DSU III AR Rackmount

USER MANUAL

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FCC regulations require that the following information be provided in this manual:

1. This equipment complies with Part 68 of the FCC rules. On the bottom of the equipment housing is a label that shows the FCC registration number and Ringer Equivalence Number (REN) for this equipment. If requested, provide this information to the telephone company (REN is not required for some types of analog or digital facilities).

2. If this equipment causes harm to the telephone network, the telephone company may temporarily discontinue service. If possible, advance notification is given, otherwise, notification is given as soon as possible. The telephone company will advise the customer of the right to file a complaint with the FCC.

3. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of this equipment; advance notification and the opportunity to maintain uninterrupted service is given.

4. If experiencing difficulty with this equipment, please contact ADTRAN for repair and warranty information. The telephone company may require this equipment to be disconnected from the network until the problem is corrected, or it is certain the equipment is not malfunctioning.

5. This unit contains no user serviceable parts.

6. An FCC compliant telephone cord with a modular plug is provided with this equipment. In addition, an FCC compliant cable appropriate for the dial backup option ordered is provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using an FCC compatible modular jack, which is Part 68 compliant.

7. The following information may be required when applying to the local telephone company for leased line facilities:

Service Type	Digital Facility Interface Code	Service Order Code	Network Jacks
2.4 kbps Digital Interface	04DU5-24	6.0F	RJ-48S
4.8 kbps Digital Interface	04DU5-48	6.0F	RJ-48S
9.6 kbps Digital Interface	04DU5-96	6.0F	RJ-48S
19.2 kbps Digital Interface	04DU5-19	6.0F	RJ-48S
38.4 kbps Digital Interface	04DU5-38	6.0F	RJ-48S
56 kbps Digital Interface	04DU5-56	6.0F	RJ-48S
64 kbps Digital Interface	04DU5-64	6.0F	RJ-48S

8. In the event of equipment malfunction, all repairs should be performed by ADTRAN. It is the responsibility of users requiring service to report the need for service to their distributor or ADTRAN. See the last page of this manual for information on contacting ADTRAN for service.

Federal Canadian Emissions Requirements
Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio frequencies. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded cables must be used with this unit to ensure compliance with Class A FCC limits.

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

CANADIAN EMISSIONS REQUIREMENTS

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Cet appareil nuerique respecte les limites de bruits radioelectriques applicables aux appareils numeriques de Class A prescrites dans la norme sur le materiel brouilleur: "Appareils Numeriques," NMB-003 edictee par le ministre des Communications.

CANADIAN EQUIPMENT LIMITATIONS

Notice: The Canadian Industry and Science Canada label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational, and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be made by an authorized Canadian maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

Caution: Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or an electrician, as appropriate.

The Load Number (LN) assigned to each terminal device denotes the percentage of the total load to be connected to a telephone loop which is used by the device, to prevent overloading. The termination on a loop may consist of any combination of devices subject only to the requirement that the total of the Load Numbers of all devices does not exceed 100.

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Chapter 1
Introduction

ABOUT THIS MANUAL

This manual provides the information necessary for installation and operation of the Smart 16 DSU III AR Rackmount. Operation instructions for the Smart 16 Shelf or other data communication devices that may be used with the shelf are provided in the manuals furnished with those products.

PRODUCT OVERVIEW

The ADTRAN DSU III AR provides a reliable, high speed data connection for customer Data Terminal Equipment (DTE) through Digital Data Service (DDS) lines, DDS secondary channel services (DDSII), or 4-wire Switched 56 network (SW56) lines. The DSU III AR supports both synchronous and asynchronous data communication over the DDS or 4-wire Switched 56 networks.

This unit is an all rate DSU/CSU, supporting services from 2.4 to 64 kbps including 19.2 and 38.4 kbps services. The DSU III AR may be used in either point-to-point or multi-point circuits.

The DSU III AR provides both V.35 and EIA-232 electrical and physical DTE interfaces to accommodate a variety of applications. A second EIA-232 interface is provided for use on DDS lines with secondary channel services.

To ensure a reliable connection, the unit features an extended receiver capability which permits operation over long loops (3.4 miles or 5.5 km of 26 AWG at 56 kbps).

In addition to DDS, the unit also supports Switched 56 (4-wire) service with dialing accomplished from the front panel. This model is compatible with AT&T Accunet and Sprint SW56 type services.

Figure 1-1 shows a typical point-to-point application for the DSU III AR.

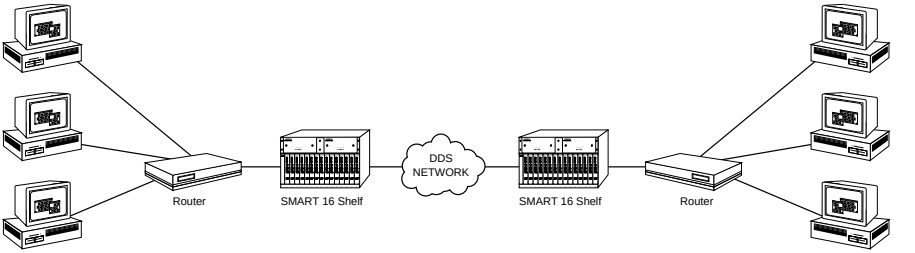

Figure 1-1
Typical Point-to-Point Application for the DSU III AR

DDS Overview

Digital Data Service (DDS) is a nationwide 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 customers and may provide data for routing Inter-LATA to an interexchange carrier. In DDS mode, the DSU III AR supports all DDS service rates yielding synchronous DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 kbps and asynchronous DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4, and 57.6 kbps. At the service rates of 56 kbps and 64 kbps, the unit can be configured to run slower DTE rates (async or sync). 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.

4-Wire Switched 56 Overview

This switched, 4-wire Digital Data Service allows customers to pay for data connection only for the time the unit is active. The regional operating companies provide the 4-wire local loop service to SW56 customers. In SW56 mode the DSU III AR supports synchronous DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4, and 56 kbps and asynchronous DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4, and 57.6 kbps.

WARRANTY AND CUSTOMER SERVICE

ADTRAN will replace or repair this product within five years from the date of shipment if it does not meet its published specifications or fails while in service. For detailed warranty, repair, and return information refer to the ADTRAN Equipment Warranty and Repair and Return Policy Procedure.

Return Material Authorization (RMA) is required prior to returning equipment to ADTRAN.

For service, RMA requests, or further information, contact one of the numbers listed at the end of this manual.

Chapter 2
Installation

UNPACK, INSPECT, POWER UP

Receiving Inspection

Carefully inspect the DSU III AR Rackmount for any shipping damages. If damage is suspected, file a claim immediately with the carrier and contact ADTRAN Customer Service. If possible, keep the original shipping container for use in shipping the DSU III AR Rackmount for repair or verification of damage during shipment.

Equipment Included

The following items are included in ADTRAN shipments of the DSU III AR Rackmount.

- DSU III AR Rackmount main module
- rear plug in module
- user manual insert
- RJ-45S cable to connect the DSU III AR Rackmount to the network

Customer Provides

The customer must provide an EIA-232 interface cable with standard 25-pin male D-type connectors (Cannon or Cinch DB-19604-432) or a V.35 cable.

Power Up

The shelf and installed units are internally powered by an AC or DC power supply. An optional second power supply can be used for redundant protection. For information regarding installation of power supplies see the *Smart 16 Shelf User Manual*.

INSTALLATION

The SMART 16 Shelf has 17 vertical slots in the front and rear of the chassis. The left-most front position is reserved for the SMART 16 Shelf Controller card. All other front slots can be used in any order for Rackmount cards. The PWR/CTRL rear segment occupies the right-rear slot behind the Controller card. All other rear slots are occupied by DTE/Network Interface cards.

Cards may be inserted and removed while the SMART 16 Shelf is receiving power.

Install rackmount cards using the following procedure:

1. The rear segment should be installed first by sliding the card along the card guides until the panel is flush with the chassis.

2. Tighten the captive screws at the top and bottom of the panel.

3. Slide the rackmount card into the corresponding front slot until contact is made with both the back plane connector and the rear segment.

See the chapter *Operation* for more information.

TELCO CONNECTORS

The DSU III AR Rackmount has two eight-pin modular jacks labeled **LINE 1** and **LINE 2** as shown in Figure 2-1. The **LINE 1** connector provides connection to the network when the unit is configured for either dedicated or switched operation. See the appendix *Pinouts* for this connector's pin assignments.

The **LINE 2** connector is not used with this unit.

DTE CONNECTION/PRIMARY DTE

The primary DTE should be connected to either the EIA-232 DTE connector or the CCITT V.35 DTE connector. The maximum cable length recommended is 50 feet for EIA-232 and 100 feet for the CCITT V.35. See the appendix *Pinouts* for the EIA-232 interface's pin assignments.

The V.35 connector is recommended for use with data rates above 19.2 kbps. The EIA-232 connector works up to 56 kbps with a low capacitance cable or with the external transmit clock option selected.

The EIA-232 interface should be used only for speeds of up to 19.2 kbps. For speeds over 19.2 kbps, use the V.35 connector.

SECONDARY CHANNEL CONNECTION

If used, the secondary DTE should be connected to the auxiliary EIA-232 connector. The pin assignments for this connector are shown in the appendix *Pinouts*.

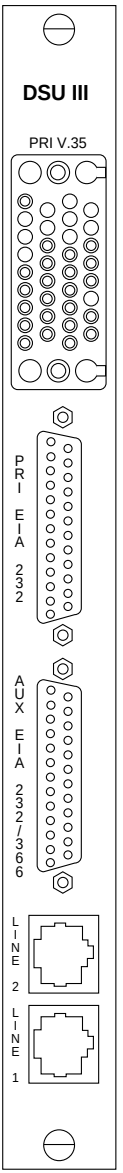

Figure 2-1
DSU III AR Rackmount Rear Panel

Chapter 3
Operation

FRONT PANEL OPERATION

The DSU III AR Rackmount faceplate is shown in Figure 3-1.

LED Description

The front panel LEDs of the DSU III AR Rackmount indicate the status of the DTE interface, tests, alarm conditions, and error conditions. Their definitions are as follows:

RS: Request to Send	Reflects the status of the request to send pin of the primary DTE connector.
CS: Clear to Send	Reflects the status of the clear to send pin of the primary DTE connector.
TD: Transmit Data	Becomes active when data is received from the DTE.
RD: Receive Data	Becomes active when data is transmitted to the DTE.
CD: Carrier Detect	Becomes active when the DSU is receiving a carrier signal from the line.

ALM: Alarm Indication	Becomes active whenever an alarm condition exists. Alarm conditions include: • Open loop on network • No frame synchronization
Test LEDs	When the DSU III AR Rackmount is in test mode, one of the test LEDs activates to indicate the type of test being performed: DTE, Loop, RDL, PTRN.
Error	Indicates error detection during a test.
Select Key	Press to select test to be performed (signified by illumination of Test LEDs).
Test Key	Press to initiate selected test.

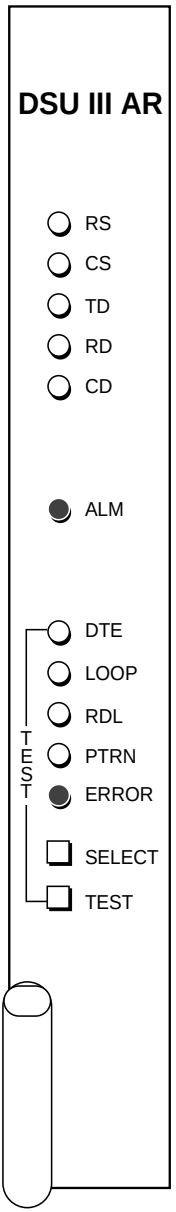

Figure 3-1
DSU III AR Rackmount Front View

VT 100 TERMINAL CONNECTION AND OPERATION

The Smart 16 Shelf is configured by attaching a VT 100 compatible terminal or equivalent to the control port on the rear of the Smart 16 Shelf Controller card. Optionally, a DATAMATE (ADTRAN part number 1200.045L1) may be used.

The connection for a terminal is made through the EIA-232 25-pin connector on the rear PWR/CTRL segment. This connection is used for both local and remote configuration.

To access the Main menu of the DSU III AR Rackmount specify the number of the slot occupied in the Select Unit menu. All other Terminal Utility Menu options are described in detail in the *SMART 16 Shelf User Manual*.

The VT 100 Main menu of the DSU III AR Rackmount offers six options: status, local configuration, remote configuration, local test, remote test, and dial as shown in Figure 3-2.

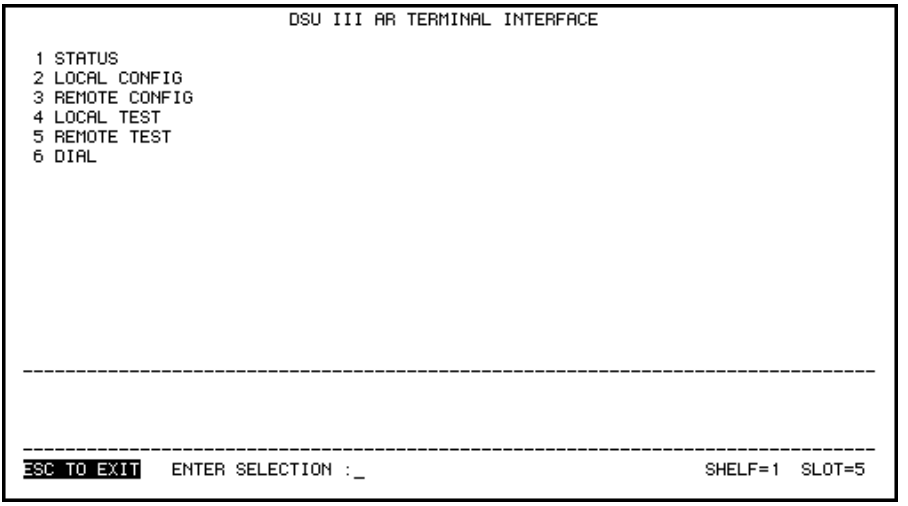

Figure 3-2
VT 100 DSU III AR Rackmount Main Menu

REMOTE COMMAND

The DSU III AR Rackmount can be controlled remotely from another DSU III AR. The Configuration (CONFIG) menu allows the DSU III AR Rackmount remote configuration capability to be enabled or disabled.

DATAMATE CONNECTION

The DATAMATE is a hand-held device that plugs into the RJ-11 jack on the front of the controller. The DATAMATE can also be plugged into the RJ-11 jack at the top of the rear SMART 16 shelf controller.

Once communication with a DSU III AR Rackmount has been established, the DATAMATE menu structure is identical to that of the stand alone product.

The DSU III AR uses a multilevel menu approach to access its many features. All menu operations are displayed in the DATAMATE's LCD window.

The opening menu is the access point for all other operations. There are four Main menu branches: Status, Test, Configuration, and Dial. Each Main menu item has several functions and submenus to identify and access specific parameters.

LCD Display of the Main Menu

```
1=STATUS      2=TEST
3=CONFIG      4=DIAL
```

The DIAL option is only available when the unit is configured for a Switched 56 network type. For more information, see the chapter Dial Selection.

Chapter 4
Configuration

CONFIGURATION OVERVIEW

The DSU III AR Rackmount contains four different user profiles (sets of configurations options) that are stored in read only memory. These profiles are listed in the appendix *Configuration Profiles*. The unit is shipped from the factory using profile 1 as follows:

Connector Type V.35
DTE Data Format ..... Synchronous
Tx Clock Options ..... Normal
CS Options ..... Follows RS
Anti-stream Timer ..... Off
CD Options ..... Normal
TR Options ..... Ignored
Auto Answer ..... Enabled
SR Options ..... Off Test + OOS
DTE Rate ..... Same as Loop
DTE Command Options ..... Disabled
Scrambler Mode ..... Off
Secondary Channel Rate ..... Off
Loop Rate ..... Auto
Network Address 0
Network Type ..... Dedicated
Clock Source ..... From Network
Test Timeout ..... Off
EIA LLB ..... Disabled
EIA RLB ..... Disabled
Remote Configuration ..... Enabled
Remote Digital Loopback (RDL) ..... RDL Accepted

If profile 1 matches the desired system requirements, no additional configuration is required to place the unit into service. If profile 1 does not match the desired system requirements, modify the default configuration or select another profile more closely matching the desired configuration and modify.

When a new profile is loaded, or the existing profile is modified, it is stored in the nonvolatile configuration memory, configuring the unit with that profile every time power is turned on or the unit is reset.

CONFIGURATION METHODS

There are two input methods for the controller card:

- An EIA-232 interface, mounted on the rear of the shelf, to which a VT 100 compatible terminal can be connected. For remote applications a modem can be used.
- The DATAMATE, an optional corded hand-held keypad with a 2 x 16 LCD display.

Two additional input methods are available through the DSU III AR:

- In-band AT commands from an asynchronous DTE port (see the appendix *AT Commands* for a list of these commands).
- V.25 bis in-band dialing and configuration from both synchronous and asynchronous DTE ports. The V.25 bis option supports the following protocols: SDLC (synchronous data link control), bi-sync, and asynchronous.

The configuration menu for the VT 100 terminal is shown in Figure 4-1 and the configuration menu for the DATAMATE is shown in Figure 4-2.

VT 100 CONFIGURATION

To configure the DSU III AR Rackmount using a VT 100 terminal, select **Local Configuration** or **Remote Configuration** from the Terminal Interface menu. See the section *VT 100 Terminal Connection and Operation* in the chapter *Operation* for more information. The VT 100 Local Configuration Menu has two sections: DTE Options and Network/Test/Command Options as shown in Figure 4-1.

To set any of the parameters listed on the terminal screen, select the menu number corresponding to the parameter. The options are displayed at the bottom of the screen. Select the number corresponding to the desired option.

```
                        DSU III AR CONFIGURATION MENU
DTE OPTIONS                                NETWORK/TEST/COMMAND OPTIONS
 1 CONNECTOR TYPE=V.35                     16 LOOP RATE=AUTO
 2 DTE DATA FORMAT=SYNCHRONOUS             17 NETWORK ADDRESS=0
 3 ASYNC WORD LENGTH=10 BITS               18 NETWORK TYPE=DEDICATED
 4 TRANSMIT CLOCK=NORMAL                   19 CLOCK SOURCE=FROM NETWORK
 5 CS CONTROL=FOLLOWS RS                   20 TEST TIMEOUT=0
 6 RS-CS DELAY=SHORT                       21 REMOTE TEST=EN
 7 ANTI-STREAM=TIMER OFF                   22 LL EIA=DIS
 8 CD CONTROL=NORMAL                       23 RL EIA=DIS
 9 TR CONTROL=IGNORED                      24 REMOTE CONFIG=EN
10 AUTO ANSWER=EN                          25 FRONT PANEL=EN
11 SR CONTROL=OFF TEST+OOS                 26 ENTER MAN CMD
12 DTE RATE(@56K)=56K SYNC/57.6K ASY
13 DTE CMD SET=DISABLED
14 SCRAMBLE(@56SC/64K)=OFF
15 SEC CHANNEL RATE=OFF

--------------------------------------------------------------------------------



--------------------------------------------------------------------------------
ESC TO EXIT   ENTER SELECTION :_                                SHELF=1  SLOT=5
```

Figure 4-1
VT 100 Local Configuration Menu

DTE Options

The DTE Option side of the Configuration menu is used to select the configuration parameters that control the operation of the DSU III AR's DTE interface (such as the DTE rate, data format, transmit clock, CS options, and CD options).

Connector Type

Select RS-232 or V.35 to specify which of the primary channel connectors is used to connect to the DTE. The factory default setting is V.35.

DTE Data Format

Select the SYNCHRONOUS or ASYNCHRONOUS mode of operation for the DTE interface. The factory default setting is SYNCHRONOUS. If ASYNCHRONOUS is chosen, the word length must be selected.

Async Word Length

Select a word length of 9, 10, or 11 bits for asynchronous operation.

Transmit Clock

Select a NORMAL or EXTERNAL source of the clock for use during data transfer from the DTE to the DSU III AR. The factory default setting is NORMAL.

To use the internal clock of the DSU III AR Rackmount select NORMAL. To use the external transmit clock from the DTE select EXTERNAL.

The External clock option is normally used in modem tail circuit applications. A DSU to modem interconnect diagram for this application is shown in the appendix *DSU to Modem Interconnect*.

The External clock option is also recommended when the EIA-232 connector is used for rates above 19.2 kbps. A special DSU cable diagram for this application is shown in the appendix *EIA-232 Connector.* Using this option and special cable eliminates data errors caused by excessive delays in the DTE transmit clock receiver and transmit data driver.

CS Control

Select one of five different control modes for the CS lead. The default factory setting is FOLLOWS RS with CS DELAY SHORT.

Forced On
The CS lead remains on.

Follows RS
The CS is on with RS after delay and off with RS or if the DSU cannot pass data.

Follows CD
The CS state matches the CD state. No data can be received from the DTE device until CD is activated. The CS lead only follows CD when the unit is able to pass data.

Follows RS + CD
CS follows RS after delay and is also off if CD is off. If CD goes off after RS is on, the DSU III AR will turn off CS but continue to pass data until RS goes off. CS is also off if the DSU cannot pass data.

Off With LOCD
Off five seconds after LOCD. Valid only in SW56 mode. CS is forced on but will turn off for five seconds after a call is disconnected.

RS-CS Delay

If one of the options chosen in the CS Control selection involves request to send (RS), then the delay from RS to CS must be selected.

Specified times for the short and long delays at the different operating speeds are shown in Table 4-A.

Table 4-A

Short and Long Delays at Different Operating Speeds

Rate	Short Option	Long Option	Tolerance	Add to Maximum Time for Secondary Channel
64K	1.1ms	16.1ms	±.4ms	
56K	1.1ms	16.1ms	±.4ms	.33ms
38.4K	1.5ms	16.5ms	±.4ms	.63ms
19.2K	1.5ms	16.5ms	±.4ms	1.25ms
9.6K	1.5ms	16.5ms	±.4ms	2.5ms
4.8K	1.9ms	16.9ms	±.7ms	5.0ms
2.4K	3.8ms	18.8ms	±1.3ms	10.0ms

Anti-Stream

The ANTI-STREAM option is used to select the anti-stream timeout. The anti-stream timeout is the maximum time the DSU III AR transmits data into the network from the DTE. This feature prevents one DTE device on a multi-drop network from continuously tying up the transmit circuit back to the master DSU. The factory default setting is TIMER OFF.

Timer Off

Anti-stream timer is disabled.

Time 10 Sec

Timeout equals 10 seconds.

Time 30 Sec

Timeout equals 30 seconds.

Time 60 Sec
Timeout equals 60 seconds.

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

CD Control

Select one of three different control modes for the receive line signal detector (CD) lead. The default factory setting is NORMAL.

Forced On
The CD lead remains active all the time.

Normal
The CD lead is on only when data is present on the loop.

Off With LOCD
The CD is on except after disconnect in Switched 56 applications.

TR Control

Select the DSU III AR response to the data terminal ready (TR) lead. The factory default setting is IGNORED.

Ignored
The TR input is ignored.

Idle When Off
In SW56 mode, TR off causes the DSU to go On Hook (idle). The unit also does not dial out if TR is off. In dedicated mode, the DSU goes into DTE command mode when TR goes off. When TR goes on, if the DSU

does not receive a command in the number of seconds set in S40, the DSU goes into data mode.

Off>On Dial #1
Dial stored #1. TR goes off to on (SW56 only).

Off>On Dial #2
Dial stored #2. TR goes off to on (SW56 only).

Auto Answer

Specify how incoming calls are to be answered. If ENABLED, incoming calls are automatically answered by the DSU III AR. If DISABLED, an incoming call can be answered manually by an AT or V.25 command from the DTE, or by raising TR from the DTE. The factory default setting is ENABLED.

SR Control

The SR OPTIONS menu is used to select the operating mode for the data set ready (SR) lead. The factory default setting is OFF TEST ONLY.

Forced On
The SR control lead remains on regardless of the state of the network.

Off OOS Only
The SR control lead is on except when the DSU III AR Rackmount receives an out-of-service condition from the network.

Off LOCD Only
The SR control lead is off five seconds after disconnect (SW56 only).

Off Test Only
The SR lead is on except when the DSU III AR Rackmount is executing a test.

Off Test+OOS

The SR lead is on except during a test or when receiving an out-of-service condition from the network.

Off Test + LOCD

The SR lead is off five seconds after disconnect or while executing a test.

DTE Rate

This option sets the operating speed of the DTE interfaces. The selectable DTE rates over a 56 or 64 kbps loop with no secondary channel are listed below. If a slower loop rate is selected, then the DTE rate automatically matches the loop rate. If an attempt is made to set the DTE rate for loop rates slower than 56 kbps, the DSU III AR briefly displays DTE RATE SAME AS THE NETWORK before returning to the status screen. The factory default setting is SAME AS LOOP.

DTE Rate Options

synchronous: 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 56K
asynchronous: 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 57.6K, SAME AS LOOP

DTE Command Set

The DTE COMMAND option is used to enable AT commands from the DTE, enable V.25 bis SDLC (Synchronous Data Link Control) commands, enable V.25 (Bisync and Async), or disable all DTE command modes. The factory default setting is DISABLE.

NOTE

When the unit is in DTE CMD OPTION mode (idle in SW56 mode, forced with TR option, or from escape sequence in AT mode) with AT COMMAND SET or V.25 SYNC selected, the DTE format is independent of the DATA FORMAT option. However, if V.25 BSC/ASYNC is selected, the unit will use V.25 BISYNC (BSC) commands for synchronous data format or V.25 ASYNC commands for asynchronous data format.

Scramble

If the DSU III AR is set for a loop rate of 56 kbps with secondary channel or 64K, then SCRAMBLER ON/OFF options are available. The factory default setting is SCRAMBLER OFF.

Scrambler Off
DTE data scrambler disabled.

Scrambler On
DTE data scrambler enabled.

Data Invert (Suppress LBE)
DTE data invert enabled (56 kbps secondary channel Loop Rate only). LBE codes from DTE suppressed (64 kbps only).

Secondary Channel Rate

Select the operating speed for the secondary channel if the secondary channel option was selected during setup of the Network Options. The factory default is OFF. The secondary channel has an internal 256 byte buffer. If the secondary channel speed is higher than the throughput in the network, CTS flow control is activated. If the secondary DTE does not respond to CTS flow control, care should be taken to prevent the secondary channel internal buffer from overflowing.

Network/Test/Command Options

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 DSU III AR also supports subrate DTE data over a 56 kbps or 64 kbps loop. The loop rate must be set independently of the DTE rate.

Loop Rate Selections

AUTO, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 56K, 64K, 2.4K SEC CH, 4.8K SEC CH, 9.6K SEC CH, 19.2K SEC CH, 38.4K SEC CH, 56K SEC CH

The default factory setting is AUTO. When configured to AUTO, the DSU will automatically attempt to adapt to the loop rate. Since 64k and 56k secondary channel look identical on the network, the DSU III will adapt to 56k secondary channel for either loop rate. If the loop rate is known, select the rate from the menu.

Network Address

A two-digit decimal address can be assigned to each DSU III AR. This addressing capability makes it possible to perform remote configuration and testing in point-to-point and multi-drop networks and adds an additional level of security in 4-wire SW56 networks. The factory default setting is 0.

Network Type

This option configures the DSU III AR for the specific type of network being used. The factory default setting is DEDICATED.

Dedicated

Any 4-wire DDS network

AT&T/MCI

AT&T/MCI SW56 service

US Sprint
US Sprint SW56 service

Clock Source

The CLOCK SOURCE options specify the timing source for the DSU III AR's internal circuitry. The factory default setting is FROM NETWORK.

Master
DSU is master timing source.

From Network
Network Rx signal is timing source.

When operating on a DDS network, the timing should be FROM NETWORK. On a point-to-point private network, one DSU III AR must be set for MASTER, and the other set for FROM NETWORK.


NOTE

Select Master timing only if the circuit has no timing source (for example, two DSUs and a crossover cable).

Test Timeout

The TEST TIMEOUT option sets the length of time a DSU III AR remains in a test mode before automatically returning to the data mode. Enter the timeout from 0 to 255 seconds. The factory default setting is off (0).

Remote Test

Enables or disables remote testing capabilities. The factory default setting is ENABLED.

Local Loopback EIA

The Local Loopback EIA (Electronics Industries Association) option specifies whether or not the DSU III AR responds to the LLB input from the DTE. The factory default setting is DISABLED.

Remote Loopback EIA

The Remote Loopback EIA option specifies whether or not the DSU III AR responds to the RLB input from the DTE. The factory default setting is DISABLED.

Remote Configuration

This option sets up the DSU III AR to accept or reject remote configuration commands. The factory default setting is ENABLED.

Front Panel

Enables or disables front panel operation. The factory default setting is ENABLED.

Enter Manual Command

The Manual Command option is a shortcut method for entering configuration and control commands for the DSU III AR. The available manual commands are listed in Table 4-B.

DATAMATE CONFIGURATION

To configure the DSU III AR Rackmount using a DATAMATE, select the correct shelf and slot location. Then select 3=CONFIG from the AR Main menu. The DATAMATE menu tree is shown in Figure 4-2. The options are described in the following paragraphs.

Network Options

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 DSU III AR also supports subrate DTE data over a 56 kbps or 64 kbps loop. The loop rate must be set independently of the DTE rate.

Loop Rate Selections

AUTO, 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 56K, 64K
(For options 2.4K, 4.8K, 9.6K, 19.2K, 38.4K, and 56K secondary channel must be enabled or disabled.)

The default factory setting is AUTO. When configured to AUTO, the DSU automatically attempts to adapt to the loop rate. Since 64k and 56k secondary channel look identical on the network, the DSU III will adapt to 56k secondary channel for either loop rate. If the loop rate is known, select the rate from the menu.

Network Address

A two-digit decimal address can be assigned to each DSU III AR. This addressing capability makes it possible to perform remote configuration and testing in point-to-point and multi-drop networks and adds an additional level of security in 4-wire SW56 networks. The factory default setting is 0.

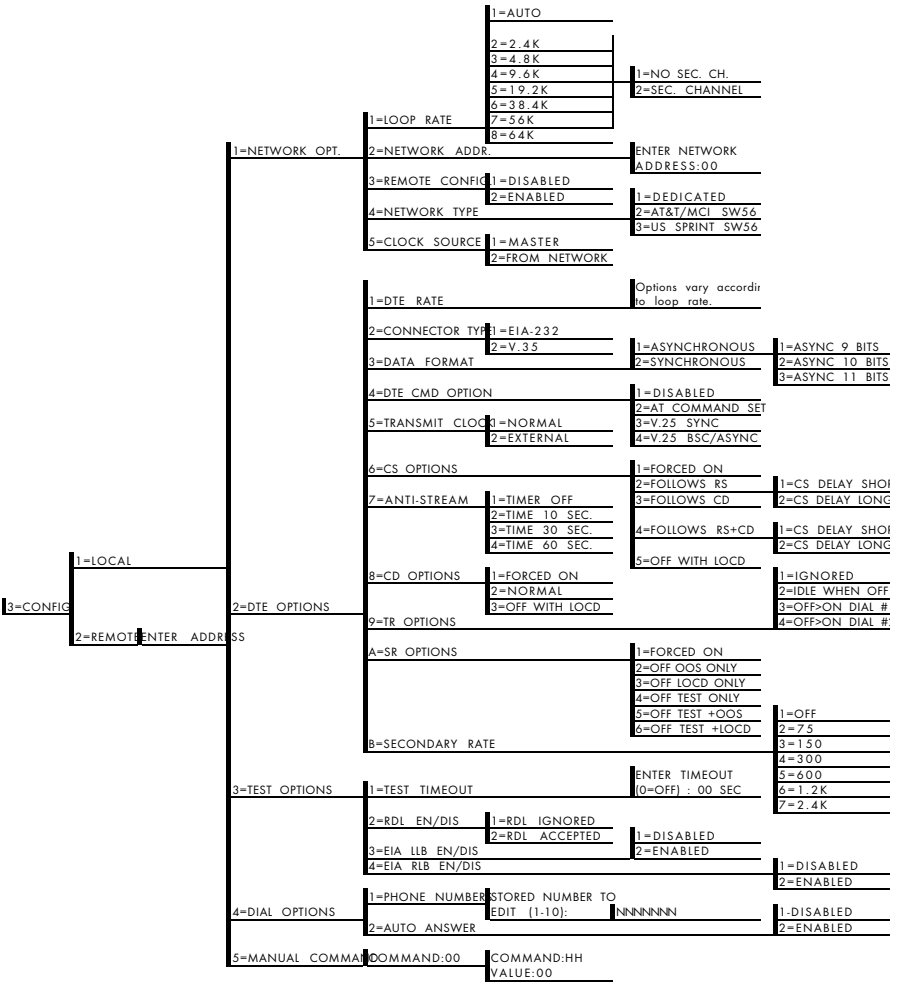

Figure 4-2
DATAMATE Configuration Menu

Remote Configuration

This option sets up the DSU III AR to accept or reject remote configuration commands. The factory default setting is ENABLED.

Network Type

This option configures the DSU III AR for the specific type of network being used. The factory default setting is DEDICATED.

Dedicated
Any 4-wire DDS network

AT&T/MCI SW56
AT&T/MCI SW56 service

US Sprint SW56
US Sprint SW56 service

Clock Source

The CLOCK SOURCE options specify the timing source for the DSU III AR internal circuitry. The factory default setting is FROM NETWORK.

Master
DSU is master timing source.

From Network
Network Rx signal is timing source.

When operating on a DDS network, the timing should be FROM NETWORK. On a point-to-point private network, one DSU III AR must be set for MASTER, and the other set for FROM NETWORK.

Select Master timing only if the circuit has no timing source (for example, two DSUs and a crossover cable).

DTE Options

DTE Rate

This option sets the operating speed of the DTE interface. The default setting is SAME AS LOOP. If the DSU III AR is set for a loop rate of 56 kbps with secondary channel or 64K, then the SCRAMBLER option must be selected after selecting the DTE rate. The factory default setting is SCRAMBLER OFF.

Scrambler Off
DTE data scrambler disabled.

Scrambler On
DTE data scrambler enabled.

Suppress LBE (Data Invert)
LBE codes from DTE suppressed (64 kbps only). DTE data invert enabled (56 kbps secondary channel Loop Rate only).

Connector Type

Select RS-232 or V.35 to specify which of the primary channel connectors is used to connect to the DTE. The factory default setting is V.35.

Data Format

Select the SYNCHRONOUS or ASYNCHRONOUS mode of operation for the DTE interface. The factory default setting is SYNCHRONOUS. If ASYNCHRONOUS is chosen, the word length must be selected (9, 10, or 11 bits).

DTE Command Option

The DTE COMMAND option is used to enable AT commands from the DTE, enable V.25 bis SDLC (Synchronous Data Link Control) commands, enable V.25 (Bisync and Async), or disable all DTE command modes.

The factory default setting is DISABLE.

When the unit is in DTE CMD OPTION mode (idle in SW56 mode, forced with TR option, or from escape sequence in AT mode) with AT COMMAND SET or V.25 SYNC selected, the DTE format is independent of the DATA FORMAT option. However, if V.25 BSC/ASYNC is selected, the unit will use V.25 BISYNC (BSC) commands for synchronous data format or V.25 ASYNC commands for asynchronous data format.

Transmit Clock

Select a NORMAL or EXTERNAL source of the clock for use during data transfer from the DTE to the DSU III AR. The factory default setting is NORMAL.

To use the internal clock of the DSU III AR Rackmount select NORMAL. To use the external transmit clock from the DTE select EXTERNAL.

The External clock option is normally used in modem tail circuit applications. A DSU to modem interconnect diagram for this application is shown in the appendix *DSU to Modem Interconnect*.

The External clock option is also recommended when the EIA-232 connector is used for rates above 19.2 kbps.

CS Options

Select one of five different control modes for the CS lead. The default factory setting is FOLLOWS RS with CS DELAY SHORT.

Forced On

The CS lead remains on and request to send (RS) is ignored as long as the unit is able to pass data.

Follows RS

The CS state matches the RS state. No data can be received from the DTE device until RS is activated. The CS lead only follows RS when the unit is able to pass data, for example, when the unit is on-line.

Follows CD

The CS state matches the CD state. No data can be received from the DTE device until CD is activated. The CS lead only follows CD when the unit is able to pass data, for example, when the unit is on-line.

Follows RS + CD

CS follows RS after delay and is also off if CD is off. If CD goes off after RS is on, DSU III AR will turn off CS but continue to pass data until RS goes off. CS is also off if DSU cannot pass data.

Off With LOCD

Off five seconds after LOCD. Valid only in SW56 mode. CS is forced on but will turn off for five seconds after a call is disconnected.

Anti-Stream

The ANTI-STREAM option is used to select the anti-stream timeout. The anti-stream timeout is the maximum time the DSU III AR transmits data into the network from the DTE. This feature prevents one DTE device on a multi-drop network from continuously tying up the transmit circuit back to the master DSU. The factory default setting is TIMER OFF.

Timer Off

Anti-stream timer is disabled.

Time 10 Sec

Timeout equals 10 seconds.

Time 30 Sec

Timeout equals 30 seconds.

Time 60 Sec

Timeout equals 60 seconds.

The anti-stream timer is reset to zero when RS changes to the active state and is updated every second while RS is active. When the anti-stream timeout expires, the DSU III AR stops transmitting DTE data into the net-

work but continues to accept data from it. This condition exists until the DTE deactivates the RS input.

CD Options

Select one of three different control modes for the receive line signal detector (CD) lead. The default factory setting is NORMAL.

Forced On
The CD lead remains active all the time.

Normal
The CD lead is active when data is received from the far end. If a configuration problem has been detected, CD remains off until the error is corrected.

Off With LOCD
The CD is on except after disconnect in Switched 56 applications.

TR Options

Select the DSU III AR response to the data terminal ready (TR) lead. The factory default setting is IGNORED.

Ignored
The TR input is ignored.

Idle When Off
In SW56 mode, TR off causes the DSU to go On Hook (idle). The unit also will not dial out if TR is off. In dedicated mode, the DSU goes into DTE command mode when TR goes off. When TR goes on, if the DSU does not receive a command in the number of seconds set in S40, the DSU goes into data mode.

Off>On Dial #1
Dial stored #1. TR goes off to on.

Off>On Dial #2
Dial stored #2. TR goes off to on.

SR Options

The SR OPTIONS menu is used to select the operating mode for the data set ready (SR) lead. The factory default setting is OFF TEST ONLY.

Forced On
The SR control lead remains on regardless of the state of the network.

Off OOS Only
The SR control lead is on except when the DSU III AR Rackmount receives an out-of-service condition from the network.

Off LOCD Only
The SR lead goes off 5 seconds after disconnect (SW56 only).

Off Test Only
The SR lead is on except when the DSU III AR Rackmount is executing a test.

Off Test+OOS
The SR lead is on except during a test or when receiving an out-of-service condition from the network.

Off Test + LOCD
The SR lead goes off 5 seconds after disconnect or if unit is executing a test.

Secondary Rate

Select the operating speed for the secondary channel if the secondary channel option was selected during setup of the Network Options. The factory default is OFF. The secondary channel has an internal 256 byte buffer. If the secondary channel speed is higher than the throughput in the network, CTS flow control is activated. If the secondary DTE does not respond to CTS flow control, care should be taken to prevent the secondary channel internal buffer from overflowing.

Test Options

Test Timeout

The TEST TIMEOUT option sets the length of time a DSU III AR remains in a test mode before automatically returning to the data mode. Enter the timeout from 0 to 255 seconds. The factory default setting is off (0).

Remote Digital Loopback

The RDL (Remote Digital Loopback) option specifies whether or not the DSU III AR responds to an RDL request from the far end of the circuit. The factory default setting is RDL ACCEPTED.

EIA Local Loopback

The Local Loopback EIA (Electronics Industries Association) option specifies whether or not the DSU III AR responds to the LLB input from the DTE. The factory default setting is DISABLED.

EIA Remote Loopback

The Remote Loopback EIA option specifies whether or not the DSU III AR responds to the RLB input from the DTE. The factory default setting is DISABLED.

Dial Options

The Dial Options are described in the chapter *Dial Selection*.

Manual Command

The Manual Command option is a shortcut method for entering configuration and control commands for the DSU III AR. The available manual commands are listed in Table 4-B.

Table 4-B
Manual Commands

Command Description	Command	Value
AT Command Echo		
Disable	82	00
Enable	82	01
AT Result Code		
Enable	85	00
Disable	85	01
AT Long or Short Code		
Short form	86	00 to FF
Long form	86	00 to FF
AT Escape Character	2	00 to FF
AT CR Character	3	00 to FF
AT LF Character	4	00 to FF
AT BS Character	5	00 to FF
AT Escape Char. Timer	0C	00 to FF
Abort Call Timer	7	00 to FF
DTR Recognize Delay (x 2.5ms)	19	00 to FF
DTR Initiated Command Timeout (seconds)	28	00 to FF
Load Factory Opt.		
Option Set #1	8A	00
Option Set #2	8A	01
Option Set #3	8A	02
Option Set #4	8A	03
Store User Profile		
Save to Profile 0	91	00
Save to Profile 1	91	01
Select User Profile		
Power Up Profile 0	93	00
Power Up Profile 1	93	01
Network Address Lock		
Network Addr. Unlock	C3	00
Network Addr. Lock	C3	01

AT COMMANDS

The DSU III AR RM 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 or three pluses (+++) to the DSU III AR RM. 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 with delay between each character being less than the guard time.

Once the command mode is entered, AT commands can be transmitted to the DSU III AR RM to configure most of the options or initiate tests to check both the DSU III AR RM and the network connections. All command lines must begin with the AT character set in either capital or lower case letters.

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 DSU III AR RM 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 DSU III AR RM are listed in the appendix *AT Commands*.

V.25 BIS COMMANDS

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

The V.25 bis option supports the following protocols:

- SDLC (Synchronous Data Link Control)
- BI-SYNC
- ASYNCHRONOUS

SDLC Option

Character Format

- Data bits - 8
- 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.

Bi-Sync Option

Character Format

- Data bits - 7
- Parity bit - Odd

Command Structure

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

Asynchronous Option

Character Format

- Start bit - 1
- Data bits - 7
- Parity bit - Even
- Stop bit - 1

Command Structure

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

Command Descriptions

The ADTRAN V.25 bis command set is a subset of the CCITT V.25 bis command set. In addition to the CCITT commands supported, ADTRAN has added configuration commands for both local and remote DSUs. The ADTRAN V.25 bis command set follows:

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

The following list contains possible responses to V.25 bis commands:

VAL	Valid V.25 command processed
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

If verbose (wordy) responses are disabled (ATV0), the following list of three-character responses are the only ones returned:

VAL	Valid V.25 command processed
INV	Invalid command received
CFI	Call failed
INC	Incoming call
CNX	Call connected

Syntax and Possible Responses

CIC (Connect Incoming Call)

This command causes the DSU to go on-line. For dial backup units, this command hangs up the dial backup line and initiates an attempt to reestablish the main (DDS) line. There are no parameters associated with this command. Possible indications include VAL, CNX, and CFIxx.

CNL (Configuration Local)

This command is used to pass AT commands to the local modem via the V.25 bis command processor. This allows the DSU III AR RM to be configured with AT commands via a synchronous interface. The command has the following format:

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

A local password 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 include VAL and INVn.

CNR (Configuration Remote)

This command is used to pass AT commands over the network to the remote DSU via the V.25 bis command

processor. This allows a remote DSU III AR RM to be configured from a synchronous interface. The command's format is as follows:

```
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 include VAL and INVn.

Switched 56 Operation

CRN (Call Request with Number)

When the DSU III AR RM is configured for SW56 operation, the CRN command causes the DSU to dial the supplied number. The command's format follows:

```
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 DSU III AR RM responds with the call failure indication CFINS (Call Failure Indication Not Stored).

For a DBU 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 include VAL,CNX, and CFIxx.

CRS (Call Request Using Stored Number)

The CRS command causes the DSU III AR RM to dial the number stored in the specified register. The format of this command is as follows:

```
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 include VAL,CNX, and CFIxx.

DIC (Disregard Incoming Call)

This command causes the V.25 bis processor to return to command mode even if there is an incoming call pending. This allows local commands to be issued and incoming calls to be ignored. There are no parameters associated with this command. The DSU responds with VAL.

PRN (Program Number)

This command stores the supplied number into the specified register. The command has the following format:

```
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. This response is also returned if the number to be stored contains invalid characters. 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 DSU responds with VAL.

RLN (Request List of Numbers)

This command causes the DSU III AR RM to return the number stored in the specified register. The format of this command follows:

```
RLN   [REGISTER NUMBER]
```

If the register number is invalid, the INVPV response is

returned. When a correct register number is entered, the following response is returned:

```
LSN   [REGISTER NUMBER];[NUMBER
STORED]VAL
```

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

Chapter 5
Status

STATUS

The VT 100 Status screen (Figure 5-1) displays the unit/loop status and the DTE leads.

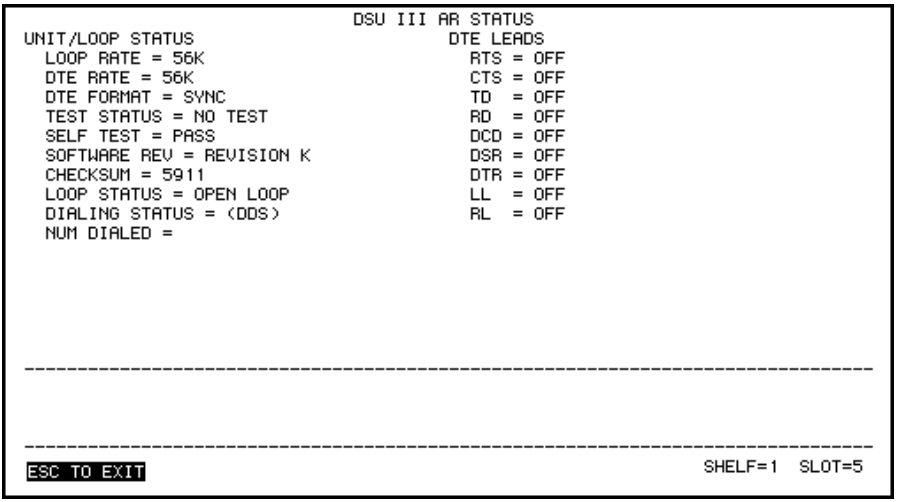

Figure 5-1
VT 100 Status Display

The DATAMATE status selection displays two lines of the current operational status of the network and the DTE interfaces.

After 30 seconds of no front panel operation, the DATAMATE automatically reverts to the Status display; see Figure 5-2. To exit from the LOOP IS NORMAL, LOOP xx DTE xx SYNC/ASYNC, or the TR SR LLB RLB ON/OFF screens press **Cancel**.

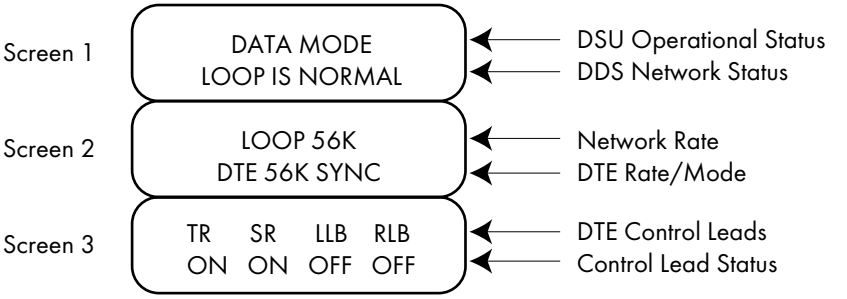

Figure 5-2
Status Display

Unit/Loop Status

Loop Rate
This portion of the Status display indicates the current loop rate.

DTE Rate
Indicates the current DTE Rate setting for the DSU.

DTE Format
Indicates the current DTE Format setting for the DSU.

Test Status
This portion of the Status screen displays the type of test currently running on the DSU III AR Rackmount. If no test is being performed at this time **NO TEST** is displayed. See the chapter *Testing and Troubleshooting* for more information on tests.

Self Test
A self test is performed during power up. PASS indicates there are no problems with the operation of the DSU III AR Rackmount.

Software Rev.

Indicates the software version of the DSU III AR Rackmount.

Checksum

Displays the checksum of the software.

Loop Status

For normal operation **LOOP IS NORMAL** should be displayed. The status of the main telco line is indicated by one of the following messages:

Check Telco	The Transmit and Receive (Tx/Rx) pairs of the loop connection are reversed. The pairs should be swapped for normal operation.
LL Test From Telco	A local loopback test has been initiated from the telco. This test may be terminated only by the telco.
RL Test From Telco	A remote loopback test has been initiated from the telco. This test may be terminated only by the telco.
Loop is Normal	The DSU is connected to the dedicated line.
No Rx Signal	The DSU detects sealing current but no receive signal.
No Frame Sync	The DSU cannot sync on the signal from the telco.
Rate Adapting	The DSU is attempting to determine the loop rate provided from the telco.
OOS/OOF	The telco is transmitting an out of service code.

Open Loop	The DDS physical connection has been broken.

The following messages also appear on the DATAMATE under loop status:

Answering Call	The DSU III AR Rackmount detects an incoming call.
No Wink from CO	The DSU did not see a proper signal from the network during dialing.
Call Disconnect	The SW56 was terminated.
Waiting for Call	The module is waiting for a call.

Dialing Status

Displays the DSU's current dialing status.

Number Dialed

Displays the number currently being dialed.

DTE Leads

Displays the status of the DTE leads. The status of the first five leads listed below can also be viewed on the AR's front panel LEDs.

RTS (RS on the front panel)	Request To Send
CTS (CS on the front panel)	Clear To Send
TD	Transmit Data
RD	Receive Data
DCD (CD on the front panel)	Data Carrier Detect
DSR (SR)	Data Set Ready
DTR (TR)	Data Terminal Ready
LL	Local Loopback
RL	Remote Loopback

Chapter 6
Testing and Troubleshooting

TEST OVERVIEW

The DSU III AR Rackmount performs a variety of diagnostic functions that isolate portions of the circuit to identify the problem source.

The unit also responds to standard DDS network tests initiated from telco test centers. In addition, it can run several tests such as local and remote loopbacks to aid in problem isolation. Normal operation is shown in Figure 6-1.

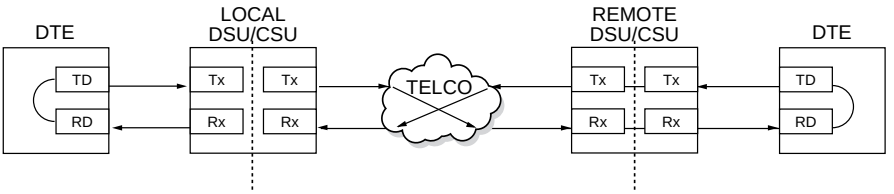

Figure 6-1
Normal Operation Before Initiating Loopback Test

All diagnostic tests disrupt data flow.

Executing a Test from the Front Panel

A test can be executed from the front panel using the **Test** and **Select** buttons on the front panel. To specify the test, press the **Select** button under the Test LEDs and scroll through the available tests. When the yellow LED(s) for the desired test is illuminated, press **Test** to execute. If there are any errors the red Error LED indicator turns on. To terminate the test, press **Test** again. The tests available from the front panel are shown in Table 6-A.

Table 6-A

Tests Available from Front Panel

Push Select Button	DTE LED	LOOP LED	RDL LED	PTRN LED	Test
1 Time	•				DTE Only
2 Times	•			•	DTE with Test Pattern
3 Times	•	•			DTE and Loop
4 Times		•			Loop Only
5 Times			•		Remote Digital Loopback
6 Times			•	•	RDL with Test Pattern
7 Times				•	Test Pattern

Executing a Test from a VT 100 Terminal

Select Local Test or Remote Test from the options shown in the Main Terminal Interface Menu. See the section *VT 100 Terminal Connection and Operation* in the chapter *Operation* for more information.

The VT 100 Test Menus are shown in Figure 6-2.

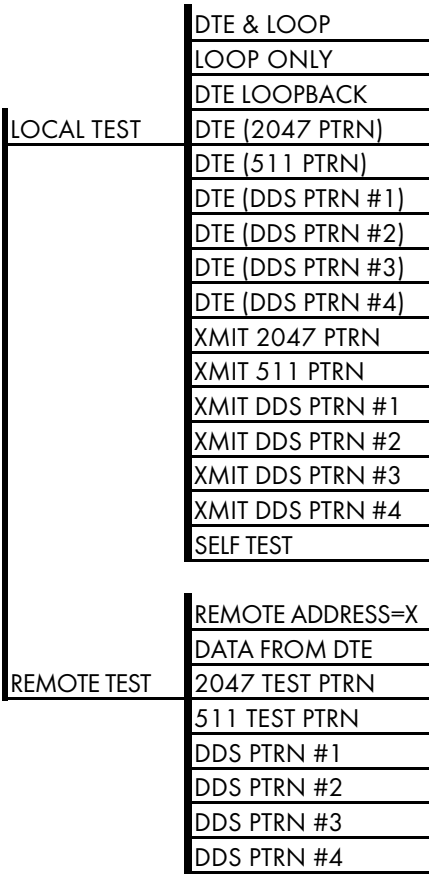

Figure 6-2
VT 100 Test Menus

Executing a Test from a DATAMATE

Select TEST from the Main menu, then select LOCAL UNIT or REMOTE UNIT. The local and remote unit options are shown in the menu tree in Figure 6-3.

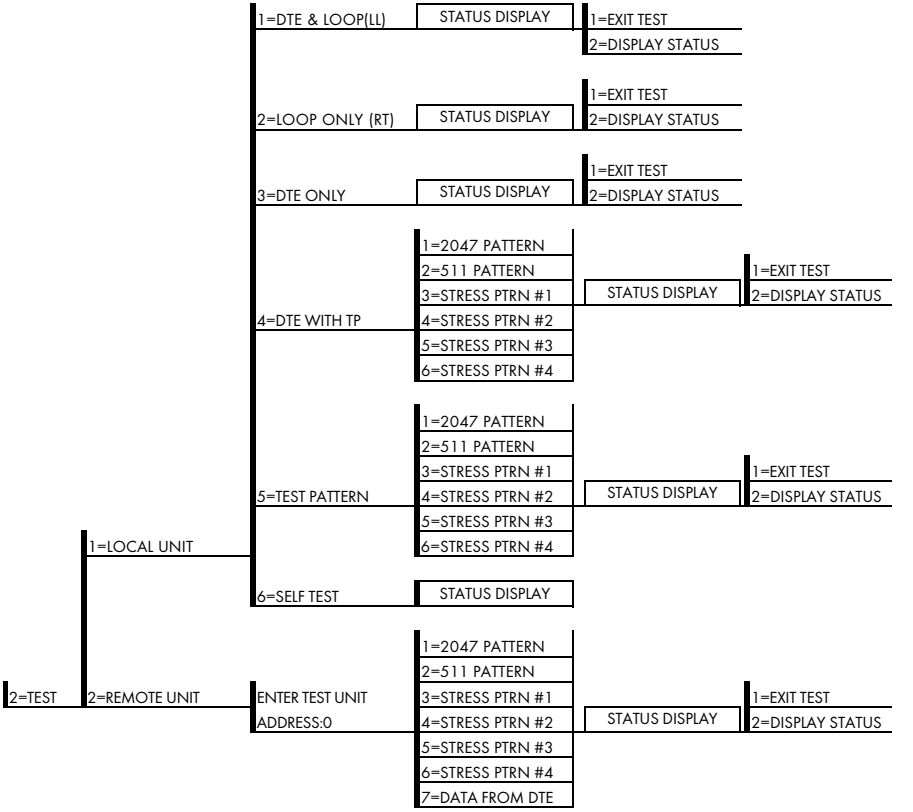

Figure 6-3
DATAMATE Test Menu

Test Status Display

The Test Status display appears automatically during a test displaying the test type, the error count, and options for injecting errors or clearing the error count. Exit the test by selecting the number corresponding to **EXIT TEST**.

Figure 6-4 shows an example of a VT 100 Test Status Display for a test with a test pattern.

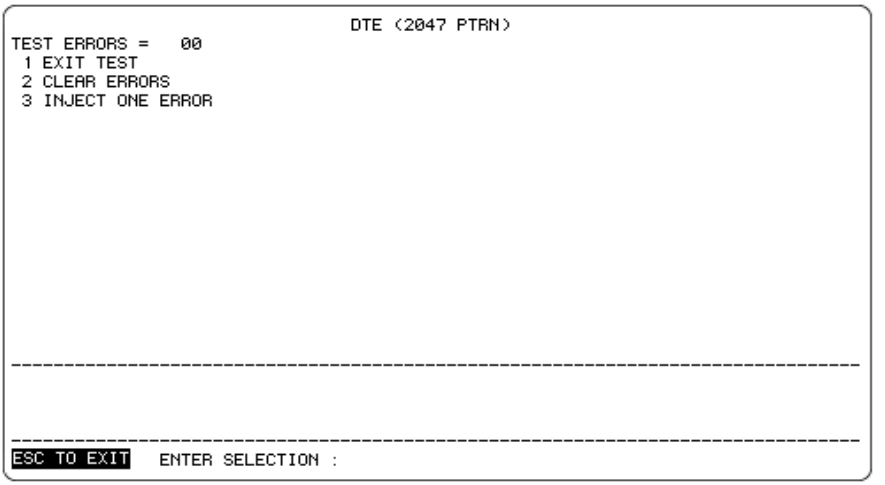

Figure 6-4
VT 100 Sample Test Status Display

The DATAMATE Test Status display appears automatically during a test. The Test Status display is similar to the Status screen described in the section *Status*, with additional prompts for the type of test and the number of errors (for tests with a test pattern).

Figure 6-5 shows an example of a DATAMATE Test Status Display for a test with a test pattern.

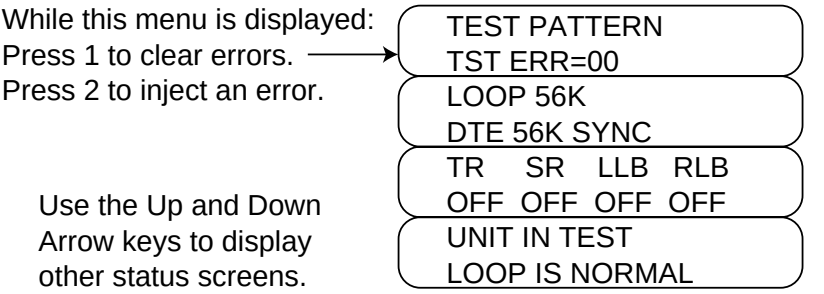

Figure 6-5
DATAMATE Test Status Displays

LOCAL TEST OPTIONS

The local DSU III AR Rackmount can perform a variety of tests. Figure 6-6 shows the VT 100's LOCAL TEST OPTIONS screen. Figure 6-3 shows the DATAMATE test options menu. Each test is described in the following pages.

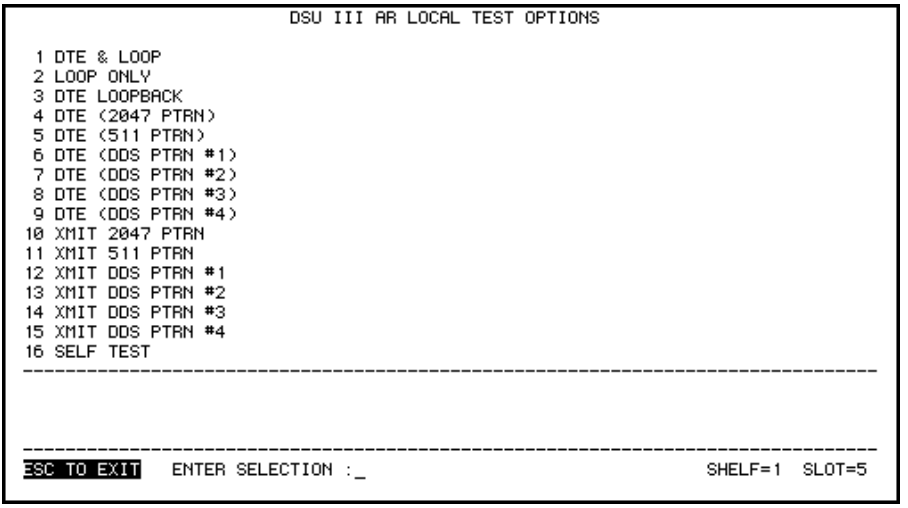

Figure 6-6
VT 100 Test Options Menu

DTE & Loop (LL)

Test Description

The DTE & Loop test splits the DSU III AR Rackmount into two separate DTE and loop interface sections and then loops the receive data of each interface back to its respective transmit data. The DTE & Loop test provides a bidirectional loopback at the DSU/CSU. Figure 6-7 illustrates the loopback points and the signal paths for this test.

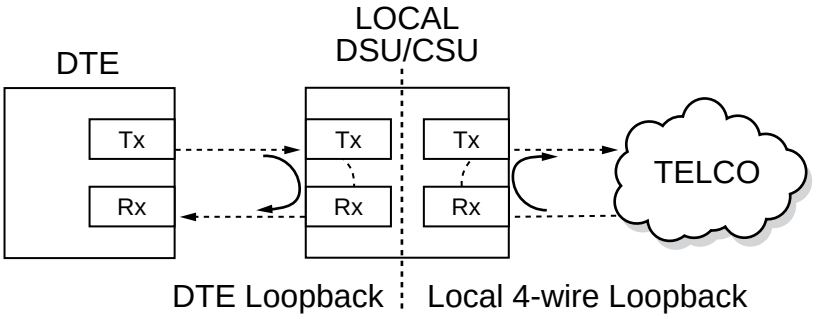

Figure 6-7
DTE & Loop Test

Test Purpose

The DTE & Loop test is used for the following purposes:

- Verify integrity of the DTE interface and cable
- Provide a loopback for network tests

Interpreting Test Results

A BERT tester must be used to interpret the test results of a DTE & Loop test. DTE equipment may also be used if it has the capability to determine if the data received is the same as the data sent.

Loop Only (RT)

The Loop Only (RT) test allows the loop interface and a major portion of the DTE interface for the local DSU III AR Rackmount to be tested from the remote site over the actual communication circuit. Figure 6-8 illustrates the loopback point and the signal paths for this test.

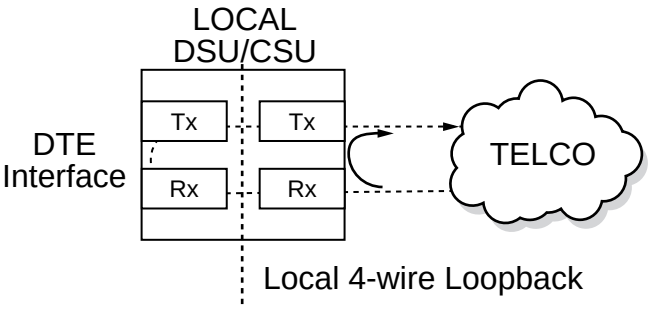

Figure 6-8
Loop Only Test

Test Purpose

The Loop Only test is used to provide a loopback for network tests.

Interpreting Test Results

The Loop Only test is used for the purpose of looping the DDS circuit back to the telco. No test results are available from the local DSU III AR Rackmount.

DTE Loopback

The DTE Loopback (DTE Only for the DATAMATE) test provides a method for testing both the DTE interface drivers and receivers of the local DSU III AR Rackmount. For this test, the DTE transmit data is connected to the DTE receive data at a point close to the physical DTE interface. This test can be used to verify proper operation between the local DTE and the local DSU III AR Rackmount. See Figure 6-9.

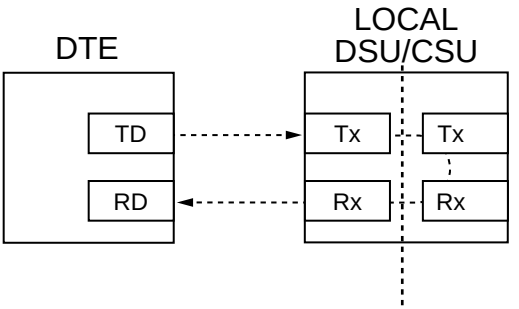

Figure 6-9
DTE Loopback Diagram

Test Purpose

The DTE Loopback test is used for the following purposes:

- Verify integrity of the DTE interface
- Verify integrity of connection between DTE and DSU III AR Rackmount

Interpreting Test Results

A BERT tester must be used to interpret the test results of a DTE Loopback test. DTE equipment may also be used if it has the capability to determine if the data received is the same as the data sent.

DTE with Test Pattern

For the DTE with TP (test pattern) the test pattern is generated using the DSU/CSU internal test pattern generator. This test can be used to detect deficiencies within the network interface. Figure 6-10 illustrates the loopback point and the data paths for this test. This test is completely internal to the DSU/CSU unit.

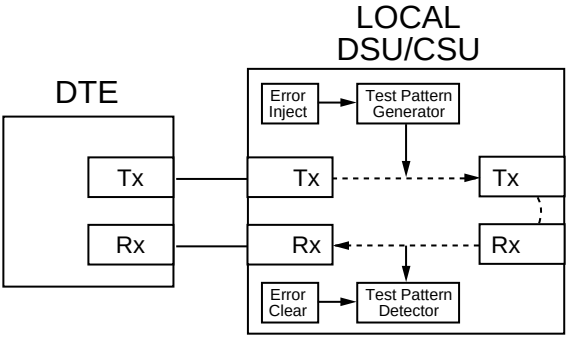

Figure 6-10
DTE with Test Pattern

Test Purpose

A DTE test using a test pattern is used to verify the integrity of the network interface and of the connection between DTE and the DSU III AR.

Test Pattern Descriptions

The test patterns are described as follows:

2047 Pattern	Standard 2047 pattern.
511 Pattern	Standard 511 random pattern.
Stress Pattern 1	Stress pattern with alternating high and low ones densities. Repeated pattern of 100 octets: 1111 1111; followed by 100 octets: 0000 0000.

Stress Pattern 2	Stress pattern with alternating medium and low ones densities. Repeated pattern of 100 octets: 0111 1110; followed by 100 octets: 0000 0000.
Stress Pattern 3	Stress pattern with medium ones density. Continuous series of octets: 0011 0010.
Stress Pattern 4	Stress pattern with low ones density. Continuous series of octets: 0100 0000.

Interpreting Test Results

If errors occur during this test, the test error count can be reset to zero by selecting **CLEAR ERRORS** on the VT 100 Terminal Screen or by pressing **1** on the DATAMATE. To verify proper operation of this test, single bit errors can be injected into the transmitted test pattern by selecting **INJECT ONE ERROR** on the VT 100 terminal or by pressing **2** on the DATAMATE. These errors appear on the TEST ERRORS counter.

Test Pattern

The Test Pattern option converts the local DSU III AR Rackmount into a BERT tester for the purpose of testing the DDS circuit. If this test is used, both the local and remote DSU/CSU must be simultaneously transmitting a test pattern or the remote DSU/CSU must be in loopback with the local DSU/CSU transmitting a test pattern. Sending a test pattern from one DSU/CSU will result in an error message. Figure 6-11 illustrates the data paths for this mode.

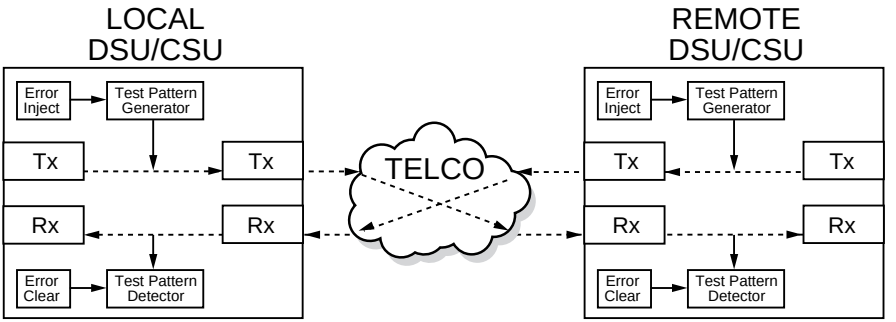

Figure 6-11
Test Pattern Only

Test Purpose

A Test Pattern test has the following purposes:

- Transmits user selected test pattern using an internal test pattern generator, and compares the received data using internal test pattern detector to detect if there are any errors on the DDS circuit.
- Injects errors and verifies the unit transmits data across the communication circuit to the remote unit.
- Helps determine from which direction the circuit is receiving errors.

Interpreting Test Results

If the unit is functioning properly, the test error count should be zero.

Self Test

The Self Test verifies current operation of the DSU III AR Rackmount. It can be performed at any time and is recommended if there is any question about the DSU's health.

Test Purpose

To determine if the DSU is functioning properly.

Interpreting Test Results

Once Self Test is activated, the LEDs cycle on and off as the system runs the self test. CHECKSUM is displayed during a test. PASS/FAIL is displayed at the end of a test.

Possible self test results are as follows:

PASS
EPROM CHECKSUM FAILURE!!
RAM CHECK FAILED!!
LOCAL LOOP SELF TEST FAILED!!
NONVOLATILE MEMORY FAILED!!

If any messages other than **PASS** is displayed contact ADTRAN technical support (see last page of this manual).

REMOTE TEST OPTIONS

A remote DSU III AR Rackmount can perform a variety of tests involving the remote DSU III AR, as shown in Figure 6-12.

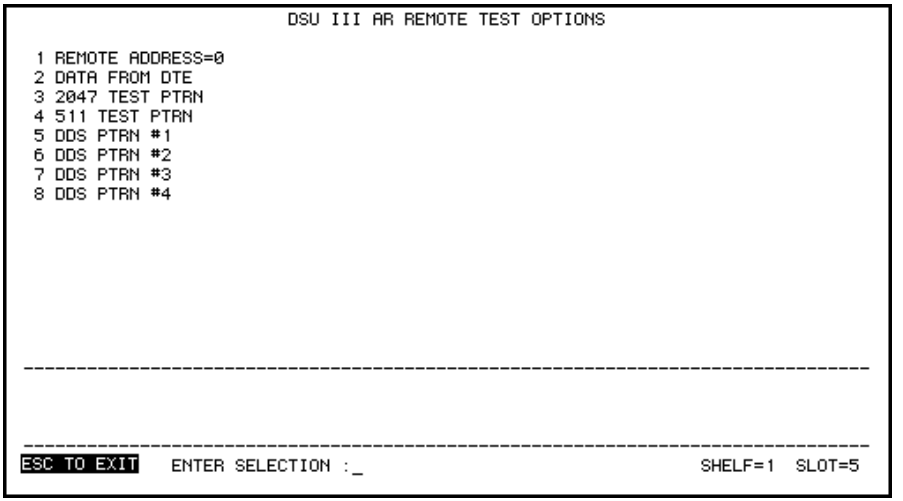

Figure 6-12
Remote Test Options

Data from DTE

This test loops back the remote end, data from the DTE may then be transmitted and verified.

Test Patterns

The test selections with test patterns use the internal pattern generator of the DSU III AR to transmit and verify a test pattern over the DDS network. The remote unit is placed in RDL automatically. The DSU III AR is capable of transmitting six test patterns with its built-in test pattern generator. For more information on the test patterns see the section *DTE with Test Pattern*. See Figure 6-13 for a V.54 Remote Digital Loopback (RDL) Test with a Test Pattern.

If a test is successful the Status menu is displayed, if not **Unable to Execute Test** is displayed.

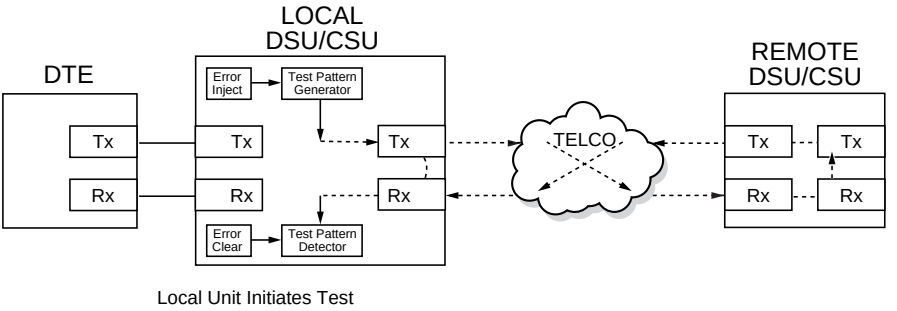

Figure 6-13
V.54 RDL with Test Pattern

Remote Test Purpose

The remote test tests the local DSU, the DDS circuit, and the remote DSU.

Interpreting Remote Test Results

If the unit is functioning properly, the error count should be zero.

TROUBLESHOOTING

This section is intended to provide a quick and easy means of diagnosing suspected problems associated with local or remotely attached ADTRAN DSU/CSUs.

Messages from the DSU/CSU

The DSU III AR Rackmount displays messages on the VT 100 display and LEDs concerning the status of the unit and the local loop. If the Alarm LED is on, one or more of the messages shown in Table 6-B is displayed.

NOTE

Status messages are displayed in the Status Menu.

Table 6-B

Messages from the DSU/CSU

Message	Meaning	Probable Cause	Action
LOOP IS NORMAL	Good local loop sig being received fro the telco.	Indicates good local loop.	No action required; properly connected t telco circuit.
OPEN LOOP	Unit not receiving signal from the te	Bad telco cable from the DSU to telco jac or bad circuit to tel	Replace telco cable from DSU to wall jac If a problem persists contact telco provi
NO RX SIGNAL	Unit detects sealing current but no data signal from telco.	Bad conductor in tel cable from DSU to telco jack or bad circuit to telco.	Replace telco cable from DSU to wall jac If a problem persists contact telco provi
OOS/OOF FROM NET	Unit detects an Out Service or Out of Frame condition fr the telco.	Telco is having prob with DDS circuit or remote unit is turned or is disconnected.	Check remote unit. Contact telco service provider.
CHECK TELCO LINE	Transmit/receive p reversal detected.	Telco wall jack wired incorrectly.	Switch wire pairs in jack or contact telco service provider.
TEST FROM TELCO	Telco activated a loopback to test the DDS circuit.	Telco is testing circuit.	Wait until test is complete or contact telco service provi

Chapter 7
Dial Selection

DIAL OPTIONS

The DIAL selection includes options for manual dialing, redialing, and dialing stored numbers. The DIAL selection is available for use only if AT&T/MCI SW56 or US SPRINT SW56 is the selected NETWORK TYPE. Figure 7-1 shows the VT 100 Dial Menu. Figure 7-2 shows the DATAMATE's menu path used to access these options.

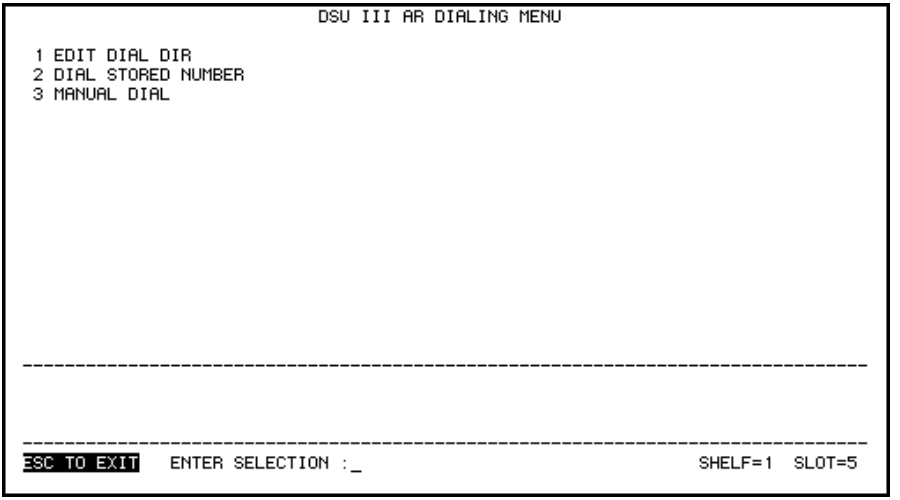

Figure 7-1
VT 100 Terminal Dial Menu

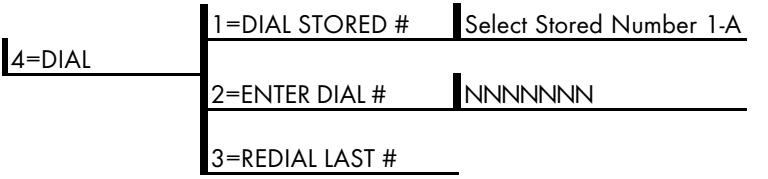

Figure 7-2
DATAMATE Dial Options Menu

Dial Stored

This option allows a stored number to be dialed. The numbers are stored within the CONFIG selection of the DATAMATE. Figure 7-3 shows the menu path used to access the Phone Numbers option. When using the VT 100 interface, select 1=EDIT DIAL DIR to store numbers.

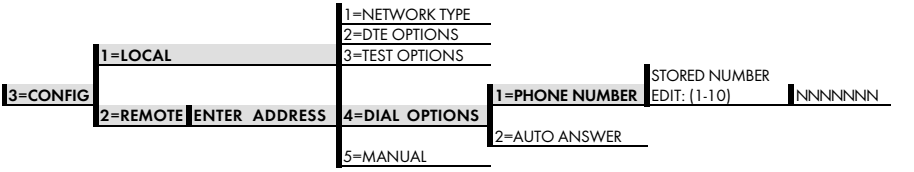

Figure 7-3
DATAMATE's Path to Storing Numbers Option

Enter Dial # (Manual Dial on the VT 100 Interface)

This option allows you to enter a phone number of up to 36 digits for the DSU III AR to dial.

Redial Last

Selecting this option redials the last phone number entered.

Appendix A
AT Commands

Table A-A shows the AT commands available for the DSU III AR rackmount.

Table A-A
AT Commands

Command	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 From	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

Table A-A (Cont'd)
AT Commands

Command	Title	Default
AT&Xn	Transmit Clock	0
AT&Yn	Power Up User Profile	0
AT&Zn=x	Store Phone Number	none
AT%Bn	Loop Rate Select	0
AT%Kn	DTE Rate Select	none
AT%P	Password Control	0
AT%P=x	Password Entry	0
T%P>x	Password Verify	0
AT%R	Initiate Remote Config.	none
AT%Tn	Anti-stream Option	0
AT_An	LLB Control	0
AT_Cn	SR Control During Test	0
AT_Dn	RTS-CTS Delay	0
AT_Fn	Scrambler Control	0
AT_Jn	Auto Answer Enable/Disable	0
AT_N=xx	Set Network Address	none
AT_Pn	Front Panel Enable/Disable	0
AT_Rn	LB Enable/Disable	0
AT_S=xx	Set Serial Number	none
AT_Tn	Select Test Pattern	0
AT_Xn	Clock Source Select	0
AT_Yn	Secondary Channel Rate Select	0

Appendix B
Pinouts

EIA-232 CONNECTORS

The DSU III AR Rackmount is equipped with two EIA-232 connectors labeled PRI EIA 232 and AUX EIA 232/366. Table B-A shows the pin assignments for these connectors. For more information see the section *DTE Connection* in the chapter *Installation*.

Table B-A

Pin Assignments for EIA-232 Connectors

Pin	EIA	Description
1	AA	Protective Ground (PG)
2	BA	Transmit Data (SD)
3	BB	Receive Data (RD)
4	CA	Request-to-Send (RS)
5	CB	Clear-to-Send (CS)
6	CC	Data Set Ready (SR)
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)
20	CD	Data Terminal Ready (TR)
24	DA	External TX Clock (ETC)

V.35 CONNECTOR

The DSU III AR Rackmount is equipped with a V.35 Connector labeled PRI V.35. Table B-B shows the pin assignments for this connector. For more information see the chapter *Installation*.

Table B-B

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 (RS)
D	106	Clear to Send (CS)
E	107	Data Set Ready (SR)
F	109	Received Line Signal Detector (CD)
H	-	Data Terminal Ready (TR)
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)

TELCO CONNECTORS

The DSU III AR Rackmount has two eight-position modular jacks labeled **LINE 1** and **LINE 2**. Table B-C shows the pin assignments for the Main connector and Table B-D shows the pin assignments for the Backup connector. For more information see the chapter *Installation*.

Table B-C

Pin Assignments for LINE 1 Connector

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

Table B-D

Pin Assignments for LINE 2 Connector

Pin	Name	Description
4-wire Switched 5		
1	R1	Transmit Data from DSU to Network-Ring 1
2	T1	Transmit Data from DSU to Network-Tip 1
3-6	-	Not Used
7	T	Receive Data from Network to DSU-Tip
8	R	Receive Data from Network to DSU-Ring
2-wire Switched 56, V.32 bis and ISDN		
1-3	-	Not Used
4	T	Network-Tip
5	R	Network-Ring
6-8	-	Not Used

Appendix C
Configuration Profiles

DEFAULT CONFIGURATION PROFILES

The DSU III AR Rackmount contains four different user profiles (sets of configurations options) stored in read only memory; see Table C-A. The unit is shipped from the factory with profile 1 loaded into the nonvolatile configuration memory. See the chapter *Installation* and the section *Enter Manual Command* for more information.

Profile 1

Profile 1 is configured for a 56 kbps, synchronous, point-to-point, or dial up operation with a V.35 connector.

Profile 2

Use profile 2 for a 56 kbps, synchronous, point-to-point, or dial up operation with an EIA-232 connector.

Profile 3

Use profile 3 for a SW56, asynchronous operation with CS and CD forced on.

Profile 4

Use profile 4 for a SW56 operation with DTR idle when off.

Table C-A
Default Configuration Profiles

	Profile Numbers			
	(00) 1	(01) 2	(02) 3	(03) 4
Manual Command				
Escape Character	43=2BH	43=2BH	43=2BH	43=2BH
CR Character	13=0DH	13=0DH	13=0DH	13=0DH
LF Character	10=0AH	10=0AH	10=0AH	10=0AH
BS Character	8	8	8	8
SW56 Abort Call Timer	50=32H	50=32H	50=32H	50=32H
Escape Guard Timer	50=32H	50=32H	50=32H	50=32H
Command Echo	Enable	Enable	Enable	Enable
Result Code	Enable	Enable	Enable	Enable
Long or Short Code	Long	Long	Long	Long
Test Pattern Type	2047	2047	2047	2047
CS Delay	Short	Short	Short	Short
DTR Recog. Delay (x2.5ms)	3	3	3	3
DTR Command Timeout (x1	sec) 8	8	8	8
Front Panel En/Dis	Enable	Enable	Enable	Enable
AT Password Control	Disable	Disable	Disable	Disable
Network Options				
Loop Rate	AUTO	AUTO	56k	AUTO
Network Address	0	0	0	0
Remote Conf. En/Dis	Enable	Enable	Enable	Enable
Network Type	Dedicated	Dedicated	AT&T/MCI SW56	AT&T/MCI SW56
Clock Source	From Networ	From Networ	From Networ	From Netwo
DTE Options				
Remote DSU Address	0	0	0	0
DTE Rate (56/64k loop)	Same as Loop	Same as Loop	Same as Loop	Same as Lo
Scrambler Mode	OFF	OFF	OFF	OFF
Connector Type	V.35	EIA232	EIA232	V.35
DTE Data Format	SYNC	SYNC	ASYNC	SYNC
DTE Command Options	DIS	DIS	DIS	DIS
Transmit Clock	Normal	Normal	Normal	Normal
CS Options	Follow RS	Follow RS	Forced On	Follow RS
Anti-stream Timer	Timer Off	Timer Off	Timer Off	Timer Off
CD Options	Normal	Normal	Forced On	Normal
TR Options	Ignored	Ignored	Ignored	Idle When C
SR Options	Off Test+OOS	Off Test+OOS	Off Test+OOS	Off Test+OO
Secondary Channel Rate	OFF	OFF	OFF	OFF

Table C-A (Cont'd)

Default Configuration Profiles

	Profile Numbers			
	(00) 1	(01) 2	(02) 3	(03) 4
Test Options				
Test Timeout	Off	Off	Off	Off
RDL En/Dis	RDL Accepted	RDL Accepted	RDL Accepted	RDL Accepte
EIA Controlled LLB	Disable	Disable	Disable	Disable
EIA Controlled RLB	Disable	Disable	Disable	Disable
Dial Options				
Auto Answer	Enable	Enable	Enable	Enable

Appendix D
DSU to Modem Interconnect

MODEM TAIL CIRCUIT APPLICATION

A DSU III AR Rackmount to modem interconnect diagram for a modem tail circuit application is shown in Figure D-1.

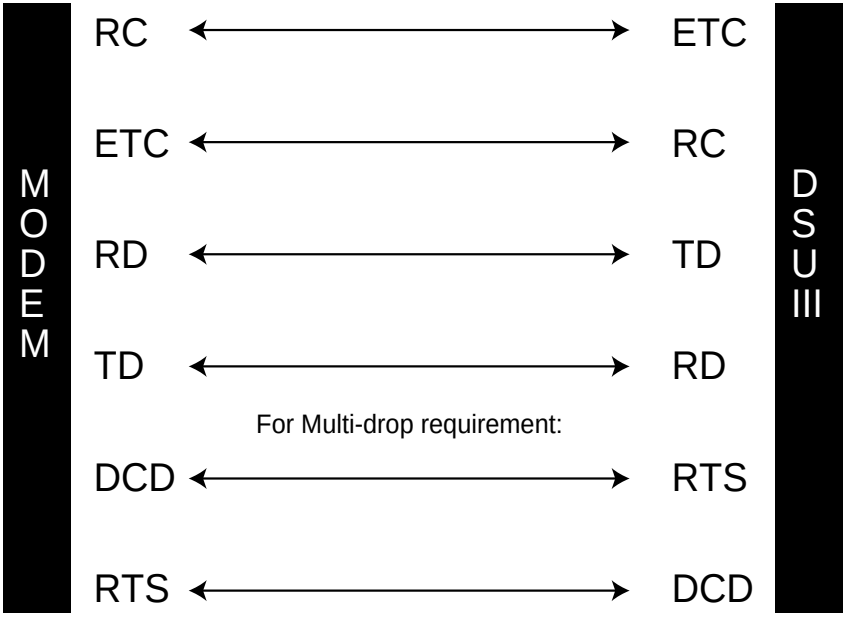

Figure D-1
DSU III AR Rackmount to Modem Interconnect

Appendix E
EIA-232 Connector

56 AND 64 KBPS APPLICATION

The EIA-232 connector, shown in Figure E-1, may be used for 56 and 64 kbps applications. Using the External clock option and this cable should eliminate data errors caused by excessive delays in the DTE transmit clock receiver and transmit data driver. When creating this cable at the DTE interface EIA-232 connector, tie transmit clock lead (TC) to external transmit (ETC) as shown.

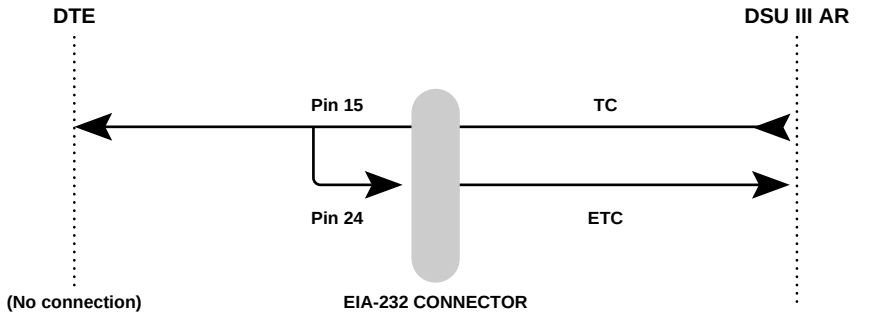

Figure E-1
EIA-232 Connector

Appendix F
Specifications Summary

SPECIFICATIONS AND FEATURES

This section describes the standard specifications and features incorporated in the DSU III AR RM.

Operating Modes

Dedicated DDS (point-to-point, multi-point)
DDSII DDS with secondary channel (point-to-point, multi-point) Switched 56 (4-wire)

Data Rates

Dedicated mode service rate: 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 kbps
Switched mode service rate: 56 kbps

DTE Rates

DTE rates match service rates
DTE-to-loop rate matching in both dedicated and switched modes
Synchronous rates: 2.4, 4.8, 9.6, 19.2, 38.4, 56, and 64 kbps
Asynchronous rates: 2.4, 4.8, 9.6, 19.2, 38.4, and 57.6 kbps

FCC Approval

FCC part 15, class A and part 68

DTE Interfaces

Both EIA-232 and V.35 electrical and physical DTE interfaces

Data Buffering

Internal slack buffer

Clocking
Normal DDS or private network tributary
(slaved to network receive clock)
Private network master (internal clock)
Normal DDS with tail circuit
Private network master (slaved to external clock)

Switched Mode Dialing Options
Stored number
Front panel keypad
DTR dialing of stored number
In-band AT commands
V.25 bis in-band dialing

Diagnostics
Network: CSU and DSU loopbacks
User: Local DTE and loop, remote V.54
Test Patterns: 2047, 511, DDS, stress patterns 1 to 4

Line Requirements
Loop transmission parameters as defined in:
AT&T PUB 62310: Dedicated DDS
AT&T PUB 41468: Switched 56
SPRINT TS 0046: Switched 56

Line Interface
RJ-48S, 4-wire, full duplex

Receiver Sensitivity
-45 dB at all rates

Environment
Operating Temperature: 0°C to 50°C (32°F to 122°F)
Storage Temperature: -20°C to 70°C (-4°F to 158°F)
Relative Humidity: Up to 95% non-condensing
Dimensions: 1.00"H, 6.75"W, 10.50"D
Weight: 1.5 lbs

Index

Symbols

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Product Support Information

Pre-sales Inquiries and Applications Support

Please contact your local distributor, ADTRAN Applications Engineering, or ADTRAN Sales:

Applications Engineering	(800) 615-1176
Sales	(800) 827-0807

Post-Sale Support

Please contact your local distributor first. If your local distributor cannot help, please contact ADTRAN Technical Support and have the unit serial number available.

Technical Support	(800) 726-8663

Repair and Return

If ADTRAN Technical Support determines that a repair is needed, Technical Support will coordinate with the Return Material Authorization (RMA) department to issue an RMA number. For information regarding equipment currently in house or possible fees associated with repair, contact RMA directly at the following number:

RMA Department	(205) 971-8722

Identify the RMA number clearly on the package (below address), and return to the following address:

ADTRAN, Inc.
RMA Department
901 Explorer Boulevard
Huntsville, Alabama 35806-2807