APPENDIX A

Cabling Specifications

The following appendix lists the pinouts for Ethernet, Token Ring, and synchronous serial appliques, and signal summaries for assorted cables.

Note All pins not specifically listed are not connected.

Following is a list of the pinouts and signal summaries contained in this appendix:

- CPU console port wiring scheme
- CPU auxiliary port wiring scheme
- Dial-on-demand cable requirements
- Applique and cable pinouts
  - Ethernet 10BaseT pinout
  - Ethernet AUI pinout
  - Token Ring pinouts
  - Serial pinouts
- Optical bypass switch pinout

CPU Console Port Wiring Scheme

By default, the console ports on the processor cards are wired for data communications equipment (DCE). Both DSR and DCD are active when your system is running. The RTS signal tracks the state of the CTS input. The console port does not support hardware flow control. The console port uses a female DB-25 connector. Table A-1 lists the DCE wiring scheme for the console port.

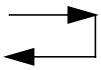

Table A-1 CPU Console Port RS-232 DCE Wiring Scheme

Pin	Signal	Description
1	GND	Ground
2	TxD (in)	Transmit Data
3	RxD (out)	Receive Data
4	RTS	Ready To Send
5	CTS	Clear To Send
6	DSR (out)	Data Set Ready
7	GND	Ground
8	DCD (out)	Data Carrier Detect

CPU Auxiliary Port Wiring Scheme

An auxiliary port is (optionally) supported for all processors. This is a data terminal equipment (DTE) port on the processor card (CSC/3 and CSC/4) to which an RS-232 port from a channel service unit/digital service unit (CSU/DSU) or protocol analyzer can be attached for access from the network.

The auxiliary port shares the ribbon cable between the processor card and the console port. The console-port end of the cable is split, so it has two DB-25 connectors at the connector-panel end: one for the console port and one for the auxiliary port. The processor-card end of the cable has one 50-pin ribbon connector, which connects to the console cable port on the processor card. The auxiliary port uses a male DB-25 connector. Table A-2 lists the signals used on this port.

Table A-2 CPU Auxiliary Port RS-232 DTE Wiring Scheme

Pin	Signal	Description
2	TxD (out)	Transmit Data
3	RxD (in)	Receive Data
7	Signal Ground	–
20	DTR (out)[1]	Data Terminal Ready
24	TxClk (out)	Transmit Clock

1. Both DTR and RTS are active when your system is running. Modem control signals are ignored. The auxiliary port does not support hardware flow control.

Dial-on-Demand Cable Requirements

To use the dial-on-demand feature (discussed in the *Router Products Configuration Guide* publication) with some synchronous modems, you might need special cable modifications. If your modem follows the V.25 bis specification and raises Data Set Ready (DSR), a cable modification is required to swap DSR with Data Carrier Detect (DCD or CD). If your modem ignores the V.25 bis specification and raises DCD, no cable modifications are required. Figure A-1 shows the configuration for the RS-232 cable, and Figure A-2 shows the configuration for the HD V.35 cable.

For the RS-232 cables, swap pin 6 (DSR) with pin 8 (CD) at either end.

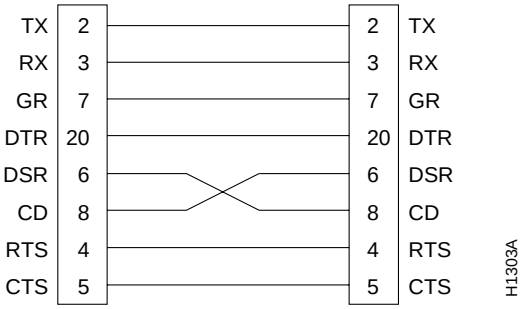

Figure A-1 RS-232 Cable Configuration for Dial on Demand

Receive Line Signal Detect (RLSD) is the HD V.35 equivalent of CD. For the high-density (HD) V.35 cables, swap pin E (DSR) with pin F (RLSD) at the standard V.35 end, or swap pin 20 (DSR) with pin 22 (RLSD) at the HD end.

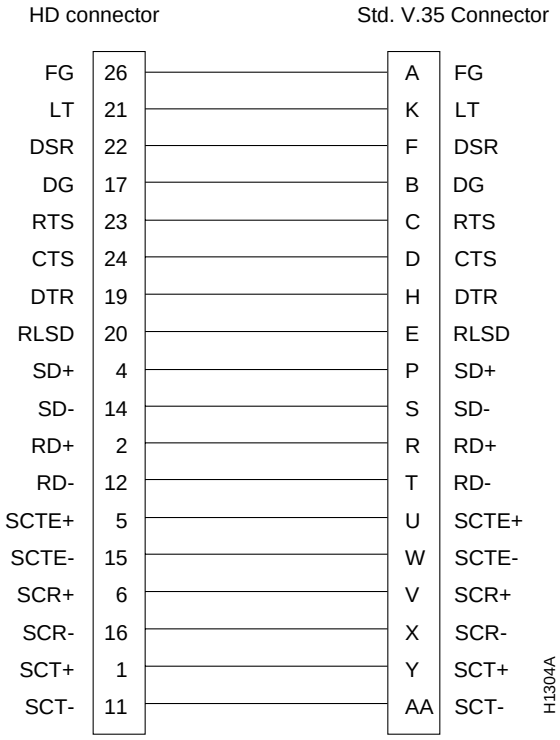

Figure A-2 HD V.35 Cable Configuration for Dial on Demand

Applique and Cable Pinouts

As you use your router, it may become necessary to modify, build, or repair cables, and this appendix provides the pinouts you will need. If an applique contains jumpers that allow any modifications of the applique, that information also is included.

Ethernet and Token Ring Appliques

The next three sections cover Ethernet and Token Ring appliques. The following appliques are included: Ethernet 10BaseT, Ethernet AUI, Token Ring.

Ethernet 10BaseT Pinout

The Ethernet 10BaseT applique (see Figure A-3) combines an RJ-45 connector for direct connection to an unshielded twisted-pair (UTP) network segment and a UTP transceiver. The 10BaseT applique is compliant with IEEE 802.3. The pinout for the 10BaseT RJ-45 connector is listed in Table A-3.

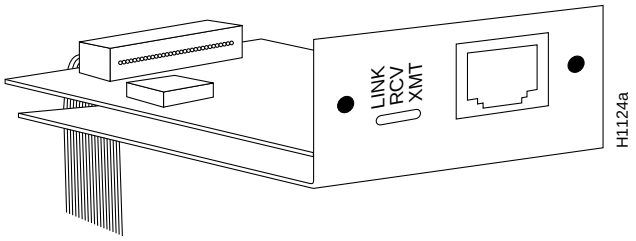

Figure A-3 10BaseT Ethernet Transceiver Applique

Table A-3 10BaseT RJ-45 Connector Pinout

Pin	Signal Name
1	TD+
2	TD–
3	RD+
4	Not used
5	Not used
6	RD–
7	Not used
8	Not used

Ethernet AUI Pinout

An attachment unit interface (AUI) transceiver must be used with most Ethernet products. (The 10BaseT transceiver applique is an exception to this.) Transceivers are available from a variety of sources for thick LAN, thin LAN, twisted-pair Ethernet, and other media. Table A-4 lists the Ethernet AUI pinout.

Table A-4 Ethernet (AUI) Pinout

Pin	Circuit	Description
3	DO-A	Data Out Circuit A
10	DO-B	Data Out Circuit B
11	DO-S	Data Out Circuit Shield[1]
5	DI-A	Data In Circuit A
12	DI-B	Data In Circuit B
4	DI-S	Data In Circuit Shield
7	CO-A	Control Out Circuit A[1]
15	CO-B	Control Out Circuit B[1]
8	CO-S	Control Out Circuit Shield[1]
2	CI-A	Control In Circuit A
9	CI-B	Control In Circuit B
1	CI-S	Control In Circuit Shield
6	VC	Voltage Common
13	VP	Voltage Plus
14	VS	Voltage Shield[1]
Shell	PG	Protective Ground

1. Not used.

Twisted-Pair Cabling

There are several types of twisted-pair cable. Unshielded twisted-pair (UTP) cable should be 26 to 22 American wire gauge (AWG)—0.4- to 0.6-millimeter (mm)—wire in a multiwire cable with 100-ohms impedance. The 802.3 specification states that the maximum length of a 10BaseT link segment is 100 meters or 328 feet of UTP wiring. *Do not exceed these limits*.

If you are *not* connected to a hub, and another 10BaseT transceiver applique is connected to the opposite end of your link, the UTP cabling must be crossed as shown in Figure A-4. The RD– and RD+ signals must be swapped with the TD– and TD+ signals. When the opposite end of your link is connected to a hub, the hub performs this crossover function, and it is not necessary to cross the cables.

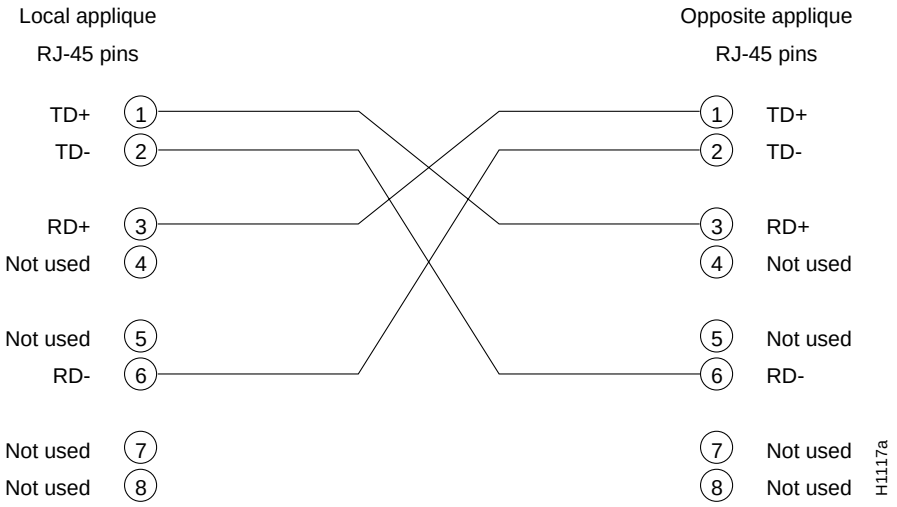

Figure A-4 Applique-to-Applique UTP Cable Diagram

Token Ring Pinouts

The pinout for the Token Ring applique used with the CSC-1R, CSC-2R, and CSC-R16M cards is listed in Table A-5. The pinout for the Token Ring applique (APP-LTR2) used with the CSC-C2CTR cards is listed in Table A-6.

Table A-5 CSC-1R, CSC-2R, and CSC-R16M Token Ring Applique Pinout

Pin	Signal
1	Receive0/R1–
2	Receive0/G6+
8	Transmit0/B9+
9	Ring Transmit0/O5–

Table A-6 CSC-C2CTR Token Ring Applique Pinout (APP-LTR2)

Pin	Signal
1	Ring-In B
5	Ring-Out A
6	Ring-In A
9	Ring-Out B
10, 11	Ground

Serial Applique Pinouts

The following sections discuss the pinouts and jumpers for the following serial appliques and cables. In the serial pinout tables, the symbols <— and —> indicate signal direction with respect to DCE and DTE devices. For example, "DCE <— DTE" means *this signal is from DTE to DCE*.

- G.703 (no pinout necessary)
- HD V.35 NRZI dual mode (DCE or DTE)
- HD V.35 dual mode (DCE or DTE)
- High-Speed Serial Interface (HSSI)
- RS-232 (DCE and DTE)
- RS-232 Synchronous Data Link Control (SDLC) dual mode (DCE or DTE)
- RS-449 (DCE and DTE)
- X.21 dual mode (DCE or DTE)
- X-21 to RS-449 adapter cable

G.703 Applique

The G.703 network interface is the output port, consisting of two BNC connectors (TX and RX), adjacent to the approval symbol. The input port is connected by a ribbon cable to either a CSC-MCI or CSC-SCI interface card. Clock (timing) for the G.703 applique is derived from the network input at approximately 2048 kilobits per second (Kbps) (E1 speed). The G.703 supports only DTE. You must use two 75-ohm coaxial cables, of diameter 5mm, terminated in male BNC connectors, with maximum cable attenuation of 6 decibels (dB) at 1024 kilohertz (KHz). Attenuation characteristics should follow the *root f law.* The outer conductor is isolated from system earth. A total of six G.703 appliques can be mounted on a ladder plate, or a single applique can be mounted on an individual plate. Figure A-5 shows the layout of the G.703 applique.

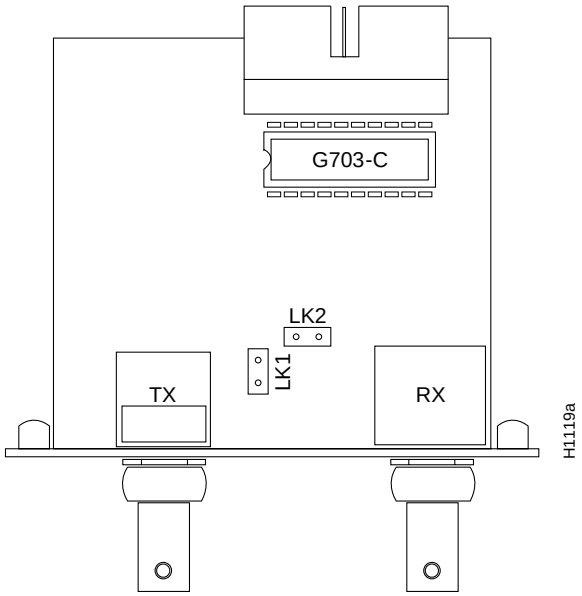

Figure A-5 G.703 Applique—Component-Side View

Safety Warnings and Requirements for the G.703

These warning notices apply to the Input Port, the port marked "SAFETY WARNING: see instructions for use."

Warning The port marked "SAFETY WARNING: see instructions for use" does not provide isolation sufficient to satisfy the requirements of BS6301; apparatus connected directly to this port should either have been approved to BS6301 or have previously been evaluated against British Telecommunications PLC (Post Office) Technical Guides 2 or 26 and given permission to attach. Any other usage will invalidate the approval of the Applique.

Warning Interconnection of the applique Input Port (the port marked "SAFETY WARNING: see instructions for use"), directly, or by way of any other apparatus, with ports on other apparatus (marked or not so marked) may produce hazardous conditions on the network. Users should seek advice from a competent engineer before making such a connection.

Warning The applique is approved as Independent of Host. As such, the applique is only approved for use with a host and with host attachments that are either type approved in their own right, or, if supplied after 1st March 1989, are covered by the terms of the General Approval number NS/G/1234/J/100003. A Host supplied under the terms of the General Approval number NS/G/1234/J/100003 satisfies the conditions of the paragraphs above.

Warning The applique must not be modified in any way. Any form of modification invalidates the approval for connection and the warranty of the unit. The applique approval label must be visible externally. The approval label must not be detached from the applique, nor attached to the host. The terms of the approval require that there must be a minimum distance (5 mm) between the applique and any other part of the host, including other appliques. This condition is met by default when the applique is installed in a chassis in accordance with the instructions.

Warning If voltages greater than 250V are present in the host, users should refer to a competent safety engineer for advice. It is a condition of the approval that a copy of these user instructions and safety warnings must be supplied with the host. Failure to provide the applique user instructions with the host will invalidate the applique approval. Failure to install the applique in accordance with these instructions will invalidate the approval. If you experience difficulties, or are in any doubt, contact a customer service representative.

HD V.35 NRZI Dual-Mode Applique

The high-density (HD) V.35 NRZI applique uses a 26-pin female HD connector that mates with a male 26-pin connector on the V.35 cable. The other end of the cable is a larger 34-pin connector, which carries the male or female configuration. The cable used determines the mode (DCE or DTE) of the applique. (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.)

Table A-7 lists pinouts for the HD V.35 NRZI applique (and cable) when used as a DCE or DTE interface. The HD V.35 NRZI applique and external interface cable options are listed by product number in Table A-8 and Table A-9, respectively.

Table A-7 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
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.

Table A-8 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 A-9 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.

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 A-6.)

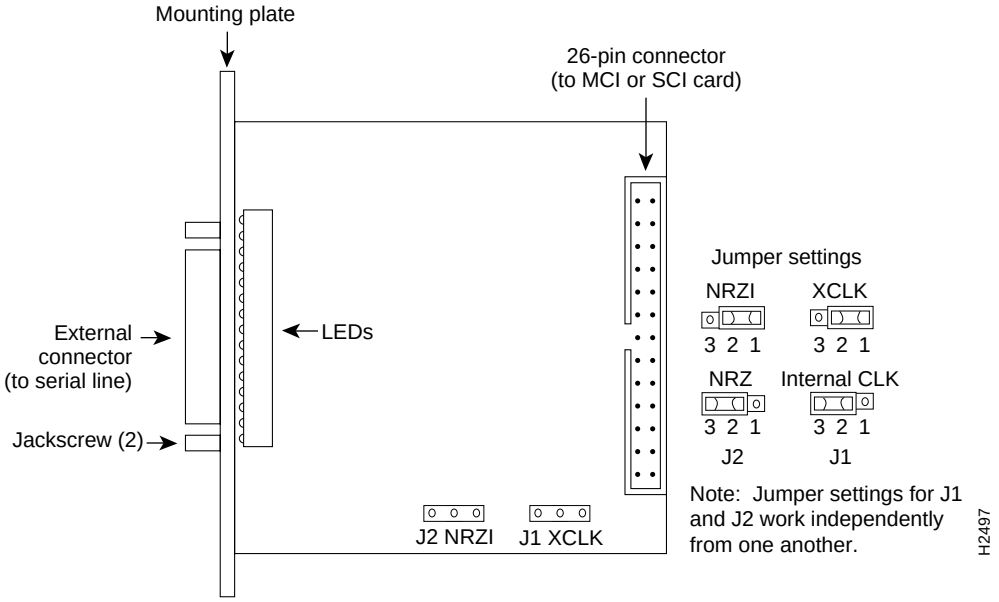

Figure A-6 HD V.35 NRZI Applique—Component Side

HD V.35 Dual-Mode Applique

The high-density (HD) V.35 applique carries the same signals as the old-style V.35 applique, but provides them on a smaller 26-pin HD connector (the old-style applique used a 38-pin connector). The smaller 26-pin connector is male on all four versions of the HD V.35 cable, and the larger 34-pin connector on each cable carries the male or female configuration. The cable used determines the mode of the applique. Table A-10 lists the pinout for the HD V.35 applique (and cable) when used as a DCE or DTE interface. The HD V.35 applique and external interface cable options are listed by product number in Table A-11 and Table A-12, respectively.

Table A-10 HD V.35 Dual-Mode Applique and Cable Pinout

Applique/Cable (26-Pin Connector)			Cable (34-Pin Connector)		
Pins	Direction DCE DTE	Pins	Pins	Mnemonic	Function
26	–	26	A	FG	Frame Ground
17	–	17	B	SG	Signal Ground
24	<—	23	C	RTS	Request To Send
23	—>	24	D	CTS	Clear To Send
25	—>	22	E	DSR	Data Set Ready
19	—>	20	F	RLSD	Receive Line Signal Detect (Carrier Detect)
20	<—	19	H	DTR	Data Terminal Ready
22	<—	21	K	LT	Local Test (Loopback)
4	—>	2	R	RD+	Receive Data+
14	—>	12	T	RD–	Receive Data–
5	—>	6	V	SCR+	Serial Clock Receive+
15	—>	16	X	SCR–	Serial Clock Receive–
2	<—	4	P	SD+	Send Data+
12	<—	14	S	SD–	Send Data–
6	<—	5	U	SCTE+	Serial Clock Transmit External+
16	<—	15	W	SCTE–	Serial Clock Transmit External–
3	—>	1	Y	SCT+	Serial Clock Transmit+
13	—>	11	a	SCT–	Serial Clock Transmit–
9[1]	–	9	–	DCE/DTE	Selects DCE mode
18[1]	–	18	–	DCE/DTE	Selects DCE mode

1. Pins 9 and 18 are tied together to force the applique to be DCE when the DTE/DCE jumper on the MCI or SCI card is set for DCE, and the appropriate cable is used.

Table A-11 HD V.35 Appliques by Product Number

Product No.	Mode[1]	Plate Size	Number of Interfaces
APP-JX1	Dual	Individual	1 HD V.35
APP-LX2	Dual	Long	2 HD V.35
APP-LX4	Dual	Long	4 HD V.35
APP-LX6	Dual	Long	6 HD V.35
APP-LX8	Dual	Long	8 HD V.35

1. If an individual DTE HD V.35 applique is ordered, the product number APP-IX1 is used (X = HD V.35). The mode of the applique must be indicated as DTE or DCE so that the appropriate cable can accompany the applique. If an individual applique without a mounting plate is required, use APP-X=.

HD V.35 Cables

Table A-12 lists the four external interface cables available for the HD V.35 applique and provides the product numbers. The HD V.35 supports both DTE and DCE modes; the external HD V.35 cable attached to the applique determines this mode. The cable has a 26-pin male connector on one end and a 34-pin male or female connector on the other end.

Table A-12 HD V.35 External Interface Cables by Product Number

Product No.	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 mode of the applique (DTE or DCE) and the cable gender required.

The HD V.35 applique has only one jumper (JP1), which selects Serial Clock Transmit Internal (SCT) (from the chassis) or Serial Clock Transmit External (SCTE) (to the chassis) as the timing source for Signal Detect (SD) when the applique is in DCE mode. The default is SCTE (for DTE mode), which is selected when the JP1 jumper is in. To select SCT (for DCE mode), remove the jumper. The cable used determines the mode of the applique. The HD V.35 applique is illustrated in Figure A-7.

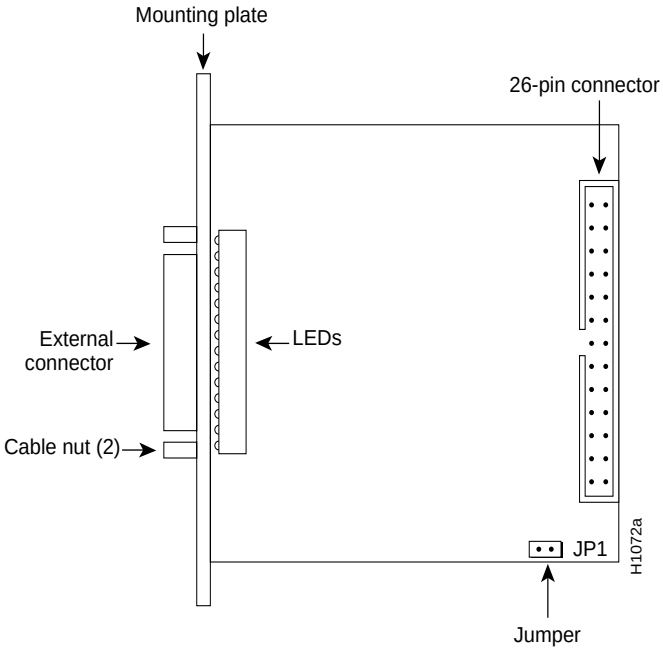

Figure A-7 HD V.35 Applique—Bottom View

High Speed Serial Interface

The High-Speed Serial Interface (HSSI) is used with the High-Speed Communications Interface (HSCI) card and the high-speed serial applique (APP-LHS). These devices comply with the EIA/TIA-613 electrical specification. There are no user-configurable jumpers on the HSCI card or APP-LHS applique; however, the HSSI null modem cable is discussed, and its pinout is listed in the following sections.

HSSI Null Modem Cable

Table A-13 lists the pinouts for a null modem cable, which uses 50-pin male connectors, and is used with HSSI. The null modem cable can directly connect two routers back to back; the two routers must be in the same location, and both must be DTE devices. This setup allows you to verify the operation of the HSSI or to directly link the routers in order to build a larger node. To connect two routers, attach a null modem cable between the HSSI ports. You must then turn on the internal transmit clock in both routers with the following command:

```
hssi internal-clock
```

Configure each HSSI port in the router (and all other routers with HSSI ports) with this command. When the internal clock has been turned on in a router, the yellow send timing (ST) indicator on the applique lights. When the internal clock has been turned on in both routers (each end), the ST and receive timing (RT) indicators light up on each router.

When you disconnect the null modem cable, use the following command to disable the internal transmit clock:

```
no hssi internal-clock
```

Use this command to turn off the transmit clock for each port on both routers.

Table A-13 HSSI Interface Cable Pinout

DTE	DTE	Direction DTE DCE	Signal Mnemonic and Name	
1	26	–	SG	Signal Ground
2	27	<—	RT	Receive Timing
3	28	<—	CA	DCE Available
4	29	<—	RD	Receive Data reserved
5	30	<—	LC	Loopback Circuit C
6	31	<—	ST	Send Timing
7	32	–	SG	Signal Ground
8	33	—>	TA	DTE Available
9	34	—>	TT	Terminal Timing
10	35	—>	LA	Loopback Circuit A
11	36	—>	SD	Send Data
12	37	—>	LB	Loopback Circuit B
13	38	–	SG	Signal Ground
14–18	39–43	—>	5	Ancillary *to* DCE
19	44	–	SG	Signal Ground
20–24	45–49	<—	5	Ancillary *from* DCE
25	50	–	SG	Signal Ground

RS-232 DCE and DTE Appliques

The RS-232 DCE and DTE appliques have either a female (for DCE) or male (for DTE) 25-pin D-type connector. The mode is fixed for each and printed on the applique. (See the DTE applique in Figure A-8.) The internal ribbon cable attaches to the 26-pin connector. Table A-14 lists the pinouts for the RS-232 DCE and DTE appliques.

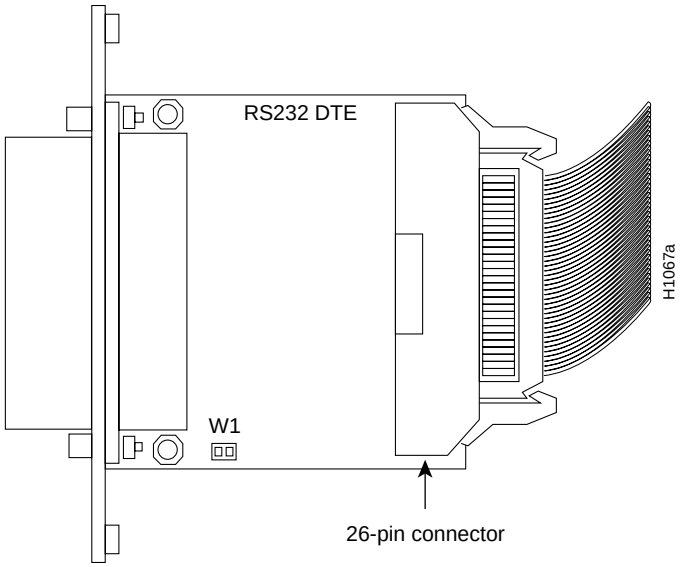

Figure A-8 RS-232 DTE Applique—Component-Side View

Table A-14 RS-232 DCE and DTE Applique Pinouts

Pins	Direction DCE DTE	Mnemonic	Function
3	—>	RxD	Receive Data
17	—>	RxC (SCR)	Receive Clock
2	<—	TxD	Transmit Data
15	—>	TxC (SCT)	Transmit Clock
20	<—	DTR	Data Terminal Ready
4	<—	RTS	Ready To Send
5	—>	CTS	Clear To Send
8	—>	CD	Carrier Detect
9	<—	LL	Local Loopback
6	—>	DSR	Data Set Ready
24	<—	TT (SCTE)	Serial Clock Transmit External
1	–	Chassis GND	Ground
7	–	Signal GND	Ground

Older RS-232 Appliques

Very early MCI cards were shipped with an RS-232 DTE applique assembly designed by a third-party vendor. These older appliques, marked *SCO-232*, do not have any LEDs. If you are using this RS-232 DTE applique assembly on the other side of a link, the applique has Carrier Detect (CD) on pin 6, which is contrary to current RS-232 specifications. When using this applique with an RS-232 DCE applique assembly, you must use a cable adapter or breakout box to change the cable as shown in Figure A-9. All other signals on the 25-pin cable should be straight through.

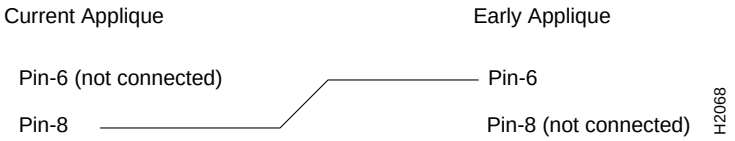

Figure A-9 Cable Change Required When Using Older RS-232 Applique

RS-232 SDLC Dual-Mode Applique

The Synchronous Data Link Control (SDLC) nonreturn to zero inverted (NRZI) applique has a female 25-pin D-type connector. An internal ribbon cable attaches to the 26-pin connector. (See Figure A-10.) Jumpers J1 and J2 set the mode (DCE or DTE); J3 sets the nonreturn to zero function; and J4 has no user function (default position is on pin 1 and 2). (See Table A-15.) Table A-16 lists the pinout for the SDLC DCE applique and the crossover cable required when the SDLC applique is used in DTE mode.

Warning To avoid permanent damage to the SDLC applique, *do not connect the internal ribbon cable from the interface card to the applique, while power is on to the chassis*. Turn off the power to the chassis *before* connecting this ribbon cable.

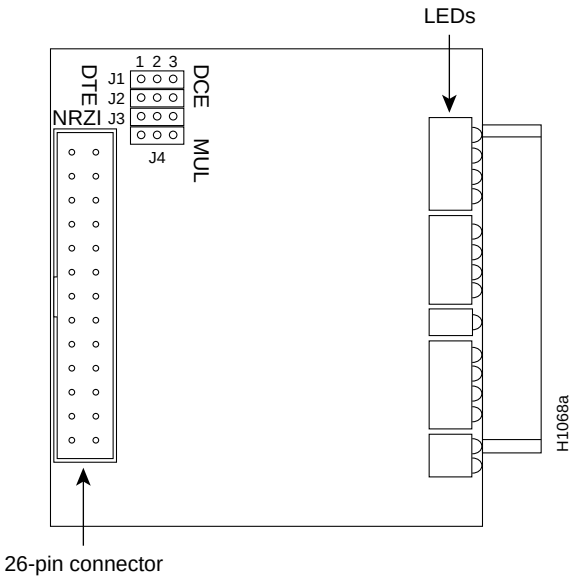

Figure A-10 SDLC Applique—Component-Side View

Table A-15 RS-232 SDLC Applique Jumpers

Jumper Pin Numbers				
Jumper	**1**	**2**	**3**	**Function**
J1	Jumpered		Out	DTE[1]
J2	Jumpered		Out	
J1	Out	Jumpered		DCE
J2	Out	Jumpered		
J3	Jumpered		Out	NRZI
J3	Out	Jumpered		NRZ
J4	Jumpered		Out	Default[2]

1. Using the SDLC applique for DTE requires a crossover cable that grounds pin 11 of the applique for DTE selection. (See Table A-16.)
2. Leave J4 in the default position.

Table A-16 Pinout for the SDLC DCE Applique and the Crossover Cable

SDLC DCE Applique and Router End of the Crossover Cable (DTE)		**Network End of the Crossover Cable (DCE)**	
DB-25 Male		**DB-25 Female**	
Mnemonic	**Pin**	**Mnemonic**	**Pin**
Shield	1	Shield	1
TxD	2	RxD	3
RxD	3	TxD	2
RTS	4	CTS	5
CTS	5	RTS	4
DSR	6	LTST (LL)	18
Ground	7	Ground	7
DCD	8	DTR	20
NC[1]	11	–	–
TxC	15	TxC	15
RxC	17	SCTE	24
LTST (LL)	18	DSR	6
DTR	20	DCD	8
SCTE	24	RxC	17
TM	25	TM	25

1. NC = No connection; however, using the SDLC applique for DTE mode requires the CAB-R32NZ crossover cable that ties pin 11 to ground for DTE selection. The part number for this crossover cable is 72-0757-01.

RS-449 DCE and DTE Appliques

The RS-449 DTE applique contains a male 37-pin connector, while the RS-449 DCE applique contains a female 37-pin connector. The internal ribbon cable connects to the 26-pin connector. The mode is labeled on the circuit card (either *RS-449 DTE* or *RS-449 DCE*). The RS-449 DCE applique is shown in Figure A-11, and the RS-449 DTE is shown in Figure A-12.

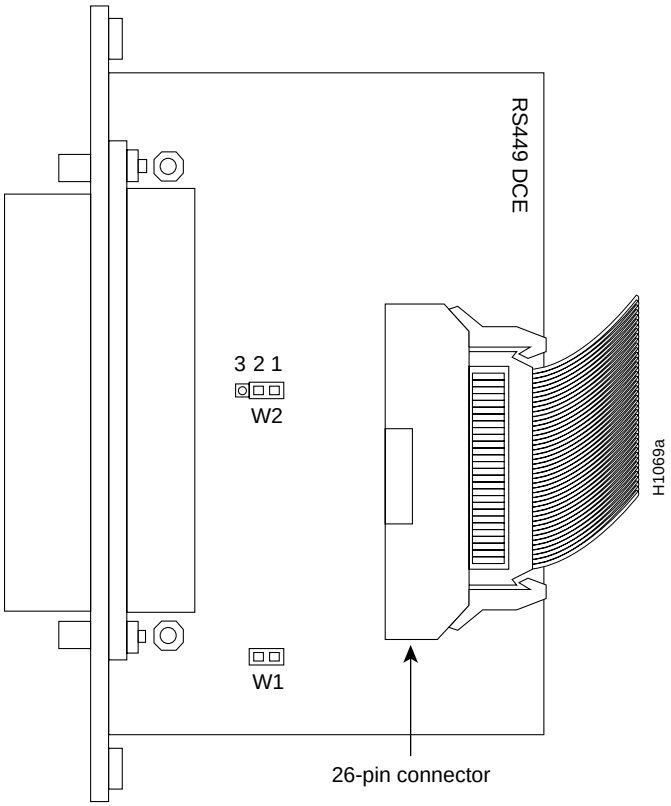

Figure A-11 RS-449 DCE Applique—Component-Side View

The RS-449 DCE applique requires that the clock be supplied from the MCI card or the SCI card. The DCE applique contains an additional jumper field (W2) which selects the transmit data clock source. Pins 1 and 2 of W2 are jumpered together causing the applique to expect to see the transmit clock on the serial clock transmit external (SCTE/TT) lines of the interface cable.

It is important that the DTE attached to this interface returns SCTE/TT along with its data to avoid cable-induced clock problems. This is the factory default, and it is the recommended setting for reliable operation at high data rates. If the DTE device does not return a clock on SCTE/TT, connecting pins 2 and 3 of W2 together causes the DCE applique to use the outgoing clock serial clock transmit (SCT/ST) instead of SCTE/TT.

The RS-449 DTE applique (see Figure A-12) returns transmit clock on SCTE/TT. This is designed to compensate for clock phase shifting on long cables. It is important that the DCE device connected to the DCE applique modem be configured to accept SCTE/TT.

On both the DTE and DCE RS-449 appliques, pin 10 carries the local loopback (LL) signal. Use the software configuration subcommand **loopback** to invoke loopback to check out your installation or to verify that the applique is functioning correctly. The **loopback** command will assert pin 10 (LL) in DTE mode and will loop the Send Data (SDA and SDB) signals to the Receive Data (RDA and RD) signals. If the DCE applique ever gets the loopback pin (pin 11) asserted by the DTE device, it will loop SDA and SDB to RDA and RDB.

Following is sample output of the **loopback** command for serial 0:

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

The **no loopback** command returns the interface to normal function.

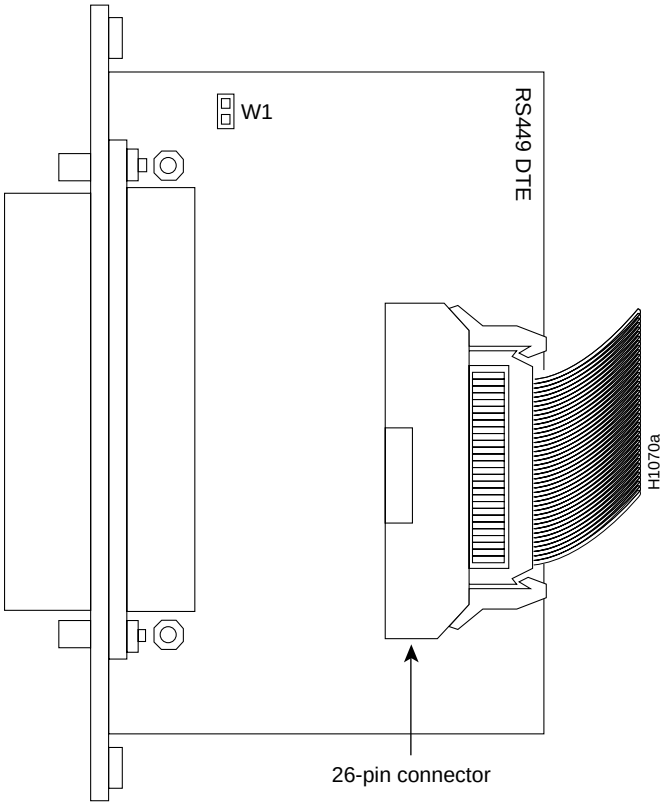

Figure A-12 RS-449 DTE Applique—Component-Side View

Table A-17 lists the pinouts of the RS-449 DCE and DTE appliques.

Table A-17 RS-449 DCE and DTE Applique Pinouts

Pin	Direction DCE	Direction DTE	Mnemonics	Function
1	–		Chassis ground	–
4	<—		SDA (TxD+)	Transmit Data+
22	<—		SDB (TxD–)	Transmit Data–
5	—>		STA (SCT+)	Serial Clock Transmit Internal+
23	—>		STB (SCT–)	Serial Clock Transmit Internal–
6	—>		RDA (RxD+)	Receive Data+
24	—>		RDB (RxD–)	Receive Data–
7	<—		RSA (RTS+)	Request To Send+
25	<—		RSB (RTS–)	Request To Send–
8	—>		RTA (SCR+)	Serial Clock Receive+
26	—>		RTB (SCR–)	Serial Clock Receive–
9	—>		CSA (CTS+)	Clear To Send+
27	—>		CSB (CTS–)	Clear To Send–
11	—>		DMA (DSR+)	Data Set Ready+
29	—>		DMB (DSR–)	Data Set Ready–
12	<—		TRA (DTR+)	Data Terminal Ready+
30	<—		TRB (DTR–)	Data Terminal Ready–
13	—>		RRA (RLSD+, CD+)	Carrier Detect+
31	—>		RRB (RLSD–, CD–)	Carrier Detect–
17	<—		TTA (SCTE+)	Serial Clock Transmit External+
35	<—		TTB (SCTE–)	Serial Clock Transmit External–
10	<—		LL	Local Loopback
19, 20, 37	–		Signal Ground	–

X.21 Dual-Mode Applique

The X.21 applique, which is designed for domestic and international use, meets the CCITT specification for a DTE, VDE Class B, and FCC Class A, CSA C108.8. The applique can be set for either DTE or DCE mode, with default mode as DTE. Change the mode to DCE by changing the position of jumpers J1, J2, and J3. (See Figure A-13.) All three jumpers must be in the same position (DCE or DTE) in order for the applique to operate properly. Jumper J4 connects logic ground to chassis ground when in the default position. (See Figure A-13.) Special DTE and DCE cables are required for DTE or DCE operation. Table A-18 lists the pinout for the dual-mode X.21 applique.

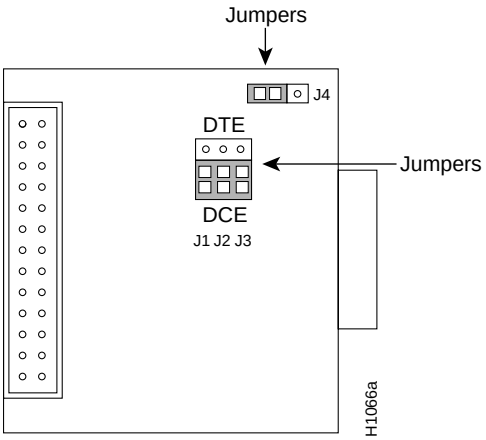

Figure A-13 X.21 Applique with Jumpers Set for DCE Operation—Component-Side View

Table A-18 X.21 Applique Pinout

Pin	DTE Mnemonic/Function	Direction DTE	Direction DCE	Pin	DCE Mnemonic/Function
1	Shield Drain	–		1	Shield Drain
2	TxD (Transmit Data) - a	—>		4	RxD - a
3	Control - a	—>		5	Indicate - a
4	RxD (Receive Data) - a	<—		2	TxD - a
5	Indicate - a	<—		3	Control - a
6	RxC (Receive Clock) - a	<—		7	DCE Clock - a
7	DCE Clock - a[1]	—>		6	RxC - a
8	GROUND	–		8	GROUND
9	TxD (Transmit data) - b	—>		11	RxD - b
10	Control - b	—>		12	Indicate - b
11	RxD (Receive Data) - b	<—		9	TxD - b
12	Indicate - b	<—		10	Control - b
13	RxC (Receive Clock) - b	<—		14	DCE Clock - b
14	DCE Clock - b[1]	—>		13	RxC - b
15	–	–		–	

1. These signals go to the DCE device only when the jumpers are set for DCE, and the DCE transition cable is used.

X.21 to RS-449 Adapter Cable

Figure A-14 provides the pinout for constructing an X.21 to RS-449 adapter cable. This is of particular importance for X.21 connections in the United Kingdom and Germany.

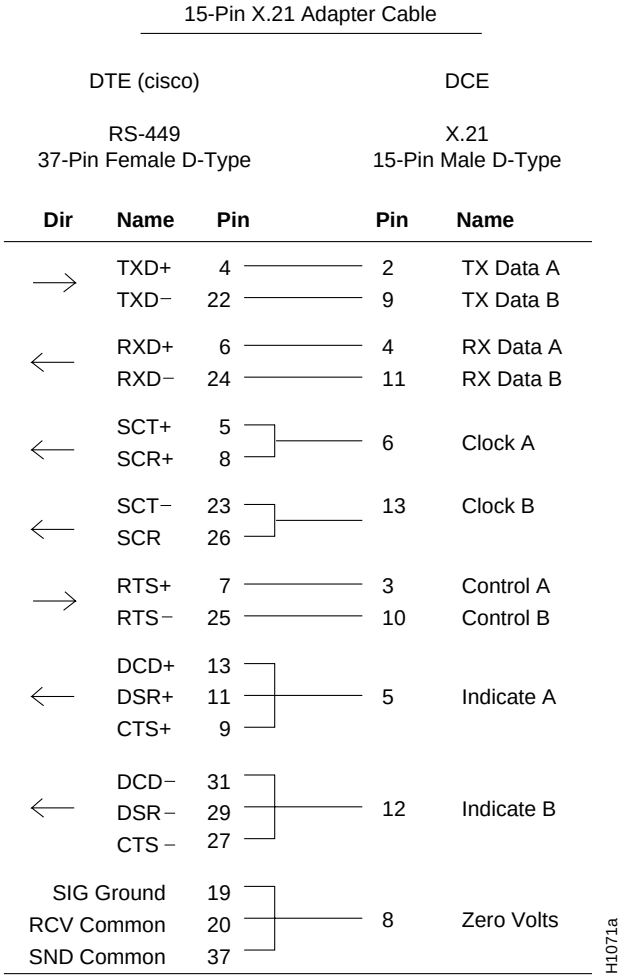

Figure A-14 15-Pin X.21 to RS-449 Adapter Cable Pinout

FDDI Optical Bypass Switch Pinout

Table A-19 lists the signal descriptions for the optional, optical bypass switch available for systems configured with a multimode-to-multimode Fiber Distributed Data Interface (FDDI).

Table A-19 Optical Bypass Switch Pinout

Pin	Description
1	+5V to secondary switch
2	+5V to primary switch
3	Ground to enable primary switch
4	Ground to enable secondary switch
5	Sense circuit—1 kohm to +5V
6	Ground—sense circuit return

Optical Bypass Switch Adapter Cable

The CAB-FFLC adapter cable (see Figure A-15) is designed to electrically isolate the chassis system in the case of a miswired optical bypass switch.

Warning The external CAB-FFLC adapter for the FDDI optical bypass cable (shipped with your system) protects chassis multimode FDDI systems and users from external +5V short circuits. Defective optical bypass cables, which contain a short between +5V and ground, may result in current flows sufficient to melt the optical bypass cable and force the chassis to shut down due to overcurrent. Occurrences of +5V short circuits external to the optical bypass are extremely rare; however, we strongly recommend the adapter be installed for all APP-LMM FDDI systems.

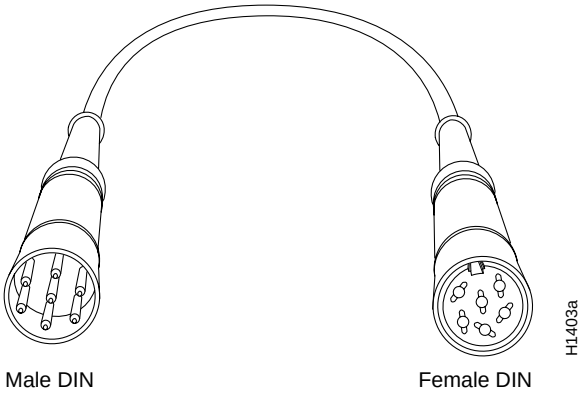

Figure A-15 CAB-FFLC Adapter Cable and DIN Connectors

The CAB-FFLC cable ships in three ways: in the accessories box with a chassis incorporating an APP-LMM FDDI applique, with the APP-LMM FDDI applique spare (designated as APP-LMM=), or shipped separately (designated as CAB-FFLC=).

Installing the CAB-FFLC Adapter Cable

Following is the procedure for installing the CAB-FFLC adapter cable. The CAB-FFLC adapter attaches between the male Deutsche Industre-Norm (DIN) connector on the optical bypass interface cable and the female DIN connector on the APP-LMM FDDI applique. No tools are required for this procedure.

Warning To prevent shock hazard and avoid damaging the system, turn off power to the chassis and disconnect the power cable. The optical bypass interface cable must not be disconnected from or connected to the DIN connector, while power to the system is on.

Step 1 Turn OFF the power to the chassis.

Step 2 Remove the optical bypass interface cable from the DIN socket on the APP-LMM FDDI applique (if attached).

Step 3 Connect the female DIN connector on the CAB-FFLC to the male DIN connector on the optical bypass interface cable. (See Figure A-16.)

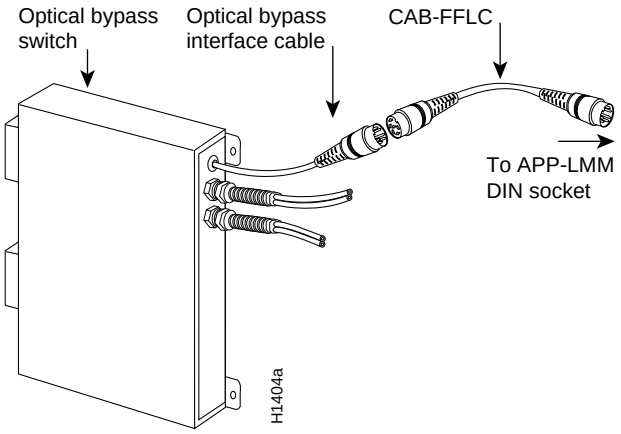

Figure A-16 CAB-FFLC Adapter Cable Connections

Step 4 Connect the male DIN connector on the CAB-FFLC to the female DIN socket on the APP-LMM FDDI applique. (See Figure A-16.)

Step 5 Connect the power cable, turn ON the power to the chassis, and allow the system to boot.

Note If you experience trouble during the installation or need additional upgrade or product information, contact a customer service representative.