Doc. No. 78-3792-02

PA-8T-V35 Synchronous Serial Port Adapter Installation and Configuration

Product Number: PA-8T-V35(=)

This configuration note describes the installation and configuration of the PA-8T-V35 synchronous serial port adapter, which can be used in the Cisco 7200 series routers, and on the second-generation Versatile Interface Processor (VIP2) in all Cisco 7500 series routers, and in Cisco 7000 series routers using the 7000 Series Route Switch Processor (RSP7000) and 7000 Series Chassis Interface (RSP7000CI).

Note For VIP2 users, use this configuration note in conjunction with the configuration note *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration* (Document Number 78-2658-xx), which shipped with your VIP2.

For Cisco 7200 series router users, use this configuration note in conjunction with the *Cisco 72xx Installation and Configuration Guide* that shipped with your Cisco 7200 series system.

For complete descriptions of interface subcommands and the configuration options available for interfaces, and which support the 8T-V.35 port adapter functionality, refer to the appropriate software configuration publication listed in the section “If You Need More Information.”

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Document Contents

This configuration note is organized into three parts:

1. The following sections include general information and information about port adapter installation:
   - If You Need More Information, page 2
   - Port Adapter Installation Prerequisites, page 3
2. The following section includes information specific to the 8T-V.35 port adapter:
   - What Is the 8T-V.35 Port Adapter?, page 6
3. The following sections include information specific to the 8T-V.35 port adapter's use in the VIP2 in Cisco 7500 series routers and in Cisco 7000 series routers using the RSP7000 and RSP7000CI, and in the Cisco 7200 series routers:
   - VIP2 and the 8T-V.35 Port Adapter, page 20
   - Cisco 7200 Series and the 8T-V.35 Port Adapter, page 40

The section "Cisco Connection Online," on page 59, includes general reference information.

If You Need More Information

The Cisco Internetwork Operating System (Cisco IOS) software running your router contains extensive features and functionality. The effective use of many of these features is easier if you have more information at hand. For additional information on configuring the Cisco 7000 family routers and VIP2, or the Cisco 7200 series, the following documentation resources are available:

- Cisco Connection Documentation, Enterprise Series CD-ROM

  This publication and additional Cisco Systems publications are available on a CD-ROM called Cisco Connection Documentation, Enterprise Series, which is Cisco's online library of product information. The CD-ROM is updated and shipped monthly, so it might be more up to date than printed documentation. To order Cisco Connection Documentation, Enterprise Series CD-ROM, contact a Cisco Sales or Customer Service representative.

- For Cisco 7000 family systems with Cisco IOS Release 11.1(6)CA, a Cisco-approved Release 11.1(6)CA beta software version, or a later Cisco IOS release or, for Cisco 7200 series systems with Cisco IOS Release 11.1(6)CA, a Cisco-approved Release 11.1(6)CA beta software version, or a later Cisco IOS release, refer to the following modular configuration and modular command reference publications as appropriate for your configuration:
  - *Configuration Fundamentals Configuration Guide*
  - *Configuration Fundamentals Command Reference*
  - *Wide-Area Networking Configuration Guide*
  - *Wide-Area Networking Command Reference*
  - *Network Protocols Configuration Guide*
  - *Network Protocols Command Reference*
  - *Bridging and IBM Networking Configuration Guide*
  - *Bridging and IBM Networking Command Reference*
  - *Configuration Builder Getting Started Guide*
  - *Troubleshooting Internetworking Systems*

- For hardware installation and maintenance information on the Cisco 7000 family routers, and the VIP2, refer to the following publications:
  - *Cisco 7000 Hardware Installation and Maintenance*
  - *Cisco 7010 Hardware Installation and Maintenance*
  - *Cisco 7505 Hardware Installation and Maintenance*
  - *Cisco 7507 Hardware Installation and Maintenance*
  - *Cisco 7513 Hardware Installation and Maintenance*
  - *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration*
- For hardware installation and maintenance information on the Cisco 7200 series routers, refer to the *Cisco 72xx Installation and Configuration Guide* that shipped with your Cisco 7200 series router.
- To obtain information about documentation, refer to the Cisco Connection Documentation, Enterprise Series CD-ROM, the section "Cisco Connection Online," on page 59, or call Customer Service at 800 553-6387 or 408 526-7208. Customer Service hours are 5:00 a.m. to 6:00 p.m. Pacific time, Monday through Friday (excluding company holidays). You can also send e-mail to cs-rep@cisco.com. You can also refer to the *Cisco Information Packet* that shipped with your router.

Port Adapter Installation Prerequisites

This section provides software and hardware requirements, a list of parts and tools you will need to perform the port adapter installation, and safety and ESD-prevention guidelines to help you avoid injury and damage to the equipment during installation. Also included is information on the systems in which port adapters can be installed and overview information on interface specifications.

The following sections discuss general information and information about port adapter installation requirements:

Software and Hardware Requirements

Following are specific hardware and software prerequisites to ensure proper operation of the 8T-V.35 port adapter:

- The 8T-V.35 can be used in the second-generation Versatile Interface Processor (VIP2) in all Cisco 7500 series routers, and in Cisco 7000 series routers using the RSP7000 and RSP7000CI.
- The specific VIP2 model recommended for the 8T-V.35 is VIP2-40(=), which has 2 MB of SRAM and 32 MB of DRAM. However, the 8T-V.35 is supported by the VIP2-10 and VIP2-20 models.

Note The 8T-V.35 port adapter can be installed in either port adapter slot 0 or slot 1 on the VIP2 motherboard and in any available port adapter slot in Cisco 7200 series chassis.

- The 8T-V.35 port adapter requires that the host Cisco 7200 series router is running Cisco IOS Release 11.1(6)CA, or later. There are no restrictions to the number of installed 8T-V.35 port adapters in the Cisco 7200 series routers.
- The 8T-V.35 port adapter used in the second-generation Versatile Interface Processor (VIP2) in all Cisco 7500 series routers, and in Cisco 7000 series routers using the RSP7000 and RSP7000CI requires Cisco IOS Release 11.1(7)CA, or later. There are no restrictions to the number of installed 8T-V.35 port adapters when Cisco 7000 or Cisco 7500 series routers are running Cisco IOS Release 11.1(7), or later.

Note Cisco IOS Release 11.1(6)CA supports a limited number of installed 8T-V.35 port adapters in a VIP2 in all Cisco 7500 series routers, and in Cisco 7000 series routers using the RSP7000 and RSP7000CI. If you plan to run Cisco IOS Release 11.1(6)CA on your Cisco 7500 or Cisco 7000 series router, you can install no more than four 8T-V.35 port adapter in the router.

List of Parts and Tools

You need the following tools and parts to install a port adapter. If you need additional equipment, contact a service representative for ordering information.

- PA-8T-V35= port adapter
- VIP2 (for installation in a Cisco 7000 or Cisco 7500 series chassis only)
- 8T-V.35 compact serial cable (8T-V.35 compact serial cables are available *only* from Cisco Systems; they are *not* available from outside commercial cable vendors.)
- Number 1 Phillips and a 3/16-inch, flat-blade screwdriver (for VIP2 installation only)
- Your own ESD-prevention equipment or the disposable grounding wrist strap included with all upgrade kits, field replaceable units (FRUs), and spares

Safety Guidelines

Following are safety guidelines that you should follow when working with any equipment that connects to electrical power or telephone wiring.

Electrical Equipment Guidelines

Follow these basic guidelines when working with any electrical equipment:

- Before beginning any procedures requiring access to the chassis interior, locate the emergency power-off switch for the room in which you are working.
- Disconnect all power and external cables before moving a chassis.

- Do not work alone when potentially hazardous conditions exist and never assume that power has been disconnected from a circuit; always check.
- Do not perform any action that creates a potential hazard to people or makes the equipment unsafe. Carefully examine your work area for possible hazards such as moist floors, ungrounded power extension cables, and missing safety grounds.

Telephone Wiring Guidelines

Use the following guidelines when working with any equipment that is connected to telephone wiring or to other network cabling:

- Never install telephone wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
- Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying telephone lines.

Preventing Electrostatic Discharge Damage

Electrostatic discharge (ESD) damage, which can occur when electronic cards or components are improperly handled, results in complete or intermittent failures. Port adapters and processor modules comprise printed circuit boards that are fixed in metal carriers. Electromagnetic interference (EMI) shielding and connectors are integral components of the carrier. Although the metal carrier helps to protect the board from ESD, use a preventive antistatic strap during handling.

Following are guidelines for preventing ESD damage:

- Always use an ESD wrist or ankle strap and ensure that it makes good skin contact.
- Connect the equipment end of the strap to an unfinished chassis surface.
- When installing a component, use any available ejector levers or captive installation screws to properly seat the bus connectors in the backplane or midplane. These devices prevent accidental removal, provide proper grounding for the system, and help to ensure that bus connectors are properly seated.
- When removing a component, use any available ejector levers or captive installation screws to release the bus connectors from the backplane or midplane.
- Handle carriers by available handles or edges only; avoid touching the printed circuit boards or connectors.
- Place a removed component board-side-up on an antistatic surface or in a static shielding container. If you plan to return the component to the factory, immediately place it in a static shielding container.
- Avoid contact between the printed circuit boards and clothing. The wrist strap only protects components from ESD voltages on the body; ESD voltages on clothing can still cause damage.
- Never attempt to remove the printed circuit board from the metal carrier.

Caution For safety, periodically check the resistance value of the antistatic strap. The measurement should be between 1 and 10 megohms.

What Is the 8T-V.35 Port Adapter?

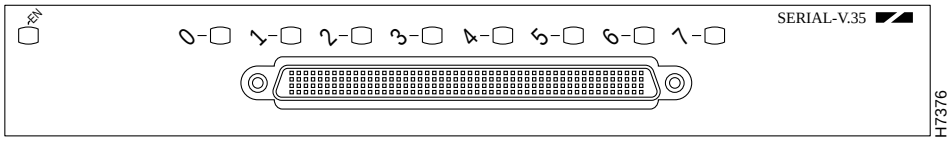
The 8T-V.35 port adapter, shown in Figure 1, provides up to eight synchronous serial interfaces for Cisco 7000 family routers. 8T-V.35 network interfaces provide a direct connection between the high-speed bus in the router and the external networks. Each 8T-V.35 interface provides full-duplex (FDX) operation at T1 (1.544 Mbps) and E1 (2.048 Mbps) speeds.

All eight 8T-V.35 interfaces connect to the external networks through a single port that has a 200-pin, D-shell receptacle. You must use a V.35 compact serial cable to connect 8T-V.35 interfaces to an external data service unit (DSU) or channel service unit (CSU). The compact serial cable attached to the single receptacle determines the mode (DCE or DTE) for all eight interfaces.

Note While the VIP2 supports online insertion and removal (OIR), individual port adapters do not. To replace port adapters, you must first remove the VIP2 from the chassis, then replace port adapters as required.

The Cisco 7200 series routers support the OIR of all port adapter types.

Figure 1 8T-V.35 Port Adapter, Faceplate View



The V.35 interface is most commonly used in the United States and throughout Europe. All Cisco 7200 series and VIP2 serial interface types support nonreturn to zero (NRZ) and nonreturn to zero inverted (NRZI) format, and both 16-bit and 32-bit cyclic redundancy checks (CRCs). The default configuration is for NRZ format and 16-bit CRC. You can change the default settings with software commands. (See the section “Configuring the 8T-V.35 Interfaces” on page 28.)

There is no default mode or clock rate set on the Cisco 7200 and VIP2 serial ports, although an internal clock signal is present on all ports for DCE support. The internal clock also allows you to perform local loopback tests without having to terminate the port or connect a cable. To use the port as a DCE interface, you must set the clock rate and connect a DCE compact serial cable. To use the port as a DTE interface, you need only connect a DTE compact serial cable to the port. Because the serial adapter cables determine the mode and interface type, the 8T-V.35 port adapter interface becomes a DTE when a DTE cable is connected to it.

If a DTE cable is connected to a port with a clock rate set, the DTE ignores the clock rate and uses the external clock signal that is sent from the remote DCE. For a brief description of the **clock rate** command, refer to the section “Configuring Timing (Clock) Signals,” on page 33. For complete command descriptions and instructions, refer to the publications listed in the section “If You Need More Information” on page 2.

Serial signals can travel a limited distance at any given bit rate; generally, the slower the bit rate, the greater the distance. All serial signals are subject to distance limits beyond which a signal degrades significantly or is completely lost. Table 1 lists recommended transmission speeds and distances for V.35 serial interfaces. The recommended maximum rate for V.35 is 2.048 Mbps.

Table 1 Recommended Transmission Speed Versus Distance

	V.35 Distances	
Rate (bps)	**Feet**	**Meters**
2400	4,100	1,250
4800	2,050	625
9600	1,025	312
19200	513	156
38400	256	78
56000	102	31
2048000	25	8

V.35 supports 2.048-Mbps rates without any problems; we do not recommend exceeding the above specifications for transmission speed versus distance. Do so at your own risk. The total aggregate bandwidth for the 8T-V.35 port adapter is 8.5 Mbps, which can be divided into 8 Mbps on one port; 4 Mbps on two ports; or two Mbps on four ports.

The 8T-V.35 port adapter can be installed on the VIP2 in port adapter slot 0 and port adapter slot 1, or in any available port adapter slot on the Cisco 7200 series routers (slots 1 through 6 for the Cisco 7206, and slot 1 through 4 for the Cisco 7204). Port adapters have a handle attached, but this handle is occasionally not shown in this document to allow a full view of detail on the port adapter's faceplate.

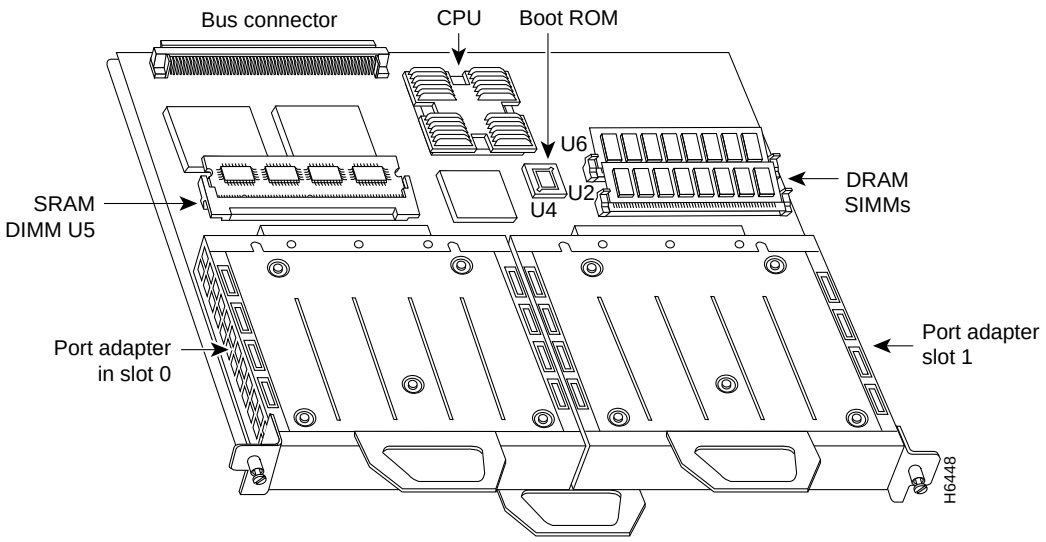
The following sections discuss information specific to the 8T-V.35 port adapter:

- Port Adapter Locations on the VIP2 and in the Cisco 7200 Series Routers, page 7
- 8T-V.35 Port Adapter LEDs, page 9
- 8T-V.35 Port Adapter Receptacle, Cables, and Pinouts, page 10

Port Adapter Locations on the VIP2 and in the Cisco 7200 Series Routers

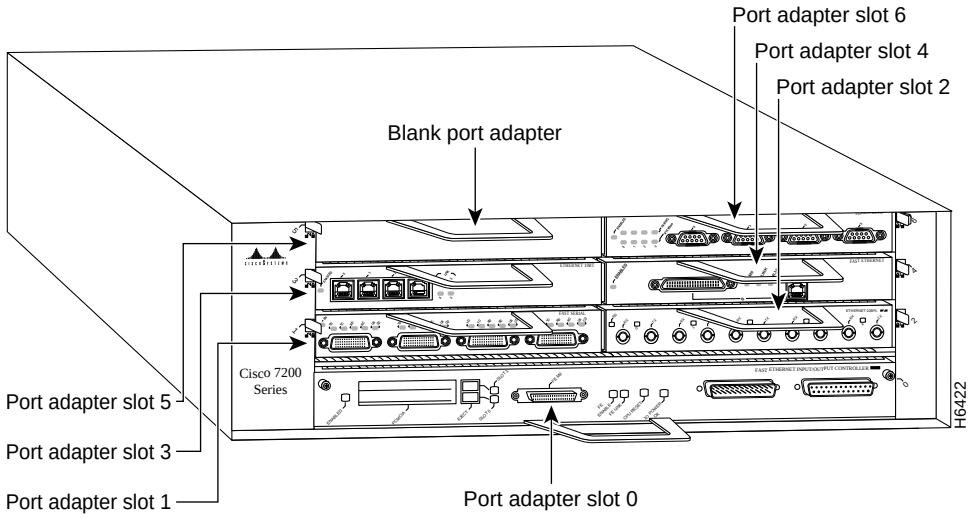
Figure 2 shows a VIP2 with installed port adapters. Port adapters have handles that allow for easy installation and removal. With the VIP2 oriented as shown in Figure 2, the left port adapter is in port adapter slot 0, and the right port adapter is in port adapter slot 1. In the Cisco 7000, Cisco 7507, and Cisco 7513 chassis, the VIP2 is installed vertically. In the Cisco 7010 and Cisco 7505 chassis, the VIP2 is installed horizontally.

Figure 2 Port Adapters on the VIP2 (Horizontal Orientation Shown)



In the Cisco 7200 series routers, which consist of the Cisco 7204 and the Cisco 7206, port adapter slots are numbered from left to right, beginning with port adapter slot 1 and continuing through port adapter slot 4 for the Cisco 7204, and slot 6 for the Cisco 7206. Port adapter slot 0 is the optional Fast Ethernet port on the I/O controller. Figure 3 shows a Cisco 7206 with port adapters installed.

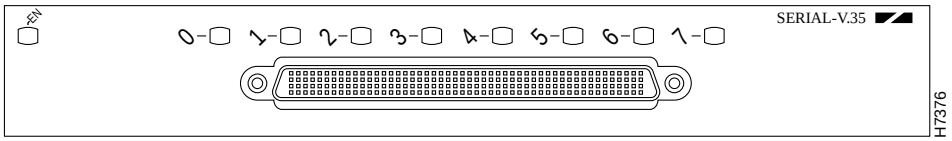
Figure 3 Cisco 7200 Series Port Adapters—Cisco 7206 Shown



8T-V.35 Port Adapter LEDs

The 8T-V.35 port adapter has one row of eight status LEDs (one for each port) and one enabled (EN) LED. (Refer to Figure 4.)

Figure 4 LEDs on the 8T-V.35 Port Adapter (Horizontal Orientation Shown)



After system initialization, the enabled LED goes on to indicate that the port adapter has been enabled for operation.

The following conditions must be met before the 8T-V.35 port adapter is enabled:

- The port adapter is correctly connected to the backplane or midplane and receiving power
- A valid microcode version for the port adapter has been downloaded successfully
- The bus recognizes the port adapter or 8T-V.35-equipped VIP2

If any of the above conditions are not met, or if the initialization fails for other reasons, the enabled LED will not go on.

The bicolored (green and amber) LED for each port indicates port status. Table 2 lists port LED colors and status.

Table 2 8T-V.35 Port LED Indications

Port LED	Color	Status
0 through 7	Green	The port is initialized by the system (the software recognizes the hardware), and a V.35 compact serial cable is properly connected at the router (VIP2 or Cisco 7200 series) end and the network end.
	Amber	The port is in loopback mode, the compact serial cable is not properly connected at the router or network end, or there is a problem with the hardware at the network end of the compact serial cable.
	Off	The port is administratively down.

8T-V.35 Port Adapter Receptacle, Cables, and Pinouts

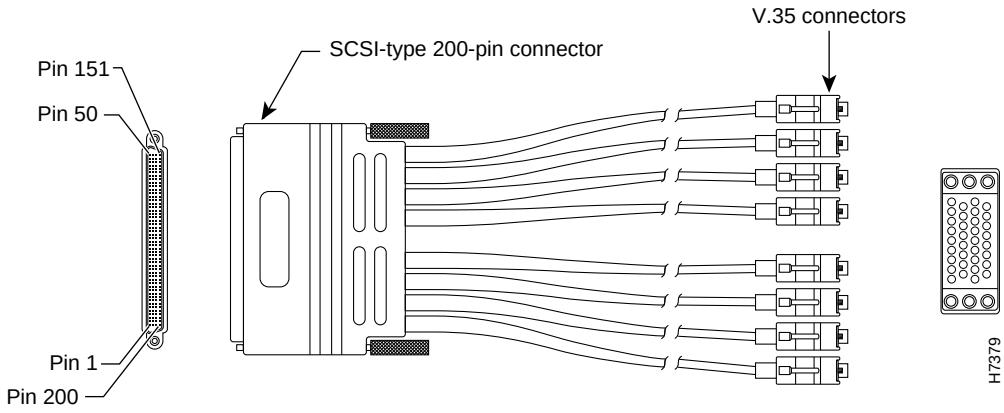
The compact serial cable for the 8T-V.35 port adapter is available in DTE or DCE mode with a 200-pin, D-shell receptacle at the router (VIP2 or Cisco 7200 series) end and eight, 34-pin Winchester block-type receptacles or plugs at the network end. Refer to Figure 5.

Note The V.35 compact serial cable attached to the single 8T-V.35 port determines the mode (DTE or DCE) of the eight 8T-V.35 interfaces.

Following are the product numbers, according to mode, for the 8T-V.35 compact serial cable:

- DTE mode with a 34-pin Winchester-type V.35 plug (CAB-OCT-V35-MT[=])
- DCE mode with a 34-pin Winchester-type V.35 receptacle (CAB-OCT-V35-FC[=])

Figure 5 V.35 Compact Serial Cable



Metric (M3) thumbscrews are included with each compact serial cable to allow connections to devices that use metric hardware. Because the 8T-V.35 port adapter uses a special, high-density port that requires special compact serial interface cables, we recommend that you obtain the cables from the factory.

Figure 6 8T-V.35 Compact Serial Cable Connectors

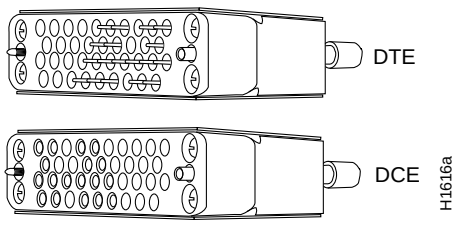


Table 3 lists connector pinouts for the 8T-V.35 DTE compact serial cable (CAB-OCT-V35-MT[=]). Table 4 lists connector pinouts for the 8T-V.35 DCE compact serial cable (CAB-OCT-V35-FC[=]).

Table 3 8T-V.35 DTE Compact Serial Cable Pinouts

Router End (200-Position Plug)				Network End (34-Pin Connector)	
Pin	**Signal**	**Note**	**Direction**	**Signal**	**Pin**
J8-126	MODE_1	Shorting	–		
J8-125	GROUND	Group			
J8-175	MODE_0	Shorting	–		
J8-176	GROUND	Group			
J8-26	MODE_DCE	Shorting	–		
J8-25	GROUND	Group			
	SHIELD_GROUND	Braid		SHIELD GND	J0-A
J8-16	O_RTS/CTS+	Twisted pair # 7	------>	RTS	J0-C
J8-14	O_DTR/DSR+		------>	DTR	J0-H
J8-23	I_CTS/RTS+	Twisted pair # 8	<------	CTS	J0-D
J8-21	I_DSR/DTR+		<------	DSR	J0-E
J8-12	IO_DCD/DCD+	Twisted pair # 6	<------	RLSD	J0-F
J8-11	SIG_GROUND			SIG GND	J0-B
J8-19	O_LL/NIL+	Twisted pair # 9	------>	LT	J0-K
J8-18	SIG_GROUND			SIG GND	J0-B
J8-1	O_TXD/RXD+	Twisted pair # 1	------>	SD+	J0-P
J8-2	O_TXD/RXD-		------>	SD-	J0-S
J8-5	I_RXD/TXD+	Twisted pair # 3	<------	RD+	J0-R
J8-6	I_RXD/TXD-		<------	RD-	J0-T
J8-3	O_TXCE/RXC+	Twisted pair # 2	------>	SCTE+	J0-U
J8-4	O_TXCE/RXC-		------>	SCTE-	J0-W
J8-7	I_RXC/TXCE+	Twisted pair # 4	<------	SCR+	J0-V
J8-8	I_RXC/TXCE-		<------	SCR-	J0-X
J8-9	IO_TXC/TXC+	Twisted pair # 5	<------	SCT+	J0-Y
J8-10	IO_TXC/TXC-		<------	SCT-	J0-AA
	SHIELD_GROUND	Braid		SHIELD GND	J1-A
J8-35	O_RTS/CTS+	Twisted pair # 7	------>	RTS	J1-C
J8-37	O_DTR/DSR+		------>	DTR	J1-H
J8-28	I_CTS/RTS+	Twisted pair # 8	<------	CTS	J1-D
J8-30	I_DSR/DTR+		<------	DSR	J1-E
J8-39	IO_DCD/DCD+	Twisted pair # 6	<------	RLSD	J1-F
J8-40	SIG_GROUND			SIG GND	J1-B
J8-32	O_LL/NIL+	Twisted pair # 9	------>	LT	J1-K
J8-33	SIG_GROUND			SIG GND	J1-B
J8-50	O_TXD/RXD+	Twisted pair # 1	------>	SD+	J1-P
J8-49	O_TXD/RXD-		------>	SD-	J1-S
J8-46	I_RXD/TXD+	Twisted pair # 3	<------	RD+	J1-R
J8-45	I_RXD/TXD-		<------	RD-	J1-T

Router End (200-Position Plug)				Network End (34-Pin Connector)	
Pin	**Signal**	**Note**	**Direction**	**Signal**	**Pin**
J8-48	O_TXCE/RXC+	Twisted pair # 2	------>	SCTE+	J1-U
J8-47	O_TXCE/RXC-		------>	SCTE-	J1-W
J8-44	I_RXC/TXCE+	Twisted pair # 4	<------	SCR+	J1-V
J8-43	I_RXC/TXCE-		<------	SCR-	J1-X
J8-42	IO_TXC/TXC+	Twisted pair # 5	<------	SCT+	J1-Y
J8-41	IO_TXC/TXC-		<------	SCT-	J1-AA
	SHIELD_GROUND	Braid		SHIELD GND	J2-A
J8-66	O_RTS/CTS+	Twisted pair # 7	------>	RTS	J2-C
J8-64	O_DTR/DSR+		------>	DTR	J2-H
J8-73	I_CTS/RTS+	Twisted pair # 8	<------	CTS	J2-D
J8-71	I_DSR/DTR+		<------	DSR	J2-E
J8-62	IO_DCD/DCD+	Twisted pair # 6	<------	RLSD	J2-F
J8-61	SIG_GROUND			SIG GND	J2-B
J8-69	O_LL/NIL+	Twisted pair # 9	------>	LT	J2-K
J8-68	SIG_GROUND			SIG GND	J2-B
J8-51	O_TXD/RXD+	Twisted pair # 1	------>	SD+	J2-P
J8-52	O_TXD/RXD-		------>	SD-	J2-S
J8-55	I_RXD/TXD+	Twisted pair # 3	<------	RD+	J2-R
J8-56	I_RXD/TXD-		<------	RD-	J2-T
J8-53	O_TXCE/RXC+	Twisted pair # 2	------>	SCTE+	J2-U
J8-54	O_TXCE/RXC-		------>	SCTE-	J2-W
J8-57	I_RXC/TXCE+	Twisted pair # 4	<------	SCR+	J2-V
J8-58	I_RXC/TXCE-		<------	SCR-	J2-X
J8-59	IO_TXC/TXC+	Twisted pair # 5	<------	SCT+	J2-Y
J8-60	IO_TXC/TXC-		<------	SCT-	J2-AA
	SHIELD_GROUND	Braid		SHIELD GND	J3-A
J8-85	O_RTS/CTS+	Twisted pair # 7	------>	RTS	J3-C
J8-87	O_DTR/DSR+		------>	DTR	J3-H
J8-78	I_CTS/RTS+	Twisted pair # 8	<------	CTS	J3-D
J8-80	I_DSR/DTR+		<------	DSR	J3-E
J8-89	IO_DCD/DCD+	Twisted pair # 6	<------	RLSD	J3-F
J8-90	SIG_GROUND			SIG GND	J3-B
J8-82	O_LL/NIL+	Twisted pair # 9	------>	LT	J3-K
J8-83	SIG_GROUND			SIG GND	J3-B
J8-100	O_TXD/RXD+	Twisted pair # 1	------>	SD+	J3-P
J8-99	O_TXD/RXD-		------>	SD-	J3-S
J8-96	I_RXD/TXD+	Twisted pair # 3	<------	RD+	J3-R
J8-95	I_RXD/TXD-		<------	RD-	J3-T

Router End (200-Position Plug)				Network End (34-Pin Connector)	
Pin	**Signal**	**Note**	**Direction**	**Signal**	**Pin**
J8-98	O_TXCE/RXC+	Twisted pair # 2	------>	SCTE+	J3-U
J8-97	O_TXCE/RXC-		------>	SCTE-	J3-W
J8-94	I_RXC/TXCE+	Twisted pair # 4	<------	SCR+	J3-V
J8-93	I_RXC/TXCE-		<------	SCR-	J3-X
J8-92	IO_TXC/TXC+	Twisted pair # 5	<------	SCT+	J3-Y
J8-91	IO_TXC/TXC-		<------	SCT-	J3-AA
	SHIELD_GROUND	Braid		SHIELD GND	J4-A
J8-116	O_RTS/CTS+	Twisted pair # 7	------>	RTS	J4-C
J8-114	O_DTR/DSR+		------>	DTR	J4-H
J8-123	I_CTS/RTS+	Twisted pair # 8	<------	CTS	J4-D
J8-121	I_DSR/DTR+		<------	DSR	J4-E
J8-112	IO_DCD/DCD+	Twisted pair # 6	<------	RLSD	J4-F
J8-111	SIG_GROUND			SIG GND	J4-B
J8-119	O_LL/NIL+	Twisted pair # 9	------>	LT	J4-K
J8-118	SIG_GROUND			SIG GND	J4-B
J8-101	O_TXD/RXD+	Twisted pair # 1	------>	SD+	J4-P
J8-102	O_TXD/RXD-		------>	SD-	J4-S
J8-105	I_RXD/TXD+	Twisted pair # 3	<------	RD+	J4-R
J8-106	I_RXD/TXD-		<------	RD-	J4-T
J8-103	O_TXCE/RXC+	Twisted pair # 2	------>	SCTE+	J4-U
J8-104	O_TXCE/RXC-		------>	SCTE-	J4-W
J8-107	I_RXC/TXCE+	Twisted pair # 4	<------	SCR+	J4-V
J8-108	I_RXC/TXCE-		<------	SCR-	J4-X
J8-109	IO_TXC/TXC+	Twisted pair # 5	<------	SCT+	J4-Y
J8-110	IO_TXC/TXC-		<------	SCT-	J4-AA
	SHIELD_GROUND	Braid		SHIELD GND	J5-A
J8-135	O_RTS/CTS+	Twisted pair # 7	------>	RTS	J5-C
J8-137	O_DTR/DSR+		------>	DTR	J5-H
J8-128	I_CTS/RTS+	Twisted pair # 8	<------	CTS	J5-D
J8-130	I_DSR/DTR+		<------	DSR	J5-E
J8-139	IO_DCD/DCD+	Twisted pair # 6	<------	RLSD	J5-F
J8-140	SIG_GROUND			SIG GND	J5-B
J8-132	O_LL/NIL+	Twisted pair # 9	------>	LT	J5-K
J8-133	SIG_GROUND			SIG GND	J5-B
J8-150	O_TXD/RXD+	Twisted pair # 1	------>	SD+	J5-P
J8-149	O_TXD/RXD-		------>	SD-	J5-S
J8-146	I_RXD/TXD+	Twisted pair # 3	<------	RD+	J5-R
J8-145	I_RXD/TXD-		<------	RD-	J5-T

Router End (200-Position Plug)				Network End (34-Pin Connector)	
Pin	**Signal**	**Note**	**Direction**	**Signal**	**Pin**
J8-148	O_TXCE/RXC+	Twisted pair # 2	------>	SCTE+	J5-U
J8-147	O_TXCE/RXC-		------>	SCTE-	J5-W
J8-144	I_RXC/TXCE+	Twisted pair # 4	<------	SCR+	J5-V
J8-143	I_RXC/TXCE-		<------	SCR-	J5-X
J8-142	IO_TXC/TXC+	Twisted pair # 5	<------	SCT+	J5-Y
J8-141	IO_TXC/TXC-		<------	SCT-	J5-AA
	SHIELD_GROUND	Braid		SHIELD GND	J6-A
J8-166	O_RTS/CTS+	Twisted pair # 7	------>	RTS	J6-C
J8-164	O_DTR/DSR+		------>	DTR	J6-H
J8-173	I_CTS/RTS+	Twisted pair # 8	<------	CTS	J6-D
J8-171	I_DSR/DTR+		<------	DSR	J6-E
J8-162	IO_DCD/DCD+	Twisted pair # 6	<------	RLSD	J6-F
J8-161	SIG_GROUND			SIG GND	J6-B
J8-169	O_LL/NIL+	Twisted pair # 9	------>	LT	J6-K
J8-168	SIG_GROUND			SIG GND	J6-B
J8-151	O_TXD/RXD+	Twisted pair # 1	------>	SD+	J6-P
J8-152	O_TXD/RXD-		------>	SD-	J6-S
J8-155	I_RXD/TXD+	Twisted pair # 3	<------	RD+	J6-R
J8-156	I_RXD/TXD-		<------	RD-	J6-T
J8-153	O_TXCE/RXC+	Twisted pair # 2	------>	SCTE+	J6-U
J8-154	O_TXCE/RXC-		------>	SCTE-	J6-W
J8-157	I_RXC/TXCE+	Twisted pair # 4	<------	SCR+	J6-V
J8-158	I_RXC/TXCE-		<------	SCR-	J6-X
J8-159	IO_TXC/TXC+	Twisted pair # 5	<------	SCT+	J6-Y
J8-160	IO_TXC/TXC-		<------	SCT-	J6-AA
	SHIELD_GROUND	Braid		SHIELD GND	J7-A
J8-185	O_RTS/CTS+	Twisted pair # 7	------>	RTS	J7-C
J8-187	O_DTR/DSR+		------>	DTR	J7-H
J8-178	I_CTS/RTS+	Twisted pair # 8	<------	CTS	J7-D
J8-180	I_DSR/DTR+		<------	DSR	J7-E
J8-189	IO_DCD/DCD+	Twisted pair # 6	<------	RLSD	J7-F
J8-190	SIG_GROUND			SIG GND	J7-B
J8-182	O_LL/NIL+	Twisted pair # 9	------>	LT	J7-K
J8-183	SIG_GROUND			SIG GND	J7-B
J8-200	O_TXD/RXD+	Twisted pair # 1	------>	SD+	J7-P
J8-199	O_TXD/RXD-		------>	SD-	J7-S
J8-196	I_RXD/TXD+	Twisted pair # 3	<------	RD+	J7-R
J8-195	I_RXD/TXD-		<------	RD-	J7-T

Router End (200-Position Plug)				Network End (34-Pin Connector)	
Pin	**Signal**	**Note**	**Direction**	**Signal**	**Pin**
J8-198	O_TXCE/RXC+	Twisted pair # 2	------>	SCTE+	J7-U
J8-197	O_TXCE/RXC-		------>	SCTE-	J7-W
J8-194	I_RXC/TXCE+	Twisted pair # 4	<------	SCR+	J7-V
J8-193	I_RXC/TXCE-		<------	SCR-	J7-X
J8-192	IO_TXC/TXC+	Twisted pair # 5	<------	SCT+	J7-Y
J8-191	IO_TXC/TXC-		<------	SCT-	J7-AA

Table 4 8T-V.35 DCE Compact Serial Cable Pinouts

Router End (200-Position Plug)				Network End (34-Pin Connector)	
Pin	**Signal**	**Note**	**Direction**	**Signal**	**Pin**
J8-126	MODE_1	Shorting	–		
J8-125	GROUND	Group			
J8-175	MODE_0	Shorting	–		
J8-176	GROUND	Group			
	SHIELD_GROUND	Braid		SHIELD GND	J0-A
J8-23	I_CTS/RTS+	Twisted pair # 8	<------	RTS	J0-C
J8-21	I_DSR/DTR+		<------	DSR	J0-H
J8-16	O_RTS/CTS+	Twisted pair # 7	------>	CTS	J0-D
J8-14	O_DTR/DSR+		------>	DTR	J0-E
J8-12	IO_DCD/DCD+	Twisted pair #6	------>	RLSD	J0-F
J8-11	SIG_GROUND			SIG GND	J0-B
J8-20	I_NIL/LL+	Twisted pair #9	<------	LT	J0-K
J8-18	SIG_GROUND			SIG GND	J0-B
J8-5	I_RXD/TXD+	Twisted pair #3	<------	SD+	J0-P
J8-6	I_RXD/TXD-		<------	SD-	J0-S
J8-1	O_TXD/RXD+	Twisted pair #1	------>	RD+	J0-R
J8-2	O_TXD/RXD-		------>	RD-	J0-T
J8-7	I_RXC/TXCE+	Twisted pair #4	<------	SCTE+	J0-U
J8-8	I_RXC/TXCE-		<------	SCTE-	J0-W
J8-3	O_TXCE/RXC+	Twisted pair #2	------>	SCR+	J0-V
J8-4	O_TXCE/RXC-		------>	SCR-	J0-X
J8-9	IO_TXC/TXC+	Twisted pair #5	----->	SCT+	J0-Y
J8-10	IO_TXC/TXC-		------>	SCT-	J0-AA
	SHIELD_GROUND	Braid		SHIELD GND	J1-A
J8-28	I_CTS/RTS+	Twisted pair # 8	<------	RTS	J1-C
J8-30	I_DSR/DTR+		<------	DSR	J1-H
J8-35	O_RTS/CTS+	Twisted pair # 7	------>	CTS	J1-D
J8-37	O_DTR/DSR+		------>	DTR	J1-E

Router End (200-Position Plug)				Network End (34-Pin Connector)	
Pin	**Signal**	**Note**	**Direction**	**Signal**	**Pin**
J8-39	IO_DCD/DCD+	Twisted pair #6	------>	RLSD	J1-F
J8-40	SIG_GROUND			SIG GND	J1-B
J8-31	I_NIL/LL+	Twisted pair #9	<------	LT	J1-K
J8-33	SIG_GROUND			SIG GND	J1-B
J8-46	I_RXD/TXD+	Twisted pair #3	<------	SD+	J1-P
J8-45	I_RXD/TXD-		<------	SD-	J1-S
J8-50	O_TXD/RXD+	Twisted pair #1	------>	RD+	J1-R
J8-49	O_TXD/RXD-		------>	RD-	J1-T
J8-44	I_RXC/TXCE+	Twisted pair #4	<------	SCTE+	J1-U
J8-43	I_RXC/TXCE-		<------	SCTE-	J1-W
J8-48	O_TXCE/RXC+	Twisted pair #2	------>	SCR+	J1-V
J8-47	O_TXCE/RXC-		------>	SCR-	J1-X
J8-42	IO_TXC/TXC+	Twisted pair #5	----->	SCT+	J1-Y
J8-41	IO_TXC/TXC-		------>	SCT-	J1-AA
	SHIELD_GROUND	Braid		SHIELD GND	J2-A
J8-73	I_CTS/RTS+	Twisted pair # 8	<------	RTS	J2-C
J8-71	I_DSR/DTR+		<------	DSR	J2-H
J8-66	O_RTS/CTS+	Twisted pair # 7	------>	CTS	J2-D
J8-64	O_DTR/DSR+		------>	DTR	J2-E
J8-62	IO_DCD/DCD+	Twisted pair #6	------>	RLSD	J2-F
J8-61	SIG_GROUND			SIG GND	J2-B
J8-70	I_NIL/LL+	Twisted pair #9	<------	LT	J2-K
J8-68	SIG_GROUND			SIG GND	J2-B
J8-55	I_RXD/TXD+	Twisted pair #3	<------	SD+	J2-P
J8-56	I_RXD/TXD-		<------	SD-	J2-S
J8-51	O_TXD/RXD+	Twisted pair #1	------>	RD+	J2-R
J8-52	O_TXD/RXD-		------>	RD-	J2-T
J8-57	I_RXC/TXCE+	Twisted pair #4	<------	SCTE+	J2-U
J8-58	I_RXC/TXCE-		<------	SCTE-	J2-W
J8-53	O_TXCE/RXC+	Twisted pair #2	------>	SCR+	J2-V
J8-54	O_TXCE/RXC-		------>	SCR-	J2-X
J8-59	IO_TXC/TXC+	Twisted pair #5	----->	SCT+	J2-Y
J8-60	IO_TXC/TXC-		------>	SCT-	J2-AA
	SHIELD_GROUND	Braid		SHIELD GND	J3-A
J8-78	I_CTS/RTS+	Twisted pair # 8	<------	RTS	J3-C
J8-80	I_DSR/DTR+		<------	DSR	J3-H
J8-85	O_RTS/CTS+	Twisted pair # 7	------>	CTS	J3-D
J8-87	O_DTR/DSR+		------>	DTR	J3-E

Router End (200-Position Plug)				Network End (34-Pin Connector)	
Pin	**Signal**	**Note**	**Direction**	**Signal**	**Pin**
J8-89	IO_DCD/DCD+	Twisted pair #6	------>	RLSD	J3-F
J8-90	SIG_GROUND			SIG GND	J3-B
J8-81	I_NIL/LL+	Twisted pair #9	<------	LT	J3-K
J8-83	SIG_GROUND			SIG GND	J3-B
J8-96	I_RXD/TXD+	Twisted pair #3	<------	SD+	J3-P
J8-95	I_RXD/TXD-		<------	SD-	J3-S
J8-100	O_TXD/RXD+	Twisted pair #1	------>	RD+	J3-R
J8-99	O_TXD/RXD-		------>	RD-	J3-T
J8-94	I_RXC/TXCE+	Twisted pair #4	<------	SCTE+	J3-U
J8-93	I_RXC/TXCE-		<------	SCTE-	J3-W
J8-98	O_TXCE/RXC+	Twisted pair #2	------>	SCR+	J3-V
J8-97	O_TXCE/RXC-		------>	SCR-	J3-X
J8-92	IO_TXC/TXC+	Twisted pair #5	----->	SCT+	J3-Y
J8-91	IO_TXC/TXC-		------>	SCT-	J3-AA
	SHIELD_GROUND	Braid		SHIELD GND	J4-A
J8-123	I_CTS/RTS+	Twisted pair # 8	<------	RTS	J4-C
J8-121	I_DSR/DTR+		<------	DSR	J4-H
J8-116	O_RTS/CTS+	Twisted pair # 7	------>	CTS	J4-D
J8-114	O_DTR/DSR+		------>	DTR	J4-E
J8-112	IO_DCD/DCD+	Twisted pair #6	------>	RLSD	J4-F
J8-111	SIG_GROUND			SIG GND	J4-B
J8-120	I_NIL/LL+	Twisted pair #9	<------	LT	J4-K
J8-118	SIG_GROUND			SIG GND	J4-B
J8-105	I_RXD/TXD+	Twisted pair #3	<------	SD+	J4-P
J8-106	I_RXD/TXD-		<------	SD-	J4-S
J8-101	O_TXD/RXD+	Twisted pair #1	------>	RD+	J4-R
J8-102	O_TXD/RXD-		------>	RD-	J4-T
J8-107	I_RXC/TXCE+	Twisted pair #4	<------	SCTE+	J4-U
J8-108	I_RXC/TXCE-		<------	SCTE-	J4-W
J8-103	O_TXCE/RXC+	Twisted pair #2	------>	SCR+	J4-V
J8-104	O_TXCE/RXC-		------>	SCR-	J4-X
J8-109	IO_TXC/TXC+	Twisted pair #5	----->	SCT+	J4-Y
J8-110	IO_TXC/TXC-		------>	SCT-	J4-AA
	SHIELD_GROUND	Braid		SHIELD GND	J5-A
J8-128	I_CTS/RTS+	Twisted pair # 8	<------	RTS	J5-C
J8-130	I_DSR/DTR+		<------	DSR	J5-H
J8-135	O_RTS/CTS+	Twisted pair # 7	------>	CTS	J5-D
J8-137	O_DTR/DSR+		------>	DTR	J5-E

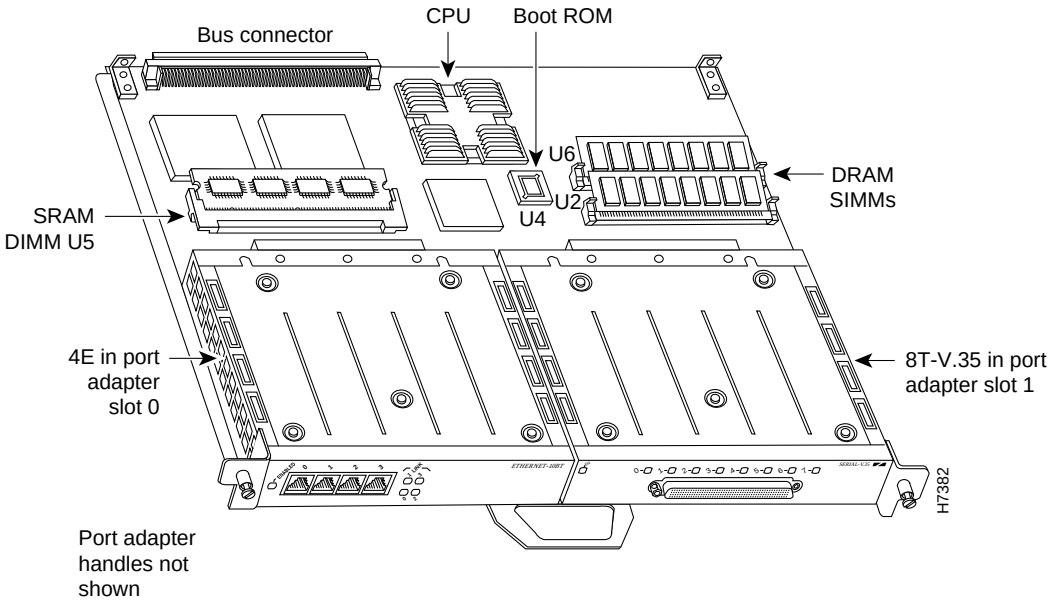
Router End (200-Position Plug)				Network End (34-Pin Connector)	
Pin	**Signal**	**Note**	**Direction**	**Signal**	**Pin**
J8-139	IO_DCD/DCD+	Twisted pair #6	------>	RLSD	J5-F
J8-140	SIG_GROUND			SIG GND	J5-B
J8-131	I_NIL/LL+	Twisted pair #9	<------	LT	J5-K
J8-133	SIG_GROUND			SIG GND	J5-B
J8-146	I_RXD/TXD+	Twisted pair #3	<------	SD+	J5-P
J8-145	I_RXD/TXD-		<------	SD-	J5-S
J8-150	O_TXD/RXD+	Twisted pair #1	------>	RD+	J5-R
J8-149	O_TXD/RXD-		------>	RD-	J5-T
J8-144	I_RXC/TXCE+	Twisted pair #4	<------	SCTE+	J5-U
J8-143	I_RXC/TXCE-		<------	SCTE-	J5-W
J8-148	O_TXCE/RXC+	Twisted pair #2	------>	SCR+	J5-V
J8-147	O_TXCE/RXC-		------>	SCR-	J5-X
J8-142	IO_TXC/TXC+	Twisted pair #5	----->	SCT+	J5-Y
J8-141	IO_TXC/TXC-		------>	SCT-	J5-AA
	SHIELD_GROUND	Braid		SHIELD GND	J6-A
J8-173	I_CTS/RTS+	Twisted pair # 8	<------	RTS	J6-C
J8-171	I_DSR/DTR+		<------	DSR	J6-H
J8-166	O_RTS/CTS+	Twisted pair # 7	------>	CTS	J6-D
J8-164	O_DTR/DSR+		------>	DTR	J6-E
J8-162	IO_DCD/DCD+	Twisted pair #6	------>	RLSD	J6-F
J8-161	SIG_GROUND			SIG GND	J6-B
J8-170	I_NIL/LL+	Twisted pair #9	<------	LT	J6-K
J8-168	SIG_GROUND			SIG GND	J6-B
J8-155	I_RXD/TXD+	Twisted pair #3	<------	SD+	J6-P
J8-156	I_RXD/TXD-		<------	SD-	J6-S
J8-151	O_TXD/RXD+	Twisted pair #1	------>	RD+	J6-R
J8-152	O_TXD/RXD-		------>	RD-	J6-T
J8-157	I_RXC/TXCE+	Twisted pair #4	<------	SCTE+	J6-U
J8-158	I_RXC/TXCE-		<------	SCTE-	J6-W
J8-153	O_TXCE/RXC+	Twisted pair #2	------>	SCR+	J6-V
J8-154	O_TXCE/RXC-		------>	SCR-	J6-X
J8-159	IO_TXC/TXC+	Twisted pair #5	----->	SCT+	J6-Y
J8-160	IO_TXC/TXC-		------>	SCT-	J6-AA
	SHIELD_GROUND	Braid		SHIELD GND	J7-A
J8-178	I_CTS/RTS+	Twisted pair # 8	<------	RTS	J7-C
J8-180	I_DSR/DTR+		<------	DSR	J7-H
J8-185	O_RTS/CTS+	Twisted pair # 7	------>	CTS	J7-D
J8-187	O_DTR/DSR+		------>	DTR	J7-E

Router End (200-Position Plug)				Network End (34-Pin Connector)	
Pin	**Signal**	**Note**	**Direction**	**Signal**	**Pin**
J8-189	IO_DCD/DCD+	Twisted pair #6	------>	RLSD	J7-F
J8-190	SIG_GROUND			SIG GND	J7-B
J8-181	I_NIL/LL+	Twisted pair #9	<------	LT	J7-K
J8-183	SIG_GROUND			SIG GND	J7-B
J8-196	I_RXD/TXD+	Twisted pair #3	<------	SD+	J7-P
J8-195	I_RXD/TXD-		<------	SD-	J7-S
J8-200	O_TXD/RXD+	Twisted pair #1	------>	RD+	J7-R
J8-199	O_TXD/RXD-		------>	RD-	J7-T
J8-194	I_RXC/TXCE+	Twisted pair #4	<------	SCTE+	J7-U
J8-193	I_RXC/TXCE-		<------	SCTE-	J7-W
J8-198	O_TXCE/RXC+	Twisted pair #2	------>	SCR+	J7-V
J8-197	O_TXCE/RXC-		------>	SCR-	J7-X
J8-192	IO_TXC/TXC+	Twisted pair #5	----->	SCT+	J7-Y
J8-191	IO_TXC/TXC-		------>	SCT-	J7-AA

VIP2 and the 8T-V.35 Port Adapter

The 8T-V.35 port adapter is used on the VIP2, and can be installed in either port adapter slot 0 or port adapter slot 1. Figure 7 shows the 8T-V.35 port adapter installed on a VIP2 in port adapter slot 1.

Figure 7 VIP2 with a 8T-V.35 Port Adapter in Port Adapter Slot 1



The following sections discuss information specific to the 8T-V.35 port adapter and its use on the VIP2 in Cisco 7000 series and Cisco 7500 series routers:

- Installing or Replacing a Port Adapter on a VIP2, page 21
- Attaching a 8T-V.35 Compact Serial Cable, page 25
- Replacing an 8T-V.35 Compact Serial Cable, page 26
- Using the EXEC Command Interpreter, page 28
- Configuring the 8T-V.35 Interfaces, page 28
  - Selecting Chassis Slot, Port Adapter, and Port Adapter Port Numbers, page 29
  - Shutting Down an Interface, page 30
  - Configuring Interfaces, page 32
  - Configuring Timing (Clock) Signals, page 33
  - Checking the Configuration, page 35

Installing or Replacing a Port Adapter on a VIP2

Depending on the circumstances, you might need to install a new port adapter on a VIP2 motherboard or replace a failed port adapter in the field. In either case, you need a number 1 Phillips screwdriver, an antistatic mat onto which you can place the removed interface processor, and an antistatic container into which you can place a failed port adapter for shipment back to the factory.

Caution To prevent system problems, do not remove port adapters from the VIP2 motherboard, or attempt to install other port adapters on the VIP2 motherboard while the system is operating. To install or replace port adapters, first remove the VIP2 from its interface processor slot.

Note Each port adapter circuit board is mounted to a metal carrier and is sensitive to ESD damage. The following procedures should be performed by a Cisco-certified service provider only. While the VIP2 supports online insertion and removal (OIR), individual port adapters do not. To replace port adapters, you must first remove the VIP2 from the chassis, then install or replace port adapters as required. If a blank port adapter is installed on the VIP2 in which you want to install a new port adapter, you must first remove the VIP2 from the chassis, then remove the blank port adapter.

When only one port adapter is installed on a VIP2, a blank port adapter must fill the empty slot to allow the VIP2 and router chassis to conform to electromagnetic interference (EMI) emissions requirements, and so that air flows through the chassis properly. If you plan to install a new port adapter, you must first remove the blank port adapter.

Following is the standard procedure for removing and replacing any type of port adapter on the VIP2:

Step 1 Attach an ESD-preventive wrist strap between you and an unfinished chassis surface.

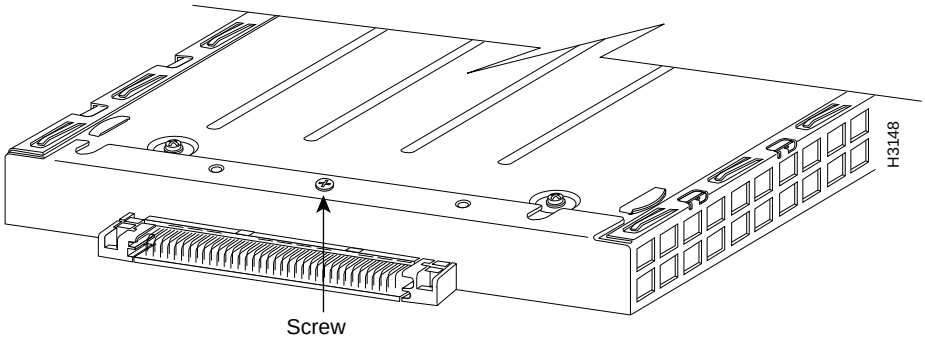
Step 2 For a new port adapter installation or a port adapter replacement, disconnect any interface cables from the ports on the front of the port adapter, although this is not required. You can remove VIP2s with cables attached; however, we do not recommend it.

Step 3 To remove the VIP2 from the chassis, follow the steps in the section “Removing a VIP2” in the configuration note *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration* (Document Number 78-2658-xx), which shipped with your VIP2.

Step 4 Place the removed VIP2 on an antistatic mat.

Step 5 Locate the screw at the rear of the port adapter (or blank port adapter) to be replaced. (See Figure 8.) This screw secures the port adapter (or blank port adapter) to its slot.

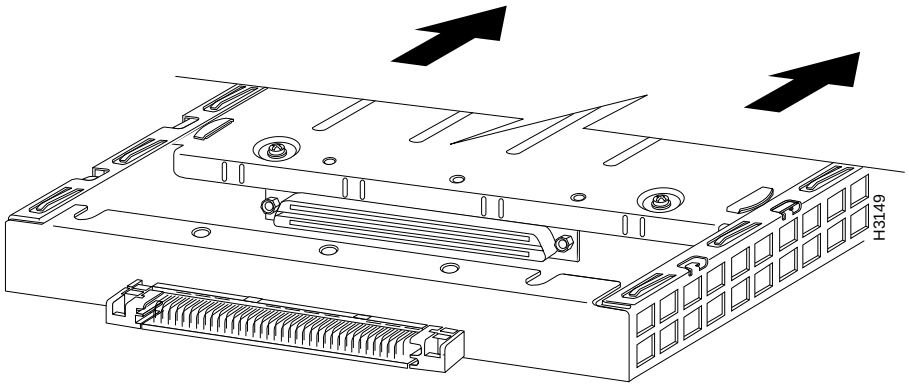
Figure 8 Location of Port Adapter Screw, Partial Port Adapter View



Step 6 Remove the screw that secures the port adapter (or blank port adapter).

Step 7 With the screw removed, grasp the handle on the front of the port adapter (or blank port adapter) and carefully pull it out of its slot, away from the edge connector at the rear of the slot. (See Figure 9.)

Figure 9 Pulling a Port Adapter Out of a Slot, Partial Port Adapter View

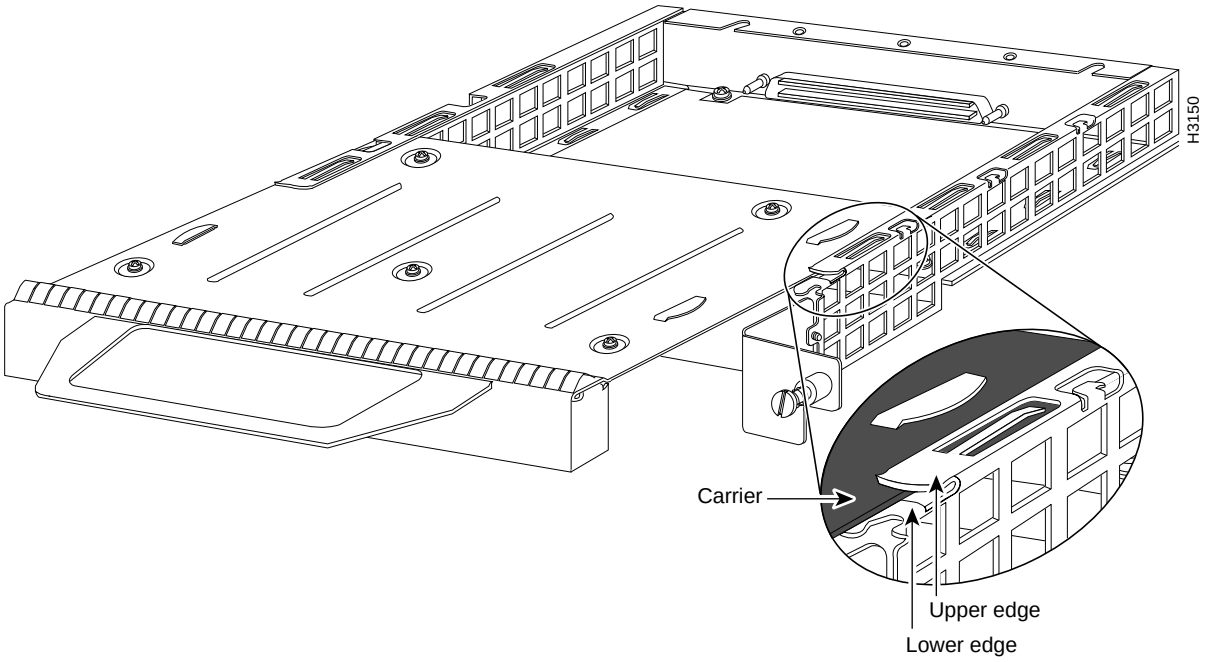


Step 8 If you removed a port adapter, place it in an antistatic container for safe storage or shipment back to the factory. If you removed a blank port adapter, no special handling is required; however, store the blank port adapter for potential future use.

Step 9 Remove the new port adapter from its antistatic container and position it at the opening of the slot. (See Figure 10.)

Caution To prevent jamming the carrier between the upper and lower edges of the port adapter slot, and to assure that the edge connector at the rear of the port adapter mates with the connector at the rear of the port adapter slot, make certain that the leading edges of the carrier are between the upper and lower slot edges, as shown in the cutaway in Figure 10.

Figure 10 Installing a New Port Adapter

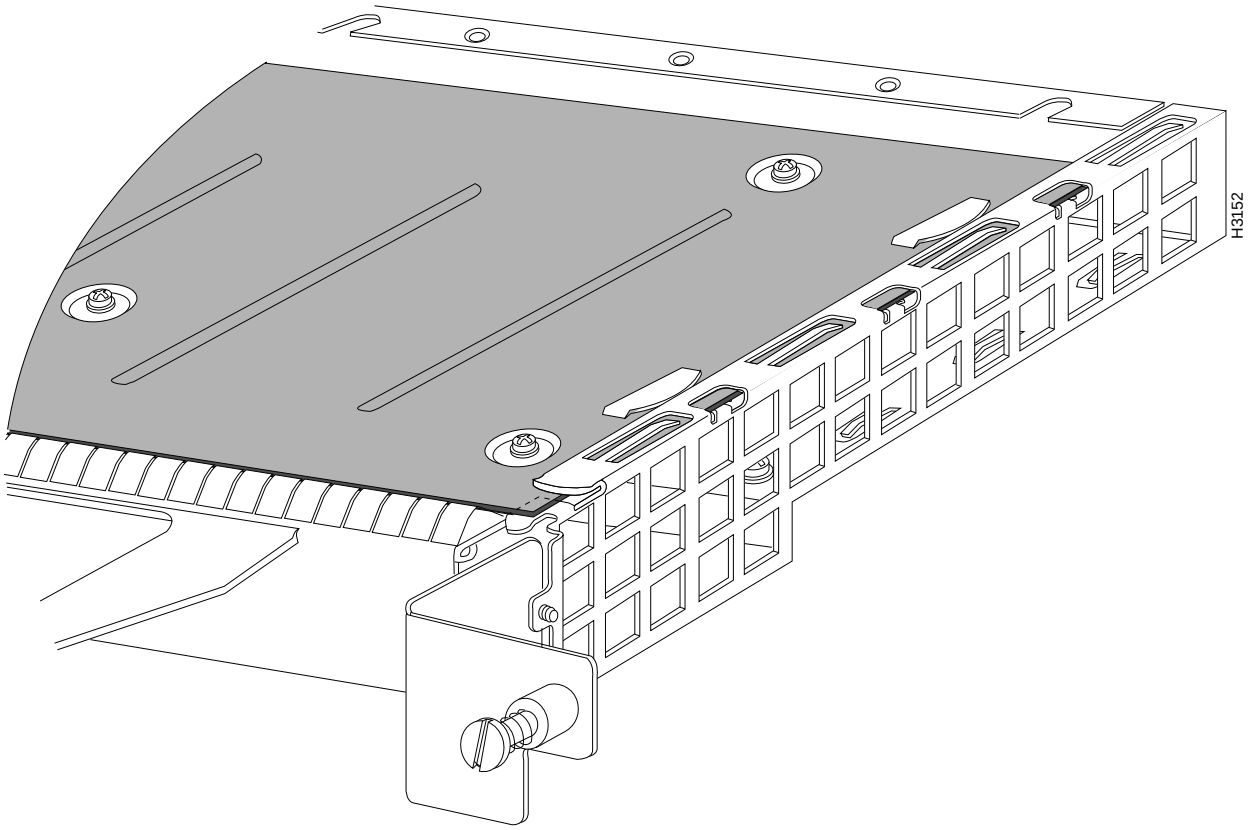


Step 10 Before you begin to insert the new port adapter in its slot, verify that the port adapter carrier is between the upper and lower slot edges, as shown in Figure 11. Do not jam the carrier between the slot edges.

Caution To ensure a positive ground attachment between the port adapter carrier and the VIP2 motherboard and port adapter slot, and to ensure that the connectors at the rear of the port adapter and slot mate properly, the carrier must be between the upper and lower slot edges, as shown in Figure 11.

Step 11 Carefully slide the new port adapter into the port adapter slot until the connector on the port adapter is completely mated with the connector on the motherboard.

Figure 11 Aligning the Carrier Edge with Upper and Lower Slot Edges, Partial View



Step 12 Install the screw in the rear of the port adapter slot. (See Figure 8 for its location.) Do not overtighten this screw.

Step 13 To replace the VIP2 in the chassis, follow the steps in the section "Installing a VIP2," in the configuration note *Second-Generation Versatile Interface Processor (VIP2) Installation and Configuration* (Document Number 78-2658-xx), which shipped with your VIP2.

Step 14 If disconnected, reconnect the interface cables to the interface processor.

This completes the procedure for installing a new port adapter or replacing a port adapter on a VIP2.

Attaching a 8T-V.35 Compact Serial Cable

On a single 8T-V.35 port adapter, you can use only one compact serial cable. 8T-V.35 compact serial cables are available *only* from Cisco Systems; they are *not* available from outside commercial cable vendors.

Caution Only attach a V.35 compact serial cable to the 8T-V.35 port adapter installed in your router. Attaching a compact serial cable of another interface type to the port adapter could damage your router or the hardware at the network end of the cable.

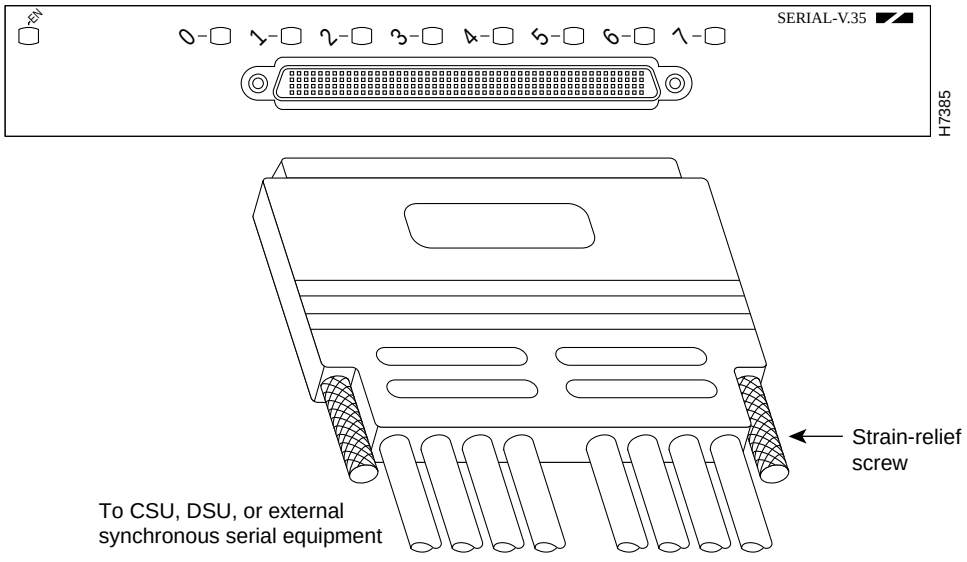
Connect a compact serial cable to a 8T-V.35 port adapter as follows:

Step 1 Attach the compact serial cable directly to the receptacle on the 8T-V.35 port adapter and tighten the strain-relief screws. (See Figure 12.)

Note Port adapters have a handle attached, but this handle is not shown to allow a full view of detail on each port adapter's faceplate.

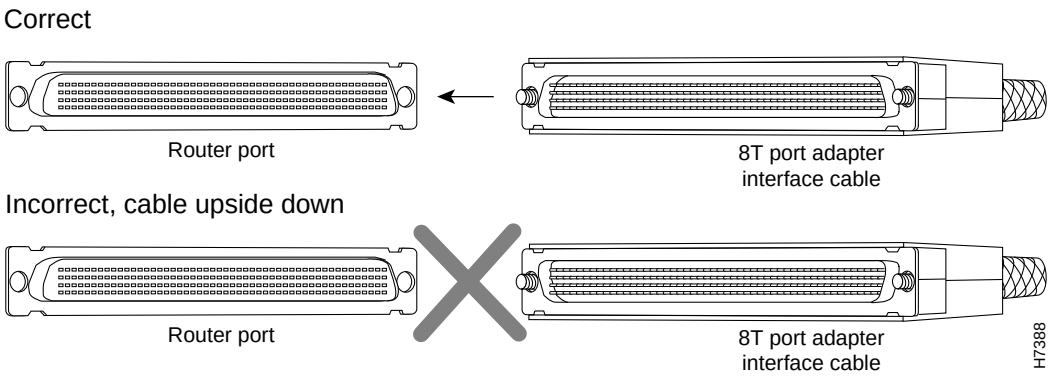
When attaching the cable receptacle on the 8T-V.35 port adapter, use the cable-management bracket that shipped with your router for extra strain relief.

Figure 12 Connecting a 8T-V.35 Compact Serial Cable (Front View—Shown without Handle)



Caution Compact serial cables must be attached correctly or damage to the cable plug will result. Attempting to force a cable plug on the 200-pin receptacle can damage the plug. Figure 13 shows the correct orientation of the compact serial cable to the 8T-V.35 port adapter.

Figure 13 Connecting the Compact Serial Cable



Step 2 Attach the network end of your serial cable to your DSU, CSU, DTE, or other external synchronous-serial equipment and tighten the strain-relief screws.

This completes the procedure for attaching an 8T-V.35 compact serial cable to the 8T-V.35 port adapter.

Replacing an 8T-V.35 Compact Serial Cable

The compact serial cable connected to each port determines the mode of the ports (the electrical interface type is always V.35). The default mode of the ports is DCE, which allows you to perform a loopback test on any port without having to attach a port adapter cable. For information related to the **loopback** command, refer to the section "Using the ping and loopback Commands" later in this document. Although DCE is the default, there is no default clock rate set on the interfaces. When there is no cable attached to a port, the software actually identifies the port as *Universal, Cable Unattached* rather than either a DTE or DCE interface.

Caution Only attach a V.35 compact serial cable to the 8T-V.35 port adapter installed in your router. Attaching a compact serial cable of another interface type to the port adapter could damage your router or the hardware at the network end of the cable.

Following is an example of the **show controller cbus** command that shows an interface port (2/1/0) that has a V.35 DTE cable attached:

```
Router# show controller cbus

slot2: VIP2, hw 2.2, sw 21.40, ccb 5800FFA0, cmdq 480000C0, vps 8192
    software loaded from flash slot0:muck/amcrae/vip2_21-40.mxt
    FLASH ROM version 255.255
   Mueslix Serial(8), HW Revision 0x1, FW Revision 1.20
    Serial2/1/0, applique is V.35 DTE
      gfreeq 48000140, lfreeq 480001B0 (1536 bytes), throttled 0
      rxlo 4, rxhi 90, rxcurr 0, maxrxcurr 0
      txq 48001A80, txacc 48001A82 (value 58), txlimit 58
[display text omitted]
```

To change the mode of a port online, you replace the compact serial cable and use software commands to restart the interface and, if necessary, reconfigure the port for the new interface. At system startup or restart, the VIP2 polls the interfaces and determines the electrical interface type of each port (according to the type of compact serial cable attached). However, it does not necessarily repoll an interface when you change the adapter cable online. To ensure that the system recognizes the new interface type, shut down and reenable the interface after changing the cable.

Perform the following steps to change the mode of a port by replacing the compact serial cable. First shut down the interface, then replace the cable and bring up the interface with the new cable attached so that the system recognizes the new interface. (Refer to the section "Shutting Down an Interface" later in this document when shutting down an interface.) If you are replacing a cable with one of the same mode, these steps are not necessary (simply replace the cable without interrupting operation).

Step 1 At the privileged level of the EXEC, specify the port address, shut down the interface, and write the configuration to nonvolatile random-access memory (NVRAM). Add additional configuration commands, if any, before you exit from Configuration mode (before you enter **Ctrl-Z**).

```
Router> enable
Password:
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# int serial 3/1/0
Router(config-int)# shutdown
Ctrl-Z
Router#
```

Step 2 Locate and remove the adapter cable to be replaced.

Step 3 Connect the new cable between the 8T-V.35 port adapter and the network connection. Tighten the thumbscrews at both ends of the cable to secure it in the ports.

Step 4 Enter Configuration mode again, bring the port back up, and save the running configuration to NVRAM.

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# int serial 3/1/0
Router(config-int)# no shutdown
Ctrl-Z
Router#

Router# copy running-config startup-config
```

These steps will prompt the system to poll the interface and recognize new interface immediately.

When you configure a port for a DCE interface for the first time, or when you set up a loopback test, you must set the clock rate for the port. When you connect a DCE cable to a port, the interface will remain down, and the interface will not function until you set a clock rate (regardless of the DCE mode default).

If you are changing the mode of the interface from DCE to DTE, you do not need to change the clock rate for the port. After you replace the DCE cable with a DTE cable and the system recognizes the interface as a DTE, it will use the external clock signal from the remote DCE device and ignore the internal clock signal that the DCE interface normally uses. Therefore, once you configure the clock rate on a port for either a DCE interface or loopback, you can leave the clock rate configured and still use that port as a DTE interface.

This completes the procedure for replacing an 8T-V.35 compact serial cable on the 8T-V.35 port adapter.

Using the EXEC Command Interpreter

Before you use the **configure** command to configure the interfaces or change an existing configuration, you must enter the privileged level of the EXEC command interpreter with the **enable** command. The system will prompt you for a password if one has been set.

The system prompt for the privileged level ends with a pound sign (#) instead of an angle bracket (>). At the console terminal, enter the privileged level as follows:

Step 1 At the user-level EXEC prompt, enter the **enable** command. The EXEC prompts you for a privileged-level password, as follows:

```
Router> enable

Password:
```

Step 2 Enter the password (the password is case-sensitive). For security purposes, the password is not displayed.

Step 3 When you enter the correct password, the system displays the privileged-mode system prompt (#) as follows:

```
Router#
```

Proceed to the following section to configure the new interfaces.

Configuring the 8T-V.35 Interfaces

If you installed a new 8T-V.35-equipped VIP2 or if you want to change the configuration of an existing interface, you must enter Configuration mode using the **configure** command. If you replaced a 8T-V.35 port adapter that was previously configured, the system will recognize the new 8T-V.35 port adapter interfaces and bring each of them up in their existing configuration.

After you verify that the new 8T-V.35 port adapter is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interfaces. Be prepared with the information you will need, such as the following:

- Protocols you plan to route on each new interface
- Internet protocol (IP) addresses if you will configure the interfaces for IP routing
- Whether or not the new interfaces will use bridging
- Timing source for each new interface and clock speeds for internal timing

Refer to the appropriate software documentation for descriptions of the configuration options available and instructions for configuring a serial interface.

The following sections describe the commands for configuring an external clock signal for a DCE interface and for configuring a port for NRZI encoding or 32-bit CRC. Configuration commands are executed from the privileged level of the EXEC command interpreter, which usually requires password access. (See the section “Shutting Down an Interface” on page 30.) Refer to the description that follows and contact your system administrator, if necessary, to obtain access.

Selecting Chassis Slot, Port Adapter, and Port Adapter Port Numbers

The following section describes how to identify chassis slot, port adapter, and serial interface port numbers.

Note Although the processor slots in the seven-slot Cisco 7000, Cisco 7507, and 13-slot Cisco 7513 are vertically oriented and those in the five-slot Cisco 7010 and Cisco 7505 are horizontally oriented, all models use the same method for slot and port numbering.

In the router, physical port addresses specify the actual physical location of each interface port on the router interface processor end. (See Figure 14.) This address is composed of a three-part number in the format *chassis slot number/port adapter number/interface port number.*

- The first number identifies the chassis slot in which the VIP2 is installed (as shown in the example system in Figure 14).
- The second number identifies the physical port adapter number on the VIP2, and is either 0 or 1.
- The third number identifies the interface ports on each 8T-V.35 port adapter are always numbered in sequence as interface 0 through 7.

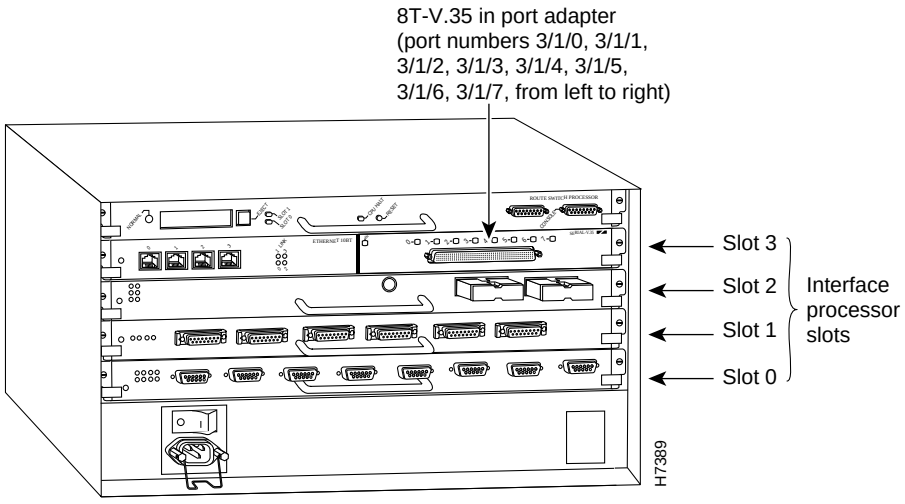
Interface ports on the 8T-V.35 port adapter maintain the same address regardless of whether other interface processors are installed or removed. However, when you move a VIP2 to a different slot, the first number in the address changes to reflect the new slot number.

Figure 14 shows some of the slot port adapter and interface ports of a sample Cisco 7505 system. For example, on the 8T-V.35-equipped VIP2 in chassis slot 3, the addresses for the interface ports are 3/1/0 through 3/1/7 (chassis slot 3, port adapter slot 1, and interface ports 0 through 7). If the port adapter was in port adapter slot 0, these same interface ports would be numbered 3/0/0 through 3/0/7.

The first port adapter slot number is always 0; the second port adapter slot number is always 1. The individual interface port numbers always begin with 0. The number of additional ports depends on the number of ports on a port adapter. Port adapters can occupy either port adapter slot. There are no restrictions.

Note If you remove the 8T-V.35-equipped VIP2 (shown in Figure 14) from chassis slot 3 and install it in chassis slot 2, the addresses of those same ports become 2/1/0 through 2/1/7.

Figure 14 Serial Interface Port Number Example (Cisco 7505 Shown)



You can identify interface ports by physically checking the slot/port-adapter/interface port location on the back of the router or by using **show** commands to display information about a specific interface or all interfaces in the router.

Shutting Down an Interface

Before you remove an interface that you will not replace, replace a compact serial cable, or replace port adapters, shut down (disable) the interfaces to prevent anomalies when you reinstall the new or reconfigured interface processor. When you shut down an interface, it is designated *administratively down* in the **show** command displays.

Follow these steps to shut down an interface:

Step 1 Enter the privileged level of the EXEC command interpreter. (Refer to the previous section for instructions.)

Step 2 At the privileged-level prompt, enter Configuration mode and specify that the console terminal will be the source of the configuration subcommands, as follows:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
```

Step 3 Specify the slot/port address of the first interface that you want shut down by entering the subcommand **interface**, followed by the *type* (**serial**) and *slot/port* (interface processor slot number/0). The example that follows is for a VIP2 in interface processor slot 1:

```
Router(config)# interface serial 1/1/0
```

Step 4 Enter the **shutdown** command, as follows:

```
Router(config-int)# shutdown
```

Step 5 To shut down additional interfaces, enter the slot/port address of each additional interface followed by the **shutdown** command. When you have entered all the interfaces to be shut down, press **Ctrl-Z** (hold down the **Control** key while you press **Z**) to exit Configuration mode and return to the EXEC command interpreter prompt, as follows:

```
Router(config-int)# int serial 1/1/0
Router(config-int)# shutdown
Router(config-int)# int serial 1/1/1
Router(config-int)# shutdown
Ctrl-Z
Router#
```

Step 6 Write the new configuration to memory, as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

The system displays an OK message when the configuration has been stored.

Step 7 To verify that new interfaces are now in the correct state (shutdown), use the **show interface serial** *slot/port* command to display the specific interface, or use the **show interfaces** command, without variables, to display the status of all interfaces in the system.

```
Router# show int serial 1/1/0

Serial 1/1/0 is administratively down, line protocol is down
  Hardware is M8T-V.35
  [display text omitted]
```

Step 8 To reenable the interfaces, repeat the previous steps, but use the **no shutdown** command in Step 4; then write the new configuration to memory, as follows:

```
Router(config)# int serial 1/1/0
Router(config-int)# no shutdown
Ctrl-Z
Router#

Router# copy running-config startup-config
[OK]
Router# show int serial 1/1/0

Serial 1/1/0 is up, line protocol is up
  Hardware is M8T-V.35
  [display text omitted]
```

For complete descriptions of software configuration commands, refer to the publications listed in the section “If You Need More Information” on page 2.

Configuring Interfaces

Following are instructions for a basic configuration: enabling an interface, specifying IP routing, and setting up external timing on a DCE interface. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration and the protocols you plan to route on the interface. For complete descriptions of configuration subcommands and the configuration options available for serial interfaces, refer to the appropriate software documentation.

Each 8T-V.35 port adapter contains four serial interfaces. The following steps describe a basic configuration. Press the **Return** key after each step unless otherwise noted. At any time you can exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable

Router>
```

Following is an example of a basic configuration procedure:

Step 1 At the privileged-level prompt, enter Configuration mode and specify that the console terminal will be the source of the configuration subcommands, as follows:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
```

Step 2 At the prompt, specify the first interface to configure by entering the subcommand **interface**, followed by the *type* (**serial**) *and slot/port* (interface processor slot number/0). The example that follows is for the first interface of the first port adapter, on a VIP2 in interface processor slot 1:

```
Router(config)# interface serial 1/0/0
```

Step 3 If IP routing is enabled on the system, you can assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand, as in the following example:

```
Router(config-int)# ip address 1.1.1.10 255.255.255.0
```

Step 4 Add any additional configuration subcommands required to enable routing protocols and set the interface characteristics.

Step 5 If you are configuring a DTE interface, proceed to Step 7. If you are configuring a DCE interface, you also need to configure the external clock signal, as described in the next step.

Step 6 Set the clock rate with the **clock rate** command. (See the section “Configuring Timing (Clock) Signals” on page 33.)

```
Router(config-int)# clock rate 72000
```

Step 7 Change the shutdown state to up and enable the interface as follows:

```
Router(config-int)# no shutdown
```

Step 8 Configure additional interfaces as required.

Step 9 When you have included all of the configuration subcommands to complete the configuration, press **Ctrl-Z** to exit Configuration mode.

Step 10 Write the new configuration to nonvolatile memory as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

This completes the procedure for creating a basic configuration.

Configuring Timing (Clock) Signals

All interfaces support both DTE and DCE mode, depending on the mode of the interface cable attached to the port. To use a port as a DTE interface, you need only connect a DTE compact serial cable to the port. When the system detects the DTE mode cable, it automatically uses the external timing signal. To use a port in DCE mode, you must connect a DCE interface cable and set the clock speed with the **clock rate** configuration command. You must also set the clock rate to perform a loopback test. This section describes how to set the clock rate on a DCE port and, if necessary, how to invert the clock to correct a phase shift between the data and clock signals.

Setting the Clock Rate

The default operation on a 8T-V.35 port adapter DCE interface is for the DCE device to generate its own clock signal (TxC) and send it to the remote DTE. The remote DTE device returns the clock signal to the DCE. The **clock rate** command specifies the rate as a bits-per-second value. In the following example, the clock rate for the serial interface on a 8T-V.35 port adapter on a VIP2 in interface processor slot 3 (3/1/0) is defined as 72 kbps:

```
Router(config)# interface serial 3/1/0
Router(config-int)# clock rate 72000
```

Use the **no clock rate** command to remove the clock rate.

Following are the acceptable clockrate settings:

1200, 2400, 4800, 9600, 19200 38400, 56000, 64000,
72000, 125000 148000, 250000, 500000, 800000, 1000000,
1300000, 2000000, 4000000, 8000000

Inverting the Clock Signal

Systems that use long cables or cables that are not transmitting the TxC (clock) signal may experience high error rates when operating at the higher transmission speeds. If an 8T-V.35 port adapter DCE port is reporting a high number of error packets, a phase shift might be the problem. Inverting the clock may correct this shift.

When the 8T-V.35 port adapter interface is a DTE, the **invert-txc** command inverts the TxC signal it receives from the remote DCE. When the 8T-V.35 port adapter interface is a DCE, this command inverts the clock signal to the remote DTE port. Use the **no invert-txc** command to change the clock signal back to its original phase.

Inverting the Data Signal

If the interface on the 8T-V.35 synchronous serial port adapter is used to drive a dedicated T1 line that does not have B8ZS encoding (a method to avoid 15 zeros), the data stream must be inverted (both TXD and RXD) either in the connecting CSU/DSU or the interface. To invert the data stream coming out of the 8T-V.35 port adapter, use the **invert data** command.

By inverting the HDLC data stream, the HDLC zero insertion algorithm becomes a ones insertion algorithm that satisfies the T1 requirements. Be careful not to invert data both on the interface and on the CSU/DSU as two data inversions will cancel each other out.

Configuring NRZI Format

All 8T-V.35 interfaces support nonreturn-to-zero (NRZ) and nonreturn-to-zero inverted (NRZI) formats. Both formats use two different voltage levels for transmission. NRZ signals maintain constant voltage levels with no signal transitions (no return to a zero voltage level) during a bit interval and are decoded using absolute values (0 and 1). NRZI uses the same constant signal levels but interprets the absence of data (a space) at the beginning of a bit interval as a signal transition and the presence of data (a mark) as no transition. NRZI uses relational encoding to decode signals rather than determining absolute values.

NRZ format, the factory default on all interfaces, is most common. NRZI format, which is configured with a software command, is commonly used with EIA/TIA-232 connections in IBM environments.

To enable NRZI encoding on any interface, specify the slot and port address of the interface followed by the command **nrzi-encoding [*mark*]**. Enter **Ctrl-Z** when you have finished with the configuration change. In the example that follows, the first serial port on a 8T-V.35 port adapter in interface processor slot 3 is configured for NRZI encoding:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# interface serial 3/1/0
Router(config-int)# nrzi-encoding
Ctrl-Z
Router#
```

To disable NRZI encoding on a port, specify the slot and port address and use the **no nrzi-encoding** command. For complete command descriptions and instructions, refer to the related software documentation.

Configuring CRCs

CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. All interfaces use a 16-bit CRC (CRC-CITT) by default, but also support a 32-bit CRC. The sender of a data frame calculates the *frame check sequence* (FCS). Before it sends a frame, the sender appends the FCS value to the message. The receiver recalculates the FCS and compares its calculation to the FCS from the sender. If there is a difference between the two calculations the receiver assumes that a transmission error occurred and sends a request to the sender to resend the frame.

The default for all serial interfaces is 16-bit CRC. To enable 32-bit CRC on an interface, specify the slot and port address of the interface followed by the command **crc 32**. In the example that follows, the first serial port on a 8T-V.35 port adapter on a VIP2 in interface processor slot 3 is configured for 32-bit CRC:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# interface serial 3/1/0
Router(config-int)# crc 32
Ctrl-Z
Router#
```

To disable CRC-32 and return to the default CRC-16 (CRC-CITT) setting, specify the slot and port address and use the **no crc 32** command. For command descriptions, refer to the related software documentation.

Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces, and use the **ping** and **loopback** commands to check connectivity.

Using show Commands to Verify the VIP2 Status

The following steps use **show** commands to verify that the new interfaces are configured and operating correctly.

Step 1 Display the system hardware configuration with the **show version** command. Ensure that the list includes the new serial interfaces.

Step 2 Display all the current interface processors and their interfaces with the **show controllers cbus** command. Verify that the new VIP2 appears in the correct slot.

Step 3 Specify one of the new serial interfaces with the **show interfaces** *type slot/port adapter/interface* command and verify that the first line of the display specifies the interface with the correct slot number. Also verify that the interface and line protocol are in the correct state: up or down.

Step 4 Display the protocols configured for the entire system and specific interfaces with the **show protocols** command. If necessary, return to Configuration mode to add or remove protocol routing on the system or specific interfaces.

Step 5 Display the running configuration file with the **show running-config** command. Display the configuration stored in NVRAM using the **show startup-config** command. Verify that the configuration is accurate for the system and each interface.

If the interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network interface is properly connected and terminated. If you still have problems bringing up the interface, contact a customer service representative for assistance.

To display information about a specific interface, use the **show interfaces** command with the interface type and port address in the format **show interfaces** [*type slot/port adapter/port*].

Following is an example of how the **show interfaces** [*type slot/port adapter/port*] command displays status information (including the physical slot and port address) for the interfaces you specify. In these examples, most of the status information for each interface is omitted, and the eight serial interfaces (0–7) are in chassis slot 3, in port adapter slot 1. (Interfaces are administratively shut down until you enable them.)

```
Router# sh int serial 3/1/0
Serial3/1/0 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 1.1.1.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted]

Router# sh int serial 3/1/1
Serial3/1/1 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 1.1.1.1
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted]

Router# sh int serial 3/1/2
Serial3/1/2 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 1.1.1.2
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted]

Router# sh int serial 3/1/3
Serial3/1/3 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 1.1.1.3
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted]

Router# sh int serial 3/1/4
Serial3/1/4 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 1.1.1.4
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted]

Router# sh int serial 3/1/5
Serial3/1/5 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 1.1.1.5
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted]
```

```
Router# sh int serial 3/1/6
Serial3/1/6 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 1.1.1.6
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted]

Router# sh int serial 3/1/7
Serial3/1/7 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 1.1.1.7
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
(display text omitted]
```

With the VIP2 configuration shown in Figure 14, a 8T-V.35 port adapter is in port adapter slot 1. With the **show interfaces** *type slot/port adapter/port* command, use arguments such as the interface type (serial, and so forth) and the slot, port adapter, and port numbers (slot/port adapter/port) to display information about a specific serial interface only.

The following example of the **show interfaces serial** *slot/port adapter/port* command shows all of the information specific to the first 8T-V.35 interface port (interface port 0) in chassis slot 3, port adapter slot 1:

```
Router# sh int serial 3/1/0
Serial3/1/0 is up, line protocol is up
  Hardware is cyBus Serial
  Internet address is 1.1.1.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive not set
  Last input 2d18h, output 00:00:54, output hang never
  Last clearing of "show interface" counters never
  Input queue: 0/75/0 (size/max/drops); Total output drops: 0
  Queueing strategy: weighted fair
  Output queue: 0/64/0 (size/threshold/drops)
     Conversations  0/1 (active/max active)
     Reserved Conversations 0/0 (allocated/max allocated)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     16 packets input, 1620 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 1 ignored, 0 abort
     3995 packets output, 1147800 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     1 carrier transitions
     RTS up, CTS up, DTR up, DCD up, DSR up
```

For complete VIP2 command descriptions and examples, refer to the publications listed in the section “If You Need More Information” on page 2.

The **show version** (or **show hardware**) command displays the configuration of the system hardware (the number of each interface processor type installed), the software version, the names and sources of configuration files, and the boot images. Following is an example of the **show version** command used with a Cisco 7500 series system:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) GS Software (RSP-A), Version 11.1(471) [amcrae 125]
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Sat 10-Aug-96 17:56 by amcrae
Image text-base: 0x600108A0, data-base: 0x60952000

ROM: System Bootstrap, Version 5.3(16645) [szhang 571], INTERIM SOFTWARE
ROM: GS Software (RSP-BOOT-M), Version 11.1(6), RELEASE SOFTWARE (fc1)

gshen_7500 uptime is 5 days, 4 minutes
System restarted by reload
System image file is "rsp-jv-mz", booted via slot0

cisco RSP2 (R4600) processor with 16384K bytes of memory.
R4600 processor, Implementation 32, Revision 2.0
Last reset from power-on
G.703/E1 software, Version 1.0.
SuperLAT software copyright 1990 by Meridian Technology Corp).
Bridging software.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV Inc).
Chassis Interface.
1 EIP controller (6 Ethernet).
1 VIP2 controller (8 Ethernet)(1 HSSI).
14 Ethernet/IEEE 802.3 interfaces.
1 HSSI network interface.
125K bytes of non-volatile configuration memory.

8192K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x0
```

To determine which type of port adapter is installed on a VIP2 in your system, use the **show diag** *slot* command. Specific port adapter information is displayed, as shown in the following example of a 8T-V.35 port adapter in chassis slot 9:

```
Router# show diag 9
Slot 9:
        Physical slot 9, ~physical slot 0x7, logical slot 8, CBus 0
        Microcode Status 0xC
        Master Enable, LED, WCS Loaded
        Board is analyzed
        Pending I/O Status: Console I/O
        EEPROM format version 1
        VIP2 controller, HW rev 2.3, board revision UNKNOWN
        Serial number: 03513619  Part number: 73-1684-03
        Test history: 0x00        RMA number: 00-00-00
        Flags: cisco 7000 board; 7500 compatible

        EEPROM contents (hex):
          0x20: 01 15 02 03 00 35 9D 13 49 06 94 03 00 00 00 00
          0x30: 06 3D 00 2A 1A 00 00 00 00 00 00 00 00 00 00 00
```

```
Slot database information:
Flags: 0x4      Insertion time: 0x12A0 (08:56:58 ago)

Controller Memory Size: 8 MBytes

PA Bay 0 Information:
        Mueslix Serial PA, 8 ports
        EEPROM format version 1
        HW rev FF.FF, Board revision UNKNOWN
        Serial number: 4294967295  Part number: 255-65535-255

PA Bay 1 Information:
        Fast-Serial PA, 4 ports
        EEPROM format version 1
        HW rev 1.0, Board revision A0
        Serial number: 02024473  Part number: 73-1389-05
```

Using the ping and loopback Commands

The *packet internet groper* (**ping**) and **loopback** commands allow you to verify that an interface port is functioning properly and to check the path between a specific port and connected devices at various locations on the network. This section provides brief descriptions of these commands. After you verify that the system and VIP2 have booted successfully and are operational, you can use these commands to verify the status of interface ports. Refer to the publications listed in the section "If You Need More Information" on page 2, for detailed command descriptions and examples.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal; each signal that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate that the connection failed.

Following is an example of a successful **ping** command to a remote server with the address 1.1.1.10:

```
Router# ping 1.1.1.10 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 1.1.1.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the server and that the server is active (powered on), and repeat the **ping** command.

The loopback test allows you to detect and isolate equipment malfunctions by testing the connection between the 8T-V.35 port adapter interface and a remote device such as a modem or a CSU/DSU. The **loopback** subcommand places an interface in loopback mode, which enables test packets that are generated from the **ping** command to loop through a remote device or interface cable. If the packets complete the loop, the connection is good. If not, you can isolate a fault to the remote device or interface cable in the path of the loopback test.

Note You must configure a clock rate on the port *before* performing a loopback test. However, if no cable is attached to the port, the port is administratively up, and the port is in loopback mode, you do not have to configure a clock rate on the port before performing a loopback test.

Depending on the mode of the port, issuing the **loopback** command checks the following path:

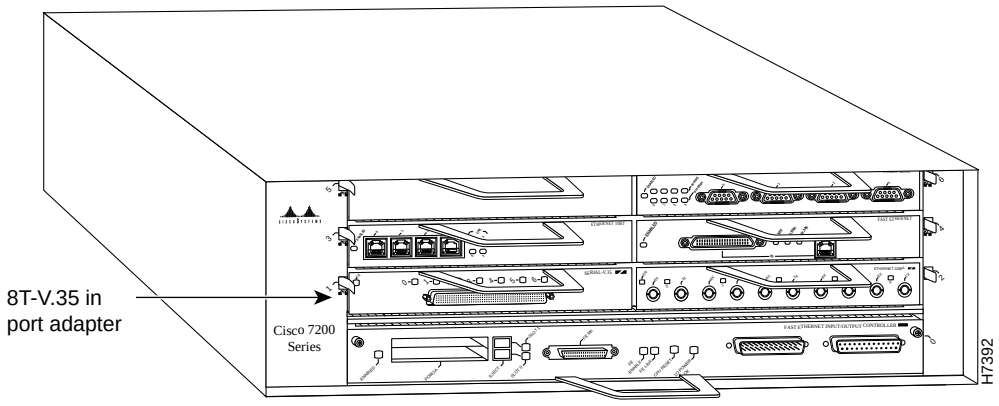
- When no interface cable is attached to the 8T-V.35 port adapter interface, or if a DCE cable is attached to a port that is configured as line protocol up, the **loopback** command tests the path between the VIP2 and the interface port only (without leaving the VIP2 and port adapter).
- When a DTE cable is attached to the port, the **loopback** command tests the path between the VIP2 and the near (VIP2) side of the DSU or modem to test the 8T-V.35 port adapter interface and interface cable.

Refer to the appropriate software configuration document for command descriptions and examples.

Cisco 7200 Series and the 8T-V.35 Port Adapter

The 8T-V.35 port adapter is used in the Cisco 7200 series and can be installed in any of the available port adapter slots. Figure 15 shows a 8T-V.35 port adapter installed in port adapter slot 1 of a Cisco 7206.

Figure 15 Cisco 7206 with a 8T-V.35 Port Adapter in Port Adapter Slot 1



The following sections include information that is specific to the 8T-V.35 port adapter and its use in the Cisco 7200 series routers:

Installing or Replacing a Port Adapter in Cisco 7200 Series Routers

Depending on your circumstances, you might need to install a new port adapter in a Cisco 7200 series router or replace a failed port adapter in the field. In either case no tools are necessary; all port adapters available for the Cisco 7200 series connect directly to the router midplane and are locked into position by a port adapter lever. When removing and replacing a port adapter, you will need an antistatic mat onto which you can place a removed port adapter and an antistatic container into which you can place a failed port adapter for shipment back to the factory.

Note The Cisco 7200 series routers support OIR; therefore, you do not have to power down the Cisco 7200 series routers when removing and replacing a 8T-V.35 port adapter.

When a port adapter slot is not in use, a blank port adapter must fill the empty slot to allow the router to conform to EMI emissions requirements and to allow proper air flow across the port adapters. If you plan to install a new port adapter in a slot that is not in use, you must first remove a blank port adapter.

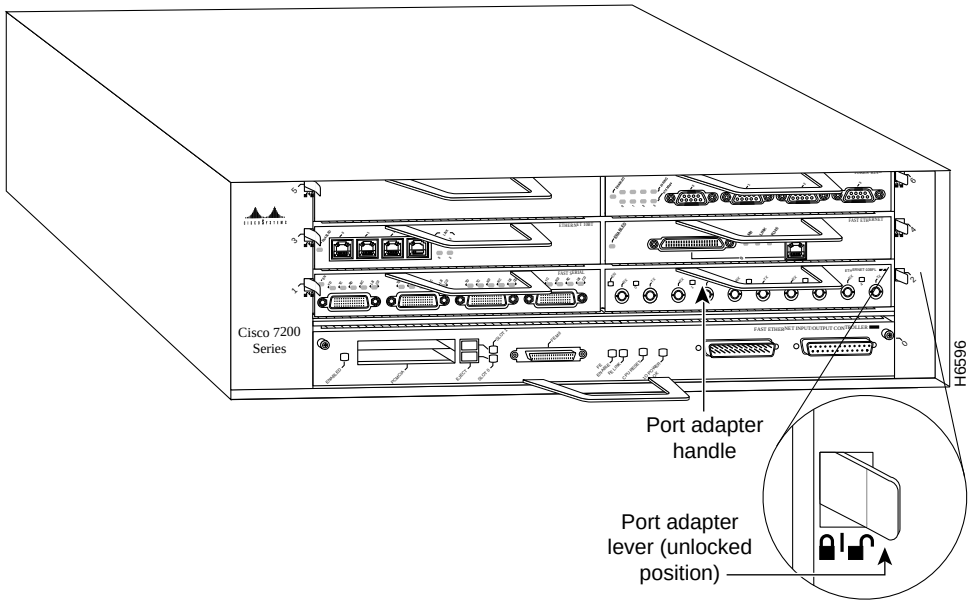
Removing a Port Adapter

Following is the procedure for removing a port adapter from a Cisco 7200 series router:

Step 1 Attach an ESD-preventative wrist strap between you and an unfinished chassis surface.

Step 2 Place the port adapter lever for the desired port adapter slot in the unlocked position. The port adapter lever remains in the unlocked position. (Refer to Figure 16.)

Figure 16 Placing the Port Adapter Lever in the Unlocked Position (Cisco 7206 shown)



Step 3 Grasp the handle on the port adapter and pull the port adapter from the midplane, about half way out of its slot. If you are removing a blank port adapter, pull the blank port adapter from the chassis slot.

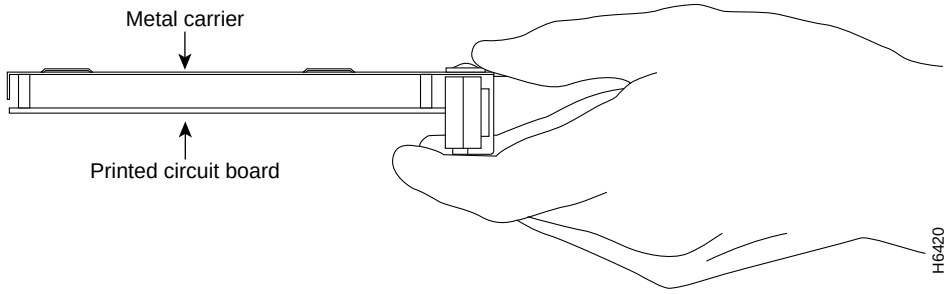
Note As you disengage the port adapter from the router midplane, OIR administratively shuts down all active interfaces on the port adapter.

Step 4 With the port adapter half way out of the slot, disconnect all cables from the port adapter.

Step 5 After disconnecting the cables, pull the port adapter from its chassis slot.

Caution Always handle the port adapter by the carrier edges and handle; never touch the port adapter's components or connector pins. (Refer to Figure 17.)

Figure 17 Handling a Port Adapter



Step 6 Place the port adapter on an antistatic surface with its components facing upward, or in a static shielding bag. If the port adapter will be returned to the factory, immediately place it in a static shielding bag.

This completes the procedure for removing a port adapter from a Cisco 7200 series router.

Replacing a Port Adapter

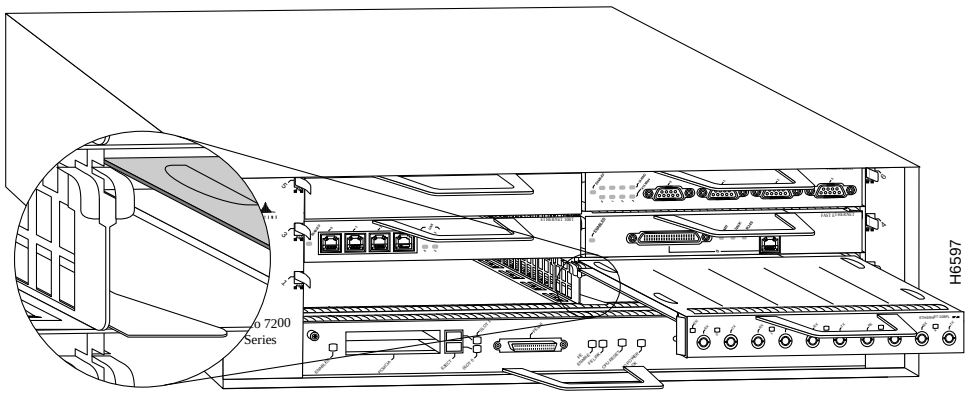
Following is the procedure for installing a new port adapter in a Cisco 7200 series router:

Step 1 Attach an ESD-preventative wrist strap between you and an unfinished chassis surface.

Step 2 Use both hands to grasp the port adapter by its metal carrier edges and position the port adapter so that its components are downward. (Refer to Figure 17).

Step 3 Align the left and right edge of the port adapter metal carrier between the guides in the port adapter slot. (Refer to Figure 18.)

Figure 18 Aligning the Port Adapter Metal Carrier Between the Slot Guides (Cisco 7206 Shown)



Step 4 With the metal carrier aligned in the slot guides, gently slide the port adapter half way into the slot.

Caution Do not slide the port adapter all the way into the slot until you have connected all required cables. Trying to do so will disrupt normal operation of the router.

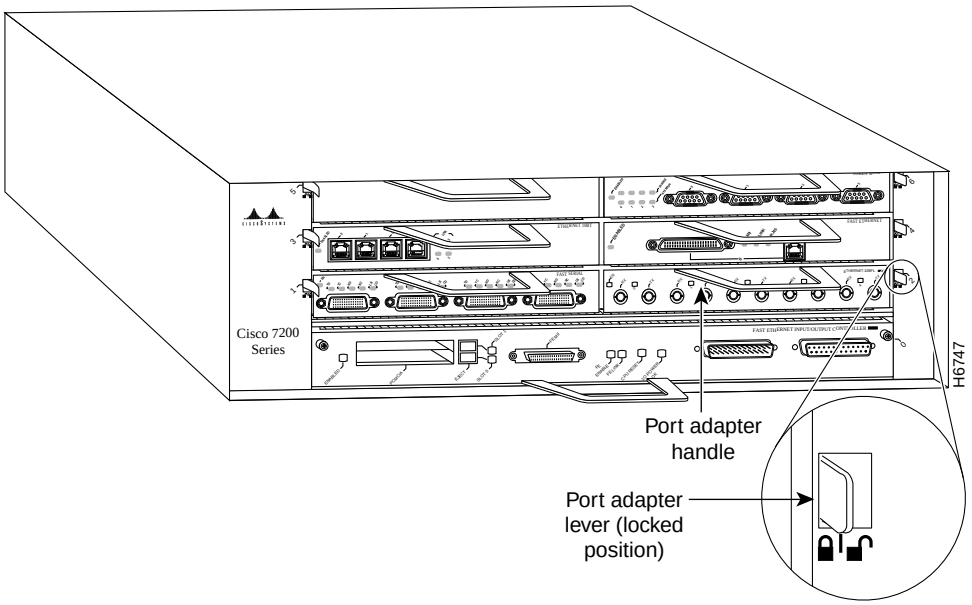
Step 5 With the port adapter half way in the slot, connect all required cables to the port adapter.

Step 6 After connecting all required port adapter cables, carefully slide the port adapter all the way into the slot until you feel the port adapter's connectors mate with the midplane.

Step 7 After feeling the connector's mate, move the port adapter lever to the locked position. Figure 19 shows the port adapter lever in the locked position.

Note If the port adapter lever does not move to the locked position, the port adapter is not completely seated in the midplane. Carefully pull the port adapter half way out of the slot, reinsert it, and move the port adapter lever to the locked position.

Figure 19 Placing the Port Adapter Lever in the Locked Position (Cisco 7206 Shown)



This completes the procedure for installing a new port adapter in a Cisco 7200 series router.

Attaching an 8T-V.35 Compact Serial Cable

On a single 8T-V.35 port adapter, you can use only one compact serial cable. 8T-V.35 compact serial cables are available only from Cisco Systems; they are not available from outside commercial cable vendors.

Caution Only attach a V.35 compact serial cable to the 8T-V.35 port adapter installed in your router. Attaching a compact serial cable of another interface type to the port adapter could damage your router or the hardware at the network end of the cable.

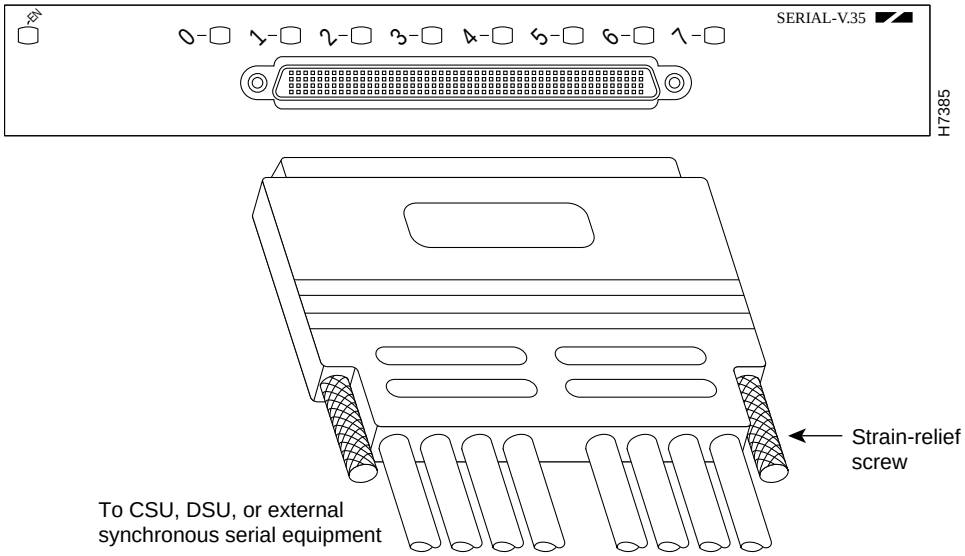
Connect a compact serial cable to the 8T-V.35 port adapter as follows:

Step 1 Attach the compact serial cable directly to the receptacle on the 8T-V.35 port adapter and tighten the strain-relief screws. (See Figure 20.)

Note Port adapters have a handle attached, but it is not shown in Figure 20 to allow a full view of detail on each port adapter's faceplate.

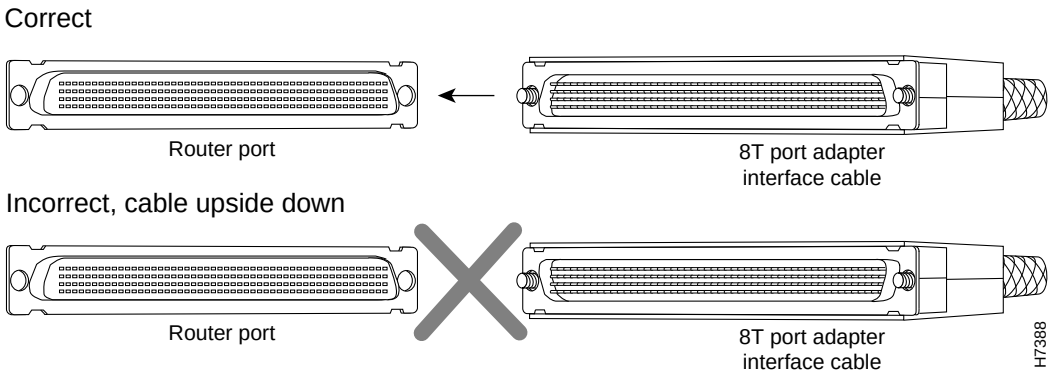
When attaching the cable receptacle on the 8T-V.35 port adapter, use the cable-management bracket that shipped with your router for extra strain relief.

Figure 20 Connecting a 8T-V.35 Compact Serial Cable (Front View—Shown without Handle)



Caution Compact serial cables must be attached correctly or damage to the cable plug will result. Attempting to force a cable plug on the 200-pin receptacle can damage the plug. Figure 21 shows the correct orientation of the compact serial cable to the 8T-V.35 port adapter.

Figure 21 Connecting the Compact Serial Cable



Step 2 Attach the network end of your serial cable to your DSU, CSU, DTE, or other external synchronous-serial equipment and tighten the strain-relief screws.

This completes the procedure for attaching an 8T-V.35 compact serial cable to the 8T-V.35 port adapter.

Replacing an 8T-V.35 Compact Serial Cable

The compact serial cable connected to each port determines the mode of the port (the electrical interface type is always V.35). The default mode of the ports is DCE, which allows you to perform a loopback test on any port without having to attach a compact serial cable. For information related to the **loopback** command, refer to the section "Using the ping Command" later in this document. Although DCE is the default, there is no default clock rate set on the interfaces. When there is no cable attached to a port, the software actually identifies the port as *cable type: None present* rather than either a DTE or DCE interface.

Caution Only attach a V.35 compact serial cable to the 8T-V.35 port adapter installed in your router. Attaching a compact serial cable of another interface type to the port adapter could damage your router or the hardware at the network end of the cable.

Following is an example of the **show controllers** command that shows an interface port (1/0) that has a V.35 DCE cable attached:

```
Router# sh cont serial 1/0

M8T-V.35: show controller:
PAS unit 0, subunit 0, f/w version 1-19, Rev id 0x2800001, version 2
idb = 0x60942688, ds = 0x608A6570, ssb=0x608C6CF0
Clock mux=0x0, ucmd_ctrl=0x1C, port_status=0xC
maxdgram=1524, bufpool=32Kb, 64 particles
     DCD=up  DSR=up  DTR=down  RTS=down  CTS=up
line state: down
cable type : V.35 DCE cable, received clockrate 123984
[display text omitted]
```

To change the mode of a port online, you replace the compact serial cable and use software commands to restart the interface and, if necessary, reconfigure the port for the new interface. At system startup or restart, the network processing engine polls the interfaces and determines the electrical interface type of each port (according to the type of compact serial cable attached). However, it does not necessarily repoll an interface when you change the adapter cable online. To ensure that the system recognizes the new interface type, shut down and reenable the interface after changing the cable.

Perform the following steps to change the mode of a port by replacing the compact serial cable. First shut down the interface, then replace the cable and bring up the interface with the new cable attached so that the system recognizes the new interface. (Refer to the section "Shutting Down an Interface" later in this document when shutting down an interface.) If you are replacing a cable with one of the same mode, these steps are not necessary (simply replace the cable without interrupting operation).

Step 1 At the privileged level of the EXEC, specify the port address, shut down the interface, and write the configuration to nonvolatile random-access memory (NVRAM). Add additional configuration commands, if any, before you exit from Configuration mode (before you enter **Ctrl-Z**).

```
Router> enable
Password:
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# int serial 3/1/0
Router(config-int)# shutdown
Ctrl-Z
Router#
```

Step 2 Locate and remove the adapter cable to be replaced.

Step 3 Connect the new cable between the 8T-V.35 port adapter and the network connection. Tighten the thumbscrews at both ends of the cable to secure it in the ports.

Step 4 Enter Configuration mode again, bring the port back up, and save the running configuration to NVRAM.

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# int serial 3/1/0
Router(config-int)# no shutdown
Ctrl-Z
Router#

Router# copy running-config startup-config
```

These steps will prompt the system to poll the interface and recognize new interface immediately.

When you configure a port for a DCE interface for the first time, or when you set up a loopback test, you must set the clock rate for the port. When you connect a DCE cable to a port, the interface will remain down, the clock LEDs will remain off, and the interface will not function until you set a clock rate (regardless of the DCE mode default).

If you are changing the mode of the interface from DCE to DTE, you do not need to change the clock rate for the port. After you replace the DCE cable with a DTE cable and the system recognizes the interface as a DTE, it will use the external clock signal from the remote DCE device and ignore the internal clock signal that the DCE interface normally uses. Therefore, once you configure the clock rate on a port for either a DCE interface or loopback, you can leave the clock rate configured and still use that port as a DTE interface.

This completes the procedure for replacing an 8T-V.35 compact serial cable on the 8T-V.35 port adapter.

Using the EXEC Command Interpreter

Before you use the **configure** command to configure the interfaces or change an existing configuration, you must enter the privileged level of the EXEC command interpreter with the **enable** command. The system will prompt you for a password if one has been set.

The system prompt for the privileged level ends with a pound sign (#) instead of an angle bracket (>). At the console terminal, enter the privileged level as follows:

Step 1 At the user-level EXEC prompt, enter the **enable** command. The EXEC prompts you for a privileged-level password, as follows:

```
Router> enable

Password:
```

Step 2 Enter the password (the password is case-sensitive). For security purposes, the password is not displayed.

Step 3 When you enter the correct password, the system displays the privileged-mode system prompt (#) as follows:

```
Router#
```

Proceed to the following section to configure the new interfaces.

Configuring the 8T-V.35 Interfaces

If you installed a new 8T-V.35 port adapter or if you want to change the configuration of an existing interface, you must enter Configuration mode to configure the new interfaces. If you replaced a 8T-V.35 port adapter that was previously configured, the system will recognize the new 8T-V.35 port adapter interfaces and bring each of them up in their existing configuration.

After you verify that the new 8T-V.35 port adapter is installed correctly (the enabled LED goes on), use the privileged-level **configure** command to configure the new interfaces. Be prepared with the information you will need, such as the following:

- Protocols you plan to route on each new interface
- Internet protocol (IP) addresses if you will configure the interfaces for IP routing
- Whether or not the new interfaces will use bridging
- Timing source for each new interface and clock speeds for external timing

For a summary of the configuration options available and instructions for configuring a serial interface on a Cisco 7200 series router, refer to the appropriate configuration publications listed in the section "If You Need More Information" on page 2.

The following sections describe the commands for configuring an external clock signal for a DCE interface and for configuring a port for NRZI encoding or 32-bit CRC. Configuration commands are executed from the privileged level of the EXEC command interpreter, which usually requires password access. (See the section "Shutting Down an Interface" on page 30.) Refer to the description that follows and contact your system administrator, if necessary, to obtain access.

Selecting Port Adapter Slot and Serial Interface Port Numbers

The following section describes how to identify port adapter slot and serial interface port numbers.

Physical port addresses specify the actual physical location of each interface port on the router. (See Figure 22.) This address is composed of a two-part number in the format *port adapter slot number/interface port number*, as follows:

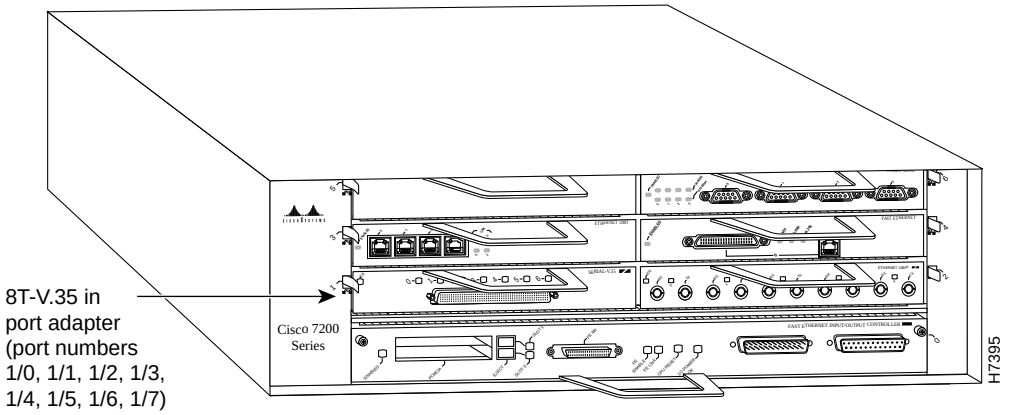
- The first number identifies the chassis slot in which the 8T-V.35 port adapter is installed.
- The second number identifies the interface ports on each 8T-V.35 port adapter, which are always numbered in sequence as interface 0 through 7.

Interface ports on the 8T-V.35 port adapter maintain the same address regardless of whether other port adapters are installed or removed. However, when you move a port adapter to a different slot, the first number in the address changes to reflect the new slot number.

Figure 22 shows the interface ports of a 8T-V.35 port adapter in slot 1 of a Cisco 7206 router. The port adapter slot numbers start with 1 and continue through 6 for the Cisco 7206 and continue through 4 for the Cisco 7204 (slot 0 is always reserved for the Fast Ethernet port on the I/O controller—if present). The individual interface port numbers always begin with 0. The number of additional ports depends on the number of ports on a port adapter. Port adapters can occupy any port adapter slot. There are no restrictions.

For example, the addresses of the interface ports on the 8T-V.35 port adapter in chassis slot 1 are 1/0 through 1/7 (chassis slot 1 and interface ports 0 through 7). If the 8T-V.35 port adapter was in port adapter slot 4, these same interface ports would be numbered 4/0 through 4/7.

Figure 22 Serial Interface Port Number Example



You can identify interface ports by physically checking the slot/port adapter/interface port location on the back of the router or by using software commands to display information about a specific interface or all interfaces in the router.

Shutting Down an Interface

Before you remove an interface that you will not replace, replace a compact serial cable, or replace port adapters, shut down (disable) the interfaces to prevent anomalies when you reinstall the new or reconfigured interface processor. When you shut down an interface, it is designated *administratively down* in the **show** command displays.

Follow these steps to shut down an interface:

Step 1 Enter the privileged level of the EXEC command interpreter. (Refer to an earlier section for instructions.)

Step 2 At the privileged-level prompt, enter Configuration mode and specify that the console terminal will be the source of the configuration subcommands, as follows:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
```

Step 3 Specify the slot/port address of the first interface that you want shut down by entering the subcommand **interface**, followed by the *type* (**serial**) and *slot/port* (port adapter slot number/0). The example that follows is for a port adapter in slot 1:

```
Router(config)# interface serial 1/0
```

Step 4 Enter the **shutdown** command, as follows:

```
Router(config-int)# shutdown
```

Step 5 To shut down additional interfaces, enter the slot/port address of each additional interface followed by the **shutdown** command. When you have entered all the interfaces to be shut down, press **Ctrl-Z** (hold down the **Control** key while you press **Z**) to exit Configuration mode and return to the EXEC command interpreter prompt, as follows:

```
Router(config-int)# int serial 1/0
Router(config-int)# shutdown
Router(config-int)# int serial 1/1
Router(config-int)# shutdown
Ctrl-Z
Router#
```

Step 6 Write the new configuration to memory, as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

The system displays an OK message when the configuration has been stored.

Step 7 To verify that new interfaces are now in the correct state (shutdown), use the **show interface serial** *slot/port* command to display the specific interface, or use the **show interfaces** command, without variables, to display the status of all interfaces in the system.

```
Router# show int serial 1/0

Serial 1/0 is administratively down, line protocol is down
  Hardware is M8T-V.35
  [display text omitted]
```

Step 8 To reenable the interfaces, repeat the previous steps, but use the **no shutdown** command in Step 4, then write the new configuration to memory, as follows:

```
Router(config)# int serial 1/0
Router(config-int)# no shutdown
Ctrl-Z
Router#

Router# copy running-config startup-config
[OK]
Router# show int serial 1/0
Serial 1/0 is up, line protocol is up
  Hardware is M8T-V.35
[display text omitted]
```

For complete descriptions of software configuration commands, refer to the publications listed in the section “If You Need More Information” on page 2.

Configuring Interfaces

Following are instructions for a basic interface configuration: enabling an interface, specifying IP routing, and setting up external timing on a DCE interface. You might also need to enter other configuration subcommands, depending on the requirements for your system configuration and the protocols you plan to route on the interface. For complete descriptions of configuration subcommands and the configuration options available for serial interfaces, refer to the appropriate software documentation.

Each 8T-V.35 port adapter contains four serial interfaces. The following steps describe a basic configuration. Press the **Return** key after each step unless otherwise noted. At any time you can exit the privileged level and return to the user level by entering **disable** at the prompt as follows:

```
Router# disable

Router>
```

Following is an example of a basic configuration procedure:

Step 1 At the privileged-level prompt, enter Configuration mode and specify that the console terminal will be the source of the configuration subcommands, as follows:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
```

Step 2 At the prompt, specify the first interface to configure by entering the subcommand **interface**, followed by the *type* (**serial**) *and slot/interface* (port adapter slot number and interface number). The example that follows is for the first interface of the first port adapter in slot 1:

```
Router(config)# interface serial 1/0
```

Step 3 If IP routing is enabled on the system, you can assign an IP address and subnet mask to the interface with the **ip address** configuration subcommand, as in the following example:

```
Router(config-int)# ip address 1.1.1.10
```

Step 4 Add any additional configuration subcommands required to enable routing protocols and set the interface characteristics.

Step 5 If you are configuring a DTE interface, proceed to Step 7. If you are configuring a DCE interface, you also need to configure the external clock signal, as described in the next step.

Step 6 Set the clock rate with the **clock rate** command. (See the section “Configuring Timing (Clock) Signals” on page 52.)

```
Router(config-int)# clock rate 72000
```

Step 7 Change the shutdown state to up and enable the interface as follows:

```
Router(config-int)# no shutdown
```

Step 8 Configure additional interfaces as required.

Step 9 When you have included all of the configuration subcommands to complete the configuration, press **Ctrl-Z** to exit Configuration mode.

Step 10 Write the new configuration to nonvolatile memory as follows:

```
Router# copy running-config startup-config
[OK]
Router#
```

This completes the procedure for creating a basic configuration.

Configuring Timing (Clock) Signals

All interfaces support both DTE and DCE mode, depending on the mode of the interface cable attached to the port. To use a port as a DTE interface, you need only connect a DTE compact serial cable to the port. When the system detects the DTE mode cable, it automatically uses the external timing signal. To use a port in DCE mode, you must connect a DCE interface cable and set the clock speed with the **clock rate** configuration command. You must also set the clock rate to perform a loopback test. This section describes how to set the clock rate on a DCE port and, if necessary, how to invert the clock to correct a phase shift between the data and clock signals.

Setting the Clock Rate

The default operation on an 8T-V.35 port adapter DCE interface is for the DCE device to generate its own clock signal (TxC) and send it to the remote DTE. The remote DTE device returns the clock signal to the DCE. The **clock rate** command specifies the rate as a bits-per-second value. In the following example, the clock rate for the serial interface on an 8T-V.35 port adapter in port adapter slot 1 (1/0) is defined as 72 kbps:

```
Router(config)# interface serial 1/0
Router(config-int)# clock rate 72000
```

Use the **no clock rate** command to remove the clock rate.

Following are the acceptable clockrate settings:

1200, 2400, 4800, 9600, 19200 38400, 56000, 64000,
72000, 125000 148000, 250000, 500000, 800000, 1000000,
1300000, 2000000, 4000000, 8000000

Inverting the Clock Signal

Systems that use long cables or cables that are not transmitting the TxC (clock) signal may experience high error rates when operating at the higher transmission speeds. If an 8T-V.35 port adapter DCE port is reporting a high number of error packets, a phase shift might be the problem. Inverting the clock may correct this shift.

When the 8T-V.35 port adapter interface is a DTE, the **invert-txc** command inverts the TxC signal it receives from the remote DCE. When the 8T-V.35 port adapter interface is a DCE, this command inverts the clock signal to the remote DTE port. Use the **no invert-txc** command to change the clock signal back to its original phase.

Inverting the Data Signal

If the interface on the 8T-V.35 synchronous serial port adapter is used to drive a dedicated T1 line that does not have B8ZS encoding (a method to avoid 15 zeros), the data stream must be inverted (both TXD and RXD) either in the connecting CSU/DSU or the interface. To invert the data stream coming out of the 8T-V.35 port adapter, use the **invert data** command.

By inverting the HDLC data stream, the HDLC zero insertion algorithm becomes a ones insertion algorithm that satisfies the T1 requirements. Be careful not to invert data both on the interface and on the CSU/DSU as two data inversions will cancel each other out.

Configuring NRZI Format

All 8T-V.35 interfaces support nonreturn-to-zero (NRZ) and nonreturn-to-zero inverted (NRZI) formats. Both formats use two different voltage levels for transmission. Both formats use two different voltage levels for transmission. NRZ signals maintain constant voltage levels with no signal transitions (no return to a zero voltage level) during a bit interval and are decoded using absolute values (0 and 1). NRZI uses the same constant signal levels but interprets the absence of data (a space) at the beginning of a bit interval as a signal transition and the presence of data (a mark) as no transition. NRZI uses relational encoding to decode signals rather than determining absolute values.

NRZ format, the factory default on all interfaces, is most common. NRZI format, which is configured with a software command, is commonly used with EIA/TIA-232 connections in IBM environments.

To enable NRZI encoding on any interface, specify the slot and port address of the interface followed by the command **nrzi-encoding [***mark***]**. Enter **Ctrl-Z** when you have finished with the configuration change. In the example that follows, the first serial port on an 8T-V.35 port adapter in port adapter slot 1 is configured for NRZI encoding:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# interface serial 1/0
Router(config-int)# nrzi-encoding
Ctrl-Z
Router#
```

To disable NRZI encoding on a port, specify the slot and port address and use the **no nrzi-encoding** command. For complete command descriptions and instructions, refer to the related software documentation.

Configuring CRCs

CRC is an error-checking technique that uses a calculated numeric value to detect errors in transmitted data. All interfaces use a 16-bit CRC (CRC-CITT) by default, but also support a 32-bit CRC. The sender of a data frame calculates the *frame check sequence* (FCS). Before it sends a frame, the sender appends the FCS value to the message. The receiver recalculates the FCS and compares its calculation to the FCS from the sender. If there is a difference between the two calculations the receiver assumes that a transmission error occurred and sends a request to the sender to resend the frame.

The default for all serial interfaces is 16-bit CRC. To enable 32-bit CRC on an interface, specify the slot and port address of the interface followed by the command **crc 32**.

In the example that follows, the first serial port on an 8T-V.35 port adapter in slot 1 is configured for 32-bit CRC:

```
Router# configure terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# interface serial 1/1
Router(config-int)# crc 32
Ctrl-Z
Router#
```

To disable CRC-32 and return to the default CRC-16 (CRC-CITT) setting, specify the slot and port address and use the **no crc 32** command. For command descriptions, refer to the related software documentation.

Checking the Configuration

After configuring the new interface, use the **show** commands to display the status of the new interface or all interfaces, and use the **ping** and **loopback** commands to check connectivity.

Using show Commands to Verify the New Interface Status

The following steps use **show** commands to verify that the new interfaces are configured and operating correctly.

Step 1 Display the system hardware configuration with the **show version** command. Ensure that the list includes the new serial interfaces.

Step 2 Display all the current interface processors and their interfaces with the **show controllers** command. Verify that the new 8T-V.35 port adapter appears in the correct slot.

Step 3 Specify one of the new interfaces with the **show interfaces** *port adapter type slot/interface* command and verify that the first line of the display specifies the interface with the correct slot number. Also verify that the interface and line protocol are in the correct state: up or down.

Step 4 Display the protocols configured for the entire system and specific interfaces with the **show protocols** command. If necessary, return to Configuration mode to add or remove protocol routing on the system or specific interfaces.

Step 5 Display the running configuration file with the **show running-config** command. Display the configuration stored in NVRAM using the **show startup-config** command. Verify that the configuration is accurate for the system and each interface.

If the interface is down and you configured it as up, or if the displays indicate that the hardware is not functioning properly, ensure that the network interface is properly connected and terminated. If you still have problems bringing the interface up, contact a service representative for assistance.

Using show Commands to Display Interface Information

To display information about a specific interface, use the **show interfaces** command with the interface type and port address in the format **show interfaces** [*type slot/port*].

Following is an example of how the **show interfaces** [*type slot/port*] command displays status information (including the physical slot and port address) for the interface you specify. In this example, most of the status information for each interface is omitted, and an 8T-V.35 serial interface in slot 1 is used. In these examples, most of the status information for each interface is omitted, and the eight serial interfaces (0–7) are in port adapter slot 1. (Interfaces are administratively shut down until you enable them.)

```
Router# sh int serial 1/0
Serial1/0 is up, line protocol is up
  Hardware is M8T-V.35
  Internet address is 1.1.1.0
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
(display text omitted]

Router# sh int serial 1/1
Serial1/1 is up, line protocol is up
  Hardware is M8T-V.35
  Internet address is 1.1.1.1
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
(display text omitted]

Router# sh int serial 1/2
Serial1/2 is up, line protocol is up
  Hardware is M8T-V.35
  Internet address is 1.1.1.2
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
(display text omitted]

Router# sh int serial 1/3
Serial1/3 is up, line protocol is up
  Hardware is M8T-V.35
  Internet address is 1.1.1.3
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
(display text omitted]

Router# sh int serial 1/4
Serial1/4 is up, line protocol is up
  Hardware is M8T-V.35
  Internet address is 1.1.1.4
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
(display text omitted]

Router# sh int serial 1/5
Serial1/5 is up, line protocol is up
  Hardware is M8T-V.35
  Internet address is 1.1.1.5
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
(display text omitted]
```

```
Router# sh int serial 1/6
Serial1/6 is up, line protocol is up
  Hardware is M8T-V.35
  Internet address is 1.1.1.6
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
(display text omitted]

Router# sh int serial 1/7
Serial1/7 is administratively down, line protocol is down
  Hardware is M8T-V.35
  Internet address is 1.1.1.7
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
(display text omitted]
```

With the **show interfaces** *type slot/port* command, use arguments such as the interface type (serial, and so forth), slot, and port number (slot/port number) to display information about a specific serial interface only.

The following example of the **show interfaces serial** *slot/port* command shows all of the information specific to the first 8T-V.35 interface port (interface port 0) in port adapter slot 1:

```
Router# sh int serial 1/0
Serial1/0 is up, line protocol is up
  Hardware is M8T-V.35
  MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec, rely 255/255, load 1/255
  Encapsulation HDLC, loopback not set, keepalive set (10 sec)
  Last input never, output 1d17h, output hang never
  Last clearing of "show interface" counters never
  Output queue 0/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     0 packets input, 0 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     24 packets output, 5137 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions     DCD=down  DSR=down  DTR=down  RTS=down  CTS=down
```

The **show version** (or **show hardware**) command displays the configuration of the system hardware (the number of each interface processor type installed), the software version, the names and sources of configuration files, and the boot images. Following is an example of the **show version** command:

```
Router# show version

Cisco Internetwork Operating System Software
IOS (tm) 7200 Software (C7200-J-M), Version 11.1(6) [rmontino 105]
Copyright (c) 1986-1996 by cisco Systems, Inc.
Compiled Sun 04-Aug-96 06:00 by rmontino
Image text-base: 0x600088A0, data-base: 0x605A4000

ROM: System Bootstrap, Version 11.1(6) RELEASED SOFTWARE

Router uptime is 4 hours, 22 minutes
System restarted by reload
System image file is "c7200-j-mz", booted via slot0

cisco 7206 (NPE150) processor with 12288K/4096K bytes of memory.
R4700 processor, Implementation 33, Revision 1.0 (Level 2 Cache)
Last reset from power-on
Bridging software.
```

```
SuperLAT software copyright 1990 by Meridian Technology Corp.
X.25 software, Version 2.0, NET2, BFE and GOSIP compliant.
TN3270 Emulation software (copyright 1994 by TGV INC).
Chassis Interface.
4 Ethernet/IEEE 802.3 interfaces.
2 FastEthernet/IEEE 802.3 interfaces.
4 Token Ring /IEEE802.5 interfaces.
12 Serial network interfaces.
1 Compression port adapter.
125K bytes of non-volatile configuration memory.
1024K bytes of packet SRAM memory.

20480K bytes of Flash PCMCIA card at slot 0 (Sector size 128K).
8192K bytes of Flash internal SIMM (Sector size 256K).
Configuration register is 0x2
```

To determine which type of port adapter is installed in your system, use the **show diag** *slot* command. Specific port adapter information is displayed, as shown in the following example of an 8T-V.35 port adapter in chassis slot 1:

```
Router# show diag 1

Slot 1:
Mueslix serial (V.35) port adapter, 8 ports
Port adapter is analyzed
Port adapter insertion time 2d09h ago
Hardware revision 255.255               Board revision UNKNOWN
Serial number     4294967295    Part number    255-65535-255
Test history      0xFF          RMA number     255-255-255
EEPROM format version 1
EEPROM contents (hex):
0x20: 01 0D FF FF FF FF FF FF FF FF FF FF FF FF FF FF
0x30: FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
```

For command descriptions and examples for the Cisco 7200 series routers, refer to the publications listed in the section “If You Need More Information” on page 2.

Using the ping Command

The *packet internet groper* (**ping**) and **loopback** commands allow you to verify that an interface port is functioning properly and to check the path between a specific port and connected devices at various locations on the network. This section provides brief descriptions of these commands. After you verify that the router has booted successfully and is operational, you can use these commands to verify the status of interface ports. Refer to the publications listed in the section “If You Need More Information” on page 2, for detailed command descriptions and examples.

The **ping** command sends an echo request out to a remote device at an IP address that you specify. After sending a series of signals, the command waits a specified time for the remote device to echo the signals. Each returned signal is displayed as an exclamation point (!) on the console terminal; each signal that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate that the connection failed.

Following is an example of a successful **ping** command to a remote server with the address 1.1.1.10:

```
Router# ping 1.1.1.10 <Return>
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 1.1.1.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the server and that the server is active (powered on), and repeat the **ping** command.

The loopback test allows you to detect and isolate equipment malfunctions by testing the connection between the 8T-V.35 port adapter interface and a remote device such a modem or a CSU/DSU. The **loopback** subcommand places an interface in loopback mode, which enables test packets that are generated from the **ping** command to loop through a remote device or interface cable. If the packets complete the loop, the connection is good. If not, you can isolate a fault to the remote device or interface cable in the path of the loopback test.

Note You must configure a clock rate on the port *before* performing a loopback test. However, if no cable is attached to the port, the port is administratively up, and the port is in loopback mode, you do not have to configure a clock rate on the port before performing a loopback test.

Depending on the mode of the port, issuing the **loopback** command checks the following path:

- When no interface cable is attached to the 8T-V.35 port adapter interface, or if a DCE cable is attached to a port that is configured as line protocol up, the **loopback** command tests the path between the network processing engine and the interface port only (without leaving the network processing and port adapter).
- When a DTE cable is attached to the port, the **loopback** command tests the path between the network processing engine and the near (network processing engine) side of the DSU or modem to test the 8T-V.35 port adapter interface and interface cable.

For complete descriptions of interface subcommands and the configuration options available for Cisco 7200 series-related interfaces, refer to the publications listed in the section “If You Need More Information” on page 2.

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You can access CCO in the following ways:

- WWW: http://www.cisco.com.
- WWW: http://www-europe.cisco.com.
- WWW: http://www-china.cisco.com.
- Telnet: cco.cisco.com.
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and baud rates up to 14.4 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact cco-help@cisco.com. For additional information, contact cco-team@cisco.com.

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This document is to be used in conjunction with the *Cisco 7000 Hardware Installation and Maintenance*, *Cisco 7010 Hardware Installation and Maintenance*, *Cisco 7505 Hardware Installation and Maintenance*, *Cisco 7507 Hardware Installation and Maintenance*, *Cisco 7513 Hardware Installation and Maintenance*, *Cisco 72xx Installation and Configuration Guide*, and *Versatile Interface Processor (VIP2) Installation, Configuration, and Maintenance* publications.

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