CHAPTER 3

Reference

This chapter contains information about troubleshooting, enabling booting from Flash memory, copying to Flash memory, and cable pinouts. For additional information about the Cisco 2500 series router hardware, refer to the *Cisco 2500 Series Hardware Installation and Maintenance* publication.

Note The *Cisco 2500 Series Hardware Installation and Maintenance* publication is available on UniverCD or a printed copy can be ordered separately.

Troubleshooting

The key to problem solving in this system is to try to isolate the problem to a specific subsystem. By comparing what the system is doing to what it should be doing, the task of isolating a problem is greatly simplified.

Troubleshooting might require copying or reloading the operating system image from Flash memory or testing cables. Flash memory and cable information is included in this chapter.

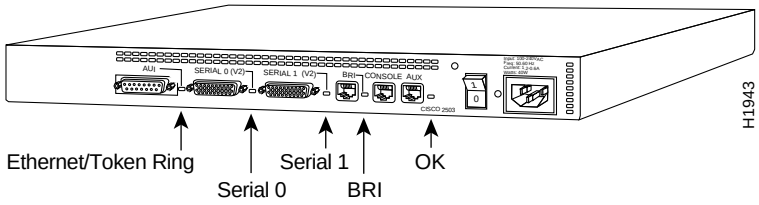
Check the following items to help isolate the problem:

- With the power switch and OK LED ON (see Figure 3-1), does the fan operate? If no, suspect the fan or the 12-volt (V) power supply.
- Does the system not boot up, but the OK LED is ON? Suspect the 12V power supply.
- Does the system partially boot, but the OK LED is not ON? Suspect a 5V power supply failure.

- Does the system shut down after being ON a short time?
  - Suspect a thermal-induced shutdown.
  - Ensure that the chassis intake and exhaust vents are clear.
  - Suspect a power supply failure.

The green OK LED (to the right of the AUX port) should be ON after the system initializes correctly. (See Figure 3-1.)

Figure 3-1 Router LEDs—Rear-Panel View



Note If an interface is extremely busy, its LED will always be ON.

For more complete network troubleshooting information, refer to the *Troubleshooting Internetworking Systems* publication.

Note *Troubleshooting Internetworking Systems* is available on UniverCD or a printed copy can be ordered separately.

Enabling Booting from Flash Memory

To enable booting from Flash memory, set configuration register bits 3, 2, 1, and 0 to a value between 2 and 15 in conjunction with the **boot system flash** *[filename*] configuration command.

To enter the configuration mode, while in the system software image specify a Flash filename from which to boot, enter the **configure terminal** command at the enable prompt, as in the example following:

```
router# configure terminal
Enter configuration commands, one per line.
Edit with DELETE, CTRL/W, and CTRL/U; end with CTRL/Z
boot system flash [filename]
```

To disable break and enable the **boot system flash** command, enter the **config-register** command with the value shown in the example following:

```
router# config term
Enter configuration commands, one per line.
Edit with DELETE, CTRL/W, and CTRL/U; end with CTRL/Z
config-reg 0x2102
^Z
router#
```

Copying to Flash Memory

Copying a new image to Flash memory might be required whenever a new image or maintenance release becomes available. To copy a new image into Flash memory (write to Flash memory), you *must* first reboot from ROM and *then* copy the new image into Flash memory. You *cannot* copy a new image into Flash memory while the system is running from Flash memory. Use the **copy tftp flash** command for the copy procedure.

Following is a sample output for setting the configuration register to 0x2101, which tells the system to boot from ROM, but does *not* reset the break disable or check for a default netboot filename.

```
router# configure terminal
Enter configuration commands, one per line.
Edit with DELETE, CTRL/W, and CTRL/U; end with CTRL/Z
config-reg 0x2101
^Z
```

Following is sample output for reloading the router and then copying a file (called *IJ09140Z*) to Flash memory from a TFTP server (called *server1*):

```
router# reload
...
router(boot)# copy tftp flash
File  Length   Name/status
  1   4035664 IJ09140Y
[4035728 bytes used, 158576 available, 4194304 total]
Address or name of remote host [255.255.255.255]? server1
Source file name? IJ09140Z
Destination file name [default = source name]? <Return>
Accessing file 'IJ09140Z' on 131.108.1.111...
Loading IJ09140Z from 131.108.1.111 (via Ethernet0): !
Erase flash device before writing? [confirm]y
Flash contains files. Are you sure? [confirm]y
Copy 'IJ09140Z' from TFTP server
as 'IJ09140Z' into Flash WITH erase? [yes/no] y
Erasing device...  ... erased
Loading IJ09140Z from 131.108.1.111 (via Ethernet0):
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!.!!.!
!!!!!!!!!!!!!!!!!!!!!!!!!.!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!.!!!!!!!!!!!!!!!!!!!!!!!.!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 3235932/8 388608 bytes]

Verifying checksum...  OK (0x6871)
Flash copy took 60700 msecs
```

Following is a sample output for setting the configuration register to 0x2102, which tells the system to boot from ROM if netboot fails, disable break, and check for a default netboot filename.

```
router(boot)# config term
Enter configuration commands, one per line.
Edit with DELETE, CTRL/W, and CTRL/U; end with CTRL/Z
config-reg 0x2102
^Z
```

After copying the file (called *IJ09140Z*) to Flash memory from a TFTP server (called *server1*), the router is reloaded, as follows:

```
router(boot)# reload
...
```

The system is now ready to be configured to boot from the new image you copied to Flash memory. For more information on the **copy tftp flash** command, and other related commands, refer to the router products configuration publication

Note The router products configuration publication is available on UniverCD or a printed copy can be ordered separately.

Cable Pinouts

The following tables list the pinouts for the cables that can be used with the 2500 series products:

- Console asynchronous serial port an adapter, Table 3-1
- Auxiliary asynchronous serial port and adapter, Table 3-2
- RJ-45 Straight and Rolled Cables, Table 3-3
- Pins for the RJ-45, M/F DTE, MF DCE, and MMOD, Table 3-4
- Connection Configuration, Table 3-5
- BRI, Table 3-6
- EIA-530 DTE synchronous serial, Table 3-7

- EIA/TIA-232 DTE and DCE synchronous serial, Table 3-8
- EIA/TIA-449 DTE and DCE synchronous serial, Table 3-9
- V.35 DTE and DCE synchronous serial, Table 3-10
- X.21 DTE and DCE synchronous serial, Table 3-11
- Ethernet AUI, Table 3-12
- Ethernet 10BaseT (RJ-45), Table 3-13
- Token Ring, Table 3-14
- Asynchronous serial (RJ-45), Table 3-15
- Asynchronous-Line Cable (68-Pin SCSI), Table 3-16

Table 3-1 Console Port Pinouts (RJ-45)

Pin[1]	Signal	Input/Output
1	–	–
2	DTR	Output
3	TXD	Output
4	GND	–
5	GND	–
6	RXD	Input
7	CD	Input
8	–	–

1. Any pin not referenced is not connected.

Table 3-2 Auxiliary Port Pinouts (RJ-45)

Pin[1]	Signal	Input/Output
1	RTS	Output
2	DTR	Output
3	TXD	Output
4	GND	–
5	GND	–
6	RXD	Input
7	CD	Input
8	CTS	Input

1. Any pin not referenced is not connected.

The connection of pins between the RJ-45 connector and the end device depends on the type of cable and adapter used. Either a straight or rolled cable can be used. Refer to Table 3-3 for the pinout of a straight and a rolled cable. The Cisco 2500 series products now ship with a rolled cable. Refer to Table 3-4 for a list of the pins used on the RJ-45 connector, the male/female DTE (MDTE/FDTE) adapter, the male/female DCE (MDTE/FDTE) adapter, and the male modem (MMOD) adapter used to connect terminals and modems to Cisco 2500 series products. Refer to Table 3-5 for the cable and adapter configurations that can be used to connect terminals and modems to Cisco 2500 series products.

Table 3-3 RJ-45 Straight and Rolled Cables

RJ-45 Pins	Straight Cable Pinout	Rolled Cable Pinout
1	1	8
2	2	7
3	3	6
4	4	5
5	5	4
6	6	3
7	7	2
8	8	1

Table 3-4 Pins for the RJ-45, MDTE/FDTE, MDCE/FDCE, and MMOD

Cable	DB-25 Adapters		
RJ-45 Pins	MDTE/FDTE Pins[1]	MDCE/MDTE Pins	MMOD Pins[2]
1	4	5	5
2	20	6	8
3	2	3	3
4	7	7	7
5	7	7	7
6	3	2	2
7	6	20	20
8	5	4	4

1. The FDTE adapter that is available through Cisco is labeled “Terminal.”
2. The MMOD adapter that is available through Cisco is labeled “Modem.”

Table 3-5 Connection Configuration

Cisco 2500 Port	RJ-45 Cable Type	DB-25 Adapter	End Device
Console	Rolled	MDTE/FDTE	Terminal
Console	Straight	MDCE/FDCE	Terminal
Console[1]	Rolled	MMOD	Modem
Aux	Rolled	MDTE/FDTE	Terminal
Aux	Straight	MDCE/FDCE	Terminal
Aux	Rolled	MMOD	Modem

1. Connecting a modem to the console port is not recommended. The console port does not have modem or flow control.

Figure 3-2 RJ-45-to-DB-9 Adapter Pinouts

RJ-45 Pin	Signal	DB-9 Pin
1	RTS	7
2	DTR	4
3	TXD	3
4	GND	5
5	GND	5
6	RXD	2
7	DSR	6
8	CTS	8

Table 3-6 BRI Port Pinout (RJ-45)

8 Pin[1]	TE[2]	NT[3]	Polarity
3	Transmit	Receive	+
4	Receive	Transmit	+
5	Receive	Transmit	–
6	Transmit	Receive	–

1. Pins 1, 2, 7, and 8 are not used.
2. TE refers to terminal terminating layer 1 aspects of TE1, TA, and NT2 functional groups.
3. NT refers to network terminating layer 1 aspects of NT1 and NT2 functional groups.

Warning Network hazardous voltages are accessible in the BRI cable. If you detach the BRI cable, detach the end away from the router first to avoid possible electric shock. Network hazardous voltages are also accessible on the system card in the area of the BRI port (RJ-45 connector), even when power is turned OFF.

Note All serial cables have a DB-60 connector on the router end. The following pinouts represent only the router ends of the cables. Because of the small pins on the DB-60 connector, manufacturing and soldering these cables yourself might be very difficult and is not recommended. In the following tables, serial pinouts for DTE and DCE cables use arrows to indicate signal direction: —> indicates DTE to DCE, and <— indicates DCE to DTE.

Table 3-7 EIA-530 DTE Serial Cable Pinout (DB-25)

25 Pin[1]	Signal	Direction DTE DCE[2]	25 Pin	Signal	Direction DTE DCE
J2-1	Shield	–	J2-8	CF(A), DCD+	<—
–	–	–	J2-10	CF(B), DCD–	<—
J2-2	BA(A), TxD+	—>	J2-15	DB(A), TxC+	<—
J2-14	BA(B), TxD–	—>	J2-12	DB(B), TxC–	<—
J2-3	BB(A), RxD+	<—	J2-17	DD(A), RxC+	<—
J2-16	BB(B), RxD–	<—	J2-9	DD(B), RxC–	<—
J2-4	CA(A), RTS+	—>	J2-18	LL	—>
J2-19	CA(B), RTS–	—>	J2-7	Circuit GND	–
J2-5	CB(A), CTS+	<—	J2-20	CD(A), DTR+	—>
J2-13	CB(B), CTS–	<—	J2-23	CD(B), DTR–	—>
J2-6	CC(A), DSR+	<—	J2-24	DA(A), TxCE+	—>
J2-22	CC(B), DSR–	<—	J2-11	DA(B), TxCE–	—>

1. Any pin not referenced is not connected.
2. The EIA-530 interface cannot be operated in DCE mode. A DCE cable is not available for the EIA-530 interface.

Table 3-8 EIA/TIA-232 DTE and DCE Serial Cable Pinouts (DB-25)

25 Pin[1]	Signal	Direction DTE	Direction DCE	25 Pin	Signal	Direction DTE	Direction DCE
J2-1	Shield GND	_		J2-7	Circuit GND	–	
				Shield	–	–	
J2-2	TxD	—>		J2-8	DCD	<—	
Shield	–	–		Shield	–	–	
J2-3	RxD	<—		J2-15	TxC	<—	
Shield	–	–		Shield	–	–	
J2-4	RTS	—>		J2-17	RxC	<—	
Shield	–	–		Shield	–	–	
J2-5	CTS	<—		J2-18	LTST	—>	
Shield	–	–		Shield	–	–	
J2-6	DSR	<—		J2-20	DTR	—>	
Shield	–	–		Shield	–	–	
				J2-24	TxCE	—>	
				Shield	–	–	

1. Any pin not referenced is not connected.

Table 3-9 EIA/TIA-449 DTE and DCE Serial Cable Pinouts (DB-37)

37 Pin[1]	Signal	Direction DTE	Direction DCE	37 Pin	Signal	Direction DTE	Direction DCE
J2-1	Shield GND	–		J2-9	CS+	—>	
				J2-27	CS–	—>	
J2-4	SD+	<—		J2-10	LL	—>	
J2-22	SD–	<—		J2-37	SC	–	
J2-5	ST+	—>		J2-11	DM+	—>	
J2-23	ST–	—>		J2-29	DM–	—>	
J2-6	RD+	—>		J2-12	TR+	<—	
J2-24	RD–	—>		J2-30	TR–	<—	
J2-7	RS+	<—		J2-13	RR+	—>	
J2-25	RS–	<—		J2-31	RR–	—>	
J2-8	RT+	—>		J2-17	TT+	<—	
J2-26	RT–	—>		J2-35	TT–	<—	
				J2-19	SG	–	
				J2-20	RC	–	

1. Any pin not referenced is not connected.

Table 3-10 V.35 DTE and DCE Serial Cable Pinouts (Winchester-Type 34 Pin)

34 Pin[1]	Signal	Direction DTE	Direction DCE	34 Pin	Signal	Direction DTE	Direction DCE
J2-A	Frame GND	–		J2-H	DTR	—>	
				Shield	–	–	
J2-B	Circuit GND	–		J2-K	LT	—>	
Shield	–	–		Shield	–	–	
J2-C	RTS	—>		J2-P	SD+	—>	
Shield	–	–		J2-S	SD–	—>	
J2-D	CTS	<—		J2-R	RD+	<—	
Shield	–	–		J2-T	RD–	<—	
J2-E	DSR	<—		J2-U	SCTE+	—>	
Shield	–	–		J2-W	SCTE–	—>	
J2-F	RLSD	<—		J2-V	SCR+	<—	
Shield	–	–		J2-X	SCR–	<—	
				J2-Y	SCT+	<—	
				J2-AA	SCT–	<—	

1. Any pin not referenced is not connected.

Table 3-11 X.21 DTE and DCE Serial Cable Pinouts (DB-15)

15 Pin[1]	Signal	Direction DTE	Direction DCE
J2-1	Shield GND	–	
J2-2	Transmit+	—>	
J2-9	Transmit–	—>	
J2-3	Control+	—>	
J2-10	Control–	—>	
J2-4	Receive+	<—	
J2-11	Receive–	<—	
J2-5	Indication+	<—	
J2-12	Indication–	<—	
J2-6	Timing+	<—	
J2-13	Timing–	<—	
J2-8	Circuit GND	–	
Shield	–	–	

1. Any pin not referenced is not connected.

Table 3-12 Ethernet (AUI) Port Pinout (DB-15)

15 Pin	Ethernet Circuit	Signal
1	CI-S	Control In Circuit Shield
2	CI-A	Control In Circuit A
3	DO-A	Data Out Circuit A
4	DI-S	Data In Circuit Shield
5	DI-A	Data In Circuit A
6	VC	Voltage Common
7	CO-A	Control Out Circuit A (not connected)
8	CO-S	Control Out Circuit Shield (not connected)
9	CI-B	Control In Circuit B
10	DO-B	Data Out Circuit B
11	DO-S	Data Out Circuit Shield
12	DI-B	Data In Circuit B
13	VP	Voltage Plus
14	VS	Voltage Shield (L25 and M25)
15	CO-B	Control Out Circuit B (not connected)
Shell	PG	Protective Ground

Table 3-13 Ethernet 10BaseT Port Pinout (RJ-45)

Pin	Signal
1	TX+
2	TX–
3	RX+
4	–
5	–
6	RX–
7	–
8	–

Table 3-14 Token Ring Port Pinout (DB-9)

9 Pin[1]	Signal
1	Receive R1–
3	+5V[2]
5	Transmit O5–
6	Receive G6+
9	Transmit B9+

1. Pins 2, 4, 7, and 8 are ground.
2. 600 mA maximum.

Table 3-15 Asynchronous Breakout Cable Pinout (8-Pin RJ-45)

8-Pin RJ-45	Signal	Direction
1	CTS	<—
2	DSR/DCD	<—
3	RXD	<—
4	RXD/GND	-
5	TXD/GND	-
6	TXD	—>
7	DTR	—>
8	RTS	—>

Table 3-16 Asynchronous-Line Cable Pinout (68-Pin SCSI)

RJ-45 Plug	Pin	Signal	68-Pin SCSI (J1)
1	8	RTS	2
	7	DTR	36
	6	TXD	3
	5	TXD GND	37
	4	RXD GND	4
	3	RXD	38
	2	DSR	5
	1	CTS	39
2	8	RTS	6
	7	DTR	40
	6	TXD	7
	5	TXD GND	41
	4	RXD GND	8
	3	RXD	42
	2	DSR	9
	1	CTS	43
3	8	RTS	10
	7	DTR	44
	6	TXD	11
	5	TXD GND	45
	4	RXD GND	12
	3	RXD	46
	2	DSR	13
	1	CTS	47

RJ-45 Plug	Pin	Signal	68-Pin SCSI (J1)
4	8	RTS	14
	7	DTR	48
	6	TXD	15
	5	TXD GND	49
	4	RXD GND	16
	3	RXD	50
	2	DSR	17
	1	CTS	51
5	8	RTS	18
	7	DTR	52
	6	TXD	19
	5	TXD GND	53
	4	RXD GND	20
	3	RXD	54
	2	DSR	21
	1	CTS	55
6	8	RTS	22
	7	DTR	56
	6	TXD	23
	5	TXD GND	57
	4	RXD GND	24
	3	RXD	58
	2	DSR	25
	1	CTS	59

RJ-45 Plug	Pin	Signal	68-Pin SCSI (J1)
7	8	RTS	26
	7	DTR	60
	6	TXD	27
	5	TXD GND	61
	4	RXD GND	28
	3	RXD	62
	2	DSR	29
	1	CTS	63
8	8	RTS	30
	7	DTR	64
	6	TXD	31
	5	TXD GND	65
	4	RXD GND	32
	3	RXD	66
	2	DSR	33
	1	CTS	67

Figure 3-3 shows the DB-25 breakout cable with pinouts for the 68-pin SCSI port and the DB-25 port. Table 3-17 lists the pinouts for the DB-25 end, and Table 3-18 lists the pinouts for the 68-pin SCSI connector end.

Figure 3-3 Asynchronous Serial Interface Breakout Cable Assembly (68-Pin SCSI-to-DB-25)

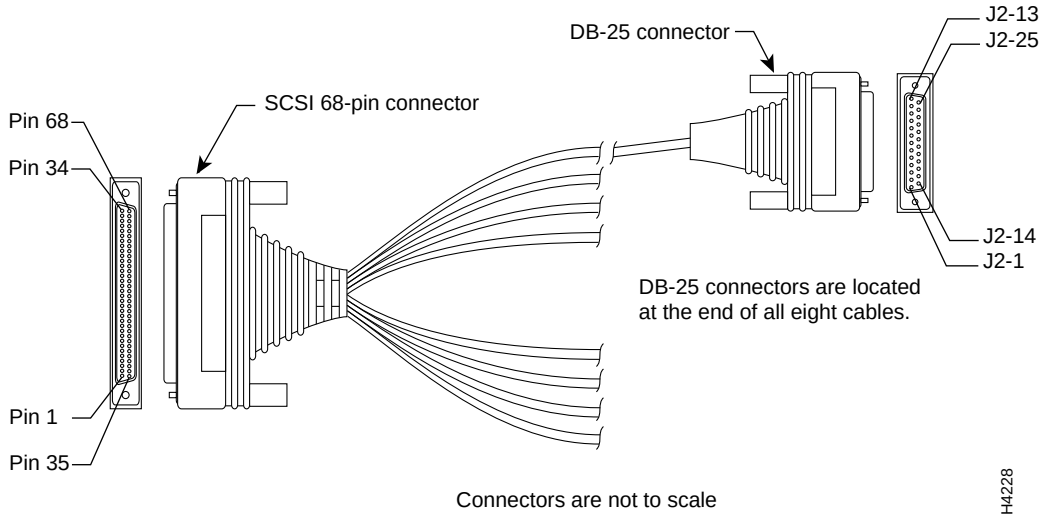


Table 3-17 Asynchronous Breakout Cable Pinouts (DB-25)

DB-25 Plug[1]	Signal	Direction
4	RTS	—>
20	DTR	—>
2	TXD	—>
7	TXD GND	—
7	RXD GND	—
3	RXD	<—
8	DSR	<—
5	CTS	<—

1. Any pin not referenced is not connected.

Table 3-18 Asynchronous Cable Pinouts (68-Pin SCSI-to-DB-25)

DB-25 Plug	Pin	Signal	68-Pin SCSI (J1)
1	4	RTS	2
	20	DTR	36
	2	TXD	3
	7	TXD GND	37
	7	RXD GND	4
	3	RXD	38
	8	DSR	5
	5	CTS	39

DB-25 Plug	Pin	Signal	68-Pin SCSI (J1)
2	4	RTS	6
	20	DTR	40
	2	TXD	7
	7	TXD GND	41
	7	RXD GND	8
	3	RXD	42
	8	DSR	9
	5	CTS	43
3	4	RTS	10
	20	DTR	44
	2	TXD	11
	7	TXD GND	45
	7	RXD GND	12
	3	RXD	46
	8	DSR	13
	5	CTS	47
4	4	RTS	14
	20	DTR	48
	2	TXD	15
	7	TXD GND	49
	7	RXD GND	16
	3	RXD	50
	8	DSR	17
	5	CTS	51

DB-25 Plug	Pin	Signal	68-Pin SCSI (J1)
5	4	RTS	18
	20	DTR	52
	2	TXD	19
	7	TXD GND	53
	7	RXD GND	20
	3	RXD	54
	8	DSR	21
	5	CTS	55
6	4	RTS	22
	20	DTR	56
	2	TXD	23
	7	TXD GND	57
	7	RXD GND	24
	3	RXD	58
	8	DSR	25
	5	CTS	59
7	4	RTS	26
	20	DTR	60
	2	TXD	27
	7	TXD GND	61
	7	RXD GND	28
	3	RXD	62
	8	DSR	29
	5	CTS	63

DB-25 Plug	Pin	Signal	68-Pin SCSI (J1)
8	4	RTS	30
	20	DTR	64
	2	TXD	31
	7	TXD GND	65
	7	RXD GND	32
	3	RXD	66
	8	DSR	33
	5	CTS	67