TSU RM with V.35

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ADTRAN

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ADTRAN Year 2000 (Y2K) Readiness Disclosure

ADTRAN has established a Year 2000 program to ensure that our products will correctly function in the new millennium. ADTRAN warrants that all products meet Y2K specifications regardless of model or revision.

Information about ADTRAN's Y2K compliance program is available at the following locations:

ADTRAN Web Site	www.adtran.com
Product Matrix	www.adtran.com/y2kfax.html
Faxback Document Line	(256) 963-8200 *Y2K plans and product certifications are listed in the matrix.*
Y2K Project Line	(256) 963-2200
E-mail	year2000@adtran.com

FCC regulations require that the following information be provided to the customer in this manual.

1. This equipment complies with Part 68 of the FCC rules. The required label is attached to the bottom of the chassis.

2. If your TSU RM causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify you in advance. If advance notice is not practical, you will be notified as soon as possible. You will be advised of your right to file a complaint with the FCC.

3. Your telephone company may make changes in its facilities, equipment, operations, or procedures that could affect the proper operation of your equipment. If they do, you will be given advance notice so as to give you an opportunity to maintain uninterrupted service.

4. If you experience trouble with the TSU RM, please contact ADTRAN at (256) 963-8000 for repair/ warranty information. The telephone company may ask you to disconnect this equipment from the network until the problem has been corrected, or until you are sure the equipment is not malfunctioning.

5. This unit contains no user serviceable parts.

6. An FCC compliant telephone cord and modular plug is 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 Part 68 compliant. See installation instructions for details.

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

Service Type	SOC	FIC	USOC
1.544 Mbps - SF	6.0F	04DU9-BN	RJ48C
1.544 Mbps - SF and B8ZS	6.0F	04DU9-DN	RJ48C
1.544 Mbps - ESF	6.0F	04DU9-1KN	RJ48C
1.544 Mbps - ESF	6.0F	04DU9-1SN	RJ48C

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.

CAUTION *Changes 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 EQUIPMENT LIMITATIONS

NOTE

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

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

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

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

CAUTION

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

IMPORTANT SAFETY INSTRUCTIONS

WARNING *When using 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 a bathtub, wash bowl, kitchen sink, laundry tub, in a wet basement, or 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 INSTRUCTIONS

Warranty and Customer Service

ADTRAN will replace or repair this product within five years from the date of shipment if the product does not meet its published specifications or if it fails while in service. For detailed warranty, repair, and return information, see 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 more information, contact one of the numbers found at the inside back page of this manual.

Table of Contents

List of Figures

List of Tables

Chapter 1   Introduction

GENERAL DESCRIPTION

The ADTRAN T1 Data Service Unit (TSU), in either the standalone or the rackmount (RM) version for the Smart 16 shelf, provides a reliable, high-speed data connection from customer synchronous data terminal equipment (DTE) through T1/FT1 lines.

The TSU serves as the link between user data sources such as LAN bridges and routers, computers, CAD systems, and teleconferencing equipment. The amount of bandwidth allocated to the port is user-programmable at Nx56 or Nx64 kbps where N = 1 to 24. The DTE data can occupy contiguous or alternate channels in the T1 stream and the channels may start at any position. The DTE port provides a V.35 electrical and physical interface.

The network interface may be either D4 superframe format (SF) or extended superframe format (ESF) and the line code may be straight **AMI** or **B8ZS**. In the case of a fractional connection, the unused channels of the T1 are filled with all **1s** idle code.

The TSU Network diagram is shown in Figure 1-1 on page 1-2.
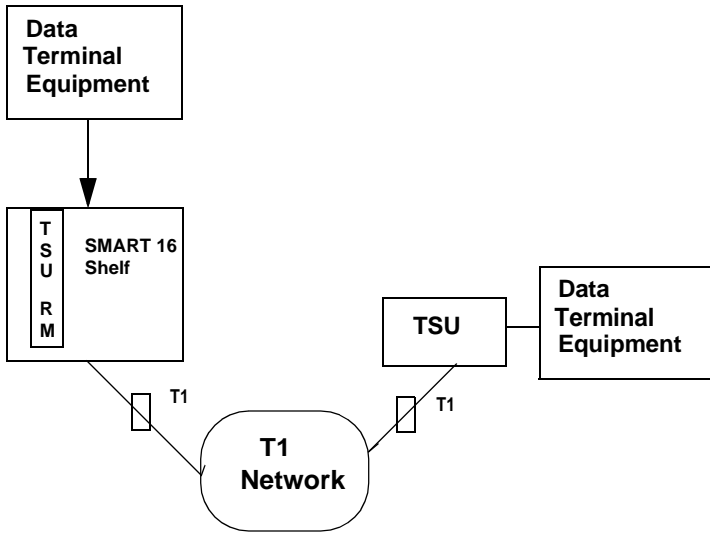
Figure 1-1.   TSU Network Diagram

Chapter 2 Physical Description

The TSU RM consists of two cards. The first is the TSU main card, which has a front panel with nine LED indicators. The second card is the TSU interface, which mounts on the rear of the shelf and contains all the jacks necessary for connection to the network, test jacks, and the DTE connector.

FRONT PANEL

The front panel of the TSU contains nine LED indicators that provide DTE interface, network, test, status and utility information. These indicators are shown in Figure 2-1.

TSU
V.35

OK

TD
RD
RS
CS

ERR
ALM
LB
DBU
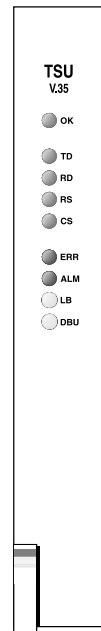
Figure 2-1. TSU Front Panel

OK Status (green)

The **OK LED** indicates the result of the last self-test. If all the tests were passed, the LED is **On**.

DTE Status (green)

TD
Transmitted data from the DTE

RD
Received data from the TSU

RS
Request-to-send from the DTE

CS
Clear-to-send from the TSU

> **NOTE**
>
> *The active state for the status indicators (RS and CS) is On, while the on state for the data indicators (TD and RD) represents a change in state from low to high.*

Error/Alarm Status (red)

ERR
On indicates that CRC errors (in ESF), bipolar violations (BPVs), or frame bit errors have occurred within the last second.

ALM
On indicates that one of the alarm conditions is currently active. See Table 2-1 on page 2-3.

Table 2-1. Alarm Conditions

ALARM	DESCRIPTION
LOS	Loss of signal at NI
AIS	Alarm indicator signal (all 1s) received at NI
OOF	Out of frame at NI
Yellow	Yellow alarm received at NI
PLL Alarm	Phase locked loop alarm (unable to lock on clock source)

Loopback Status (yellow)

LB
The **LB LED** indicates the loopback status of the unit. If the TSU is in line loopback, payload loopback, or DTE loopback, the **LB LED** is **ON**.

Dial Backup Status (yellow)

DBU
DBU ON indicates the unit is in Dial Backup mode.

REAR PANEL

The TSU rear panel is shown in Figure 2-2. The connectors are shown
in Table 2-2 on page 2-5.
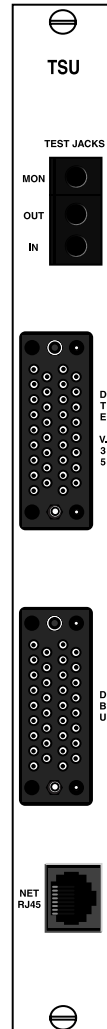
Figure 2-2. TSU Rear Panel

Table 2-2. Rear Panel Connectors

Connectors	Description
DTE V.35	This 34-pin connector provides the synchronous DTE interface.
NET RJ45	The **NET RJ45** connection to the T1/FT1 network is made through the eight-pin modular jack. The pin assignments for these connectors are described in *Network and DTE Connections* in *Chapter 3, Installation*.
TEST jacks	These three jacks are Bantam connectors that are used when troubleshooting the T1 link.
MON jack	The monitor jack is resistively isolated from the **IN** jack and may be used during normal operation of the T1 line.
In and Out jacks	The **IN** and **OUT** jacks are intrusive test jacks. When a test connector is plugged into one of these jacks, the corresponding connections on the **NET RJ45** jack are bypassed. The **IN** jack is used to transmit data from a test set into the TSU. The **OUT** jack is used to transmit data out of the TSU and into a test set
DBU V.35	This 34-pin connector provides the interface to an external DTE device for use in a dial backup application.

Chapter 3   Installation

UNPACKING

After unpacking the TSU, carefully inspect it for shipping damages. If damage is suspected, immediately file a claim with the carrier and contact ADTRAN Customer and Product Service (see *Customer Service and Product Support* on the inside back cover of this manual). If possible, keep the original shipping container to return the unit to ADTRAN for repair or verification of shipping damage.

POWERING

The TSU receives power from the SMART 16 shelf. The shelf supplies ±5 VDC and ±12 VDC to the TSU when the unit is in one of the 16 slots.

NETWORK AND DTE CONNECTIONS

Network Connections

The eight-position modular jack labeled **NET RJ45** on the rear of the TSU interface board is used for connection to the network. See Table 3-1 for the pinout of this connector.

Connector type = (USOC) RJ48C

Table 3-1. Network RJ45 Pinout

PIN	NAME	DESCRIPTION
1	R1	RX Data Ring
2	T1	RX Data Tip
3	unused	
4	R	TX Data Ring
5	T	TX Data Tip
6, 7, 8	unused	

DTE Connections

The two V.35 connectors located on the rear of the interface card are used for connection to the primary DTE and to the external DTE DBU.

Connector type = V.35

Table 3-2. V.35 Pinout

PIN	CCITT	DESCRIPTION
A	101	Protective Ground (PG)
B	102	Signal Ground (SG)
C	105	Request-to-Send (RTS) from DTE
D	106	Clear-to-Send (CTS) to DTE
E	107	Data Set Ready (DSR) to DTE
F	109	Received Line Signal Detector (DCD) to DTE
J, L	-	Local Loopback (LL) from DTE
N, BB	-	Remote Loopback (RL) from DTE
R	104	Receive Data (RD-A) to DTE
T	104	Receive Data (RD-B) to DTE
V	115	RX Clock (RC-A) to DTE
X	115	RX Clock (RC-B) to DTE
P	103	Transmit Data (TD-A) from DTE
S	103	Transmit Data (TD-B) from DTE
Y	114	TX Clock (TC-A) to DTE
AA	114	TX Clock (TC-B) to DTE
U	113	External TX Clock (ETC-A) from DTE
W	113	External TX Clock (ETC-B) from DTE
K, NN	-	Test Mode (TM) to DTE

Chapter 4 Operation

The user configures and controls the TSU through the controller card in the SMART 16 shelf. The user has two choices of input/output devices for the controller card.

• An EIA-232 port, mounted on the rear of the shelf, provides a VT 100 compatible ASCII terminal interface. A modem can be used for remote applications.

• The ADTRAN DATAMATE, an optional hand-held control unit, provides a 2x16-character LCD display and an 18-position keypad.

However, if the controller is a Smart16e, a 10BaseT interface is provided for Ethernet connection. In this way the unit may be configured and controlled via a MIB browser, or via Advision.

MENU STRUCTURE

The TSU uses a hierarchical structure to access its many features from either the DATAMATE or terminal interface on the controller. All of the setup features of the TSU are accessed by first making a choice from the main menus shown in Figure 4-1 and Figure 4-2 and pressing **Enter**.

```
                    TSU TERMINAL INTERFACE

   1 STATUS
   2 TESTS
   3 CONFIG
   4  UTIL




```
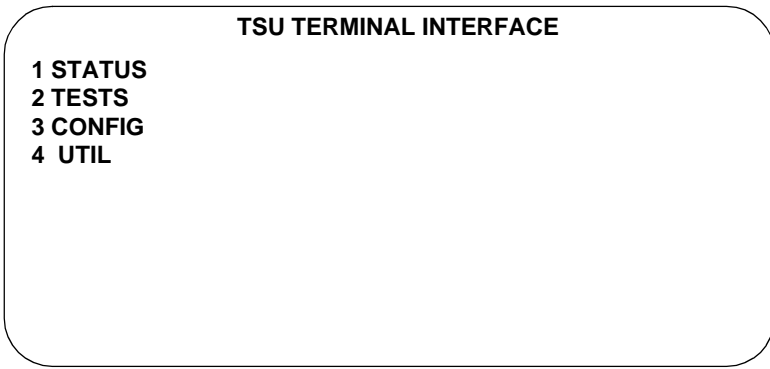
Figure 4-1. Display of Terminal Main Menu

```
1=STATUS       2=TEST

3=CONFIG       4=UTIL
```
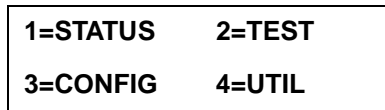
Figure 4-2. Display of DATAMATE Main Menu

CONFIGURATION MENU

The TSU has **8** network options and 11 DTE options. These options are
set from the terminal or **DATAMATE** interface by selecting the **NET-
WORK** or **DTE** options under **CONFIGURATION**.

From the main menu, select **3** and press **Enter**. The individual options
are described following the configuration menus shown in Figure 4-3,
below and Figure 4-4 on page 4-4.

```
                      TSU CONFIGURATION MENU

                                    DTE/OTHER OPTIONS
    NETWORK OPTIONS                 9 RATE(NX56/64)=NX64
    1 FORMAT=ESF                    10 CONT/ALT CHANNELS=CONTIGUOUS
    2  LINE CODE=B8ZS               11 DTE TX CLK=INTRNAL
    3 YELLOW ALARM=ENABLED          12 STARTING CHANNEL=1
                                    13 NUMBER OF CHANNELS=24
    4  XMIT PRM=OFF                 14 DATA OPTION=NORMAL
    5 CLOCK SOURCE=INTERNAL         15 CTS OPTION= NORMAL
    6 BIT STUFFING=DISABLED         16 DCD OPTION=NORMAL
    7  TX LB0=0.0 DB                17 DSR OPTION= NORMAL
    8  RX SENSITIVITY=NORMAL        18 INBAND OPTION=OFF
                                    19 DBU OPTIONS
```

Figure 4-3. Display of Terminal Configuration Menu

		1) FORMAT
		2) LINE CODE
		3) YEL. ALARM
	1)NETWORK OPTIONS	4) XMIT PRM
		5) CLOCK SOURCE
		6) BIT STUFFING
		7) SET LBO
		8) RX SENSITIVITY
CONFIG		1) RATE (Nx56/64)
		2) CONT/ALT CHAN
		3) DTE TX CLK
		4) START CHANNEL
	2) DTE OPTIONS	5) # OF CHANNELS
		6) DATA OPTION
		7) CTS OPTION
		8) DCD OPTION
		9) DSR OPTION
		A) INBAND OPTION
	3) DBU OPTIONS	

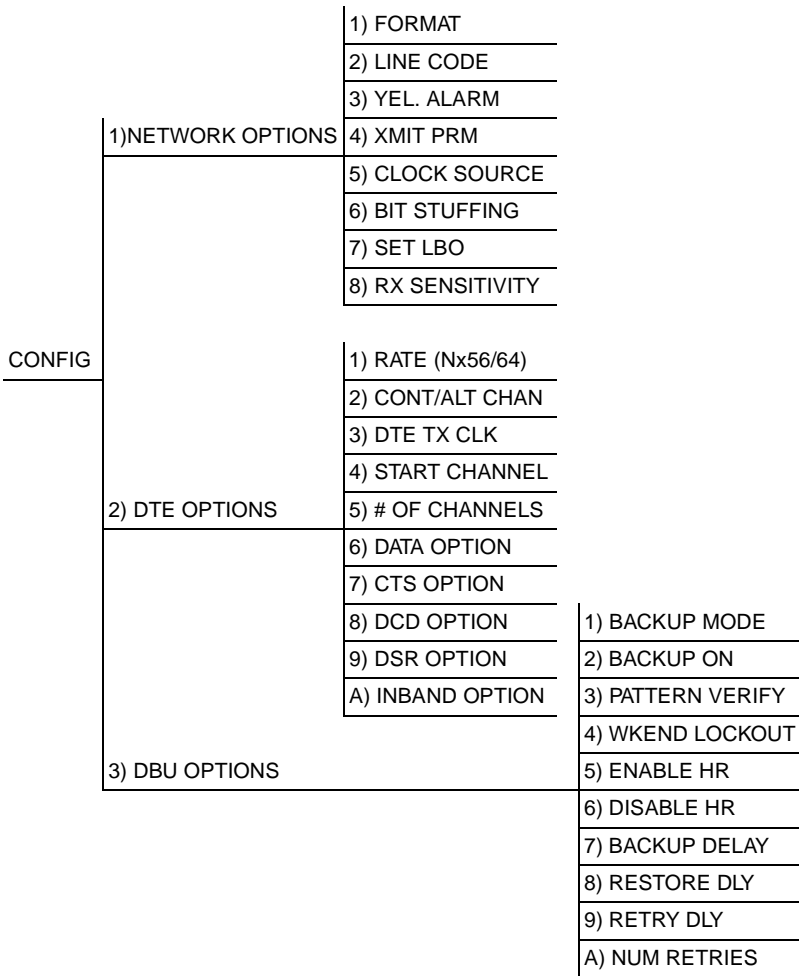|	
1) BACKUP MODE
2) BACKUP ON
3) PATTERN VERIFY
4) WKEND LOCKOUT
5) ENABLE HR
6) DISABLE HR
7) BACKUP DELAY
8) RESTORE DLY
9) RETRY DLY
A) NUM RETRIES

Figure 4-4. DATAMATE Configuration Menu Tree

Network Options

Format

This option selects the framing format for the network interface. Superframe format (SF) and extended superframe format (ESF) are the two choices. ESF provides an out-of-band communications channel that allows the carrier to retrieve performance monitoring data and initiate loopbacks in accordance with ANSI T1.403 and AT&T 54016. If on a public network, this setting must be in accordance with the type of service provided by the carrier.

Line Code

This option selects whether the TSU uses straight AMI line coding or B8ZS. B8ZS ensures `1s`-density requirements on the network by replacing an all `0s` byte with a specific byte containing two intentional bipolar violations (BPVs). If on a public network, this setting must be in accordance with the service provided by the carrier.

Yellow Alarm

This option enables or disables the transmission of yellow alarms by the TSU. When the TSU is in red alarm caused by loss of signal/out of frame conditions (LOS/OOF), a pattern may be sent towards the network to alert the carrier/far end of the red alarm. In D4 format, the yellow alarm is sent in-band and thus corrupts the data in the outgoing direction. Some private network applications may require that the yellow alarm transmission be disabled. If using a carrier-provided T1, enable the yellow alarm.

Transmit Performance Report Message (XMIT PRM)

When this option is enabled, a status update (Performance Report Message) is sent towards the network by the TSU when in ESF mode. This report is sent in accordance with ANSI T1.403 and is a summary of the last four seconds of operation.   Enable this option unless told otherwise by the carrier. The PRM is sent when this option is `ON`.

Clock Source

A master timing source must be defined for proper operation of the T1 link. If the TSU is connected to a carrier-provided T1 line, the clock source should be set to **NETWORK**. If the TSU is part of a private network, the user must option one of the TSUs for **NETWORK TIMING** and the other to internal or **DTE TIMING**. When optioned for **INTERNAL TIMING**, the TSU uses its internal 1.544 MHz clock source. When optioned for DTE, the TSU derives timing from the DTE transmit clock.

Bit Stuffing

Bit stuffing is an option used to ensure pulse density requirements on carrier-provided T1 lines in accordance with ANSI T1. 403 and AT&T 62411. If B8ZS is enabled, Nx56 is optioned, alternate channels are being used, or inverted data (HDLC) is used, the N pulse density requirement is already met and bit stuffing should be disabled. If none of the above options are selected, enable bit stuffing.

> **NOTE**
>
> *Bit stuffing corrupts the user data from the DTE when it fails to meet the 12.5 percent 1s density requirement. If the DTE data do not meet this requirement, enable one of the above options.*

Set Line Build Out

Set Line Build Out (Set LBO) selects the transmit level of the outgoing T1 stream. Attenuation of the T1 signal can be added to avoid overdriving repeaters on the T1 line. On most carrier-provided T1 lines, a smart jack is installed at the network demarcation point and should receive a **0 dB** signal. If there is no smart jack, the auto line build-out feature may be deployed. This feature enables the TSU to base its transmit level on the level of the signal received from the network. If trouble exists with the auto line build-out feature, try each of the selections until achieving reliable operation.

RX Sensitivity

This option selects the desired receiver sensitivity setting. The factory default is **NORMAL**, which is adequate for most applications. The **EXTENDED** setting should be used only in applications where the **NORMAL** setting will not suffice.

DTE/Other Options

Rate (Nx56/64)

This selection chooses whether the DTE data rate is Nx56 or Nx64 kbps, where N = 1 to 24. N corresponds to the number of channels occupied within the T1/FT1 stream.

On Fractional T1 (FT1), the user is billed based on bandwidth (number of channels allocated) so N determines the cost of a circuit. On a private network, the limiting factor for N will be the maximum data rate of the DTE equipment.

On a carrier-provided T1 that does not support B8ZS, Nx56 may be chosen to ensure pulse density requirements and eliminate 1s density restrictions on the DTE data. The trade-off is a 1/8 reduction in bandwidth.

The alternate channels option discussed below may also be used to meet this requirement; however, the carrier must allow it. The maximum number of channels is 12.

Contiguous/Alternate Channels

As mentioned above, the TSU may be optioned to use contiguous or alternate channels within the T1 stream. The **ALTERNATE CHANNELS** option provides another means of meeting pulse density requirements. If the number of channels is no more than 12 and the carrier allows this setting, this option may be the better solution. The **ALTERNATE CHANNELS** option means that every other channel within the T1 (from the starting channel position through the ending channel position) is occupied with DTE data. All other channels will have idle code.

The **Contiguous Channels** option means that the DTE data occupy one
channel after the other (starting at the programmed channel and using
the number of channels chosen).

DTE Transmit (Tx) Clock

This option controls the clock the TSU uses to accept the transmit (TX)
data from the DTE. Most applications will allow for this to be set to
INTERNAL. If the interface cable is long (causing a phase shift in the
data), you can select the clock as **INT/INV** (Internal/Inverted). This
switches the phase of the clock, which should compensate for a long
cable. The factory default setting for this option is **AUTO**.

The **AUTO DTE TX CLK** setting will allow the TSU to automatically
detect the delay from the DTE device to the TSU and set the proper
phase of the clock. This feature will automatically select between the
INTERNAL and **INT-INV** settings. If the DTE provides a clock with TX
data, the clock selection is set to **EXTERNAL**. The TSU will depend on
an externally supplied clock to accept the TX data.

Starting Channel

The DTE data can occupy the T1 stream starting in any of the 24 chan-
nels. For a full T1 link, this value should be one. For a public FT1 link,
this value should correspond to the value specified by the carrier.

Number of Channels (N)

The number of channels used within the T1 stream can be set from 1
to 24. The user bandwidth and DTE data rate are determined by Nx56
kbps or Nx64 kbps, depending upon the rate setting described in
Rate (Nx56/64) on page 4-7.

Data Option

The data option may be set for **NORMAL** or **INVERT**. The **INVERT**
mode provides another method to meet pulse density requirements.
In the **INVERT** mode, data transmitted to or received from the DTE are
inverted before being sent downstream. This option is useful for
HDLC-style DTE protocols since they restrict the number of consecu-

tive 1s transmitted. Inverting HDLC data restricts the number of consecutive zeros transmitted. The data are sent unaltered in the **NORMAL** mode.

CTS Option

This option allows Clear To Send (CTS) to operate normally (Normal) or to be forced **ON** all the time (Forced On). This option should be set in accordance with the DTE requirements. Normal operation is described below.

CTS usually follows RTS. CTS is **OFF** when any of the following conditions exist:

- RTS is not asserted
- TSU is in self-test mode
- TSU is in local loopback
- TSU is sending test pattern
- TSU is receiving yellow alarm in ESF mode.

DCD Option

This option allows **Data Carrier Detect** (DCD) to operate normally (**NORMAL**) or to be forced **ON** all the time (**FORCED ON**). This option should be set in accordance with the DTE requirements. Normal operation is described below.

DCD, also known as Received Line Signal Detector (RLSD), is **ON** when data are being received from the network. DCD is **OFF** when either of the following conditions exist:

- Network signal is out-of-frame
- TSU is sending a test pattern.

DSR Option

This option allows **Data Set Ready** (DSR) to operate normally
(**NORMAL**) or to be forced **ON** all the time (Forced On). This option
should be set in accordance with the DTE requirements. Normal op-
eration is described below.

DSR is OFF if any of the following conditions exist:

• TSU is in self-test mode.
• TSU is in local loopback mode
• TSU is sending test pattern.

Inband Option

The Inband Configuration Channel enables/disables an 8 kbps re-
mote configuration channel. When this option is set to ON, the first
occupied DS0 operates in 56K mode and the DTE clock rate is reduced
by 8 kbps. The TSU uses this 8 kbps channel to send and receive con-
figuration data across a T1 span. This feature is useful when FDL con-
nectivity is not available across the T1 span.

The 8 kbps channel is only taken out of the first DS0. If two 64K DS0s
are mapped, the DTE rate would be 120 kbps instead of 128 kbps. This
menu option can also be set to **AUTO**, which activates the Inband
Channel only when commands are sent from T-Watch to the remote
unit. If no T-Watch activity is detected for 10 minutes, the Inband
Channel is deactivated.

DBU Options

Backup Mode
Configures the TSU to originate or to answer a dial backup
call. You can completely disable dial backup either by select-
ing **DISABLE** or by setting the backup delay to **NEVER**. See
BACKUP DELAY on page 4-11 for details.

Backup On
Sets the dial backup criteria. **NETWORK FAIL** uses conditions such as Red Alarm, Yellow Alarm, and Inband Poll Failure as dial backup criteria. **NET/DATA FAIL** uses a data transition failure in addition to all of the network fail conditions as criteria for dial backup.

Pattern Verify
Establishes the integrity of the dial backup link. When enabled, the DTE DBU generates an alternating ones pattern which can be detected by the far end unit. Once the pattern is detected, backup of the primary network will continue. For proper operation, this option must be enabled on both ends of the dial backup link.

Wkend Lockout
If enabled, no backup will occur from midnight Friday to midnight Sunday.

Enable HR
Sets the beginning of the dial backup window. Dial backup is only allowed between the enable and disable hours. If the enable and disable hours are set to zero, dial backup will be allowed 24 hours a day.

Disable HR
Sets the end of the dial backup window.

Backup Delay
Sets the delay time between the occurrence of a backup condition and the initiation of a dial backup session. Delay times include: 1 sec, 3 sec, 10 sec, 30 sec, 1 min, 5 min, 10 min, Never.

If **NEVER** is selected, the TSU will not go into dial backup mode when a backup condition is present. This is equivalent to disabling the dial backup feature under the **BACKUP MODE** menu.

Restore Dly

Sets the delay time for switching back to the T1/FT1 network after no backup conditions exist. Delay times include: 1 sec, 3 sec, 10 sec, 30 sec, 1 min, 5 min, 10 min, Never.

If **NEVER** is selected, the TSU stays in dial backup even after no backup conditions exist on the primary network. To switch back to the primary network, select **FORCED RESTORE** from the **DBU UTILITIES** menu.

Retry Dly

Sets the delay time between dial backup retries. Delay times include: 1 sec, 3 sec, 10 sec, 30 sec, 1 min, 5 min, 10 min, Never.

Setting the delay to **NEVER** is the same as setting the number of retries to zero.

Num Retries

Sets the number of dial backup retries. Valid range is 1-99.

TEST MENU

The test menus initiate different types of tests and allow the user to view test results. The test menu can be accessed by selecting **2** from either the terminal or the **DATAMATE**. The test menus are shown in Figure 4-5 through Figure 4-**8** followed by a discussion of each test item.

```
                            TSU TEST OPTIONS

 LOCAL TESTS                      REMOTE TESTS
 1 RUN SELF TEST                  4) TEST PATTERN=NO PATTERN
 2 LOCAL LBS=NO LOOPBACK          5) DBU LOOPBACK=DISABLE
 3 REMOTE LBS=NO LOOPBACK         6) INTERFACE TEST=ENABLE
```
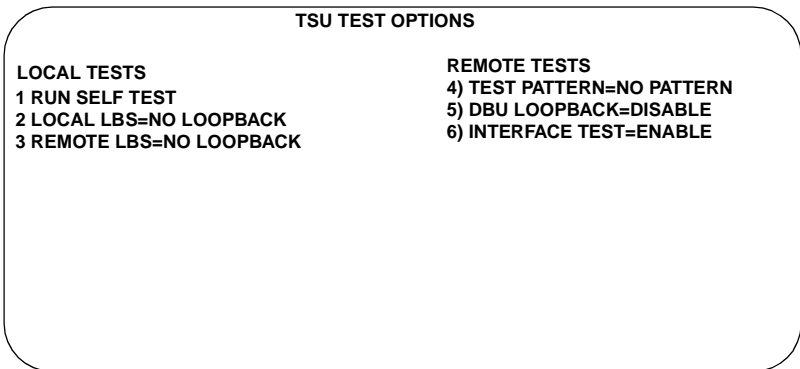
Figure 4-5. Display of Terminal Test Menu

```
                            TSU TEST RESULTS

 PATTERN (511) ERRORS = 102
 1 EXIT TEST
 2 CLEAR ERRORS
```
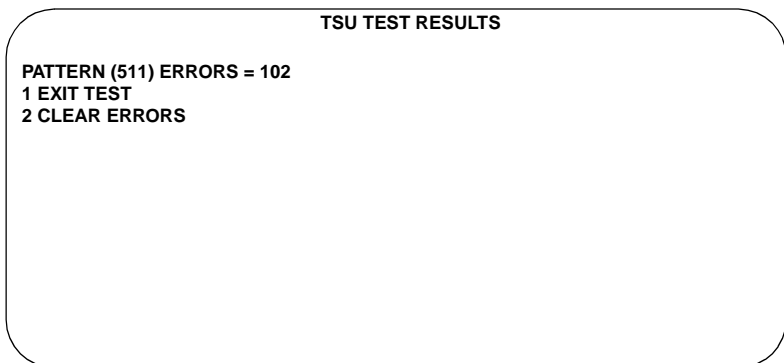
Figure 4-6. Display of Terminal Test Results

		1) RUN SELF TEST	1) NO LOOPBACK
	1) LOCAL UNIT	2) LOCAL LBS	2) PAYLOAD ON
			3) LINE ON
TEST			4) DTE LB ON
			5) DATA LB ON
		1) TEST RESULTS	1) NO PATTERN
	2) REMOTE UNIT	2) TEST PATTERN	2) ALL ONES
			3) ALL ZEROS
			4) 511
			5) 1 IN 8
			6) QRSS
			1) NO LOOPBACK
		3) REMOTE LBS	2) AT&T FDL PLB
			3) ANSI FDL PLB
			4) AT&T INBAND LLB
		1) DBU LOOPBACK	5) ANSI FDL LLB
	3) DBU TESTS	2) INTERFACE TST	6) FT1 LOOPBACK
		3) DBU TST RESULT	

Figure 4-7. DATAMATE Test Menu Tree

CODE VIOL TOTAL
0

Figure 4-8. DATAMATE Test Results Display Example

Local Unit

Run Self-Test

The TSU has an extensive set of self-test functions. When this test is
initiated from the terminal, the TSU branches to the status display
where the self-test results are shown. When this test is initiated from
the **DATAMATE**, the firmware checksum is displayed, followed by the
self-test result. The LEDs on the front of the TSU scroll during self test.

Local Loopbacks

When the TSU is performing a local loopback, it loops the data re-
ceived at one of its interfaces back to transmit data for that interface.
When in line loopback, every bit received at the network interface is
looped back to the network as shown in Figure 4-9.
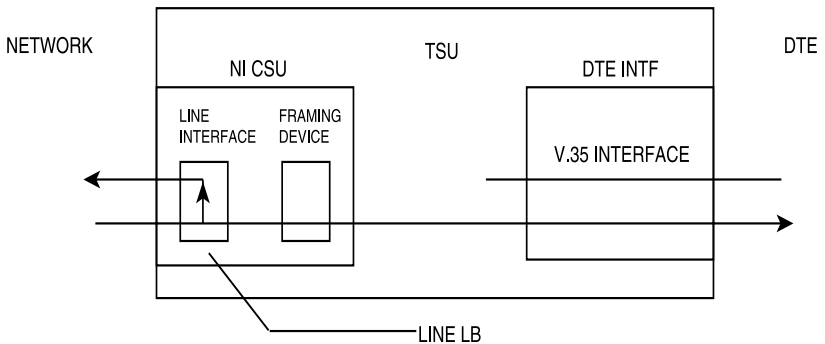
Figure 4-9. Local Line Loopback

For payload loopback, the TSU loops back all the data (payload) bits
within the T1 stream, but regenerates the framing bits as shown in
Figure 4-10.
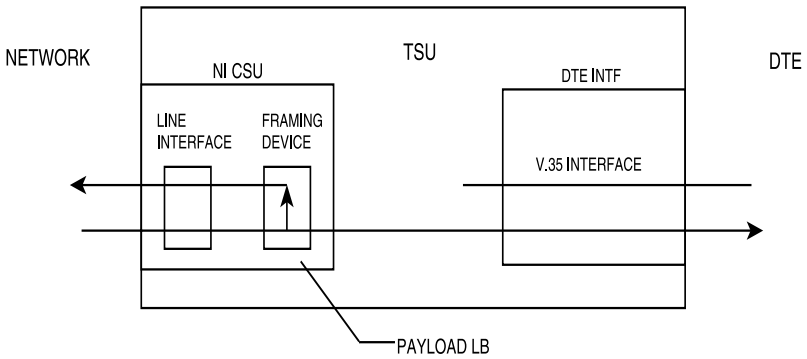
Figure 4-10. Payload Loopback

When in DTE loopback, the TSU loops all the data received at the DTE interface back to the DTE as shown in Figure 4-11.
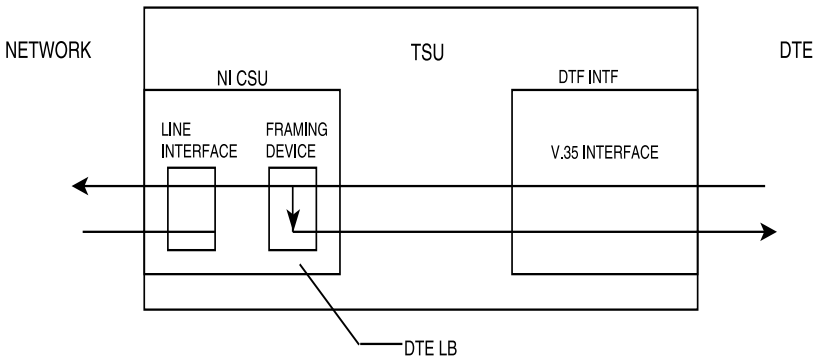
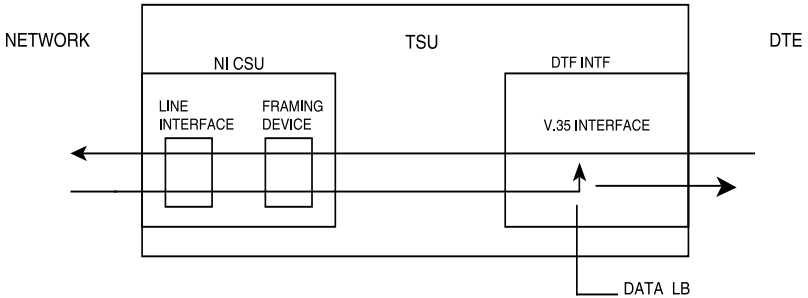**Figure 4-11. Local DTE Loopback**

Figure 4-12.   Data Loopback

When in data loopback the TSU loops back all active channels toward
the network. Data passes through the line interface, framing device,
and FIFOs of the DTE interface. All ones are inserted into the idle
channels.

Remote Unit

Remote Loopbacks

When a remote loopback is chosen, a code is sent towards the network
that is intended to loopback the far end TSU.   These loopbacks will be
either line (LLB) or payload (PLB) as described in **LOCAL LOOPBACKS**
on page 4-15. Some of these codes are sent out-of-band in the ESF Fa-
cility Data Link (FDL - 4 kbps control channel) and some are sent in-
band. The FDL codes only work when the framing bits are actually
transported from one end of the T1 to the other. This type of test is val-
id for full T1 but may not be for FT1. The AT&T inband LLB and the
V.54 inband PLB do not use the FDL, but the AT&T code requires a full
T1 link. For FT1, it is more reliable to use the V.54 INBAND PLB when
the units on both ends support it.

Test Patterns

The TSU can send five different data patterns to the network. These patterns are used for testing the T1 link. The all 1's pattern sends all 1s in every channel of the T1. The all 0's pattern sends all zeros in every channel of the T1. The 1 in 8 pattern sends a fixed pattern where one out of every eight bits is set. This pattern is used to test pulse density requirements, and also occupies all channels of the T1. The 511 and QRSS patterns are pseudo-random patterns sent only in the active DS0s.

When a pattern is started from the terminal, a **TSU REST RESULTS** screen is displayed. If the 511 or QRSS pattern is sent, a count of receive errors is displayed. If any other pattern is sent, a Code Violations (CV) total is displayed. If the pattern is started from the DATAMATE, the Error or CV total is found under the **TEST RESULTS** selection. The Error and CV Totals are cleared upon entering the display.

DBU Tests

DBU Loopback
When enabled, this option loops the DBU's receive to its transmit. Dial backup data is looped back towards the network.

Interface Test
Tests the integrity of the dial backup interface by forcing a dial backup session and then sending an alternating pattern. In order to test both the transmit and receive sides of the interface, the remote DBU must be placed in loopback (TX and RX tied together). Display the test results with the **DBU TEST RESULT** option.

DBU Test Result
This is used in conjunction with the interface test to display the DBU test results. If the alternating pattern is being successfully received across the dial backup link, the DBU error total will read **0**.

STATUS MENU

The status menus of the DATAMATE and terminal allow errors and alarms to be viewed and error/alarm histories to be cleared. If an alarm occurs after power-up or after the history registers were last cleared, the history registers are set again. Current errors/alarms reflect only the current status. The different errors and alarms were discussed in the Front Panel section of Chapter 2. The terminal Status menus and the DATAMATE Status tree are shown in Figure 4-13 through Figure 4-17.

```
                          TSU STATUS

  1 CLEAR HISTORY
  2 DISPLAY STATUS
  3 LOCAL PERFORMANCE
  4 REMOTE PERFORMANCE
  5) DBU STATUS
```
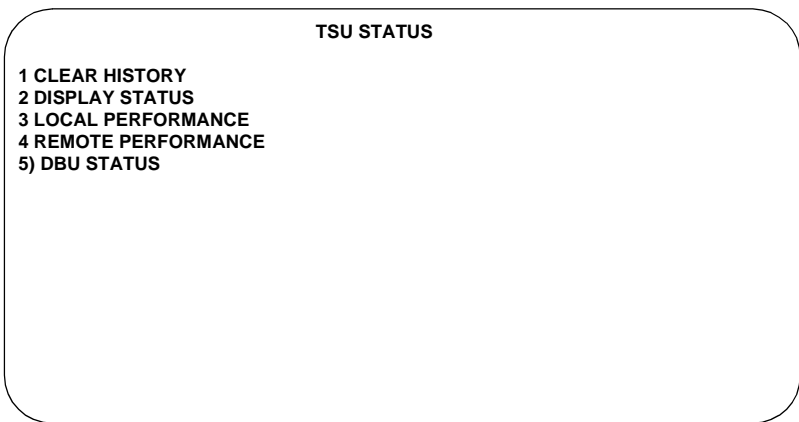
Figure 4-13. Display of Terminal Status Selection Menu

```
                        TSU STATUS DISPLAY

CURRENT ERRORS/ALARMS/RESULTS          HISTORY ERRORS/ALARMS
 RX LOS= YES                            RX LOS = YES
 RX AIS= NO                             RX ASI = YES
 RX OOF = YES                           RX OOF= YES
 RX YELLOW = NO                         RX YELLOW = YES
 RX RED= YES                            RX RED= YES
 RX CVS = NO                            RX CVS = YES
 RX BPVS = NO                           RX BPVS = YES
 RX FRM ERRS = NO                       RX FRM ERRS = YES
 PLL ALARM = NO                         PLL ALARM = YES
 SELF TEST = PASS
 SOFTWARE REV = REVISION E
 CHECKSUM = E203
```

Figure 4-14. Terminal Status Display Example

```
                        DBU STATUS

DCD=NO                        DBU SECONDS=0
DTR=NO                        IN DBU=NO
DSR=NO
RTS=NO
CTS=NO
RI=NO
```

Figure 4-15.   Display of Terminal DBU Status

		RX LOS	
		RX ALS	
		RX OOF	
		RX YELLOW	
		RX RED	
		RX CVS	
	1) CLEAR HISTORY	RX BPVS	
	2) CURR ERR/ALM	RX FRM ERRS	
	3) ERR/ALM HIST	PLL ALARM	
STATUS	4) RESET LOC PERF		DCD
	5) VIEW LOC PERF	ES	DTR
	6) RESET REM PERF	SES	DSR
	7) VIEW REM PERF	UAS	RTS
		%AV	CTS
		%EF	RI
	8) DBU STATUS		DBU SECS
			IN DBU

Figure 4-16. DATAMATE Status Menu Tree

(*YES, -NO)

NI RX AIS *

Figure 4-17. DATAMATE Status Display Example

Status Display Explanation

Status Displays

- NI means **Network Interface**
- TI means **Terminal** or **DTE Interface**

DATAMATE Status

- The first line indicates that an asterisk **(*)** means **Yes** and a dash **(-)** means **No**.
- The second line lists the applicable interface alarm in question.
- The last field shows the state of **error/alarm**.

Performance monitoring statistics for either the local or remote TSU can be viewed on the DATAMATE or displayed on a CRT screen through the terminal interface for the SMART16 shelf.

The parameters available in the perfomance monitoring reports are:

%AV	percent available seconds
%EF	percent error-free seconds
ES	errored seconds
UAS	unavailable seconds
SES	severely errored seconds
BES	bursty errored seconds
LOFC	loss of frame count

With the DATAMATE, statistics for the local TSU are viewed by selecting **VIEW LOC PERF** in the **Status** menu (shown in Figure 4-16 on page 4-21). Statistics for the remote TSU are viewed by selecting **VIEW REM PERF** from this menu. A sample DATAMATE performance monitoring display is shown in Figure 4-18 on page 4-24.

The performance parameter plus the 15-minute and 24-hour totals for the selected parameter are shown on the second line of the display under their respective legends.

Other performance parameters are displayed by using the arrow keys to cycle the display through the complete list of the available parameters.

The statistics for the local TSU can be cleared by selecting **RESET LOC PERF** from the menu shown in Figure 4-16 on page 4-21.

The statistics for the remote TSU can be cleared by selecting **RESET REM PERF** from this menu.

For the terminal interface, the performance monitoring menu for the local TSU is displayed by selecting **LOCAL PERFORMANCE** in the **Status** menu shown in Figure 4-13 on page 4-19, while the performance monitoring menu for the remote TSU is accessed by selecting **REMOTE PERFORMANCE** from the menu.

The performance monitoring menu for the local TSU is shown in Figure 4-19 on page 4-24. The only difference between this menu and the menu for the remote TSU is the first line of the display, which denotes remote performance monitoring instead of local performance monitoring.

Both a performance summary and detailed report are available with the terminal interface. The performance summary report shows statistics for the current 15-minute interval, the 24-hour totals, the number of valid 15-minute intervals, and the seconds into the current 15-minute interval.

A performance summary report is shown in Figure 4-20 on page 4-24. The detailed report provides a 24-hour history of any one of the available parameters. One hour totals for the last 24-hours are displayed for the selected parameter as shown in Figure 4-21 on page 4-25.

NOTE   *The remote performance statistics are available only when the network interface framing format is optioned for ESF.*

```
┌─────────────────┐
│  ES 15/24 HR    │
│                 │
│     10/20       │
└─────────────────┘
```

Figure 4-18. DATAMATE Performance Monitoring Display

TSU LOCAL PERFORMANCE MONITORING

1 CLR LOCAL PERF
2 PERFORMANCE SUMMARY
3 24 HOUR ES REPORT
4 24 HOUR UAS REPORT
5 24 HOUR SES REPORT
6 24 HOUR BES REPORT
7 24 HOUR LOFC REPORT

Figure 4-19. Terminal Performance Monitoring Selection

TSU LOCAL PERFORMANCE SUMMARY

VALID INTERNALS = 21
CURRENT SECONDS = 334
CURRENT %AV = 0.3
        %EF = 0.3
         ES = 0
         UAS = 333
         SES = 0
         BES = 0
         LOFC = 0
24 HOUR %AV = 60.7
        %EF = 40.5
         ES = 42
         WAS =7426
         SES = 39
         BES = 3
         LOFC = 2

Figure 4-20. Terminal Performance Summary

TSU LOCAL ES

INTERVAL (HR)	TOTAL	INTERVAL (HR)	TOTAL
1	0	13	0
2	0	14	0
3	10	15	0
4	32	16	0
5	0	17	0
6	0	18	0
7	0	19	0
8	0	20	0
9	0	21	0
10	0	22	0
11	0	23	0
12	0	24	0

Figure 4-21. Terminal Detailed Report Example

UTILITY MENU

The Utility menu displays and sets system parameters (see Figure 4-23). This includes setting the time and date, and resetting all parameters to factory values and forced DBU options. This menu also displays the unit's software revision and checksum. The Terminal Utility Menu and the DATAMATE status tree are shown in Figure 4-22 and Figure 4-23.

```
                          TSU UTILITIES

   1) FACTORY RESTORE
   2) DIAL BACKUP=FORCED RESTORE
   3) TIME/DATE
```
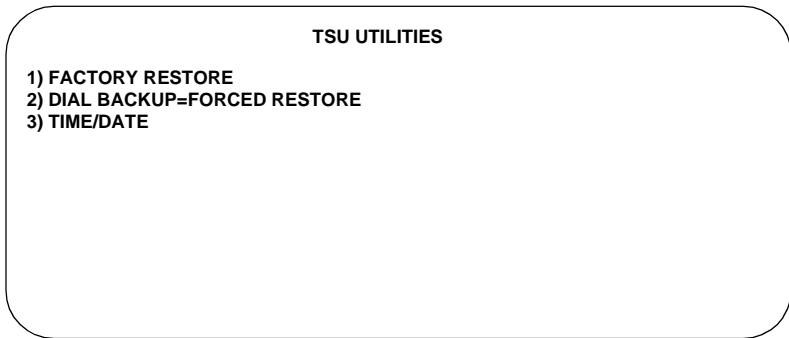
Figure 4-22. Terminal Utility Menu Tree
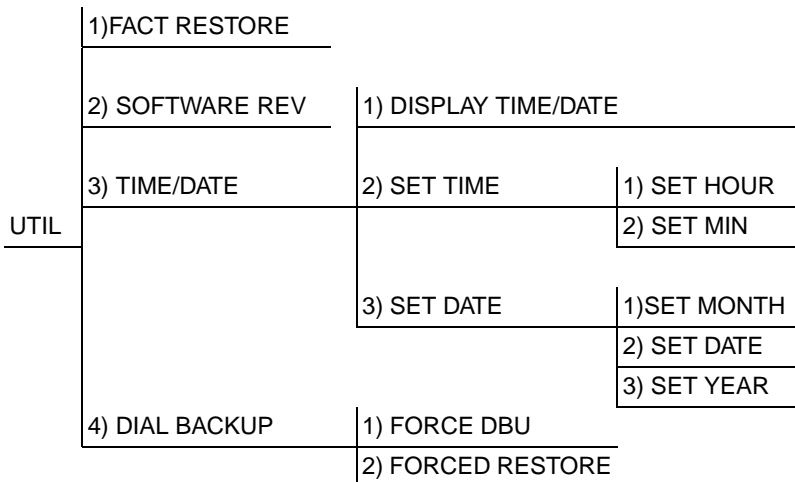
Figure 4-23. DATAMATE Utility Menu Tree

Factory Restore

Fact Restore resets all the configuration options to factory preset values. These values are listed in Table 4-1 and Table 4-2.

Table 4-1. Network Factory Defaults

OPTION	SETTING
FORMAT	ESF
LINE CODE	B8ZS
YELLOW ALARM	ENABLED
XMIT PRM	OFF
CLOCK SOURCE	NETWORK
BIT STUFFING	DISABLED
TX LBO	0.0 dB
RX SENSITIVITY	NORMAL

Table 4-2. DTE Factory Defaults

OPTION	SETTING
RATE (NX56/64)	Nx64
CONT/ALT CHANNELS	CONTIGUOUS
DTE TX CLK	INTERNAL
STARTING CHANNEL	1
NUMBER OF CHANNELS	24
DATA OPTION	NORMAL
CTS OPTION	NORMAL
DCD OPTION	NORMAL
DSR OPTION	NORMAL
INBAND OPTION	OFF

Software Rev

Use the Software Revision submenu to access the display of the current software revision level and its checksum. This information is required when requesting assistance from ADTRAN Customer and Products Service or when updates are needed.

Time/Date

This menu option is used to view or to edit the current time and date. The time and date are maintained during power off conditions.

From Datamate
To display the current time and date:

1. Select **DISPLAY TIME/DATE**.
2. To edit time and date, select **SET TIME** or **SET DATE**.
3. Enter the desired minute, hour, month, date, or year and press **Enter**.

From Terminal
To display and edit the current time and date:

1. Select **TIME/DATE** from the Utilities menu.
2. Select either the time or date and press **Enter**.
3. Enter the desired hour, minute, month, date, or year and press **Enter**.

Dial Backup (DBU) Utilities

Use the dial backup utilities menu to force a dial backup call or hang up a dial backup call.

Force DBU

Choosing this option causes the unit to initiate a dial backup call. **BACKUP MODE** must be set to **ORIGINATE** and the dial backup call will be terminated after the amount of time specified in **RESTORE DELAY** has elapsed.

Forced Restore

Select this option to drop the DBU call and restore the T1/FT1 link.

Appendix A Specifications

Network Interface	DS1 interface per AT&T 62411 and ANSI T1.403
Framing Format	D4 (SF) or ESF
Line Code	AMI or B8ZS
TX LBO	Auto or Manual from 0.0 dB to -22.5 dB
Performance Monitoring	As per ANSI T1.403 and AT&T 54016
DTE Interface	V.35 synchronous
DTE Data Rates	Nx56 or Nx64 kbps (N = 1 to 24)
Channel Allocation	Alternate or Contiguous
Starting Channel	Programmable
Timing Sources	Network, Internal, or DTE master
Data Option	Normal or Inverted data (Inverted HDLC)

Index

Product Support Information

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-Sales 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 theCustomer 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, Inc.
> CAPS Department
> 6767 Old Madison Pike
> Progress Center
> Building #6, Suite 690
> Huntsville, AL 35807

> RMA # _____