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Tech Notes

Hardware Troubleshooting for Cisco 1700 Series Routers

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Introduction

Valuable time and resources are often wasted replacing hardware that actually functions properly. This document helps troubleshoot potential hardware issues with Cisco 1700 Series Routers, and can help you identify which component may be causing a hardware failure, depending on the type of error that the router is experiencing.

Note: This document does not cover any software-related failures except for those that are often

mistaken as hardware issues.

Prerequisites

Requirements

Readers of this document should be knowledgeable of the following:

- [1700 Series Hardware Installation Guide](#)
- [Troubleshooting Router Crashes](#)
- [1700 Series Router Technical Support Page](#)

Components Used

The information in this document is based on the hardware versions below.

- Cisco 1700 Series Routers

The information presented in this document was created from devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If you are working in a live network, ensure that you understand the potential impact of any command before using it.

Hardware-Software Compatibility and Memory Requirements

Whenever you install a new card, module, or Cisco IOS® software image, it is important to verify that the router has enough memory, and that the hardware and software are compatible with the features you wish to use.

Perform the following recommended steps to check for hardware-software compatibility and memory requirements:

1. Use the [Software Advisor](#) ([registered](#) customers only) tool to choose software for your network device.

Tips:

- The [Software Support for Hardware](#) ([registered](#) customers only) section helps you verify whether the modules and cards installed on the router are supported by the desired Cisco IOS software version.
 - The [Software Support for Features](#) ([registered](#) customers only) section helps you determine the Cisco IOS software image needed by choosing the types of features you wish to implement.
2. Use the [IOS Upgrade Planner](#) ([registered](#) customers only) to check the minimum amount of memory (RAM and Flash) required by the Cisco IOS software, and/or download the Cisco IOS software image. To determine the amount of memory (RAM and Flash) installed on your router, refer to the *Memory Requirements* section of [How to Choose a Cisco IOS Software Release](#).

Tips:

- If you want to keep the same features as the version that is currently running on your router, but don't know which feature set you are using, enter the **show version** command on your router and paste it into the [Output Interpreter](#) ([registered](#) customers only) tool to find out. It is important to check for feature support, especially if you plan to use recent software features.
 - If you need to upgrade the Cisco IOS software image to a new version or feature set, refer to [How to Choose a Cisco IOS Software Release](#) for more information.
3. If you determine that a Cisco IOS software upgrade is required, follow the [Software Installation and Upgrade Procedure](#) for the Cisco 1700 Series Router.

Tip: If your 1700 does not have a connection to the network or does not have a valid Cisco IOS software image, you may need to use the console port of the router to perform an [Xmodem Console Download Procedure Using ROMmon](#). This procedure does not require the use of a Trivial File Transfer Protocol (TFTP) server.

4. If the router does not boot after a Cisco IOS software upgrade, refer to the [Router Does Not Boot](#) section of this document for more information.

Error Messages

The [Error Message Decoder](#) ([registered](#) customers only) tool allows you to check the meaning of an error message. Error messages appear on the console of Cisco products, usually in the following form:

```
%XXX-n-YYYY : [text]
```

Here is an example error message:

```
Router# %SYS-2-MALLOCFAIL: Memory allocation of [dec] bytes failed from [hex],  
pool [chars], alignment [DEC]
```

Some error messages are informational only, while others indicate hardware or software failures and require action. The [Error Message Decoder](#) ([registered](#) customers only) tool provides an explanation of the message, a recommended action (if needed), and if available, a link to a document that provides extensive troubleshooting information about that error message.

Conventions

For more information on document conventions, refer to the [Cisco Technical Tips Conventions](#).

Modules and Cards

The Cisco 1700 Series Routers include two WAN interface card slots. In addition, the Cisco 1750 and Cisco 1751 routers include one Voice Interface Card (VIC) slot that can be used only for a voice interface card. The Cisco 1760 router includes two VIC-only slots. However, not all Cisco WAN Interface Cards (WICs), Voice Interface Cards (VICs), and Voice WAN Interface Cards (VWIC)s are supported by the 1700 Series Router. The documents below can help you verify that the module/card is supported:

- For WIC compatibility information, refer to the [WIC Hardware Compatibility Matrix](#).
- For VIC/VWIC compatibility information, refer to the [Voice Hardware Compatibility Matrix](#).

DSP Optimization on the Cisco 1751 and Cisco 1760 Routers

- To find software configuration information for changing the codec complexity of the analog Voice Interface Cards (VICs) and optimizing the Digital Signal Processor (DSP) resources among the analog and BRI VICs on the Cisco 1751 and Cisco 1760 routers, refer to [DSP Optimization on the Cisco 1751 and Cisco 1760 Routers](#).
- The [DSP Calculator tool](#) ([registered](#) customers only) can help you determine the DSP requirements for the Cisco 1751 and the Cisco 1760 routers, based on the interface modules selected and their codec configurations. This tool supports Cisco IOS Software Releases 12.2(8) YN and later.

WIC-1ENET Module

The Cisco WIC-1ENET is a single-port Ethernet interface card supporting 10BASE-T Ethernet. The card provides the Cisco 1700 Series Router with additional Ethernet interfaces.

The Cisco WIC-1ENET card is only supported on the Cisco 1700 series routers and requires Cisco IOS Software Release 12.2(2)XJ or later if the card is installed in any WIC slot other than slot 0, or if more than one card is installed. The card can be used with Cisco IOS Software Release 12.2(4)T, but the card must be installed in slot 0, and only one Cisco WIC-1ENET card can be installed in the router.

For information on compatibility and hardware/software requirements for the Cisco WIC-1ENET card, refer to [Cisco WIC-1ENET Requirements](#).

Identifying the Issue

This section explains what to do to determine the cause of the potential hardware issue(s).

In order to determine the cause, the first step is to capture as much information about the problem as possible. The following information is essential for determining the cause of the problem:

- Console logs - For more information, refer to [Applying Correct Terminal Emulator Settings for Console Connections](#).
- Syslog information - If the router is set up to send logs to a syslog server, you may be able to obtain information on what happened. For details, refer to the *How to Configure Cisco Devices for Syslog* section of [Resource Manager Essentials and Syslog Analysis: How-To](#).
- **show technical-support** command output - The **show technical-support** command is a compilation of many different commands including **show version**, **show running-config**, and **show stacks**. TAC engineers usually ask for this information to troubleshoot hardware issues. It is important to collect the **show technical-support** information before doing a reload or power-cycle as these actions can cause all information about the problem to be lost.
- The complete bootup sequence if the router experiences boot errors.

If you have the output of a **show** command from your Cisco device (including **show technical-support**), you can use the [Output Interpreter](#) ([registered](#) customers only) to display potential issues and fixes. To use the [Output Interpreter](#) ([registered](#) customers only) , you must be logged in and have JavaScript enabled.

Troubleshooting ISDN Interfaces

Here is a list of references to use for troubleshooting ISDN interfaces:

- [Troubleshooting ISDN Layer 1](#)
- [Troubleshooting ISDN Layer 2](#)
- [Troubleshooting ISDN Layer 3](#)

Troubleshooting Router Hangs

Refer to [Troubleshooting Router Hangs](#) for this issue.

Troubleshooting Bus Error Crashes

The system encounters a bus error when the processor tries to access a memory location that either does not exist (a software error) or does not respond properly (a hardware problem). A bus error can be identified by looking at the output of the **show version** command provided by the router (if not power-cycled or manually reloaded).

Here are two examples of bus error crashes:

```
Router uptime is 2 days, 21 hours, 30 minutes
System restarted by bus error at PC 0x30EE546, address 0xBB4C4
System image file is "flash:igs-j-1.111-24.bin", booted via flash
.....
```

At the console prompt, the following error message might also be seen during a bus error:

```
*** System received a Bus Error exception ***
signal= 0xa, code= 0x8, context= 0x608c3a50
PC = 0x60368518, Cause = 0x20, Status Reg = 0x34008002
```

For more information regarding this issue, refer to [Troubleshooting Bus Error Crashes](#).

Router Does Not Boot

Capturing information from the console of the router is essential for troubleshooting a router that does not boot. The console output should be logged in a file for later analysis or for the Cisco Technical Assistance Center (TAC) if a TAC case is opened.

The following table lists symptoms and recommended actions to take if you are encountering boot problems:

Symptom	Recommended Action
No LEDs are on after powering on the router	Verify that the power supply is plugged in fir that does not resolve the issue, replace the po supply. If the problem persists, replace the ro
LEDs are on after powering on the router, but there is nothing on the console	<p>Follow these steps to connect the PC or termi the router:</p> <ol style="list-style-type: none"> 1. Verify that your PC or terminal emulat software is configured to communicate the switch using hardware flow control 2. Configure the baud rate and character f of the PC or terminal to match these co port default characteristics: 9600 baud, bits, 1 stop bit, No parity. 3. Using the supplied rollover cable, inser RJ-45 connector into the console port. 4. Attach the supplied RJ-45-to-DB-9 fen DTE adapter to a PC, or attach an appr adapter to the terminal. 5. Insert the other end of the supplied roll cable in the attached adapter. 6. Run the terminal emulation program if using a PC or a terminal. <p>If that doesn't help, verify that the equipment for connecting to the console is operating pro You can do this by connecting to a known go router to check your console equipment. If th equipment is successfully tested, but the prob remains, replace the router.</p>
<p>Router displays the System Bootstrap version and hangs at that point, or falls into a booting loop, repeating the same information over and over:</p> <pre>System Bootstrap, Version 11.1(7)AX (7)AX], EARLY DEPLOYMENT RELEASE SOFTWARE (fc2) Copyright (c) 1994-1996 by cisco Systems, Inc.</pre>	<p>The memory may not be well-seated. First, tr reseat (remove and then re-insert) the Dynam (DRAM) single inline memory module (SIM memory). If the router still does not boot, repl router.</p> <p>You can find information on the location of t DRAM SIMMs in the Cisco 1700 Series Rou Documentation.</p>
	<p>Set the configuration register to 0x2102 and i the router:</p> <pre>rommon 1 > confreg 0x2102</pre>

<p>Router boots in ROMmon; no error messages on the console</p>	<pre>rommon 2 > reset</pre> <p>If the router remains in ROMmon, follow the procedure described in ROMmon Recovery for Cisco 1700 Series Router.</p>
<p>Router boots in boot mode; no error messages on the console</p>	<p>Set the configuration register to 0x2102 and reload the router. There is no need to save the running configuration before reloading:</p> <pre>router(boot)#configure terminal Enter configuration commands, one per line. End with CNTL/Z. router(boot)(config)#config-register 0x2102 router(boot)(config)#end router(boot)#reload System configuration has been modified Save? [yes/no]: no Proceed with reload? [confirm]</pre> <p>Note: The config-register command is the only Cisco IOS software configuration command that doesn't get saved in nonvolatile RAM (NVRAM). The config-register command changes the configuration register immediately, but this only takes effect during the next boot.</p>
<p>Router boots in boot mode, with the following messages on the console:</p> <pre>getdevnum warning: device "PCMCIA slot 1" has size of zero getdevnum warning: device "PCMCIA slot 1" has size of zero pen: read error...requested 0x4 bytes, got 0x0 trouble reading device magic number boot: cannot open "flash:" boot: cannot determine first file name on device "flash:"</pre>	<p>The Flash card is removed or badly inserted. Verify the presence of the Flash card by running the flash command:</p> <pre>router(boot)#show flash %Device in REMOVED state</pre> <p>Insert or reseal the Flash. If the problem persists, replace the Flash card. If that doesn't resolve the problem, replace the router.</p>
<p>Router boots in boot mode, with the following messages on the console:</p> <pre>device does not contain a valid magic number boot: cannot open "flash:" boot: cannot determine first file name on device "flash:"</pre>	<p>The Flash is empty or the filesystem is corrupted. Copy a valid image on the Flash, and while copying you will be prompted to erase the old Flash (if it exists). Then reload the router.</p> <p>Refer to Software Installation and Upgrade Procedures for instructions on how to copy an image onto the Flash.</p>
	<p>This message only occurs when loading an image run from RAM. Since 1700 routers support it</p>

<p>Router boots in boot mode, with the following message on the console:</p> <pre>SYSTEM INIT: INSUFFICIENT MEMORY TO BOOT THE IMAGE!</pre>	<p>that run in RAM and images that run directly Flash (for example, relocatable images), there are two solutions for the problem:</p> <ul style="list-style-type: none"> • Upgrade the DRAM • Load a relocatable image; load an image from Flash <p>For more information on image types, refer to Naming Conventions.</p> <p>For information on memory requirements, refer to the Release Notes for your version of Cisco IOS software.</p> <p>Refer to the Cisco 1700 Series Router Documentation for where to locate the DRAM SIMMs for upgrading the 1720, 1750, 1751, and 1760.</p>
<p>Router boots in boot mode, with the following messages on the console:</p> <pre>loadprog: error - Invalid image for platform</pre>	<p>The Cisco IOS software image is not appropriate for the 1700 router, or it is corrupted. Erase the Flash and download a new valid Cisco IOS software image.</p> <p>For more information on loading new software on a 1700 router, refer to Software Installation and Upgrade Procedure.</p>

Router Crashes

When we refer to a "system crash", we mean a situation where the system has detected an unrecoverable error and has restarted itself. A crash can be caused by software problems, hardware problems, or both. This section deals with hardware-caused crashes and crashes that are software-related, but may be mistaken for hardware problems.

Important: If the router is reloaded after the crash (for example, through a power-cycle or the **reload** command), important information about the crash will be lost, so try to collect **show technical-support** and **show log** output, as well as the crashinfo file (if possible) before reloading the router!

Refer to [Troubleshooting Router Crashes](#) for more information regarding this issue.

Watchdog Timeouts

Cisco processors have timers that guard against certain types of system hangs. The CPU periodically resets a watchdog timer. The watchdog timer basically controls the time of each process. If the timer is not reset, a trap occurs. If a process is longer than it should be, the watchdog timer is used to escape from this process.

There are two main types of watchdog timeouts. The first type is usually caused by a software problem and is reported in the router console logs as:

```
%SYS-2-WATCHDOG: Process aborted on watchdog timeout
```

The second type of watchdog timeout is usually due to a hardware problem and is reported in one or both of these two ways:

- The **show version** command output shows:

```
System returned to ROM by watchdog timer expired
```

- The console logs show:

```
*** Watch Dog Timeout ***
```

Refer to [Troubleshooting Watchdog Timeouts](#) to further troubleshoot this issue.

Router Is Dropping Packets

Packet losses caused by hardware problems are fairly easy to identify. The following section uses the output of the **show interfaces** command to identify packet losses.

Cyclic Redundancy Check (CRC) and Frame Errors

If CRC errors or frame errors are constantly increasing on the interface, this usually indicates a hardware problem.

```
router#show interface ethernet 0
Ethernet0/0 is up, line protocol is up
...
    121 input errors, 102 CRC, 19 frame, 0 overrun, 0 ignored
```

An exception to this is when CRC and frame errors are found on channelized interfaces; they can indicate clocking problems as well. The fault that is causing the errors can be anywhere between two connected interfaces: on cables, intermediate devices, or on interfaces themselves. Troubleshooting techniques differ slightly for different interface types.

Ethernet Interfaces

For Ethernet interfaces, troubleshooting differs between a shared environment (devices connected through a hub or with a coaxial cable) and a switched environment (devices connected to a switch).

In a switched environment, there are only three components that could cause the error:

- cable
- local interface (port)
- remote interface (port)

Consequently, the troubleshooting steps are simple. For example, if a router is connected to a switch, the troubleshooting steps would be:

1. Replace the cable.
2. If this does not solve the problem, try another port on the switch.
3. If the problem persists, replace the router.

In a shared environment, the source of the problem is a lot harder to find. Every piece of hardware that makes up the shared segment can be the cause. All components (cables, connectors, and so on) have to be tested one by one.

Ignored Packets

```
router#show interfaces ethernet 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 are no free buffers 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 doesn't 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
...
    1567 packets input, 0 bytes, 22 no buffer
    22 input errors, 0 CRC, 0 frame, 0 overrun, 22 ignored, 0 abort
```

You may also see an increase in the buffer failures counter in the pool that matches the MTU size:

```
router#show buffers
...
Big buffers, 1524 bytes (total 50, permanent 50):
    50 in free list (5 min, 150 max allowed)
    3066 hits, 189 misses, 0 trims, 24 created
    12 failures (0 no memory)
```

The number of preconfigured permanent, free, and maximum allowed buffers may not be completely compatible for every environment. You can read more about this and how to avoid it in [Buffer Tuning](#).

If "ignores" are only increasing on one interface and are not followed by an increment of the no buffer counter, and the interface is not heavily loaded, then this interface could be faulty. In that case, capture the output of the **show technical-support** command and contact the TAC. The load on the interface can be viewed in the output of the **show interfaces** command:

```
router#show interfaces serial 0
...
    reliability 255/255, txload 100/255, rxload 122/255
```

Input and Output Queue Drops

Input queue drops are never caused by hardware problems. Output queue drops may be caused by a hardware problem only if the output queue is constantly full and no packets are being sent out of the interface. You can read more about these kinds of drops in [Troubleshooting Input Queue Drops and Output Queue Drops](#).

If the issue you are having is not listed on this page, please read through the documents in the [Related Information](#) section. If you still need assistance, please contact the [Cisco Technical Assistance Center](#).

Memory Leaks

Memory allocation failure means either that the router has used all available memory (temporarily or permanently) or that the memory has fragmented into such small pieces that the router cannot find a usable available block. This can happen with the processor memory (used by the Cisco Internet Operating System [IOS]) or with the packet memory (used by incoming and outgoing packets).

Symptoms of memory allocation failure include, but are not limited to:

- The console or log message: "%SYS-2-MALLOCFAIL: Memory allocation of 1028 bytes failed from 0x6015EC84, Pool Processor, alignment 0"
- Refused Telnet sessions
- The **show processor memory** command is displayed no matter what command you type on a console
- There is no output from some **show** commands
- You see "Low on memory" messages
- You see the console message "Unable to create EXEC - no memory or too many processes"
- The router hangs; there is no console response

For more information regarding this issue, refer to [Troubleshooting Memory Problems](#).

Summary

If you have identified a component that needs to be replaced, contact your Cisco partner or reseller to request a replacement for the hardware component that is causing the issue. If you have a support contract directly with Cisco, use the TAC [Case Open Tool](#) ([registered](#) customers only) to open a TAC case and request a hardware replacement. Make sure you attach the following information:

- Console captures showing the error messages
- Console captures showing the troubleshooting steps taken and the boot sequence during each step
- The hardware component that failed and the serial number for the chassis

- Troubleshooting logs
 - Output from the **show technical-support** command
-

Related Information

- [Cisco 1700 Series Routers Documentation](#)
 - [ROMmon Recovery for the Cisco 1700 Series Router](#)
 - [Image Naming Conventions](#)
 - [Software Installation and Upgrade Procedures](#)
 - [Capacity and Performance Management: Best Practices](#)
 - [How to Choose a Cisco IOS Software Release – *Memory Requirements*](#)
 - [Buffer Tuning](#)
 - [Troubleshooting Input Queue Drops and Output Queue Drops](#)
 - [Cisco IOS Software Skills](#)
 - [Rebooting Documentation](#)
 - [Loading and Maintaining System Images](#)
 - [Cisco 1700 Series Product Support Page](#)
 - [Technical Support - Cisco Systems](#)
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