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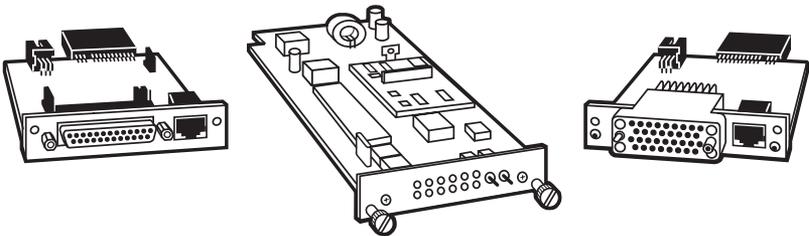
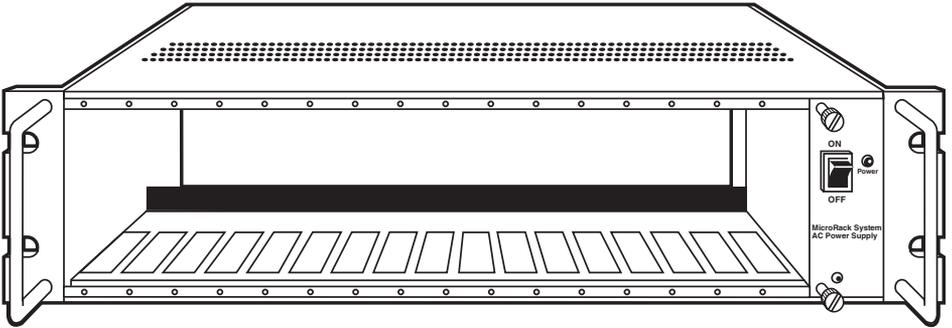
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APRIL 1999

MT160A	PS462A
MT161C-25	PS463A
MT161C-V35	RM202
PS460A	RM204
PS460AE	RM208
PS461A	RM216

MicroCSU/DSU Cards MicroRACK



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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.

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1. Specifications

MicroCSU/DSUs (MT160A, MT161C-25, MT161C-V35)

DDS Type — Dedicated DDS

Transmission Format — Asynchronous, synchronous

Internal Interface — Connection to rack chassis via a 50-pin male card edge

External Interface — DB25 female, M/34 female, RJ-48S

Standards — AT&T 62310 compliant

DDS Line Rates — 2.4, 4.8, 9.6, 19.2, 56, and 64 Kbps

DTE Rates — 2.4, 4.8, 9.6, 19.2, 38.4, 56, 57.6, and 64 Kbps

Leads Supported — MT160A, MT161C-V35: B, C, D, E, F, H, L, M, N, P, R, S, T, U, V, W, X, Y, AA; MT161C-25: 1–9, 11, 12, 14–18, 20, 21, 24, 25

Control Port — Configuration and diagnostics

Transmission Line — 4-wire

Applications — DDS point-to-point or multipoint; campus-area point-to-point

Indicators — (10) LEDs: POWER, TD, RD, CTS, CD, DTR, NS, OS, ER, and TM

Operation — Full duplex

Clocking — Internal, External, Recovered

Diagnostics — V.54 compliant local and remote loopback tests; V.52 compliant 511 BER test, telco CSU and DSU loops

Power Supply — Rackmount power supply is switchable between 120 and 240 VAC; chassis supplies 10 VAC to the MicroCSU/DSU, typical consumption is 1.5W per slot

Fuse — 400 mA for 120V applications; 200 mA for 240V applications

Operating Temperature — 32° to 114°F (0° to 45°C)

Storage Temperature — -40° to 176°F (-40° to 80°C)

Humidity — Up to 95%, noncondensing

Size — MT160A: 2.5"H x 5"W x 1"L (6.4 x 12.7 x 2.5 cm); MT161C-25, MT161C-V35: 2.5"H x 4.5"W x 1"L (6.4 x 11.4 x 2.5 cm)

Weight — 1 lb. (0.5 kg)

MicroRacks (RM202, RM204, RM208, RM216)

Indicators — Indicators are on the front card (MT160A)

Number of Slots — RM202: 2; RM204: 4; RM208: 8; RM216: 16

Power Source — Internal

Input Voltage — 120 VAC

Input Current/Amps — 200 mA

Input Connector Type — IEC 950

Connector Style — On the CSU/DSU rear cards

Operating Temperature — 32° to 114°F (0° to 45°C)

Storage Temperature — -40° to 176°F (-40° to 80°C)

Humidity — 0 to 95%, noncondensing

Size — RM202: 3.5"H x 3.5"W x 7.5"D (8.9 x 8.9 x 19.1 cm); RM204: 3.5"H x 5.5"W x 7.5"D (8.9 x 14 x 19.1 cm); RM208: 3.5"H x 9.5"W x 7.5"D (8.9 x 24.1 x 19.1 cm); RM216: 3.5"H x 19"W x 7.5"D (8.9 x 48.3 x 19.1 cm)

Weight — RM202, RM208, RM216: 5 lb. (2.2 kg); RM204: 4 lb. (1.8 kg)

Power Supply (PS460A)

Power Source — Internal

Input Voltage — 110 volts AC

Power Supply (PS460AE)

Power Source — Internal

Fuses — (4) Included (2 in the drawer and 2 spares)

Input Voltage — 115 or 230 volts AC, autosensing

Power Supply (PS461A)

Power Source — Internal

Input Voltage — 48 volts DC

Input Connector Type — PS461A: Terminal screw connections

Indicators — Power, DC input

Size — 3.5"H x 1.5"W x 7"D (8.9 x 3.8 x 17.8 cm)

Weight — 1 lb. (0.5 kg)

Power Supplies (PS462A and PS463A)

FRONT POWER-SUPPLY CARD

Power Supply —	PS462A: 24 VDC; PS463A: 12 VDC
Input Voltage —	PS462A: 13–36VDC; PS463A: 10–20 VDC
Input Protection —	PS462A: Triggered at 39 VDC; PS463A: Triggered at 22 VDC
Maximum Input Current —	PS462A: 2A @ 18 VDC; PS463A: 4A @ 10 VDC
Isolation Voltage —	500V RMS, input to output
Output Voltage —	12 VAC @ 2A
Output Power —	24W
Switches —	Power on/off
Indicators —	Power, DC Input

REAR POWER-SUPPLY CARD

- Connection** — Cage-clamp terminal block with +DC In, -DC In, Frame Ground, Alarm, Alarm C, +DC Out, -DC Out
- Wire** — 26-14 solid or stranded cable
- Alarm** — Opens when power is attached and closes when power is disconnected

2. Introduction

2.1 Overview

The MicroCSU/DSU operates either synchronously or asynchronously and supports data rates to 64 Kbps. An easily accessible control port allows the user to enable diagnostic utilities, including V.54 and V.52 test. Ten easy-to-read LEDs monitor data and control signals.

The Cards are AT&T® compliant and are fully compatible with DDS, Clear Channel 64, and other digital services available from major service providers including AT&T, Sprint®, and MCI®. They can also be used as high-speed modems for private twisted pair.

In order for your MicroCSU/DSU to function properly, you will need one front card (MT160A), one rear card (MT161C-25 or MT161C-V35), one power supply (PS460A, PS461A, PS462A, or PS463A), and one MicroRack (RM202, RM204, RM208, or RM216).

The MicroCSU/DSU Cards are designed to mount in any size MicroRack. Depending on which model MicroRack you choose, it will hold up to 16 cards. Measuring only 3.5 inches high, the Card is designed to occupy only 2U in a 19-inch rack. The MicroRacks are powered by either the MicroRack AC Power Supply (PS460A) or a MicroRack DC Power Supply (PS461A, PS462A, or PS463A). The MicroRacks use mid-plane architecture (the front card can be plugged into different rear cards). Therefore, the MicroCSU/DSU Cards can have several interface options and can be switched with other short-haul cards.

The table on the next page lists the names and codes of the products described in this manual.

<u>Code</u>	<u>Product Name</u>
MT160A	MicroCSU/DSU Front Card
MT161C-25	MicroCSU/DSU DB25 Rear
MT161C-V35	MicroCSU/DSU V35 Rear
PS460A	MicroRack AC Power Supply
PS461A	MicroRack 48-VDC Power Supply
PS462A	MicroRack 24-VDC Power Supply
PS463A	MicroRack 12-VDC Power Supply
RM202	MicroRack 2
RM204	MicroRack 4
RM208	MicroRack 8
RM216	MicroRack 16

2.2 Features

- Operates over dedicated digital lines.
- Supports rates of 56 and 64 Kbps and all sub-rates.
- Provides both RS-232 and V.35 interfaces.
- Features V.52 and V.54-compliant tests.
- Easy-to-read LEDs monitor data and line signals.
- AT&T 62310 compliant.
- Can be used as a high-speed modem for private twisted pair.

3. Before You Begin

This chapter describes how to install the MicroCSU/DSU for dedicated operation or for use as a campus-area short-haul modem.

3.1 Dedicated DDS Configuration

The MicroCSU/DSU can easily be configured for dedicated DDS operation by means of the DIP switches on the bottom of the enclosure. Set the Line Rate to match the rate of service to which you subscribe. Set the Mode switches for Network Clocking. The Rate Converter and Data Format options should be set as required for your application. The remaining options may also need to be set depending on your terminal equipment and your application.

3.2 Campus Area Short-Haul Configuration

The unit can also be used for campus area point-to-point short-haul applications on private twisted-pair wires. Set the Line Rates the same on both units. Set the Mode switch for the appropriate Transmit Clock Mode for your application. Internal, External, and Looped Clock Modes are available. Set the remaining options as needed by your terminal equipment or your application.

3.3 Network Interface Connection

The Network Interface is an 8-position modular connector. Connect this port to the RJ-48S jack provided by the digital data service provider. If you are using the MicroCSU/DSU for private short-haul communication, the twisted-pair cable will connect to this port. See **Appendix B** for the pin assignments of this connector.

4. Configuration

Before you can operate your MicroCSU/DSU, you must configure the unit. This chapter describes reading the LED status monitors, setting the DIP switches, and using the control port.

4.1 Front-Panel LEDs

There are ten front-panel status LEDs that indicate the condition of the CSU/DSU and the communication link. Figure 1 shows the location of each LED. Following Figure 1 is a description of each LED's function.

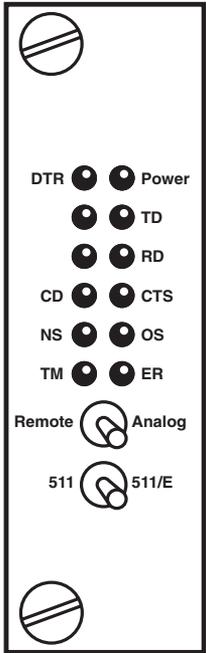


Figure 1. The MicroCSU/DSU's LEDs.

- POWER will glow red when the proper power is applied to the rack.
- TD and RD will glow red to indicate an Idle condition or Binary “1” data on the respective terminal interface signals. Green indicates Binary “0” data.
- CTS will glow red to indicate an Off condition. Green indicates an On condition. When on, the unit is ready to send data. If CTS remains off, check the Forced RTS, Circuit Assurance, and Anti-Streaming Settings.
- CD will glow red to indicate that the Idle code is being received. Green indicates that data is being received.
- DTR will glow to indicate that the DTR signal from the terminal is active.
- NS indicates No Signal. This means the MicroCSU/DSU receiver does not detect a signal from the digital service provider (or, in the case of short-haul operation, from the remote MicroCSU/DSU). If NS is lit, check for an unplugged cable, broken wire, or an incorrect Line Rate selection.
- OS indicates Out-of-Service. This means the MicroCSU/DSU has received an Out-of-Service signal from the digital service provider and indicates a problem with the service provider’s equipment. If this condition persists, contact your service provider.
- ER indicates the likelihood of a Bit Error in the received signal. ER will flash if the MicroCSU/DSU receives illegal bi-polar violations. During the 511 or 511/E test, ER will flash to indicate that the Test Pattern Detector has detected a bit error.
- TM indicates Test Mode. It will light if the unit is placed into a test mode. The unit can be placed in test mode by the local user, by the remote user, or by the service provider.

4.2 Source of Configuration

The unit defaults to the use of Hardware Switches for configuration. It can also be set to use Soft Switches for configuration, in which case the Hardware Switches will be ignored.

4.2.1 HARDWARE SWITCHES

It is possible to override the Soft Switches and force the unit to use the Hardware Switches. To do this, powerup the unit once with the Line Rate (SW1-1, 1-2, 1-3) set to OFF, OFF, OFF. Then set the Hardware Switches as you require and powerup the unit again.

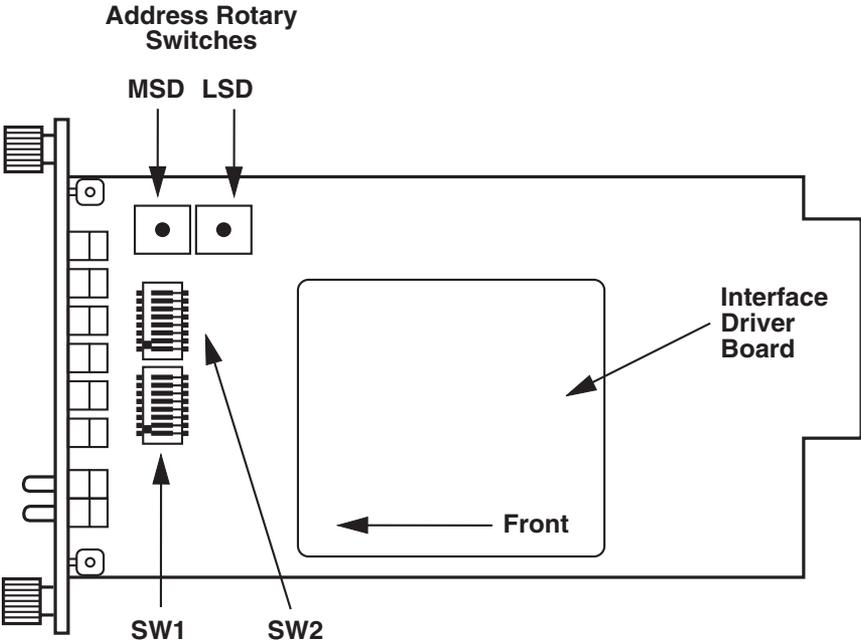


Figure 2. The MicroCSU/DSU Front Card, bottom view, showing the location of the DIP switches.

The sixteen DIP switches can be configured as either On or Off. Figure 3 shows the orientation of the DIP switches with respect to ON/OFF positions.

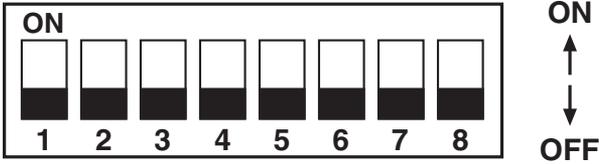


Figure 3. Close-up of DIP switches showing ON/OFF positions.

TERMINAL INTERFACE

The MicroCSU/DSU supports RS-232 and V.35 terminal interface electrical specifications by means of an interface driver board. Install this board by observing the markings “This side up for RS-232,” “This side up for V.35,” and “Front.” (The arrow should point toward the front panel.)

SWITCH SET 1

The configuration switches on switch set 1 (SW1) allow you to specify Line Rate, Circuit Assurance, Force RTS, Character Length, Data Format, and DSR System Status. Table 1 (on the next page) summarizes the SW1 switch settings, including the factory defaults. Following the chart is a description of each switch setting.

SWITCH SET 1 SUMMARY			
Position	Function	Factory Default	
Switch SW1-1	Line Rate	Off	56,000 bps
Switch SW1-2		On	
Switch SW1-3		On	
Switch SW1-4	Circuit Assurance	Off	Disabled
Switch SW1-5	Force RTS	Off	Enabled
Switch SW1-6	Character Length	Off	10-Bit
Switch SW1-7	Data Format	Off	Synchronous
Switch SW1-8	DSR System Status	Off	Disabled

Table 1. Summary of switch settings and factory defaults

Line Rate

These switches control the signaling rate on the line or RJ-48S port of the unit. They should be set to match the speed of your digital service.

<u>SW1-1</u>	<u>SW1-2</u>	<u>SW1-3</u>	<u>Setting</u>
On	On	On	2.4 Kbps
On	On	Off	4.8 Kbps
On	Off	On	9.6 Kbps
On	Off	Off	19.2 Kbps
Off	On	On	56 Kbps
Off	On	Off	64 Kbps
Off	Off	Off	Force configuration pointer to default to Hardware Switches

Circuit Assurance

The transmitter and the CTS output can be configured to go On only when a working communication circuit is established. If Circuit Assurance is used, enable it on only one end of the communication link.

<u>SW1-4</u>	<u>Circuit Assurance</u>	<u>Description</u>
On	Enabled	CTS will go low and the transmitter will be held off if the receiver is in the No Signal state or CD is low
Off	Disabled	The transmitter and CTS will operate without regard to the receiver state

Force RTS

The RTS input can be forced on, ignoring the terminal's RTS signal. RTS controls the transmitter by either sending the user's data or sending an idle code.

<u>SW1-5</u>	<u>RTS Forced On</u>	<u>Description</u>
Off	Enabled	An On (high) condition is transmitted regardless of the state of this unit's RTS input
On	Disabled	The RTS input controls the transmitter

Character Length

In asynchronous data format, 10- and 11-bit characters are supported. This setting is ignored in synchronous data format.

		<u>Character Description</u>			
<u>SW1-6</u>	<u>Character Length</u>	<u>Start</u>	<u>Data bits</u>	<u>Parity</u>	<u>Stop bits</u>
Off	10-bit	1	8	None	1 or more
		1	7	1	1 or more
		1	7	None	2
On	11-bit	1	8	1	1 or more
		1	9	None	1 or more

Data Format

The data-format selection controls whether an async-to-sync conversion is performed.

<u>SW1-7</u>	<u>Data Format</u>
On	Asynchronous
Off	Synchronous

DSR System Status

The behavior of the DSR output during performance of a local loop can be controlled.

<u>SW1-8</u>	<u>DSR System Status</u>	<u>Description</u>
On	Enabled	DSR remains high (On) during the Analog Loop
Off	Disabled	DSR goes low (Off) during the Analog Loop

SWITCH SET 2

The configuration switches on switch set 2 (SW2) control the Rate Converter, Loop Control from Terminal, Mode of Operation, Anti-Stream Timer, and CTS Delay. Table 2 summarizes SW2 switch settings, including the factory defaults. Following Table 2 is a description of each switch setting.

SWITCH SET 2 SUMMARY			
Position	Function	Factory Default	
Switch SW2-1	Rate Converter	Off	Disabled
Switch SW2-2		Off	
Switch SW2-3		Off	
Switch SW2-4	Loop Control from DTE	Off	Disabled
Switch SW2-5	Mode	Off	Network
Switch SW2-6		Off	Clock
Switch SW2-7	Anti-Streaming Timer	On	Disabled
Switch SW2-8	CTS Display	Off	Normal

Table 2. Summary of switch settings and factory defaults

Rate Converter

The rate converter allows a 56 or 64K line rate to be used for operation at slower data rates. If the rate converter is disabled, the DTE interface rate is the same as the line rate.

<u>SW2-1</u>	<u>SW2-2</u>	<u>SW2-3</u>	<u>DTE Interface Rate</u>
On	On	On	2.4 Kbps
Off	On	On	4.8 Kbps
On	Off	On	9.6 Kbps
Off	Off	On	19.2 Kbps
On	On	Off	38.4 Kbps
Off	Off	Off	Disabled

Loop Control from Terminal

The local loop and remote loop can be activated from the DTE interface using signals LL and RL.

<u>SW2-4</u>	
On	Enabled LL and RL inputs
Off	Disable

Mode

The mode of operation, Switched or Dedicated, is selected with these switches. The appropriate transmitter clocking modes can be selected for Dedicated DDS or campus-area (private) operation.

<u>SW2-5</u>	<u>SW2-6</u>	<u>Mode</u>	<u>Description</u>
On	Off	External Clock Mode	Transmit Clock derived from terminal interface
Off	Off	Network Clock Mode (Looped Clock Mode)	Transmit Clock derived from from the received line signal; Use this mode for Dedicated DDS operation
On	On	Internal Clock Mode	Transmit Clock derived internally

Anti-Stream Timer

The anti-stream timer protects multidrop networks from a drop that is continuously transmitting. If the terminal keeps RTS raised for more than 30 seconds, the timer forces RTS off internally. This allows the rest of the multidrop network to resume operation. The CSU/DSU remains in the forced-off condition until the terminal drops RTS.

<u>SW2-7</u>	<u>Timer</u>	<u>Timer Value in Sec. at Various Line Rates</u>				
		<u>56</u>	<u>19.2</u>	<u>9.6</u>	<u>4.8</u>	<u>2.4</u>
On	Disabled	—	—	—	—	—
Off	Enabled	2	4	8	15	30

CTS Delay

The RTS/CTS turn-on delay can be set to Normal or Extended.

<u>SW2-8</u>	<u>CTS Delay</u>	<u>Delay in mSec. at Various Line Rates</u>				
		<u>56</u>	<u>19.2</u>	<u>9.6</u>	<u>4.8</u>	<u>2.4</u>
Off	Normal	0.3	0.9	1.9	3.8	7.5
On	Extended	1.3	3.8	7.5	15	30

4.2.2 SOFTWARE SWITCHES

The MicroCSU/DSU Front Card has an internal control port that allows software configuration. Control port signals are carried to each card in the rack along the power bus board inside the rack chassis. Access to all rack card control ports is provided by a single control card.

Accessing the Software Control Port

Once you have set each Card's address, plugged each front card into the rack chassis, and properly installed the control card, you are ready to access the Main Menu. Follow these steps:

1. Connect the serial RS-232C port of a VT100 terminal (or similar RS-232 DTE with terminal emulation) to the EIA-561 control port on the control card.
2. Power on the terminal and set its RS-232C port as follows:
 - 9600 baud
 - 8 data bits, 1 stop bit, no parity
 - local echo
 - CR=CR/LF on inbound data
 - ANSI, VT100 emulation
3. Press [CTRL+B] on the terminal, then enter the address of the card you wish to configure, and press [RETURN].

NOTE

Do not use the universal address [99]. Configure only one card at a time.

The Main Menu should then display on the terminal screen.

```

MAIN MENU—Esc to exit menu mode

1. Select Hardware/Software Switch Control
2. Read Hardware/Software Configuration
3. Set Software Switch Parameters
4. Display Line/Loop Status
5. Set Switched 56 Parameters
  
```

Figure 4. Main Menu.

Using the Software Menu System

The Menu System operates as follows:

1. All selections must be followed by [RETURN].
2. To make a selection from any menu, enter the option number at the prompt and press [RETURN].
3. To exit any menu without making a selection, press [ESC] followed by [RETURN].

NOTE

You can also exit by just pressing [RETURN]. However, doing this in the Store Phone Number Menu will clear the buffer of the currently stored number.

Verifying Software Switch Control

In order to use software switches for configuration, you must disable the hardware switch settings. To do this, use the following procedure.

NOTE

If this procedure is omitted, your software configurations will be overridden by the hardware switch settings.

1. On the Main Menu, choose item 1, "Select Hardware/Software Switch Control." The following screen will appear:

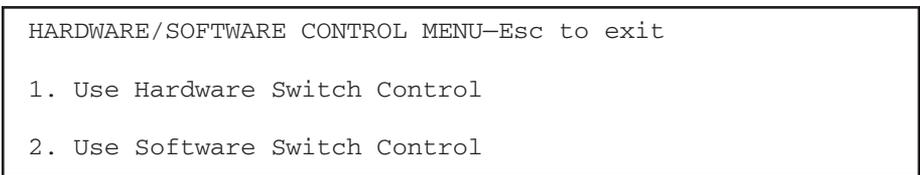


Figure 5. Hardware/Software Control Menu.

2. In the Hardware/Software Control menu, select item 2 to enable software switch control.
3. The Main Menu will automatically reappear after your selection is entered.

Setting Software Switch Parameters

From the Main Menu, selecting item 3, “Set Software Switch Parameters” will take you to the Software Switch Menu (below). From this screen, you can soft configure the Card parameters.

```
SOFTWARE SWITCH MENU—Esc to exit

1. Line Rate                               8. DTE Loop Control
2. Circuit Assurance                       9. Clock Mode
3. RTS                                     A. Anti-Stream Timer
4. Character Length                       B. RTS/CTS Delay
5. Data Frmt (Sync/Async)                C. 511 Test Pattern
6. DSR Loop Status                       D. Remote Digital Loop
7. Rate Adapter/DTE Rate                 E. Local Line Loop
```

Figure 6. Software Switch Menu.

For each screen described next, selecting a numbered option and pressing [RETURN] stores that option setting and returns you to the Software Switch Menu.

NOTE

All lettered options must be entered in lower case.

Line Rate

Choosing option 1 in the Software Switch Menu takes you to the Line Rate Menu. This option controls the signaling rate on the line. Set it to match the speed of your digital service. For line rates of 56 or 64 Kbps, it is possible to operate the DTE interface at a lower rate. To do this, set the line rate to 56 or 64 Kbps. Then set the DTE Speed as required (Software Switch Menu option 7).

```
LINE RATE MENU—Esc to exit

1. 2400 bps                4. 19.2 Kbps
2. 4800 bps                5. 56 Kbps (DEFAULT)
3. 9600 bps                6. 64 Kbps
```

Figure 7. Line Rate Menu.

Circuit Assurance

Choosing option 2 in the Software Switch Menu takes you to the Circuit Assurance Menu. On dedicated (DDS) circuits, the transmitter and the CTS output can be configured to go ON only when a working communication circuit is established. If you use Circuit Assurance with DDS services, enable it on only one end of the communications link. For Switched-56 services, enable Circuit Assurance on both ends of the circuit. When Circuit Assurance is disabled, the transmitter and CTS operate without regard to the receiver state.

```
CIRCUIT ASSURANCE MENU—Esc to exit

1. Enable Circuit Assurance
2. Disable Circuit Assurance (DEFAULT)
```

Figure 8. Circuit Assurance Menu.

Force RTS

Choosing option 3 in the Software Switch Menu takes you to the RTS Menu. The RTS input can be forced ON, ignoring the RTS signal from the DTE. When RTS is forced ON, the transmitter is always enabled and the user may send data.

```
RTS Menu—Esc to exit

1. RTS Forced On (DEFAULT)
2. RTS Follows DTE Signal
```

Figure 9. RTS Menu.

NOTE

When the Line Rate (Software Switch Menu option 1) is 64 Kbps, RTS is always forced ON, regardless of the Force RTS switch setting.

Character Length

Choosing option 4 in the Software Switch Menu takes you to the Character Length Menu. In asynchronous data format, the Card supports 10-bit and 11-bit character lengths. Set this option according to the characteristics of the data being transmitted.

```
CHARACTER LENGTH MENU—Esc to exit

1. 10 Bit Character Length (DEFAULT)

2. 11 Bit Character Length
```

Figure 10. Character Length Menu.

DTE Data Format

Choosing option 5 in the Software Switch Menu takes you to the Data Format Menu. This option controls whether an async-to-sync conversion is performed between the DTE and the Card. (Data is always transferred synchronously between two Cards.) For an asynchronous DTE, select the asynchronous data format. For a synchronous DTE, select the synchronous data format.

```
DATA FORMAT MENU—Esc to exit

1. Asynchronous Data Format

2. Synchronous Data Format (DEFAULT)
```

Figure 11. Data Format Menu.

NOTE

The async rate of 57.6 Kbps is supported at the 56 Kbps line rate, provided the DTE equipment is configured to transmit two stop bits. The extra stop bit reduces the DTE's effective data rate to allow synchronization with the 56 Kbps line speed. Set the Card for two stop bits by selecting "11 bit character length" in the Character Length Menu.

NOTE

You can use the Card to transmit lower-speed asynchronous data (up to 9.6 Kbps) over synchronous circuits by simple over-sampling. To do this, select the synchronous data format and set the line Line Rate (Software Switch Menu option 1) to at least four times that asynchronous data rate you wish to send. For example, use a Line Rate of 9.6 Kbps or higher for 2.4 Kbps async data.

DSR Status During Local Loopback

Choosing option 6 in the Software Switch Menu takes you to the DSR Loop Status Menu. This option controls the behavior of the DSR output during local loopback. To force DSR high (ON) during local loopback, enable this option. To force DSR low (OFF) during a local loopback, disable it.

```
DSR LOOP STATUS MENU—Esc to exit
1. DSR On During Local Line Loop
2. DSR Off During Local Line Loop (DEFAULT)
```

Figure 12. DSR Loop Status Menu.

Rate Converter/DTE Rate

Choosing option 7 in the Software Switch Menu takes you to the Rate Adapter/DTE Rate Menu. The Card rate converter adapts a 56 Kbps or 64 Kbps line rate to slower DTE data rates. Set the Rate Converter to match the DTE data rate. If the DTE data rate is the same as the line rate, disable rate conversion by selecting item 6 on this menu.

```
RATE ADAPTER/DTE RATE MENU—Esc to exit
1. Line=56/64, DTE=2.4
2. Line=56/64, DTE=4.8
3. Line=56/64, DTE=9.6
4. Line=56/64, DTE=19.2
5. Line=56/64, DTE=38.4
6. Line Rate=DTE Rate (DEFAULT)
For 57.6, use Line Rate=DTE Rate, set Line Rate to
56 Kbps, config DTE for 2 Stop bits and set Char
Length accordingly.
```

Figure 13. Rate Adapter/DTE Rate Menu.

NOTE

For DTE data rates of 56 Kbps or 64 Kbps, set the rate adapter to “Line Rate=DTE Rate,” and set the Line Rate to 56 or 64 Kbps, respectively. For DTE rate of 57.6 Kbps, set rate adapter to “Line Rate=DTE Rate,” set line rate to 56 Kbps, set DTE for two stop bits, and set CSU/DSU character length to “11 bits.”

DTE Loop Control

Choosing option 8 in the Software Switch Menu takes you to the DTE Loop Control Menu. The local and remote loopbacks on the Card can be controlled from the DTE interface by raising or lowering the LL and RL signals. To allow the DTE to control these loopbacks in this manner, enable this option. Disable if you want the Card to ignore these signals.

```
DTE LOOP CONTROL MENU—Esc to exit

1. Enable DTE Loop Control

2. Disable DTE Loop Control (DEFAULT)
```

Figure 14. DTE Loop Control Menu.

Clock Mode

Choosing option 9 in the Software Switch Menu takes you to the Clock Mode Menu.

```
CLOCK MODE MENU—Esc to exit

1. Internal (Master) Clock

2. Network (Looped) Clock (DEFAULT)

3. External (DTE) Clock

4. Switched 56 Clock
```

Figure 15. Clock Mode Menu.

Set this option as follows:

- **Internal (Master):** To use the Card internal reference clock as the timing source, select item 1. Use internal timing in point-to-point applications where the Card is being used as a limited distance modem. (Set the far-end Card for looped timing as described below.)
- **Network (Looped):** To have the Card derive a transmit clock from the incoming data stream from the network, select item 2. This is the default setting and appropriate for most applications.
- **External (Terminal Timing):** To have the Card use the DTE-supplied transmit clock (pin 24 on an RS-232/V.24 interface or pins U and W on a V.35 interface), select item 3. Use external timing for tail-circuit applications, in which the RS-232 or V.35 ports of two Cards are interconnected.
- **Switched 56:** When using a Card with Switched 56 service, select item 4.

Anti-Streaming Timer

Choosing option “a” (options “a” through “e” must be entered in lower-case letters) in the Software Switch Menu takes you to the Anti Stream Timer Menu. This option lets you enable or disable the anti-streaming timer, which protects multidrop networks from a drop that is continuously transmitting. If the DTE asserts RTS for a period of time exceeding the timer interface, the timer forces RTS off internally. This allows the rest of the multidrop network to resume operation. The Card holds RTS off until the terminal drops RTS. The timer interval decreases as the line rate increases.

```
ANTI-STREAM TIMER MENU—Esc to exit

1. Enable Anti-Stream Timer
2. Disable Anti-Stream Timer (DEFAULT)
```

Figure 16. Anti-Stream Timer Menu.

RTS/CTS Delay

Choosing option “b” in the Software Switch Menu takes you to the RTS/CTS Delay Menu. This option lets you set the RTS/CTS turn-on delay to Normal or Extended. The delay interval decreases as the line rate increases.

```
RTS/CTS DELAY MENU—Esc to exit

1. Normal RTS/CTS Delay (DEFAULT)

2. Extended RTS/CTS Delay (4xNormal)
```

Figure 17. RTS/CTS Delay Menu.

4.3 Rear Card Configuration

The MicroCSU/DSU Front Card has two interface card options: the MicroCSU/DSU DB25 Rear (DB25/RJ-48S) and the MicroCSU/DSU V35 Rear (M/34/RJ-48S). Each of these options supports one interface connection and one 4-wire connection. Figure 18 illustrates the two interface options.

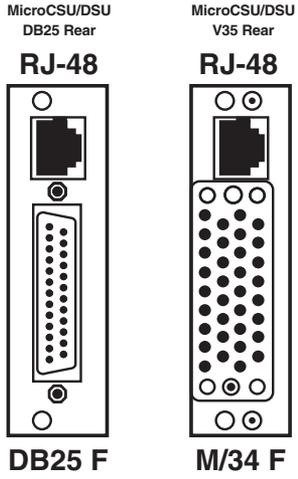


Figure 18. The interface cards.

Prior to installation, you will need to examine the rear card you have selected and make sure it is properly configured for your application. Each rear card is configured by setting straps located on the PC board.

To configure the rear cards, you must set the configuration straps. Figure 19 shows the orientation of these straps. Each strap can either be on pegs 1 and 2, or on pegs 2 and 3. **Sections 4.3.1** and **4.3.2** describe the strap locations and possible settings for each rear card.

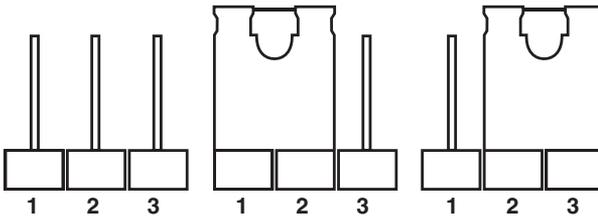


Figure 19. Orientation of interface card straps.

4.3.1 MICROCSU/DSU DB25 REAR STRAP SETTINGS

Figure 20 shows strap locations for the MicroCSU/DSU DB25 Rear (DB25/RJ-48S). These straps determine various grounding characteristics for the terminal interface and twisted-pair lines.

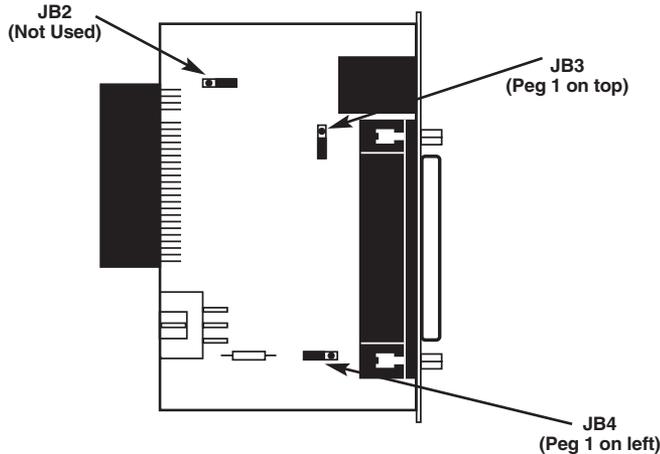


Figure 20. DB25/RJ-48S strap locations.

Table 3 provides an overview of interface strap functions for the rear interface cards. Following this overview is a detailed description of each strap’s function.

Strap	Function	Position 1 & 2	Position 2 & 3
JB3	DTE Shield (Pin 1) & FRGND	Connected	Open*
JB4	FRGND & SGND	Connected	Open*

NOTE: * indicates factory default

Table 3. Summary of strap settings

DTE Shield (Pin 1) & FRGND (JB3)

In the connected position, this strap links DB25 pin 1 and frame ground. In the open position, pin 1 is “lifted” from frame ground.

JB3

Position 1 & 2 = DTE Shield (Pin 1) and FRGND Connected

Position 2 & 3 = DTE Shield (Pin 1) and FRGND Not Connected

SGND & FRGND (JB4)

In the connected position, this strap links DB25 pin 7 (Signal Ground) and frame ground. In the open position, pin 1 is “lifted” from frame ground.

JB4

Position 1 & 2 = SGND (Pin 7) and FRGND Connected

Position 2 & 3 = SGND (Pin 7) and FRGND Not Connected

4.3.2 MICROCSU/DSU V35 REAR STRAP SETTINGS

Figure 21 shows the strap location for the MicroCSU/DSU V35 Rear (M/34/RJ-48S). This strap determines whether Signal Ground and Frame Ground will be connected.

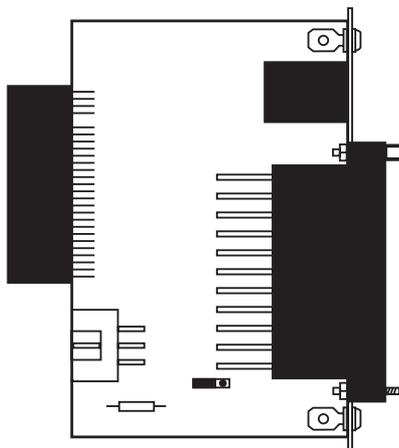


Figure 21. M/34/RJ-48S strap locations.

SGND & FRGND (JB4)

In the connected position, this strap links Signal Ground and Frame Ground.

JB4

Position 1 & 2 = SGND and FRGND Connected

Position 2 & 3 = SGND and FRGND Not Connected

5. Installation

This chapter describes the functions of the MicroRack chassis, tells how to install front and rear MicroCSU/DSU cards into the chassis, and provides diagrams for wiring the interface connections correctly.

The MicroRacks come with two, four, eight, or sixteen short-range modem card slots, plus its own power supply. Measuring only 3.5 inches high, the MicroRack is designed to occupy only 2U in a 19-inch rack. Sturdy front handles allow the MicroRack 16 to be extracted and transported conveniently.

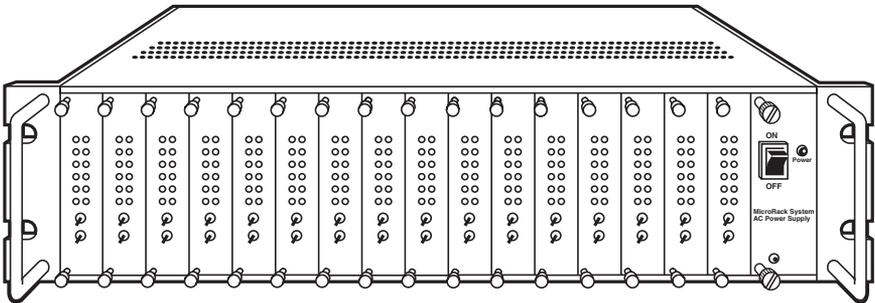


Figure 22. The MicroRack 16.

The power supply consists of two cards: a front power-supply card and the rear power entry card. The two cards meet inside the rack chassis and plug into each other by means of a multipin connector. Use the steps on the next page as a guide for installing the power-supply module.

Rear (Power Entry) Card Installation

1. Attach the ground wire using the star washer and the #6-32 nut. Use a wrench to tighten the nut securely.
2. Slide the power entry card into the back of the chassis along the metal guide rails provided.
3. Secure the rear card using the #4-40 metal screws provided.

CAUTION

To avoid shock, do not connect power cables until the power-supply module is fully assembled.

Front (Power Supply) Card Installation

1. Make sure the power switch is in the OFF position.
2. Slide the power-supply card into the front of the chassis. It should meet the rear card when it's almost all the way into the chassis.
3. Push the front card gently into the multipin connector on the rear card.
4. Secure the front card using the thumbscrews.

Rear Card Power Connection for the AC Power Supply

The PS460A rear card is equipped with a shrouded male IEC-320 AC power interface. This interface accepts a domestic U.S. power cord or any number of international power cords.

DC Rear Card Power Connection

The power supply's rear card comes equipped with a cage-clamp terminal block. The steps below will help you install the rear card.

CAUTION

Connect the equipment to a SELV DC supply source that is electrically isolated from the AC power sources. The DC power source should also be reliably connected to earth ground.

1. Strip back the insulation on each of the wires about a quarter of an inch.
2. Use a small flatblade screwdriver to open the cage clamp as shown in Figure 3-2. Insert the stripped portion of the wire into the opening and remove the screwdriver. The cage clamp will clamp the wire, producing a reliable connection. Make sure all strands of wire are captured and that there is no exposed wire.
3. Connect the earth ground wire to the frame ground terminal.
4. Connect the +VDC power wire to the +DC In terminal. Connect the -VDC power wire to the -DC In terminal. The power-supply card is protected against accidental reversal of polarity. If the DC-Input LED does not light, check the polarity of the input wiring.
5. Connect the Alarm contacts as needed by your application.

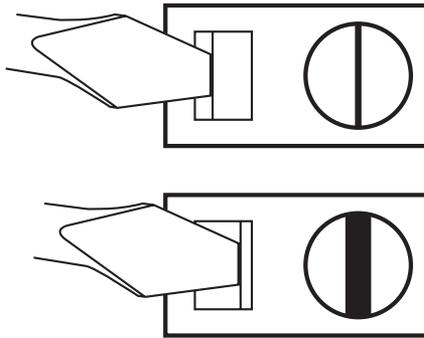


Figure 23. Connecting bare wires to the rear power-entry card.

Replacing the Power Supply Fuse

The rack chassis power supply uses a 400 mA fuse for 120-VAC circuits, and a 200 mA fuse for 240-VAC circuits. The fuse compartment is located just below the AC socket on the rear card. To replace the fuse, follow the steps on the next page:

- 1) Turn the power switch off and remove the power cord.
- 2) Using a small screwdriver, pop the compartment open (it will slide open like a drawer). Depending upon the exact part used, the drawer may slide completely out of the fuse holder or it may stop partway out.

- 3) Note that there are two fuses in the drawer. The front fuse is the spare, and the rear fuse is the “active” fuse.
- 4) If the active fuse appears to be blown, remove it from the clips and replace it with the spare from the front compartment. Note the size and rating of the blown fuse before discarding it.
- 5) Buy a replacement fuse at an electronics store. (Note: For continued protection against the risk of fire, replace only with the same type and rating of fuse.)

Switching the Power Supply Between 120 and 240 Volts

The power supply module should be installed in the rack chassis before any CSU/DSU cards. Here are the steps to select the switch for the proper voltage level.

- 1) Locate the two-position switch near the back of the card. Slide the switch to the desired voltage. (Note: The actual values on the switch may be “110/220” or “115/230.”)
- 2) Verify that the existing fuse is the correct value (400 mA for the 120-volt, 200 mA for the 240-volt).
- 3) Connect the power supply cord.

Wiring the MicroCSU/DSU

Each of the rear interface cards compatible with the MicroCSU/DSU has one terminal interface port and one 4-wire (twisted pair) port. For specific interface pinouts, refer to **Appendix B**.

Operating the Power Supply

The AC power supply has a single power LED on the front panel, which lights when the power switch is turned on and the unit is connected to an AC power source.

The DC power supplies feature two front-panel LEDs that indicate the condition of the power line. The “Power ” LED will only light when the power switch is turned on and the low voltage AC power is available to the function cards installed in the rack. The “DC Input” LED will light whenever a power source is present (with correct polarity), regardless of whether or not the power switch is turned on.

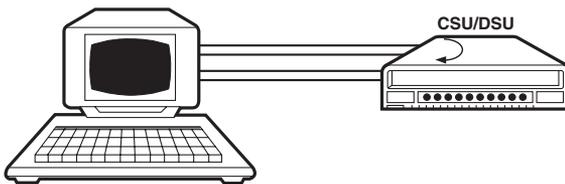
6. DDS Testing

The MicroCSU/DSU offers three tests to evaluate the condition of the CSU/DSUs and the communication link: local analog loopback testing, remote digital loopback testing, and telco testing. This section describes how to utilize each of these test modes.

6.1 Local Analog Loopback Testing

The Local Analog Loopback (LAL) test checks the operation of the local MicroCSU/DSU. Any data sent to the local MicroCSU/DSU in this test mode will be echoed (returned) back to the user device. For example, characters typed on the keyboard of a terminal will appear on the terminal screen. To perform an Analog Loopback test, follow these steps:

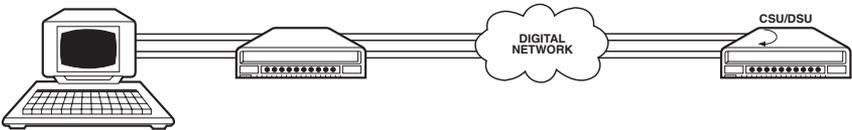
- 1) Activate Analog Loopback. This may be done in one of two ways: by moving the front-panel toggle switch to Analog or by raising signal LL on the terminal interface. Once LAL is activated, the MicroCSU/DSU transmit output is connected to its own receiver. The “test” LED should be lit.
- 2) Verify that the data terminal equipment is operating properly and can be used for a test. If a fault is indicated, call your supplier.
- 3) Perform a BER (bit error rate) test on each unit. 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 MicroCSU/DSU.



6.2 Remote Digital Loopback Testing

The Remote Digital Loopback (RDL) test checks the performance of both the local and remote MicroCSU/DSUs, and the communication link between them. Any characters sent to the remote MicroCSU/DSU in this test mode will be returned back to the originating device. For example, characters typed on the keyboard of the local terminal will appear on the local terminal screen after having been passed to the remote MicroCSU/DSU and looped back. To perform an RDL test, follow these steps:

- 1) Activate RDL. This may be done in two ways: by moving the front-panel toggle switch to “Remote” or by raising the RL signal on the terminal interface.
- 2) Perform a BER (bit error rate) test on the system.
- 3) If the BER test equipment indicates a fault and the Local Analog Loopback test was successful for both MicroCSU/DSU modems, you may have a problem with the line between the CSU/DSUs. You should inspect the line for proper connections.



6.3 V.52 BER Test Generator

The MicroCSU/DSU has a built-in test pattern generator and detector. It can be invoked at both ends of a link simultaneously, or it can be used with the Local Analog or Remote Digital Loopback. The following example requires two operators: one to initiate and monitor the test at the local MicroCSU/DSU modem, and one at the remote MicroCSU/DSU modem. To use the V.52 BER test by itself, both operators should simultaneously follow these steps:

- 1) Locate the “511/511E” toggle switch on the front panel of the MicroCSU/DSU and move it to “511.” This activates the V.52 BER test mode and transmits a “511” pseudorandom test pattern to the other unit. If any errors are received, the receiving CSU/DSU’s red “Error” LED will blink sporadically.

NOTE

For this test to function, the “511” switch on both MicroCSU/DSU modems must be on.

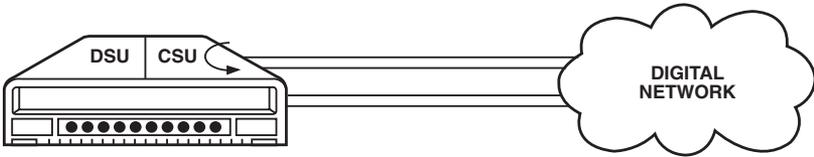
- 2) If the test indicates no errors are present, move the V.52 toggle switch to the “511/E” test. The 511/E test transmits the 511 pseudorandom test pattern and periodically injects intentional errors. If the test is working properly, the receiving CSU/DSU’s red “Error” LED will blink regularly. A successful 511/E test will confirm that the link is in place, and that the MicroCSU/DSU’s built-in 511 generator and detector are working properly.
- 3) This test can be done by one operator by first activating the local analog loop or remote digital loop.

6.4 Telco Testing

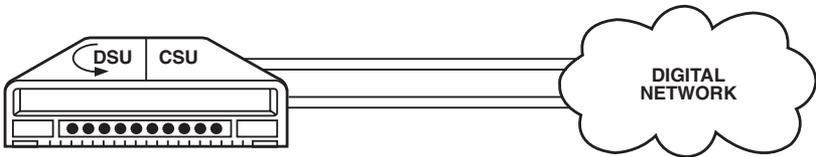
The digital service provider’s central office can perform CSU Loop and DSU Loop diagnostic testing. These diagnostics allow the central office to evaluate circuit operation without making visits to a customer’s premises.

6.4.1 CSU Loop

The CSU Loop is activated when the central office reverses the DC sealing current that flows between the TX pair and the RX pair. In this case, the MicroCSU/DSU recognizes this and loops signals on the RX pair back to the central office on the TX pair. While the CSU Loop is activated by the central office, the TM light is illuminated.

**6.4.2 DSU Loop**

The DSU Loop is activated when the central office sends a DSU loop signal over the twisted-pair wire. The MicroCSU/DSU senses this signal and loops the digital data back to the central office. While the DSU Loop is activated, the TM light is illuminated.



Appendix A. Cable Recommendations

The MicroCSU/DSU has been tested using twisted-pair cable with the following characteristics:

<u>Wire Gauge</u>	<u>Capacitance</u>	<u>Resistance</u>
19 AWG	83nf/mi or 15.72 pf/ft.	0.0163 ohms/ft.
22 AWG	83nf/mi or 15.72 pf/ft.	0.0326 ohms/ft.
24 AWG	83nf/mi or 15.72 pf/ft.	0.05165 ohms/ft.

For optimum performance from your MicroCSU/DSU, keep the following guidelines in mind:

- *Always use twisted-pair wire*—this is not an option.
- Use twisted-pair wire with a capacitance of 20 pf/ft. or less.
- Avoid twisted-pair wire thinner than 26 AWG (in other words, avoid higher AWG numbers than 26).
- Use of twisted pair with a resistance greater than the above specifications may cause a reduction in maximum distance obtainable. Functionality should not be affected.
- Many different environmental factors can affect the maximum distances obtainable at a particular site.

Appendix B. Interface Pin Assignment

B.1 DDS Interface

The DDS Interface is an RJ-48S modular jack.

<u>Pin #</u>	<u>Signal</u>
1	TX+
2	TX-
3	No connection
4	No connection
5	No connection
6	No connection
7	RX+
8	RX-

B.2 M/34 Connector, Terminal Interface

<u>Pin #</u>	<u>Signal</u>
B	SGND (Signal Ground)
C	RTS
D	CTS
E	DSR
F	CD
H	DTR
L	LL (Local Loop)
M	TM (Test Mode)
N	RL (Remote Loop)
P	TD
R	RD
S	TD/
T	RD/

M/34 Connector, Terminal Interface (continued)

U	XTC
V	RC
W	XTC/
X	RC/
Y	TC
AA	TC/

B.3 DB25 Connector, Terminal Interface

Pins are assigned according to RS-232E and EIA-530 standards.

<u>Pin #</u>	<u>Signal</u>
1	Frame Ground
2	TD
3	RD
4	RTS
5	CTS
6	DSR
7	SGND (Signal Ground)
8	CD
9	/RC
11	/XTC
12	/TC
14	/TD
15	TC
16	/RD
17	RC
18	LL (Local Loop)
20	DTR
21	RL (Remote Loop)
24	XTC
25	TM (Test Mode)

Appendix C. Transmitter Clock Source During Test Loops

Clock Mode	Normal	Analog Loop	Originating Remote Loop	Receiving Remote Loop
Internal	INT	INT	INT	RC
External	EXT	INT	EXT	EXT
Network	RC	INT	RC	RC

RC = Receive Clock