Troubleshooting

Your Cisco 7401ASR router went through extensive testing before leaving the factory. However, if you encounter problems starting the router, use the information in this chapter to help isolate the cause of the problems. This chapter contains the following sections:

- Troubleshooting Overview, page 5-1
- Problem Solving Using a Subsystems Approach, page 5-2
- Upgrading the Boot Helper (Boot Loader) Image, page 5-7
- PXF Troubleshooting Information, page 5-8

The procedures in this chapter assume that you are troubleshooting the initial system startup, and that your router is in the original factory configuration. If you have removed or replaced components or changed any default settings, the recommendations in this chapter might not apply. Make sure to review the safety warnings listed in the publication *Cisco 7401ASR Regulatory Compliance and Safety Information* that accompanied your Cisco 7401ASR router before using the troubleshooting procedures in this chapter.

Troubleshooting Overview

This section describes the troubleshooting methods used in this chapter and describes how the Cisco 7401ASR router is divided into subsystems for more efficient problem solving. If you are unable to easily solve the problem, contact a customer service representative for assistance and further instructions. Provide the representative with the following information:

- Date you received the router
- Chassis serial number
- Type of software and release number
- Brief description of the problem you are having
- Brief explanation of the steps you have taken to isolate and resolve the problem
- Maintenance agreement or warranty information

The following table shows the general troubleshooting strategy described in this appendix. Refer to this table, as necessary, to follow the steps to isolate problems to a specific subsystem; resolve the problem if possible.

	Action	Yes	No
Step 1	Turn power on. Go to Step 2.	–	–
Step 2	Green STATUS LED on?	Go to Step 4.	Troubleshoot power system, and go to Step 3.
Step 3	Green STATUS LED on?	Go to Step 4.	Obtain technical assistance.
Step 4	Fans operating?	Go to Step 6.	Troubleshoot cooling subsystem, and go to Step 5.
Step 5	Fans operating?	Go to Step 6.	Obtain technical assistance.
Step 6	GBIC ENABLE LEDs and FE (100 Mbps) LEDs on?	Go to Step 8.	Check all cable connections and restart system. Check that the GBIC is fully seated. Go to Step 7.
Step 7	GBIC ENABLE LEDs and FE (100 Mbps) LEDs on?	Go to Step 8.	Obtain technical assistance
Step 8	Port adapter ENABLE LEDs on?	Go to Step 10.	Reseat port adapters and restart system. Go to Step 9.
Step 9	Port adapter ENABLE LEDs on?	Go to Step 10.	Obtain technical assistance.
Step 10	System startup successful.	—	—

In addition to following the subsystems approach to troubleshooting, Cisco Registered Direct users can access troubleshooting tools at http://www.cisco.com/kobayashi/support/tac/tools_az.shtml.

Problem Solving Using a Subsystems Approach

The key to solving problems with the system is isolating 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 caused by a single component, it is more efficient to first isolate the problem to a subsystem rather than troubleshoot each component in the system. For these troubleshooting procedures, consider the following subsystems:

- Power subsystem—This subsystem comprises the power supply, the external power cable, and the system board.
- Cooling subsystem—The fans should be operating whenever system power is on. Contact your customer service representative if you determine a fan is not functioning properly.
- Processor subsystem—This subsystem includes the processing and input/output functions, the port adapter or service adapter, and system memory and management functions. The ENABLE LED on the port adapter indicates if the port adapter is initialized. A port adapter that is partially installed can cause the system to pause indefinitely and reload.

The following sections help you isolate a problem to one of these subsystems and direct you to the appropriate troubleshooting section.

Identifying Startup Problems

Startup problems are commonly due to the source power or to a port adapter or service adapter that is dislodged from the system board. Although an over temperature condition is unlikely at initial startup, the environmental monitoring functions are included in this chapter because they also monitor internal voltages.

When you start up the router for the first time, you should observe the startup sequence described in the "Starting the System and Observing Initial Conditions" section on page 3-9 in Chapter 3, "Starting and Configuring." This section contains a more detailed description of the normal startup sequence and describes the steps to take if the system does *not* perform that sequence as expected.

LEDs indicate all system states in the startup sequence. By checking the state of the LEDs, you can determine when and where the system failed in the startup sequence. Use the following descriptions to isolate the problem to a subsystem, and then proceed to the appropriate sections to try to resolve the problem.

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

- You should immediately hear the fans operating. If not, proceed to the "Troubleshooting the Cooling Subsystem" section on page 5-5. If you determine that the power supply is functioning normally and that a fan is faulty, contact a customer service representative. If a fan does not function properly at initial startup, there are no installation adjustments that you should make.
- The STATUS LED should come on. As the system boots to ROM monitor state, the STATUS LED is amber. The STATUS LED turns green when the system boots to the Cisco IOS state. If the system does not boot properly, call your local service representative.
- The native GBIC ENABLE and 100 Mbps LEDs should come on as follows:
  - The 100 Mbps LED comes on and indicates that a Fast Ethernet port (0 or 1) is initialized and enabled for operation by the system. This LED comes on during a successful router boot and remains on during normal operation of the router. If this LED remains off when you start the router, it is probably a problem with the Fast Ethernet port. Consult the table on page 5-2.
  - The GBIC ENABLE LED comes on and indicates that a GBIC port (0 or 1) is initialized and enabled for operation by the system. This LED comes on during a successful router boot and remains on during normal operation of the router.

    If this LED remains off when you start the router, it is probably a problem with the Gigabit Ethernet port. Consult the table on page 5-2.
  - The GBIC LINK LED comes on only when a router Gigabit Ethernet port (0 or 1) is receiving a carrier signal from the network. This LED remains off during normal operation of the router unless there is an incoming carrier signal, and does not indicate startup problems.
  - The FE LINK LED comes on only when a router Fast Ethernet port (0 or 1) is receiving a carrier signal from the network. This LED remains off during normal operation of the router unless there is an incoming carrier signal, and does not indicate startup problems.
- The ENABLED LED on the port adapter or service adapter comes on when the processor completes its initialization of the adapter for operation. The ENABLED LED indicates that the adapter is receiving power and has been recognized by the processor; it does not indicate the state of the individual interfaces on the adapters. If an ENABLED LED fails to come on, proceed to the "Upgrading the Boot Helper (Boot Loader) Image" section on page 5-7.
- When all LEDs come on to indicate that the system has booted successfully, the initial system banner should be displayed on the console screen. If it is not displayed, see Appendix A, "Specifications," the "Console and Auxiliary Port Signals and Pinouts" section on page A-8 to verify that the terminal is set correctly and that it is properly connected to the console port.

Troubleshooting the Power Subsystem

Check the following to help isolate a problem with the power subsystem:

Note If the system powers off, wait at least one minute before manually rebooting the system, or it will pause indefinitely.

Table 5-1 Troubleshooting the Power Subsystem

Symptom	Possible Cause	Possible Solution
System begins power on, amber STATUS LED comes on.	System has failed to boot Cisco IOS, turning the STATUS LED green.	Power off, and reboot the system. Check to be sure you are using the correct Cisco IOS release. If Cisco IOS does not boot, and the green STATUS LED is not displayed, contact a service representative.
System does not power on.	AC power cable not fully seated at system or at the wall outlet (power source).	Turn the router power switch to the off position and reseat the AC power cable at the system or at the wall outlet (power source).
	DC power cable not turned on at the panel board of the circuit breaker.	Turn the router power switch to the off position and locate the circuit breaker on the panel board that services the DC circuit, switch the circuit breaker to the on position.
	Power source is faulty.	Turn the switch off, connect the power cable to another power source, if available, and turn the router power switch back on.
	Faulty power cable.	Turn the switch to the off position, remove the cable and replace it.
	Faulty power supply.	If the system still fails to come up when the power supply is connected to a different power source with a new power cable, the power supply is probably faulty. Contact a service representative.
System powers off, no STATUS LED, and no operating fans.	Power supply failure.	Contact a service representative.

Troubleshooting the Cooling Subsystem

Check the following to help isolate a problem with the cooling subsystem:

Table 5-2 Troubleshooting the Cooling Subsystem

Symptom	Possible Cause	Possible Solution
System displays the following message: `Router: 00:03:46:%ENVM-3-BLOWER:Fan 2 may have failed`	One or more fans are not operating.	Contact a service representative.

System shuts down, some fans may or may not continue to rotate, and this error message is displayed:
`Queued messages:`
`%ENVM-1-SHUTDOWN: Environmental Monitor initiated shutdown`
This error message indicates that the system has detected an overtemperature condition or out-of-tolerance power condition inside the chassis.
	• One or more fans are not operating.
	• The fans are operating too slowly.
	• The power supply is not operating.
	To determine if the fans are operating, listen for them. In noisy environments, place your hand on the rear of the chassis to feel if air is being forced out the vents.
		Contact a service representative.

	Heated exhaust air from other equipment is entering the router's inlet vents.	Move other equipment or the router to ensure proper airflow.

System shuts down and this error message is displayed:
`Queued messages:`
`%ENVM-1-SHUTDOWN: Environmental Monitor initiated shutdown`
This error message indicates that the system has detected an overtemperature condition or out-of-tolerance power condition inside the chassis.
Note The system fans may continue to operate although the system shuts down.
	The error message could indicate a faulty component or temperature sensor. Before the system shuts down, use the **show environment** or **show environment table** command to display the internal chassis environment. See Chapter 3, "Starting and Configuring," the "Reporting Functions" section on page 3-5 for descriptions of the **show environment** and **show environment table** commands.	Contact a service representative.

	If an environmental shutdown results from an out-of-tolerance power condition, the system shuts down.	If the system still fails to come up when the power supply is connected to a different power source with a new power cable, the power supply is probably faulty. Contact a service representative.

Troubleshooting the I/O Subsystem

The procedures in this section assume that you have not made changes to your configuration file.

If the Cisco 7401ASR router I/O LEDs do not go on as expected (see the "Identifying Startup Problems" section on page 5-3), check the following items to help isolate the problem:

Table 5-3 Troubleshooting the I/O Subsystem

Symptom	Possible Cause	Possible Solution
LEDs remain off when the system power switch is turned on.	Power supply or cooling subsystem is faulty.	If the LEDs stay off, first see the "Troubleshooting the Power Subsystem" section on page 5-4 and the "Troubleshooting the Cooling Subsystem" section on page 5-5 to ensure that both the fans and the power supply are functioning properly.
Power supply and fans appear operational, but none of the I/O LEDs are on.	The improperly connected port adapter has indefinitely paused the system.	Reseat the port adapter, tighten the screw of the port adapter latch, and then restart the system.
The prior configuration—native Gigabit Ethernet or the Fast Ethernet/Ethernet—LEDs remain on after configuring the ports to change the configuration from one Ethernet type to the other.	The **media-type** command was not used when changing the configuration of these ports.	See Chapter 3, "Starting and Configuring," the "Configuring the Native Gigabit Ethernet and Fast Ethernet/Ethernet Interfaces" section on page 3-15.

Troubleshooting the Processor Subsystem

The processor subsystem comprises the system board and the port adapter. A port adapter that is partially connected to the system board sends incomplete signals to the processor, which faults the PCI bus and causes the system to pause indefinitely. Therefore, first ensure that the system software has initialized successfully and then check to see if the port adapter is fully connected.

Troubleshooting the Port Adapter or Service Adapter

Check the following to help isolate a problem with the port adapter or service adapter:

Table 5-4 Troubleshooting the Port Adapter or Service Adapter

Symptom	Possible Cause	Possible Solution
Port adapter or service adapter ENABLE LED is off.	The port adapter or service adapter might have pulled away from the system board.	Reseat the adapter in its slot (you do not have to turn off the system power when removing or replacing port adapter and service adapters). After the system reinitializes the interfaces, the ENABLE LED on the port adapter or service adapter should go on. If the ENABLE LED remains off, the system detected a processor hardware failure. (This LED should be on in normal operation.) Contact a service representative for instructions.

Upgrading the Boot Helper (Boot Loader) Image

The boot helper (boot loader) image resides in Flash memory and contains a subset of the Cisco IOS software. This image is used to boot your router from the network or to load Cisco IOS images onto the router. This image is also used if the system cannot find a valid system image.

Your boot helper (boot loader) image should correspond to the Cisco IOS release that is running on your router.

Note The Cisco 7401ASR router requires the c7400-kboot-mz boot helper image.

To upgrade your boot helper (boot loader) image, obtain the most current boot helper image through Cisco.com and copy the new boot helper image to Flash memory on your router. For information on how to access Cisco.com, see the "Cisco.com" section in the Preface. Follow the Software Center link under Service and Support. You need to get a login code from a Cisco representative to retrieve files from the Software Center.

To obtain a boot helper (boot loader) image from Cisco.com and upgrade your bootflash, do the following:

Step 1 Download the boot helper (boot loader) image from Cisco.com to a Trivial File Transfer Protocol (TFTP) server.

Step 2 Reformat the Flash memory on your router as follows:

```
router# format bootflash:
Format operation may take a while. Continue? [confirm]
Format operation will destroy all data in "bootflash:".  Continue? [confirm]
Formatting sector ...
Format of bootflash:complete
```

Note Reformatting Flash memory erases the current Flash memory contents.

Step 3 Copy the boot helper image from the TFTP server to Flash memory as follows:

```
router# copy tftp bootflash:
Address or name of remote host []? biff
Source filename []? c7200-boot-mz.120-5.S
Destination filename [c7200-boot-mz.120-5.S]?
Accessing tftp://biff/c7200-boot-mz.120-5.S...
Loading c7200-boot-mz.120-5.S from 192.168.254.254 (via
Ethernet4/0):!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 3132516/6264832 bytes]

3132516 bytes copied in 28.488 secs (111875 bytes/sec)
```

This completes the procedure for upgrading your boot helper (boot loader) image. For more detailed instructions on loading and maintaining system images and microcode, including boot helper images, refer to the *Cisco IOS Configuration Fundamentals Configuration Guide*, which is available on Cisco.com.

PXF Troubleshooting Information

Note The VPN Acceleration Module (VAM) is not compatible with the PXF processor.

Cisco IOS Statistics Not Supported by PXF

Some standard Cisco IOS statistics are not supported in the PXF path, including:

- Subinterface counters
- ATM VC counters
- Class-match statistics on classes with neither policing nor class-based weighted fair queueing (CBWFQ)

Features Not Supported by PXF

Features that are not supported by PXF are punted to the Route Processor (RP), which can cause high RP CPU usage.

High PXF CPU Usage

Enter the **show pxf accounting summary** command to display information about PXF CPU usage:

```
Router# show pxf accounting summary
.
.
.
10 second averages: PXF complex busy: 1% PXF read pipeline full: 0%
```

The PXF has 16 processors, only one of which is in use at a time when there is a low traffic rate. Even though only one of the processors is working, all of the PXF processors are slightly slowed. At higher traffic rates, many of the PXF processors are working at the same time, but there is no additional slow down.

High Route Processor CPU Usage

High RP CPU usage may result from punting of packets from the PXF processors to the RP. Enter the **show pxf accounting summary** command to view the number and cause of punts.

```
Router# show pxf accounting summary

Pkts        Dropped   RP Processed        Ignored
               Total              0           48360              0

     PXF Statistic:
     Packets RP -> PXF:
         switch ip:                 0
         switch raw:         30048360
         qos fastsend:              0
         qos enqueue:            1938
     Total:                  30050298

     Packets PXF -> RP:
         qos pkts:               1938
         fast pkts:          30000000
         drops:total                0
         punts:total            48360
           "    not IP             :      40572
           "    CEF no adjacency   :       7788
     Total:                  30050298
```

```
Packets ignored:                0     |    ring space:
    shadow ring full:           0     |        shadow ring:           16384
    in ring full:               0     |        inring:                  968
    PXF inactive:               0

tx credits:              16230330     |    delayed credits:               0
holdq enqueues:                 0     |    requeue drops:                 0
interrupts:                 40538     |    interrupt misses:           1947
interrupt packets:          53326
pending read bytes:             0

     Interface    Pkts In   Chars In   Pkts Out  Chars Out     Punted    Dropped
         Fa0/0          0          0   30000000 1740000000        970          0
         Et1/0          0          0          0          0      21309          0
         Et1/1          0          0          0          0          0          0
         Et1/2          0          0          0          0          0          0
         Et1/3          0          0          0          0          0          0
         Se2/0          0          0          0          0        963          0
         Se2/1          0          0          0          0          0          0
         Se2/2          0          0          0          0          0          0
         Se2/3          0          0          0          0          0          0
         Fa3/0          0          0          0          0        963          0
         PO4/0   30000000 1440000000          0          0        963          0
         AT5/0          0          0          0          0      23192          0
           Vi1          0          0          0          0          0          0
           Vt1          0          0          0          0          0          0
           Vi2          0          0          0          0          0          0
           Vt2          0          0          0          0          0          0
```

Note CPU usage becomes more efficient as packet load increases. For example, if you are running at 60% CPU with only 33% of customer load on the system, this does not mean that you need 180% CPU for 100% of customers. Part of the original 60% CPU usage is overhead usage, which does not increase as packet load increases.

Ignored Packets

Packet ignores on an interface may result from high CPU usage. Enter the **show interfaces** command to display any input ignores:

```
Router# show interfaces ethernet 0/0
        Ethernet0/0 is up, line protocol is up
        ...
        21 input errors, 0 CRC, 0 frame, 0 overrun, 21 ignored
```

Packets are ignored if there is no available CPU to accept the new packet. This can happen if the router is overloaded with traffic, but can also happen if the interface is faulty. If ignores are present on all interfaces, then the router is probably overloaded with traffic, or does not have sufficient free buffers in the pool that match the maximum transmission unit (MTU) on interfaces. In the latter case, an increment of the ignored counter is followed by an increment of the no buffer counter:

```
Router# show interfaces serial 0/0
        ...
        1567 packets input, 0 bytes, 22 no buffer
        22 input errors, 0 CRC, 0 frame, 0 overrun, 22 ignored, 0 abort
```

No Buffers

If there are too many buffers configured for the output hold queue on an interface, this can use memory and result in dropped input packets. Enter the **show running-config** command and the **show interfaces** command to display the status of the incoming packet interfaces.

Priority and Policing Configured in the Class Policy

PXF does not support a configured priority and policing in the same class of a policy.

PXF Punts

If a feature that is supported in the PXF path appears not to be working, it could be the result of PXF failing to punt packets when it should. If you have only particular interfaces running the feature, you can configure a feature that PXF does not support on that interface to force PXF to punt packets.

QoS Fast-send and QoS Enqueue

PXF is responsible for managing the outbound traffic queues on an interface on which output QoS queueing is configured. All traffic destined for this interface must be processed by PXF, including both keepalive packets that originate in the router, known as QoS Fast-send packets, and packets that are switched in IOS, known as QoS Enqueue packets. If there is excessive traffic on the QoS Enqueue or on the QoS Fast-send path, QoS functionality can be disrupted. Use the **show pxf accounting summary** command to display the QoS Fast-send and QoS Enqueue packets:

```
Router# show pxf accounting summary
.
.
.
qos fastsend:              8
qos enqueue:               5
```

WFQ Queues

When there is an increase in ignored packets and in the no buffer count, it is possible that the output weighted fair queueing (WFQ) queues are too long. To specify the number of dynamic queues to be reserved for use by the class-default class as part of the default class policy, use the **fair-queue** policy-map class configuration command; for example:

```
Router# fair-queue

policy-map policy9
 class class-default
 fair-queue 16
 queue-limit 20
```