Troubleshooting the Installation

Overview

The Cisco 12404 Internet router undergoes extensive testing and burn-in before leaving the factory. However, if you encounter problems starting up the router, use the information in this chapter to help isolate the cause of the problems.

Performing Other Configuration Tasks

This section describes how to perform the following additional configuration tasks.

Configuring the Software Configuration Register

The software configuration register is a 16-bit register in Non-Volatile Random Access Memory (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 (zero)

    - 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 (See Chapter 3, Boot Process Overview, page 3-41) 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.

- Recover a lost password.

- Force an automatic boot using a boot image.

- 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 actually a composite of several settings.

Table 4-1   Software Configuration Register Bit Value and Function

Bit Number[1]	Hexadecimal Value	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
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 Definitions

Boot Field	Definition
00	At power-on, the system remains at the ROM monitor prompt (`rommon>`), awaiting a user command to boot the system manually.
01	At power-on, the system automatically boots the first system image found in the onboard Flash memory SIMM on the RP.

Table 4-2   Boot Field and Definitions (continued)

Boot Field	Definition
02 to 0F	At power-on, 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 12404 Internet 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 discover that you need an 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 [Filo(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), the following options are available to you:

- You can instruct the system to boot from a specific Flash SIMM image (by entering the **boot bootflash:***filename* command) or you can instruct the system to boot 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. If the configuration file contains boot instructions, however, 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 the following format:

cisco*<bootfieldvalue>-<processorname>*

For example, the filename formation process would yield a range of typical filenames like the following:

```
cisco2-grp

.
.
.

cisco17-grp
```

or

```
cisco2-prp

.
.
.

cisco17-prp
```

- The system would use one of the filenames in this range to use in booting 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, and the system 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:

```
Milo> enable
Password: <password>
Filo#
```

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

```
Filo# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Filo(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:

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

- Consult the hexadecimal column in Table 4-1 for the possible settings to enter
  as the four-bit *value* parameter.

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

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

- 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 Cisco 12404 Internet router.

Step 5   Enter the **show version** privileged EXEC command to display the software
configuration register value currently in effect.

```
Filo# show version

.
.
.

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

- This value is used the next time the router reloads. The value appears on the
  last line of the screen display

Step 6   Save the software configuration register settings as described in Chapter 3,
"Saving the Running Configuration Settings to NVRAM".

> ✎
>
> **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 your router using the **boot** command and any arguments needed.

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 earlier in Boot Field Settings, 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 (rommon>) 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:

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

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. 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/Filename	Bit 3	Bit 2	Bit 1	Bit 0
Bootstrap mode	0	0	0	0
Default software	0	0	0	1
cisco2-grp or cisco2-prp	0	0	1	0
cisco3-grp or cisco3-prp	0	0	1	1
cisco4-grp or cisco4-prp	0	1	0	0
cisco5-grp or cisco5-prp	0	1	0	1
cisco6-grp or cisco6-prp	0	1	1	0
cisco7-grp or cisco7-prp	0	1	1	1
cisco10-grp or cisco10-prp	1	0	0	0
cisco11-grp or cisco11-prp	1	0	0	1
cisco12-grp or cisco12-prp	1	0	1	0
cisco13-grp or cisco13-prp	1	0	1	1
cisco14-grp or cisco14-prp	1	1	0	0
cisco15-grp or cisco15-prp	1	1	0	1
cisco16-grp or cisco16-prp	1	1	1	0
cisco17-grp or cisco17-prp	1	1	1	1

Bits 8 through 14

The significance of other important bits 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 five 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 Destinations*

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's 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 in the software configuration register 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 does not work for password recovery, and you must 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.

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 to whatever settings the console port is set).

Step 3   Enter the **show version** command at the privileged EXEC mode prompt to display the existing software configuration register value.

Tip   Write this value on paper for use in Step 13.

```
Filo# show version

.
.
.
```

- The current configuration setting appears in the last line of the **show version** command output.

Step 4   If the Break function is disabled, turn off power to the power supplies, wait 5 seconds, and 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 (**^]**).

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

```
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:

```
Filo>
```

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

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

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

✎

Note   Note the greater than symbol > has changed to the number sign (also known as the pound sign) #.

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

```
Filo# show startup-config

.
.
.
```

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

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

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

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

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

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

Step 14   Enter **Ctrl-Z** to exit global configuration mode.

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

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 1 component, it is more efficient to first isolate the problem to a subsystem rather than troubleshoot each component in the system.

AC Power Entry Module

The Cisco 12404 Internet router can be configured for an AC power source. For the troubleshooting procedures in this chapter, the Cisco 12404 router consists of two AC power entry modules (PEMs).

DC-DC Power Converters

A DC-DC power converter is installed on each card in the card cage. The converter is under control of the MBus module, another component on each card. The DC-DC converter takes –48 VDC and converts it into +2.5, +3.3 and +5 VDC for use by the card circuitry.

Cooling System

Cooling subsystem is comprised of one fan tray assembly and one air filter. The fan tray assembly and air filter are hot swappable, and can be replaced while the system is running. The fan tray assembly should be operating whenever the system power is on; except when the fan tray assembly is being removed and replaced.

⚠ **Warning**   **Replace the fan tray assembly within 2 minutes of removing it from the chassis or the router will go into a critical failure mode and shutdown, due to an overtemp condition.**

⚠ **Caution**   Replace the fan tray assembly safely and quickly to maintain EMI compliance.

Processor Subsystem

The processor subsystem includes the RP and all line cards. Each card has an onboard processor. 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. Two 4-character alphanumeric LED displays at the right of each line card or RP faceplate display status and error messages, which can aid in troubleshooting.

Identifying Startup Problems

Startup problems are commonly due to power source or to a card not properly seated 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. This section contains a description of the normal startup sequence 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. The MBus module receives +5 VDC 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 telling the MBus module processor what kind of card it is mounted on, which in turn, determines how the MBus module will function.

- The consolidated switch fabric (CSF) containing the system clock, immediately powers on.

- The MBus module on the RP monitors the progress of the clock and scheduler card power on. When the CSF 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 on. 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.

- As the boot process progresses for each card, the card's status 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 +5 VDC that powers the MBus module.

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

When you start up the system by turning on the power supply power switches, the following should occur:

- The two Green INPUT OK LEDs for the AC PEMs should go on immediately; they should remain on as long as the system is receiving power from the AC power source, and the power switch is in the on position. If either of these LEDs does not go on, or if it goes off while the power switch is still on, there could be a problem with either the power source, the internal DC voltage –48 VDC that the power supplies distribute to the internal components, or the cooling subsystem.

The Green INPUT OK LEDs indicate the status of the PEM and internal DC voltages. These LEDs stay on when all of the following conditions are met:

- AC power source voltage from an AC power source operating between 100-120 VAC, 15-Amp service in North America; and a range of 185-264 VAC, 10-Amp service, in an international environment.

- Power supplies are providing the –48 VDC to internal components.

- All internal DC voltages are within tolerance.

  - If the AC power source or any of the internal DC voltages exceed allowable tolerances, the OUTPUT OK LED will not go on, or will go off shortly after you turn on the power. Because both the RP (which use +2.5, +3.3 and +5 VDC), and the fan tray assembly (which uses –48 VDC) are required for operation, a problem with any of the internal DC lines can prevent the system from starting up or continuing operation.

  - For example, if there is a problem with the –48 VDC line that supplies the fan tray, the system will start up, but will also recognize that the fan are not operating. The system will initiate a fan failure shutdown sequence, display the appropriate warning messages, then shut down after two minutes. If there is a problem with any of the other DC lines, the RP will not be able to initialize the system software, so the system might attempt to start up and fail during the boot sequence.

- When the system is powered on, the fan tray, located at the side of the chassis, immediately begins operating.

- When the system is powered on, the alphanumeric LED displays on the RP indicate the following.

    - The left display indicates which RP software component is running.

    - The right display indicates the phase of the boot process that is currently occurring.

Troubleshooting the Power Subsystem

The power subsystem in the Cisco 12404 router consists of the following components.

- AC PEMs

- DC PDUs and PEMs

- Processor subsystem

- Route Processor

- Line cards

Troubleshooting the AC Power Subsystem

The AC PEMs provide –48 VDC OUTPUT. The +5 VDC OUTPUT from the CSF powers the MBus module on each card in the system. The MBus module, in turn, control the DC-DC converters also present on each card in the system. The DC-DC converter takes –48 VDC from the power supply and converts it into +2.5, +3.3 and +5 VDC, which is distributed to the card circuitry.

Begin checking the power subsystem by first looking at the three LEDs on the power supply faceplate. The INPUT OK LED on an AC PEM goes on when AC power is applied, The OUTPUT OK LED goes on when the PEM power switch is turned on.

The amber OUTPUT FAIL LED is normally off, but goes On if the PEM detects a fault.

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

Continue by checking the following to help isolate the problem with the power subsystem.

- Are the power supply INPUT OK and OUTPUT OK LEDs on?

  – If yes, the power source is good, and the power supplies are functional.

  – If no, but the fan tray assembly is operating, suspect a faulty PEM LED. If the fan tray assembly is operating, all internal DC voltages are within tolerance. Use the **show environment** command to check the voltages on each card. The fan tray assembly uses –48 VDC.

  – If no and there is not other obvious activity, first suspect that the PEM, power switch is not in the ON position. Ensure PEM, power switch is toggled to the ON position.

  – If the PEM power switch is set correctly and the INPUT OK LED remains off, suspect the AC power source, or the power cable.

- Turn the PEM power switch Off and check the AC power source

- Verify that the AC power source circuit breaker is On and has not tripped.

- Verify that the AC power source circuit breaker has the proper current rating.

- Verify each AC PEM in the Cisco 12404 Internet router chassis is attached to a separate power source.

- Check that the uninterruptable power supply (UPS) is functioning correctly. (In the case of systems powered by an AC power source, there might be a UPS for each AC PEM in the system.)

  – Check the power cable or power cord from the power source to the Cisco 12404 router.

- Verify that it is in good shape and is not damaged.

- If the insulation appears cracked or broken, or the plugs appear loose, do not use the cable. Immediately replace it with a new cord or cable.

- If the LED fails to go On after you connect the power supply to a new power source. Turn the power switch Off and exchange the power cable with a replacement, if one is available, and turn the power switch back on. If the INPUT OK LED then goes on, return the first power cable for replacement.

- If the LED still fails to go on when connected to a different power source with a new power cable, the PEM is probably faulty. If a spare PEM is available, replace the existing module with the spare and restart the system.

- If the INPUT OK LED then goes on, return the faulty PEM 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 Power Subsystem

The DC PEMs and PDUs provide DC power to the router which is distributed to the card circuitry.

Begin checking the power subsystem by first looking at the three LEDs on the power supply faceplate. The INPUT OK LED on an DC PEM goes on when DC power is applied, The OUTPUT OK LED goes on when the PEM power switch is turned on.

The amber OUTPUT FAIL LED is normally off, but goes On if the PEM detects a fault.

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

Continue by checking the following to help isolate the problem with the power subsystem.

- Are the power supply INPUT OK and OUTPUT OK LEDs on?

    - If yes, the power source is good, and the power supplies are functional.

    - If no, but the fan tray assembly is operating, suspect a faulty PEM LED. If the fan tray assembly is operating, all internal DC voltages are within tolerance. Use the **show environment** command to check the voltages on each card. The fan tray assembly uses –48 VDC.

    - If no and there is not other obvious activity, first suspect that the PEM, power switch is not in the ON position. Ensure the PEM power switch is On.

    - If the PEM power switch is On and the INPUT OK LED remains off, suspect the DC power source, or the power cable.

- Turn the PEM power switch Off and check the DC power source at the DC PDU terminal block.

- Verify that the DC power source circuit breaker is On and has not tripped.

- Verify that the DC power source circuit breaker has the proper current rating.

- Verify each DC PEM in the Cisco 12404 router chassis is attached to a separate power source.

- Check that the uninterruptable power supply (UPS) is functioning correctly. Systems powered by a DC power source, might have a UPS for each DC PDU in the system.

- Check the power cables from the power source to the Cisco 12404 router.

- Verify that it is in good shape and is not damaged.

- If the insulation appears cracked or broken, or the plugs appear loose, do not use the cable. Immediately replace it with a new cord or cable.

- If the LED fails to go On after you connect the power supply to a new power source. Turn the power switch Off and exchange the power cable with a replacement, if one is available, and turn the power switch back on. If the INPUT OK LED then goes on, return the first power cable for replacement.

- If the LED still fails to go on when connected to a different power source with a new power cable, the PEM is probably faulty. If a spare PEM is available, replace the existing module with the spare and restart the system.

- If the INPUT OK LED then goes on, return the faulty PEM for replacement.

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

Troubleshooting the Processor Subsystem

The Cisco 12404 Internet router processor subsystem consists of the RP, the line cards, and the CSF card. The RP and the line cards each have two processors. One processor is the main processor; and 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 12404 router requires one RP be installed. The system cannot operate unless the RP is installed. 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 Route Processor

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; therefore, even if the RP has not powered up, its right display could be on. If both displays are off, the RP may not be properly seated in the backplane connector, there 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. (See Table 4-5 which 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. Write the message being displayed on a piece of paper. Turn off the system power supply power switches, then turn them back on to reset the system and start the boot process again. If the system halts again, the RP could be faulty and might need to be replaced.

    - If the PEMs and fans 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 CSF card is faulty.

    - Turn the PEM power switch to the OFF position on each PEM.

    - Loosen the two captive screws on the left and right sides of the RP faceplate, and use the ejector levers to eject and reseat the RP. Tighten the captive screws, then power on the system by turning the PEM power switches on.

- Is a Critical, Major, or Minor alarm LED on the CSF card on?

  - If any of the three CSF card LEDs 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 (Table 4-6). You might want to reseat or replace the RP.

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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 4-6   RP Alphanumeric LED Display Messages

LED Display[1]	Indications[2]
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

Table 4-6   RP Alphanumeric LED Display Messages (continued)

LED Display[1]	Indications[2] (continued)
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 briefly (millisecond duration); others last several seconds.

Troubleshooting the Line Cards

Line cards can be installed in slots in the card cage. As each line card powers on, 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.

Check the following to help isolate a problem with the line cards:

- Are both banks of alphanumeric LED displays 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 power supply. So, 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 the system power supply may 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 4-7 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 few milliseconds; others can last for several seconds.

Table 4-7   Line Card Alphanumeric LED Display Messages

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

Table 4-7   Line Card Alphanumeric LED Display Messages (continued)

LED Display[1]	Indications[2] (continued)
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 briefly (millisecond duration); others last several seconds.

Troubleshooting the Cooling Subsystem

The Cisco 12404 Internet router has a fan tray assembly located on the left side of the chassis when you are facing the front of the chassis. The fan tray assembly assembly provides cooling air for the router components. The fan tray assembly receives power and signals though a connector mounted on the fan tray, which mates with a connector mounted on the backplane.

The fan tray assembly contains:

- 7 fans
- 2 controller cards
- 1 connector

Note   In noisy environments listen for the fans. Place your hand at the left side of the chassis beside the fan tray assembly to feel for air being forced out the exhaust vents.

- If the fans come On, the –48 VDC line from the power supply to the fan tray assembly is good.

- If the fans do not come On, there could a problem with either the fan tray assembly or the –48 VDC power. Check the OUTPUT FAIL LED on each power supply. If the OUTPUT FAIL LED on a PEM is On, the PEM is faulty and should be replaced.

- If the fans do not come on and the PEM OUTPUT FAIL LED is Off (–48 VDC is OK), ensure that the fan tray assembly is seated properly to the backplane connector.

  - Remove the fan tray assembly by loosening the two captive screws holding it to the chassis, grasp the fan tray assembly handle and pull the fan tray assembly out and then firmly push the fan tray assembly into its housing to reseat the fan tray assembly. Tighten the two captive screws.

- If the fans do not come on, there could be a problem with the fan tray assembly controller card.

- The following message on your console monitor, indicates that the system has detected an overtemperature condition or out-of-tolerance power inside your router.

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

  An overtemperature condition is unlikely at initial startup due to an environmental shutdown. As a precaution, ensure 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 all sides of the chassis to allow cooling air to enter and hot air to exhaust. Should an overtemperature condition occur at initial startup:

  - Check the condition of the air filter. If the air filter appears dirty, you should remove the air filter and replace it; or remove the air filter, take it away from the chassis, and vacuum the air filter.

  - The overtemperature condition message could also indicate a faulty component or temperature sensor. Before the system shuts down, use the show environment all or show environment table commands to display the internal system environment including voltages and temperatures measured at each card.

If the fan tray assembly is faulty, you must replace the entire fan tray assembly.

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