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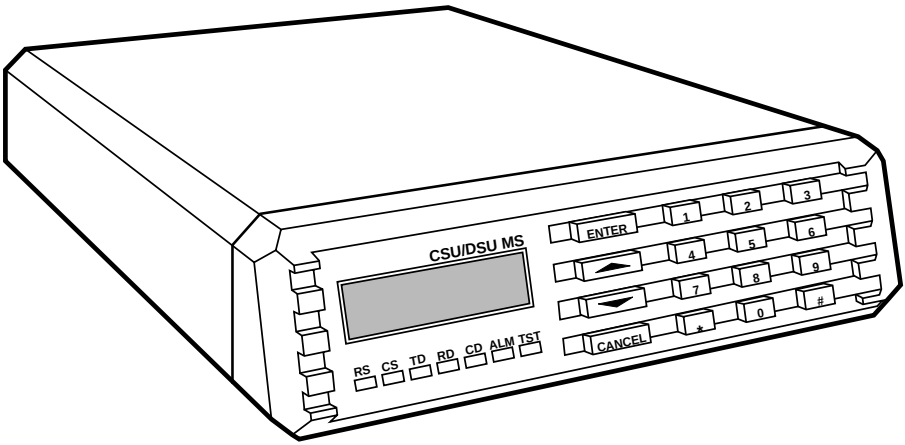
NETWORK SERVICES

MARCH 1999
MT132A-R2

CSU/DSU MS



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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 J 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.

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Contents

1.0 Specifications

DTE Rates—Async: 2.4, 4.8, 9.6, 19.2, 38.4, 56, 57.6, and 64 Kbps; Sync: 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 Kbps; Secondary channel (async or sync): 75, 150, 300, 600, 1200, and 2400 bps

Interface—Primary V.35/M34, primary RS-232/DB25, auxiliary RS-232/DB25, Telco—RJ-45

Indicators—RTS, CTS, TD, RD, CD, Alarm, Test

Power—115 VAC, 60 Hz, 8 watts

Size—2.3"H x 8.8"W x 11"D (5.8 x 22.4 x 27.9 cm)

Weight—31 lb. (14.1 kg)

2.0 Introduction

2.1 Overview

The CSU/DSU MS provides a reliable, high speed data connection from a customer's Data Terminal Equipment (DTE) through Digital Data Service (DDS) lines, DDS secondary channel services (DDSII), or 4-wire Switched 56 Network (SW56) lines. The CSU/DSU MS supports both synchronous and asynchronous data communication over the DDS or SW56 networks.

There are three easy methods to configure the CSU/DSU MS:

1. A front-panel dial key and an LCD display provide quick and easy access to the configuration menus.
2. "AT" commands or V.25 bis commands in-band.
3. Remote CSU/DSU MS units can be configured from the local unit by using the front panel, AT commands, or V.25 bis commands.

2.2 The Front Panel

Figure 2-1 shows the front view of the CSU/DSU MS.

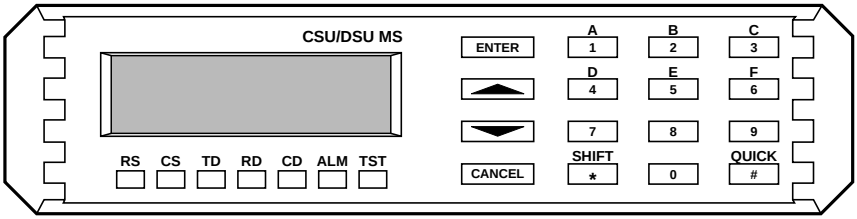

Fig. 2-1. CSU/DSU MS Front View.

LED Identification

RS—Request to Send

CS—Clear to Send

TD—Transmit Data

RD—Receive Data

CD—Carrier Detect

ALM—Alarm Indication

TST—Test Mode

2.3 Introduction to DDS

Digital Data Service (DDS) is a service that allows interconnection and transport of data at speeds up to 64 Kbps. The local exchange carriers provide the local loop service to DDS interexchange carrier. In DDS mode, the CSU/DSU MS supports all DDS service rates yielding DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4 (sync or async), 56, and 64 Kbps. An additional rate of 57.6 Kbps is available in async mode. At the service rate of 56 Kbps, the unit can be configured to run slower DTE rates (async or sync) over the 56 Kbps service. Secondary channel operation is supported at all service rates up to 56 Kbps, providing terminal rates of 75, 150, 300, 600, 1200, and 2400 bps. The secondary rates available depend on the service rate configured.

2.4 Introduction to Switched 56

This dial-up 4-wire Digital Data Service allows customers to pay for data connection only when the unit is active. The regional operating companies provide the 4-wire local loop service to SW56 customers. Switched 56 service is supplied by AT&T, U.S. Sprint®, and other interexchange carriers. In SW56 mode, the CSU/DSU MS supports DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4 (sync or async), and 56 Kbps (sync). The additional DTE rate of 57.6 Kbps is available in async modes.

2.5 CSU/DSU MS Rear View

The rear panel has three data DTE connectors which provide primary channel V.35 or RS-232, and a secondary channel RS-232 port (auxiliary EIA 232). An 8-pin Telco jack, a captive (directly attached) power cord, and a power switch are also located on the rear panel. Pin assignments for the DTE and network connections are listed in **Chapter 3**.

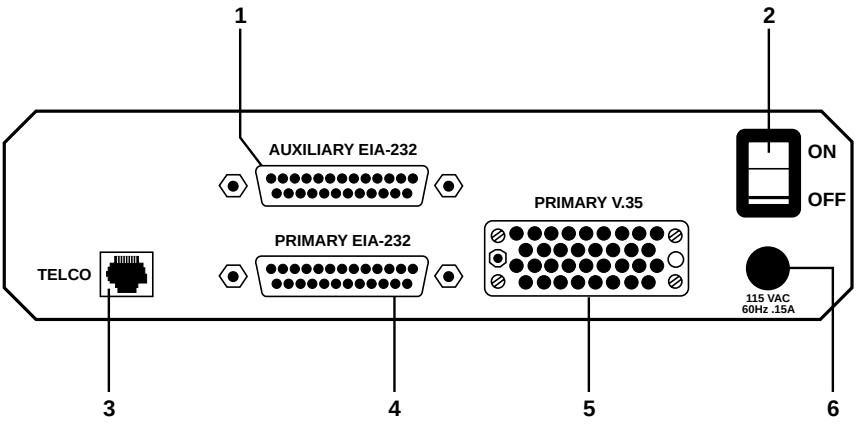

Fig. 2-2. CSU/DSU MS Rear View.

Table 2-1. Key to Fig. 2-2.

Item	Function
1. Auxiliary EIA-232	Secondary channel services
2. Power Switch	Used to turn power on or off
3. Telco	Connection to the telephone company
4. Primary EIA-232	DTE interface
5. Primary V.35	High-speed digital data interface
6. 115 VAC connection	Power-cord connection

3.0 Installation

3.1 Unpack, Inspect, Power On

Carefully inspect the CSU/DSU MS for any shipping damage. If you suspect damage, file a claim immediately with the carrier and then contact your dealer. If possible, keep the original shipping container.

Your package should include the following items:

- The CSU/DSU MS unit
- Two line interface cables: an 8-position/modular to 8-position modular, and 8-position/ modular to 8-position spade lug
- This user's manual

You need to provide the following items:

- DTE cable(s)
- An RS-232 interface cable with standard DB25 male connectors or V.35 cable

Each CSU/DSU MS unit with a captive eight-foot power cord, terminated by a three-prong plug that connects to a grounded power receptacle.

CAUTION

Power to the CSU/DSU MS must be from a grounded 115-VAC, 60-Hz power supply.

A telco connector is provided for interface to the network and three others provide connection to the data terminal equipment (DTE).

3.2 Network Interface Connection

The CSU/DSU MS has a eight-position modular jack labeled "Telco," used for connecting to the network when the unit is configured for either dedicated or switched operation. The pinout for the Telco connector is listed in **Table 3-1**.

Table 3-1. Pin Assignments for Telco Connector.

Pin	Name	Description
1	R	Transmit Data (from CSU/DSU MS to Network Ring)
2	T	Transmit Data (from CSU/DSU to Network-Tip)
3-6		Not Used
7	T1	Receive Data (From Network to CSU/DSU-Tip 1)
8	R1	Receive Data (From Network to CSU/DSU-Ring 1)

3.3 DTE Data Connection

The primary DTE should be connected to either the RS-232 DTE connector or the CCITT V.35 DTE connector. The maximum cable lengths recommended are 50 feet for the RS-232, and 100 feet for the CCITT V.35. The pin assignments for the connectors are listed in **Tables 3-2** and **3-3**.

The V.35 connector is recommended for use with data rates above 19.2 Kbps. The RS-232 connector will work at up to 56 Kbps with a low-capacitance cable or with the external transmit-clock option selected. The primary DTE rate is configured from the front panel. The primary Data Terminal Equipment can operate in asynchronous or synchronous mode.

CAUTION

To prevent possible radio-frequency-interference emissions, a shielded V.35 cable is required.

Table 3-2. Pin Assignments for Primary RS-232 Connector.

Pin	EIA	Description
1	AA	Protective Ground (PG)
2	BA	Transmit Data (SD)
3	BB	Receive Data (RD)
4	CA	Request to Send (RTS)
5	CB	Clear to Send (CTS)
6	CC	Data Set Ready (DSR)
7	AB	Signal Ground (SG)
8	CF	Received Line Signal Detector (CD)
9	-	+12 Test Point
10	-	-12 Test Point
15	DB	Transmit Clock (TC)
17	DD	Receive Clock (RC)
18	-	Local Loopback (LL)
20	CD	Data Terminal Ready (TR)
21	-	Remote Loopback (RL)
22	CE	Ring Indicator (RI)
24	DA	External TX Clock (ETC)
25	-	Test Indicator

Table 3-3. Pin Assignments for Primary V.35 Connector.

Pin	CCITT	Description
A	101	Protective Ground (PG)
B	102	Signal Ground (SG)
C	105	Request to Send (RTS)
D	106	Clear to Send (CTS)
E	107	Data Set Ready
F	109	Received Line Signal Detector (CD)
H	-	Data Terminal Ready (DTR)
J	-	Ring Indicator (RI)
L		Local Loopback (LL)
N	-	Remote Loopback (RL)
R	104	Received Data (RD-A)
T	104	Received Data (RD-B)
V	115	Receiver Signal Element Timing (SCR-A)
X	115	Receiver Signal Element Timing (SCR-B)
P	103	Transmitted Data (SD-A)
S	103	Transmitted Data (SD-B)
Y	114	Transmitter Signal Element Timing (SCT-A)
AA	114	Transmitter Signal Element Timing (SCT-B)
U	113	External TX SIgnal Element (SCX-A)
W	113	External TX Signal Element (SCX-B)
NN	-	Test Indicator (TI)

3.4 Secondary Channel Connection

If used, the secondary data terminal equipment should be connected to the auxiliary EIA 232 connector. The pinout for the connector is listed in Table 3-4.

Table 3-4. Pin Assignments for Auxiliary RS-232 Connector.

Pin	CCITT	Description
1	AA	Protective Ground (PG)
2	BA	Transmit Data (TD)
3	BB	Receive Data (RD)
4	CA	Request to Send (RTS)
5	CB	Clear to Send (CTS)
6	CC	Data Set Ready (DSR)
7	AB	Signal Ground (SG)
8	CF	Received Line Signal Detector (CD) on all the time

3.5 Configuration

The CSU/DSU MS contains four different user profiles (sets of configuration options), listed in **Appendix D**, that are stored in read-only memory. If profile 1 matches the desired system requirements, then no additional configuration is required to put the unit into service. If profile 1 does not match the desired system requirements, there are two options available:

1. Modify the default configuration.
2. Select one of the other profiles that more nearly matches the desired configuration, then modify it to required specifications.

When a new profile is loaded, or the existing profile is modified, it is stored in the non-volatile configuration memory. The CSU/DSU MS is then configured with that profile every time power is turned on, or the unit is reset.

The CSU/DSU MS provides four different methods for local configuration (see below) and two different methods (remote by front panel and remote by AT command) for remote configuration.

1. Front panel
2. AT commands
3. V.25 bis
4. Remote commands

3.5.1 Front Panel

The front panel provides access to all operation parameters of the CSU/DSU MS through a multi-level menu structure that begins with the four-part Main Menu. (See **Chapter 4**.)

1=STATUS: Displays status of network and DTE interface

2=TEST: Controls local and remote testing

3=CONFIG: Displays/changes current configuration parameters

4=DIAL: Provides manual dialing functions (available only when the unit is configured for SW56 operation)

3.5.2 AT Commands

In addition to the front panel, the CSU/DSU MS can be configured and controlled with in-band AT commands from an asynchronous DTE port just as modems are.

To exit the data mode and enter the command mode, the asynchronous DTE device must transmit a proper escape sequence to the CSU/DSU MS. A specified time delay must occur between the last data character and the first escape sequence character. This is the guard time delay, and it can be changed by writing a value to the S12 register. The default value for the guard time is one second. For a valid escape sequence to occur, the DTE must transmit the escape-code character three times in succession, and the delay between characters must be less than the guard time.

Once the command mode is entered, AT commands can be transmitted to the CSU/DSU MS to configure most of the options, dial remote CSU/DSUs, or initiate tests to check both the CSU/DSU MS and the network connections. All command lines must begin with the AT character set in either capital or lower-case letters. A command line can be terminated at any time by transmitting the CTRL-X (ASCII 018) after the AT attention code. The CSU/DSU MS will ignore this command line and issue an OK response.

The command line may contain a single command or a series of commands after the AT attention code. When a series of commands is used, the individual commands may be separated with spaces for readability. The maximum length for a command line is 40 characters.

Each command line is executed by the CSU/DSU MS upon receipt of a terminating character. The default terminating character is a carriage return (ASCII 013), but it can be changed by writing a different value to register S3.

Before the terminating character is transmitted, the command line can be edited by using the backspace character (ASCII 008) to erase errors so the proper commands can be entered.

Valid AT commands for the CSU/DSU MS are listed in **Appendix C**.

3.5.3 V.25 bis Commands

When configured for the V.25 bis option, the CSU/DSU MS accepts in-band dialing and configuration commands from both synchronous and asynchronous DTE ports.

The V.25 bis option supports the following protocols:

1. SDLC
2. Bisync
3. Asynchronous

SDLC Option Character Format

CHARACTER FORMAT:

1. Data bits=8
2. Parity bit=ignored

COMMAND STRUCTURE:

[F][A][C][V.25 bis COMMAND][FCS][F]

The address field [A] is FFH. The control field [C] is set to 13H except for cases of multi-frame responses. For this case, the control field is set to 03H in all but the last frame. The 03H in the control field indicates that other frames are to follow while the 13H in the control field indicates the final frame.

Bisync Option

CHARACTER FORMAT:

1. Data bits=7
2. Parity bit=ODD

COMMAND STRUCTURE

[SYN][SYN][STX][V.25 bis COMMAND][ETX]

Asynchronous Option

CHARACTER FORMAT:

1. Start bit=1
2. Data bits=7
3. Parity bits=EVEN
4. Stop bit=1

COMMAND STRUCTURE:

[V.25 bis COMMAND][CR][LF]

Command Descriptions

The command set that the CSU/DSU MS uses is a subset of the CCITT V.25 bis command set. In addition to the CCITT commands supported, the CSU/DSU MS has configuration commands for both the local and remote CSU/DSU MS units. The proprietary V.25 bis command set is:

CIC—Connect Incoming Call

CNL—CoNfiguration Local

CNR—CoNfiguration Remote

CRN—Call Request with Number

CRS—Call Request using Stored number

DIC—Disregard Incoming Call

PRN—PRogram Number

RLN—Request List of Numbers

Possible responses to V.25 bis commands are:

VALA—Valid V.25 bis command processed

INV—Invalid command detected

CFIET—Call failed on switched network—busy detected

CFIDE—Call failed on switched network—no wink detected

CFINS—Call failed—no dial string in specified register

INVCU—Unknown command detected

INVPS—Invalid parameter syntax

INVPV—Invalid parameter value

INVBL—Invalid local password

INVBM—Invalid remote password

INC—Incoming call

CNX—Call connected

NOTE

If verbose responses are disabled (ATV0), the responses listed below are the only ones returned.

VAL—Valid V.25 command processed

INV—Invalid command received

CFI—Call failed

INC—Incoming call

CNX—Call connected

The Syntax and Possible Responses

- CIC, Connect Incoming Call—Causes the CSU/DSU MS to go online. For dial-backup units, this command hangs up the dial backup line and initiates an attempt to re-establish the main (DDS) line. There are no parameters associated with this command. Possible responses: VALA, CNX, CFIxx

- CNL, Local Configuration—Used to pass AT commands to the local modem via the V.25 bis command processor. This allows the CSU/DSU MS to be configured with AT commands via a synchronous interface. The format of this command is:

  CNL[LOCAL PASSWORD];[ONE OR MORE AT COMMANDS]

  The local password may or may not be required depending on the present configuration of the unit. Responses to CNL commands are returned in the data format currently configured. Possible responses: VALA and INVAn

- CNR, Remote Configuration—Used to pass AT commands over the network to the remote CSU/DSU MS via the V.25 bis command processor. This allows a remote CSU/DSU MS to be configured from a synchronous interface. The format of this command is:

  CNR[REMOTE PASSWORD];AT[ONE OR MORE AT COMMANDS]

  The remote password may or may not be required depending on the present configuration of the remote unit. Responses to the CNR commands are returned in the data format currently configured. Possible responses: VAL and INVAn

Switched 56 Operation

- CRN, Call Request with Number—When the CSU/DSU MS is configured for switched 56 operation, the CRN command causes the CSU/DSU MS to dial the supplied number. The format of this command is:

  CRN [NUMBER TO BE DIALED]

  If no number is included in the command, the number stored in dial register number 1 is dialed. If no number is provided and no number is stored in dial register number 1, the CSU/DSU MS responds with the call-failure indication CFINS (Call Failure Indication Not Stored).

  For a CSU/DSU MS unit, this command initiates dialing on the backup circuit. If the number supplied contains non-dialable digits, they are ignored and only the dialable digits are dialed. Possible responses: VAL, CNX, CFIxx

- CRS, Call Request using Stored number—Causes the CSU/DSU MS to dial the number stored in the specified register. The format of this command is:

  CRS [OPTIONAL SPACE] [REGISTER NUMBER 1-10]

  If this command is issued

without the register-number parameter, the INVPS (INValid Parameter Syntax) response is issued. If this command is issued and the register parameter is not in the valid range for dialing registers, the INVPV (INValid Parameter Value) response is returned. Other responses: VAL, CNX, CFIxx

- DIC, Disregard Incoming Call—Causes the V.25 bis processor to return to command mode even if there is an incoming call pending. This allows the user to issue local commands and ignore the incoming calls. There are no parameters associated with this command. The only possible responses is VAL,

- PRN, PRogram Number—Stores the supplied number into the specified register. The format of this command is:

  PRN [REGISTER NUMBER]; [NUMBER TO BE STORED]

  If this command is entered with no parameters, the INVPS response is returned. If no register number is included in the command or if it is invalid, the INVPV response is returned. If the number to be stored contains invalid characters, the INVPV response is also returned. The characters 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, P, T, and & are valid dial characters. If no digits are issued with this command, the specified register is cleared. The only possible response is: VAL.

- RLN, Request List of Numbers—Causes the CSU/DSU MS to return the number stored in the specified register. The format of this command is:

  RLN [REGISTER NUMBER]

  If the register number is invalid, the INVPV response is returned. When a correct register number is entered, the response is:

  LSN [REGISTER NUMBER]; [NUMBER STORED]VAL

  If no register number is present in the command, the CSU/DSU MS responds with a list of all the registers and the stored numbers. This list is followed by the VAL response.

3.5.4 Remote Command

Remote configuration is available by attaching a remote device via the primary EIA-232 connection on the rear panel and setting the CSU/DSU MS to accept remote configurations.

The 3=CONFIG menu is used to enable or disable the remote configuration capability of the CSU/DSU MS. See **Section 4.5, 3=CONFIG**.

4.0 Operation

Figure 4-1 shows the front view of the CSU/DSU MS and explains the functions of the front panel buttons.

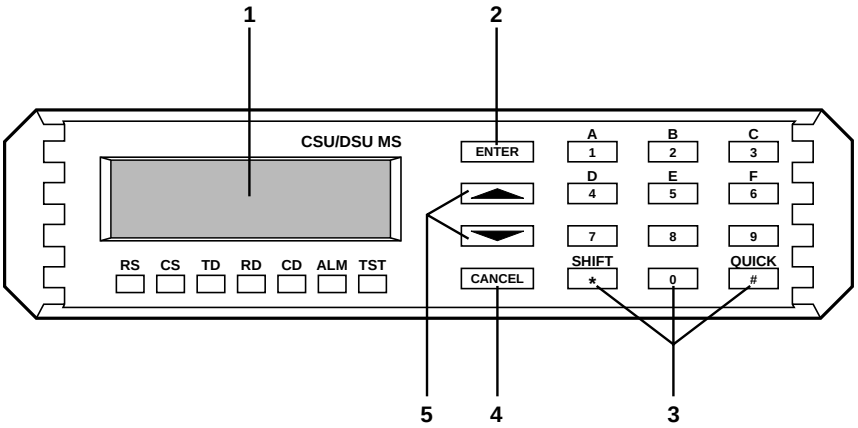

Fig. 4-1. CSU/DSU MS Front View.

Table 4-1. Key to Fig. 4-1.

Item	Function
1. LCD Window	Displays menu items and messages in two 16-character lines.
2. ENTER	Selects active menu items.
3. Numeric Keypad	Numbers/letters activate menu items.
*(Shift)	The letters are entered by pressing the shift key before each desired character.
#(Quick)	Quick return to the 3 main menu choices.
4. CANCEL	Exits submenus.
5. Up and Down scroll arrows	Changes display of menu items.

LEDs

RS—Request to Send

CS—Clear to Send

TD—Transmit Data

RD—Receive Data

CD—Carrier Detect

ALM—Alarm Indication

TST—Test Mode

4.1 Manual Operation and Button Functions

- **Enter Button**—This button is used to select menu items.

  Examples—To select menu items, follow these steps:

1. Press the Up or Down scroll buttons to display menu items.
2. When the desired menu item is displayed, press the number of the item to activate. The item will start flashing.
3. When the desired menu item is flashing, press the Enter button to select.
4. You have invoked a submenu or set a configuration parameter. The display of "command accepted" indicates a valid operation.

- **Cancel Button—**This button is used to cancel the current activity, and return to the previous menu. You can press the Cancel button repeatedly until the desired menu level is displayed.

  Examples—When the Submenu item is displayed, press the Cancel button. The display returns to the previous menu. Repeat unit you reach the desired menu level.

- **Up and Down Scroll**—This button allows you to view all of the submenu selections available in the active menu. Submenu items display two at a time and in a circular or wrapping fashion. When the submenu items are scrolled, they will continuously appear from beginning to end in a forward (down button) or reverse (up button) pattern.

NOTE

The active menu item or configuration parameter flashes.

Examples—

1. To view submenu items in a forward pattern, follow these steps:

a. When the menu is selected and the submenu items are displayed, press the down scroll button.

b. When you reach the end of the list, press the down scroll button again to continue the display of the same menu from the beginning.

2. To view submenu items in a reverse pattern, follow these steps:

a. When the menu is selected and the submenu items are displayed, press the up scroll button.

b. When you reach the beginning of the list, press the up scroll button again to continue the display of the same menu from the end.

- **Numeric Keypad**—Numbers 0 through 9 and alpha characters, A through F, are used to activate menu items. Numbers 0 through 9 are also used to enter parameters settings.

- *** (Shift) key**—The asterisk on the keypad is called the Shift key. You can activate alpha characters by pressing the shift key before each alpha keystroke.

- **# (Quick)**—Quickly returns you to the main menu choices.

Examples:

1. To activate a menu item, follow these steps:

a. When you know the menu *number* of the selection you wish to choose, either by seeing it in the display or remembering it from use, press the *number* of the desired menu item. The display will automatically update by activating (flashing) the desired selection. Press Enter to complete the selection.

b. You can also activate a menu item via its corresponding alpha character. To select a menu item in this way, use the scroll key to display the submenu *letter*. Press the * (asterisk) on the keypad, then press the desired letter.

NOTE

1. If you mistakenly press the letter without using the * (Shift) key, the numbered item will become active. To correct this, repeat the correct procedure.

2. Certain menu items can only be selected via method b (by selecting the corresponding letter). These cases are listed below.

- You *cannot* use numbers to select the following items, because these menus have more than 9 choices (you'll run out of numbers):

  Submenu of 2=DTE Options

  Submenu of 1=Local

  Submenu of 3=Configuration

- You *must* use the alpha character method to select submenu items A and B from the 2=DTE OPTIONS menu.

4.2 Menu Structure

The CSU/DSU MS uses a multilevel menu approach to access its many features. All menu operations are displayed in the LCD window.

The opening menu is the access point to all other operations. There are three main menu items, and one optional item:

1=Status,

2=Test,

3=Configuration,

4=Dial (optional).

The Dial menu is available only when Accunet SW56 or US Sprint SW56 is selected as the network type from the Network Opt, a submenu of the Configuration Main Menu.

Each Main Menu item has several functions and submenus to identify and access specific parameters. To find a particular function, look at the menu diagrams in this manual. There is a diagram for each main menu.

Figure 4-2 shows the LCD display of the opening menu.

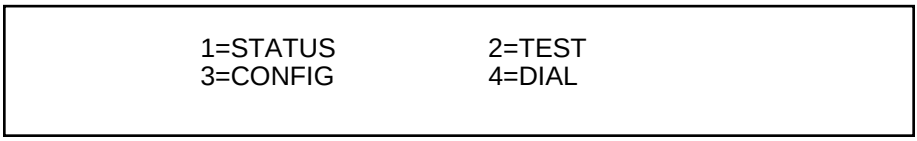

Fig. 4-2. LCD Display of Opening Menu.

4.3 The Four Opening Menu Functions

1=STATUS—This option displays all relevant information for the network and DTE interfaces, including the current operating data mode, loop status, rate of service from the network, DTE data rate and format and DTE interface lead status. The system will return to the status display when idle.

2=TEST—This option controls local and remote testing, selects local or remote testing, defines unit address for remote testing, and selects type of test and test pattern when required.

3=CONFIG—This option selects all desired network and DTE operating parameters. When certain loop rates (64K or 56SC) are selected, a scramble option submenu is displayed in lieu of the DTE rate menu to control scrambling.

4=DIAL—This option provides manual dialing functions This menu item is displayed and available for use only when the Accunet® SW56 or US Sprint SW56 is selected as the network type from the network opt. menu.

4.4 General Operations and Menus

4.4.1 How to Use the Menus

Activate—The initial pressing of any number will activate (cause to flash) that numbered menu item.

Display—Use the up and down scroll keys to display menu choices. In this manual, choices are listed in order using the down scroll button. When all menu items have been displayed, continued pressing of the scroll button will repeat the menu display list. Using the up scroll key will move through selections in reverse order.

Select—Pressing the Enter button will select the activated menu item, which may in turn offer further choices. If the activated item is a parameter choice, it will be entered into the system. The message "Command Accepted" is displayed briefly before returning to the currently active menu/submenu item.

Abort—To abort any operation, press the Cancel button or the # (Quick) button. The system will return to the main menu.

Exit—Once you have selected a parameter, and "Command Accepted" or other message has been displayed, the display will return to the active menu item. You can make another menu selection, or you can use Cancel or #(Quick). If no further operation follows, the system will return to the Status display.

4.4. 3 Menu Map

In this manual, the description of each operation will begin with a menu map. Each level of a menu is separated by a slash (/) mark. For example, the menu map

3=CONFIG/1=LOCAL/3=TEST OPTIONS/1=TEST TIMEOUT/(Parameter)

would be operated by the following method:

From the opening Main Menu, shown in Fig. 4-3, press the number 3 to activate 3=CONFIG. That item will begin flashing.

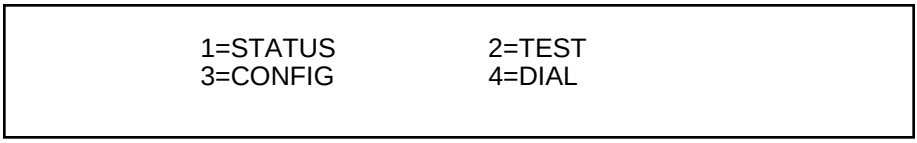

Fig. 4-3. Main Menu.

4.4.2 Loading Factory Defaults

- Select 3 (Config) on the front panel; press Enter.
- Select 1 (local) or 2 (remote); press Enter.
- Press 5 (manual command); press Enter. COMMAND : 00 will appear.

Enter the value for the default you want. 00 equals default 1, 01 equals default 2, 02 equals default 3, and 03 equals default 4. Turn to page 89 for more information.

When the menu 3=CONFIG is flashing, press the Enter button. Two lines of submenu items will appear.

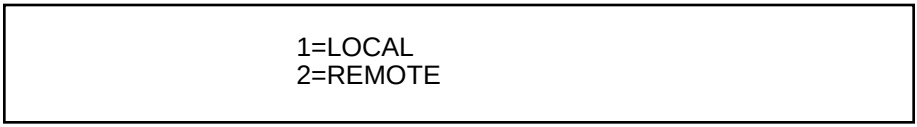

Fig. 4-4. Display of Submenu Items.

Press the number 1 to activate the submenu 1=LOCAL. That item will begin flashing. Press Enter to select the activated submenu, and you will see two lines of submenu items.

Fig. 4-5. Display of Items from Menu 1=LOCAL.

Use the down scroll button to display menu items 3=TEST OPTIONS and 4=DIAL OPTIONS.

Fig. 4-6. Display of Items 3 and 4.

Press the number 3 to activate the submenu 3=TEST OPTIONS. Press Enter to select the activated submenu, and two lines of submenu items are displayed.

Fig. 4-7. Two Lines from the TEST OPTIONS menu.

Press the number 1 to activate the Submenu TEST TIMEOUT, and the system prompts you to enter the desired parameters.

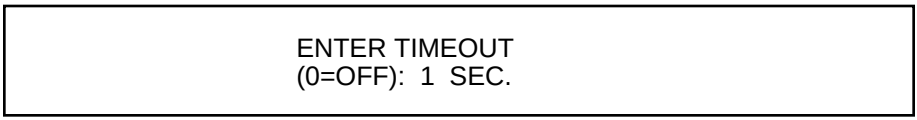

Fig. 4-8. Enter Timeout Screen.

Use the number keys to enter the number of seconds desired for the Timeout. Press Enter to configure this system parameter, and the system responds with an acceptance or rejection of the command and returns to the previous submenu. If the system rejects your command, try it again, making sure you enter a legal value.

4.5 1=STATUS

The Status Selection displays two lines at a time of the current operational status of the network and the DTE interfaces.

After 30 seconds of no front-panel operation on the CSU/DSU MS, it automatically reverts to the status display.

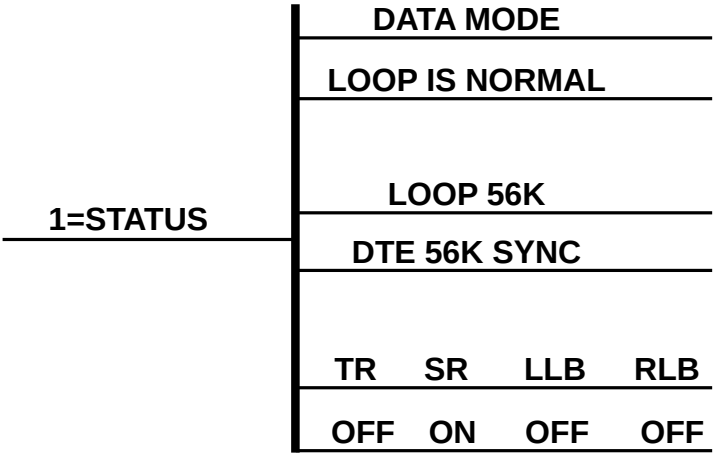

Fig. 4-9. Status Display.

Submenu items

- Data Mode: Current operation mode of the CSU/DSU MS
- Loop is Normal: Current status of the network interface
- Loop XX: Indicates the rate of the service from the network
- DTE 56K Sync: Indicates the DTE data rate and format
- TR SR LLB RLB: Lists four of the DTE interface leads
- Off/On: State of the respective leads displayed immediately above.

Operation: Follow standard operating procedure.

To view additional information, press the Up or Down scroll key, and two new lines of information are displayed.

To exit the Status menu, press the Cancel key.

4.6 2=TEST

The CSU/DSU MS is able to perform a variety of tests that allow problems in specific components of the communications circuit to be isolated and identified. You can initiate and terminate these various test modes for the CSU/DSU MS from either the front panel or the DTE interface. When operating in an asynchronous mode, you can use AT commands to control the testing from the DTE interface. For synchronous operation, V.25 bis commands can provide the test control.

The unit also responds to standard DDS network tests initiated from the telephone company test centers. In addition, it can run several tests such as local and remote loopbacks to aid in problem isolation. There are six built-in test patterns that you can use with both local and remote loopbacks. See **Fig. 4-10**.

Menu flow is normally depicted from left to right. When scrolling through submenu items with the down scroll button, the flow will wrap from bottom to top and repeat the menu order. To back up, press the up scroll button. At every level of the menu, pressing the Cancel button will return to the previous menu level. Pressing the Cancel button repeatedly returns the system to the main menu, or you can press #(Quick) to return to the main menu immediately.

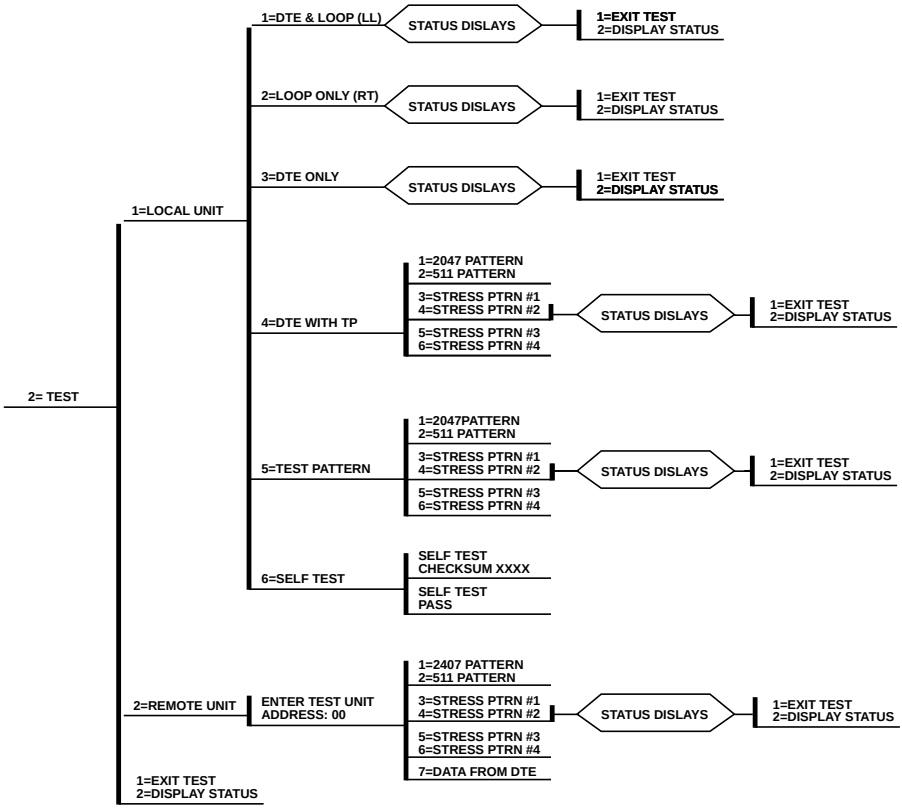

Fig. 4-10. Complete Test Menu.

4.6.1 1=LOCAL UNIT, SUBMENU OF 2=TEST

The LOCAL UNIT selection specifies one of six different tests to be performed by the local CSU/DSU MS. The selections are shown as submenu selections 1 through 6.

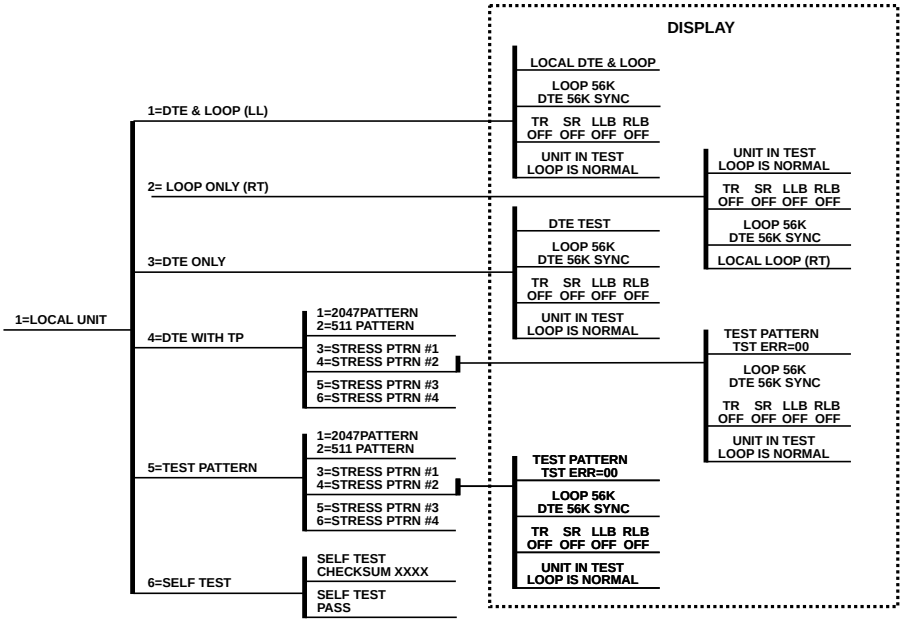

Fig. 4-11. Local Unit Menu.

Menu Map
2=TEST/1=LOCAL UNIT

Operation
Follow standard operating procedure. When 2=TEST is flashing, press the Enter button, and the first two submenu items will be displayed.

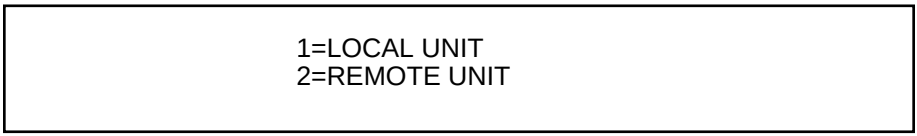

Fig. 4-12. Submenu Display.

Use the number 1 key to activate the 1=Local Unit Test submenu. Press the Enter key to enter the submenu, and two submenu choices will be displayed.

Table 4-2. Test Commands.

Front Panel	AT Command	Description
1=DTE & LOOP (LL)	&T10	TD/RD and RX/TX Loopbacks
2=LOOP ONLY (RT)	&T11	RX/TX Loopback at DTE interface
3=DTE ONLY	&T1	TX/RX Loopback at network interface
4=DTE WITH TP	&T8	TX/RX Loopback with test pattern
5=TEST PATTERN	&T9	Transmit/receive test pattern
6=SELF TEST	NA	Check internal components

1=DTE & LOOP (LL)

The DTE and LOOP test splits the CSU/DSU MS into separate DTE and loop interface sections and then loops the receive data of each interface back to its respective transmit data. A block diagram illustrating the loopback points and the signal paths for this test is shown in **Fig. A-1**.

When the LL lead from the DTE is activated, the test described above is also performed by the CSU/DSU MS. The CSU/DSU MS acknowledges this DTE-activated test by activating the TM on the DTE interface.

This particular test permits the separate sections of the CSU/DSU MS to be checked. First, it allows the local DTE interface drivers and receivers to be tested with an external data analyzer of data from the DTE device. Second, it allows the loop interface section of the local CSU/DSU MS to be tested from the remote site over the actual communications circuit.

Testing from the remote end of the circuit is normally done with a bit error rate tester (BERT), or by using an internal Test Pattern Generator on the Remote CSU/DSU MS unit.

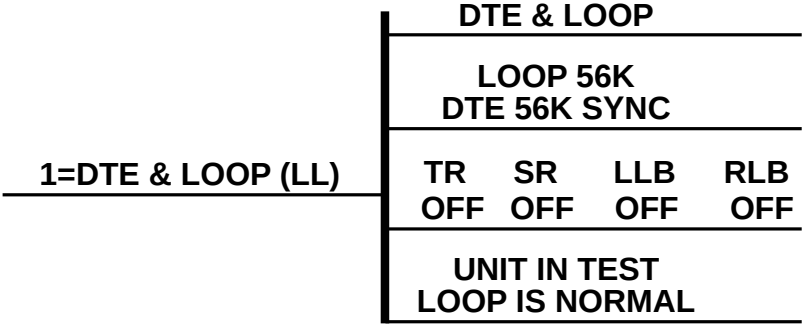

Fig. 4-13. Status Display.

Menu Map

2=TEST/1=LOCAL UNIT/1=DTE & LOOP(LL)/Displays

Operation

Follow standard operating procedures. When 1=DTE & LOOP (LL) is flashing, press the Enter button to initiate the test. The system briefly displays "Please Wait" after which it displays the type of test being performed.

Fig. 4-14. DTE & Loop.

Use the scroll buttons to continue viewing the other test results.

Test Displays

DTE & Loop—Type of test being performed

Loop 56K—Loop rate

DTE 56K Sync—DTE rate and data type

Available interface leads:

TR—Terminal Ready Input

SR—Set Ready Output

LLB—Local Loopback Input

RLB—Remote Loopback Input

OFF/ON—State of the respective leads displayed immediately above

Unit in Test—Operating mode of the CSU/DSU MS

Loop is Normal—Status of network service

To Exit a Test

Press the #(Quick) key to access the 1=EXIT TEST/2=DISPLAY STATUS submenu, or press the Cancel key to change from the status display to the main menu. The TEST selection is active (flashing). Press the Enter key, and the alternate test control menu is displayed.

Fig. 4-15. Exiting a Test.

1=EXIT TEST—terminates the test in progress and returns the CSU/DSU MS to the main menu.

2=DISPLAY STATUS—re-enters the test display for additional viewing.

Table 4-2. Submenu Test Commands.

Front Panel	AT Command	Description
1=EXIT TEST	&T0	Stops test/returns to data mode
2=DISPLAY STATUS	N/A	Displays present test status

2=LOOP ONLY (RT)

With the LOOP ONLY (RT) test, the network receive data is looped to the network transmit Path inside the DTE interface section of the CSU/DSU MS. The physical DTE interface is ignored for this test. A block diagram illustrating the loopback point and the signal paths for this test is shown in **Fig. A-2**.

This test allows the loop interface and a major portion of the DTE interface for the local CSU/DSU MS to be tested from the remote site over the actual communications circuit. Like the DTE and LOOP (LL) test, the test from the remote site is usually done with a BERT tester.

While this test is being performed, the message, LOCAL LOOP (RT) is shown on the CSU/DSU MS display. The other status messages shown in the menu diagram are accessible by using the UP/DOWN SCROLL keys.

The loopback point within the CSU/DSU MS and its operation for the LOOP ONLY (RT) test are the same as the Remote Digital Loopback (RT) test initiated and controlled from a remote CSU/DSU MS.

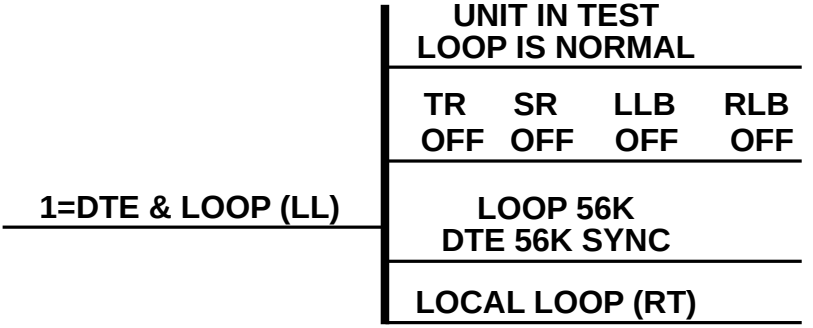

Fig. 4-16. Status Display.

Menu Map	*Operation*
2=TEST/1=LOCAL UNIT/2=LOOP ONLY (RT)/Displays	Follow standard operating procedures. When 2=LOOP ONLY (RT) is flashing, press the Enter button. The system briefly displays "Please Wait," after which it displays the first of the test results.

LOCAL LOOP (RT)

Fig. 4-17. Local Loop (RT).

Continue with operational procedures described for DTE & LOOP (LL).

The next six selections are the same as for DTE & Loop (LL).

Local Loop (RT)—Type of test being performed.

3=DTE ONLY

The DTE ONLY test provides a method for testing both the DTE interface drivers and receivers of the local CSU/DSU MS plus its loop transmitter and receiver. For this test, the loop transmit data is connected to the loop receive data at a point close to the physical network interface. The data is then sent back towards the DTE. The transmit circuit to the network is terminated in a zero condition for this test. A block diagram illustrating the loop back point and the signal paths for this test is shown in **Fig. A-3**.

Test patterns from an external BERT tester are routed through the DTE interface section of the CSU/DSU MS and then to the output of the loop-transmitter section where the signal is encoded for transmission. Instead of being coupled onto the physical transmit circuit of the network, the output of the loop transmitter is coupled back to the loop receiver input where the signal is then decoded and returned to the BERT tester where the serial receive data stream is checked for any bit errors.

This test must be used to verify proper operation of both the DTE and loop-interface sections of the local CSU/DSU MS.

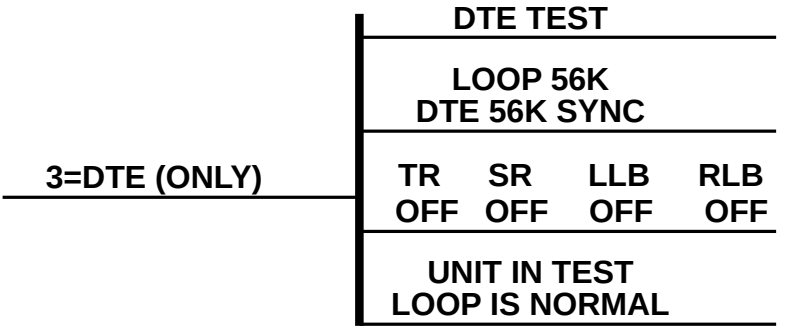

Fig. 4-18. Status Display.

Menu Map	*Operation*
2=TEST/1=LOCAL UNIT/3=DTE ONLY/Displays	Follow standard operating procedures. When 3=DTE Only (LAL) is flashing, press the Enter button. The system briefly displays "Please Wait," after which it displays the first of the test results.

DTE TEST

Fig. 4-19. DTE Test.

Continue with operational procedures described for DTE & LOOP (LL).

DTE ONLY—Type of test being performed.

The remaining six sections are the same as for DTE & LOOP (LL).

4=DTE WITH TP

The DTE WITH TP (test pattern) test is similar to the DTE ONLY test described above. Instead of using an external BERT tester connected to the DTE interface, this test uses the internal test pattern generator and detector built into the CSU/DSU MS. The loopback point and the data paths for this test are illustrated in **Fig. A-4**. This test is primarily used to test the transmitter and receiver sections of the local CSU/DSU MS.

The internal test-pattern generator and detector of the CSU/DSU MS operate with one of six different data patterns. When DTE WITH TP test is selected, the particular test pattern to be transmitted by the generator must also be selected. When a selection is made, the test-pattern detector examines the receive data stream until synchronization to the specified pattern is achieved. Once synchronized, the detector continues to check the receive data and reports any bit errors detected.

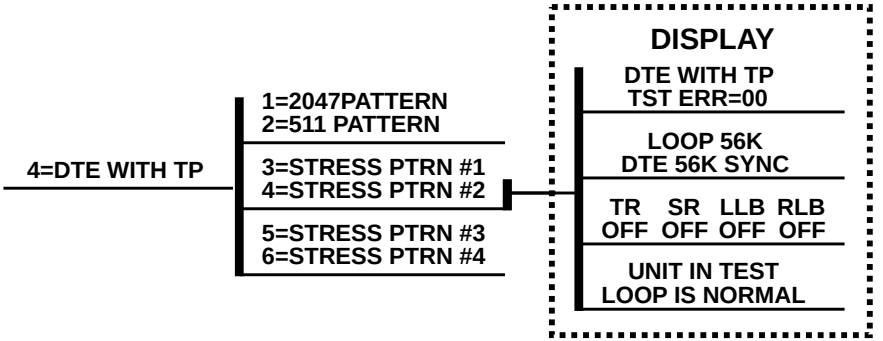

Fig. 4-20. DTE With TP Menu.

Menu Map	*Operation*
2=TEST/1=LOCAL UNIT/4=DTE WITH TP/Submenus 1-6/Displays	Follow standard operating procedures. When 4=DTE With TP is flashing, press the Enter button. The system briefly displays "Please Wait," after which it displays the first of the test results.

1=2047 PATTERN
2=511 PATTERN

Fig. 4-21. Pattern Options.

Continue with operational parameters described for DTE & Loop (LL).

1=2047 Pattern—Selects the 2047 Pattern

2=511 Pattern—Selects the 511 Pattern

3=Stress Pattern #1—Selects DDS Stress Pattern 1

4=Stress Pattern #2—Selects DDS Stress Pattern 2

5=Stress Pattern #3—Selects DDS Stress Pattern 3

6=Stress Pattern #4—Selects DDS Stress Pattern 4

Table 4-3. DTE With Test Patterns Commands.

Front Panel	AT Command	Description
1=2047 Pattern	_T0	Standard 2047 random data pattern
2=511 Pattern	_T1	Standard 511 random data pattern
3=Stress Ptrn #1	_T2	DDS stress pattern #1
4=Stress Ptrn #2	_T3	DDS stress pattern #2
5=Stress Ptrn #3	_T4	DDS stress pattern #3
6=Stress Ptrn #4	_T5	DDS stress pattern #4

While this test is being performed, the CSU/DSU MS displays:

```
DTE WITH TP
TEST ERR=XX
```

Fig. 4-22. Test Patterns Display.

The first line of the display indicates the type of test being performed. The second line of the display indicates the number of errors accumulated by the test pattern detector.

If errors occur during this test, the TEST ERR display can be reset to zero by pressing the "1" key. To verify proper operation of this test, single bit errors can be injected into the transmitted test pattern by pressing the "2" key. These errors will appear on the TEST ERR display.

5=TEST PATTERN

The TEST PATTERN selection actually converts the local CSU/DSU MS into a BERT tester for use in testing a remote CSU/DSU MS over the actual communications circuit. With this test, the remote CSU/DSU MS can be looped back in either the DTE and LOOP (LL) or the LOOP ONLY (RT) mode. Instead of being looped back, the remote CSU/DSU MS can operate in the data mode with data supplied from an external BERT tester, or it can be operating in the TEST PATTERN mode. The data paths for this mode are illustrated in **Fig. A-5**.

When this test selection is chosen, the system presents the same test patterns as for DTE With TP.

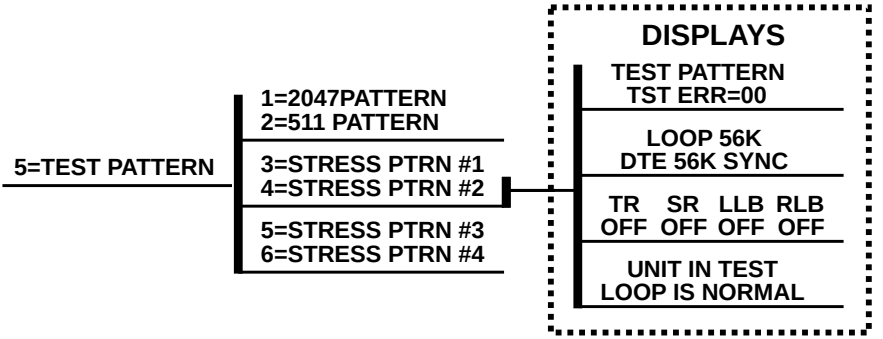

Fig. 4-23. Test Pattern.

Menu Map

2=TEST/1=LOCAL
UNIT/5=TEST
PATTERN/Submenus 1-6/Displays

Operation

Follow standard operating procedures. When 5=TEST PATTERN is flashing, press the Enter button. The system briefly displays "Please Wait," after which it displays the first of the test results.

Continue with operational procedures described for DTE & Loop (LL).

1=2047 PATTERN
2=511 PATTERN

Fig. 4-24. Test Pattern Options.

6=SELF TEST

The self test is set designed to verify current operation of the CSU/DSU MS. It can be performed at any time. Try this test if you have any doubt about whether the CSU/DSU MS is working.

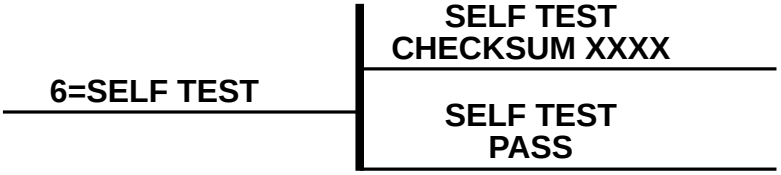

Fig. 4-25. Self Test.

Menu Map

2=TEST/1=LOCAL UNIT/6=SELF TEST

Operation

Follow standard operating procedures. When 6=SELF TEST is flashing, press the Enter button. The LEDs are active as the system runs the test, displays the results, and then returns to the Main Menu display.

SELF TEST
CHECKSUM XXXX

Fig. 4-26. Self Test Checksum.

Self Test Pass indicates no problem with the operation. Self Test Checksum XXXX is the software version.

4.6.2 2=Remote Unit Submenu of 2=Test

The Remote Unit submenu allows you to put a remotely installed CSU/DSU MS into Loopback. This also applies to CSU/DSU MS units installed in a multi-point network. After putting the remote CSU/DSU MS into loopback, you can choose one of 6 Test Patterns or data from the DTE. Test-pattern results are then displayed.

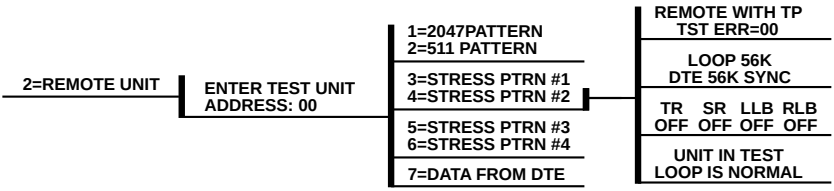

Fig. 4-27. Remote Unit Submenu of 2=Test.

Menu Map

2=TEST/2=REMOTE
UNIT/SELECTIONS

Operation

Follow standard operating procedures. When 2=REMOTE UNIT is flashing, press the Enter button. The prompt to enter the test unit address is displayed.

```
ENTER TEST UNIT
ADDRESS:XX
```

Fig. 4-28. Test Unit Address Prompt.

Use the number keys to type the address of the remote CSU/DSU MS. Press the Enter key to enter the address into the system, and the first of the submenu items is displayed.

```
1=2047 PATTERN
2=511 PATTERN
```

Fig. 4-29. Test Pattern Choice.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command accepted" and return to the status menu.

1=2047 Pattern—Selects the 2047 Pattern

2=511 Pattern—Selects the 511 Pattern

3=Stress Pattern #1—Selects DDS Stress Pattern 1

4=Stress Pattern #2—Selects DDS Stress Pattern 2

5=Stress Pattern #3—Selects DDS Stress Pattern 3

6=Stress Pattern #4—Selects DDS Stress Pattern 4

7=Data from DTE

Status Displays

Remote with TP

TEST Err-00

Local DTE & Loop—Type of test being performed

Loop 56K—Loop rate

DTE 56K Sync—DTE rate and data type

Available interface leads

TR—Terminal Ready Input

SR—Set Ready Output

LLB—Local Loopback Input

RLB—Remote Loopback Input

OFF/ON—State of the respective leads displayed immediately above

Unit in Test—Operating mode of CSU/DSU MS

Loop is Normal—Status of network service

1=EXIT TEST
2=DISPLAY STATUS

The menu choices here are used to immediately exit the test selection or to re-enter status display. These menu items are available only after tests have been performed.

1=EXIT TEST—exits the testing process, returning to the Main Menu for selection.

2=DISPLAY STATUS—re-enters test display for additional viewing.

When a test has been requested, the system briefly displays "Please Wait" before presenting the first test display. At any test-result display, press the #(Quick) key to access the 1=EXIT TEST/ 2=DISPLAY STATUS submenu, or press the Cancel key to change from the status display to the main menu. The TEST selection is active (flashing).

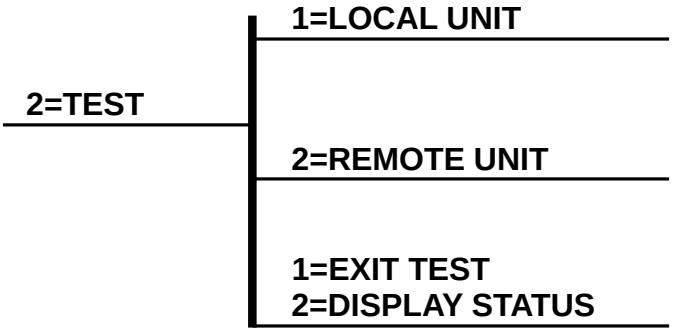

Fig. 4-30. Exit Test and Display Status.

Menu Map

2=TEST/1=LOCAL UNIT or REMOTE UNIT/Tests/1=EXIT TEST or 2=DISPLAY STATUS

Press the Enter key, and the alternate test control menu is displayed.

```
1=EXIT TEST
2=DISPLAY STATUS
```

Fig. 4-31. Exit Test and Display Status Options.

1=Exit Test—terminates the test in progress and returns the CSU/DSU MS to the data mode.

2=Display Status—re-enters test display for additional viewing.

4.7 3=CONFIG

The Configuration menu consists of a group of five submenus, each relating to a specific interface or function of the CSU/DSU MS that requires setup:

- 1=Network Opt.—Network Interface Parameters
- 2=DTE Options—DTE Interface Parameters
- 3=Test Options—Unit Test Options
- 4=Dial Options—Unit Dialing Options
- 5=Manual Command

The CSU/DSU MS has four different user profiles (sets of configurations options) that are stored in read-only memory. The unit is shipped from the factory with profile number 1 (default configuration) loaded into the current (non-volatile configuration) memory. If profile 1 matches requirements for the system, then no additional configuration is required to put the unit into service. If profile 1 does not match system requirements, it can be modified, or one of the other profiles that more closely matches the system requirements can be loaded into current memory. When a different profile is loaded, or the existing profile is modified, it is stored in the current (non-volatile configuration) memory. The CSU/DSU MS is then configured with that profile every time power is turned on or until the unit is reset.

4.7.1 Submenus of 3=CONFIG

1=LOCAL—Configuration submenus are available to set all the configuration parameters by manual operation of the front panel.

2=REMOTE—Establishes communication with the remote CSU/DSU MS so the front panel of the local CSU/DSU MS can be used to configure the remote CSU/DSU MS.

Operation

Follow standard operating procedures.

4.7.2 Complete Configuration Menu

Menu flow is normally depicted from left to right. When scrolling through submenu items with the down scroll buttons, the flow will wrap from bottom to top and repeat the menu order. To back up, press the up scroll button. At every level of the menu, pressing the Cancel button will return to the previous menu level. Pressing the Cancel button repeatedly will return the system to the main menu, or you can press the #(Quick) button to return to the main menu immediately.

Press the Enter button to enter the Configuration mode, and the two submenu choices, 1=LOCAL/2=REMOTE, are displayed.

Fig. 4-32. Local and Remote Options.

Use the "1" key to activate the 1=Local Menu. Press the Enter key to enter the local submenus, and the first two submenu choices will be displayed.

Fig. 4-33. Network Opt and DTE Options Choices.

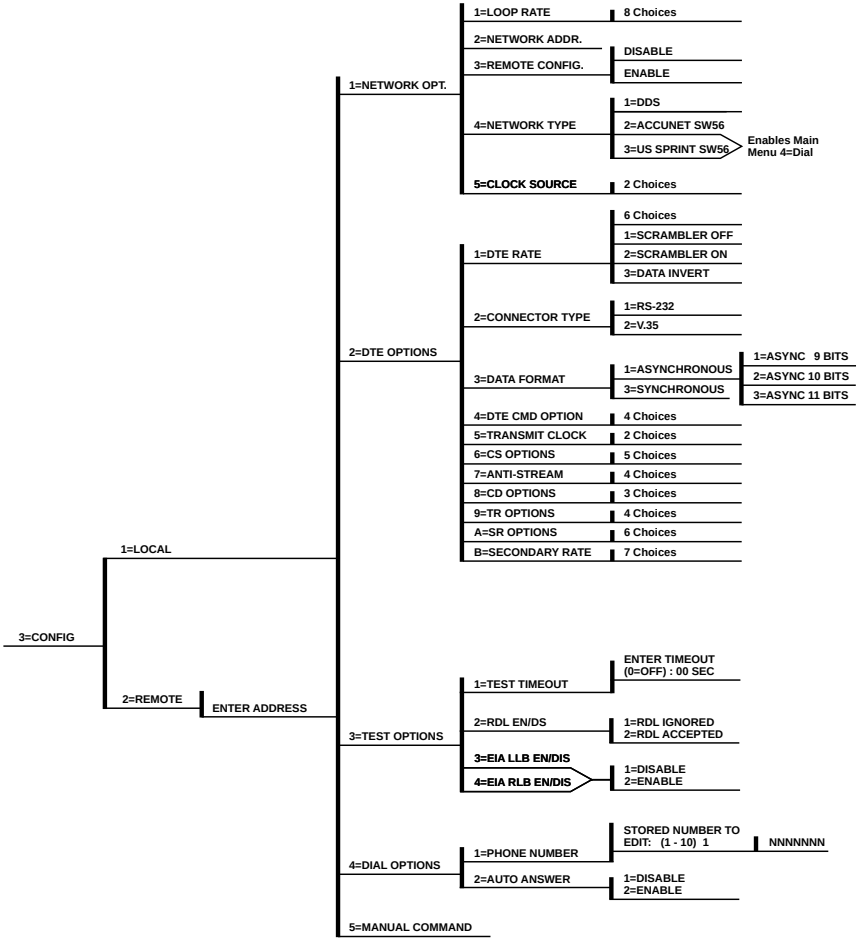

Fig. 4-34. Configuration Menu.

4.7.3 Network Options

This option offers the choices of the configuration parameters that control the loop operation of the CSU/DSU MS.

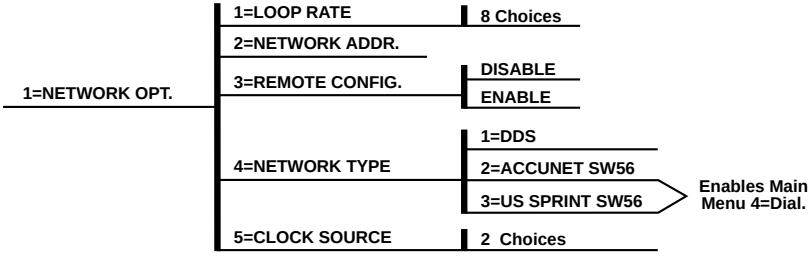

Fig. 4-35. Network Opt.

Menu Map

3=CONFIG/1=LOCAL/1=NETWORK OPT.

Operation

Follow standard operating procedures. When 1=NETWORK OPT. is flashing, press the Enter button. The first of the submenu items is displayed.

Fig. 4-36. Loop Rate and Network Addr. Options.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the active menu.

Non-Standard Operation

If submenu 1 or 8 is selected, the system will briefly display "Command Accepted" and return to the active Loop Rate menu.

If any submenu 2 through 7 is selected, the system will prompt for a selection of 1=No Second Channel or 2=Second Channel. If this option is presented, continue the same operation to arrive at the display of "Command Accepted."

Submenu 1 Loop Rate

The Loop Rate option sets the loop operating speed. The unit should be set to the rate required by the DDS Service. The CSU/DSU MS also supports subrate DTE data over a 56K loop. The loop rate must be set independently of the DTE rate.

Eight loop-rate selections are available. After selecting any loop rate other than Auto or 64K (1 or 8), the option for a secondary channel is available.

The various loop rates and format selections are listed in **Table 4-4** with the equivalent AT commands that perform the same configuration functions.

Table 4-4. Loop Rate Commands.

Front Panel	AT Command	Selections Description
1=AUTO	%B0	CSU/DSU MS auto-adapts to network rate
2=2.4K NO SEC. CH	%B1	2.4K with no secondary channel
3=4.8K NO SEC. CH	%B2	4.8K with no secondary channel
4=9.6K NO SEC. CH	%B3	9.6K with no secondary channel
5=19.2K NO SEC. CH	%B4	19.2K with no secondary channel
6=38.4K NO SEC. CH	%B5	38.4K with no secondary channel
7=56K NO SEC. CH	%B6	56K with no secondary channel
8=64K NO SEC. CH	%B7	64K clear channel
2=2.4K SEC. CH	%B9	2.4K with secondary channel
3=4.8K SEC. CH	%B10	4.8K with secondary channel
4=9.6K SEC. CH	%B11	9.6K with secondary channel
5=19.2K SEC. CH	%B12	19.2K with secondary channel
6=38.4K SEC. CH	%B13	38.4K with secondary channel
7=56K SEC. CH	%B14	56K with secondary channel

Submenu 2 Network Addr.

A two-digit decimal address can be assigned to each CSU/DSU MS. This addressing capability makes it possible to perform remote configuration and testing in point-to-point and a multidrop network.

Use the number keys to select an address. Press the Enter key to enter the address into the system. The system will briefly display "Command Accepted" and return to the active network address menu.

Table 4-5. Network Address Commands.

Front Panel	AT Command	Description
xx (Decimal)	_N=xx	Assigns a 2 digit network address

Submenu 3 Remote Configuration

This option sets up the CSU/DSU MS to accept or reject remote configuration commands. Use the number of the desired mode to activate the selection. Press Enter to select the mode. The system will briefly display "Command Accepted" and return to the active NETWORK.OPT menu with the REMOTE CONFIG selection active.

Table 4-6. Remote Configuration Commands.

Front Panel	AT Command	Description
1=DISABLE	&P4	Disable Remote Configuration
2=ENABLE	&P5	Enable Remote Configuration

Submenu 4 Network Type

The network type option configures the CSU/DSU MS for the specific type of network being used.

Use the number of the desired network type to activate the selection. Press Enter to select the network type. The system will briefly display "Command Accepted" and return to NETWORK OPT menu with the NETWORK TYPE selection active.

NOTE

Additional menus become available when using the Accunet 56 or the US Sprint SW56. See Section 4.7.6.

Table 4-7. Network Type Commands.

Front Panel	AT Command	Description
1=DDS-dedicated	&L0	Any 4-wire DDS network
2=AT&T/MCI SW56	&L1	AT&T Switched 56 Service (Accunet)
3=US Sprint SW56	&L2	Sprint Switched 56 Service

Submenu 5 Clock Source

The clock source options specifies the timing source for the CSU/DSU MS's internal circuitry. When operating on a DDS network, the timing should be from network. On a point-to-point private network, one CSU/DSU MS must be set for master, and the other for from network.

Table 4-8. Clock Source Commands.

Front Panel	AT Command	Description
1=MASTER	_X0	CSU/DSU MS is the master timing source
2=FROM NETWORK	_X1	Network RX Signal is timing source

4.7.4 2=DTE Options

This option selects the configuration parameters that control the operation of the DTE interface of the CSU/DSU MS.

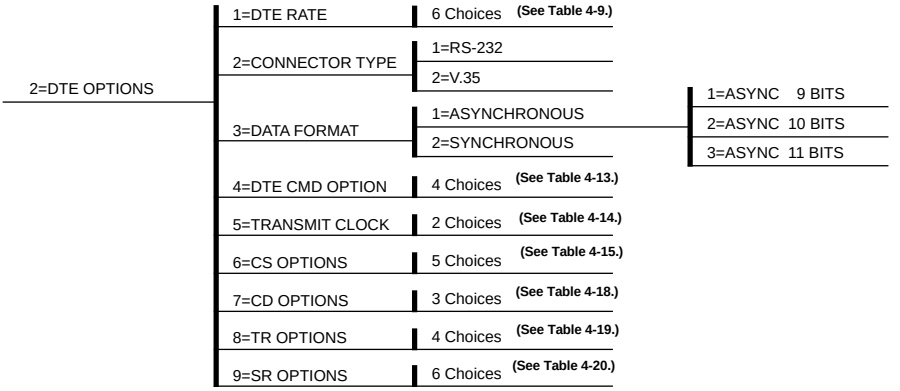

Fig. 4-37. DTE Options.

Menu Map

3=CONFIG/1=LOCAL/2=DTE OPT.

Operation

Follow standard operating procedures. When 2=DTE OPT is flashing, press the Enter button. The first of the submenu items will be displayed.

Fig. 4-38. DTE Rate and Connector Type Options.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the active menu.

Submenu 1 Data Rate

The DTE Rate option sets the operating speed of the DTE interface when the unit is set for 56K. The CSU/DSU MS supports six different DTE rates over a 56K loop.

Use the number of the desired DTE rate to activate the selection. Press Enter to select the DTE rate. The system will briefly display "Command Accepted" and return to the DTE Options menu with the DTE rate selection active.

If a loop rate of 56K or 64K was chosen during Network Opt configuration, then the DTE rate menu shown in **Table 4-9** appears.

Table 4-9. DTE Rate Commands.

Front Panel	AT Command	Description
1=DTE 56K/57.6K	%K8	DTE rate 56K sync or 57.6 async
2=DTE 2.4K	%K3	DTE rate 2.4K sync and async
3=DTE 4.8K	%K4	DTE 4.8K sync and async
4=DTE 9.6K	%K5	DTE 9.6K sync and async
5=DTE 19.2K	%K6	DTE 19.2K sync and async
6=DTE 38.4K	%K7	DTE 38.4K sync and async

If a loop rate of 56K with secondary channel or 64K was chosen during NETWORK OPT configuration, then the following DTE Rate menu appears.

Table 4-10. Loop Rate of 56K.

Front Panel	AT Command	Description
1=SCRAMBLER OFF	_F0	DTE data scrambler disabled
2=SCRAMBLER ON	_F1	DTE data scrambler enabled
3=DATA INVERT	_F2	DTE data invert enabled

NOTE

For point-to-point operation at 56K with secondary channel, both the primary and secondary channel data cannot be zero simultaneously. For those applications that use HDLC, you can eliminate the above constraint by selecting the DATA INVERT OPTION. You can also eliminate the constraint by selecting the SCRAMBLER ON option.

For 64K clear-channel operation, the DTE data sequences might mimic network loop maintenance functions and erroneously cause other network elements to activate loopbacks. To prevent this, select the SCRAMBLER ON option for this mode of operation.

The SCRAMBLER ON option must be selected in both the local and remote CSU/DSU MS units for the situations described above, and it must never be used for multipoint operation.

Submenu 2 Connector Type

The CONNECTOR TYPE option specifies which of the PRIMARY CHANNEL connectors is used to connect to the Data Terminal Equipment.

Menu Map

3=CONFIG/1=Local/2=DTE Opt.

Operation

Follow standard operating procedures. When 2=DTE OPT is flashing, press the Enter button. The first of the submenu items is displayed.

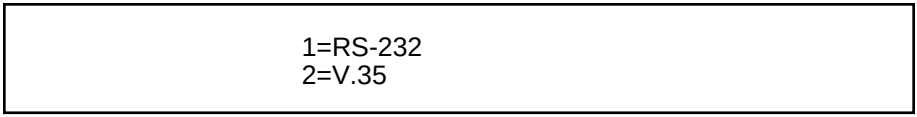

Fig. 4-39. RS-232 and V.35 Submenu Items.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the DTE OPTIONS menu.

Table 4-11. Connector Type Commands.

Front Panel	AT Command	Description
1=RS-232	N/A	Enables the EIA 232 interface
2=V.35	N/A	Enables the V.35 interface

Submenu 3 Data Format

The DATA FORMAT option is used to select either the synchronous or the asynchronous mode of operation for the DTE interface.

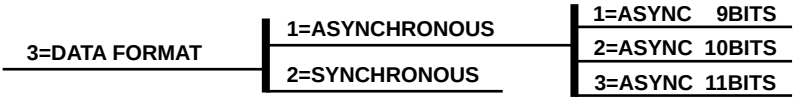

Fig. 4-40. Data Format Option.

Menu Map

3=CONFIG/1=LOCAL/2=DTE
OPT/3=DATA FORMAT

Operation

Follow standard operating procedures. When 3=DATA FORMAT is flashing, press the Enter button. The first of the submenu items is displayed.

1=ASYNCHRONOUS
2=SYNCHRONOUS

Fig. 4-41. Asynchronous and Synchronous Options.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the DTE OPTIONS menu.

NOTE

If you choose the asynchronous option, you must select the length of the data bytes.

Use the number of the desired submenu choice to activate the desired async format. Press Enter to enter the selected choice into the system. The system will briefly display "Command Accepted" and return to the DTE OPTIONS menu with the Data For selection active.

Table 4-12. Data Format Commands.

Front Panel	AT Command	Description
1-ASYNCHRONOUS	&Q0	Always asynchronous
2=SYNCHRONOUS	&Q2	Always synchronous
For asynchronous options, select the length of the data bytes.		
1=ASYNC 9 BITS	N/A	9 bits including start, stop, parity
2=ASYNC 10 BITS	N/A	10 bits including start, stop, parity
3=ASYNC 11 BITS	N/A	11 bits including start, stop, parity

Submenu 4 DTE CMD Option

The DTE COMMAND option is used to enable the DTE interface for one of the three different command modes.

3=CONFIG/1=LOCAL/2=DTE OPT/4=DTE CMD OPTION

Follow standard operating procedures. When 4=DTE CMD OPTION is flashing, press the Enter button. The first of the submenu items is displayed.

1=DISABLED
2=AT COMMAND SET

Fig. 4-42. Disabled and AT Command Set Options.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the active menu.

Table 4-13. DTE CMD Commands.

Front Panel	AT Command	Description
1=DISABLED	N/A	Disables all DTE command modes
2=AT COMMAND SET	N/A	Enables AT commands from DTE
3=V.25 SYNC	N/A	Enables V.25 bis (SDLC) commands
4=V.25 BSC/ASYNC	N/A	Enables V.25 (BISYNC and ASYNC)

Submenu 5 Transmit Clock

The Transmit Clock option is used to select the source of the clock used to transfer data from the DTE into the CSU/DSU MS.

Menu Map

3=CONFIG/1=LOCAL/2=DTE OPT/5=TRANSMIT CLOCK

Operation

Follow standard operating procedures. When 5=TRANSMIT CLOCK is flashing, press the Enter button. The first of the submenu items is displayed.

1=NORMAL
2=EXTERNAL

Fig. 4-43. Normal and External Submenu Items.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the DTE OPTIONS menu with the Transmit Clock selection active.

Table 4-14. Transmit Clock Commands.

Front Panel	AT Command	Description
1=NORMAL	&X0	TX clock from CSU/DSU MS selected
2=EXTERNAL	&X1	ETC clock from DTE selected

NOTE

The External clock option is normally used in modem tail circuit applications. A-CSU/DSU MS-to-modem interconnect diagram for this application is shown in Fig. 4-60.

Submenu 6 CS Options

The CS OPTIONS menu is used to select one of five different control modes for the Clear to Send (CTS) lead.

Menu Map

3=CONFIG/1=LOCAL/2=DTE OPT/6=CS OPTIONS

Operation

Follow standard operating procedures. When 6=CS OPTIONS is flashing, press the Enter button. The first of the submenu items is displayed.

1=FORCED ON
2=FOLLOWS RS

Fig. 4-44. Forced On and Follows RS Submenu Items.

NOTE

If one of the options chosen involves request to send (RS), then you must also select the delay from RS to CS.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the active menu or display choices for the delay.

Table 4-15. CS Options Commands.

Front Panel	AT Command	Description
1=FORCED ON	&R0	CS always On
2=FOLLOWS RS	&R1	CS state same as RS state
3=FOLLOWS CD	&R2	CS state same as CD state
4=FOLLOWS RS+CD	&R3	CS state same as RS and CD state
5=OFF with LOCD	&R4	On except 5 sec after disconnect in switched 56 applications
If one of the options chosen involves request to send (RS), select the delay from RS to CS.		
1=CS DELAY SHORT	_D0	Short delay from RS to CS selected
2=CS DELAY LONG	_D1	Long delay from RS to CS selected

Table 4-16. Specified Times for Short and Long Delays.

Rate	Short Delays	Long Delay
64	1.1 ms	16.1 ms
56	1.1 ms	16.1 ms
19.2	1.5 ms	16.5 ms
4.8	1.5 ms	16.5 ms
2.4	1.5 ms	16.5 ms

Submenu 7 Anti-Stream

The ANTI-STREAM option is used to select the anti-stream timeout which is the maximum time the CSU/DSU MS transmits data into the network from the DTE. This feature prevents one DTE device on a multidrop network from continuously tying up the transmit circuit back to the master CSU/DSU MS.

The anti-stream timer is reset to zero when RS transitions to the active state and is updated every second while RS is active. When the anti-stream timeout expires, the CSU/DSU MS stops transmitting DTE data into the network but continues to accept data from it. This condition exists until the DTE deactivates the RS input.

Menu Map

3=CONFIG/1=LOCAL/2=DTE OPT/7ANTI-STREAM

Operation

Follow standard operating procedures. When 7=ANTI-STREAM is flashing, press the Enter button. The first of the submenu items is displayed.

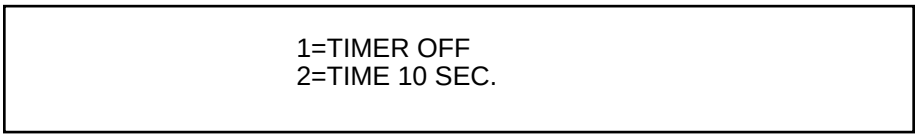

Fig. 4-45. Timer Off and Time 10 Sec. Submenu Items.

NOTE

If one of the options chosen involves request to send (RS), then the you must select the delay from RS to CS.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the DTE OPTIONS menu with the Anti-Stream selection active.

Table 4-17. Anti-Stream Commands.

Front Panel	AT Command	Description
1=TIMER OFF	%T0	Anti-stream timer disabled
2=TIME 10 SEC.	%T1	Timeout equal 10 seconds
3=TIME 30 SEC.	%T2	Timeout equal 30 seconds
4=TIME 60 SEC.	%T3	Timeout equal 60 seconds

Submenu 8 CD Options

The CD OPTIONS menu is used to select one of three different control modes for the receive line signal detector (CD) lead.

Menu Map

3=CONFIG/1=LOCAL/2=DTE OPT/8=CD OPTIONS

Operation

Follow standard operating procedures. When 6=CS OPTIONS is flashing, press the Enter button. The first of the submenu items is displayed.

Fig. 4-46. Forced On and Normal Submenu Options.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the DTE OPTIONS MENU.

Table 4-18. CD Options Commands.

Front Panel	AT Command	Selections Description
1=FORCED ON	&C0	On all the time
2=NORMAL	&C1	On only when data present on loop
3=OFF with LOCD	&C2	On except 5 sec after disconnect in Switched 56 operation

Submenu 9 TR Options

The TR OPTIONS menu is used to select the response of the CSU/DSU MS to the data terminal ready (TR) lead.

Menu Map

3=CONFIG/1=LOCAL/2=DTE OPT/9=TR OPTIONS

Operation

Follow standard operating procedures. When 9=TR OPTIONS is flashing, press the Enter button. The first of the submenu items is displayed.

Fig. 4-47. Ignored and Idle When Off Submenu Options.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the active menu.

Table 4-19. TR Options Commands.

Front Panel	AT Command	Selections Description
1=IGNORE	&D0	Ignore the TR input
2=IDLE WHEN OFF	&D2	On hook then TR OFF (idle)
3=OFF>ON DIAL #1	&D3	Dial Stored #1: TR goes OFF to ON
4=OFF>ON DIAL #2	&D4	Dial Stored #2: TR goes OFF to ON

Submenu A SR Options

The SR Options menu is used to select the operating mode the the Data Set Ready (SR) lead.

Menu Map

3=CONFIG/1=LOCAL/2=DTE OPT/A=SR OPTIONS

Operation

To display the SR Options submenu of the 1=Local submenu of 3=CONFIG, follow these steps:

1. Use the scroll buttons to display the 9=TR Options and A=SR Options.
2. Press the * (Shift) key , then press the letter A to activate the SR Options submenu.
3. Press the Enter key to enter the SR Options submenu.
4. The first of the SR Options submenu items is displayed.

Fig. 4-48. Forced On and OFF OOS Only Submenu Options.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the active menu.

Table 4-20. SR Options Commands.

Front Panel	AT Command	Selections Description
1=FORCED ON	&S0	Always ON
2=OFF OOS ONLY	&S1	OFF when network out of service
3=OFF LOCD ONLY	&S2	OFF 5 sec after disconnect (SW56)
4=OFF TEST ONLY	&S3	OFF for test only
5=OFF TEST+OOS	&S4	OFF for test or OOS
6=OFF TEST+LOCD	&S5	OFF 5 sec after disconnect or test

Submenu B Secondary Rate

The Secondary Rate option is used to select the operating speed for the secondary channel if the secondary channel option was selected during setup of the NETWORK OPT.

Menu Map

3=CONFIG/1=LOCAL/2=DTE OPT/B=SECONDARY RATE

Operation

To display the SECONDARY RATE submenu of the 1=LOCAL submenu of 3=CONFIG, follow these steps:

1. Use the scroll buttons to display the B=Secondary Rate.
2. Press the * (Shift) key, then press the letter B to activate the Secondary Rate submenu.
3. Press the Enter key to enter the Secondary Rate submenu.
4. The first of the Secondary Rate submenu items is displayed.

```
1=OFF          2=75
3=150          4=300
```

Fig. 4-49. The First of the Secondary Rate Submenu Items.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the active menu.

Table 4-21. Secondary Rate Commands.

Front Panel	AT Command	Selections Description
1=OFF	_Y0	No secondary channel selected
2=75	_Y1	Secondary channel rate: 75 bps
3=150	_Y2	Secondary channel rate: 150 bps
4=300	_Y3	Secondary channel rate: 300 bps
5=600	_Y4	Secondary channel rate: 600 bps
6=1.2K	_Y5	Secondary channel rate: 1200 bps
7=2.4K	_Y6	Secondary channel rate: 2400 bps

4.7.5 Test Options

The Test Options menu is used to enable or disable different test modes as well as specify the maximum test time allowed.

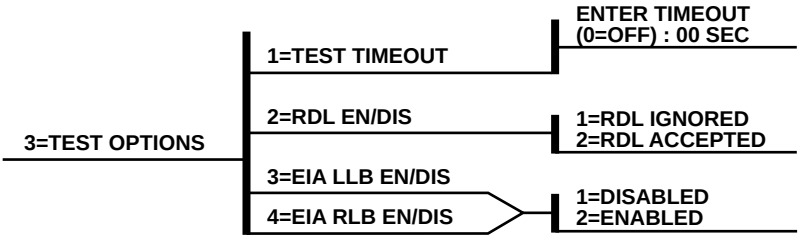

Fig. 4-50. Test Options.

Menu Map

3=CONFIG/1=LOCAL/3=
TEST OPTIONS

Operation

Follow standard operating procedures. When 3=TEST OPTIONS is flashing, press the Enter button. The first of the Test Option submenu items is displayed.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the active menu.

Submenu 1 Test Timeout

The Test Timeout option is used to specify the length of time a CSU/DSU MS remains in a test mode before an automatic return to the data mode. The LCD display is shown in **Fig. 4-51**.

Fig. 4-51. LCD Display.

Enter the timeout as a two-digit decimal value.

Submenu 2 RDL Select

The RDL Select option is used to specify whether or not the CSU/DSU MS responds to a remote digital loopback (RDL) request from the far end of the circuit.

Table 4-22. RDL Select Commands.

Front Panel	AT Command	Description
1=RDL IGNORED	&T5	RDL request from remote CSU/DSU ignored
2=RDL ACCEPTED	&T4	RDL request accepted

Submenu 3 EIA LLB Select

The EIA LLB Select option is used to specify whether or not the CSU/DSU MS responds to the local loopback (LLB) input from the DTE.

Table 4-23. EIA LLB Select Commands.

Front Panel	AT Command	Description
1=DISABLED	_R0	EIA RLB disabled
2=ENABLED	_R1	EIA RLB enabled

Submenu 4 EIA RLB Select

The EIA RLB Select option is used to specify whether or not the CSU/DSU MS responds to the remote loopback (RLB) input from the DTE.

Table 4-24. EIA RLB Select Commands.

Front Panel	AT Command	Description
1=DISABLED	_R0	EIA RLB disabled
2=ENABLED	_R1	EIA RLB enabled

4.7.6 4=Dial Options

The Dial Option menu is used to store up to ten phone numbers and define Answer operation of the CSU/DSU MS when it is configured for Switched 56 operation.

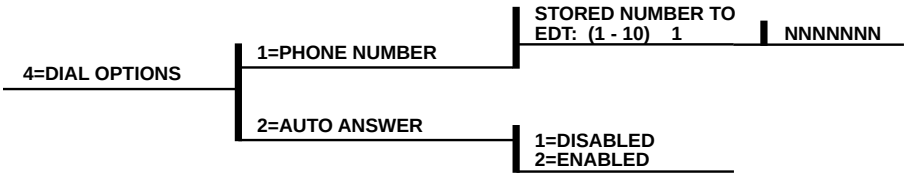

Fig. 4-52. 4=Dial Options.

Menu Map

3=CONFIG/1=LOCAL/4=DIAL OPTIONS

Operation

Follow standard operating procedures. When 4=DIAL OPTIONS is flashing, press the Enter button. The first of the Dial Options submenus is displayed.

Continue with standard operating procedures to select menu options. At the end of the options, the system will briefly display "Command Accepted" and return to the active menu.

Submenu 1 Phone Number

The CSU/DSU MS has storage for ten numbers of 36 digits each. If you need to edit a phone number, you must re-enter the entire number. This overwrites the previously stored number.

```
STORE NUMBER TO
EDIT (1-10): X
```

Fig. 4-53. Store Number to Edit.

Operation

Use the number keys to type the number you wish to edit. Press Enter, and the number is displayed for editing.

NOTE

Typing numbers will begin a new entry from left to right.

Submenu 2 Auto Answer

The Auto Answer option is used to specify whether incoming calls are to be automatically answered by the CSU/DSU MS or manually by the user.

Table 4-25. Auto Answer Commands.

Front Panel	AT Command	Description
1=DISABLED	_J0	Auto Answer disabled
2=ENABLED	_J1	Auto Answer enabled

4.7.7 5=Manual Command

The Manual Command option is a short cut method for entering configuration and control commands for the CSU/DSU MS.

Operation

The first display prompts the user to enter to command number.

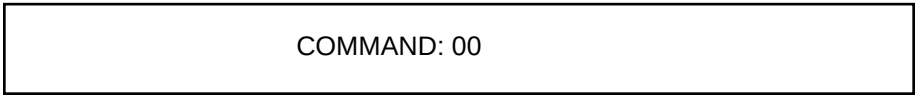

Fig. 4-54. Command Prompt.

Use the number keys to enter the hexadecimal command number. Press the Enter key. The command number is entered. The display shows both the command number and the present value or setting for the command. The command value can be edited or re-issued with the existing value.

Fig. 4-55. Command and Value Options.

Use the number keys to enter the hexadecimal value. Press the Enter key to complete. The system will briefly display "Command Accepted" and return to the active menu.

Appendix A: Test Diagrams

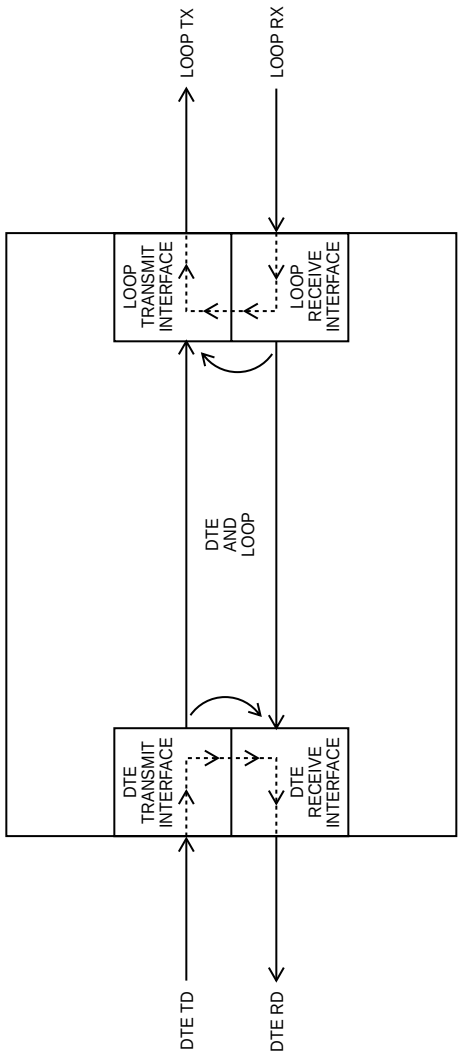

Fig. A-1. DTE and Loop Test Diagram.

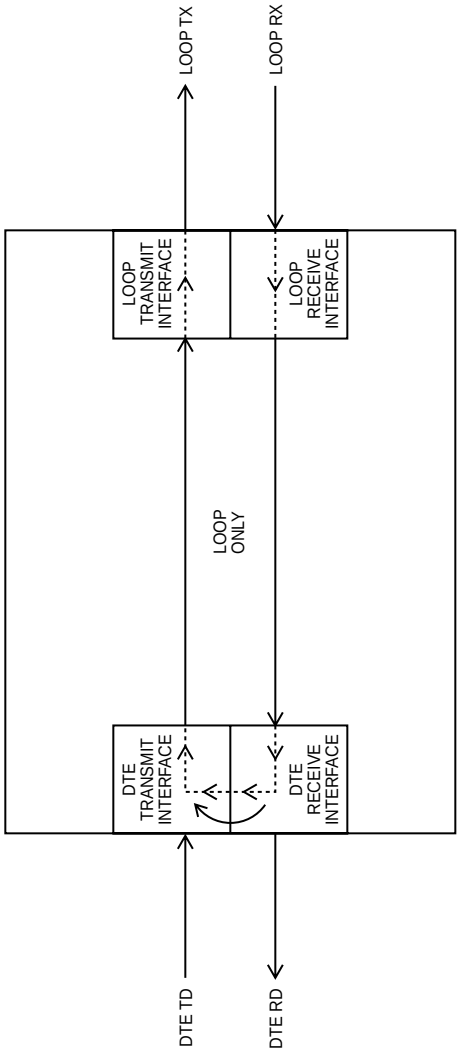

Fig. A-2. Loop Only Test Diagram.

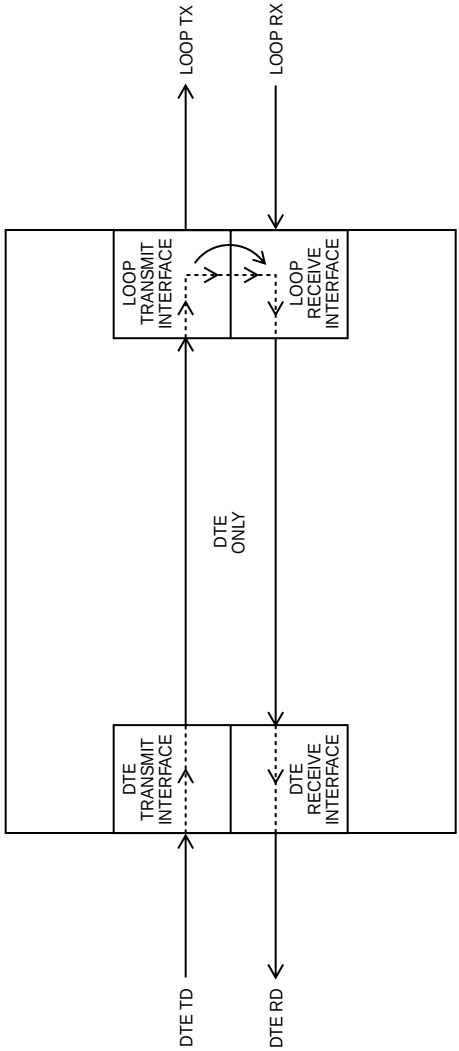

Fig. A-3. DTE Only Test Diagram.

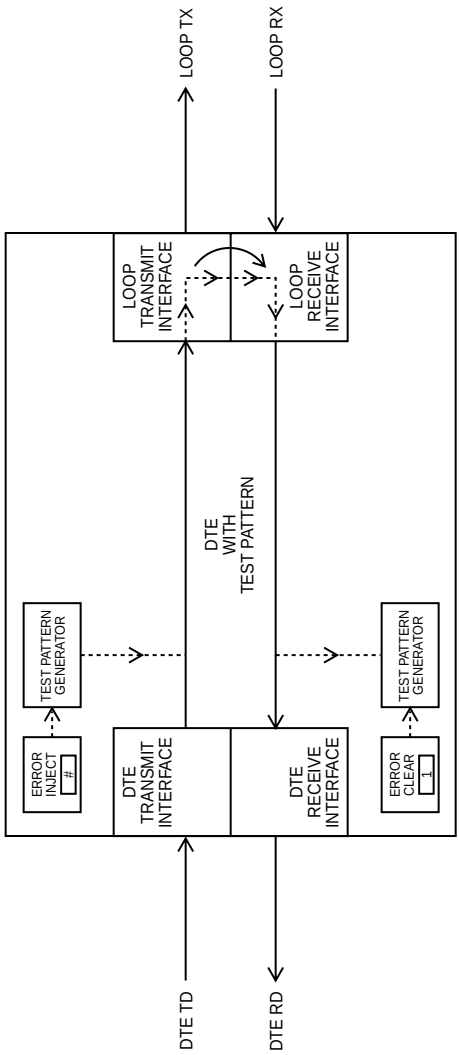

Fig. A-4. DTE With Test Pattern Diagram.

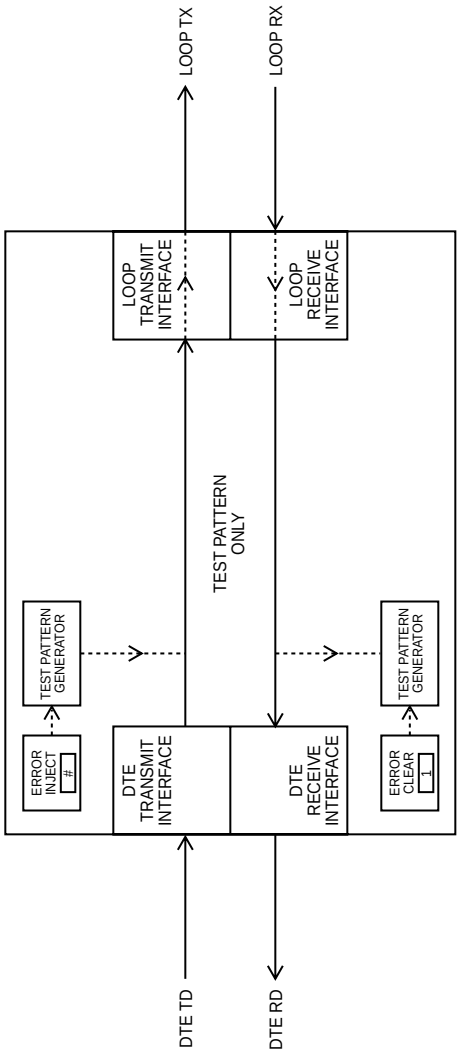

Fig. A-5. Test Pattern Only Diagram.

Appendix B: Clocking Configurations

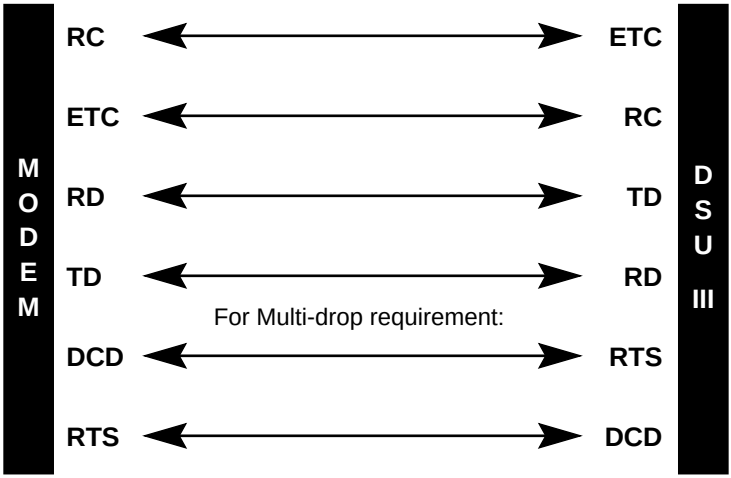

Fig. B-1. CSU/DSU SW56 to Modem Interconnect Diagram.

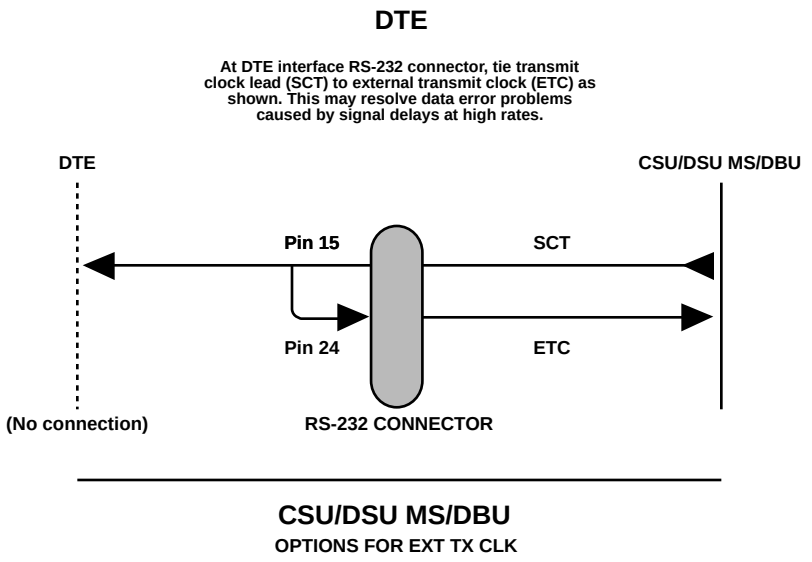

Fig. B-2. EIA 232 Connector for 56 Kbps Application.

Appendix C: AT Commands

Table C-1. AT Commands.

Comd	Title	Default
A/	Re-execute command	none
ATA	Answer	none
ATDn	Dial Number	none
ATE	Echo Command	1
ATH	Hang Up Call	none
ATO	Go Online	none
ATQn	Result Code Display	0
ATSn?	Read S Register	none
ATSn=x	Write to S Register	none
ATVn	Result Code Form	1
ATZ	Reset	none
AT&Cn	DCD Option	0
AT&Dn	DTR Option	0
AT&Fn	Restore Factory Options	none
AT&Kn	Flow Control	none
AT&Ln	Network Type	0
AT&Qn	DTE Data Format	0
AT&Rn	CS Options	0
AT&Sn	SR Options	0
AT&Tn	Test Commands	0
AT&V	View Current Configuration	none
AT&Wn	Store User Profile	0
AT&Xn	Transmit Clock	0
AT&Yn	Power Up User Profile	0
AT&Zn=x	Store Phone Number	none
AT\Nn	MNP® Option (V.32 DBU)	0
AT\Tn	Inactivity Timer	
AT%Bn	Loop Rate Select	0

Table C-1. AT Commands (continued).

Comd	Title	Default
AT%Cn	Compress Option (V.32 DBU)	0
AT%Kn	DTE Rate Select	
AT%P	Password Control	0
AT%P=x	Password Entry	0
T%P>x	Password Verify	0
AT%Rx	Initiate Remote Config.	0
AT%Tn	Anti-stream Option	0
AT%Cn	Compress Option (V.32 DBU)	0
AT%Kn	DTE Rate Select	
AT%P	Password Control	0
AT%P=x	Password Entry	0
T%P>x	Password Verify	0
AT%Rx	Initiate Remote Config.	0
AT%Tn	Anti-Stream Option	0
AT_An	LLB Control	0
AT_Bn	DBU Number to Dial	0
AT_Cn	SR Control During Test	0
AT_Dn	RTS-CTS Delay	0
AT_En	DBU Originate/Answer	0
AT_Fn	Scrambler Control	0
AT_Gn	DBU When OOS	0
AT_Hn	DBU When No RX Signal	0
AT_In	DBU When No Sealing Current	
AT_Jn	Auto Answer Enable/Disable	0
AT_Kn	DBU Enable/Disable	0
AT_Ln	DTE Routing Enable/Disable	0
AT_N=xx	Set Network Address	none
AT_Pn	Front Panel Enable/Disable	0
AT_RR	LB Enable/Disable	0

Table C-1. AT Commands (continued).

Comd	Title	Default
AT_S=xx	Set Serial Number	none
AT_Tn	Select Test Pattern	0
AT_Xn	Clock Source Select	0
AT_Yn	Secondary Channel Rate	

Appendix D: Configuration Profiles

Table D-1. Defaults for the CSU/DSU MS.

	Profile Numbers			
	1	2	3	4
ESCAPE CHARACTER	+(2BH)	+	+	+
CR character	CR(ODH)	CR	CR	CR
LF character	LF(OAH)	LF	LF	LF
BS character	BS(08)	BS	BS	BS
DBU Abort call timer	50	50	50	50
Escape guard time	50	50	50	50
Command echo	DIS	DIS	DIS	DIS
Result code	EN	EN	EN	EN
Long or Short code	LONG	LONG	LONG	LONG
Test pattern type	2047	2047	2047	2047
EIA controlled ALB	DIS	DIS	DIS	DIS
EIA controlled RLB	DIS	DIS	DIS	DIS
DTE Type	V.35	RS-232	V.35	V.35
Front panel en/dis	EN	EN	EN	EN
Test timeout	OFF	OFF	OFF	OFF
DTE Command Set	DIS	DIS	DIS	DIS
CS option	RS	RS	RS	RS
SR test option	OFF	OFF	OFF	OFF
TR option	IGNORE	IGNORE	IGNORE	NORMAL
DTR recog. delay (X100ms)	3	3	3	3
DTR command timeout (X100)	30	30	30	30
CD option	NRML	NRML	FORCE	NRML
SR option	NRML	NRML	NRML	NRML
RDL en/dis	EN	EN	EN	EN
DTE rate (56K loop)	56K	57.6K	56K	56K
RS-CTS delay	SHRT	SHRT	SHRT	SHRT

Table D-1. Defaults for the CSU/DSU MS (continued).

	Profile Numbers			
	1	2	3	4
DTE data format	SYNC	SYNC	ASYNC	SYNC
TC Timing source	INT	INT	INT	INT
TX Loop Timing	LOOP	LOOP	LOOP	LOOP
Network type	DDS	DDS	SW56	SW56
Anti-stream time	OFF	OFF	OFF	OFF
Inactivity timer	OFF	OFF	OFF	OFF
DBU auto restore time	60	60	60	60
Dial backup en/dis	DIS	DIS	EN	EN
DBU Original/Ans	ANS	ANS	ANS	ORIG
DBU when OOS	EN	EN	EN	EN
DBU when no RX signal	EN	EN	EN	EN
DBU when no SX	EN	EN	EN	EN
DBU number to dial	#1	#1	#1	#1
AT password control	OFF	OFF	OFF	OFF
Remote conf. en/dis	EN	EN	EN	EN
Loop Rate	AUTO	AUTO	AUTO	AUTO
Secondary channel rate	OFF	OFF	OFF	OFF
Scrambler mode	OFF	OFF	OFF	OFF
Async word length	10	10	10	10
Data Compression (V.32)	OFF	OFF	OFF	OFF
MNP mode (V.32)	NRML	NRML	NRML	NRML
SW56 DBUTYP	AT&T	AT&T	AT&T	AT&T
Flow control (V.32)	CS	CS	CS	CS
DBU redial counter	5	5	5	5
DBU FAIL_TMR	3(30S)	3	3	3
DBU redial wait time	10	10	10	10
Remote DSU address	0	0	0	0
Network address	0	0	0	0
Auto answer	ON	ON	ON	ON

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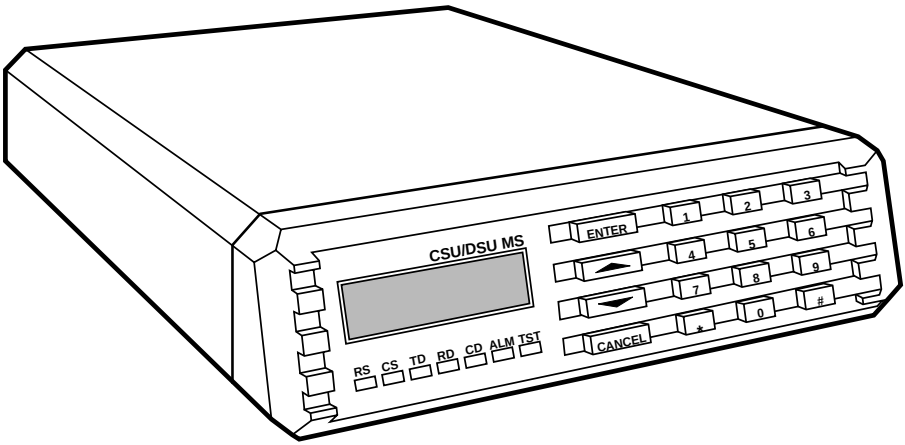
CSU/DSU MS



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