



TSU RM with EIA-530

**RACKMOUNT
T1 DATA SERVICE UNIT
with EIA-530**

USER MANUAL



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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. On the rear of the faceplate is a label that contains, among other information, the FCC registration number for this equipment. If requested, provide this information to your telephone company.
2. If your telephone equipment (TSU) causes harm to the telephone network, the Telephone Company may discontinue your service temporarily. If possible, they will notify you in advance. But if advance notice isn't 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 this equipment (TSU), please contact ADTRAN (see *Customer Service and Warranty Information* on the inside back cover of this manual) 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 are 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 RJ-45 network connector is an RJ-48C interface which is registered under Part 68 FCC rules. Part 68 FCC rules do not recognize the DB-15 network connector.
8. The following information may be required when applying to your local telephone company for leased line facilities.

Service Type	Digital Facility Interface Code	Service Order Code	Network Jacks
1.544 Mbps Digital Interface SF	04DU9-B	6.0F	RJ48C
1.544 Mbps Digital Interface ESF	04DU9-C	6.0F	RJ48C
1.544 Mbps Digital Interface ESF with B8ZS	04DU9-C	6.0F	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.



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 numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Class A prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques," NMB-003 édictée par le ministre des Communications.

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Chapter 1

Introduction

GENERAL DESCRIPTION

The ADTRAN T1 Data Service Unit (TSU) in either the stand alone 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 an EIA-530 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 alternate mark inversion (AMI) or binary 8 zero substitution (B8ZS). In the case of a fractional connection, the unused channels of the T1 are filled with all 1s idle code.

Chapter 2

Physical Description

The TSU RM is composed of two cards. The first is the TSU main card which has a front panel with eight LED indicators. The second card is the TSU interface card 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 eight LED indicators that provide DTE interface, network, and test status. These indicators are shown in Figure 2-1.

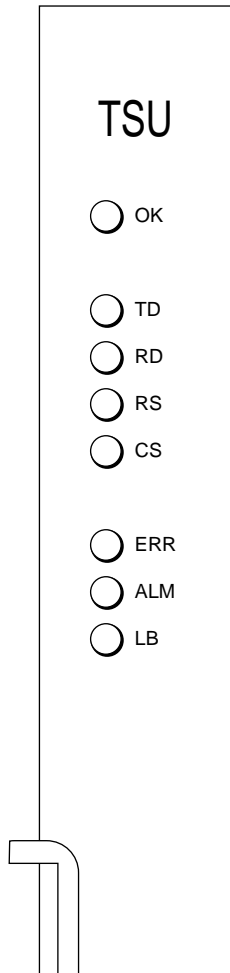


Figure 2-1
TSU Front Panel

OK Status (green)

OK 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 Transmit data from the DTE

RD Receive 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 listed in Table 2-A is active.

Table 2-A
Alarm Conditions

ALARM	DESCRIPTION
LOS	Loss of signal at NI
AIS	Alarm indicator signal (All Ones) 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 status of the unit. If the TSU is in line loopback, payload loopback, or DTE loopback, the LB LED is *On*.

REAR PANEL

The TSU rear panel is shown in Figure 2-2. The DB25 connector labeled **EIA 530** provides the synchronous DTE interface. Connection to the T1/FT1 network is made through the eight-pin modular jack labeled **NET RJ45** or the male DB15 connector labeled **NET DB-15**. The pin assignments for these connectors are described in section *Network and DTE Connections* of chapter *Installation*. The three **TEST JACKS** are Bantam connectors that are used when troubleshooting the T1 link. The **MON** (monitor) jack is resistively isolated from the **IN** jack and may be used during normal operation of the T1 line. 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** or **NET DB-15** jacks are bypassed. The **IN** jack receives data from a test set into the TSU. The **OUT** jack transmits data out of the TSU and into a test set.

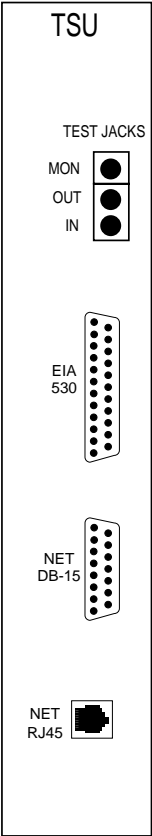


Figure 2-2
TSU Rear Panel

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 Service (see *Customer Service and Warranty Information* on the inside back cover). 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-A for the pinout of the Network RJ-45 connector.

Connector type = (USOC) RJ48C

Table 3-A
Network RJ-45 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	

There is a DB-15 connector labeled NET DB-15 on the rear of the TSU. This connector can be used instead of the RJ-45 jack for connection to the network. See Figure 3-1 for the pinout of the DB-15 network connector.

Connector type = DB-15, male

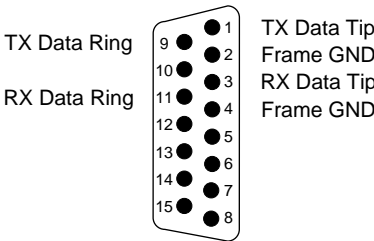


Figure 3-1
NET DB-15 Pinout

DTE Connections

A DB-25 connector, labeled EIA 530 and located on the rear of the interface board, is used for connection to the DTE. Figure 3-2 shows the pinout for this connector.

Connector type = DB-25
P/N = AMP # 747846-4

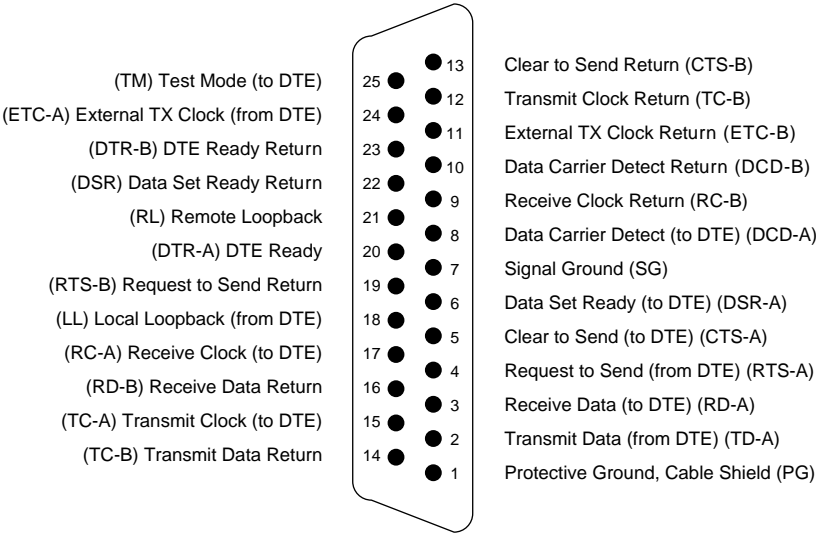


Figure 3-2
EIA-530 Pinout

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.

MENU STRUCTURES

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 Figures 4-1 and 4-2 and pressing **Enter**.

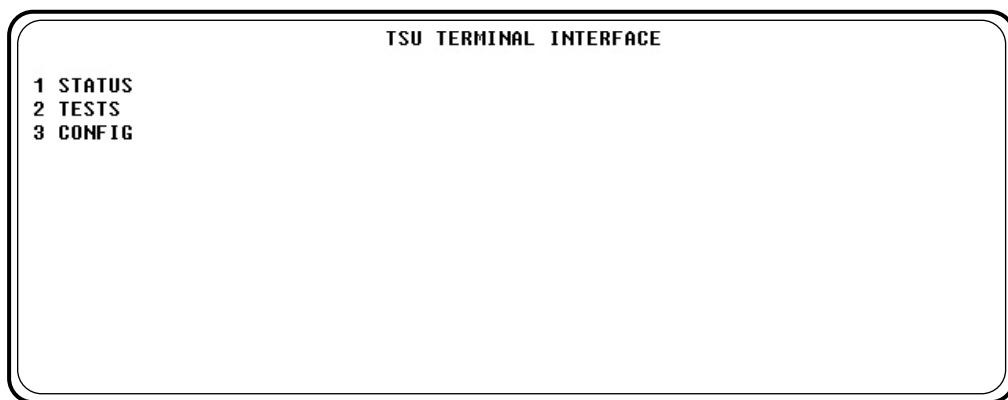


Figure 4-1

Display of Terminal Main Menu

1=STATUS 2=TEST
3=CONFIG

Figure 4-2

Display of DATAMATE Main Menu

CONFIGURATION

The TSU has seven network options and nine DTE options. These options are set from the terminal or DATAMATE interface by selecting the Network or DTE options under Configuration. From the main menu shown in Figure 4-1, select **Config** and then press **Enter**. The individual options are described following the configuration menus shown in Figures 4-3 and 4-4.

TSU CONFIGURATION MENU	
NETWORK OPTIONS	DTE/OTHER OPTIONS
1 FORMAT=ESF	8 RATE(Nx56/64)=Nx64
2 LINE CODE=B8ZS	9 CONT/ALT CHANNELS=CONTIGUOUS
3 YELLOW ALARM=ENABLED	10 DTE TX CLK=INTERNAL
4 XMIT PRM=OFF	11 STARTING CHANNEL=1
5 CLOCK SOURCE=INTERNAL	12 NUMBER OF CHANNELS=24
6 BIT STUFFING=DISABLED	13 DATA OPTION=NORMAL
7 TX LBO=0.0 dB	14 CTS OPTION=NORMAL
	15 DCD OPTION=NORMAL
	16 DSR OPTION=NORMAL
	17 FACTORY RESTORE

Figure 4-3
Display of Terminal Configuration Menu

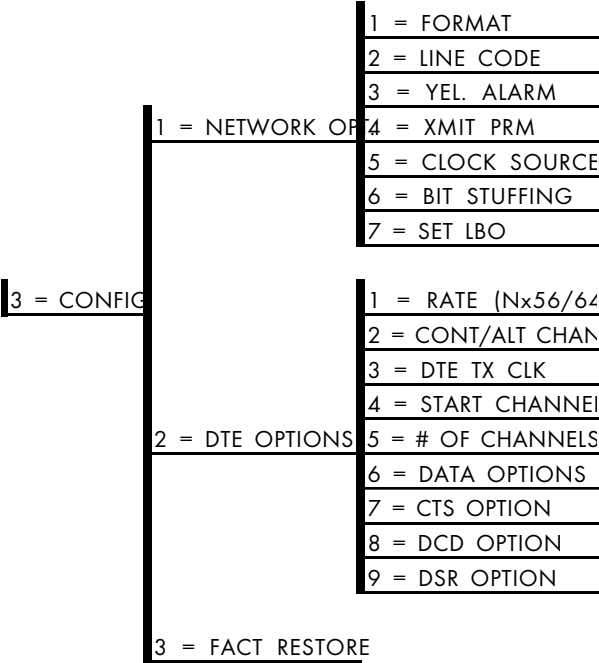


Figure 4-4
DATAMATE Configuration Menu Tree

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. When using a public network, the framing format must be compatible with the carrier-provided service.

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). When using a public network, the line code must be compatible with the carrier-provided service.

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

A Transmit Performance Report Message (XmitPRM) is a status update 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 for 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 timing, 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.



Bit stuffing corrupts the user data from the DTE when they fail to meet the 12.5% 1s density requirement. If the DTE data do not meet this requirement, enable one of the above options.

Transmit Line Build Out

Transmit Line Build Out (Tx 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.

DTE 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 and the maximum number of channels is 12.

Contiguous/Alternate Channels

As mentioned in *Rate (Nx56/64)*, 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 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 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

The data transmitted from the DTE may be clocked into the TSU using the clock provided by the TSU (Internal), the clock generated by the DTE (External), or an inverted version of the clock provided by the TSU (INT-INV). The last option overcomes propagation delays due to long DTE cables and the internal circuitry of the DTE.

Starting Channel

The DTE data can occupy the T1 stream starting in any of the 24 channels. 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 $N \times 56$ kbps or $N \times 64$ kbps, depending upon the Rate setting described in *Rate (Nx56/64)*.

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 high level data link control (HDLC)-style DTE protocols since they restrict the number of consecutive 1s transmitted. Inverting HDLC data restricts the number of consecutive 0s transmitted. The data are sent unaltered in the Normal mode.

CTS Option

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

The CTS signal is usually active after the RTS signal, depending on the DTE requirements. CTS is *Normal* when any of the following conditions exists:

- RTS is not asserted
- TSU is in self test
- 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 active 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 active when data are being received from the network. DCD is *Normal* when either of the following conditions exists:

- 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 active all the time (*Forced On*). This option should be set in accordance with the DTE requirements. Normal operation is described below.

DSR is *Normal* if any of the following conditions exists:

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

Factory Restore

This selection resets all the configuration options to the factory preset values. These values are listed in Tables 4-A and 4-B.

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

Table 4-A
Network Factory Defaults

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

Table 4-B
DTE Factory Defaults

TESTS

The two 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 DATAMATE. The test menus are shown in Figures 4-5 through 4-8 followed by a discussion of each test item.

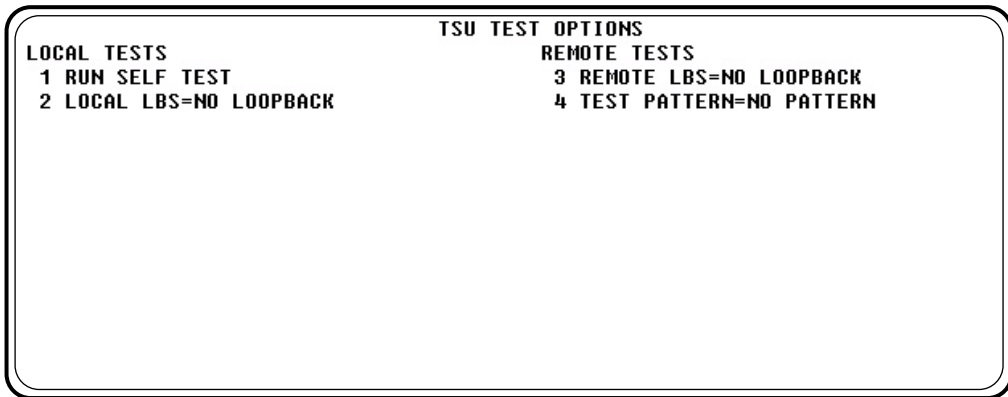


Figure 4-5
Display of Terminal Test Menu

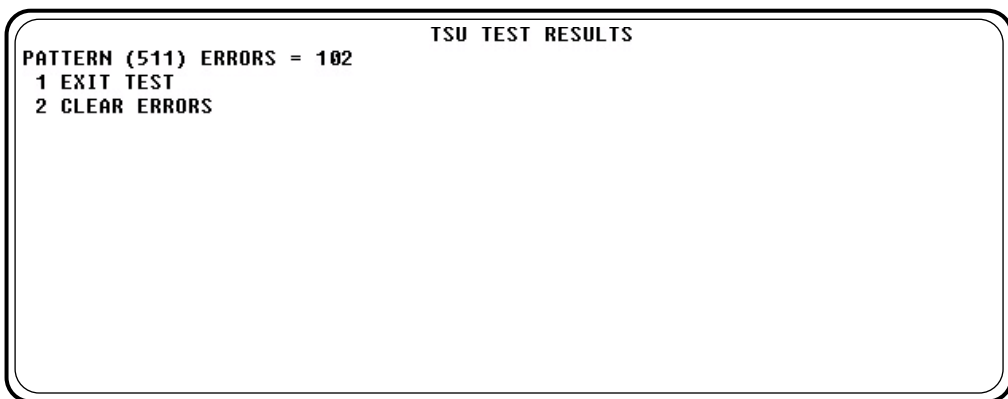


Figure 4-6
Display of Terminal Test Results

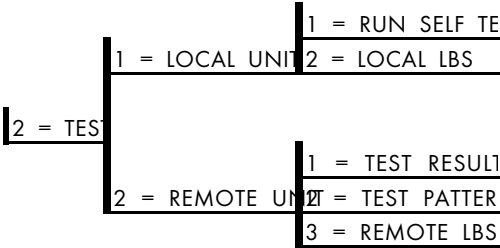


Figure 4-7
DATAMATE Test Menu Tree

CODE VIOL TOTAL
0

Figure 4-8
Display of DATAMATE Test Results

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 received 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.

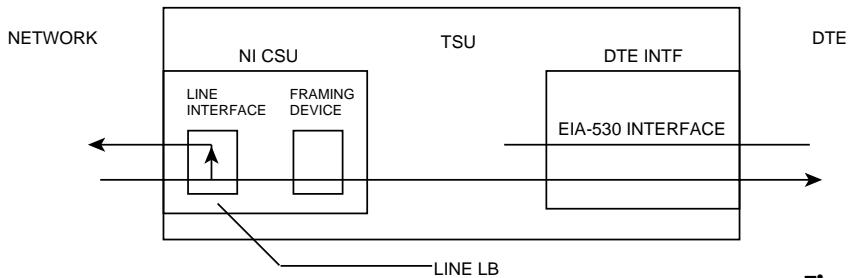


Figure 4-9
Local Line Loopback

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.

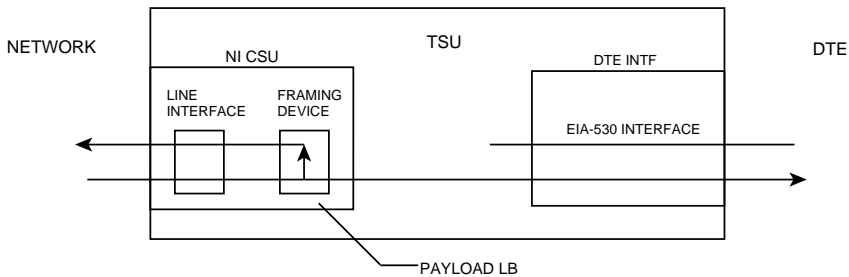


Figure 4-10
Payload Loopback

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.

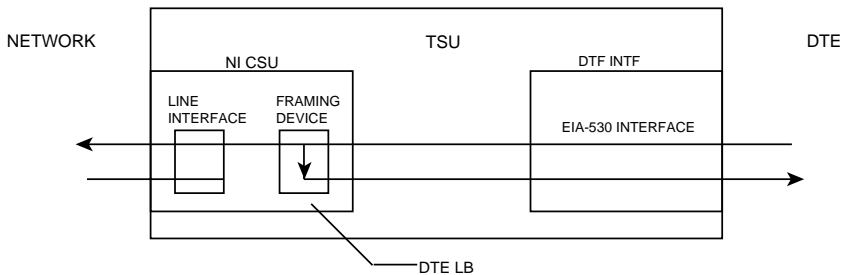


Figure 4-11
Local DTE Loopback

Remote Loopbacks

When a remote loopback is initiated, 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 section *Local Loopbacks* of this chapter. Some of these codes are sent out-of-band in the ESF Facility 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 valid for full T1 but may not be for FT1. The AT&T in-band LLB and the V.54 In-band 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 four different data patterns to the network. These patterns are used for testing the T1 link. The All Ones pattern sends all 1s in every channel of the T1. The 3 in 24 pattern sends a fixed pattern with three 1s and 21 zeros. This pattern is used to test pulse density requirements. This pattern also occupies all channels of the T1. The 511 pattern is a pseudo-random data pattern only sent to the channels programmed for the DTE data. The 1 in 8 pattern is similar to the 3 in 24 pattern except that one out of every eight bits is set. When a pattern is started from the terminal, a TSU Test Results screen is displayed. If the 511 pattern is sent, a count of receive errors is displayed. If a 511 pattern is not 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 when entering the display.

STATUS

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 section *Front Panel* of chapter *Physical Description*. The terminal Status menus and the DATAMATE Status tree are shown in Figures 4-12 through 4-15.

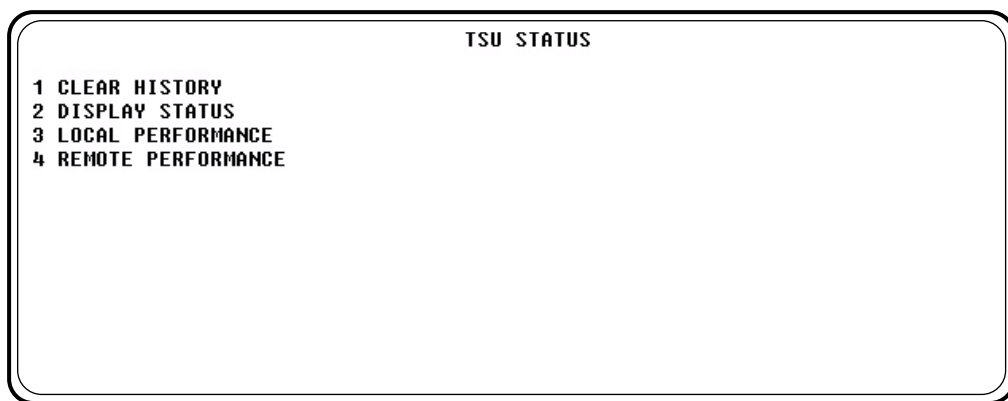


Figure 4-12

Display of Terminal Status Selection Menu

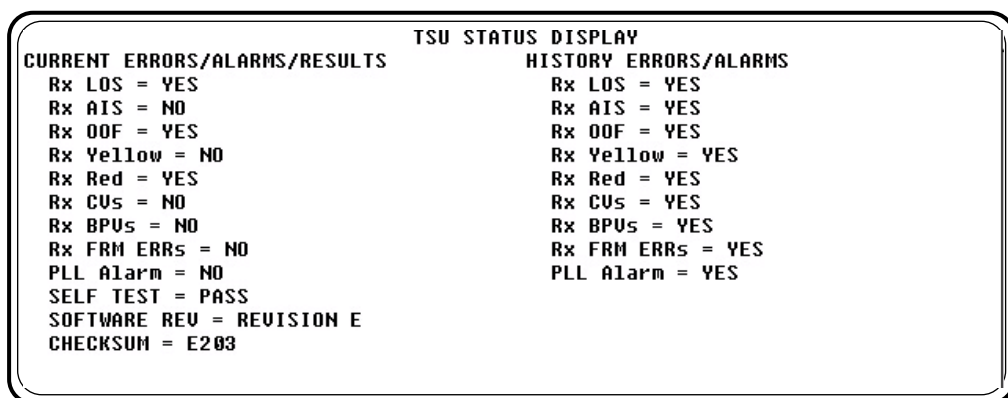


Figure 4-13

Terminal Status Display Example

	1 = CLEAR HISTORY
	2 = CURR ERR/ALM
	3 = ERR/ALM HIST
1 = STATUS	4 = RESET LOC PERF
	5 = VIEW LOC PERF
	6 = RESET REM PERF
	7 = VIEW REM PERF

Figure 4-14*DATAMATE Status Menu Tree*

(* YES,-NO)
 NI RX AIS *

Figure 4-15*DATAMATE Status Display Example*

In the status displays above, NI means network interface and TI means terminal or DTE interface. In the DATAMATE status display example above, 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 is the state of the error/alarm.*

Performance Monitoring statistics for either the local or the remote TSU can be viewed on the DATAMATE or displayed on a CRT screen through the terminal interface for the SMART 16 shelf.

The parameters available in the performance 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 4-14). 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 4-16. 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 LOCAL PERF from the menu shown in Figure 4-14, and 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 4-12 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 4-17. 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 detail 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 4-18. 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 4-19.



NOTE

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

ES 15/24 HR
10/20

Figure 4-16

DATAMATE Performance Monitoring Display Example

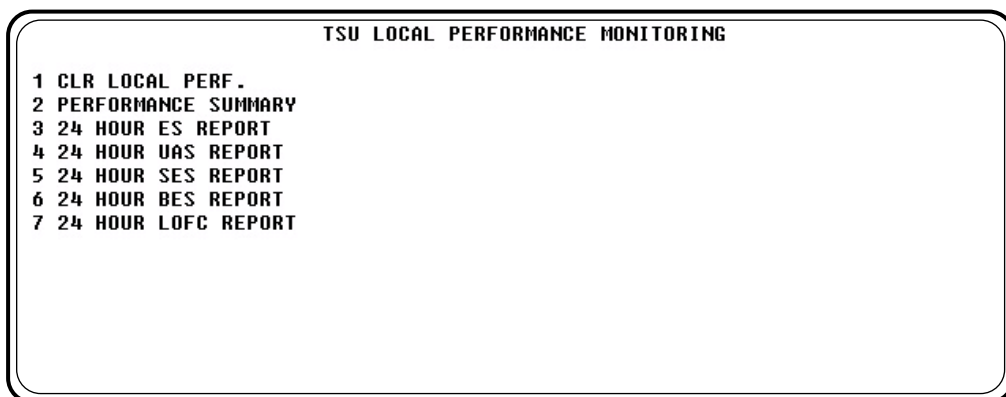


Figure 4-17

Display of Terminal Performance Monitoring Selection

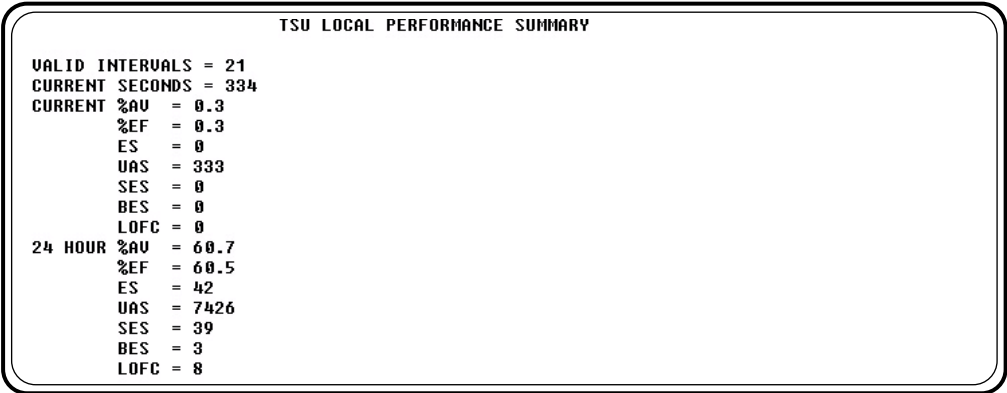


Figure 4-18

Display of Terminal Performance Summary

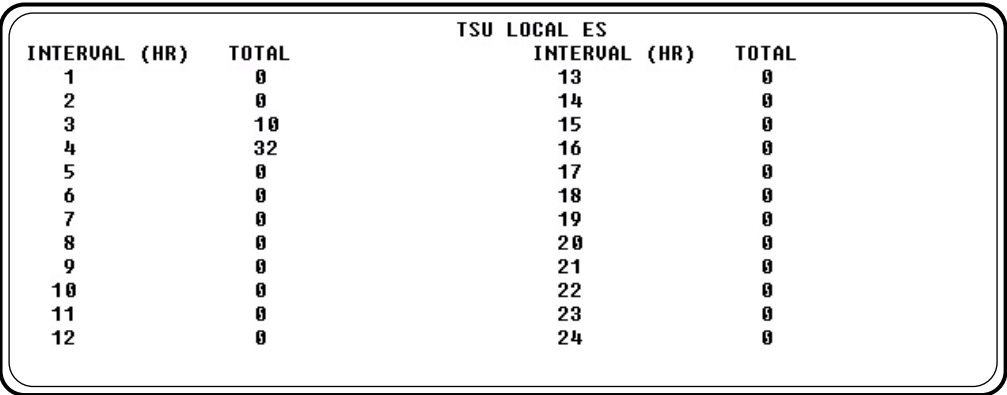


Figure 4-19

Terminal Detailed Report Example

Chapter 5

Specification Summary

SPECIFICATIONS AND FEATURES

The following pages describe the features and specifications in the TSU RM.

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

EIA-530

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)

Diagnostics

- Self Test
- Local Loopbacks
- Remote Loopbacks
- Test Patterns

Power

+5 V @ 350 mA

-5 V @ 45 mA

+12 V @ 15 mA

-12 V @ 15 mA

Environment

- Temperature
 - Operating 0°C to 50°C
(32°F to 122°F)
 - Storage -20°C to 70°C
(-4°F to 158°F)
- Relative Humidity: up to 95% non-condensing

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3 in 24 pattern 27
511 pattern 27

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ALM 5
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