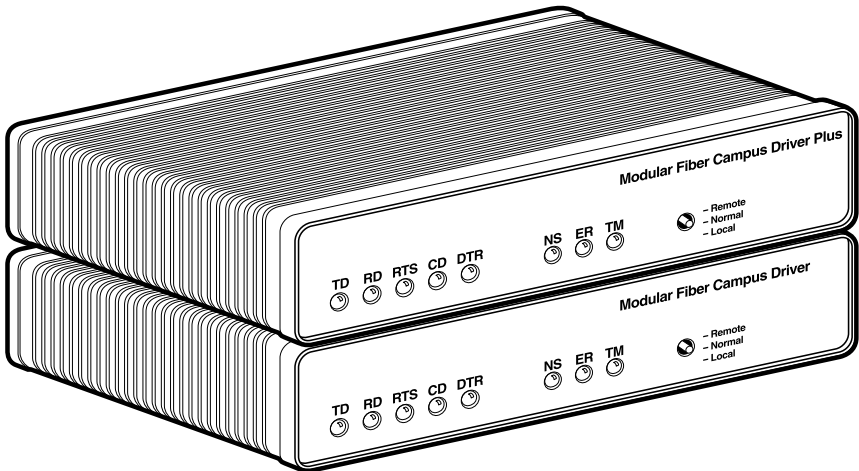




# Modular Fiber Campus Driver Plus- 256 kbps

## Modular Fiber Campus Driver-128 kbps



**CUSTOMER  
SUPPORT  
INFORMATION**

Order toll-free in the U.S.: Call 877-877-BBOX (outside U.S. call 724-746-5500)  
FREE technical support 24 hours a day, 7 days a week: Call 724-746-5500 or fax 724-746-0746  
Mailing address: **Black Box Corporation**, 1000 Park Drive, Lawrence, PA 15055-1018  
Web site: [www.blackbox.com](http://www.blackbox.com) • E-mail: [info@blackbox.com](mailto:info@blackbox.com)

**FEDERAL COMMUNICATIONS COMMISSION  
AND  
CANADIAN DEPARTMENT OF COMMUNICATIONS  
RADIO FREQUENCY INTERFERENCE STATEMENTS**

This equipment generates, uses, and can radiate radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

*This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of the Canadian Department of Communications.*

*Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par le ministère des Communications du Canada.*



The CE symbol on your equipment indicates that it complies with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the Union European (EU).

**NORMAS OFICIALES MEXICANAS (NOM)  
ELECTRICAL SAFETY STATEMENT**

**INSTRUCCIONES DE SEGURIDAD**

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc..
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
  - A: El cable de poder o el contacto ha sido dañado; u
  - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
  - C: El aparato ha sido expuesto a la lluvia; o
  - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
  - E: El aparato ha sido tirado o su cubierta ha sido dañada.

### **TRADEMARKS**

The trademarks mentioned in this manual are the sole property of their owners.

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# 1. Specifications

**Transmission**—Asynchronous and synchronous

**Clocking**—Internal, external or derived from receive signal

**Distance**—Up to 3 miles (4.8 km)

**ME621A Data Rates**—Asynchronous: 0 to 19.2 kbps; Synchronous: 4.8, 9.6, 14.4, 19.2, 28.8, 32.0, 56.0, 64.0, 128.0 kbps

**ME620A Data Rates**—Asynchronous: 2.4 to 38.4 kbps; Synchronous: 2.4, 9.6, 14.4, 28.8, 38.4, 56.0, 64.0, 72.0, 128.0, 144.0, 192.0, 256.0 kbps

**Handshaking**—Software (XON/XOFF) or hardware (RTS/CTS); both modes available at all time.

**Connectors**—(1) Fiber ST

**Link Budget**—12 dB (62.5 micron), 8 dB (50.0 micron)

**Diagnostics**—V.54 Compliant; Local Analog Loopback and Remote Digital Loopback bit-error-rate pattern

**Fiber Modes**—Single 50- or 62.5-micron core, multi-mode fiberoptic cable

**LED Indicators**—TD, RD, RTS, DTR, ER, NS and TM

**Interface Modules**—EIA RS-232/CCITT V.24, RS-232/530, CCITT V.35, X.21, Ethernet Bridge and G.703

**Power**—85 to 256 VAC universal-input power supply, 50/60 Hz

**Regulatory Compliance**—FCC part 15 Class A, UL 1950, EN60950 89/336/EEC, 73/23/EEC IEC 825 Class 1 equipment

**Temperature Range**—32 to 122°F (0 to 50°C)

**Altitude**—Up to 15,000 feet (4572 m)

**Humidity**—5 to 95% non-condensing

**Size**—1.6"H x 7.3"W x 6.6"D (4.1 x 18.5 x 16.8 cm)

**Weight**—2.02 lb. (1 kg)

## 2. Introduction

### 2.1 Description

The Modular Fiber Campus Driver (ME621A) and the Modular Fiber Campus Driver Plus (ME620A) are designed for high-speed RS-232 communication over a single multi-mode fiber. Operating at up to 128 kbps synchronous and 19.2 kbps asynchronous data rates, the ME621A is perfect for campus applications where data integrity is a must. The ME620A is even faster at a bursty 256 kbps synchronous or 38.4 kbps async. Synchronous clocking options include internal, external, or receive recovered clock.

Both models feature swappable DCE-DTE interface modules. Available interfaces include V.24/RS-232 (part number ME481C-232), V.35 (part number ME481C-35), RS-422/530 (part number ME481C-422), X.21 (part number ME481C-X21), WAN Bridge (part number ME530A), and G.703 (part number ME481C-G703). Fiber connections are made using an ST interface.

The Campus Drivers also incorporate V.54 compliant local and remote loopback test modes that are activated by a convenient front panel switch. LED status indicators monitor interface data and control signals as well as test mode status. Available with a universal AC power supply, the Campus Drivers conveniently fit in a wide range of applications and power supply environments.

If any questions or problems arise during installation or use of the Modular Fiber Campus Drivers, please call Black Box Technical Support at 724-746-5500.

### 2.2 Features

- ME621A: Synchronous data rates: 4.8 to 128 kbps; Asynchronous data rates: 0 to 19.2 kbps
- ME620A: Synchronous data rates: 2.4 to 256 kbps; Asynchronous data rates: 0 to 38.4 kbps
- Full-duplex operation over a single multi-mode fiberoptic cable
- Point-to-point distances up to 3 miles (4.8 km)
- Internal, external or receive recovered clocking options
- Field-replaceable DTE-DCE interface modules: V.24/RS-232, V.35, RS-422/530, X.21 and G.703 (modules ordered separately)

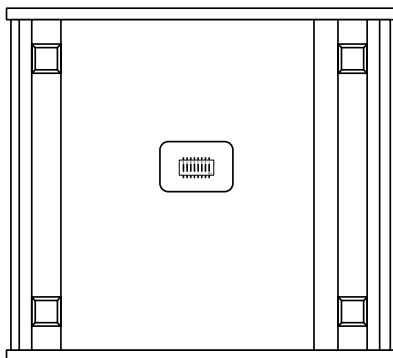


## **MODULAR FIBER CAMPUS DRIVER, MFC D PLUS**

- V.54-compliant local and remote digital loopback tests
- 8 front-panel LED status indicators
- Available with ST fiber connectors
- Made in the U.S.A.

### 3. Configuration

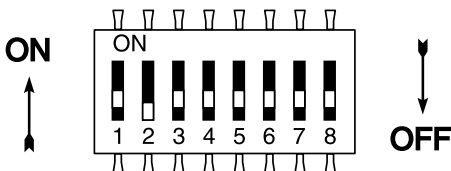
Both Models ME621A and ME620A use a mini DIP-switch package that allows configuration to a wide range of applications. These switches are located on the bottom side of the PC board (see **Figure 3-1**). Because all eight switches are externally accessible, you don't have to open the case to configure the unit.



**Figure 3-1. Underside of the Campus Driver, showing the location of the DIP switches.**

#### Configuration Switch "S1"

The switches shown in **Figure 3-2** and on DIP switch S1 are used to set the async or sync data rates, LAL and DL diagnostic functions, and the clock-mode setting. The default settings for DIP switch S1 are shown in **Table 3-1**. Following the table are detailed descriptions for each switch.



**Figure 3-2. Close-up of configuration switches.**

**Table 3-1. S1 Summary Table.**

Position	Function	Factory Default	
S1-1*	Data Rate	Off	
S1-2*	Data Rate	Off	
S1-3*	Data Rate	Off	
S1-4*	Data Rate	On	
		} 64 kbps	
S1-5	Clock Source	On	
S1-6	Clock Source	On	
		} Internal	
S1-7	DTE Control of DL	Off	Disabled
S1-8	DTE Control of LAL	Off	Disabled

### \*NOTE

Both models ME621A and ME620A use Switches S1-S4 to set the async or sync data rate. Refer to the sections below to set the ME621A or ME620A rates.

#### SWITCH S1-1 THROUGH S1-4 (MODEL ME621A): ASYNC/SYNC DATA RATE

On ME621A, Switches S1-1, S1-2, S1-3 and S1-4 set two parameters: synchronous or asynchronous data rate and the maximum transmission distance between two Model ME621As.

S1-1	S1-2	S1-3	S1-4	Data Rate (kbps)	Max. Distance in miles (km)	
On	Off	Off	On	0-19.2	3.0 (4.8)	Async Setting
Off	On	On	Off	4.8	3.0 (4.8)	} Sync Setting
Off	On	On	On	9.6	3.0 (4.8)	
On	Off	On	Off	14.4	1.5 (2.4)	
On	Off	On	On	19.2	3.0 (4.8)	
Off	Off	On	Off	28.8	1.5 (2.4)	
Off	Off	Off	Off	32.0	3.0 (4.8)	
Off	On	Off	Off	56.0	1.5 (2.4)	
Off	Off	Off	On	64.0	3.0 (4.8)	
On	On	On	On	128.0	3.0 (4.8)	

## MODULAR FIBER CAMPUS DRIVER, MFCD PLUS

### SWITCH S1-1 THROUGH S1-4 (MODEL ME620A): ASYNC/SYNC DATA RATE

On Model ME620A, Switches S1-1, S1-2, S1-3 and S1-4 set two parameters: synchronous or asynchronous data rate and the maximum transmission distance between two Model ME620As.

S1-1	S1-2	S1-3	S1-4	Data Rate (kbps)	Max Distance in miles (km)	
On	Off	Off	On	0-19.2	3.0 (4.8)	Async Settings
On	Off	Off	Off	0-38.4	1.5 (2.4)	
On	On	On	Off	2.4	1.5 (2.4)	} Sync Setting
Off	On	On	On	9.6	3.0 (4.8)	
On	Off	On	Off	14.4	1.5 (2.4)	
On	Off	On	On	19.2	3.0 (4.8)	
Off	Off	On	Off	28.8	1.5 (2.4)	
Off	Off	On	On	38.4	3.0 (4.8)	
On	On	Off	On	48.0	3.0 (4.8)	
Off	On	Off	Off	56.0	1.5 (2.4)	
Off	Off	Off	On	64.0	3.0 (4.8)	
Off	On	On	Off	72.0	1.5 (2.4)	
Off	Off	Off	Off	128.0	1.5 (4.8)	
On	On	Off	Off	144.0	1.5 (2.4)	
Off	On	Off	On	192.0	1.5 (2.4)	
On	On	On	On	256.0	1.5 (2.4)	

### SWITCHES S1-5 AND S1-6: CLOCK SOURCE

Switches S1-5 and S1-6 are set in combination to determine the transmit clock source for both models.

S1-5	S1-6	Setting	Description
On	Off	Internal	Transmit clock generated internally
On	On	Internal	Transmit clock generated internally
Off	On	External	Transmit clock derived from terminal interface
Off	Off	Received Recover	Transmit clock derived from the received line signal

**NOTE**

Because communication between two Model ME620As is always synchronous, you must set these switches whether your application is async or sync. For X.21 or async applications, configure one unit for internal clock mode and the other for receive recover clock mode.

**SWITCH S1-7: DTE CONTROL OF DL**

The setting for Switch S1-7 determines whether DTE control of remote digital loopback test is enabled or disabled. If DTE control is disabled, the DL test can only be initiated by the front-panel switch. If DTE control is not available, set switch S1-7 to the Off position.

<b>S1-7</b>	<b>Setting</b>	<b>Description</b>
On	Enabled	Respond to DL requests from DTE
Off	Disabled	Ignore DL requests from the DTE

**SWITCH S1-8: DTE CONTROL OF LAL**

The setting for switch S1-8 determines whether DTE control of local analog loopback test is enabled or disabled. If DTE control is disabled, the LAL test can only be initiated by the front-panel switch. If DTE control is not available, set switch S1-8 to the Off position.

<b>S1-7</b>	<b>Setting</b>	<b>Description</b>
On	Enabled	Respond to LAL requests from DTE
Off	Disabled	Ignore LAL requests from the DTE

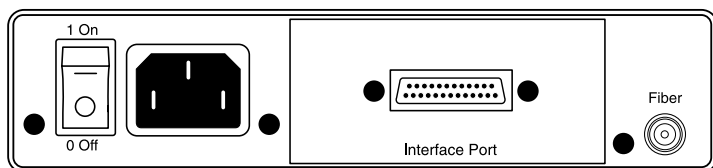
## 4. Installation

Once the ME621A or ME620A is properly configured, it is ready to connect to the fiber interface, to the serial port, and to the power source. This section tells you how to make these connections.

### 4.1 Connection to the Fiber Interface

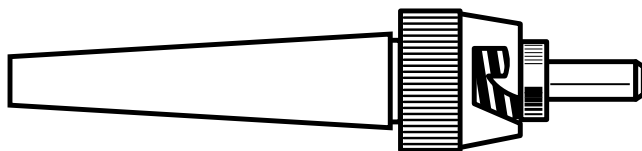
The ME621A supports communication at distances to 3 miles (4.8 km) and data rates to 128 kbps (sync) or 19.2 kbps (async). The ME620A also supports distances up to 3 miles (4.8 km), but at rates up to 256 kbps (sync) or 38.4 kbps (async).

**Figure 4-1** shows the position of the interface connectors on the ME621A or ME620A back panel.



**Figure 4-1. Rear panel of Campus Driver, showing interface and power connectors.**

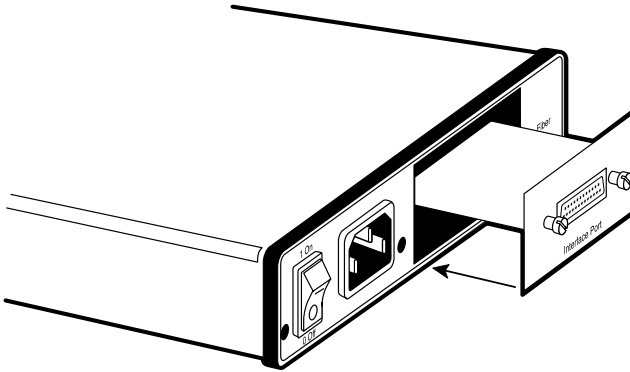
These short range modems are designed to work in pairs. You will need one at each end of single 50- or 62.5-micron multi-mode fiber cable. The fiber cable connects to each ME621A or ME620A using an ST connector. **Figure 4-2** below shows a close-up of the ST connector.



**Figure 4-2. Close-up of the ST connector.**

## 4.2 Connection to the Serial Port

The serial port interface on the Campus Driver uses interchangeable modules. Each module has a 50-pin card-edge connector on one side and a serial port on the other. Figure 4-3 below shows how a Module plugs into the back of the Campus Driver.



**Figure 4-3. Installing a plug-in serial interface module.**

### 4.2.1 CHANGING MODULES

When you purchase a particular version of the ME621A or ME620A, it should be shipped to you without any modules installed. The modules mentioned on [page 7](#) are ordered separately. If you need to install one of these Modules, follow these steps:

#### *Removing an Existing Module*

1. Turn the power switch off. Leave the power cord plugged into a grounded outlet to keep the unit grounded.
2. Loosen the two thumbscrews on the module by turning them counterclockwise.
3. Grasp the two thumbscrews and gently pull the module from the unit. Apply equal force to the thumbscrews to keep the module straight during the removal process.

#### *Installing the New Module*

1. Make sure the power switch is off. Leave the power cord plugged into a grounded outlet to keep the unit grounded.

2. Hold the module with the faceplate toward you and align the module with the guide slots in the rear panel of the Campus Driver.
3. While keeping the module's faceplate parallel with the Campus Driver rear panel, slide the module straight in, so that the card-edge contacts line up with the socket inside the chassis.

### NOTE

**The card-edge connector should meet the socket when the Module is almost all the way into the chassis. If you encounter a lot of resistance, remove the module and repeat steps 2 & 3.**

4. With the card-edge contacts aligned with the socket, firmly seat the module by using your thumbs to apply pressure directly to the right and left edges of the module faceplate. Applying moderate and even pressure should be sufficient to seat the module. You should hear it “click” into place.
5. To secure the module in place, push the thumbscrews into the chassis and turn the screws clockwise to tighten.

#### 4.2.2 CONNECTION TO A “DTE” DEVICE

The serial port on most interface modules (all except the X.21 module) is hard-wired as DCE. Therefore these modules “want” to plug into a DTE such as a terminal, PC, or host. When making the connection to your DTE device, use a straight-through cable of the shortest possible length—we recommend 6 feet (1.8 m) or less. When purchasing or constructing an interface cable, please refer to the pin diagrams in the **Appendix** as a guide.

#### 4.2.3 CONNECTION TO A “DCE” DEVICE

The serial port on most interface modules is hard-wired as a DCE (all except the X.21 module). Therefore you must use a null-modem cable when connecting to a modem, multiplexor, or other DCE device. This cable should be of the shortest possible length—we recommend 6 feet (1.8 m) or less. When purchasing or constructing a null-modem cable, use the pin diagrams in the **Appendix** as a guide.

### NOTE

**Pin-out requirements for null-modem applications vary widely between manufacturers. If you have any questions about a specific application, contact Black Box Technical Support at 724-746-5500.**



### 4.2.4 RE-CONFIGURING THE X.21 MODULE

The serial port on the X.21 Module is wired by default as a DCE, but may be switched to a DTE. This is done by reversing the orientation of the DCE/DTE strap.

To reverse DCE/DTE orientation, remove the module according to the instructions in **Section 4.2.1**. The DCE/DTE strap is located on the bottom side of the module's PC board. The arrows on the top of the strap indicate the configuration of the X.21 port (for example, if the DCE arrows are pointing toward the DB15 connector, the X.21 port is wired as a DCE). Reverse the DCE/DTE orientation by pulling the strap out of its socket, rotating it 180°, then plugging the strap back into the socket. You will see that the DCE/DTE arrows now point in the opposite directions, showing the new configuration of the X.21 port. Reinstall the module according to the instructions in **Section 4.2.1**.

## 4.3 Power Connection

The Fiber Campus Driver comes with a universal-interface AC power supply, which operates in environments ranging from 85 to 256 VAC, with no re-configuration necessary.

### CONNECTING TO AN AC POWER SOURCE

The universal AC power supply is equipped with a male IEC-320 power connection. A domestic (US) power supply cord is supplied with the unit at no extra charge. To connect the universal power supply, follow these steps:

1. Attach the power cord (supplied) to the shrouded male IEC-320 connector on the rear of the Campus Driver.
2. Plug the power cord into a nearby AC power outlet.
3. Turn the rear power switch ON.

## 5. Operation

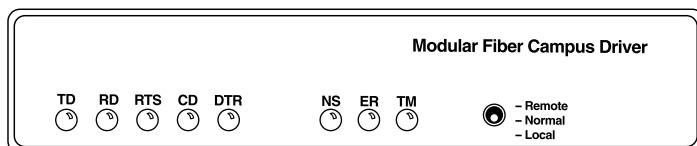
Once the Campus Driver is properly configured and installed, it should operate transparently. This section describes power-up, reading the LED status monitors, and using the built-in loopback tests.

### 5.1 Power-Up

To apply power to the Campus Driver, first be sure that you have read **Section 4.3**, and that the unit is connected to the appropriate power source. Then power up the unit using the rear power switch.

### 5.2 LED Status Monitors

The Campus Drivers feature eight front-panel LEDs that monitor power, the DTE signals, network connection, and test modes. **Figure 5-1** shows the front-panel location of each LED. Following **Figure 5-1** is a description of each LED's function.



**Figure 5-1. ME620A front panel.**

**TD & RD:** Glows red to indicate an idle condition of Binary “1” data on the respective terminal interface signals. Green indicates Binary “0” data.

**RTS:** Glows green to indicate that the Request to Send signal from the DTE is active.

**CD:** Glows red if no carrier signal is being received from the remote modem. Green indicates that the remote modem's carrier is being received.

**DTR:** Glows green to indicate that the Data Terminal Ready signal from the terminal is active.

ER: Glows red to indicate the likelihood of a Bit Error in the received signal. During the 511 or 511/E test, ER will flash to indicate that the Test Pattern Detector has detected a bit error.

TM: Glows red to indicate that the ME620A or ME621A has been placed in Test Mode. The unit can be placed in test mode by the local or remote user.

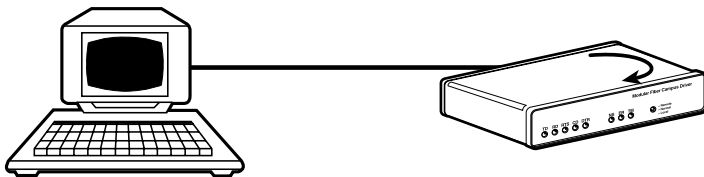
NS: Glows red to indicate that the local Campus Driver has not yet connected with the remote Campus Driver.

### 5.3 Diagnostics

The Campus Drivers are equipped with V.54 diagnostics that may be used to evaluate the condition of the local and remote units, as well as the twisted-pair link between them: local loopback (LAL) and remote digital loopback (DL).

#### 5.3.1 LOCAL ANALOG LOOPBACK

The Local Analog Loopback (LAL) test checks the operation of the local Campus Driver and is performed separately on each unit. Any data sent to the local Campus Driver in this test mode will be echoed back (returned) to the user device. (See **Figure 5-2**, below). For example, characters typed on the keyboard of a terminal will appear on the terminal screen.



**Figure 5-2. Local analog loopback.**

To perform a Local Analog Loopback test, follow these steps.

1. Activate LAL either by moving the front panel toggle switch DOWN to “Local,” or by raising the appropriate signal on the DTE interface. Once Local Analog Loopback is activated, the Campus Driver transmit output is connected to its own receiver. The test LED should glow.

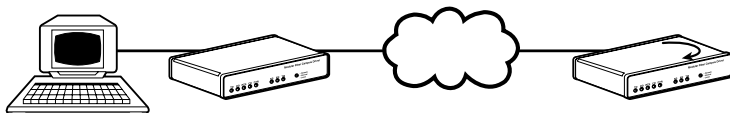
## NOTE

Although the local Campus Driver cannot communicate with the remote Campus Driver in this mode, the synchronized connection between the two modems remains intact.

2. Verify that the data terminal equipment is operating properly and can be used for a test. If a fault is indicated, call a technician or replace the unit.
3. Perform a BER (bit error rate) test on each unit using a separate BER tester. If the BER test equipment indicates no faults but the data terminal indicates a fault, follow the manufacturer's checkout procedures for the data terminal. Also, check the interface cable between the terminal and the Campus Driver.

### 5.3.2 REMOTE DIGITAL LOOPBACK

The Remote Digital Loopback test checks the performance of both the local and remote Campus Driver, and the communication link between them. Any characters sent to the remote unit in this test mode will be returned back to the originating device (see **Figure 5-2**).



**Figure 5-2. Remote digital loop.**

To perform an DL test, follow these steps:

1. Activate DL. This may be done in one of two ways: First, by moving the front panel toggle switch DOWN to "Remote." Or, second, by raising the DL signal on the terminal interface (for pin numbers, see the **Appendix**).
2. Perform a BER (bit error rate) test on the system, using BER testers on both ends.

3. If the BER test equipment indicates a fault and the Local Analog Loopback test was successful for both Campus Drivers, you may have a problem with the line between the units. You should inspect the line for proper connections.

# Appendix: Interface Pin Assignments

## V.35 Interface Pin Description, M/34 Female Connector

<b>Pin #</b>	<b>Signal</b>
B	SGND (Signal Ground)
C	RTS (Request to Send)
D	CTS (Clear to Send)
E	DSR (Data Set Ready)
F	CD (Carrier Detect)
H	DTR (Data Transfer Ready)
L	LLB (Local Line Loop)
M	TM (Test Mode)
N	DL (Remote Digital Loop)
P	TD (Transmit Data)
R	RD (Receive Data)
S	TD/ (Transmit Data-B)
T	RD/ (Receive Data-B)
U	XTC (External Transmit Clock)
V	RC (Receive Timing)
W	XTC/ (External Transmit Clock)
X	RC/ (Receive Timing)
Y	TC (Test Control-A)
AA	TC/ (Test Control-B)

### RS-232, RS-530 Interface Pin Description (DB25 Female Connector)

<b>Pin #</b>	<b>Signal</b>
1	FG (Frame Ground)
2	TD (Transmit Data)
3	RD (Receive Data)
4	RTS (Request to Send)
5	CTS (Clear to Send)
6	DSR (Data Set Ready)
7	SGND (Signal Ground)
8	CD (Carrier Detect)
9	RC/ (Receive Timing-B)
10	CD/ (Carrier Detect-B)
11	XTC/ (External Transmit Clock)
12	TC/ (Test Control-B)
13	CTS/ (Clear to Send)
14	TD/ (Transmit Data-B)
15	TC (Test Control-A)
16	RD (Receive Data)
17	RC (Receive Timing)
18	LLB (Local Line Loop)
19	RTS/ (Request to Send)
20	DTR (Data Transfer Rate)
21	DL (Remote Digital Loop)
22	DSR/ (Data Set Ready)
23	DTR/ (Data Transfer Rate)
24	XTC (External Transmit Clock)
25	TM (Test Mode)

**X.21 Interface Pin Description (DB15 Female Connector)**

<b>Pin #</b>	<b>Signal</b>
1	Frame Ground
2	T (Transmit Data-A)
3	C (Control-A)
4	R (Receive Data-A)
5	I (Indication-A)
6	S (Signal Element Timing-A)
7	BT (Byte Timing-A)
8	SGND (Signal Ground)
9	T/ (Transmit Data-B)
10	C/ (Control-B)
11	R/ (Receive Data-B)
12	I/ (Indication-B)
13	S/ (Signal Element Timing-B)
14	BT/ (Byte Timing-B)



## G.703 Interface Pin Assignment (RJ-45 8-Pin Modular)

<b>Pin #</b>	<b>Signal</b>
1	RD+ (Receive Data Tip)
2	RD- (Receive Data Ring)
3	Not Used
4	TD- (Transmit Data Ring)
5	TD+ (Transmit Data Tip)
6	Not Used
7	Not Used
8	Not Used



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