Doc. No. 78-1451-01

Installing the High-Density V.35 NRZI Applique and Interface Cable

Product Numbers: APP-JVNZ1, APP-LVNZ2,APP-LVNZ4, APP-LVNZ6, APP-LVNZ8, CAB-VTM, CAB-VTF, CAB-VCM, CAB-VCF

This document contains instructions for installing the high-density V.35 nonreturn to zero inverted (NRZI) applique in AGS+ routers.

Note The term *applique* is specific to AGS+ chassis hardware. An applique is a hardware unit that provides the external interface connections from your router to the network. Each applique includes connector mounting hardware, a connector port, and a printed circuit card that translates communications signals from and into the specified electrical attachment.

The following sections are included in this publication:

Product Description

The V.35 NRZI applique connects to the serial communications interface (SCI) card (which provides up to four synchronous serial ports) or to a multiport communications interface (MCI) card (which provides up to two synchronous serial ports). The applique can be set for NRZI operation, but is shipped with nonreturn to zero (NRZ) operation and external echo clock (TXCE) enabled as defaults.

This applique functions as either a data terminal equipment (DTE) interface or a data communications equipment (DCE) interface with NRZI or NRZ mode enabled. As DCE, the V.35 NRZI applique can provide the internal clock (TXC) or an external echo clock (TXCE). The cable determines the DTE or DCE interface, and jumpers on the applique determine NRZI/NRZ and TXC/TXCE.

By combining a DCE or DTE cable with jumper settings, the applique can have six modes:

- DTE in NRZI mode
- DTE in NRZ mode
- DCE in NRZI mode providing an internal clock
- DCE in NRZI mode providing an external clock
- DCE in NRZ mode providing an internal clock
- DCE in NRZ mode providing an external clock

Figure 1 shows the V.35 NRZI applique, jumpers, and jumper pin numbers.

Figure 1 V.35 NRZI Applique—Component Side

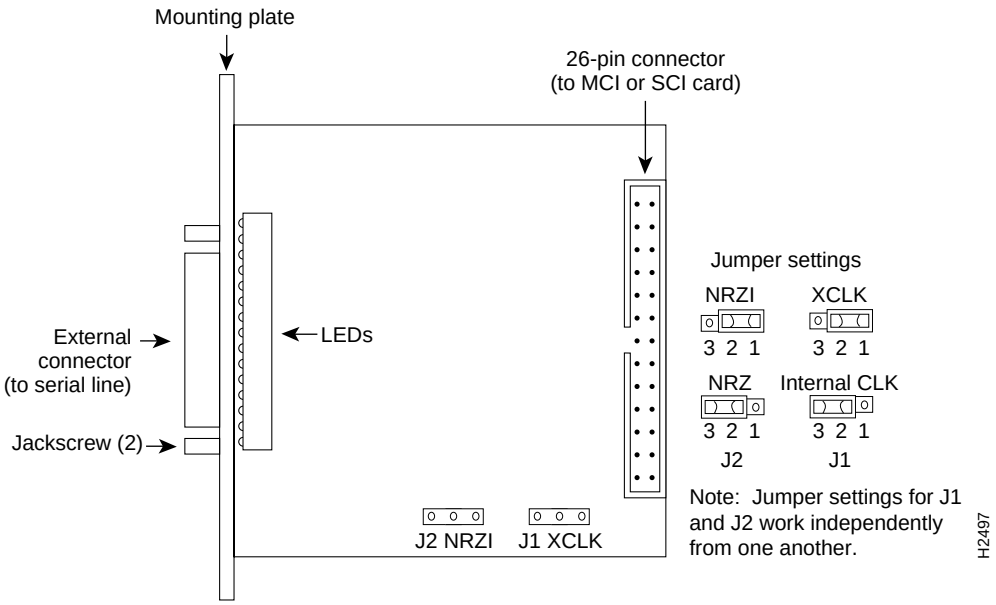


Figure 2 shows the small and large connector plates used with the V.35 NRZI applique. The V.35 NRZI applique mounts on a connector plate that attaches to the rear of the chassis. Two connector plate sizes are available: individual and large. An internal ribbon cable connects the applique to the serial network interface card (SCI or MCI) in the chassis card cage; one of these cables is used for every two appliques installed.

Figure 2 V.35 NRZI Appliques on Individual and Large Connector Plates

The V.35 NRZI applique and external interface cable options are listed by product number in Table 1 and Table 2.

Table 1 V.35 NRZI Appliques by Product Number

Product Number[1]	Mode	Plate Size	Number of Connections
APP-JVNZ1[2]	Dual	Individual	1 V.35 NRZI
APP-LVNZ2	Dual	Large	2 V.35 NRZI
APP-LVNZ4	Dual	Large	4 V.35 NRZI
APP-LVNZ6	Dual	Large	6 V.35 NRZI
APP-LVNZ8	Dual	Large	8 V.35 NRZI

1. If an individual V.35 NRZI applique is ordered, the product number APP-JVNZ1 is used.
2. VNZ = V.35 NRZI

Table 2 High-Density V.35 External Interface Cables by Product Number

Product Number	Mode[1]	Cable Gender (26-Pin to 34-Pin)
CAB-VTM	DTE	Male-to-male
CAB-VTF	DTE	Male-to-female
CAB-VCM	DCE	Male-to-male
CAB-VCF	DCE	Male-to-female

1. Each applique is shipped with the appropriate interface cable depending on the desired mode of the applique (DTE or DCE) and the cable gender required.

Configuring the V.35 NRZI Applique

The 26-pin connector is male on both (DTE and DCE) versions of the high-density V.35 cable. The V.35 NRZI applique supports DTE and DCE modes (the external cable attached to the applique determines DTE or DCE mode). The jumper settings determine NRZ or NRZI mode and external or internal clock.

V.35 NRZI Jumper Settings

Set jumpers on the applique as follows:

- To select external clock mode (XCLK), move jumper J1 to pins 1 and 2. The default is XCLK with jumper J1 on pins 1 and 2. XCLK might be required depending on the cable length and clock rate you use.
- To select NRZI mode, move jumper J2 to pins 1 and 2. The default is NRZ mode, with jumper J2 on pins 2 and 3. (Refer to Figure 1.)

V.35 NRZI Pinouts

Table 3 lists pinouts for the applique and cable when the applique is used as a DTE or DCE interface.

Table 3 V.35 NRZI Dual-Mode Applique and Cable Pinout

Applique/Cable (26-Pin Connector)		Cable (34-Pin Connector)			
DTE Pin	**DCE Pin**	**Pin**	**Signal**	**Function**	**Direction**
17, 18	17, 18	B	SGND	Signal Ground	–
23	24	C	RTS	Request to Send	To modem
24	23	D	CTS	Clear to Send	To chassis
22	25	E	DSR	Data Set Ready	To chassis
20	19	F	RLSD	Receive Line Signal Detect (Carrier Detect)	To chassis
19	20	H	DTR	Data Terminal Ready	To modem
21	22	K	LTST	Local Test (Loopback)	To modem
2	4	R	RxD+	Receive Data+	To chassis
12	14	T	RxD–	Receive Data–	To chassis
6	5	V	SCR+	Serial Clock Receive+	To chassis
16	15	X	SCR–	Serial Clock Receive–	To chassis
4	2	P	TxD+	Send Data+	To modem
14	12	S	TxD–	Send Data–	To modem
5	6	U	SCTE+	Serial Clock Transmit External+	To modem

Applique/Cable (26-Pin Connector)		Cable (34-Pin Connector)			
DTE Pin	**DCE Pin**	**Pin**	**Signal**	**Function**	**Direction**
15	16	W	SCTE–	Serial Clock Transmit External–	To modem
1	3	Y	SCT+	Serial Clock Transmit+	To chassis
11	13	a	SCT–	Serial Clock Transmit-	To chassis
–	9[1]	–	DCE/DTE	Selects DCE mode	–
–	18	–	DCE/DTE	Selects DCE mode	–

1. Pins 9 and 18 are tied together (and tied to ground through the cable) to force the applique into DCE mode when the DTE/DCE jumper on the MCI or SCI card is set for DCE and the appropriate high-density V.35 cable is used.

V.35 NRZI LEDs

Table 4 shows the 15 LEDs that indicate the status of the V.35 NRZI applique.

Table 4 V.35 NRZI Applique LED Indicators

LED Number	Color	Mnemonic DTE (DCE)	Function	Direction DTE	DCE
1	Red	RxD (TxD)	Receive Data (Transmit Data)	<—	—>
2	Red	SCR (SCTE)	Serial Clock Receive (Serial Clock Transmit External)	<—	—>
3	Red	TxD (RxD)	–	—>	<—
4	Red	SCTE (SCR)	–	—>	<—
5	Red	DTR	Data Terminal Ready	—	—>
6	Red	RTS	Clear To Send	—	—>
7	Red	RTS	Request To Send	—	<—
8	Red	DCD	Data Carrier Detect	—	<—
9	Red	LT	Software Loopback	On if configured “looped”	
10	Green	+5V	+5V present	On if OK	
11	Green	+12V	+12V present	On if OK	
12	Green	–12V	–12V present	On if OK	
13	Green	OK	Applique test OK	On if OK	
14	Green	NRZI/NRZ	NRZI selection	On for NRZI	
15	Red	DCE	Mode selection	On for DCE	

Note Depending on the chassis space available and the position of the applique, the LED pattern orientation may begin from the left or right. In every case, use the green LEDs and the single red LED (toward the end of the row) for the correct pattern orientation.

Configuring the Serial Interface

Following are the procedures for configuring the serial interface.

CSC-MCI and CSC-SCI Mode and Clocking Options

On the MCI card, jumpers W51 and W41 control the serial ports 0 and 1 in DCE mode. On the SCI card, jumpers N22, N26, N12, and N16 control the serial ports 0 through 3 in DCE mode. In addition to changing these jumpers for DCE operation, you must configure the clock rate on each serial interface of the interface card using the **clockrate** *speed* interface subcommand (where *speed* is the bit rate of the interface typically in bits per second [bps]). The applique must be DCE (or configured as DCE) to generate the clock signals.

Following is sample output of the **clockrate** *speed* command:

```
Router# configure terminal
Enter configuration commands, one per line.
Edit with DELETE, CRTL/W, and CRTL/U;end with CTRL/Z
interface serial 0
clockrate 64000
^Z
Router# write memory
[ok]
Router#
```

The **no clockrate** command removes the clock rate if you want DTE mode. Refer to the appropriate configuration and command reference publication for more information on these commands. Following are the acceptable clock rate speed settings, appearing as they are entered with the **clockrate** *speed* command:

1200, 2400, 4800, 9600, 19200, 38400, 56000, 6400, 7200, 12500, 148000, 500000, 800000, 1000000, 1300000, 2000000, and 4000000

The fastest clock rates might not work if your cable is too long. XCLK mode might be required depending on the cable length and clock rate you use.

Most DTE interfaces require a Normal External Transmit Clock signal input depending on cable length and clockrate. All DCE interfaces supply External Echo Clock (TXCE) or an Internal Transmit Clock (noninverted) signal. The MCI card clocking options are controlled by jumper areas W40 through W53, and the SCI card clocking options are controlled by jumper areas N11 through N28.

Occasionally, delays occur between the SCTE clock and the transmitted data that may push the data transition out to the point where using an inverted clock is appropriate. (Jumpers W42 and W52 for the MCI and jumpers N13, N17, N23, and N27 for the SCI are used to set the inverted clock when in DTE mode.) However, an inverted clock is not recommended.

Typical delays indicate that the inverted clock may be appropriate above 1.3 megabits per second (Mbps), depending on the DTE clock-to-data skews and setup required, and allowing some margin for temperature, cable, and other variables. Some DCE devices will not accept SCTE, so Serial Clock Transmit (SCT) must be used. Inverting the clock may be the only way to compensate for the cable length and circuit delays in the DTE and DCE.

Table 5 and Table 6 show the jumper settings for the MCI and SCI clock options, respectively. The last two columns of these tables (DTE and DCE) indicate the setting that should be used with either mode. Unless specifically noted, all products are shipped with the factory default setting to work with the DTE applique, which requires external clocking; the channel service unit/digital service unit (CSU/DSU) provides the clocking for the circuit.

Table 5 MCI Jumper Settings for Clock Options

Jumper Pair	Signal Description	Interface	DTE	DCE
W53	Normal External Transmit Clock	Serial 0	X[1]	–
W52	Inverted External Transmit Clock	Serial 0	x	–
W51	Normal Internal Transmit Clock	Serial 0	–	X
W50	Inverted Internal Transmit Clock	Serial 0	–	x
W43	Normal External Transmit Clock	Serial 1	X[1]	–
W42	Inverted External Transmit Clock	Serial 1	x	–
W41	Normal Internal Transmit Clock	Serial 1	–	X
W40	Inverted Internal Transmit Clock	Serial 1	–	x

1. X = recommended setting; x = available but not recommended.

Table 6 SCI Jumper Settings for Clock Options

Jumper Pair	Signal Description	Interface	DTE	DCE
N24	Normal External Transmit Clock	Serial 0	X[1]	–
N23	Inverted External Transmit Clock	Serial 0	x	–
N22	Normal Internal Transmit Clock	Serial 0	–	X
N21	Inverted Internal Transmit Clock	Serial 0	–	x
N28	Normal External Transmit Clock	Serial 1	X[1]	–
N27	Inverted External Transmit Clock	Serial 1	x	–
N26	Normal Internal Transmit Clock	Serial 1	–	X
N25	Inverted Internal Transmit Clock	Serial 1	–	x
N14	Normal External Transmit Clock	Serial 2	X[1]	–
N13	Inverted External Transmit Clock	Serial 2	x	–
N12	Normal Internal Transmit Clock	Serial 2	–	X
N11	Inverted Internal Transmit Clock	Serial 2	–	x
N18	Normal External Transmit Clock	Serial 3	X[1]	–
N17	Inverted External Transmit Clock	Serial 3	x	–
N16	Normal Internal Transmit Clock	Serial 3	–	X
N15	Inverted Internal Transmit Clock	Serial 3	–	x

1. X = recommended setting; x = available but not recommended.

Setting the Serial Port Mode (DTE or DCE)

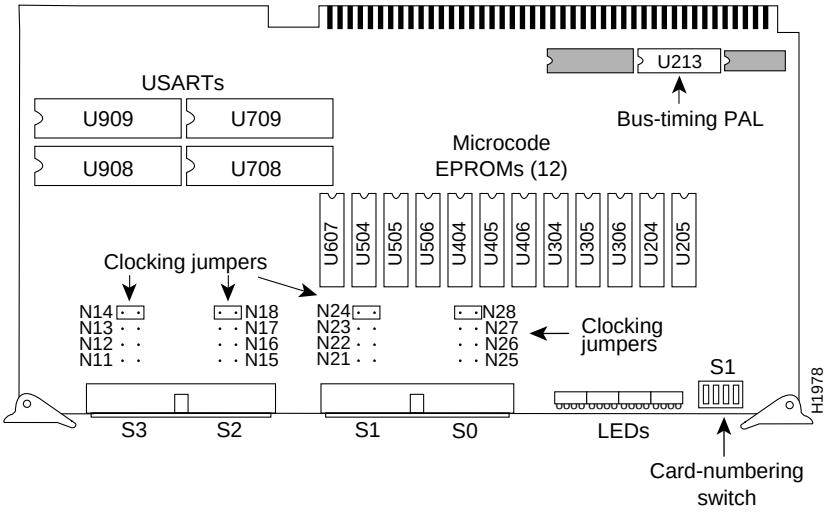
While the high-density V.35 cable determines the mode (DTE or DCE) of the applique, jumper settings on the interface card (SCI or MCI) determine the mode of the serial port clocking to your applique. The cards are shipped with the jumpers in DTE mode as a default. On the SCI card (see Figure 3), assign a serial port as DCE by changing the jumper as described in Table 7.

Table 7 SCI Jumper Settings for DCE Serial Ports

Move Jumper[1]	For Serial Port
N24 to N22	Serial 0 as DCE
N28 to N26	Serial 1 as DCE
N14 to N12	Serial 2 as DCE
N18 to N16	Serial 3 as DCE

1. The jumper positions relative to the port positions on the card appear crossed.

Figure 3 SCI Card Serial Port Jumpers



Note Attaching a V.35 NRZI applique to a modem or CSU/DSU typically requires DTE mode.

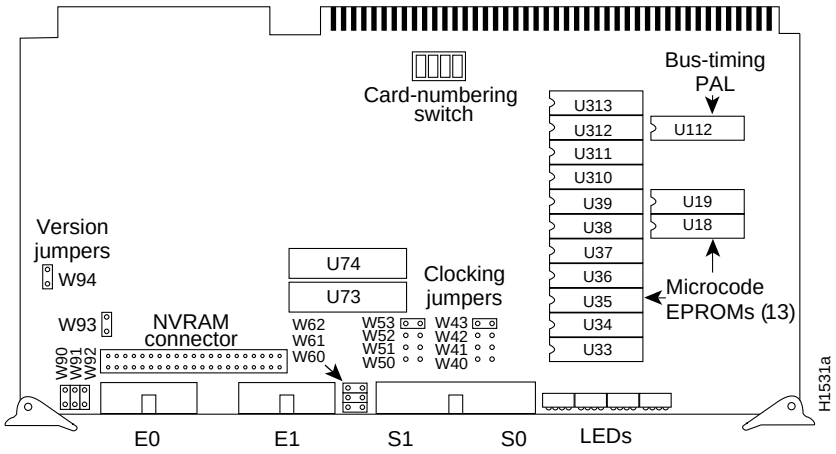
On the MCI card (see Figure 4), assign a serial port as DCE by changing a jumper as described in Table 8.

Table 8 MCI Jumper Settings for DCE Serial Ports

Move Jumper[1]	For Serial Port
W53 to W51	Serial 0 as DCE
W43 to W41	Serial 1 as DCE

1. The jumper positions relative to the port positions on the card appear crossed.

Figure 4 MCI Card Serial Port Jumpers



Installation Procedures

Following are the procedures for installing the V.35 NRZI applique.

Installation Prerequisites

Before installing the applique, ensure that your system meets the following prerequisites. If your current configuration does not meet the requirements, contact your service representative for information on hardware and software upgrades.

- You must have a high-density V.35 cable of the correct gender for the mode you are using (DTE or DCE)
- Your system must contain an MCI card with Microcode Version 1.5 or later or an SCI card with Microcode Version 1.2 or later.
- The interface card must have one configured serial port available for each applique to be installed.
- To run in NRZI mode, the system must be running Internetworking Operating System (IOS) 10.0(5) or later.

Required Parts and Tools

Following are the parts required for these procedures. If any of these parts are missing or appear damaged, contact your service representative.

- V.35 NRZI applique with attached faceplate
- One of the following four high-density V.35 cables for each applique to be installed: CAB-VTM, CAB-VTF, CAB-VCM, or CAB-VCF (see Table 2)

Note One of these cables is included with each applique shipped. The type of cable shipped is based on what applique mode was ordered and your site requirements.

- Ribbon cable for the internal connection between the applique and the serial interface card (one ribbon cable for every two appliques is included)
- ESD preventive wrist strap (a disposable wrist strap is included with the applique to prevent damage to equipment from electrostatic discharge)

Following are the tools required for these procedures:

- Number 1 and number 2 Phillips screwdrivers
- One medium, flat-blade screwdriver and one 3/16-inch nut driver

Preventing Electrostatic Discharge Damage

Electrostatic discharge damage (ESD) occurs when electronic printed circuit cards are improperly handled, and can result in complete or intermittent failures. ESD can impair electronic circuitry and equipment. Follow ESD prevention procedures when removing and replacing cards.

Following are steps for handling printed circuit cards:

Step 1 Slip on an ESD-preventive wrist strap, ensuring that it makes good skin contact.

Step 2 Connect the strap to an unpainted surface of the chassis frame or another proper grounding point or surface to safely channel unwanted ESD voltages to ground.

Step 3 Use the ejector levers to remove the card. Handle the card by its sides. Place the card on an antistatic surface or in a static shielding bag. To prevent further damage to the card by ESD voltages, defective cards must remain in the static shielding bag when returned for repair or replacement.

Step 4 Handling the new card by its edges only, insert it into the chassis. Avoid contact between the card and clothing. The wrist strap only protects the card from ESD voltages on the body; ESD voltages on clothing can still damage the card.

Caution For safety, use an ohmmeter to check the ESD-preventive wrist strap to ensure that the resistor is providing proper ESD protection. The measurement should be between 1 and 10 mega ohms.

Warning To prevent electrical shock hazard, use extreme caution around the chassis since potentially harmful voltages are present.

Accessing the Chassis Interior

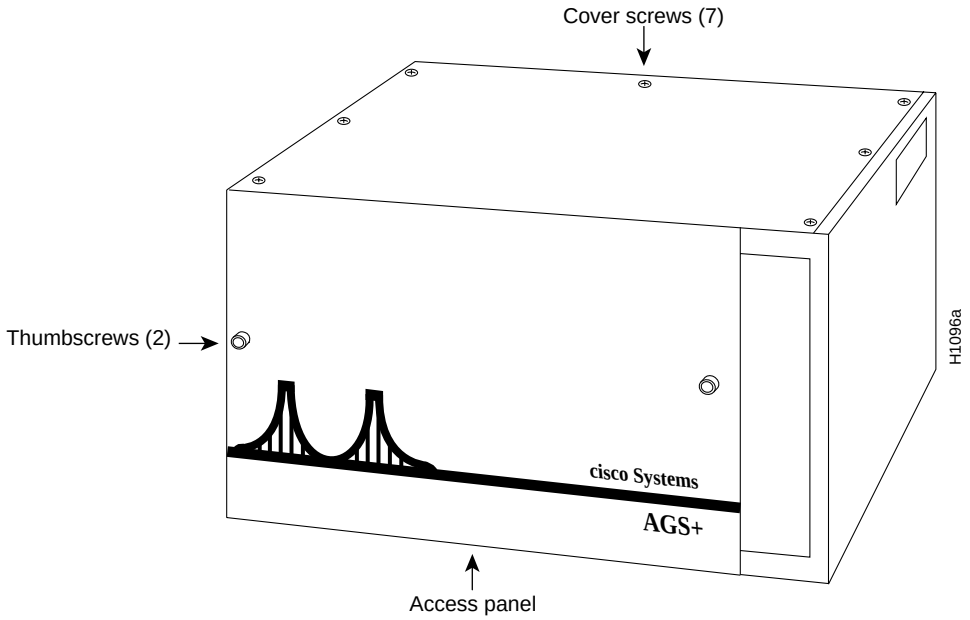
The AGS+ chassis has four large mounting plates and one large individual connection area with space for six individual mounting plates. The console port connector uses one of the individual mounting plate spaces, leaving five plates available for other applique attachments. The large mounting plates are used for multiple or large applique attachments. When ordering a replacement from the factory, specify the mode of the applique (which determines which cable is shipped with the applique) and the mounting plate size that you require. (See Table 1.)

Note Newer chassis have more screws than shown in Figure 5. There may be 5 thumbscrews and 14 cover screws.

Following is the procedure for accessing the AGS+ chassis interior:

Step 1 On the front access panel, loosen (but do not attempt to remove) the thumbscrews and pull the panel off the chassis. (See Figure 5.)

Figure 5 AGS+ Chassis Front Access Panel and Cover Screws



Step 2 Locate and remove the screws securing the top panel to the chassis.

Step 3 Lift the top cover up and away from the chassis.

Proceed to “Installing the V.35 NRZI Applique” on page 12.

Installing the V.35 NRZI Applique

Following is the procedure for installing the V.35 NRZI applique and cable.

Step 1 Turn off power to the chassis and unplug the power cord.

Step 2 On the rear of the chassis, remove the appropriate blank plate. Set the screws aside. (See Figure 6.)

Figure 6 Typical Installation

Step 3 Place the new mounting plate (with the attached V.35 NRZI applique) on the inside of the chassis against the opening.

Step 4 Position the applique with the LEDs facing out and below the connector.

Step 5 Secure the new applique with the screws you removed from the blank plate.

Step 6 Connect an internal ribbon cable between the 26-pin connector on the applique and the appropriate serial connector on the SCI or MCI card in the chassis card cage. Route the cable under the system card cage and up to the card in the front of the chassis. The connector is keyed to prevent improper insertion at the interface card. Do not stress the cable at the applique or serial connector.

Caution If you are installing more than one applique, use the 26-pin ribbon cable connector with the color coded edge as *serial 0* (n) and the second connector as *serial 1* (n+1).

Step 7 Attach the smaller end of the V.35 cable to the connector on the applique. Attach the larger end (standard V.35 female) to the network segment.

Verifying the Installation

Following is the procedure for verifying the installation:

Caution To prevent the chassis overheating while you perform the following steps, apply power only long enough to check for proper operation.

Step 1 Connect the power cable and turn ON the power to the chassis.

Step 2 For DCE only—Set the clock rate for the new interface using the **configure terminal** command and set the desired clock rate using the **clockrate** command. (See the section “CSC-MCI and CSC-SCI Mode and Clocking Options” on page 6.)

Note If the new applique is set for DCE mode, the red DCE LED goes on and remains on during operation only if a DCE cable is attached. (See Table 4.)

Step 3 After the system boots up, verify the correct mode of the newly installed interface by using the **show controller mci** command.

Following is sample output of these commands (serial 0 and DTE mode are used in the examples). The important information is contained in the last line, which indicates the type and mode of serial interface attached:

```
Router# show controller mci
MCI 0, controller type 1.1, microcode version 1.11
  128 Kbytes of main memory, 4 Kbytes cache memory
22 system TX buffers, largest buffer size 1520
  Restarts: 0 line down, 0 hung output, 0 controller error
  Interface 0 is Serial0, electrical interface is V.35 DTE NRZI
```

Note Much more information than is shown in these examples will be displayed, but has been excluded for clarity.

Step 4 After you verify the correct mode, show the port status by using the **show interface serial** *number* command (where *number* refers to the interface number of the newly installed serial port and applique).

In the following example, the important information is in the first line, which indicates the state of the newly installed serial interface; the interface should be up if everything is connected and configured correctly:

```
Router# show interface serial 0
Serial 0 is up, line protocol is up
  Hardware is MCI Serial
```

Note An installation/configuration problem or an error condition exists if no LED indicators go on at power-up or after initialization, or if the newly installed interface is not seen by the system. If this happens, check that all cards and cables are firmly seated. If a second power-up attempt fails, contact your service representative.

Completing the Installation

When the installation check is successful, all LEDs on the applique should be on except for the loopback LED (unless loopback has been configured through software). The DCE LED should be on if a DCE cable is used, and the NRZI LED should be on if the NRZI jumper set.

Step 1 Turn OFF the power and unplug the chassis.

Step 2 Replace and secure the chassis cover.

Step 3 Affix the new serial interface labels (Serial 0 and so forth) below the appropriate connector on the rear of the chassis and to the internal interface ribbon cables.

The system is ready to be installed in the network.

Error Conditions

Following are examples of possible error conditions and symptoms:

- If the applique is configured for NRZI mode and the line is set for NRZ, the interface will be up, but the line protocol will be down. In this case, check jumper settings.
- If the applique is set for DCE, but the clock rate is not set, the clock and data LEDs will not go on.
- If the cable is DTE but the MCI or SCI jumpers are set for DCE, the LEDs will not appear as they should and the interface will stay down.
- If the internal cable is not connected, the interface will not be up, the line protocol will be down, and no LEDs will be on.
- If the external cable is not connected, the interface might be up but the line protocol will be down, and the LEDs will not appear as they should.

If it becomes necessary to reconfigure a single applique after it is installed, power down the chassis, attach ESD protection, remove the chassis cover, and use a 3/16-inch nut driver to remove the strain-relief nuts that secure the individual applique to the mounting plate. With these nuts removed, the applique may be pulled out of the mounting plate, reconfigured, and reattached without having to remove the entire rear plate assembly or disconnect any interior cables.

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