APPENDIX D

ROM Monitor

This appendix describes the ROM monitor (also called the bootstrap program), the firmware that runs when the router is powered on or reset. The ROM monitor can help you isolate or rule out hardware problems encountered when installing your router.

This appendix contains the following sections:

- Entering the ROM Monitor
- ROM Monitor Commands
- ROM Monitor Syntax Conventions
- Command Descriptions

Entering the ROM Monitor

In normal operation, the ROM monitor helps to initialize the processor hardware and boot the operating system software. To use the ROM monitor, you must have access to the console port. Refer to the section “Console Port” in the chapter “Installing the Router.”

From the operating system software, you can configure the router to remain in the ROM monitor the next time it boots by setting virtual configuration register bits 3, 2, 1, and 0 to zero. From the console, enter the following configuration command:

```
configuration-register 0x0
```

The new configuration register value, 0x0, is effective after the router is rebooted with the **reload** command. The router remains in the ROM monitor and does not boot the operating system.

If the configuration value remains 0x0, you must manually boot the operating system from the console. Refer to the **boot** command in the section "Command Descriptions" later in this appendix.

Timesaver Break (system interrupt) is always enabled for five seconds after the router reboots, regardless of whether Break is configured on or off in the configuration register (see the appendix "Virtual Configuration Register"). During this five-second period, you can break to the ROM monitor prompt by pressing the Break key.

The ROM monitor prompt is as follows:

```
rommon 1 >
```

In this example, 1 (the number one) is the line number and is incremented at each prompt.

ROM Monitor Commands

Enter **?** or **help** at the ROM monitor prompt to display a list of available commands and options, as follows:

```
rommon 1 > ?
alias              set and display aliases command
boot               boot up an external process
break              set/show/clear the breakpoint
confreg            configuration register utility
cont               continue executing a downloaded image
context            display the context of a loaded image
cookie             display contents of cookie PROM in hex
dev                list the device table
dir                list files in file system
dis                disassemble instruction stream
dnld               serial download a program module
frame              print out a selected stack frame
help               monitor builtin command help
history            monitor command history
meminfo            main memory information
repeat             repeat a monitor command
reset              system reset
set                display the monitor variables
stack              produce a stack trace
```

```
sync                write monitor environment to NVRAM
sysret              print out info from last system return
unalias             unset an alias
unset               unset a monitor variable
xmodem              x/ymodem image download
rommon 2 >
```

Note To display information about command syntax, enter the command name followed by the **-?** option.

Commands are case sensitive. You can abort any command by pressing the Break key at the console.

ROM Monitor Syntax Conventions

ROM monitor syntax in this appendix uses the following conventions:

- Brackets [ ] denote an optional field. If a minus option is followed by a colon (for example, [-s:]) you must provide an argument for the option.
- A term in italics means that you must fill in the appropriate information.

Command Descriptions

This section lists some useful ROM monitor commands. Refer to the Cisco IOS configuration guides and command references for more information.

- **boot** or **b**—Boot an image. The **boot** command with no arguments boots the first image in Flash memory.

  The router does not have a dedicated boothelper image ([rx]boot) as used by some other Cisco routers. Any system image can be used for this purpose. The default boothelper image is the first image in Flash memory, but this can be overridden by setting the BOOTLDR Monitor environment variable to point to another image. The boothelper image is invoked anytime the ROM Monitor does not recognize the device ID in the boot command.

b *filename* :[*host*] boots from the specified file over the network using TFTP. If a host is specified, by either name or IP address, the router boots from that host.

b *device* :[*name*] boots the Cisco IOS software from the specified device. If the filename *name* is not specified, the router boots from the first file in the device. Some examples are shown as follows:

— **b flash:**—Boot from the first file in the first partition of Flash memory.

— **b slot0:**—Boot from the first file in the first partition of the slot 0 PCMCIA card.

— **b slot0:2:**—Boot from the first file in the second partition of the slot 0 PCMCIA card.

— **b slot0:3:***imagename*—Boot from the file named *imagename* in the third partition of the slot 0 PCMCIA card.

— **b flash**—The ROM monitor will boot from the boothelper image because it does not recognize the device ID. The boothelper image is the first file in the first partition of Flash memory.

— **b** *imagename*—The ROM monitor will boot from the boothelper image because it does not recognize the device ID. This form of the command is used to netboot the image named *imagename*.

— **b**—The ROM monitor will boot the default boothelper image, the first file in the first partition of Flash memory.

Options to the boot command are **-x**, load image but do not execute, and **-v**, verbose.

The Cisco IOS commands **show version** and **show hardware** will display the source of the currently running image.

- **dev**—List boot device identifications on the router, for example:

```
rommon 10 > dev
Devices in device table:
        id  name
    flash:  flash
    slot0:  PCMCIA slot 0
    slot1:  PCMCIA slot 1
    eprom:  eprom
```

- **dir** *device:*[*partition:*]**—**List the files on the named device, for example:

```
rommon 11 > dir flash:
          File size           Checksum   File name
        2229799 bytes (0x220627)   0x469e    C3600-j-m2
```

- **help**—Display a summary of ROM monitor commands (equivalent to **?**).
- **reset** or **i**—Reset and initialize the router, similar to power-on.

Debugging Commands

Most debugging commands are functional only when Cisco IOS software has crashed or is aborted. If you enter a debugging command and Cisco IOS crash information is not available, the following error message displays:

```
"xxx: kernel context state is invalid, can not proceed."
```

- **stack** or **k**—Produce a stack trace.
- **context**—Display processor context.
- **frame**—Display an individual stack frame.
- **sysret**—Display return information from the last booted system image. This information includes the reason for terminating the image, a stack dump of up to eight frames, and, if an exception is involved, the address where the exception occurred, for example:

```
rommon 8 > sysret
System Return Info:
count: 19,  reason: user break
pc:0x60043754,  error address: 0x0
Stack Trace:
FP: 0x80007e78, PC: 0x60043754
FP: 0x80007ed8, PC: 0x6001540c
FP: 0x80007ef8, PC: 0x600087f0
FP: 0x80007f18, PC: 0x80008734
```

- **meminfo [-l]**—Display size in bytes, starting address, available range of main memory, the starting point and size of packet memory, and size of nonvolatile memory (NVRAM). With -l option, display supported DRAM configurations. (See Table A-1 and Table A-2 in the appendix "Maintaining the Router.") The following example shows an example of the **meminfo** command:

```
rommon 9 > meminfo

Main memory size: 16 MB in 32-bit mode.
Available main memory starts at 0xa000e000, size 16328KB
IO (packet) memory size: 25 percent of main memory.
NVRAM size: 128KB
```

Configuration Register

The virtual configuration register resides in NVRAM. You can display or modify the virtual configuration register from either the ROM monitor or the operating system software. For procedures for changing the virtual configuration register from the operating system, and for information about register settings, see the appendix "Virtual Configuration Register."

To change the virtual configuration register from the ROM monitor, enter **confreg** by itself for menu mode, or enter the new value of the register in hexadecimal.

- **confreg** [*hexnum*]—Change the virtual configuration register to the value specified. The value is always interpreted as hexadecimal. Entering **confreg** without an argument displays the contents of the virtual configuration register and prompts you to alter the contents by describing the meaning of each bit.

  In either case, the new virtual configuration register value is written into NVRAM, but is not effective until you reset or power-cycle the router.

  The following display shows an example of menu mode:

```
rommon 7 > conf reg


    Configuration Summary
enabled are:
break/abort has effect
console baud: 9600
boot: the ROM Monitor
```

```
do you wish to change the configuration? y/n  [n]:  y
enable  "diagnostic mode"? y/n  [n]:  y
enable  "use net in IP bcast address"? y/n  [n]:
enable  "load rom after netboot fails"? y/n  [n]:
enable  "use all zero broadcast"? y/n  [n]:
disable  "break/abort has effect"? y/n  [n]:
enable  "ignore system config info"? y/n  [n]:
change console baud rate? y/n  [n]:  y
enter rate: 0 = 9600,  1 = 4800,  2 = 1200,  3 = 2400
            4 = 19200, 5 = 38400, 6 = 57600, 7 = 115200  [0]:  0
change the boot characteristics? y/n  [n]:  y
enter to boot:
 0 = ROM Monitor
 1 = the boot helper image
 2-15 = boot system
    [0]:  0


    Configuration Summary
enabled are:
diagnostic mode
console baud: 9600
boot: the ROM Monitor

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


You must reset or power cycle for new config to take effect
```

BOOTLDR Environment Variable

The BOOTLDR environment variable is used to change the default boothelper image from the first image in Flash memory to the specified image.

To set the BOOTLDR environment variable, perform the following tasks, beginning in the privileged EXEC mode.

First, verity that Flash memory contains the boot image:

```
router> dir [/all | /deleted] | [/long] [device:][filename]
```

Enter configuration mode:

```
router> configure terminal
```

Set the BOOTLDR environment variable to specify the Flash device and filename of the boot image:

```
router> boot bootldr device:filename
```

Exit configuration mode:

```
router> ^Z
```

Save the BOOTLDR environment variable to your startup configuration:

```
router> copy running-config startup-config
```

You can verify the contents of the BOOTLDR environment variable by using the **show boot** command:

```
router> show boot
```

Disaster Recovery

The **xmodem** command establishes a connection between a console and the router console or auxiliary port for disaster recovery if both the boot and system images are erased from Flash memory. For a description of the disaster recovery procedure, refer to the section "Recovering Software Images" in the chapter "Troubleshooting."

- **xmodem** [*filename*]—Establish an xmodem connection between the console and the router. The optional parameter *filename* specifies the source file containing the Cisco IOS image.

Other options are:

- **-c**, use cyclic redundancy check (CRC-16)
- **-y**, use Ymodem transfer protocol
- **-r**, copy the image to DRAM for launch
- **-x**, do not launch image on completion of download