A P P E N D I X   C

Bootstrap Program

The bootstrap program can help you to isolate or eliminate hardware problems encountered when installing your router. A summary of the bootstrap diagnostic tests and command options is provided.

Entering the Bootstrap Program

The bootstrap diagnostics help initialize the processor hardware and boot the main operating system software. If you set the software configuration register boot field (bits 3, 2, 1, and 0) to zero, you can start the server in standalone bootstrap mode. The bootstrap mode prompt is an angle bracket (>).

To enable the Break key, and to default to booting in the bootstrap mode, at the bootstrap prompt (>), set the configuration register to 0x0 by entering the following:

```
> o/r 0x0
```

See Table C-1 for an explanation of the **o/r** command.

Note   For more information on the virtual configuration register, refer to the appendix, "Virtual Configuration Register."

While running the system software, you can reset the configuration register to 0x0 by entering configuration mode, and then entering the following configuration command:

```
config-register 0x0
```

The new configuration register value, 0x0, takes effect after the router is rebooted. If you set the configuration to 0x0, you must manually boot the system each time you reboot the router.

Timesaver   Break (system interrupt) is always enabled for 60 seconds after rebooting the system, regardless of whether the break is configured to be off by setting the configuration register. During the 60-second window, you can break to the bootstrap program prompt.

Available Bootstrap Commands

After you are in the bootstrap mode, enter **?** at the > prompt to display a list of available commands and options, as follows:

```
?
$        Toggle cache state
B [filename] [TFTP Server IP address | TFTP Server Name]
             Load and execute system image from ROM or from TFTP server
C [address]  Continue [optional address]
D /S M L V   Deposit value V of size S into location L with modifier M
E /S M L     Examine location L with size S with modifier M
G [address]  Begin execution
H            Help for commands
I            Initialize
K            Displays Stack trace
L [filename] [TFTP Server IP address | TFTP Server Name]
             Load system image from ROM or from TFTP server, but do not
             begin execution
O            Show software configuration register option settings
P            Set break point
S            Single step next instruction
T function   Test device (? for help)
Deposit and Examine sizes may be B (byte), L (long) or S (short).
Modifiers may be R (register) or S (byte swap).
Register names are: D0-D7, A0-A7, SS, US, SR, and PC.
```

The following system bootstrap commands are especially useful:

- Boot—The **b** command with no argument reboots the system and boots the default software from ROM as defined by the lower four bits of the configuration register which form the *boot field*. You can include an argument, *filename*, to specify a file to be booted over the network using the Trivial File Transfer Protocol (TFTP). You can also include a second argument, *host*, which is the Internet address or name of a particular server host. You must enter the **i** command (explanation follows) and press **Return** before entering **b.** The various forms of the b command follow:

  — **b**—Boots the default system software from ROM

  — **b** *filename [host]*—Netboots using TFTP

  — **b flash**—Boots the first file in Flash memory

  — **b flash** *[filename]*—Boots the file (*filename*) from Flash memory

  To prevent the router from automatically netbooting or booting from anywhere, enter the **o/r 0x0** command.

- Continue—The **c** command allows you to exit the bootstrap mode without rebooting the router after you press the Break key while running the system software image.

- Help—The **h** command prints a summary of the bootstrap commands to the console screen. This is the same output produced by entering **?**.

- Initialize—The **i** command causes the bootstrap program to reinitialize the hardware, clear the contents of memory, and boot the system if so directed by the boot field in the virtual configuration register. (It is best to use the **i** command before running any tests or booting software.)

- Display Stack Trace—The **k** command displays a stack trace of the last running system software. This stack trace will be useful as a diagnostic reading if there is a problem such as an unexpected system crash.

- Display/Reset Virtual Configuration Register—The **o** command displays the virtual configuration register. The **o** command used with the **/r** option will reset the configuration register and cause the system software image to ignore the system configuration information in NVRAM (sets the *ignore NVRAM contents* bit, 0x0040).

- To reset, enter the following at the > prompt:

  o/r

Table C-1 lists additional **o** command options.

Table C-1   O Command Options

Monitor Command	Function
o	Displays the virtual configuration register, currently in effect, with a description of the bits
o/r	Resets the virtual configuration register as follows: • 9600 baud console UART speed • Break/abort has no effect • Ignore the system configuration in NVRAM • Boot from ROM
o/r *0xvalue*	Sets the virtual configuration register to the (hex) value, *value*

To automatically reboot the router, enter the **i** command after entering the **o/r** command.

Note   To enable the router to read the nonvolatile RAM configuration, clear the ignore-NVRAM-contents bit (0x0040) with the **config-register** command after using the **o/r** command.

- Memory/Bus Diagnostic—The **t m** command runs the memory test. By default, the memory test examines processor main memory.

  To test memory, enter the **t** command with the **m** option at the > prompt, as follows:

  t m

  To use the default addresses and select the default tests, press the Return key after each prompt is displayed.

The time taken to run a diagnostic is memory-size dependent and will require a minimum of 10 minutes. If the program encounters memory problems, it will display appropriate error messages on the console terminal. Be sure to reinitialize the processor before booting the system by entering **i** at the bootstrap prompt (>).

Running the Diagnostics

Follow these steps to run the bootstrap diagnostics:

Step 1 Turn off the router.

Step 2 Restart the router.

Step 3 Within 60 seconds, press the Break key on the console terminal to force the server into the bootstrap program. Wait for the server to print the two-line banner message and for the angle bracket (>) prompt to appear.