DSU III DBU Rackmount

User Manual

1200043L1	**Switched 4-Wire Version**
1200046L1	**V.32 bis Version**
1200047L1	**Switched 2-Wire Version**
1200067L1	**ISDN Version**
1200172L2	**V.34 Version**

The part number for the V.34 Dial Backup Module has been changed from 1200046L3 to 1200172L2. The functionality of the V.34 Dial Backup Module remains the same.

September 2001
61200043L1-1B

Trademarks:

DATAPATH is a registered trademark of CAE electronics and is used by Northern Telecom under license.

901 Explorer Boulevard
P.O. Box 140000
Huntsville, AL 35814-4000
(256) 963-8000

The following conventions are used in this manual.

Notes provide additional useful information.

Cautions signify information that could prevent service interruption.

Warnings provide information that could prevent damage to the equipment or endangerment to human life.

Important Safety Instructions

When using your telephone equipment, please follow these basic safety precautions to reduce the risk of fire, electrical shock, or personal injury:

1. Do not use this product near water, such as near a bathtub, wash bowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool.
2. Avoid using a telephone (other than a cordless-type) during an electrical storm. There is a remote risk of shock from lightning.
3. Do not use the telephone to report a gas leak in the vicinity of the leak.
4. Use only the power cord, power supply, and/or batteries indicated in the manual. Do not dispose of batteries in a fire. They may explode. Check with local codes for special disposal instructions.

Save These Important Safety Instructions

Affidavit Requirements for Connection to Digital Services

- An affidavit is required to be given to the telephone company whenever digital terminal equipment without encoded analog content and billing protection is used to transmit digital signals containing encoded analog content which are intended for eventual conversion into voice band analog signal and transmitted on the network.
- The affidavit shall affirm that either no encoded analog content or billing information is being transmitted or that the output of the device meets Part 68 encoded analog content or billing protection specification.
- End use/customer will be responsible to file an affidavit with the local exchange carrier when connecting unprotected CPE to a 1.544 Mbps or subrate digital service.
- Until such time as subrate digital terminal equipment is registered for voice applications, the affidavit requirements for subrate services are waived.

Affidavit for Connection of Customer Premises Equipment to 1.544 MBPS and/or Subrate Digital Services

For the work to be performed in the certified territory of _____ (telco name)

State of _____

County of _____

I, _____ (name), _____ (business address), _____ (telephone number) being duly sworn, state:

I have the responsibility for the operation and maintenance of the terminal equipment to be connected to 1.544 Mbps and/or _____ subrate digital services. The terminal equipment to be connected complies with Part 68 of the FCC rules except for the encoded analog content and billing protection specification. With respect to encoded analog content and billing protection:

( ) I attest that all operations associated with the establishment, maintenance and adjustment of the digital CPE with respect to encoded analog content and billing protection information continuously complies with Part 68 of the FCC rules and Regulations.

( ) The digital CPE does not transmit digital signals containing encoded analog content or billing information which is intended to be decoded within the telecommunications network.

( ) The encoded analog content and billing protection is factory set and is not under the control of the customer.

I attest that the operator(s) maintainer(s) of the digital CPE responsible for the establishment, maintenance and adjustment of the encoded analog content and billing information has (have) been trained to perform these functions by successfully having completed one of the following (check appropriate blocks):

( ) A. A training course provided by the manufacturer/grantee of the equipment used to encode analog signals; or

( ) B. A training course provided by the customer or authorized representative, using training materials and instructions provided by the manufacturer/grantee of the equipment used to encode analog signals; or

( ) C. An independent training course (e.g., trade school or technical institution)

recognized by the manufacturer/grantee of the equipment used to encode analog signals; or

( ) D. In lieu of the proceeding training requirements, the operator(s)/maintainer(S) is (are) under the control of a supervisor trained in accordance with _____ (circle one) above.

I agree to provide _____ (telco's name) with proper documentation to demonstrate compliance with the information in the preceding paragraph, if so requested.

_____ Signature

_____ Title

_____ Date

Subscribed and sworn to before me

This _____ day of _____, 20__

_____
Notary Public

My commission expires: _____

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 applicable. If required, this information must be given to the telephone company.
2. The following information may be required when applying to the local telephone company for leased line facilities.

Service Type	REN/SOC	FIC	USOC
2.4 kbps Digital Interface	6.0F	04DU5-24	RJ-48S
4.8 kbps Digital Interface	6.0F	04DU5-48	RJ-48S
9.6 kbps Digital Interface	6.0F	04DU5-96	RJ-48S
19.2 kbps Digital Interface	6.0F	04DU5-19	RJ-48S
38.4 kbps Digital Interface	6.0F	04DU5-38	RJ-48S
56 kbps Digital Interface	6.0F	04DU5-56	RJ-48S
64 kbps Digital Interface	6.0F	04DU5-64	RJ-48S

3. The following information may be required when applying to the local telephone company for a dial-up line for the V.34 or V.32.

Service Type	REN	FICS	USOC
Loop Start (V.32)	0.3B	02LS2	RJ-11C
Loop Start (V.34)	0.8B	02LS2	RJ-11C

4. The REN is useful to determine the quantity of devices you may connect to your telephone line and still have all of those devices ring when your number is called. In most, but not all areas, the sum of RENs of all devices should not exceed 5. To be certain of the number of devices you may connect to your line, as determined by REN, you should call your telephone company to determine the maximum REN for your calling area.
5. An FCC compliant telephone cord with a modular plug may be provided with this equipment. This equipment is designed to be connected to the telephone network or premises wiring using a compatible modular jack, which is FCC Part 68 compliant. See installation instructions for details.
6. 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.

7. The telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of this equipment. If this happens, the telephone company will provide advance notification and the opportunity to make the necessary modifications to maintain uninterrupted service.
8. If experiencing difficulty with this equipment, please contact ADTRAN for repair and warranty information. If the equipment is causing harm to the network, the telephone company may request this equipment to be disconnected from the network until the problem is resolved or it is certain that the equipment is not malfunctioning.
9. This unit contains no user serviceable parts.
10. The FCC recommends that the AC outlet to which equipment requiring AC power is to be installed is provided with an AC surge arrester.

Federal Communications Commission 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 methods 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 limitations 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.

WARNING *Users should not attempt to make such connections themselves, but should contract 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.

Limited Product Warranty

ADTRAN warrants that for five (5) years from the date of shipment to Customer, all products manufactured by ADTRAN will be free from defects in materials and workmanship. ADTRAN also warrants that products will conform to the applicable specifications and drawings for such products, as contained in the Product Manual or in ADTRAN's internal specifications and drawings for such products (which may or may not be reflected in the Product Manual). This warranty only applies if Customer gives ADTRAN written notice of defects during the warranty period. Upon such notice, ADTRAN will, at its option, either repair or replace the defective item. If ADTRAN is unable, in a reasonable time, to repair or replace any equipment to a condition as warranted, Customer is entitled to a full refund of the purchase price upon return of the equipment to ADTRAN. This warranty applies only to the original purchaser and is not transferable without ADTRAN's express written permission. This warranty becomes null and void if Customer modifies or alters the equipment in any way, other than as specifically authorized by ADTRAN.

EXCEPT FOR THE LIMITED WARRANTY DESCRIBED ABOVE, THE FOREGOING CONSTITUTES THE SOLE AND EXCLUSIVE REMEDY OF THE CUSTOMER AND THE EXCLUSIVE LIABILITY OF ADTRAN AND IS IN LIEU OF ANY AND ALL OTHER WARRANTIES (EXPRESSED OR IMPLIED). ADTRAN SPECIFICALLY DISCLAIMS ALL OTHER WARRANTIES, INCLUDING (WITHOUT LIMITATION), ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, SO THIS EXCLUSION MAY NOT APPLY TO CUSTOMER.

In no event will ADTRAN or its suppliers be liable to Customer for any incidental, special, punitive, exemplary or consequential damages experienced by either Customer or a third party (including, but not limited to, loss of data or information, loss of profits, or loss of use). ADTRAN is not liable for damages for any cause whatsoever (whether based in contract, tort, or otherwise) in excess of the amount paid for the item. Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to Customer.

Customer Service, Product Support Information, and Training

ADTRAN will replace or repair this product within five years from the date of shipment if the product does not meet its published specification, or if it fails while in service.

A return material authorization (RMA) is required prior to returning equipment to ADTRAN. For service, RMA requests, training, or more information, see the toll-free contact numbers given below.

Presales 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	(888) 4ADTRAN

The Custom Extended Services (ACES) program offers multiple types and levels of service plans which allow you to choose the kind of assistance you need. For questions, call the ACES Help Desk.

ACES Help Desk	(888) 874-2237

Repair and Return

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

CAPS Department	(256) 963-8722

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

ADTRAN Customer and Product Service
901 Explorer Blvd.
Huntsville, Alabama 35806

RMA # _____

Training

The Enterprise Network (EN) Technical Training Department offers training on our most popular products. These courses include overviews on product features and functions while covering applications of ADTRAN's product lines. ADTRAN provides a variety of training options, including customized training and courses taught at our facilities or at your site. For more information about training, please contact your Territory Manager or the Enterprise Training Coordinator.

Training - phone	(800) 615-1176, ext. 7500
Training - fax	(256) 963-6700
Training - email	training@adtran.com

ISDN Service Ordering Information for the ADTRAN DSU III DBU with ISDN Dial Backup

For ADTRAN DSU III DBU ISDN applications, the following guide can be used as an aid in ordering basic ISDN service from your local telephone company. The ADTRAN DSU III DBU ISDN includes NT1 and Terminal adapter functionality and supports data rates up to 64 kbps.

Request an ISDN Basic Rate Interface (BRI) line with the following features:

U-interface reference point
2B1Q line coding
1B+D Service (supports up to 64 kbps)

The DSU III DBU ISDN supports the following switch types and software protocols:

AT&T 5ESS	Custom, 5E6 and later software, National ISDN-1
NT1DMS-100	BCS-32 and later software (Pvc1), National ISDN-1 (Pvc2)
Siemens EWSD	National ISDN-1

Request that the ISDN line allocate one dynamic terminal endpoint identifier (TEI) for the number.

For service offered from an AT&T 5ESS, request a point-to-point line with the following features:

B1 Service:	On Demand (DMD)
Data Line Class:	Point-to-Point
Maximum B Channels:	1B+D
Circuit Switched Data (CSD) Bearer Channels:	Any
Number of CSD Calls:	1 (1B+D)
Terminal Type:	Type A

Turn the Following Features Off:

Packet Mode Data
Multi-line Hunt
Multiple Call Appearances
Electronic Key Telephone Sets (EKTS)
Shared Dictionary Numbers
Accept Special Type of Number
Intercom Groups
Network Resource Selector (Modem Pools)

Message Waiting
Hunting
InterLata Competition

For service offered from a Northern Telecom DMS-100, request a point-to-point multi-point line with the following features:

Line Type:	Basic Rate, Functional
Electronic Key Telephone Sets (EKTS):	No
Call Appearance Handling (CACH):	No
Non-initializing Terminal:	No
Circuit Switched Service:	Yes
Packet Switched Service:	No
TEI:	Dynamic
Bearer Service:	Circuit Switched voice and data permitted on any B channel (packet mode data not permitted)

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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 DBU 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 DBU provides a reliable, high-speed data connection for customer Data Terminal Equipment (DTE) through Digital Data Service (DDS) lines. The DSU III DBU provides automatic dial backup of the dedicated circuit. There are five backup options available: 4-wire Switched 56, 2-wire Switched 56, V.32 bis/42 bis, V.34, and 1B+D ISDN. The DSU III DBU supports both synchronous and asynchronous data communication over the DDS or dial backup networks.

The DSU III DBU 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 if the unit is configured for use on DDS 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).

The 4-wire Switched 56 DBU model is compatible with AT&T Accunet and Sprint SW56 type services. The 2-wire SW56 DBU is compatible with DATAPATH® type of SW56 services. The V.32 bis/V.42 bis DBU and the V.34 DBU allow switched backup over the Public Switched Telephone Network (PSTN). The 1B+D ISDN model is compatible with National ISDN and supports a U interface to the Basic Rate ISDN.

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

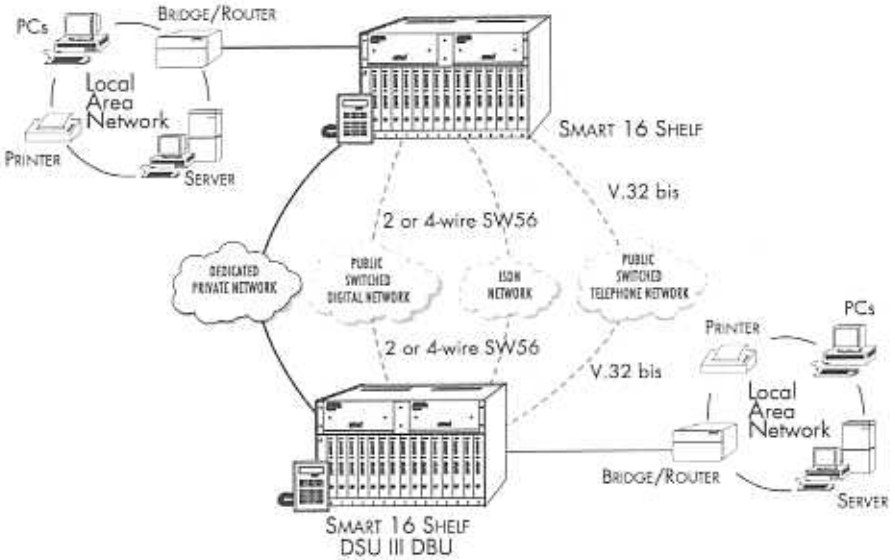

Figure 1-1
Typical Point-to-Point Application for DSU III DBU

DDS OPERATION

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 DBU supports the 56/64 kbps DDS service rate 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 asynchronous mode. 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.

DIAL BACKUP OPERATION

There are five backup options available: 4-wire Switched 56, 2-wire Switched 56, V.32 bis/42 bis, V.34, and 1B+D ISDN. Contact your local telco provider to determine which services are available in your location.

Dial Backup Options

4-Wire Switched 56 Backup Option

This dial-up, 4-wire DDS 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 DBU supports DTE rates of 2.4, 4.8, 9.6, 19.2, 38.4 kbps (asynchronous or synchronous), and 56 kbps (synchronous). An additional DTE rate of 57.6 kbps is available in async modes. When operating on a 64 kbps circuit with a 64 kbps DTE rate, the 4-wire DBU will back up at 56 kbps.

NOTE *If the line goes down during dial backup, the loop rate automatically becomes 56 kbps.*

2-Wire Switched 56 Backup Option

DATAPATH is a switched digital service offered under various service names by the local service provider. The services are generally provided by the Northern Telecom DMS/SL100 family of central office switches. DATAPATH allows the customer to pay for high speed data transfer, up to 56 kbps, only when the unit is active. The dial-up service is delivered via a 2-wire local loop that can be up to 18,000 feet at a signal level of -45 dB. When operating on a 64 kbps circuit with a 64 kbps DTE rate, the 2-wire DBU will back up at 56 kbps.

NOTE *If the line goes down during dial backup, the loop rate is unaffected (unless operating on a 64 kbps circuit, in which case the loop rate will become 56 kbps).*

V.32 bis Backup Option

The V.32 bis/42 bis modem in an asynchronous mode can use V.42 bis data compression to make up for a slower connection rate. V.42 bis increases the effective data throughput from 14.4 kbps to as high as 57.6 kbps, depending on the data type. No compression is supported in synchronous operation. In synchronous applications the maximum speed supported for backup is 14.4 kbps.

V.34 Backup Option

The V.34 modem is a super-set of the V.32 bis modem. Along with all of the V.32 bis modem's mode of operation, V.34 and V.FC modes have been added to the V.34 option. The net effect is that the V.34 option can run synchronous rates up to 28.8 kbps rather than the V.32 at 14.4 kbps. In asynchronous mode, the throughput at 57.6, 38.4, and 19.2 kbps is less dependent on data types. The maximum connection rate between two V.34 modems is 28.8 kbps. Occasionally, connections occur at 26.4, 24, and 21.6 kbps because line quality differs from one call to the next.

1B+D Basic Rate ISDN Backup Option

ISDN service provides the customer with a switched 56/64 kbps circuit. The default data rate for this option is 56 kbps. The 64 kbps data rate may be revised by using the SMART dial string as described in the section *ISDN Dial Backup* in the chapter *Dial Backup*. This option provides a U interface to the ISDN network.

NOTE *If the line goes down during dial backup, the loop rate is unaffected.*

Entering Dial Backup Mode

When a condition for entering dial backup mode is detected, the Alarm light turns on.

Operation During Critical Times

The following conditions will cause a DSU III DBU to automatically enter dial backup mode if the auto DBU option is enabled (on the originate unit):

Loss of Sealing Current

Sealing current is a low voltage DC current provided by the central office (CO) to prevent corrosion over the copper wires used in the local loop. Sealing current may also be used for local loop testing purposes. An absence of sealing current generally is an indication that the loop is open.

Out of Service (OOS) Signal

An OOS signal, generated by the network, indicates a device (or devices) in the network is out of service.

No Receive Signal

This indicates that the local loop copper pairs may be either open or shorted or the Office Channel Unit (OCU) in the CO is inoperative. In a private network, this may indicate that the transmitter of the remote DSU is inoperative.

All 1s or All 0s Condition

This condition is usually generated by the network to indicate some device (or devices) on the network is inoperative. Upon detecting an all 1s or all 0s condition, the DSU III DBU initiates a handshake routine to determine whether the remote unit's DTE is the source of the all 1s or 0s condition or if an actual network failure exists.

Operation During Noncritical Times

The DSU III DBU may be configured not to enter dial backup mode if DTR is low. This feature prevents the DSU III DBU from entering dial backup during noncritical times such as nights and weekends.

For more information see the chapter *Dial Backup*.

Conditions for Returning to the DDS Circuit

The DSU III DBU can be configured to automatically revert to the DDS circuit from the dial backup mode or wait to be returned to the DDS manually. Once the DSU III DBU enters dial backup mode, the unit polls the DDS circuit once every 100 ms to determine if the condition causing the DDS circuit failure has been corrected. Once the DSU III DBU determines that the problem has been properly corrected and the DDS circuit is stable, it will wait for the amount of time specified in the restore timer (1 - 255 minutes) before reverting to the DDS circuit. Polling of the DDS circuit is non-intrusive and return to the DDS circuit generally takes 2 - 3 seconds. The backup connection is maintained for one minute after the DDS circuit is restored. For more information see the chapter *Dial Backup*.

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 on the last page of this manual.

Chapter 2
Installation

UNPACK, INSPECT, POWER UP

Receiving Inspection

Carefully inspect the DSU III DBU 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 DBU Rackmount for repair or verification of damage during shipment.

Equipment Included

The following items are included in ADTRAN shipments of the DSU III DBU Rackmount:

- DSU III DBU Rackmount main module
- rear plug-in module
- user manual insert
- RJ-45S cable to connect the DSU III DBU Rackmount to the DDS network
- applicable cable to connect the DBU option to the network (cable type is dependent upon option type)

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. Install the rear segment 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 DBU 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 dedicated (DDS) network. See the appendix *Pinouts* for this connector's pin assignments.

The second eight-position modular jack labelled **LINE 2** is used for connection to the switched backup network. The pinout for the line 2 connector depends on the model of DBU unit. Pinouts for 4-wire Switched 56, 2-wire Switched 56, V.32 bis, V.34, and 1B+D ISDN DBU options are shown in the appendix *Pinouts*.

DTE CONNECTION/PRIMARY DTE

The primary DTE should be connected to either the **PRI EIA 232** connector or the **PRI V.35** connector. The maximum cable lengths recommended are 50 feet for the EIA-232 and 100 feet for the V.35. The pin assignments for the connectors are listed in the appendix *Pinouts*.

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.

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

SECONDARY CHANNEL CONNECTION

If used, the secondary DTE should be connected to the **AUX EIA 232/366** connector. The pin assignments for this connector are shown in the appendix *Pinouts*.

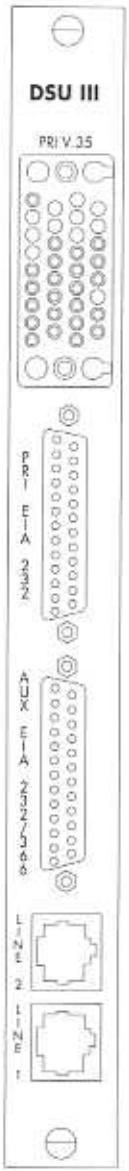

Figure 2-1
DSU III DBU Rackmount Rear Panel

Chapter 3
Operation

FRONT PANEL OPERATION

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

LED Descriptions

The front panel LEDs of the DSU III DBU 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 transmitted to the DTE.
RD: Receive Data	Becomes active when data is received from the DTE.
CD: Carrier Detect	Becomes active when frame synchronization is achieved and the DSU III DBU is ready to transfer data.

ALM: Alarm Indication	Becomes active whenever an alarm condition exists. Alarm conditions include: • Open loop on network • No frame synchronization • Unit in dial backup • Problem on dial backup line
DBU	Becomes active when unit is in dial backup.
Test LEDs	When the DSU III DBU Rackmount is in test mode, the test LEDs activate to indicate the type of test being performed: DTE, Loop, RDL, PTRN. See Table 6-A.
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. Also press to cancel a test initiated from the front panel.

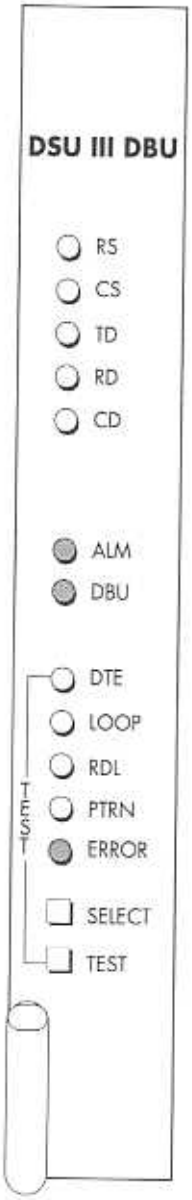

Figure 3-1
DSU III DBU Rackmount Front View

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 1200045L1) 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 DBU 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 Main menu of the DSU III DBU Rackmount offers seven options: status, local configuration, remote configuration, local test, remote test, dial backup configuration, and dial backup as shown in Figure 3-2.

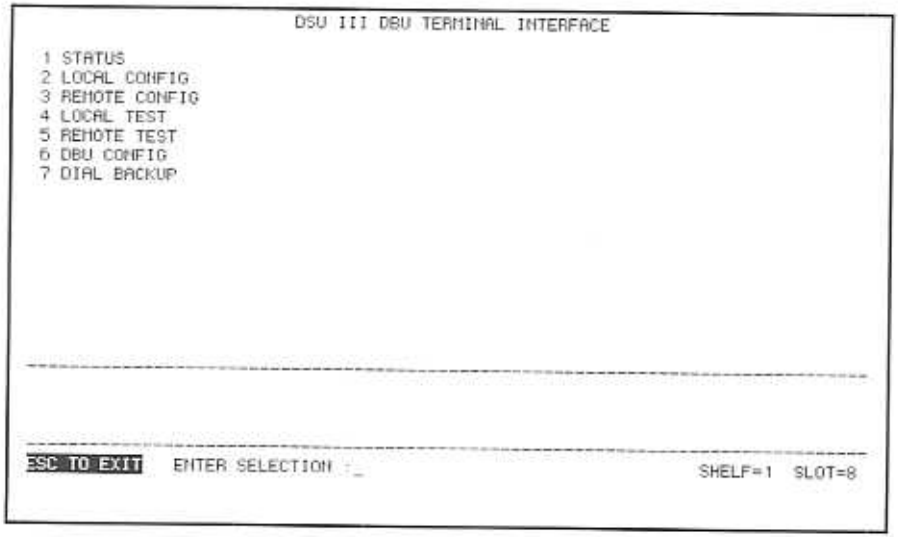

Figure 3-2
DSU III DBU Rackmount Main Menu

REMOTE COMMAND

The DSU III DBU Rackmount can be controlled remotely from another ADTRAN DSU product. The VT 100 Remote Config menu or the DATAMATE CONFIG menu allow the DSU III DBU Rackmount's 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 controller card.

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

Chapter 4
Configuration

CONFIGURATION OVERVIEW

The DSU III DBU Rackmount contains four different user profiles (sets of configuration 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:

Loop Rate	Auto
Connector Type	V.35
Auto DBU	Disabled
Orig/ANS	ANSWER
DTE Rate	56K/57.6K
Data Format	Synchronous
CD Option	Normal
CS Option	Follows RS
SR Option	Off Test + OOS
Tx Clock Option	Normal
Clock Source	From Network
Remote Configuration	Enabled
Test Timeout	0=OFF
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, located 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 DBU:

- 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 4-3.

VT 100 CONFIGURATION MENU

To configure the DSU III DBU 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 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.

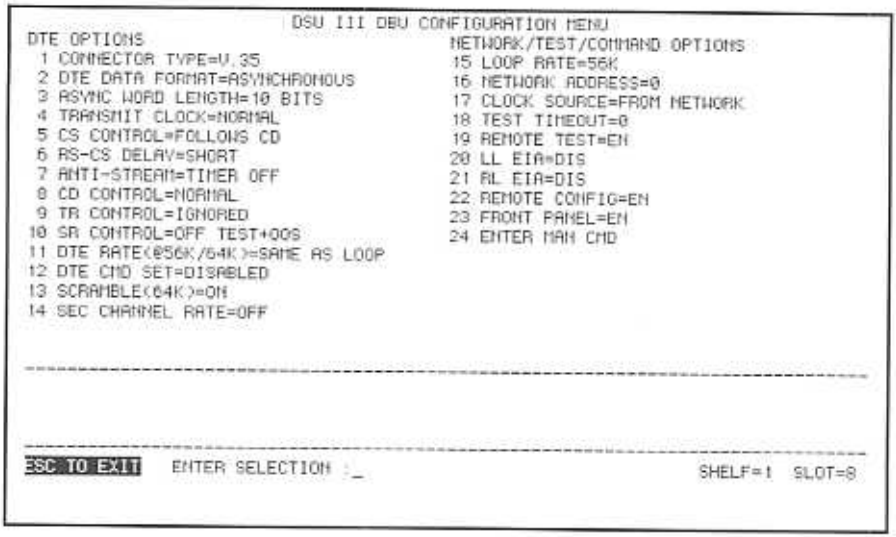

Figure 4-1
VT 100 Local Configuration Menu

VT 100 Remote Configuration

When Remote Configuration is selected, the screen shown in Figure 4-2 appears. Enter the remote shelf's address and then choose EXECUTE REMOTE CONF to access the remote unit's configuration menus.

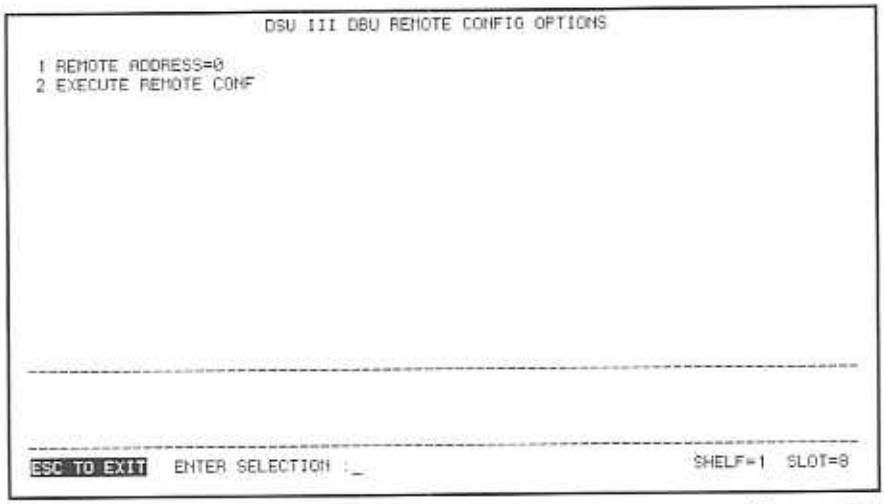

Figure 4-2
Remote Configuration Menu

VT 100 DTE Options

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

Connector Type

Select EIA-232 or V.35 to specify which of the primary channel connectors is used to connect to the DTE. The 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. The default setting is 10 bits.

Transmit Clock

To use the internal clock of the DSU III DBU Rackmount select NORMAL. To use the external transmit clock from the DTE select EXTERNAL. The factory default setting is NORMAL.

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 the control mode 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 state matches the RS state.

Follows CD

The CS state matches the CD state.

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 DBU will turn off CS but continue to pass data until RS goes off. CS is also off if the DSU cannot pass data.

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

RS-CS 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 DBU 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 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 DBU 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 two different control modes for the carrier detect (CD) lead. The default factory setting is NORMAL.

Forced On
The CD lead remains active all the time.

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

TR Control

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

Ignored
The TR input is ignored.

Command Switch
If TR is on, the DSU will switch to backup/dedicated mode.

No DBU If Off
If TR is off, the DSU will not enter dial backup mode.

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 +005.

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 DBU Rackmount receives an out-of-service condition from the network.

Off Test Only
The SR lead is on except when the DSU III DBU 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.

DTE Rate

This option sets the operating speed of the DTE interfaces. The default setting is SAME AS LOOP.

DTE Rate Options
2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 56K sync/57.6K async, 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

Scrambler should be disabled for all frame relay circuits and 56K clear channel operations. The scrambler should be enabled for 64K clear channel operations. The Scrambler option is always available regardless of loop rate on a rack mount. The factory default setting is SCRAMBLER OFF.

Scramble Off
DTE data scrambler disabled.

Scramble On
DTE data scrambler enabled.

Suppress LBE

DTE data invert enabled (56 kbps secondary channel Loop Rate only). Loopback enable (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.

VT 100 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 DBU 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 DBU. This addressing capability makes it possible to perform remote configuration and testing in point-to-point and multi-drop networks. The factory default setting is 0.

Clock Source

The CLOCK SOURCE options specify the timing source for the DSU III DBU'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 DBU 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 DBU 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

The Remote Test option specifies whether or not the DSU III DBU responds to a Remote Digital Loopback (RDL) request from the far end of the circuit. The factory default is ENABLED.

Local Loopback EIA

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

Remote Configuration

This option sets up the DSU III DBU 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 DBU. The available manual commands are listed in Table 4-B.

DATAMATE CONFIGURATION MENU

To configure the DSU III DBU Rackmount using a DATAMATE, select 3=CONFIG from the DBU's Main menu. The DATAMATE's menu tree is shown in Figure 4-3. The options are described in the following paragraphs.

DATAMATE 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 DBU also supports subrate DTE data over a 56 kbps loop. The loop rate must be set independently of the DTE rate.

Eight loop rate selections are available (shown in Figure 4-3). After selecting any loop rate other than Auto or 64 kbps the option for a secondary channel is available. The secondary channel rate is determined by the current loop rate. The default setting is AUTO.

Network Address

A two-digit decimal address can be assigned to each DSU III DBU. This addressing capability makes it possible to perform remote configuration and testing in point-to-point and multi-drop networks. The factory default setting is 0.

Remote Configuration

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

Clock Source

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

DTE Options

DTE Rate

This option sets the operating speed of the DTE interface. The default setting is SAME AS LOOP.

DTE Rate Options

2.4K, 4.8K, 9.6K, 19.2K, 38.4K, 56K sync/57.6K async, SAME AS LOOP

Connector Type

Select EIA-232 or V.35 to specify which of the primary channel connectors is used to connect to the DTE. The 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, a word length of 9, 10, or 11 bits must be selected.

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 DISABLED.

Transmit Clock

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

Select the control mode 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.

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 DBU will turn off CS but continue to pass data until RS goes off. CS is also off if the DSU cannot pass data.

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 DBU 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 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 DBU stops transmitting DTE data into the network but continues to accept data from it. This condition exists until the DTE deactivates the RS input.

NOTE *The anti-stream timer should always be set to timer off on the host unit in a multidrop circuit.*

CD Options

Select the control mode for the carrier detect (CD) lead. The default factory setting is NORMAL.

Forced On
The CD lead remains active all the time.

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

TR Options

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

Ignored
The TR input is ignored.

Command Switch
If TR is on, the DSU will switch to backup/dedicated mode.

No DBU If Off
If TR is off, the DSU will not enter dial backup mode.

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 +005.

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 DBU Rackmount receives an out-of-service condition from the network.

Off Test Only

The SR lead is on except when the DSU III DBU 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.

Secondary Rate

Select the operating speed (OFF, 75, 150, 300, 600, 1.2K, or 2.4K) 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, clear to send (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. The default setting is OFF.

DATAMATE Test Options

Test Timeout

The TEST TIMEOUT option sets the length of time a DSU III DBU 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).

RDL En/Dis

The RDL EN/DIS option specifies whether or not the DSU III DBU responds to a Remote Digital Loopback (RDL) request from the far end of the circuit. The factory default is RDL accepted.

EIA LLB En/Dis

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

EIA RLB En/Dis

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

DBU Answer Test

The dial backup connection can be tested while data is passing on the DDS. In order for this test to be performed, DBU ANSWER TEST must be enabled on the remote unit. If DBU ANSWER TEST is not enabled, the remote unit will not accept a DBU test from the other end. The factory default setting is DISABLED. For more information on testing the DBU connection see the chapter *Dial Backup*.

Dial Options

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

Manual Command

The Manual Command option is a shortcut method for entering configuration and control commands for the DSU III DBU. 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
Network Address Lock		
Network Addr. Unlock	C3	00
Network Addr. Lock	C3	01

AT Commands

In addition to the front panel, the DSU III DBU 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 DBU. 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 DBU to configure most of the options or initiate tests to check both the DSU III DBU 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 DBU 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 DBU are listed in the appendix, *AT Commands*.

V.25 bis Commands

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

The V.25 bis option supports the following protocols:

- SDLC
- 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:

CNL	Configuration local
CNR	Configuration remote

The possible responses to V.25 bis commands follow:

VALA	Valid V.25 command processed
INV	An invalid command detected
INVCU	Unknown command detected
INVPS	Invalid parameter syntax
INVPV	Invalid parameter value
INVBL	Invalid local password
INVBM	Invalid remote password

If verbose responses are disabled (ATV0), the three-character responses listed below are the only ones returned:

VAL	Valid V.25 command processed
INV	Invalid command received

Syntax and Possible Responses

CNL (Configuration Local)

This command is used to pass AT commands to the local DSU via the V.25 bis command processor. This allows the DSU III DBU to be configured with AT commands using 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: VALA and INVAn.

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 DBU to be configured from a synchronous interface. The command format 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 INVAn.

Chapter 5
Status

STATUS

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

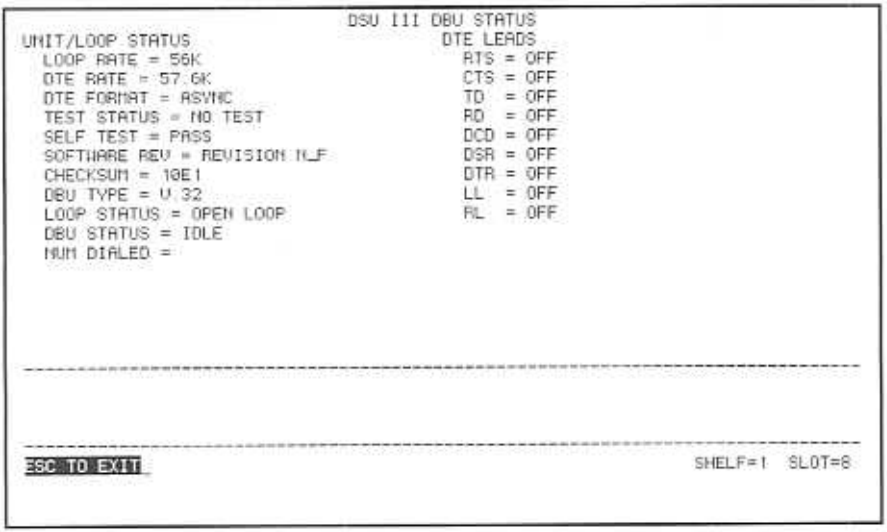

Figure 5-1
VT-100 Status Display

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**.

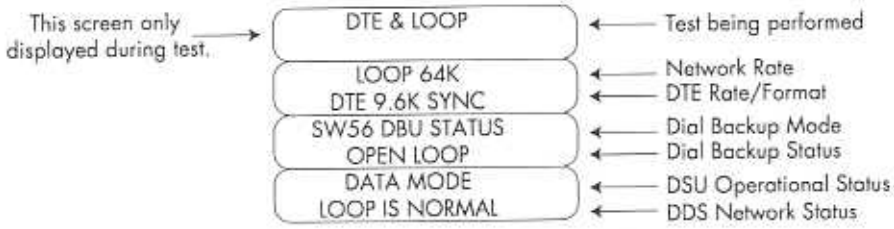

Figure 5-2
DATAMATE Status Displays

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 DBU 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 DBU Rackmount.

Software Rev.

Indicates the software version of the DSU III DBU Rackmount.

Checksum

Displays the checksum of the software.

DBU Type

Displays the DBU version (i.e., V.32, ISDN).

DU DBU Status	2-wire Switched 56 backup option installed.
ISDN DBU Status	1 B+D Basic Rate ISDN backup option installed.
SW56 DBU Status	4-wire Switched 56 backup option installed.
V.32 DBU Status	V.32 backup option installed.
V.34 DBU Status	V.34 backup option installed.
DBU Status	No backup service option card Not Installed installed in the DSU III DBU unit.

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.
Loop is Normal	The DSU is connected to the dedicated line.

Going To DBU	This message is displayed briefly while switching from the dedicated service to dial backup mode.
In Dial Backup	The DSU is in dial backup mode.
OOS/OOF	The telco is transmitting an out-of-service/out-of-frame 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 DBU Rackmount detects an incoming call.
Waiting for Call	The module is waiting for a call.

DBU Status

Displays the DSU's current dial backup status.

Answering Call	The DSU III DBU detected an incoming call message and is initiating call setup procedure.
Call Disconnect	Call disconnect message received from the remote end.
Called Unit Busy	The unit called is currently busy and cannot be connected (ISDN only).
Dialing	The unit is dialing the selected number.
Going to DBU	The DSU III DBU is entering dial backup mode.

Idle	Messages are not being transmitted but the service is immediately available for use.
Incoming Call	Incoming call messages are being received.
In Dial Backup	The DSU III DBU is currently in dial backup mode.
No RX Signal	Sealing current detected but no data signal received from telco.
No Wink From CO	Switched 56 provider encountered a service problem (4-Wire Switched 56 only).
Not Installed	No dial backup option installed in the DSU III DBU.
OOS/OOF From Net	Out-of-service signal or out-of-frame condition exists. The call cannot be completed because the called terminal or the called terminal's access line is out-of-service or is faulty (2-wire and 4-wire Switched 56 only).
Open Loop	The physical connection to the backup line has been broken (2-wire and 4-wire Switched 56 only).
DBU Line in RDL	Remote end initiated a test.
Test From Telco	The network provider has activated the CSU loopback (2-wire and 4-wire Switched 56 only).

DBU Test Pattern	The DSU III DBU is currently performing a test with a pattern.
Waiting for Call	The originating DSU III DBU is waiting on a call from the remote end.

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 DBU's front panel LEDs.

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

Chapter 6
Testing and Troubleshooting

TEST OVERVIEW

The DSU III DBU Rackmount performs a variety of diagnostic functions that isolate portions of the circuit to identify the problem source. Tests may be initiated and terminated from the Rackmount's front panel, the terminal, or the DATAMATE.

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.

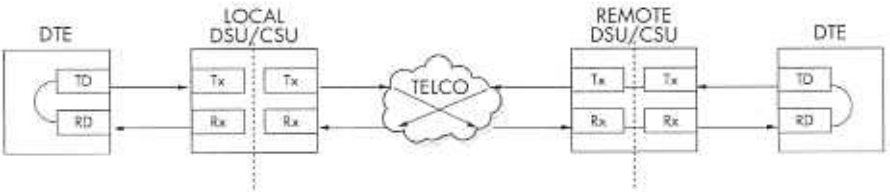

Figure 6-1
Normal Operation before Initiating Loopback Test

All diagnostic tests disrupt data flow.

Executing a Test from the Rackmount 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 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.

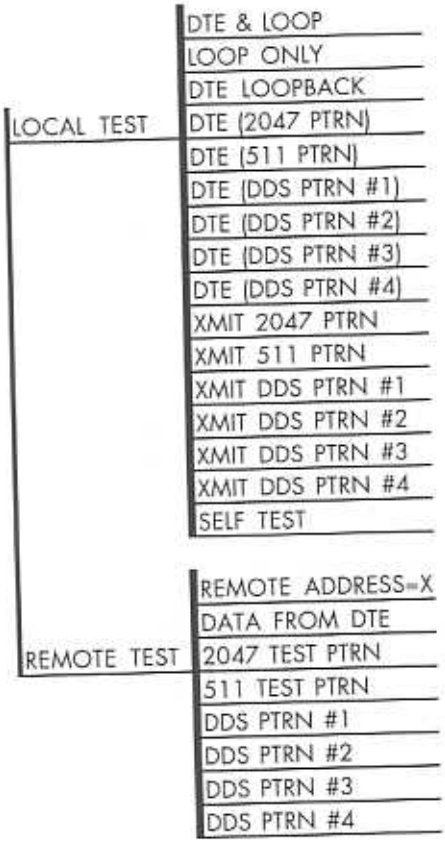

Figure 6-2
VT 100 Test Menus

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.

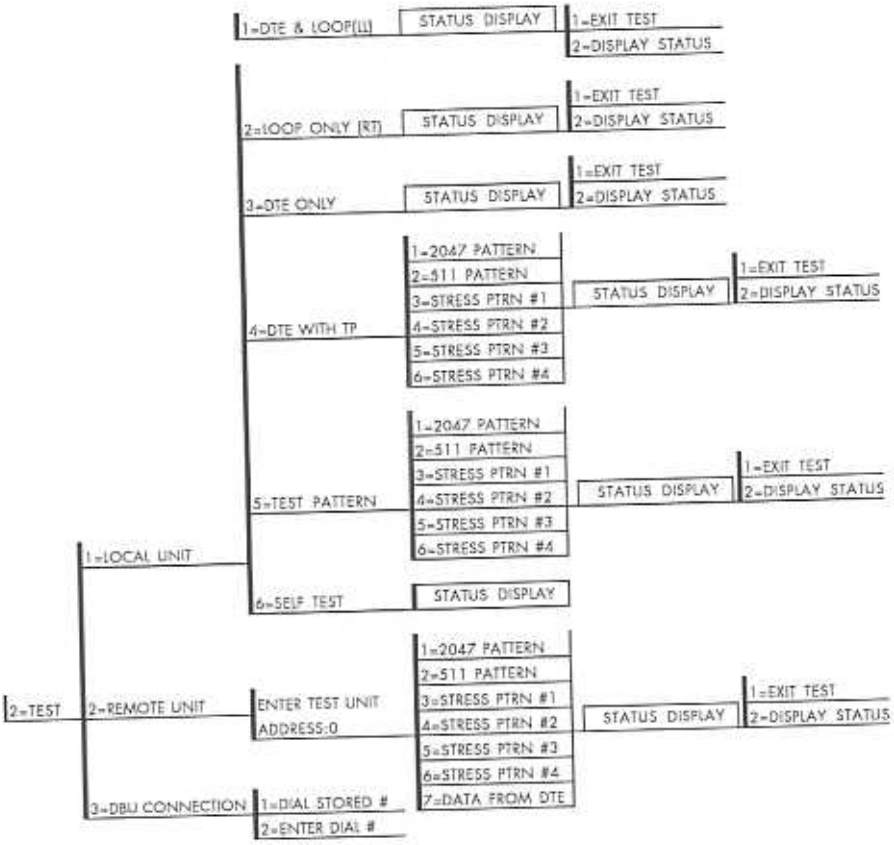

Figure 6-3
DATAMATE Test Menu

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 Test Status Display for a test with a test pattern.

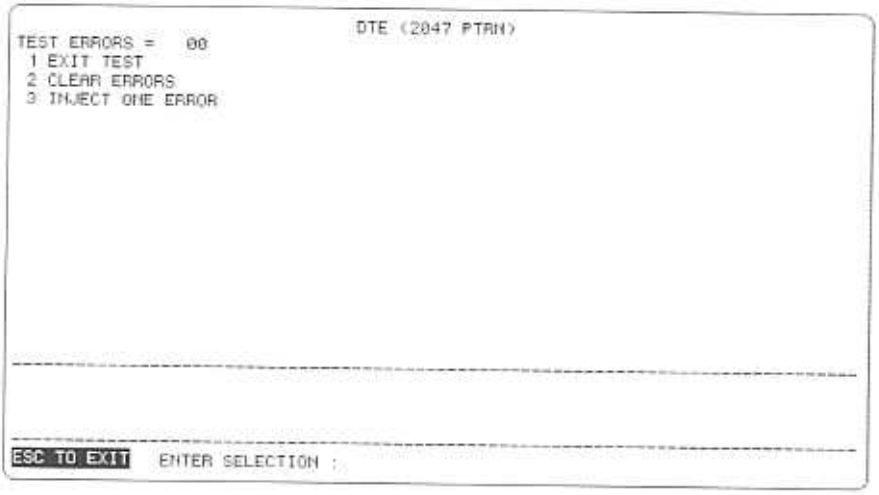

Figure 6-4
Sample Test Status Display

Figure 6-5 shows examples of DATAMATE test status displays for a test with a test pattern.

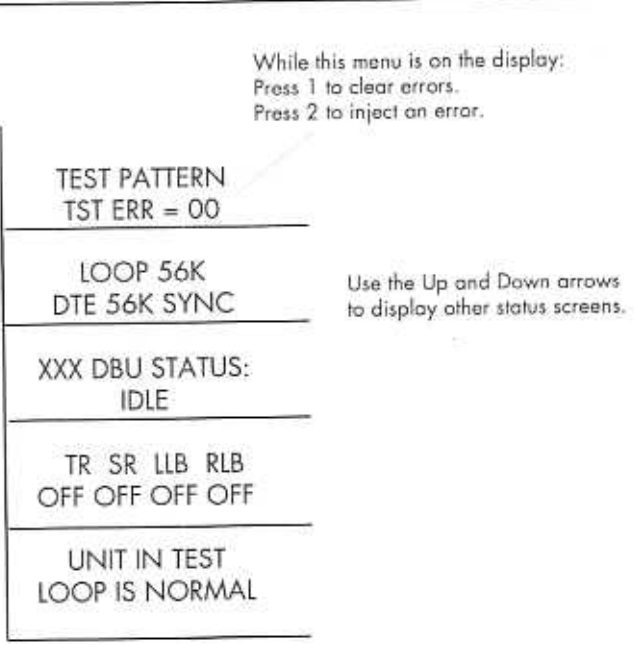

Figure 6-5
Sample Test Status Displays

LOCAL TEST OPTIONS

The local DSU III DBU Rackmount can perform a variety of tests. Figure 6-6 shows the VT 100's Local Test Options screen. Each test is described in the following pages.

```
                    DSU III DBU LOCAL TEST OPTIONS

 1 DTE & LOOP
 2 LOOP ONLY
 3 DTE LOOPBACK
 4 DTE (2047 PTRN)
 5 DTE (511 PTRN)
 6 DTE (DDS PTRN #1)
 7 DTE (DDS PTRN #2)
 8 DTE (DDS PTRN #3)
 9 DTE (DDS PTRN #4)
10 XMIT 2047 PTRN
11 XMIT 511 PTRN
12 XMIT DDS PTRN #1
13 XMIT DDS PTRN #2
14 XMIT DDS PTRN #3
15 XMIT DDS PTRN #4
16 SELF TEST
-------------------------------------------------------------------------------


-------------------------------------------------------------------------------
ESC TO EXIT   ENTER SELECTION :_                          SHELF=1  SLOT=8
```

Figure 6-6
Test Options Menu

DTE & Loop (LL)

Test Description

The DTE & Loop test splits the DSU III DBU 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.

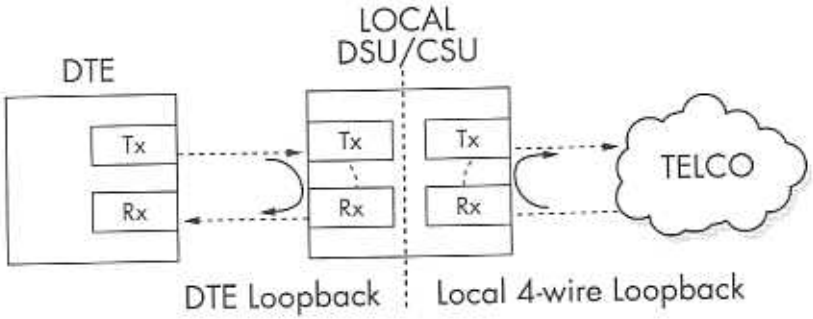

Figure 6-7
DTE & Loop Test

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 (or a DTE device capable of verifying that it is receiving back the same data it sent to itself) must be used to interpret the test results of a DTE & Loop test.

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 DBU 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.

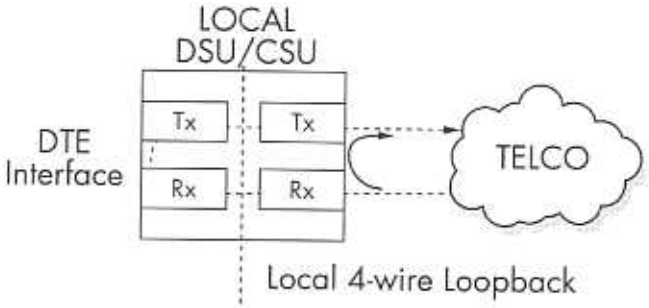

Figure 6-8
Loop Only Test

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 DBU 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 DBU 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 DBU Rackmount.

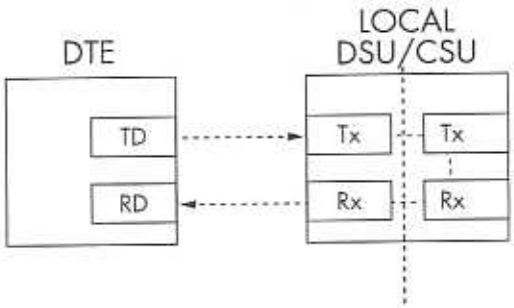

Figure 6-9
DTE Loopback Diagram

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 DBU Rackmount.

Interpreting Test Results

A BERT tester (or a DTE device capable of verifying that it is receiving back the same data it sent to itself) must be used to interpret the test results of a DTE Loopback test.

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 is completely internal to the DSU and can be used to detect deficiencies within the network interface. Figure 6-10 illustrates the loopback point and the data paths for this test.

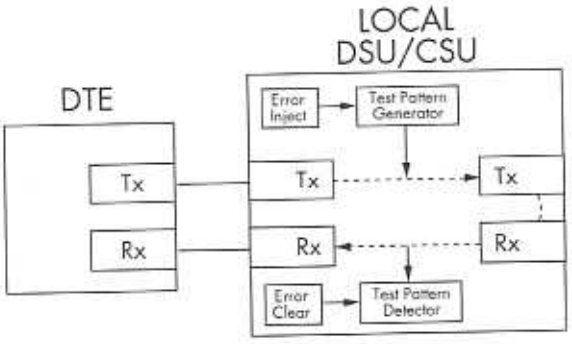

Figure 6-10
DTE with Test Pattern

Test Purpose

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

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.

XMIT Test Pattern

The Test Pattern option converts the local DSU III DBU Rackmount into a BERT tester for the purpose of testing the DDS circuit. If this test is used, the local DSU/CSU must be transmitting a pattern with the remote DSU/CSU in loopback or both the local and remote DSU/CSUs must be transmitting test patterns. Figure 6-11 illustrates the data paths for this mode.

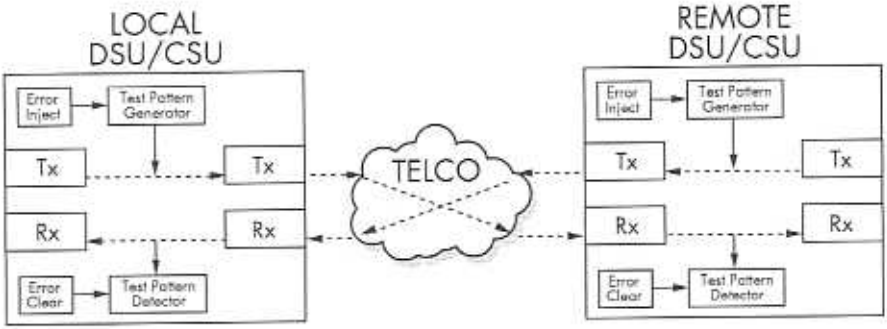

Figure 6-11
Test Pattern Only

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

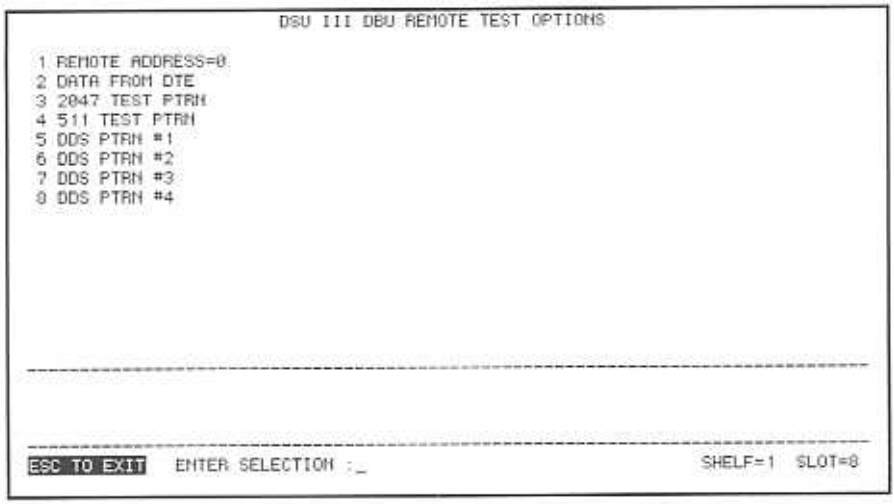

Figure 6-12
Remote Test Options

Data from DTE

This test loops back the remote end; data may then be transmitted and verified.

Test Patterns

The test selections with test patterns use the internal pattern generator of the DSU III DBU to transmit and verify a test pattern over the DDS network. The remote unit is placed in remote digital loopback (RDL) automatically. The remote unit's remote test option must be enabled. The DSU III DBU 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*. Figure 6-13 provides a diagram of a V.54 RDL with a test pattern.

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

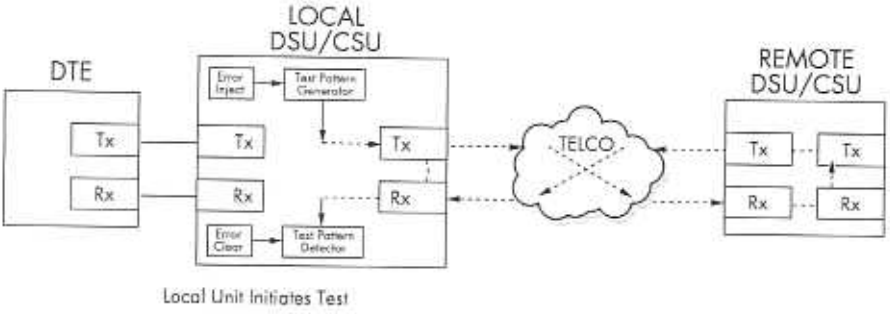

Figure 6-13
V.54 RDL with Test Pattern

Remote Test Purpose

This is used to test 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.

DBU CONNECTION

When the DSU III DBU is equipped with a dial backup option, the DBU Connection option appears as one of the Test menu selections. This test allows the dial backup network to be tested without disrupting data being transmitted on the main line (see Figure 6-14).

When this option is selected, choose a stored number or enter a number to dial. After establishing DBU connection, the DSU III DBU designated at the answer unit is placed into loopback and a test pattern is transmitted from the originate unit to the answer unit. Receive data is checked for errors and the results are displayed. While running this test, errors may be injected from the DATAMATE by pressing **2** and cleared by pressing **1**. During the DBU test, the LEDs scan back and forth and the **Test** LED is on.

NOTE *When running at a subrate over a 56K or 64K loop (or a 64K loop with Scrambler activated), the DSU will not send data during a DBU test.*

NOTE *The DBU Answer Test option must be enabled through the Configuration menu. Enabling DBU Answer Test does not affect the unit during dial backup. This option should remain disabled unless the user is performing this test.*

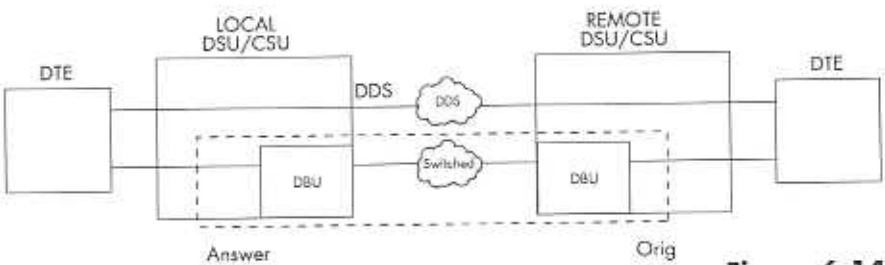

Figure 6-14
DBU Connection Test

Test Purpose

This is used to verify the DBU circuit and DBU modules in both the local and remote DSU III DBU are functioning properly.

Interpreting Test Results

If the unit is functioning properly, the test error count should be 0.

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 DBU Rackmount displays messages and illuminates LEDs to indicate 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 signal being received from the telco.	Indicates good local loop.	No action required; unit properly connected to telco circuit.
OPEN LOOP	Unit not receiving a signal from the telco.	Bad telco cable from the DSU to telco jack or bad circuit to telco.	Replace telco cable from DSU to wall jack. If a problem persists, contact telco provider.
NO RX SIGNAL	Unit detects sealing current but no data signal from telco.	Bad conductor in telco cable from DSU to telco jack or bad circuit to telco.	Replace telco cable from DSU to wall jack. If a problem persists, contact telco provider.
OOS/OOF FROM NET	Unit detects an out-of-service or out-of-frame condition from the telco.	Telco is having problems with DDS circuit or remote unit is turned off or disconnected.	Check remote unit. Contact telco service provider.
CHECK TELCO LINE	Transmit/receive pair reversal detected.	Telco wall jack wired incorrectly.	Switch wire pairs in wall 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 provider.

Chapter 7
Dial Backup

VT 100 TERMINAL DIAL OPTIONS

Dial Options Menu

The VT 100 Dial Options menu is displayed when 6 DBU CONFIG is selected from the Main menu. See Figure 7-1 for the dial options menu of the V.32 version.

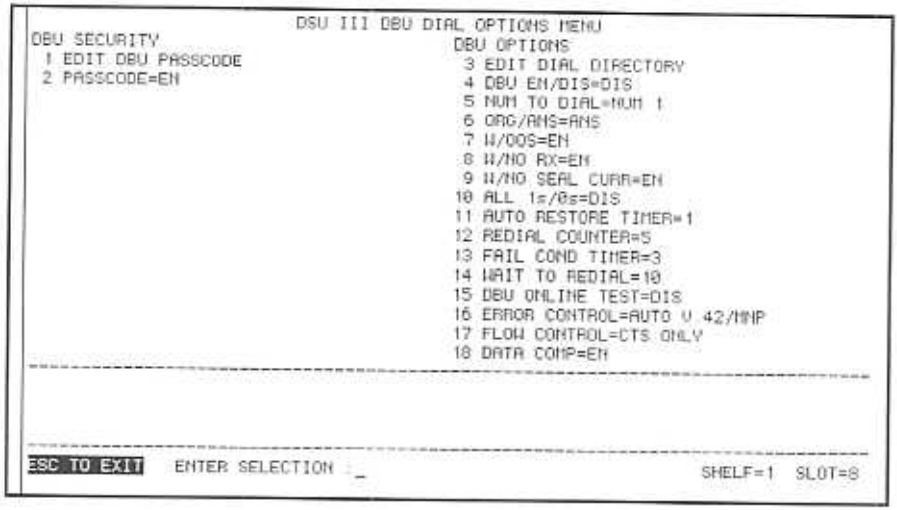

Figure 7-1
VT 100 Terminal Dial Options Menu (V.32 Version)

DBU Security

The dial backup passcode adds an additional level of security to the DSU III DBU.

When a dial backup connection is established, the originate unit transmits a pre-programmed passcode to the answer unit over the dial backup connection before the connection is considered valid. The answer unit compares the received passcode to a pre-programmed passcode.

If the passcode matches, the receive unit sends a **Passcode OK** message to the originate unit and goes on-line. If the passcode does not match, the receive unit sends an **Invalid Passcode** message to the originate unit and terminates the dial backup connection.

If a passcode is not received by an answer unit with passcode enabled, or if the **Passcode OK** message is not received by an originate unit with passcode enabled, the dial backup connection is terminated.

Edit DBU Passcode

Program a passcode of one to ten characters.

Passcode

Enable or disable the passcode function.

DBU Options

The DBU Options are used to select the modes of operation for the Dial Backup features.

Edit Dial Directory

The DSU III DBU stores up to ten numbers of 36 digits each. Edit a phone number by reentering the entire number. Enter the number in the form 1 + area code + seven-digit number. This process overwrites the previously stored number.

DBU En/Dis

The Automatic DBU option specifies whether the unit automatically enters dial backup mode or waits for manual setup. The factory default setting is Disable.

Num to Dial

The Number to Dial option offers a selection of stored numbers for the unit to automatically dial. If the leased line fails and the DSU III DBU is set to originate, it dials the numbers (in chronological order) specified under this option to set up the dial backup line. The factory default setting is Dial Stored #1.

Org/Ans

This option specifies whether the DSU III DBU originates or waits to answer if the dedicated circuit fails. One end must be set to Originate and the other to Answer. The factory default setting is Answer.

W/OOS

When enabled, the DSU III DBU enters backup mode if an out-of-service condition is detected. The factory default setting is Enable.

W/No Rx

When enabled, the DSU III DBU enters backup mode when a loss of signal is detected. The factory default setting is Enable.

W/No Seal Curr

When enabled, the DSU III DBU enters backup mode when a loss of sealing current is detected. The factory default setting is Enable.

All 1s/0s

When this option is enabled, the DSU III DBU monitors the receive data for strings of 1s or 0s that are longer than the fail timer. If this condition is detected, the local DSU III DBU initiates a handshake routine with the remote unit to determine if the DTE is generating the constant data pattern or if the network has failed.

Auto Restore Timer

Once the DDS circuit is restored, the DSU III DBU remains in backup until the DDS circuit is active for the length of time specified for the restore timer. The selection is entered in minutes (up to 255). If set to 0, the DDS must be restored manually. The factory default setting is 1 minute.

RESTORE TIMER
(0=OFF) __ __ MIN

Redial Counter

This option sets the number of times the DSU III DBU redials the far end when entering backup mode. The redial count, which is manually entered, can be up to a maximum of 99 attempts. If the DSU III DBU encounters a busy or reorder, it attempts to establish the call the specified number of times. The factory default setting is 5.

ENTER REDIAL
COUNT: __ __

Fail Cond Timer

This option sets the amount of time the dedicated circuit failure condition must be active before the DSU III DBU attempts backup. The amount of time, which is manually entered, can be up to a maximum of 99 seconds. The factory default setting is 3 seconds.

AUTO DBU FAIL
TIME: __ __ SEC

Wait to Redial

This option works in conjunction with the preceding Redial Counter. It selects the amount of time between redial attempts to connect the backup line. The amount of time, which is manually entered, can be up to a maximum of 99 seconds. The factory default setting is 10 seconds.

WAIT TO REDIAL
TIME: __ __ SEC

DBU Online Test

Enables/disables DSU's ability to perform online testing.

V.32 and V.34 Options

The following options are available with the V.32 bis version of the DBU. See Table 7-C for descriptions and AT commands for these options.

Error Control Buffer

This option determines the type of error control to be negotiated at the start of a V.32 bis or V.34 modem connection. The factory default setting is AUTO V.42/MNP.

Flow Control

This option is used to select the type of flow control used by the V.32 bis or V.34 modem. The factory default setting is CTS Only.

Data Comp

This option is used to select data compression for V.32 bis or V.34 operation when running asynchronously. When enabled, data throughput speeds as high as 57.6 kbps may be achieved. For synchronous applications the speed is limited to a maximum of 14.4 kbps for the V.32 and 28.8 kbps for the V.34. The factory default setting is Enabled.

S2W and S4W Options

The following option is available with the Switched 2-wire and Switched 4-wire versions of the DBU.

Network Type

This option is used to select the network type (AT&T/MCI/OTHER or US SPRINT). The factory default setting is AT&T/MCI/OTHER.

ISDN Options

The following option is available with the ISDN version of the DBU.

Switch Type

This option is used to select the switch type (AT&T 5ESS, NTDMS-100, or NATIONAL ISDN 1). The factory default is AT&T 5ESS.

Control Menu

The VT 100 Control menu is displayed when 7 DIAL BACKUP is selected from the Main menu. See Figure 7-2.

DBU Operation

Go to Dial Backup

The DSU III DBU prompts to dial a stored number or enter a number to dial for dial backup.

DBU Online Test

This option allows the dial backup connection to be tested manually without interrupting the data on the DDS. A stored or manually-entered number can be used.

NOTE

DBU Answer Test must be enabled on the far end to perform a DBU on-line test.

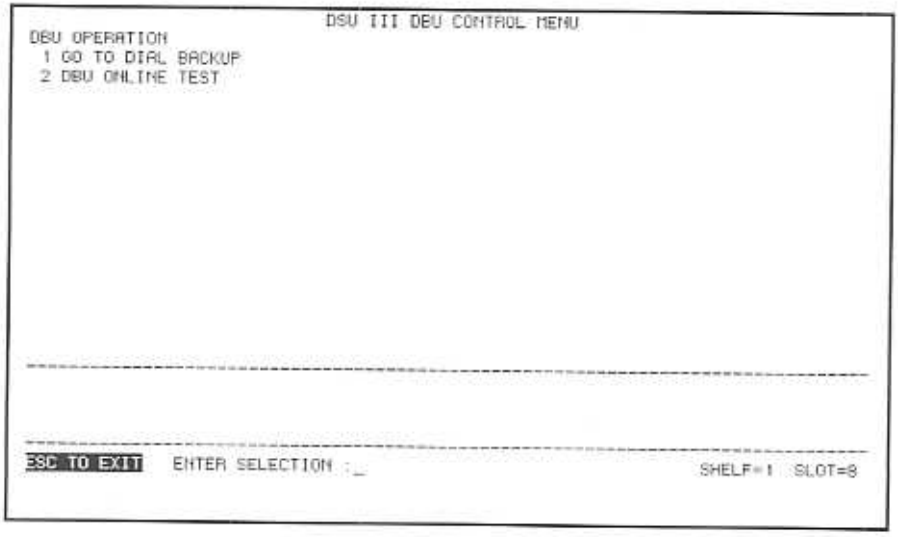

Figure 7-2
VT 100 Control Menu

DATAMATE DIAL OPTIONS

The dial options are accessed on the DATAMATE in two different menu areas. Figure 7-3 shows the DATAMATE's Dial Backup Options (4=Dial Options) menu, accessed by first activating 3=CONFIG in the Main menu and then choosing 4=DIAL OPTIONS. Shaded items are restricted to specific configurations or operation. Additional dial options are found by activating 4=DIAL in the Main menu (see the section *Dial Options in the Main Menu*).

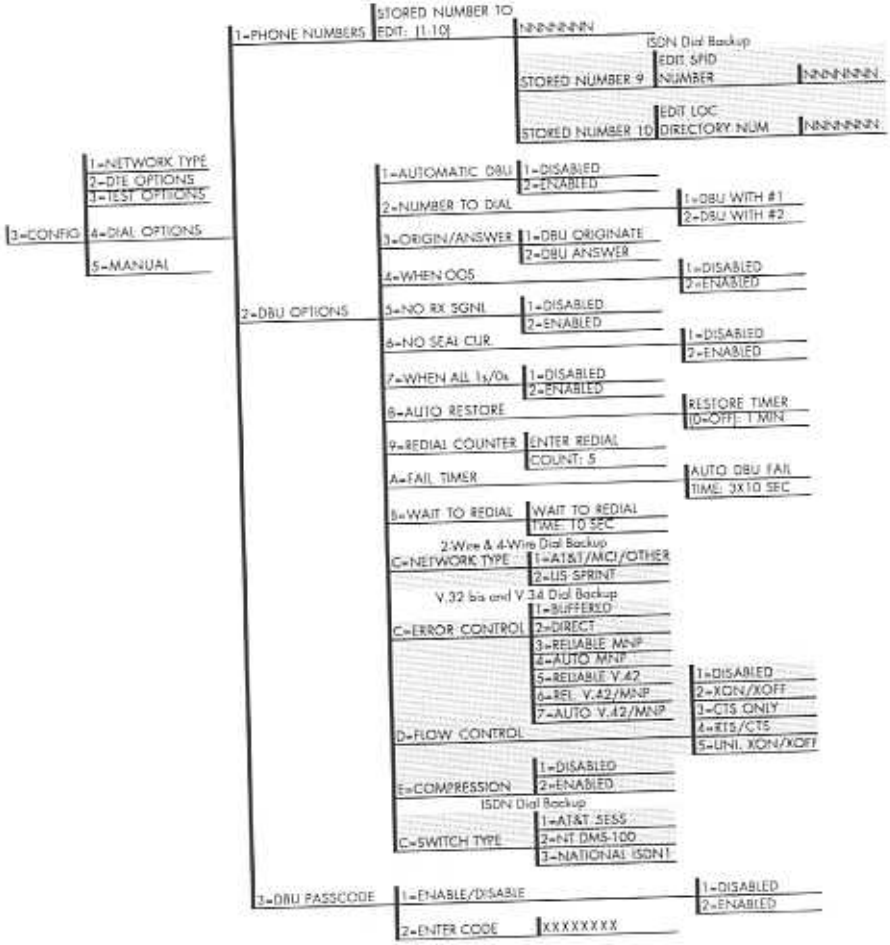

Figure 7-3
DATAMATE's Dial Options

Phone Numbers

The DSU III DBU stores up to ten numbers of 36 digits each. Edit a phone number by reentering the entire number. This process overwrites the previously stored number. Figure 7-4 shows the menu path used to access the Phone Number option on the DATAMATE (3=EDIT DIAL DIR on a terminal). See Table 7-A for AT commands.

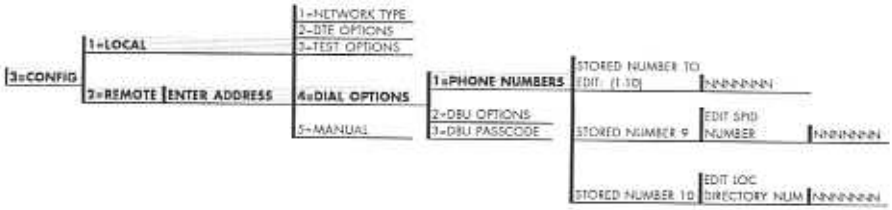

Figure 7-4
Editing Stored Phone Numbers (DATAMATE)

ISDN Dial Backup

If a clear channel 64 kbps circuit is required to back up the DDS circuit, placing #4 at the end of the smart dial string (phone number entered into Stored Number 1-8) causes the ISDN DBU mode to establish the backup connection at 64 kbps instead of 56 kbps. For example: 2059718000#4.

Setting the Service Profile Identifier (SPID)

For ISDN dial backup, the service profile identifier (SPID) is stored in Stored Number 9. The SPID is a sequence of digits identifying ISDN terminal equipment to the ISDN switch when more than one ISDN set has been attached to the same central office line. The SPID is assigned by the telco when the ISDN line is installed and normally resembles the phone number. Only the AT&T 5ESS switch is capable of recognizing a point-to-point configuration, eliminating the need for a SPID. All other switch types require a SPID.

Setting the Local Directory Number (LDN)

For ISDN dial backup, the local directory number (LDN) is stored in Stored Number 10. The LDN is the seven digit phone number.

Table 7-A

AT Commands for Storing Phone Numbers

AT Command	Description
&Zn=	Store Phone Number
&Z9=	Enter SPID Number for ISDN dial backup
&Z10=	Edit LOC for ISDN dial backup

DBU Options for all Versions

See Table 7-B for AT commands.

Automatic DBU

The Automatic DBU option specifies whether the unit automatically enters dial backup mode or waits for manual setup. The factory default setting is Disable. Auto DBU must be enabled on the answer unit for it to automatically answer, regardless of whether the originate unit automatically or manually goes into DBJ.

Number to Dial

The Number to Dial option offers a selection of stored numbers for the unit to automatically dial. If the leased line fails, and the DSU III DBU is set to originate, it dials the numbers (in chronological order) specified under this option to set up the dial backup line. The factory default setting is Dial Stored #1.

Origin/Answer

This option specifies whether the DSU III DBU originates or waits to answer if the dedicated circuit fails. One end must be set to Originate and the other to Answer. The factory default setting is Answer.

When OOS

When enabled, the DSU III DBU enters backup mode if an out-of-service condition is detected. The factory default setting is Enable.

No Rx Sgnl

When enabled, the DSU III DBU enters backup mode when a loss of signal is detected. The factory default setting is Enable.

No Seal Cur.

When enabled, the DSU III DBU enters backup mode when a loss of sealing current is detected. The factory default setting is Enable.

When All 1s/0s

When this option is enabled, the DSU III DBU monitors the receive data for strings of 1s or 0s that are longer than the Fail Timer. If this condition is detected, the local DSU III DBU initiates a handshake routine with the remote unit to determine if the DTE is generating the constant data pattern or if the network has failed.

Auto Restore

Once the DDS circuit is restored, the DSU III DBU remains in backup until the DDS circuit is active for the length of time specified for the Restore Timer. The selection is entered in minutes (up to 255). If set to 0, the DDS must be restored manually. The factory default setting is 1 minute.

RESTORE TIMER
(0=OFF) __ __ MIN

Redial Counter

This option sets the number of times the DSU III DBU redials the far end when entering backup mode. The

redial count, which is manually entered, can be up to a maximum of 99 attempts. If the DSU III DBU encounters a busy or reorder, it attempts to establish the call the specified number of times. The factory default setting is 5.

ENTER REDIAL
COUNT: __ __

Fail Timer

This option sets the amount of time the dedicated circuit failure condition must be active before the DSU III DBU attempts backup. The amount of time, which is manually entered, can be up to a maximum of 990 seconds. The factory default setting is 30 seconds. The unit automatically multiplies the setting by 10.

Wait to Redial

This option works in conjunction with the preceding Redial Counter. It selects the amount of time between redial attempts to connect the backup line. The amount of time, which is manually entered, can be up to a maximum of 99 seconds. The factory default setting is 10 seconds.

WAIT TO REDIAL
TIME: __ __ SEC

The following options must be set identically on both units:

when OOS
no Rx signal
no seal current
when all 1s/0s
auto restore
redial counter
fail timer
wait to redial

NOTE

Table 7-B
DBU Options AT Commands for All Versions

DBU Options	AT CMD	Description
Automatic DBU		
1=Disabled	_K0	Automatic DBU disabled
2=Enabled	_K1	Automatic DBU enabled
Number to Dial		
1=DBU with #1	_B0	Dial Stored #1
2=DBU with #2	_B1	Dial Stored #2
Originate/Answer		
1=DBU Originate	_E0	Originates call if DDS fails
2=DBU Answer	_E1	Answers call if DDS fails
When Out of Service (OOS)		
1=Enabled	_G1	DBU when OOS
2=Disabled	_G0	No DBU for OOS
No Receive (RX) Signal		
1=Enabled	_H1	DBU when no RX Signal
2=Disabled	_H0	No DBU when no RX signal
No Sealing Current		
1=Enabled	_I1	DBU when no Sealing Current
2=Disabled	_I0	No DBU when no Sealing Current
When all 1s/0s		
1=Disabled	_P0	No DBU when all 1s/0s detetected
2=Enabled	_P1	DBU when all 1s/0s condition exists
Auto Restore	S31=x	Sets Restore Timer
Redial Counter	S57=x	Sets Redial Counter
Fail Timer	S58=x	Sets Fail Timer
Wait to Redial	S59=x	Sets time between redial attempts

DBU Options for 2-wire and 4-wire

Network Type

This option selects the company providing the Switched Digital Service. When US Sprint is selected, an automatic Echo Canceler Suppressor tone is emitted by the DSU III DBU when dialing. Options include: AT&T/MCI/Other and US Sprint.

DBU Options for V.32 bis and V.34

See Table 7-C for option descriptions and AT commands.

Error Control

This option determines the type of error control to be negotiated at the start of a V.32 bis or V.34 modem connection. The factory default setting is AUTO V.42/MNP.

Flow Control

This option is used to select the type of flow control used by the V.32 bis or V.34 modem. The factory default setting is CTS Only.

Compression

This option is used to select data compression for V.32 bis or V.34 operation when running asynchronously. When enabled, data throughput speeds as high as 57.6 kbps may be achieved. For synchronous applications the speed is limited to a maximum of 14.4 kbps for the V.32 and 28.8 kbps for the V.34. The factory default setting is Enabled.

Table 7-C

DBU Options AT Commands for V.32 bis and V.34 Backup

DBU Options	AT CMD	Description
Error Control		
1=Buffered	\N0	Normal operation. No error control. Allows speed matching, buffering and flow control.
2=Direct	\N1	Direct operation. No error control, no buffer, and no flow control.
3=Reliable MNP	\N2	Reliable MNP operation. Uses MNP error control.
4=Auto MNP	\N3	Auto-Reliable MNP operation. Tries MNP error control first; uses normal operation if necessary.
5=Reliable V.42	\N4	Reliable V.42 (LAPM) operation. Uses V.42 (LAPM) error control. If V.42 (LAPM) error control cannot be used the call is disconnected.
6=Rel. V.42/MNP	\N5	Reliable V.42 (LAPM) or MNP operation. Uses either V.42 (LAPM) or MNP error control. If neither can be used the call is disconnected.
7=Auto V.42/MNP	\N6	Auto-Reliable V.42 (LAPM) or MNP operation. Tries to use V.42 (LAPM) error control first; MNP error control next. If neither can be used, then Normal operation is used.
Flow Control		
1=Disabled	\Q0	Flow Control Disabled
2=XON/XOFF	\Q1	Enables XOn/XOff flow control
3=CTS Only	\Q2	Enables CTS flow control from DCE
4=RTS/CTS	\Q3	Enables CTS flow control from DCE and RTS from DTE
5=UN. XON/XOFF	\Q4	Unidirectional XOn/XOff
Compression		
1=Disabled	%C0	Compression Disabled
2=Enabled	%C1	Compression Enabled

DBU Options for ISDN

Switch Type

This option selects the type of telco central office switch providing the ISDN service. There are three options for ISDN switch types:

- AT&T 5ESS
- NT DMS-100
- National ISDN1

DBU Passcode

The DBU Passcode option adds an additional level of security to the DSU. See the section *DBU Security* earlier in this chapter for more detailed information.

Enter Code

Program a passcode of one to ten characters.

Enable/Disable

Enable or disable the passcode function.

Dial Options in the Main Menu

The dial options available in the DATAMATE's Main menu (4=Dial) vary whether the DSU III DBU is currently in dial backup mode or connected to the DDS line (see Figure 7-5).

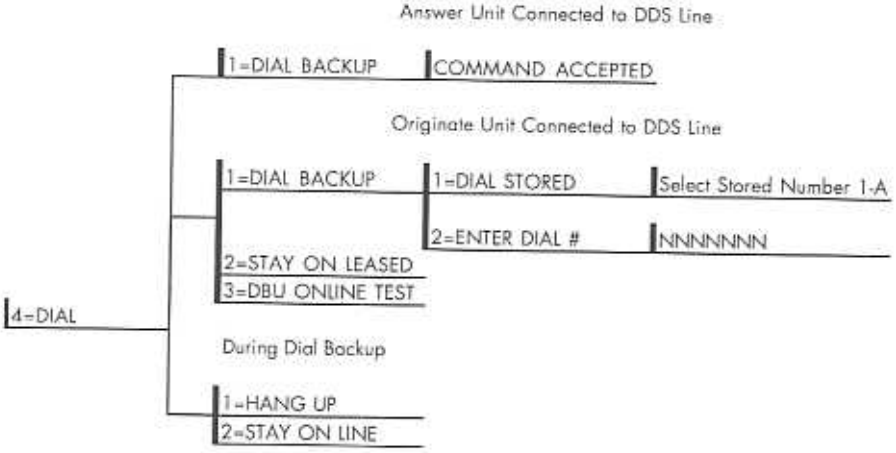

Figure 7-5
Dial Options Menu

Answer Unit Connected to DDS Line

Dial Backup

The message COMMAND ACCEPTED is displayed and the DSU III DBU waits for an incoming call. When an incoming call is detected the DSU III DBU answers the call and enters dial backup.

Originate Unit Connected to DDS Line

Dial Backup

The DSU III DBU prompts to dial a stored number or enter a number to dial for dial backup.

Stay on Leased

The DSU III DBU remains on the leased line and does not enter dial backup mode.

DBU Online Test

This option allows the dial backup connection to be tested manually without interrupting the data on the DDS. A stored or manually entered number can be used.

NOTE *DBU Answer Test must be enabled on the far end to perform a DBU on-line test.*

Dial Options During Dial Backup

Hang Up

Terminates the dial backup connection and attempts to reestablish communication on the DDS line.

Stay On Line

The DSU III DBU remains in dial backup mode and returns to the Main menu.

Appendix A
AT Commands

Table A-A shows the AT commands available for the DSU III DBU 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 Firmware	1
ATZ	Self Test	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

Table A-A (Cont'd)
AT Commands

Command	Title	Default
AT&Xn	Transmit Clock	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
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.	
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	0
AT_Jn	Auto Answer Enable/Disable	0
AT_Kn	DBU Enable/Disable	0
AT_Ln	DTE Routing Main/Backup	0
AT_N=xx	Set Network Address	none
AT_Pn	Front Panel Enable/Disable	0
AT_RR	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

Table A-A (Cont'd)
AT Commands

Command	Title	Default
AT&T10	Local DTE & Loop	none
AT&T11	Local Loop Only	none
AT&T1	Local DTE Only	none
AT&T8	Local DTE with TP	none
AT&T9	Local Test Pattern	none
AT&T0	Exit Test	none
AT_T0&T7	Remote Test Using 2047 Pattern	none
AT_T1&T7	Remote Test Using 511 Pattern	none
AT_T2&T7	Remote test using Stress PTRN #1	none
AT_T3&T7	Remote test using Stress PTRN #2	none
AT_T4&T7	Remote test using Stress PTRN #3	none
AT_T5&T7	Remote test using Stress PTRN #4	none
AT_T0&T8	Local Test Using 2047 Pattern	none
AT_T1&T8	Local Test Using 511 Pattern	none
AT_T2&T8	Local test using Stress PTRN #1	none
AT_T3&T8	Local test using Stress PTRN #2	none
AT_T4&T8	Local test using Stress PTRN #3	none
AT_T5&T8	Local test using Stress PTRN #4	none
AT&T6	Remote test using data from DTE	none

Appendix B
Pinouts

EIA-232 CONNECTORS

The DSU III DBU Rackmount is equipped with two EIA-232 connectors labeled **PRI EIA 232** and **AUX EIA 232/366**. Tables B-A and B-B show the pin assignments for these connectors. For more information see the chapter *Installation*.

Table B-A

Pin Assignments for Primary EIA-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 (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)
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 (TI)

Table B-B

Pin Assignments for Auxiliary EIA-232 Connector

Pin	CCITT	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) On all the time.

V.35 CONNECTOR

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

Table B-C

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)

TELCO CONNECTORS

The DSU III DBU Rackmount has two eight-position modular jacks labeled **LINE 1** and **LINE 2**. Table B-D shows the pin assignments for the **LINE 1** connector and Table B-E shows the pin assignments for the **LINE 2** connector. See the chapter *Installation* for more information.

Table B-D

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-E

Pin Assignments for LINE 2 Connector

Pin	Name	Description
4-wire Switched 56		
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, V.34, 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 DBU 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 non-volatile 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
DBU 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 (x100ms)	3	3	3	3
DTR Command Timeout (x100)	8	8	8	8
Front Panel En/Dis	Enable	Enable	Enable	Enable
Inactivity Timer	Off	Off	Off	Off
AT Password Control	Disable	Disable	Disable	Disable
Network Options				
Loop Rate	AUTO	AUTO	AUTO	AUTO
Network Address	0	0	0	0
Remote Conf. En/Dis	Enable	Enable	Enable	Enable
Clock Source	From Network	From Network	From Network	From Network
DTE Options				
Remote DSU Address	0	0	0	0
DTE Rate (56k loop)	56k/57.6k	56k/57.6k	56k/57.6k	56k/57.6k
Scrambler Mode	OFF	OFF	OFF	OFF
Connector Type	V.35	RS232	V.35	V.35
DTE Data Format	SYNC	ASYNC	SYNC	SYNC
DTE Command Options	DIS	DIS	DIS	DIS
Transmit Clock	Normal	Normal	Normal	Normal
CS Options	Follow RS	Follow RS	Follow RS	Follow RS
Anti-stream Timer	Timer Off	Timer Off	Timer Off	Timer Off
CD Option	Normal	Normal	Normal	Normal
TR Options	Ignored	Ignored	Ignored	Ignored
SR Options	Off Test+OOS	Off Test+OOS	Off Test+OOS	Off Test+OOS
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	0=Off	0=Off	0=Off	0=Off
RDL En/Dis	RDL Accepted	RDL Accepted	RDL Accepted	RDL Accepted
EIA Controlled LLB	Disable	Disable	Disable	Disable
EIA Controlled RLB	Disable	Disable	Disable	Disable
DBU Answer Test	Disable	Disable	Disable	Disable
Dial Options				
Automatic DBU	Disable	Disable	Enable	Enable
DBU Number to Dial	#1	#1	#1	#1
DBU Originate/Answer	Answer	Answer	Answer	Originate
DBU when OOS	Enable	Enable	Enable	Enable
DBU when No RX Signal	Enable	Enable	Enable	Enable
DBU when No Sealing Current	Enable	Enable	Enable	Enable
DBU Auto Restore Timer	1 minute	1 minute	1 minute	1 minute
DBU Redial Counter	5	5	5	5
DBU Fail-Timer (x10 seconds)	3	3	3	3
DBU Redial Wait Time	10	10	10	10
When all 1s/0s	Disable	Disable	Disable	Disable
Network Type	AT&T	AT&T	AT&T	AT&T
Error Control	AUTO 4.2/MNP	AUTO 4.2/MNP	AUTO 4.2/MNP	AUTO 4.2/MNP
Flow Control (V.32)	CTS Only	CTS Only	CTS Only	CTS Only
Data Compression (V.32)	Enabled	Enabled	Enabled	Enabled

Appendix D
DSU to Modem Interconnect

MODEM TAIL CIRCUIT APPLICATION

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

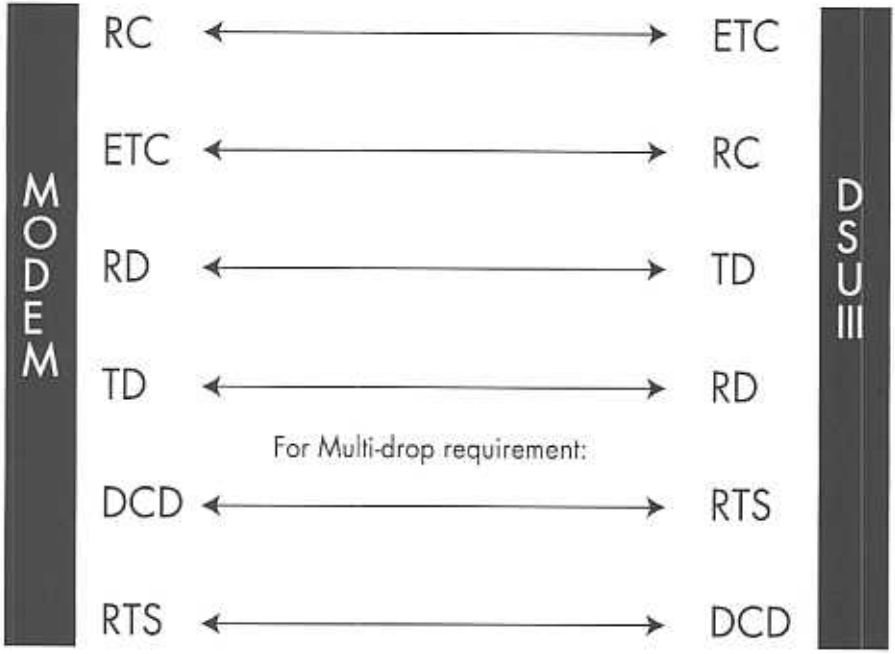

Figure D-1
DSU III DBU Rackmount to Modem Interconnect

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 the transmit clock lead (TC) to the external transmit clock lead (ETC) as shown.

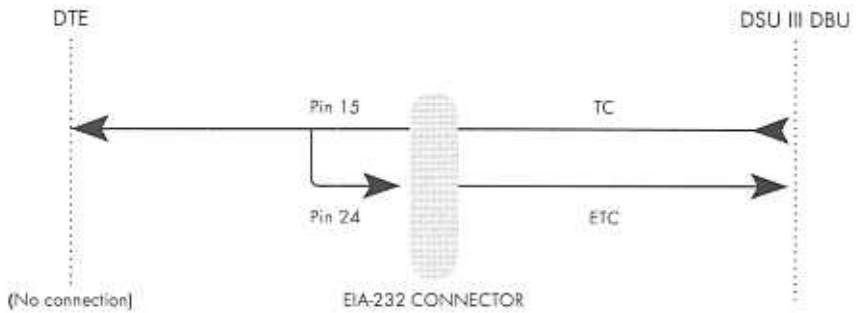

Figure E-1
EIA-232 Connector

Appendix F
Specifications Summary

SPECIFICATIONS AND FEATURES

This section describes the standard specifications and features incorporated in the DSU III DBU Rackmount.

Operating Modes

Dedicated DDS: Point-to-point and multipoint
Switched Backup: (Automatic or manual) 4-wire Switched 56, 2-wire Switched 56, V.32 bis/V.42 bis, or ISDN (1B+D)

Data Rates

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

DTE 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
Asynchronous rates: 2.4, 4.8, 9.6, 19.2, 38.4, and 57.6 kbps

DTE Interface Data Rates

V.35 and EIA-232: up to 57.6 kbps async, up to 64 kbps sync

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)
Private network master (slaved to external clock)

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

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
Backup as applicable

Receiver Sensitivity
-45dB 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

Physical
Dimensions: 1.00"H, 6.75"W, 10.50"D
Weight: 1.5 lbs

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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:	**888 4ADTRAN**

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

CAPS Department:	**256 963-8722**

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

ADTRAN Customer and Product Service
6767 Old Madison Pike
Building #6 Suite 690
Huntsville, Alabama 35807

RMA # _____