voltages and temperatures measured at each card.

If the blower module is faulty, you must replace the entire blower module.

If you are still unable to resolve the problem, contact a service representative for assistance.